Tucson Electric Power Company
Sahuarita-Nogales Transmission Line
Final Environmental Impact Statement

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Abstract: A DOE Presidential Permit is required before anyone can construct, connect, operate, and maintain an electric transmission line across the U.S. border. On August 17, 2000, TEP applied to DOE/FE for a Presidential Permit to construct a double-circuit 345,000 volt (345-kV) electric transmission line to transmit 500 MW of electricity. The transmission line would begin south of Tucson, Arizona, in the vicinity of Sahuarita, cross the U.S.-Mexico border near Nogales, Arizona, and continue into Mexico. TEP anticipates using 400 MW of capability for transport of energy between the United States and Mexico. The proposed transmission line would also provide a redundant path for the energy that is currently transmitted over an existing 115-kV transmission line from Tucson to Nogales. The local Nogales utility, Citizens Communications, has committed to the purchase of 100 MW of transmission capacity to allow for future load growth.

The issuance of a Presidential Permit for this project would constitute a major Federal action within the meaning of the *National Environmental Policy Act*. Because the proposed transmission line would traverse lands managed by the BLM and the USFS, both the BLM and the USFS are cooperating agencies for this EIS. Additionally, because TEP would undertake construction at the international border, concurrence from the U.S. Section, International Boundary and Water Commission is required.

Three alternative transmission line corridors (the Western Corridor, Central Corridor, and Crossover Corridor) are analyzed in this EIS, as well as the "No Action" alternative. The Notice of Availability of the Draft EIS was published by the Environmental Protection Agency in the *Federal Register* on August 22, 2003 (68 FR 50768), which initiated a minimum 45-day comment period that ended on October 14, 2003. Volume II of this EIS contains transcripts from the public hearings, copies of all comments received, and the Federal agencies' responses. To the extent feasible, changes in the Final EIS are indicated by a double underline (for minor changes) and by a sidebar in the margin (for larger changes). The Final EIS will be used by DOE and the Federal agency officials to ensure that they have the information needed for informed decision- making. The decisions themselves will be issued subsequent to the Final EIS, in the form of a Record of Decision for each agency, or as a letter of concurrence.

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INTRODUCTION

1.1 BACKGROUND

This Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Environmental Impact Statement (EIS) assesses the potential environmental impacts associated with constructing and operating a 345,000-volt (345-kV) electric transmission line across the United States (U.S.)-Mexico border. As explained below, the proposed action involves the following Federal entities: the U.S. Department of Energy (DOE); the U.S. Department of Agriculture, U. S. Forest Service (USFS); the U.S. Department of the Interior, Bureau of Land Management (BLM); and the U.S. Section, International Boundary and Water Commission (USIBWC) [hereafter, the Federal entities will be collectively termed the "Federal agencies" in this EIS.] This Final EIS reflects changes made to the Draft EIS. Changes are indicated by a double underline for minor changes and a sidebar in the margin for larger changes.

Under Executive Order (EO) 10485 (September 3, 1953), as amended by EO 12038 (February 3, 1978), no one may construct, connect, operate, or maintain facilities at the U.S. international border for the transmission of electric energy between the United States and a foreign country without first obtaining a Presidential Permit from the DOE. On August 17, 2000, TEP applied to DOE for a Presidential Permit to construct, connect, operate, and maintain a double-circuit, 345-kV alternating current (AC) electric transmission line across the U.S.-Mexico border. DOE determined that issuing a Presidential Permit to TEP for the proposed project would constitute a major Federal action that may have a significant impact on the environment within the meaning of the *National Environmental Policy Act* (NEPA), 42 United States Code (U.S.C.) §§ 4321 et seq. For this reason, DOE has prepared this EIS to evaluate potential environmental impacts from the proposed Federal action (granting a Presidential Permit for the proposed transmission facilities) and reasonable alternatives, including the No Action Alternative.

TEP's proposed transmission line would cross private land, state of Arizona land, up to 30 miles (48.3 km) of the Coronado National Forest administered by the USFS, approximately 1.25 mi (2.0 km) of Federal lands administered by BLM, and the international border. Therefore, in addition to the issuance of a Presidential Permit by DOE, the USFS, BLM, and USIBWC must grant approvals before TEP can implement its proposal. Section 1.1.1 describes the proposed actions addressed in this EIS and the agency approvals that would be necessary.

The potential environmental impacts of the proposed actions of all four Federal agencies are evaluated in this EIS. In accordance with the Council on Environmental Quality (CEQ) regulations implementing NEPA, DOE has assumed the role of lead Federal agency for the NEPA review of TEP's proposal and preparation of this EIS. Both the USFS and BLM are participating in this NEPA review process as cooperating agencies in order to fulfill their respective NEPA compliance requirements. DOE, USFS, and BLM will each independently issue a Record of Decision (ROD) that addresses the specific agency actions defined above and is based, among other things, on the impacts analysis and findings of this EIS. While USIBWC plans to use the findings of this EIS in its concurrence regarding the TEP proposal, it is not formally a cooperating agency and would not issue a ROD on its action. The Federal agencies can issue a ROD no sooner than 30 days after the Environmental Protection Agency (EPA) publishes a notice of availability in the *Federal Register*. DOE and BLM could issue their respective permits or ROW grants concurrently with their RODs. However, USFS regulations at 36 CFR 215 differ from the other two agencies in that they also provide for a 45-day administrative appeal period following issuance of a ROD. If an appeal or appeals are received, USFS must follow the 36 CFR 215 process and render a decision on the merit of the challenge. Until all appeals are resolved, the TEP proposal could not be implemented on National Forest System land.

The format and content of this EIS conforms to CEQ regulations and each agency's respective NEPA implementing regulations. DOE's NEPA regulations are codified at 10 CFR 1021, and BLM's are found in the BLM Manual and Handbook 1790-1 and Departmental Guidance (516 DM 1-7). The USFS relies upon CEQ regulations as primary direction for compliance with NEPA. Additionally, USFS regulations codified at 36 CFR 215 complement, but do not replace, CEQ regulations by providing a regulatory framework for compliance with NEPA and additional direction regarding public participation opportunities. The agency further interprets these regulations in its Directives System, Forest Service Manual 1950: *Environmental Policy and Procedures*, and Forest Service Handbook 1909.15, *Environmental Policy and Procedures Handbook*. These Directive System components establish policy and provide guidance for USFS NEPA practitioners and decision-makers.

1.1.1 The Proposed Action

This EIS addresses Federal actions that would individually result in an administrative decision of approval or disapproval of a TEP application, whether by permit, ROW grant, or other legally binding authorization. Although such administrative actions are not in themselves likely to impact the environment, they nevertheless *authorize implementation of an action or project* that could. These are applicant-initiated actions that become the "proposed action" or subject of the impacts analysis upon which an administrative decision is made.

Thus, approval of any of the Federal agency actions addressed in this EIS would authorize an applicant-initiated action-- the TEP proposal-- which has the potential for environmental impact. Because of this, the focus of the impacts analysis in this EIS is on all aspects of TEP's proposed action as well as reasonable alternative actions. The implementation of TEP's proposed action would be enabled by each agency's administrative approval of a TEP application.

In general, the following major elements comprise TEP's proposal, not all of which require Federal approval:

- Expand the South Substation at Sahuarita, Arizona
- Construct a double-circuit, 345-kV transmission line from Sahuarita, Arizona, to Nogales, Arizona, a distance of approximately 65 mi (104 km), including a fiber optics line for communications
- Construct a new Gateway Substation at Nogales, Arizona
- Construct a 115-kV transmission line from the new Gateway Substation to the existing Valencia Substation at Nogales, Arizona
- Add additional equipment to the existing Valencia Substation
- Construct temporary and permanent roads as necessary to access the transmission line corridor
- Construct relatively minor ancillary and support structures

More details of this proposal are as follows:

As shown on Figure 1.1-1, TEP proposes to construct a double-circuit, 345-kV transmission line approximately 65 mi (104 km) in length. The proposed transmission line would originate at TEP's existing South Substation, which is located approximately 15 mi (24 km) south of Tucson in Sahuarita, Arizona, and 1.4 mi (2.2 km) east of Interstate 19 (I-19) in Pima County, Arizona. The South Substation would be expanded by an estimated 1.3 acres (0.53 ha) to add a switching device that would connect to the proposed transmission line by moving the fenceline 100-ft (30-m) to the east. From the South Substation, the proposed transmission line would run south of Tucson, Arizona, to a new Gateway Substation outside Nogales, Arizona in Santa Cruz County. The new Gateway Substation would be constructed within a developed industrial park an estimated 0.5 mi (0.8 km) east of the Coronado National Forest boundary (see Section 2.2.1 for additional details regarding the South Substation upgrades and new construction). From the Gateway Substation, the proposed 345-kV line would continue across the U.S.-Mexico border and interconnect with the Mexico electric grid.

The specific actions that would be taken to connect TEP's 345-kV line to the Mexican electric grid are not known. TEP has indicated that further consultation between TEP and the Comisión Federal de Electricidad (CFE, the national electric utility of Mexico), is dependent upon TEP receiving a Presidential Permit for the proposed project. Nonetheless, it is reasonably foreseeable that a transmission line would need to be built from the existing Santa Ana Substation in Mexico, which is located approximately 65 miles (105 km) southwest of Nogales, to connect with TEP's proposed 345-kV line that would terminate across the U.S.-Mexican border. The specific routing of such a transmission line has not yet been determined. CFE and TEP would jointly determine what entity is responsible for designing and constructing the portion of the connecting transmission line in Mexico. The most likely entity to be responsible for the construction in Mexico is CFE, although it is possible that TEP may construct a portion of the transmission line in Mexico. It is also possible that CFE could construct a new substation in the Nogales, Sonora area that would serve as the connecting point to TEP's proposed 345-kV line. However, even in that event, a transmission line between the existing Santa Ana Substation and such a new substation would still be required, as described above, in order to connect TEP's 345-kV line with the Mexican electric grid. The proposed line in the U.S. could both export electricity to, and import electricity from, Mexico.

Three alternative transmission line corridors (the Western Corridor, Central Corridor, and Crossover Corridor) are analyzed in this EIS, as shown in Figure 1.1-2, and as described in detail in Sections 2.1.1, 2.1.2, and 2.1.3 respectively. The double-circuit transmission line would consist of 12 transmission line wires, or conductors, and two neutral ground wires that would provide both lightning protection and fiber optic communications, on a single set of support structures. The primary structures to be used are the self-weathering steel single poles, or monopoles, depicted in Figure 1.1-3. Dulled, galvanized steel lattice towers, depicted in Figure 1.1-4, would be used in specific locations for engineering reasons or to minimize overall environmental impacts (for example, impacts to soils or archaeological sites).

In addition, TEP proposes to build a 115-kV transmission line to interconnect its proposed Gateway Substation with the electric distribution system that serves Nogales, Arizona, and the greater Santa Cruz Valley Service Area through the existing Valencia Substation, as shown in Figure 1.1-5. The support structures that would be used for this 115-kV line would be the self-weathering galvanized steel single poles depicted in Figure 1.1–3. The existing electric distribution system was previously owned and operated by Citizens Communications Company (Citizens), formerly named Citizens Utilities, and is currently owned and operated by UniSource, the new parent company of TEP and Citizens. TEP would also install additional equipment at the existing Valencia Substation, but would not expand the facility beyond the existing footprint. The proposed 115-kV line from the new Gateway Substation to the Valencia Substation would cross neither the U.S.-Mexico border nor any Federal lands. Accordingly, the Federal agencies have no apparent jurisdiction over its path. This EIS does, however, present the potential environmental impacts of this line as a reasonably foreseeable connected action because project that would contribute to cumulative impacts. Moreover, the impacts of the 115-kV line from the Gateway Substation to the Valencia Substation would not occur if it were not for the proposed 345-kV line, which does require Federal approvals.

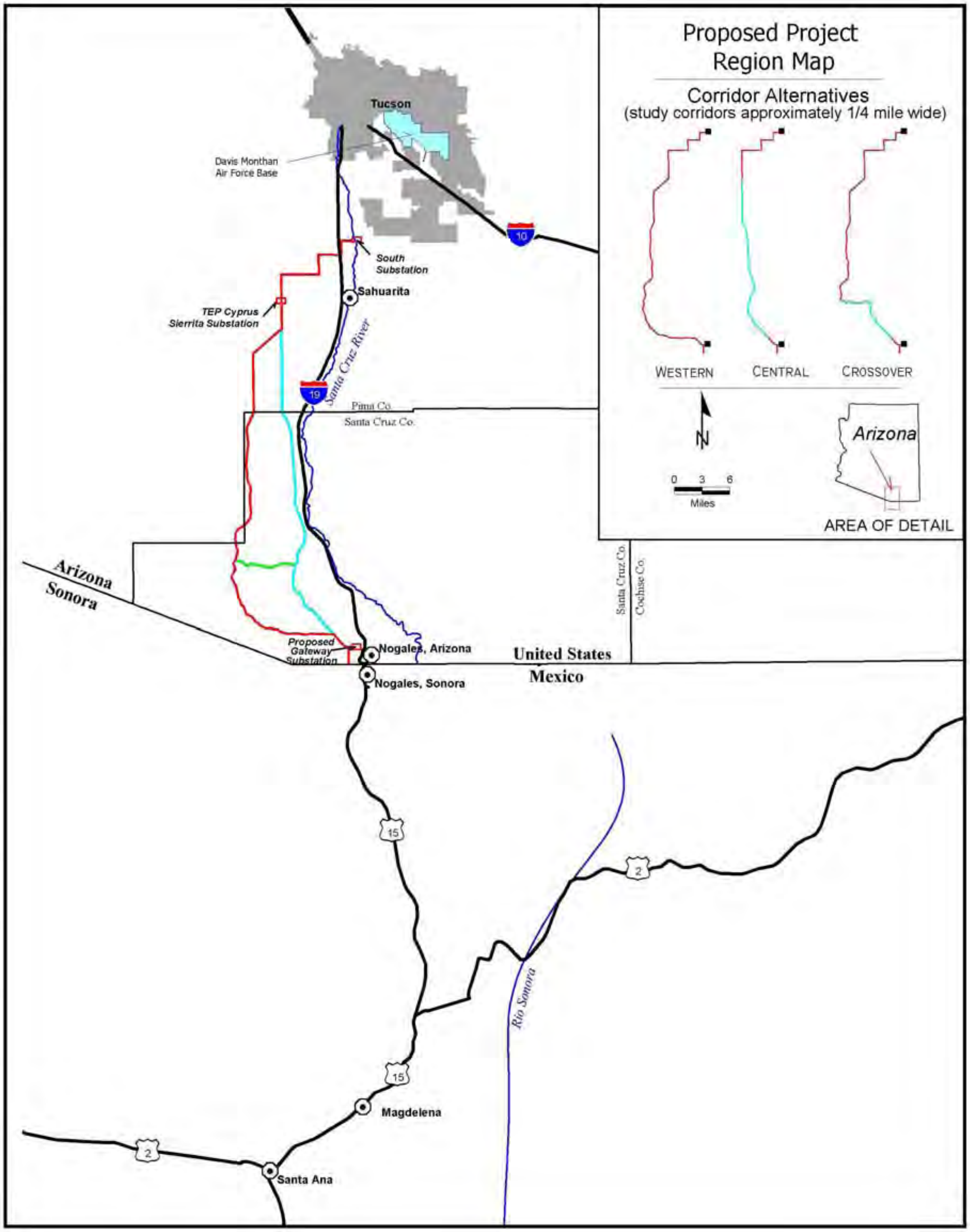

Figure 1.1–1. Proposed Project Region Map.

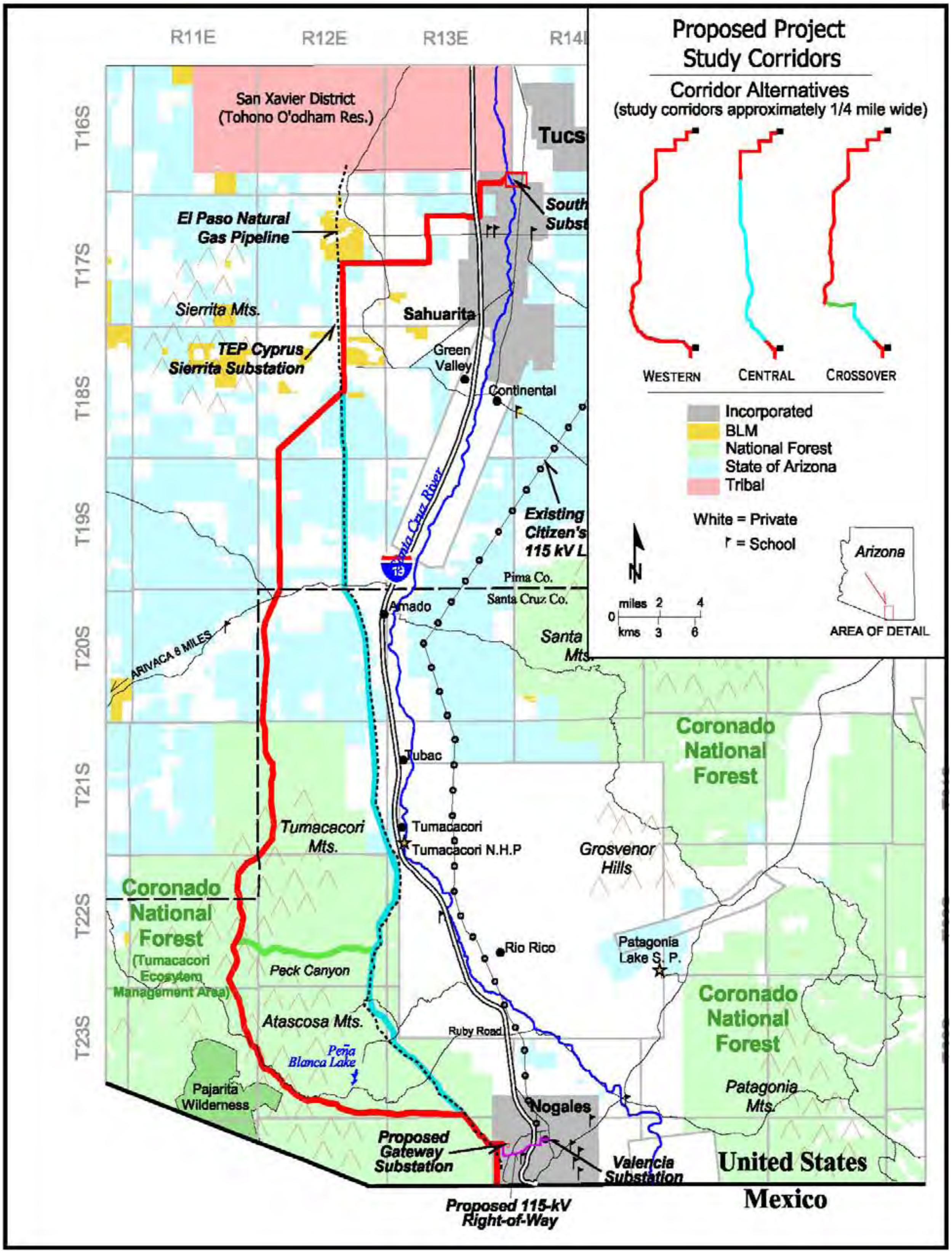

Figure 1.1–2. Proposed Project Study Corridors.

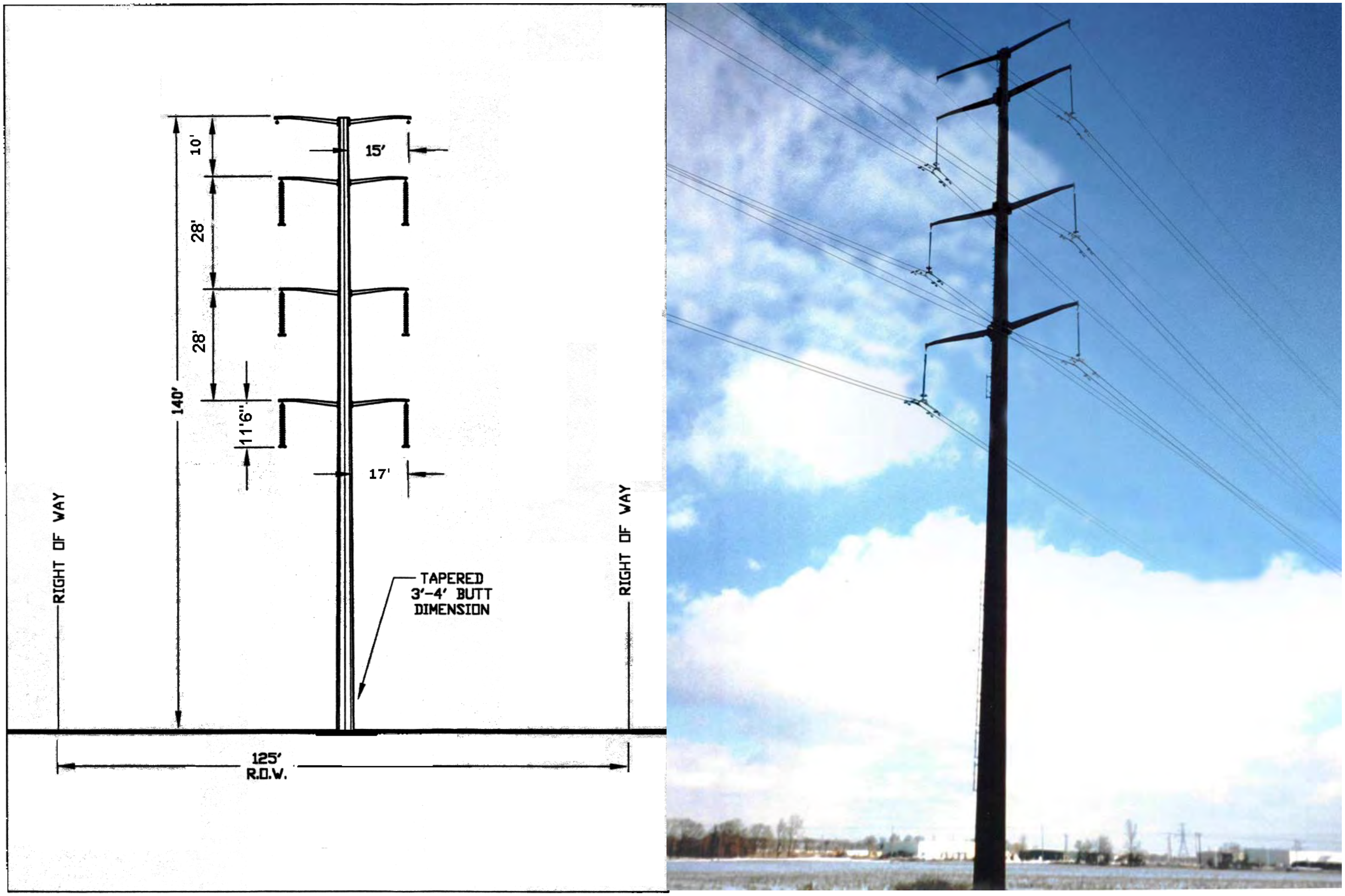

Figure 1.1–3. Monopole Transmission Line Structure Drawing and Photo.

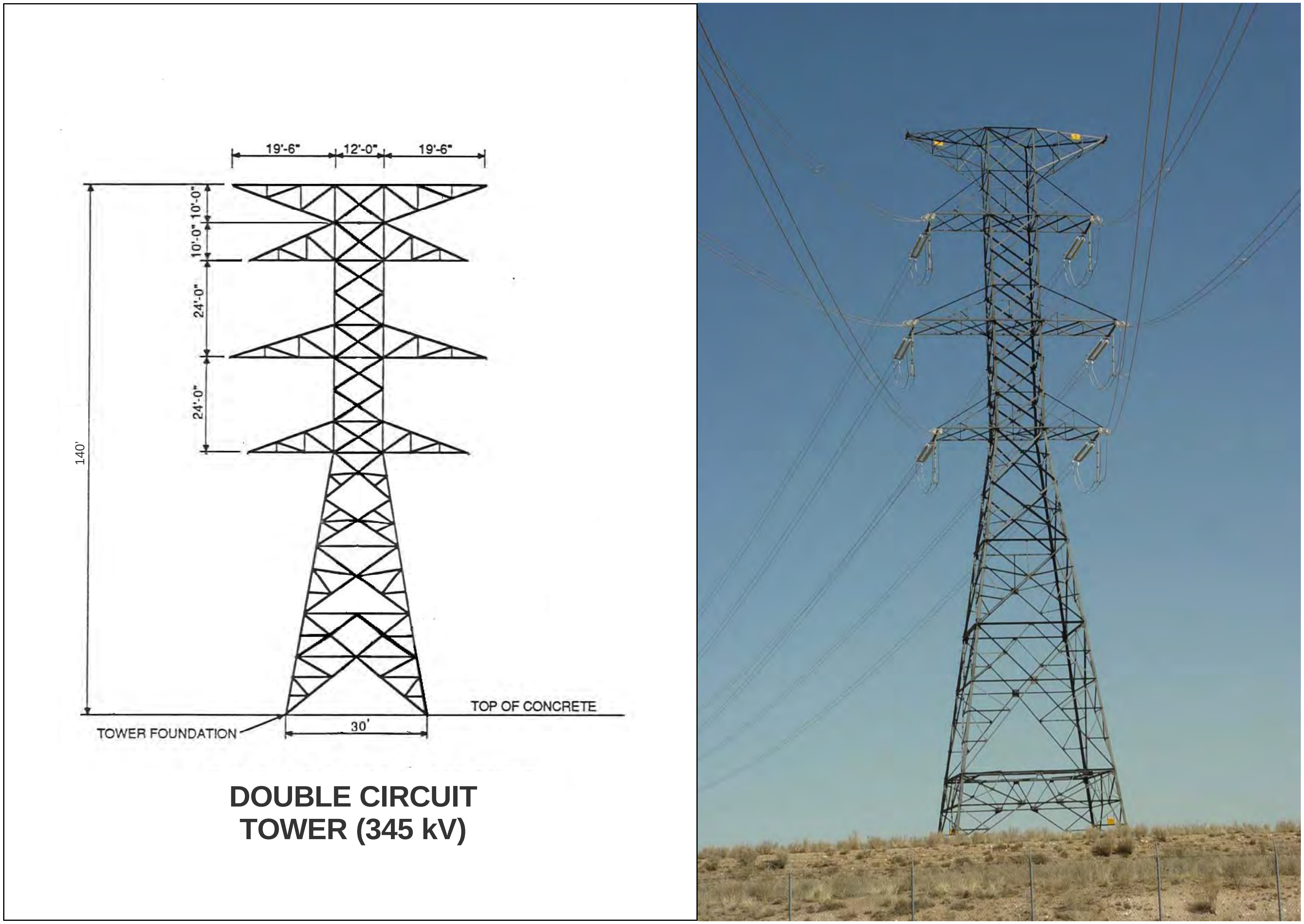

Figure 1.1–4. Lattice Tower Transmission Line Structure Drawing and Photo

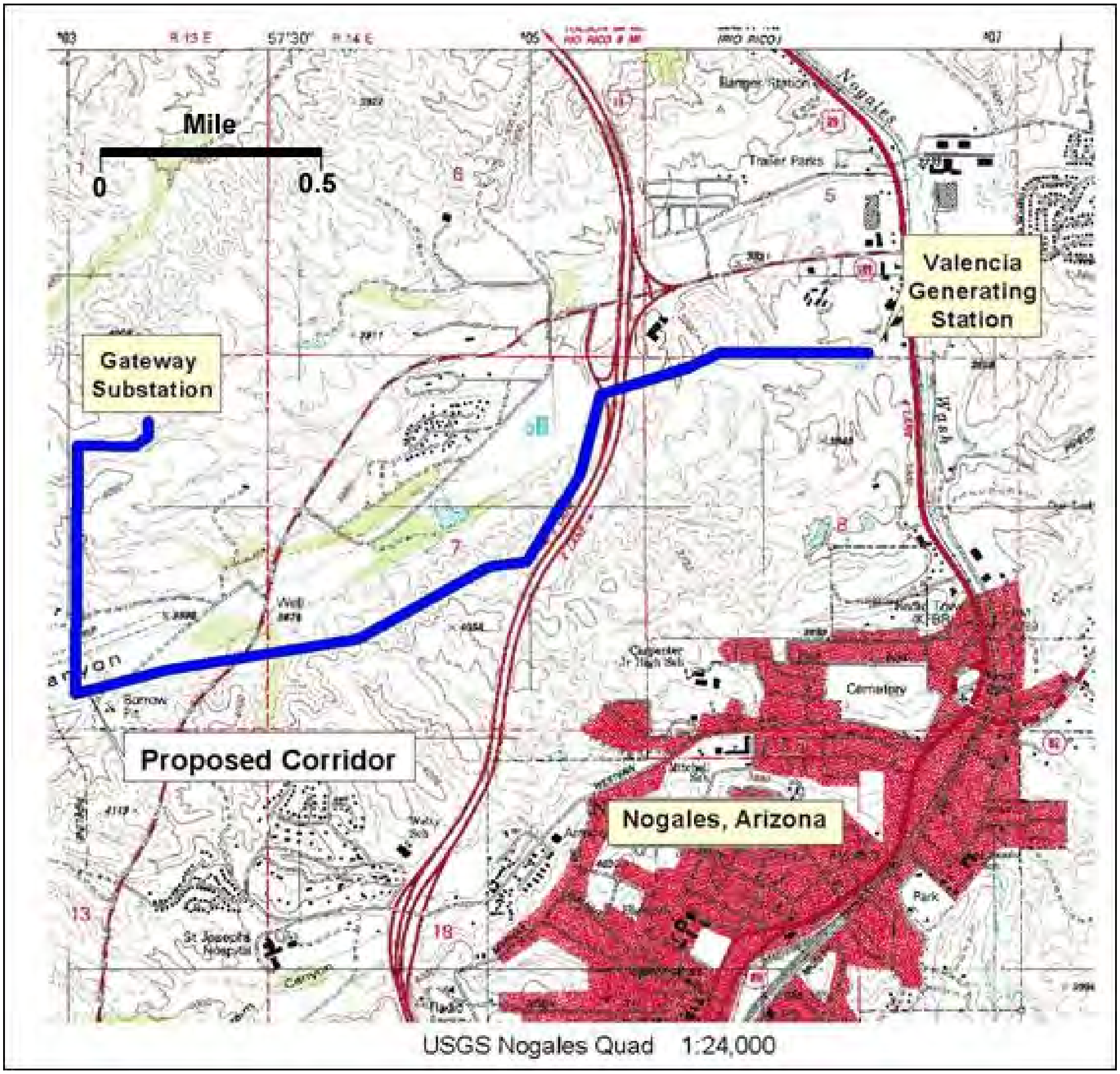

Figure 1.1-5. Gateway to Valencia 115-kV Transmission Line.

There is an existing El Paso Natural Gas Company (EPNG) buried pipeline within the project area, and segments of the three alternative transmission line corridors either cross the pipeline ROW, run immediately adjacent to the pipeline ROW, or are roughly parallel to the pipeline ROW within a distance of approximately 0.5 mi (0.8 km). This EIS uses the terms "follows or crosses" to describe the relationship between each transmission line corridor and the EPNG pipeline ROW.

The proposed actions of the Federal agencies involved in this EIS are as follows:

DOE. DOE's action is in response to TEP's request for a Presidential Permit. Like all Federal agencies, DOE must comply with NEPA and, in this instance, has agreed to be the lead Federal agency for NEPA compliance. DOE's proposed action is to approve an application by TEP for a Presidential Permit to allow construction, operation, maintenance, and connection of transmission lines and associated facilities for the export and/or import of electricity across the international border with Mexico.

USFS. Because TEP's proposed alternative transmission line routes from Sahuarita to Nogales would cross National Forest System lands within the Coronado National Forest, the USFS must authorize TEP's occupancy and use of National Forest System lands, in accordance with the Federal Land Policy and Management Act (FLPMA) of 1976 (40 U.S.C. § 1761), to use or establish a utility corridor on National Forest System lands. TEP submitted an application for such authorization to USFS on April 20, 2000.

As part of its deliberation regarding TEP's application, the USFS must comply with NEPA and the requirements of the National Forest Management Act (NFMA) (16 U.S.C. 1600-1614, as amended and 36 CFR 219). NFMA requires that proposals seeking authorization for specific uses of National Forest System lands be reviewed for consistency with the goals, objectives, standards, and guidelines set forth in the governing land and resource management plan. Should one or more inconsistencies be identified, an amendment or amendments to the land and resource management plan must be completed prior to the proponent's (e.g., TEP's) implementation of the intended use.

A proposal to amend the land and resource management plan itself requires a NEPA review, per the NFMA; this may be accomplished by either integrating the proposed amendment(s) with their related proposed action to be dually evaluated in one NEPA review, such as this TEP EIS, or by completing a wholly independent NEPA review. With regard to TEP's proposed action and alternatives, USFS has identified specific amendments to the Land and Resource Management Plan for the Coronado National Forest (1986, as amended) (hereafter, Forest Plan) that would be necessary prior to implementation of TEP's proposal and has chosen to integrate the NEPA review of the amendment process within this EIS.

BLM. TEP's proposal would require approval of a right-of-way (ROW) grant by the BLM to allow project facilities to occupy a total of 1.25 mi (2.0 km) of Federal land under BLM jurisdiction. TEP submitted a ROW application to the BLM for the transmission line on March 20, 2001, and a separate application for fiber-optic facilities on April 14, 2003. In similar fashion to the USFS NFMA consistency review, BLM must review TEP's application to determine whether the proposed use of the ROWs conforms with BLM's Resource Management Plan (BLM 1988) for the project area [43 CFR 1610.3-2(a)]. The BLM's proposed action is to authorize two ROWs on public lands under its jurisdiction: one for 1.25 mi (2.0 km) of the transmission line, and the other for 0.25 mi (0.39 km) of fiber-optic facilities.

USIBWC. Because the proposed 345-kV transmission line would cross the U.S.-Mexico border, USIBWC is required to assess whether the effects of the proposed project would be consistent with existing bilateral arrangements between the two countries or would obscure or otherwise impact the international border. As such, the USIBWC's proposed action is to concur on TEP's proposal relative to activities that will occur at and near the international border with Mexico.

1.1.2 The Origin of TEP's Proposal: TEP's Business Plan and the Proceedings of the Arizona Corporation Commission

TEP's proposed project arose from the confluence of TEP's business interests, Citizen's need for reliable power in Nogales, and the State of Arizona's strategy for solving electricity service problems in the City of Nogales, Arizona, and in the Santa Cruz Valley service area. TEP had long considered the possibility of building a 345-kV line that would connect to the Mexican electricity grid, thereby allowing TEP and others to import and export electricity. For several years, TEP prepared studies and met with Mexican energy officials to discuss such a project. Meanwhile, Citizens was taking steps to remedy service problems it was experiencing in Nogales and the Santa Cruz Valley service area. In 1998, the Santa Cruz Valley service area was serviced by only a single 55-mi (89 km), 115-kV transmission line and limited local generation at the Valencia Substation. Customers in Nogales and elsewhere throughout the area experienced numerous outages. For example, in 1998, the average hours of outage experienced annually by customers rose from 3.5 hours in 1997 to 12.3 hours in 1998. The primary cause of service degradation during this one year was attributable to four transmission line outage events. In response to these problems, the City of Nogales filed a complaint with the Arizona Corporation Commission (the ACC).

The ACC is the state agency charged with regulation of Arizona's electric utilities and responsible for assuring Arizona citizens a safe, reliable power system. State law also charges the ACC with safeguarding the public interest by balancing the need for an adequate, economical and reliable supply of electric power with the desire to minimize the effect thereof on the environment and ecology of Arizona. *See* Ariz. Rev. Stat. 40-360.07(B).

In response to the complaint filed by the City of Nogales, the ACC concluded that such outages can be expected to occur until such time as a second transmission line is constructed to Nogales. On November 2, 1999, the ACC approved a Settlement Agreement with Citizens which mandated the construction of a second transmission line to Nogales, Arizona by December 31, 2003. The Settlement Agreement states that Citizens would pay a penalty of $30,000 per month for each full month of delay in the construction after December 31, 2003. The Settlement Agreement also allows for Citizens to file for a delay in the construction date and/or waiver of the penalty no later than December 31, 2003. (See ACC Decision No. 62011, dated November 2, 1999, in Appendix J.).

At approximately the same time that Citizens was responding to the ACC, TEP approached Citizens with the concept of a joint project. Together they discussed the idea of building a transmission line to Mexico with the ACC's staff. Upon learning of the proposed 345-kV line, the ACC's staff encouraged Citizens and TEP to find a way to accomplish both Citizens' and TEP's needs with one transmission line and a single set of support structures rather than two separate lines running south. TEP and Citizens agreed to jointly construct a 345/115-kV interconnection project from TEP's existing South Substation to a proposed new TEP substation in Nogales. From there, Citizens planned to construct a new 3-mile (5 km), 115-kV, line from a proposed new substation to an existing substation to serve Nogales and the Santa Cruz Valley service area. TEP also proposed to construct a 2-mile (3 km) stretch of 345-kV line to the border to interconnect with the Mexican transmission system owned by the CFE, the national electric utility of Mexico.

Under Arizona state law, any utility desiring to construct a power plant or transmission line in Arizona must first obtain from the ACC a Certificate of Environmental Compatibility ("CEC"). *See* Ariz. Rev. Stat. § 40-360.07(A). The Arizona Power Plant and Line Siting Committee ("Siting Committee"), a committee created by the ACC, is charged with evaluating all such CEC applications and issuing recommendations concerning CECs. *Id.* The Siting Committee is made up of eleven (11) members, including actual representation by, or designees of, the State Attorney General, the Director of

Environmental Quality, the Director of Water Resources, the Director of the Energy Office of the Department of Commerce, the Chairman of the ACC, and six members appointed by the ACC representing the public, incorporated cities and towns, counties, and agricultural interests. *See* Ariz. Rev. Stat. § 40-360.01(B).

When a utility files an application for a CEC, the Siting Committee is required by state law to set a hearing date and provide public notice of the hearing date and location. *See* Ariz. Rev. Stat. § 40-360.04. Members of the public may attend the hearing, participate in the proceeding, and file comments with the Siting Committee. During the hearing, the Siting Committee hears testimony from and cross-examination of witnesses, actively participates in the questioning of witnesses, and receives evidence from parties and intervenors. The Siting Committee then votes on whether to grant or deny a CEC.

The Siting Committee, in deciding whether to approve or deny a CEC application, and/or whether to impose conditions upon the issuance of a CEC, considers the following factors as a basis for its action:

(1) Existing plans of the state, local government and private entities for other developments at or in the vicinity of the proposed site;

(2) Fish, wildlife and plant life and associated forms of life upon which they are dependent;

(3) Noise emission levels and interference with communication signals;

(4) The proposed availability of the site to the public for recreational purposes, consistent with safety considerations and regulations;

(5) Existing scenic areas, historic sites and structures or archaeological sites at or in the vicinity of the proposed site;

(6) The total environment of the area;

(7) The technical practicability of achieving a proposed objective and the previous experience with equipment and methods available for achieving a proposed objective;

(8) The estimated cost of the facilities and site as proposed by the applicant and the estimated cost of the facilities and site as recommended by the committee, recognizing that any significant increase in costs represents a potential increase in the cost of electric energy to the customers or the applicant; and

(9) Any additional factors which require consideration under applicable Federal and state laws pertaining to any such site.

Ariz. Rev. Stat. § 40-360.06. In addition, the Siting Committee is required to give "special consideration to the protection of areas unique because of biological wealth or because they are habitats for rare and endangered species." *Id.* If granted, the CEC is forwarded to the ACC for independent review and action. The ACC may affirm, modify, or deny the Siting Committee's decision. *See* Ariz. Rev. Stat. § 40-360.07.

On March 1, 2001, TEP and Citizens filed a Joint Application for a Certificate of Environmental Compatibility with the Arizona Power Plant and Transmission Line Siting Committee (Line Siting Committee) of the ACC. The Line Siting Committee evaluated three potential routes for TEP's line: a Western, Central, and Eastern route (except for the Eastern route, these are essentially the same alternatives as those that are considered in this EIS review.) Between March 1, 2001, and its final decision on October 29, 2001, the state's Line Siting Committee held 7 public hearings, a procedural conference, toured a portion of the proposed route, and heard oral argument.[1]

On October 19, 2001, the Siting Committee submitted its recommendation to issue a CEC for TEP's proposed transmission line down the Western Corridor only with a number of conditions imposed on this CEC. *See* Siting Committee Form of Decision and CEC, L-00000C-01-0111 & L-00000F-01-0111 (see Appendix J). The Siting Committee's decision to issue a CEC for the Western Corridor only was based, in pertinent part, on the following factors: (1) siting the line along the Western Corridor offered the greatest reliability due to the separation of the transmission lines by a mountain range; (2) the Western Corridor was determined to be the least visually intrusive for Arizona residents; and (3) the environmental conditions and mitigation requirements imposed in the CEC provided appropriate protection for the environment. *Id.*

This was followed by TEP's and Citizens' Joint Petition for Review by the ACC on November 2, 2001. On December 11 and 12, 2001, the ACC heard oral argument and public comments on the Line Siting Committee's decision. (For detailed information, see the transcript of the May 17, 2001, hearing at pp. 649-650 and 637-639. Appendix J provides information to access these transcripts.)

On January 3, 2002, the ACC held a special public meeting to receive additional comments and suggestions relative to the Line Siting Committee's recommendation. On January 15, 2002, the ACC issued its decision affirming the Line Siting Committee's recommendation, issuing the CEC for the Western Corridor only, and rejecting the alternative Eastern and Central Corridors.(See ACC Decision 64356 in Appendix J.) During its deliberations, the ACC acknowledged that the decision was difficult, with one Commissioner noting that "the troubling aspect of line siting cases is you either site through homes or in neighborhoods where people are disturbed or you site in sparsely populated areas where people are not disturbed." January 15, 2002 ACC Transcript, p. 114.

Voting to approve the CEC for the Western Corridor, each ACC commissioner stated that this corridor best balanced the competing public interests with environmental concerns. *See* January 15, 2002 ACC Transcript, p. 117 (Commissioner Spitzer) ("[I]n balancing all the competing considerations . . . I think public interest compels an affirmative vote on the CEC."); January 15, 2002 ACC Transcript, p. 119 (Commissioner Irvin) ("I think that the line siting has developed appropriate balance with the conditions the Commission has put in on the environmental aspects."); January 15, 2002 ACC Transcript, p. 121 (Chairman Mundell) (noting that this case is difficult because the ACC is "trying to balance protecting the environment on the one hand and making sure we have reliable, affordable electricity on the other.").

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[1] During the Line Siting Committee's proceedings, the Committee heard from 17 witnesses, took comment from over 25 members of the public, received over 18 letters of public comment, and received hundreds of pages of exhibits. The Line Siting Committee also took testimony from the DOE. Transcripts of these proceedings, comprising some 1,914 pages, are included in the administrative record. Appendix J provides information on accessing the Line Siting Committee proceedings. Twelve intervenors also participated in the case, including persons and organizations that appeared and commented in this EIS review. The intervenors were Santa Cruz County, the City of Nogales, Public Service of New Mexico, the Santa Cruz County Citizens Council, Mr. Walter Meek, Mr. Marshall Magruder, Mrs. Lucy Magruder, Mr. William Kurtz, Mrs. Ellen Kurtz, Mr. Emilio Falco, Ms. Titilah, and the Arizona Center for Law in the Public Interest. In addition to having the opportunity to file briefs and present argument to the Committee, the intervenors also had opportunities to cross examine witnesses. (See, e.g. transcript of the March 7, 2001 hearing).

As part of ACC Decision 64356, the ACC granted TEP and Citizens a CEC to construct the proposed Gateway 345-kV and 115-kV Transmission Project for the preferred Western Corridor, consistent with the Line Siting Committee's decision. The CEC issued to TEP and Citizens expires January 15, 2005. Per the ACC decision, the Gateway Project approved in Decision No. 64356 addresses the service reliability problems in Santa Cruz County and offers added benefits, such as improved reliability with a 345-kV transmission line and an interconnection with Mexico.

In 2003, Citizen's electric assets were acquired by UniSource Energy Corporation (UNS). The ACC approved the acquisition in Decision No. 66028 (July 3, 2003). UNS formed UniSource Energy Services, Inc. (UES) after the acquisition to provide electric service in the former Citizen's territories, including Santa Cruz County. UNS is the parent holding company for both TEP and UES.

TEP, however, cannot proceed to build the transmission line on Federal lands until it obtains the approvals of the Federal agencies preparing this EIS. Accordingly, both TEP's project and execution of the ACC's orders await completion of this EIS and final decisions by the Federal agencies. On December 3, 2003, the ACC called a meeting to address the issue of TEP's imminent failure to meet the December 31, 2003, completion date. After hearing from TEP, DOE, BLM, USFS, and the public, the ACC issued Order No. 66615 on December 9, 2003, which waived the $30,000 monthly penalty until June 1, 2004. The Commission also held that the need date for the transmission line would remain Dec. 31, 2003. This Order recognized that TEP has been unavoidably constrained by the necessity of awaiting the Federal agencies' actions. On July 28, 2004, the ACC met again to address another application filed by TEP and UNS seeking waiver of the $30,000/month penalty. Subsequent to this hearing, on August 3, 2004, the ACC waived the penalties indefinitely. (See ACC Decision No. 67151 in Appendix J).

1.2 PURPOSE AND NEED

1.2.1 TEP's Purpose and Need

TEP needs the respective permits and approvals from DOE, USFS, BLM, and USIBWC in order to proceed with its proposed project and to comply with the terms of the ACC's orders, which mandate the construction of a second transmission line to Nogales, Arizona and grant a Certificate of Environmental Compatibility to construct a new 345-kV transmission line to interconnect with the CFE transmission system at the U.S./Mexico border as discussed above in Section 1.1.2. For additional information regarding the ACC orders, see Appendix J.

1.2.2 Federal Agencies' Purpose and Need Statements

NEPA requires Federal decision makers to consider the environmental effects of their actions. As discussed above, because TEP's proposal involves the respective jurisdictions of four different Federal agencies, TEP will have to obtain the approval of each and all of them to go forward.

An agency's statement of purpose and need defines the reason and context for that agency's action, i.e., it explains what the agency is called upon to do, given its authority. Based on this statement of purpose and need, an agency identifies the range of reasonable alternatives it will consider in the EIS. Because each Federal agency's jurisdiction here is unique, the decision it is called upon to make also is unique, and thus each agency's purpose and need is different. Accordingly, each agency has prepared its own statement, as follows:

1.2.2.1 *DOE*

The purpose and need for DOE action is to determine whether it is in the public interest to grant or deny a Presidential Permit to TEP for the construction, operation, maintenance, and connection of the proposed

345-kV transmission line that would cross the U.S. international border. DOE published a notice of receipt of the Application for a Presidential Permit in the *Federal Register* on September 20, 2000 (65 FR 56875). In determining whether a proposed action is in the public interest, DOE considers the impact of the proposed project on the environment and on the reliability of the U.S. electric power supply system. DOE also must obtain the concurrences of the Departments of State and Defense before it may grant a Presidential Permit. If DOE determines that granting a Presidential Permit is in the public interest, the information contained in the EIS will provide a basis upon which DOE decides which alternative(s) and mitigation measures, if any, are appropriate for inclusion as conditions of the permit. In a process that is separate from NEPA, DOE will determine whether the proposed project will adversely impact the reliability of the U.S. electric system. If DOE were to approve TEP's request for a Presidential Permit, before TEP could export any electric energy to Mexico over the proposed facilities, TEP must apply for and obtain export authorization from DOE under section 202(e) of the Federal Power Act (16 U.S.C. §824a(e)). Before authorizing exports to Mexico over the proposed 345-kV facilities, DOE must ensure that the export will not impair sufficiency of electric supply within the United States and will not impede, or tend to impede, the coordinated use of the regional transmission system. Issuance of a Presidential Permit indicates only that DOE has no objection to the project, but does not mandate that the project be completed. DOE may grant a Presidential permit for one or more of the alternative corridors. In the event DOE denies a permit, TEP's transmission lines would not be allowed to cross the border into Mexico, although the transmission lines, or some other version of the project, could otherwise still be built within the United States if BLM and USFS were to approve the project.

1.2.2.2 *USFS*

The USFS's proposed action is to authorize TEP to use National Forest System lands in the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest for placement, operation, and maintenance of the proposed 345-kV electrical transmission line, access roads, fiber optics lines, and specific support facilities. TEP's land use requirements in the EMA would differ among the alternative corridor routes, ranging from approximately 15 mi (24 km) to nearly 30 mi (48 km).

The USFS purpose and need for action is mandated by its statutory responsibility under the FLPMA, which requires that it consider applications for use of National Forest System lands for purposes that are in the public interest, such as utility corridors, and that are identified as appropriate in the governing land and resource management plan. The FLPMA provides for the Secretary of Agriculture to issue, renew, or grant authorizations to occupy, use, or traverse National Forest System lands for the generation, transmission, and distribution of electrical power (Title 43, Chapter 35, Subchapter V, Section 1761).

Similarly, the purpose and need for USFS action on the proposed amendments to the Land and Resource Management Plan for the Coronado National Forest (1986, as amended) (hereafter, Forest Plan) derives from statutory requirements that " …the Forest Supervisor … ensure that, subject to valid existing rights, all …instruments for occupancy and use … are consistent with the [forest] plan" (36 CFR 219.10(e). To authorize TEP to occupy and use National Forest System lands for a 345-kV electrical transmission line, the USFS must change incompatible management direction in the Forest Plan using the amendment process defined in the Forest Service Manual 1920 and Forest Service Handbook 1909.12 and must follow "appropriate public notification and satisfactory completion of NEPA procedures." The decision by the USFS to approve or deny Forest Plan amendments associated with each of the routing alternatives in this EIS would be based, in part, on the findings of the impact analyses reported in this EIS.

The USFS decision to approve TEP's application and authorize the requested use will be based, in part, on the results of this NEPA review process (i.e., the findings of the impacts analyses reported in this EIS) and further, on the NFMA determination of the consistency of the proposed use with the parameters specified in the Forest Plan. The USFS may deny authorization for special uses for a number of different reasons, such as follows: "the proposed use would be inconsistent or incompatible with the purpose(s) for which the lands are managed, or with other uses," or the proposed use "would not be in the public interest" (36 CFR 251.4).

An amendment to the Forest Plan for the Coronado National Forest would be needed for any of the three action alternatives. The amendment process would have to be complete before implementation of the proposed project. Appendix H describes the amendment process and requirements.

1.2.2.3 *BLM*

The purpose and need for BLM action is to determine whether or not to approve an electrical transmission line ROW and a fiber optic ROW in accordance with the FLPMA. Development of the proposed transmission line would require BLM approving two separate ROW grants, one for the transmission line and one for the fiber optics line. TEP applied to BLM on March 20, 2001, for approval to construct a double circuit 345-kV transmission line across 1.25 mi (2.0 km) of Federal lands managed by BLM approximately 5 mi (8 km) west of Sahuarita, and submitted its application to BLM for the proposed fiber optic facilities on April 14, 2003. The fiber optic permit application is for an undefined use outside of TEP internal use, and would be renegotiated if the use changes. In processing the applications, BLM must consider land status, affected resources, resource values, environmental conditions, and the concerns of various interested parties in accordance with the BLM Manual and Handbook 1790-1 and Departmental Guidance (516 DM 1-7). BLM must conform to the existing BLM Resource Management Plan (BLM 1988) that designates land uses and other special uses. BLM must complete an administrative NEPA review process prior to implementing a decision documented in the ROD with regard to approval or denial of the ROW grant(s).

1.2.2.4 *USIBWC*

The purpose and need for USIBWC action is to review plans for construction of the proposed project where it would cross the border between the United States and Mexico, and to assess whether the effects of the proposed project would be consistent with existing bilateral arrangements between the two countries or would obscure or otherwise impact the international border. Specific USIBWC concerns about the proposed project include evaluating whether there would be adverse impacts on the visibility and permanent placement of the international boundary monuments and markers, whether project-associated structures could limit access to the international boundary monuments and markers, whether the present drainage patterns to and from Mexico would be affected, and whether potential transboundary pollution problems associated with the proposed project are properly addressed to insure that none occur in either country. USIBWC will not approve any construction in the United States that increases, concentrates, or relocates overland drainage flows into either the United States or Mexico. Surface drainage must be handled so that there is no increase of volume, peak runoffs, or flow concentration across the border in either direction (USIBWC 2003). Prior to construction of the selected corridor, TEP would provide to USIBWC, for its approval, copies of any hydrological or hydraulic studies and site-specific drawings for work proposed in the vicinity of the U.S.-Mexico border. This would include review of any structures proposed to be constructed in any drainage courses that cross the border. USIBWC is not a cooperating agency in preparation of this EIS, but will use information in this EIS in conjunction with review of project studies and plans to prepare a letter of concurrence, if appropriate, to the project proponents (in this case, TEP).

1.3 THE ALTERNATIVES CONSIDERED

The CEQ regulations require that Federal agencies rigorously explore and objectively evaluate all reasonable alternatives for accomplishing the proposed action (40 CFR 1502.14). As discussed in detail in Chapter 2, this EIS reviews in depth three alternative corridors for the siting of TEP's proposed 345-kV transmission line (depicted in Figure 1.1-4) and a single proposed route for the 115-kV transmission line between the Gateway and Valencia Substations in Nogales, Arizona, (depicted in Figure 1.1-5). This EIS also includes a No Action Alternative, in which the transmission lines would not be constructed and operated as proposed. In summary then, the alternatives are:

1. Western Corridor;

2. Central Corridor (Options 1 and 2);

3. Crossover Corridor (Options 1 and 2); and

4. No Action.

Western Corridor. As shown on Figure 1.1-4, the Western Corridor is the westernmost alternative connecting the South Substation in Sahuarita to the U.S.-Mexico border. The Western Corridor extends for an estimated 65.7 mi (105 km), including an estimated 9.3 mi (15.0 km) that follows or crosses the EPNG pipeline ROW. The Western Corridor crosses 29.5 mi (47.5 km) of USFS land and 1.25 mi (2.0 km) of BLM land. Portions of the Western Corridor route crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.1.

Central Corridor. As shown on Figure 1.1-5, the Central Corridor overlaps the northern portion of the Western Corridor from the South Substation in Sahuarita for approximately 18 mi (29 km), then continues south parallel to the existing EPNG pipeline ROW, connecting Sahuarita to the U.S.-Mexico border. The Central Corridor extends for an estimated 57.1 mi (91.9 km), including an estimated 43.2 mi (69.5 km) that follows or crosses the EPNG pipeline ROW. Within one 1.9 mi (3.1 km) stretch of the Coronado National Forest, two optional sub-routes for the Central Corridor are addressed: (1) Option 1 avoids a 1.9-mi (3.1-km) stretch of the EPNG pipeline ROW that is also designated as an inventoried roadless area (IRA), and (2) Option 2 follows the EPNG pipeline ROW (see Figure 2.1-3). The Draft EIS did not include both optional routes (i.e., did not include Option 2) because there was a perceived need to avoid that portion of the existing EPNG pipeline ROW that is designated as an IRA. However, based on public comments, the Federal agencies decided that a route following the EPNG pipeline ROW would be a reasonable option for the transmission lines through the Coronado National Forest. Such a route would allow the transmission lines to be constructed and operated in an area that is currently designated in the Forest Plan as a utility corridor. Additionally, an optional route within the existing EPNG pipeline ROW would not require creation of a new utility corridor and would give the USFS greater flexibility in managing the 1.9-mi (3.1-km) stretch of land that is not currently designated as a utility corridor. The estimated length of the Central Corridor within the Coronado National Forest is 15.1 mi (24.8 km). The estimated length of the Central Corridor on lands managed by BLM is 1.25 mi (2.0 km). Portions of the Central Corridor (both Option 1 and Option 2) crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.2.

Crossover Corridor. As shown on Figure 1.1-4, the Crossover Corridor overlaps the northern portion of the Western Corridor from the South Substation in Sahuarita into the Coronado National Forest, then turns east at Peck Canyon to meet up with the Central Corridor, and continues south to the U.S.-Mexico border. The Crossover Corridor extends for an estimated 65.2 mi (105 km), from the South Substation to the U.S.-Mexico border, including an estimated 17 mi (27.4 km) that follows or crosses the EPNG pipeline ROW. Like the Central Corridor, two optional sub-routes for the Crossover Corridor are addressed: (1) Option 1 avoids a 1.9-mile (3.1-km) stretch of the EPNG pipeline ROW that is designated as an IRA, and (2) Option 2 follows the EPNG pipeline ROW. The estimated length of the Crossover Corridor within the Coronado National Forest is 29.3 mi (47.2 km). The estimated length of the Crossover Corridor on lands managed by BLM is 1.25 mi (2.0 km). Portions of the Crossover Corridor (both Option 1 and Option 2) crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.3.

No Action Alternative. The CEQ regulations require that an agency "include the alternative of no action" as one of the alternatives considered (40 CFR 1502.14[d]). In the context of this EIS, "no action" means that TEP's proposed transmission lines would not be built. For DOE and the cooperating agencies, "no action" would be achieved by any one of the Federal agencies declining to grant TEP permission to build in its respective jurisdiction. Thus, in the case of DOE, "no action" means denying the Presidential Permit. For USFS, "no action" means denying the authorization. Because the action alternatives would require amendment of the Forest Plan, "no action" is further defined to mean that the Forest Plan, including the Transportation System and Utilities Corridor Map, would remain unchanged. Without authorization and associated Forest Plan amendments, the 345-kV transmission line and associated structures would not be constructed on National Forest System lands. Management of lands and resources in the Tumacacori Ecosystem Management Area would progress as expected under current management direction. For BLM, "no action" means denying access to BLM-managed Federal lands. For USIBWC, "no action" means denying permission to cross the international border. Each agency makes its own decision independently, so that it is possible that one or more agencies could grant permission for the proposal while others could deny permission. Thus, if any agency denies permission for the proposed transmission line, it would not be built.

Alternatives Considered But Eliminated from Detailed Study. The CEQ regulations also require that Federal agencies briefly discuss alternatives that were eliminated from detailed study. (40 CFR 1502.14(a)). Section 2.1.5 discusses the alternatives that were considered but eliminated from detailed study.

1.4 THE FEDERAL AGENCIES' PREFERRED ALTERNATIVES

NEPA requires the identification of the agency's preferred alternative or alternatives in a Draft EIS if one or more exists, or, if one does not yet exist at the draft stage, in the Final EIS (40 CFR Part 1502.14[e]). In the Draft EIS, DOE identified the Western Corridor as its preferred alternative. It did so for three reasons: First, the Western Corridor was TEP's preferred route. Second, this is consistent with ACC Decision 64356, in which the ACC granted TEP a CEC to construct the proposed transmission line along the preferred Western Corridor, which is also consistent with the Line Siting Committee's recommendation (see Section 1.2.2). Third, DOE hoped to focus public comment on the Western Corridor in an effort to discern public reaction to that choice versus the other alternatives. The remaining Federal agencies did not have preferred alternatives when the Draft EIS was issued, but elected instead to designate their respective preferred alternatives in the Final EIS after all of the environmental information had been reviewed and evaluated.

Each Federal agency here has its own unique jurisdiction and responsibilities in making decisions with respect to TEP's proposal. These different perspectives are reflected in the agencies' statements of purpose and need set forth in Section 1.2. This explains why the preferred alternatives of the Federal agencies, discussed below, are not necessarily the same. If TEP ultimately does not receive the unanimous consent of all Federal agencies, the State of Arizona, and regulatory entities to build along the same corridor, this project would not be allowed to proceed as proposed. The Federal agencies' preferred alternatives are as follows:

1.4.1 DOE's Preferred Alternative

The CEQ's regulations for implementing NEPA require a Federal agency to identify its preferred alternative in the Draft EIS if it has one at that time or, if one does not exist at the Draft stage, to identify its preferred alternative in the Final EIS, 40 CFR § 1502.14(e). DOE designated the Western Corridor as its preferred alternative in the Draft EIS for three reasons. First, it was the corridor designated by the State of Arizona for TEP's transmission line. Second, it was TEP's preferred route. Third, DOE believed that designating a preferred alternative in the Draft would stimulate and focus public comment on the alternatives set forth in the Draft EIS.

Since the Draft EIS was published several events have occurred that bear on DOE's designation of the Western Corridor as its preferred alternative. First, the USFS has designated the Central Corridor as its preferred alternative. Second, while the ACC's original decision designating the Western Corridor for TEP's project still stands, the ACC re-opened the siting proceeding to consider new evidence, including the analyses presented in this Final EIS. Third, DOE has received numerous comments both for and against the Western and Central Corridors, and has developed additional environmental analysis with respect to all of the alternative corridors.

In order to meet the regulatory requirements that it designate a preferred alternative, DOE has decided to continue to designate the Western Corridor, again because it reflects the State of Arizona's present choice, and continues to be TEP's preference. This being said, it is important to understand that the NEPA analysis suggests to DOE that all of the analyzed corridors appear to be acceptable from DOE's perspective, and that DOE could approve any or all of them in its Record of Decision (ROD).

Given the foregoing, it is important that the inference not be drawn from DOE's designation of the Western Corridor that DOE and the USFS disagree with respect to the suitability of the Central Corridor for this project. Indeed, DOE recognizes that the Central Corridor appears to have the fewest environmental impacts of all the corridors. DOE has designated the Western Corridor for the reasons explained above.

1.4.2 USFS' Preferred Alternative

The USFS did not identify a preferred alternative in the Draft EIS because key pieces of analysis were not yet available at the time the Draft EIS was published. Following publication of the Draft EIS, the needed analyses became available and were reviewed. Based on this review, the USFS has identified the following preferred alternative:

> Central Corridor (Option 1): issue an authorization to allow TEP to construct, operate, and maintain a 345-kV electrical transmission line across National Forest System lands of the Tumacacori Ecosystem Management Area in the route described in this EIS as Central Corridor Option 1; and approve associated Forest Plan amendments to designate new utility corridor, establish corridor width, and change visual quality objectives (see Appendix H for details associated with the USFS Forest Plan Amendments).

1.4.3 BLM's Preferred Alternative

The BLM decision regarding this EIS is to determine whether or not to approve an electrical transmission line ROW and a fiber optic ROW in accordance with the FLPMA. The BLM's preference is to grant such

ROWs. With respect to transmission line routing, each transmission line alternative would cross Federal lands managed by the BLM along the same route. As such, there would be no difference among the alternative corridors with respect to the land managed by the BLM. Because the BLM decision would not affect any route ultimately selected (if any), the BLM does not need to identify a preferred corridor alternative.

1.4.4 USIBWC's Preferred Alternative

The USIBWC decision regarding this EIS is to assess whether the effects of the proposed project would be consistent with existing bilateral arrangements between the U.S. and Mexico or would obscure or otherwise impact the international border. The USIBWC's preference is to allow the proposed project to cross the U.S.-Mexico border. With respect to transmission line routing, each transmission line alternative would cross the U.S.-Mexico border along the same route. As such, there would be no difference among the alternative corridors with respect to the USIBWC decision. Because the USIBWC decision would not affect any corridors ultimately selected (if any), the USIBWC does not need to identify a preferred corridor alternative.

1.5 TEP'S PROPOSED PROJECT CAPACITY AND USAGE

The proposed TEP 345-kV transmission line would provide a redundant path for the energy that is currently transmitted over the Citizens 115-kV transmission line from Tucson to Nogales, Arizona. While each circuit is thermally capable of transmitting 1,000 MW, the double circuit system has been designed and would be operated to transmit 500 MW total, for operational and reliability considerations (see Section 2.2.3). TEP reached agreement with Citizens to provide up to 100 MW of transmission capacity from Tucson to Nogales, Arizona. This would allow Citizens to improve reliability of electric service to its customers in Santa Cruz County. Citizens committed to the purchase of 100 MW of transmission capacity from TEP to allow for future load growth above Citizen's current Santa Cruz County load of approximately 65 MW. Once TEP's proposed 345-kV transmission line is in-service, Citizens would be able to make some needed upgrades to its existing 115-kV transmission line that would allow it to achieve a capacity of 100 MW, thus allowing either line to serve Citizens' load for the foreseeable future.

TEP anticipates using the remaining 400 MW of capability for transport of energy between the United States and Mexico. Typically an electricity producer like TEP generates and sells its own electricity using its own transmission system. However, if DOE should decide to grant a Presidential Permit to TEP, it would include a condition in the permit requiring TEP to provide non-discriminatory open access transmission service on the subject international facilities. Open access is a regulatory policy which requires transmission owners to make their transmission facilities available for the transmission of electric energy by third parties. Therefore, while the TEP international facilities could be utilized for potential future electricity exports to Mexico, the source of those future electric energy exports might not necessarily be TEP. TEP would initially use the two proposed fiber optic cables contained within the two neutral ground wires for supervision and operation of the transmission line and connected substations (TEP 2003).

The CFE electric system does not operate synchronously with the U.S. system, so during the 1990s TEP studied various possible electrical connection options with CFE, including a direct current line that would remove synchronization problems. However, the cost of such a connection proved that it was not feasible. This led TEP in 1998 to discuss with CFE the potential for a synchronous alternating current connection with the Mexican system. In 1999, TEP and CFE undertook detailed studies to investigate the feasibility of such a link. The studies undertaken by TEP and CFE contemplated that CFE would separate the Noreste region of its system from the balance of the Mexico electric grid, such that the Noreste region would synchronously be linked with the TEP system. The U.S. and Mexico systems then would be able to operate reliably with this connection at significant cost savings to both TEP and CFE (TEP 2003).

1.6 NEPA PROCESS AND PUBLIC PARTICIPATION

1.6.1 Public Scoping

A Federal agency first issues a Notice of Intent (NOI) to prepare an EIS. The NOI is published in the *Federal Register* to inform the public that an EIS will be prepared and to formally announce the beginning of the scoping process. The NOI describes the proposed action and alternatives the agency is considering; provides preliminary information on issues and potential impacts; and invites comments, questions, and suggestions (both written and oral) on the scope of the EIS. In the process known as scoping, the public provides comments directly to the Federal agency on the scope of the EIS. This aids the Federal agency in determining the alternatives, issues, and environmental impacts to be analyzed in the EIS. DOE regulations require that at least one public hearing be held to facilitate the collection of public comments.

The "Notice of Intent to Prepare an Environmental Impact Statement (EIS) and to Conduct Public Scoping Meetings and Notice of Floodplain and Wetlands Involvement" for the proposed project was published in the *Federal Register* (66 FR 35950) on July 10, 2001. Announcements were also placed in local newspapers. A fact sheet translated into Spanish has been provided on the proposed project website maintained for DOE (www.ttclients.com/TEP). Public scoping meetings were held by DOE on July 30, 2001, at the Rancho Resort in Sahuarita, Arizona, and on July 31, 2001, at the Rio Rico Resort in Rio Rico, Arizona. Both oral and written comments were invited and received at these meetings. A total of 65 individuals presented formal oral comments at the two public scoping meetings. Written scoping comments were also solicited in the announcements. The public comment period was initially to have closed on August 9, 2001, but, in response to requests from the public, was extended until August 31, 2001. From November 27 to 29, 2001, USFS, BLM, and USIBWC met with DOE to review all scoping comments received to date. As of November 27, 2001, approximately 200 people had submitted formal written scoping comments by letter, email, and postcard campaign. DOE and the cooperating agencies continued to receive public comments up to the printing of the Draft EIS. In addition to the public participation process, consultations have been ongoing with Federal, state, and local resource management and regulatory agencies as well as interested tribal governments, as documented in Chapter 10 and Appendix A of this EIS.

1.6.2 Scoping Comments

The issues raised during public scoping that were deemed within the scope of the EIS are summarized first below; then, issues raised that were not within the scope of the EIS are discussed.

Issues within the Scope of the EIS

- Three commentors made suggestions on combining portions of TEP's proposed routes to make a new alternative. The Crossover Corridor, a combination of the northern portion of the Western Corridor and the southern portion of the Central Corridor, connected with a new segment through Peck Canyon, was added to this EIS as a reasonable alternative for analysis based on these comments and tribal consultations.

- Eleven commentors questioned TEP's purpose and need for the project, and the role of the public in the decision-making process.

- One hundred and eleven (111) commentors raised issues regarding the biodiversity and visual beauty of the region. Of particular concern were:
    - National Forest System lands managed by the Coronado National Forest, including the Tumacacori Ecosystem Management Area, Pajarita Wilderness Area, Goodding Research Natural Area, Sycamore Canyon, Peña Blanca Lake Recreation Area, and the Chiltipene Botanical Area.
    - Juan Bautista de Anza Trail
    - Threatened and endangered species
    - Invasive species
    - Protection for wild raptors and birds of prey
    - Potential effects on tourism, hiking, photography and birding
    - Potential impacts of the Sonoran Desert Conservation Plan
- Thirty-three (33) commentors raised issues about effects on the local community, highlighting:
    - The rural character of the area
    - Socioeconomic issues
    - Historic and cultural resources, including the historic value of the Santa Cruz Valley, Tohono O'Odham Rancherias, historic mining properties, and Tubac Presidio State Historic Park
- Thirteen commentors raised issues regarding the potential impact of the proposed project on property values in the area.
- Two commentors requested that environmental justice issues be examined in the EIS.
- Twenty-four (24) commentors questioned potential effects on human health, including:
    - Electric and magnetic field effects
    - Interference with specially designated flight airspace
    - Potential for sabotage by terrorists
    - Safety issues related to co-locating an electrical transmission line and a natural gas pipeline
    - Fourteen (14) commentors raised issue about physical disturbance of the area, including:
    - Erosion during construction

- Floodplain and wetland involvement
- Expansion of the South Substation within a floodplain

Issues Out of Scope of the EIS

Based on the comments received during scoping, the following issues were identified in the Draft EIS as being outside the scope of the environmental review:

- Five (5) commentors stated the cumulative impacts of the proposed project and other potential future projects, such as a power plant proposed for development in Nogales, Arizona by Maestros Group or other power plants should be evaluated.
  - As required by CEQ guidance, cumulative impacts are addressed in this environmental review to the extent that the future projects are reasonably foreseeable, the potential resource area impacts overlap, and inclusion of the potential future projects would not be arbitrary. Because neither the Arizona Department of Environmental Quality nor the Pima County Department of Environmental Quality has received permit applications for new power plants in southern Arizona, the area covered by this project, this issue was determined to be speculative and therefore outside the scope of this environmental review.
- Three (3) commentors suggested that the Republic of Mexico might build power plants to sell electricity to the United States of America.
  - DOE is not aware of any proposals by the Republic of Mexico to build power plants to sell electricity to the United States of America in the area covered by this environmental review. Therefore, this assertion is considered speculative and therefore outside the scope of this environmental review.
- One (1) commentor raised issues regarding the potential for increased development (residential and commercial) in southern Arizona along the central portion of the project location due to an increased availability of electricity.
  - Whether or in what manner the proposed project may lead to additional development in southern Arizona is too speculative to be analyzed in this environmental review.
- Thirty-one (31) commentors suggested additional alternatives for consideration in lieu of the proposal described by the TEP, including: (1) TEP should build a power plant in the Republic of Mexico or Nogales, Arizona; (2) Exploration of alternative energy sources; and (3) Promotion of energy conservation
  - These suggested alternatives would not fulfill the purpose and need for action and were eliminated from further analysis in this environmental review.
- Six (6) commentors suggested that negative effects on the reliability of the United States power grid stemming from an interconnection with Mexican systems might occur.

  - Examination of the reliability of the United States electricity grid[2] is part of DOE's Presidential Permit application review process but does not involve a study of environmental impacts nor disclosure in an environmental impact statement.

- Two (2) commentors suggested coordinating routes and review processes with a concurrent and similar proposal for an electric transmission line in the area by Public Service Company of New Mexico.

  - At about the same time that TEP conceived the transmission line project undergoing environmental review in this document, another utility, Public Service Company of New Mexico (PNM), proposed a very similar transmission line project in the same general southern Arizona area and began laying the foundation for an environmental review. The PNM's project geographically paralleled TEP's proposal even to the extent of utilizing some of the same corridor routes undergoing environmental analysis in this Final EIS. PNM's proposal would have used the same general technology to transmit electric power to Nogales, Santa Cruz County, and the Republic of Mexico. As TEP's proposal progressed from the conceptual phase to technical design and entered the ACC's licensing process, realization of the PNM's proposal became moot because DOE would not permit two competing power transmission lines along roughly the same corridor and to the same ultimate destination. Thus, there is no underlying need to include the PNM's proposal as an alternative in this environmental analysis, nor to analyze the impacts of the PNM's proposal. In October 2004, PNM indicated to DOE that it would be withdrawing its application for a Presidential Permit, and on November 16, 2004, PNM sent DOE a letter officially withdrawing their Presidential Permit application (see Section 5.2).

1.6.3 Draft EIS Public Review and Comment Period

Following public scoping, the Federal agencies prepared the Draft EIS, the next step in the NEPA process. The Draft EIS describes, analyzes, and compares the potential environmental impacts of the alternatives that could be chosen to accomplish the purpose and need to which the agency is responding. It also provides information on the methodologies and assumptions used for the analyses. If one or more preferred alternative(s) exists at this stage of the NEPA process, they are identified in the Draft EIS. DOE published its Draft EIS on August 27, 2003. Copies of the Draft EIS were sent to interested parties (see Chapter 15) and filed with the U.S. Environmental Protection Agency (EPA).

The Notice of Availability of the Draft EIS was published by the EPA in the *Federal Register* on August 22, 2003 (68 FR 50768), which initiated a 53-day comment period that ended on October 14, 2003. The comment period exceeded the requirement set forth by CEQ Regulations (40 CFR 1506.10[c]) for a Draft EIS public comment period of at least 45 days. Although the official public comment period for comments on the Draft EIS closed on October 14, 2003, the Federal agencies continued to accept and consider comments after the close of the public comment period.

During the comment period, public hearings were held in Green Valley, Arizona on September 25, 2003 and in Nogales, Arizona on September 26, 2003. Notification of the public hearings was accomplished through a variety of media. The time and location of the hearings were posted in DOE's August 27, 2003, notice in the *Federal Register* (68 FR 51569) and on DOE's project website at www.ttclients.com/TEP.

[2] Note that the reliability of local electricity service in Santa Cruz County and Nogales, Arizona was among the factors considered during alternative development.

In addition, announcements were placed in newspapers and read on local radio stations in Tucson, Green Valley, and Nogales, Arizona. In Tucson, the announcements were printed in the *Arizona Daily Star/Tucson Citizen* on September 14, 21, 24 and 25, 2003. In Green Valley, the announcements were printed in the *Green Valley News* on September 17, 19 and 24, 2003, and radio announcements were made from September 22 through September 24, 2003. In Nogales, the announcements were printed in *Nogales International* on September 19, 23 and 26, 2003, and radio announcements were made in Spanish from September 23 through September 25, 2003, on Spanish language radio stations.

At each hearing, DOE received oral and written comments on the Draft EIS. In addition, the public was encouraged to provide comments via a toll-free comment line, U.S. mail, fax, e-mail or on the internet through the DOE website. The Federal agencies have considered and responded in this Final EIS to all of the comments received. Volume II of this EIS, the Comment-Response Document, describes the public comment process in detail and contains transcripts from the public hearings, copies of all comments received, and the Federal agencies' responses. The major changes are discussed in the next section.

1.6.4 Major Comments Received on the Draft Environmental Impact Statement

Approximately 7,300 discrete comments on the Draft EIS were received during the comment period. Of these, approximately 5,500 comments resulted from an e-mail campaign. The major comments received on the Draft EIS included the following:

- Objection to the proposed project because of the potential impacts to visual and recreational resources.
- Question of the need for a 345-kV transmission line. Also, some commentors expressed the opinion that the Draft EIS did not evaluate the range of reasonable alternatives, including a 115-kV line and a local power plant in Nogales.
- Concern over the effect the proposed project would have on electricity rates.
- Support for the No Action Alternative.
- Failure to address potential impacts on private property. Specifically, commentors questioned the impact of the proposed project on property values.
- Potential impacts associated with flooding. Specifically, commentors stated that the 500-year flood event should be evaluated in the EIS.
- Vviolation of the Forest Plan for the Coronado National Forest. Specifically, commentors questioned impacts associated with roads, the USFS Scenery Management System Objectives, and the USFS Recreation Opportunity Spectrum.

All of the comments identified above, as well as all other comments received, are responded to in detail in Chapter 2 of the Comment-Response Document (Volume II of this EIS). The major changes are discussed in the next section.

1.6.5 Changes from the Draft Environmental Impact Statement

The Federal agencies have changed the Draft EIS in response to comments or to reflect new information. A brief discussion of the more significant changes is provided below.

Purpose and Need, Range of Reasonable Alternatives, and Background Information. Chapters 1 and 2 were reorganized and augmented to clarify the roles of each Federal agency in the review of TEP's proposed project, and to describe the range of reasonable alternatives that a Federal agency is required to evaluate for an applicant-initiated project such as TEP's proposed project. The Federal agencies also included additional background information on the origin of TEP's proposal and on the NEPA process.

Connecting 115-kV Transmission Line in Nogales, Arizona. The Federal agencies revised the EIS to evaluate TEP's proposed 115-kV transmission line between the proposed Gateway Substation and the existing Valencia Substation in Nogales, Arizona. The construction of this 115-kV transmission line is an action that is connected to construction of the proposed 345-kV transmission line. Chapter 2 has been revised to describe the proposed 115-kV transmission line, Chapter 3 has been revised to describe the environment that would be affected by its construction and operation, and Chapter 4 has been revised to present the potential environmental effects from its construction and operation. Other sections of the EIS were revised as appropriate to reflect the proposed 115-kV transmission line. A Biological Assessment for this 115-kV transmission line was added as Appendix K.

Additional Alternatives Considered but Eliminated from Detailed Study in the Final EIS. Five new alternatives are briefly considered in the Final EIS because they were raised in the public hearings and in the written comments on the Draft EIS, but were not addressed in the Draft EIS. As discussed in Section 2.1.5 of the Final EIS, these alternatives have been considered but were determined to be unreasonable and were eliminated from further analysis: (1) upgrading existing transmission lines; (2) conservation of electricity; (3) underground construction of the 345-kV line in lieu of aboveground support structures; (4) construction of a 115-kV line in lieu of the proposed 345-kV line; and (5) an optional route for the Western and Crossover Corridors that avoids the Caterpillar Facility. In addition, Section 2.1.5 of the Final EIS has been amended to add a description of the potential environmental impacts that could be associated with a new power generating facility.

Optional Sub-Routes Added for the Central Corridor and the Crossover Corridor. Within one stretch of the Coronado National Forest, an optional sub-route for the Central Corridor and the Crossover Corridor was added to the analysis. The Draft EIS only included a route (Option 1) that circumvented the IRA because there was a perceived need to avoid that portion of the existing EPNG pipeline ROW that is also designated as an IRA. However, based on public comments, the Federal agencies decided that a sub-route following the EPNG pipeline ROW would be a reasonable option for the transmission lines through the Coronado National Forest. Therefore, the new Option 2 follows the EPNG pipeline ROW and does not circumvent the 1.9-mi (3.1-km) stretch of the EPNG pipeline ROW that is also designated as an IRA.

Cumulative Impacts. The Federal agencies revised Chapter 5, Cumulative Impacts, in the Final EIS to better assess cumulative impacts, including those from reasonably foreseeable actions. Table 5.4-1 was added to the Final EIS to provide a summary comparison of the cumulative impacts by resource area and identify any differences in cumulative impacts for the Western, Central, and Crossover Corridors. The revisions to Chapter 5 provide additional information on new power plants in Mexico and southern Arizona in the vicinity of the proposed project, and air quality impacts in the U.S.-Mexico border region.

Safety. Section 4.10, Human Health and Environment, of the Final EIS has been revised to include a discussion of the safety considerations of locating a 345-kV transmission line in the vicinity of the natural gas pipeline.

Biological Resources. The Federal agencies revised Sections 3.3 and 4.3, Biological Resources, in the Final EIS to reflect revisions to the Biological Assessments, USFS Management Indicator Species Report, and Migratory Bird Treaty Act Report prepared for the proposed project. In addition, information regarding newly-designated critical habitat for the Mexican spotted owl is provided in the Final EIS.

Native American Consultations. The Federal agencies revised Sections 3.4.2 and 4.4.2, Native American Concerns, in the Final EIS to better reflect the results of Native American consultations on the proposed project.

500-year Floodplain/Wetlands Assessment. The Federal agencies revised the Floodplain/Wetlands Assessment in Appendix C, and the related discussion and analysis in Sections 3.7 and 4.7, Water Resources, of the Final EIS to identify and evaluate impacts to the 500-year floodplain. This change was based on a determination that the South Substation (which would be expanded as part of the proposed project) would be a critical facility.

Forest Plan Amendment Appendix. A new appendix (Appendix H) was added to identify the requirements of the NFMA and the amendments to the Coronado Forest Plan that would be necessary prior to implementation of the various project alternatives.

USFS Visual Impacts Appendix. A new appendix (Appendix I) was created to provide additional information on visual impacts.

ACC Appendix. A new appendix (Appendix J) was created to provide information regarding the ACC Orders that provide the framework for the proposed action and the alternatives in this EIS.

There were also minor technical changes and clarifications made throughout the TEP EIS. None of the changes had a major effect on the comparative evaluation of the alternatives or the conclusions that can be drawn from the EIS.

1.6.6 Next Steps

As discussed in Section 1.4, this Final EIS identifies each agency's preferred alternative. It does not, however, contain the final decisions by those agencies. A Federal agency must wait a minimum of 30 days following EPA's publishing of a Notice of Availability of the Final EIS in the *Federal Register* to make its final decision. Each agency's final decision is set forth in a separate formal document. For this project to go forward as proposed, DOE would have to issue a ROD granting a Presidential Permit. Similarly, a ROD issued by the USFS would authorize the occupancy and use of specified National Forest System lands for development of a 345-kV electrical transmission line and concurrently adopt associated Forest Plan amendments. BLM would have to issue a ROD granting a ROW permit. USIBWC would have to issue a letter to TEP stating its concurrence in the EIS and supporting project studies and plans.

A ROD accomplishes several things in addition to describing the agency's decision. First, it identifies all of the alternatives that the agency considered. Second, it identifies which of the alternatives the agency considers environmentally preferable, i.e., which alternative has the least negative environmental impact, or, to put it another way, which would best protect the environment. Thirdly, it articulates the other factors that the agency considered in making its decision. Factors agencies consider in making their decisions include, but are not limited to, environmental, economic and technical considerations, the agency's mission, and the imperatives of national policy. Finally, the ROD describes whether all practicable means to avoid or minimize (i.e., mitigate) impacts are to be undertaken, and if they are not, explains why not.

NEPA does not dictate that an agency must select the most environmentally preferable alternative. As long as an agency has taken a hard look at the environmental impacts of the range of reasonable alternatives, it is free to decide among them, regardless of the environmental consequences, or even to decide that all of the action alternatives are acceptable. The purpose of the NEPA process is to ensure that accurate environmental studies are performed; that they are done with public involvement; and that public officials make decisions based on an understanding of the potential environmental consequences.

Each Federal agency here has its own unique jurisdiction and responsibilities in making decisions with respect to TEP's proposal. These different perspectives are reflected in the agencies' statements of purpose and need set forth in Section 1.2. This explains why the preferred alternatives of the Federal agencies are not necessarily the same. If TEP ultimately does not receive the unanimous consent of all Federal agencies, the State of Arizona, and regulatory entities to build along the same corridor, this project would not be allowed to proceed as proposed.

This chapter discusses Tucson Electric Power Company's (TEP) proposed action and routing alternatives for building a 345-kV double circuit transmission line from Sahuarita to Nogales, Arizona, continuing to the U.S.-Mexico border. The proposed project includes expansion of the existing South Substation in Sahuarita, construction of a new substation (Gateway Substation) in Nogales, construction of the associated 345-kV transmission line, construction of a 115-kV transmission line from the new Gateway Substation to the existing Valencia Substation, and installation of additional equipment at the Valencia Substation. This chapter describes the process for identifying and evaluating alternatives, provides a detailed description of each alternative, including the No Action Alternative, and describes construction logistics. This chapter also presents a comparison of the expected impacts from alternatives based on the analysis in Chapter 4, and discusses measures to mitigate potential impacts.

Each of the Federal actions addressed in this EIS would individually result in an administrative decision to approve or disapprove a TEP application to implement the actions listed above, whether by permit, ROW grant, or other legally binding authorization. Although such administrative actions are not in themselves likely to impact the environment, they nevertheless *authorize implementation of an action or project* that could. These are applicant-initiated actions that become the "proposed action" or the subject of the impacts analysis upon which a Federal administrative decision is made. Thus, approval of any of the Federal agency actions addressed in this EIS would authorize an applicant-initiated action— the TEP proposal— which has the potential to significantly impact the environment. With this in mind, the focus of the impacts analysis in this EIS is on all aspects of TEP's proposed action, as well as reasonable alternative actions including "no action," which is required to be considered by CEQ regulations at 40 CFR 1502.14(d). The implementation of TEP's proposed action would be dependent upon each agency's administrative approval of a TEP application, with such approval being documented in a ROD independently issued by the agency.

The range of alternatives considered in this EIS are twofold: (1) those that are defined in TEP's proposal and its applications for Federal authorizations to implement different facets of the proposal, and (2) those that are "reasonably foreseeable" by the Federal agencies and that satisfy their respective purpose and need for action, in accordance with direction in the NEPA and CEQ regulations regarding alternatives analysis in an EIS.[42 U.S.C. 4332(E) and 40 CFR 1500.2(e), 1502.14(a), respectively].

2.1 ALTERNATIVES

The alternatives developed for the proposed project are alternative routes to interconnect TEP's South Substation with the proposed Gateway Substation. TEP's evaluation of interconnection schemes resulted in the development of three potentially viable corridors for transmission interconnection in southern Arizona. One of these, the Eastern Corridor, was eliminated from further analysis as a reasonable alternative in this Environmental Impact Statement (EIS), as explained in Section 2.1.5. An additional study corridor, the Crossover Corridor, was included for analysis in this EIS based on public and tribal input received during the public scoping period and tribal consultations. Thus, the three alternatives addressed in this EIS are the Western Corridor, the Central Corridor, and the Crossover Corridor. For both the Central Corridor and the Crossover Corridor, two optional routes are addressed: (1) a route that avoids a 1.9-mile (3.1-km) stretch of the existing utility corridor that is designated as an inventoried roadless area (IRA) (see Section 2.1.2 for a more detailed description) and (2) a route that follows the existing utility corridor in the Coronado National Forest.

To facilitate a thorough, specific evaluation of the existing potentially affected environment and of potential environmental impacts of the proposed project, TEP agreed to define a 0.25-mi (0.40-km) wide study corridor for each alternative, within which the 125-ft (38-m) transmission line right-of-way (ROW) would be sited. The precise siting of the transmission line ROW within the selected study corridor would be based on further engineering evaluation and mitigation of potential impacts on cultural, paleontological, visual, and ecological resources, including provisions of mitigation agreements with Federal, state, and local agencies as listed in Chapter 9, following the issuance of Records of Decision (RODs) by the lead and cooperating agencies.[1]

TEP Corridor Identification Process. TEP has provided the following description of their corridor and substation location identification process:

> Commencing in 1995, TEP conducted a study to identify potential alternative routes from the U.S.-Mexico border to various tie points on TEP's utility grid. The first phase of this study was to develop an environmental screen to identify areas of concern and define those areas where the potential impacts may be minimal. TEP established a set of principles that was utilized to establish potential transmission line alignments. The principles were:
>
> - Stay within existing utility corridors where possible and to the extent practicable where doing so would not be detrimental to environmental and cultural factors.
> - Parallel existing infrastructures such as roads, trails and developed ROWs.
> - Follow existing legal or jurisdictional boundaries where possible. Boundaries considered were ownership or parcel boundaries; section, half section and quarter section lines, land grants, patented mining claims, and boundaries of cities, towns, or communities.
> - Avoid sensitive or regulatory areas where possible. Areas considered were known habitat of threatened or endangered species, floodplains and regulated water courses, wilderness or conservation areas, known cultural or historical sites, and visual resources.
> - Avoid the viewshed of the most concentrated residential areas.
>
> TEP evaluated potential transmission line alignments on the following factors:
>
> - The feasibility of construction and the cost. Included were environmental costs relating to the potential impacts and potential mitigation, the technical feasibility of constructing the transmission line, the construction costs, and the ability to acquire the necessary ROW.
> - The ability to acquire all regulatory permits.
> - The ability to meet TEP's purpose and need, including providing sufficient electric power reliability for Nogales, Arizona.

The routing of the transmission line was constrained by a need to connect to the existing South Substation at the northern end of the project.

For the proposed Gateway Substation, TEP initially considered the general area of the City of Nogales. TEP chose the area west of Interstate 19 (I-19) due to the dense development within the city and to avoid an unnecessary crossing of a major roadway (I-19). Topography limited the choices on the western side of

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[1] In the process of precise siting of the transmission line ROW, constraints may be identified that require minor deviations from the 0.25-mile-wide study corridor considered in this EIS. If route deviations are proposed, the agencies would review the proposed route changes to evaluate the need for additional NEPA review.

I-19 to two locations. The first location (southern site) was located adjacent to a wash that would have been impacted by the grading necessary to level the site for construction. TEP selected the second site, the proposed Gateway Substation site, because grading activities would not impact any washes or associated natural resources.

Using these principles, TEP identified three alternative corridors, as described in Sections 2.1.1 and 2.1.2, and the Eastern Corridor described in Section 2.1.4. The three corridors overlap each other in certain segments. Refer to Figures 1.1–4 and 2.1–4 for an overview map of the three corridors. Figures 2.1–1, 2.1–2, and 2.1–3 show a close-up view of the Western, Central, and Crossover Corridors as they pass through Sahuarita and Green Valley, Amado, and near Nogales, respectively. Section 2.3 contains a comparison of the alternatives based on the analysis in Chapter 4.

The expansion to the existing South Substation, the construction of the Gateway Substation (and fiber-optic regeneration site) and the Citizens 115-kV transmission line between the Gateway and Valencia substations would be the same for each of the three proposed corridors, as described in Sections 2.2.1 and 2.2.2. The three 3-acre (1.2-ha) construction staging areas and the 80-acre (32-ha) temporary laydown yard would also be the same for each of the three proposed corridors, as described in Section 2.2.3, Construction Yard and Material Handling Sites. The proposed fiber-optic wires would contain at least 48 fibers each (TEP 2003).

2.1.1 Western Corridor

The Western Corridor extends for an estimated 65.7 mi (105 km), from the South Substation to the U.S.-Mexico border, including 9.3 mi (15.0 km) that follows or crosses the EPNG ROW. The Western Corridor crosses 29.5 mi (47.5 km) of USFS land and 1.25 mi (2.0 km) of BLM land. The Western Corridor would require an estimated 429 support structures (monopoles or lattice towers), including an estimated 191 within the Coronado National Forest and 8 on BLM land. Table 4.1–1 lists the estimated areas of land that would be displaced by structures and structure construction sites. TEP would use existing utility maintenance roads, ranch access roads, and, where no access currently exists, new access ways (see Section 4.12). Approximately 20 mi (32 km) of new temporary roads would be built for construction of the Western Corridor on the Coronado National Forest (URS 2003a); spur roads off existing access roads to adjacent TEP transmission lines would provide project access on BLM land (see Figure3.1–1, Existing Utility Infrastructure). Transmission line tensioning and pulling and fiber-optic splicing sites would also temporarily disturb land (see Section 2.2.3). These sites would range in area from 0.5 to 1.5 acres (0.2 to 0.6 ha). There would be an estimated 12 sites outside of National Forest System lands occupying a total of 18 acres (7 ha), and an estimated 14 sites on the Coronado National Forest occupying a total of 10.5 acres (4.2 ha). The total new temporary area of disturbance on the Coronado National Forest during construction of the Western Corridor would be an estimated 197 acres (79.7 ha) (URS 2003a).

Following construction, TEP would close roads not required for project maintenance and would limit access to maintenance roads, in accordance with agreements with land owners or managers (for example, BLM or U.S. Department of Agriculture Forest Service [USFS]). On National Forest System land, the proposed project would not affect the existing road density because 1.0 mi (1.6 km) of existing classified road would be closed for every 1.0 mi (1.6 km) of proposed road to be used for project maintenance (see Section 4.12, Transportation). The maintenance access required by TEP would be limited to roads leading to selected structures, rather than a single cleared ROW leading to the U.S.-Mexico border. Transmission line tensioning and pulling sites, fiber-optic splicing sites, and construction yard areas would be cleared of construction-related facilities and materials within 6 months of the project becoming fully operational and the areas would be restored in accordance with agreements with land owners or managers.

The Western Corridor, together with the Central and Crossover Corridors, exits the TEP South Substation located within the incorporated area of the Town of Sahuarita and proceed westerly for 1.0 mi (1.6 km) before turning south for 1.5 mi (2.4 km). The corridors turn west across I-19 and continue through Pima County to the southwest, crossing an estimated 1.25 mi (2.0 km) of Federal lands managed by BLM parallel to two existing TEP transmission lines (138-kV and 345-kV). All corridors turn south and follow on the east side of the EPNG pipeline ROW for an estimated 5.8 mi (9.3 km), passing just east of the existing TEP Cyprus Sierrita Substation.

The Western and Crossover Corridors continue south past the Cyprus Sierrita Substation, then separate from the Central Corridor, continue southwest and south and enter Santa Cruz County after approximately 10 mi (16 km). The Western and Crossover Corridors enter the Coronado National Forest 6.0 mi (9.7 km) south of the Santa Cruz County line. While the Crossover Corridor turns east at Peck Canyon, the Western Corridor continues south along the west side of the Tumacacori and Atascosa Mountains, then meets and runs along the south side of Ruby Road as it turns gradually east, north of the Pajarita Wilderness. The Western Corridor continues south of Ruby Road then intersects the EPNG pipeline ROW and the Central and Crossover Corridors.

The Western Corridor, together with the Central and Crossover Corridors, continue through the National Forest System forest land, paralleling the EPNG pipeline ROW to the southeast for several miles to the Coronado National Forest boundary. All corridors exit the National Forest onto private land and proceed 0.5 mi (0.8 km) east to the proposed Gateway Substation. From the Gateway Substation, the corridors return to the west through private land then turn south to parallel the Coronado National Forest boundary. The corridors would meet the U.S.-Mexico border approximately 0.62 mi (1.0 km) west of Arizona State Highway 189 in Nogales, Arizona.

With respect to the Western Corridor, the Forest Supervisor proposes to issue an authorization that would allow TEP to construct, operate, and maintain a 345-kV transmission line along the route designated in this EIS as the Western Corridor. This route traverses National Forest System lands located in the Tumacacori EMA. Portions of the Western Corridor route crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish new utility corridor, establish utility corridor width, and change visual quality objectives. The proposed Western Corridor route would establish a new utility corridor through the Tumacacori EMA that joins and then follows the existing utility corridor as depicted in Figure 2.1-4. The width of this new utility corridor would be approximately 660 ft (201 m) on either side of the centerline, or approximately ¼-mi (0.40 km). The total length of this corridor through the Tumacacori EMA is approximately 29.5 mi (47.5 km), encompassing approximately 4,720 acres (1,910 ha). On National Forest System lands, the Western Corridor and its associated facilities would be located in Pima and Santa Cruz Counties, Arizona.

Use of the Western Corridor as a utility corridor would not be consistent with the governing Forest Plan for the Coronado National Forest (USFS, 1986, as amended). Compliance with the consistency requirements of the NFMA would be achieved through simultaneous adoption of the Forest Plan amendments described below.

AMENDMENT TO ESTABLISH NEW UTILITY TRANSPORTATION CORRIDOR

As shown on Figure 2.1-4, the proposed Western Corridor passes through undeveloped National Forest System lands west of the Tumacacori and Atascosa Mountains in the Tumacacori EMA, then gradually turns east to its point of connection with the existing utility transportation corridor, which is generally concurrent with the EPNG pipeline. The Western Corridor is approximately 29 mi (46.7 km) in length and ¼-mi (0.40 km) in width [approximately 660 ft (201 m) on either side of a centerline]. For consistency purposes, this proposed route is divided into two segments:

1. <u>Segment A</u>: Segment A is approximately 27.5 mi (44.3 km) in length and encompasses approximately 4,440 acres (1,781 ha). For this segment, the Forest Plan would be amended by modifying the Transportation System and Utilities Corridor Map to establish new utility corridor in the Tumacacori EMA where none existed before. The mapped location would be as depicted for Western Corridor, Segment A, in Figure 2.1-4 and the corridor width would be established as ¼-mi (0.40 km). Additionally, management direction in the Forest Plan regarding visual quality objectives would be changed.

2. <u>Segment B</u>: Segment B is approximately 2 mi (3.2 km) in length and encompasses approximately 320 acres (129.5 ha). This segment is concurrent with the route of an existing utility corridor in the Tumacacori EMA depicted on the Transportation System and Utilities Corridor Map in the Forest Plan. For this segment, the Forest Plan would be amended to establish a corridor width of ¼-mi (0.40 km). Corridor width was not previously specified in the Forest Plan. Additionally, management direction in the Forest Plan regarding visual quality objectives would be changed.

To make the Western Corridor consistent with the Forest Plan, the Forest Plan Transportation System and Utilities Corridor Map would be modified to include the new utility corridor shown on Figure 2.1-4.

AMENDMENT TO CHANGE VISUAL QUALITY OBJECTIVES IN MANAGEMENT AREAS 1, 3, 4, AND 7B

Installation of fully aboveground structures such as the proposed transmission line and associated facilities in the Western Corridor would not be consistent with Forest Plan direction for visual quality objectives. Specifically, the Forest Plan would require amendment to change the visual quality objectives in Management Areas 1, 3, 4, and 7B on 2,303 acres of the Tumacacori EMA. Table 2.1-1 details the changes to Forest Plan text required to bring the proposed action into compliance with Forest Plan direction. For each row in the table, the existing text in the Forest Plan would be deleted and replaced by the amended text.

Table 2.1-1. Comparison of Existing and Amended Forest Plan Text for Proposed Western Corridor

Forest Plan Reference	Existing Text	Amended Text
Management Area 1 Page 47 Visual Resource Management	Manage the following acres at the indicated visual quality objectives: 12,710 acres Retention 13% 51,819 acres Partial Retention 53% 33,265 acres Modification 33% 978 acres Maximum Modification 1%	Manage the following acres at the indicated visual quality objectives: 12,498 acres Retention 13% 51,819 acres Partial Retention 53% 33,265 acres Modification 33% 1,190 acres Maximum Modification 1%
Management Area 3 Page 55 Visual Resource Management	Manage the following acres at the indicated visual quality objectives: 8,125 acres Retention 55% 3,988 acres Partial Retention 27% 2,659 acres Modification 18% 49 acres Maximum Modification <0.4%	Manage the following acres at the indicated visual quality objectives: 8,076 acres Retention 55% 3,988 acres Partial Retention 27% 2,659 acres Modification 18% 49 acres Maximum Modification <0.4%
Management Area 4 Page 62 Visual Resource Management	Manage the following acres at the indicated visual quality objectives: 135,201 acres Retention 12% 406,144 acres Partial Retention 36% 440,208 acres Modification 39% 146,736 acres Maximum Modification 13%	Manage the following acres at the indicated visual quality objectives: 133,892 acres Retention 12% 405,534 acres Partial Retention 36% 440,208 acres Modification 39% 148,655 acres Maximum Modification 13%
Management Area 7B Page 71 Visual Resource Management	Manage the following acres at the indicated visual quality objectives: 6,165 acres Retention 36% 5,651 acres Partial Retention 33% 4,281 acres Modification 25% 1,027 acres Maximum Modification 6%	Manage the following acres at the indicated visual quality objectives: 6,100 acres Retention 36% 5,651 acres Partial Retention 33% 4.281 acres Modification 25% 1,092 acres Maximum Modification 6%

2.1.2 Central Corridor

The Central Corridor extends for an estimated 57.1 mi (91.9 km), from the South Substation to the U.S.-Mexico border, including 43.2 mi (69.5 km) that follows or crosses the EPNG pipeline ROW. The estimated length of the Central Corridor within the Coronado National Forest is 15.1 mi (24.3 km), and it is 1.25 mi (2.0 km) on BLM land. The Central Corridor would require an estimated 373 support structures, including an estimated 102 within the Coronado National Forest and 8 on BLM land. Table 4.1–1 lists the estimated areas of land that would be displaced by structures and structure construction sites. TEP would use existing access where feasible as described for the Western Corridor. An estimated 13.8 mi (22.2 km) of temporary new roads would be built for construction of the Central Corridor on the Coronado National Forest (URS 2003a); spur roads off existing access roads to adjacent TEP transmission lines would provide project access on BLM land. Transmission line tensioning and pulling and fiber-optic splicing sites would also temporarily disturb land (see Section 2.2.3). These sites would range in area from 0.5 to 1.5 acres (0.2 to 0.6 ha). There would be an estimated 14 sites outside of National Forest System lands occupying a total of 21 acres (8.5 ha), and an estimated 7 sites on the

Coronado National Forest occupying a total of 3.3 acres (1.3 ha). The total new temporary area of disturbance on the Coronado National Forest during construction of the Central Corridor would be an estimated 105 acres (42.5 ha) (URS 2003a).

The Central Corridor follows the same route as the Western and Crossover Corridors from the South Substation in Sahuarita to approximately 3 mi (4.8 km) south of the existing TEP Cyprus Sierrita Substation. Refer to Section 2.1.1 for a description of this common segment. The Central Corridor separates from the Western and Crossover Corridors south of the TEP Cyprus Sierrita Substation, continuing to follow or cross the EPNG pipeline ROW to the south.

The Central Corridor approaches to within approximately 1.0 mi (1.6 km) west of I-19, passing the towns of Amado, Tubac, and Tumacacori. The Central Corridor continues approximately 2.0 mi (3.2 km) south of Tumacacori then enters the Coronado National Forest, following the EPNG pipeline ROW. Within the Coronado National Forest, two optional sub-routes are addressed: (1) a route that avoids a 1.9-mi (3.1-km) stretch of the EPNG pipeline ROW that is also designated as an inventoried roadless area (IRA) and (2) a route that follows the EPNG pipeline ROW in the Coronado National Forest (see Figure 3.1-1). The Draft EIS did not include both optional routes because there was a perceived need to avoid that portion of the existing EPNG pipeline ROW that is designated as an IRA. However, based on public comments, the Federal agencies decided that a route following the EPNG pipeline ROW would be a reasonable option for the transmission lines through the Coronado National Forest. Such a route would allow the transmission lines to be constructed and operated in an area that is currently designated as a utility corridor in the governing Forest Plan. Additionally, an optional route within the existing EPNG pipeline ROW would not require creation of a new utility corridor, and would give the USFS greater flexibility in managing the 1.9-mi (3.1-km) stretch of land that is not currently utilized as a utility corridor.

The Central Corridor passes along the eastern edge of the Tumacacori and Atascosa Mountains, crosses Ruby Road, and reaches a point northwest of the Gateway Substation where it rejoins the Western Corridor (see Figure 1.1–4). The Central Corridor is identical to the Western and Crossover Corridors from the point where they join in the Coronado National Forest to the Gateway Substation and the U.S.-Mexico border. Refer to Section 2.1.1 for a description of this common segment.

With respect to the Central Corridor (Option 1), the Forest Supervisor proposes to issue an authorization to allow TEP to construct, operate, and maintain a 345-kV transmission line along the route designated in this EIS as the Central Corridor (Option 1). This route traverses National Forest System lands located in the Tumacacori Ecosystem Management Area as depicted in Figure 2.1-5. Portions of the Central Corridor (Option 1) route crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish new utility corridor, establish utility corridor width, and change visual quality objectives. The proposed Central Corridor (Option 1) route would establish a new utility corridor through the Tumacacori EMA that joins, and then follows the existing utility corridor. The width of this new utility corridor would be approximately 660 ft (201 m) on either side of the centerline, or approximately ¼-mi (0.40 km). The total length of this corridor through the Tumacacori EMA is approximately 15.1 mi (24.3 km), encompassing approximately 2,416 acres (976 ha).

With respect to the Central Corridor (Option 2), the Forest Supervisor proposes to issue an authorization to allow TEP to construct, operate, and maintain a 345-kV transmission line along the route designated in this EIS as the Central Corridor (Option 2). This route traverses National Forest System lands located in the Tumacacori Ecosystem Management Area as depicted in Figure 2.1-5. Portions of the Central Corridor (Option 2) route crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish new utility corridor, establish utility corridor width, and change visual quality objectives. The proposed Central

Corridor (Option 2) route would establish a new utility corridor through the Tumacacori EMA that joins, and then follows the existing utility corridor. The width of this new utility corridor would be approximately 660 ft (201 m) on either side of the centerline, or approximately ¼-mi (0.40 km). The total length of this corridor through the Tumacacori EMA is approximately 15.1 mi (24.3 km), encompassing approximately 2,416 acres (976 ha). On National Forest System lands, the Central Corridor and its associated facilities would be located in Santa Cruz County, Arizona.

Use of the Central Corridor (Option 1 or Option 2) as a utility corridor would not be consistent with the governing Forest Plan for the Coronado National Forest (USFS, 1986, as amended). Compliance with the consistency requirements of the NFMA would be achieved through simultaneous adoption of the Forest Plan amendments described below.

AMENDMENT TO ESTABLISH NEW UTILITY TRANSPORTATION CORRIDOR

As shown on Figure 2.1-5, the Central Corridor is divided into three segments:

1. Segment A: Central Corridor Segment A is approximately 6.7 mi (10.8 km) in length and encompasses approximately 1,072 acres (433.8 ha). This segment is concurrent with the route of an existing utility corridor in the Tumacacori EMA depicted on the Transportation System and Utilities Corridor Map in the Forest Plan. For this segment, the Forest Plan would be amended to establish a corridor width of ¼-mi (0.40 km). Corridor width was not previously specified in the Forest Plan. Additionally, management direction in the Forest Plan regarding visual quality objectives would be changed.

2. Segment B (Option 1): Central Corridor (Option 1) Segment B is approximately 1.9 mi (3.1 km) in length and encompasses approximately 304 acres (123.0 ha). For this segment, the Forest Plan would be amended by modifying the Transportation System and Utilities Corridor Map to establish new utility corridor in the Tumacacori EMA where none existed before. The mapped location would be as depicted for Central Corridor (Option 1), Segment B, in Figure 2.1-5 and the corridor width would be established as ¼-mi (0.40 km). Additionally, management direction in the Forest Plan regarding visual quality objectives would be changed.

3. Segment B (Option 2): Central Corridor (Option 2) Segment B is approximately 1.9 mi (3.1 km) in length and encompasses approximately 304 acres (123.0 ha). This segment is concurrent with the route of an existing utility corridor in the Tumacacori EMA depicted on the Transportation System and Utilities Corridor Map in the Forest Plan. For this segment, the Forest Plan would be amended to establish a corridor width of ¼-mi (0.40 km). The Forest Plan does not establish a width for this corridor. Additionally, management direction in the Forest Plan regarding visual quality objectives would be changed.

4. Segment C: Central Corridor Segment C as is approximately 6.5 mi (10.5 km) in length and encompasses approximately 1,072 acres (433.8 ha). This segment is concurrent with the route of an existing utility corridor in the Tumacacori EMA depicted on the Transportation System and Utilities Corridor Map in the Forest Plan. For this segment, the Forest Plan would be amended to establish a corridor width of ¼-mi (0.40 km). Corridor width was not previously specified in the Forest Plan. Additionally, management direction in the Forest Plan regarding visual quality objectives would be changed.

To make the Central Corridor consistent with the Forest Plan, the Forest Plan Transportation System and Utilities Corridor Map would be modified to include the new utility corridor shown on Figure 2.1-5.

AMENDMENT TO CHANGE VISUAL QUALITY OBJECTIVES IN MANAGEMENT AREAS 4 AND 7B

Installation of fully aboveground structures, such as the proposed transmission line and associated facilities in the Central Corridor would not be consistent with Forest Plan direction for visual quality objectives. Specifically, the Forest Plan would require amendment to change the visual quality objectives in Management Areas 4 and 7B on 1,160 acres (469 ha) of the Tumacacori EMA. Table 2.1-2 details the changes to Forest Plan text required to bring the Central Corridor into compliance with Forest Plan direction. For each row in the table, the existing text in the Forest Plan would be deleted and replaced by the amended text.

Table 2.1-2. Comparison of Existing and Amended Forest Plan Text for Proposed Central Corridor

Forest Plan Reference	Existing Text	Amended Text
Management Area 4 Page 62 Visual Resource Management	Manage the following acres at the indicated visual quality objectives: 135,201 acres Retention 12% 406,144 acres Partial Retention 36% 440,208 acres Modification 39% 146,736 acres Maximum Modification 13%	Manage the following acres at the indicated visual quality objectives: 135,080 acres Retention 12% 406,114 acres Partial Retention 36% 439,346 acres Modification 39% 147,749 acres Maximum Modification 13%
Management Area 7B Page 71 Visual Resource Management	Manage the following acres at the indicated visual quality objectives: 6,165 acres Retention 36% 5,651 acres Partial Retention 33% 4,281 acres Modification 25% 1,027 acres Maximum Modification 6%	Manage the following acres at the indicated visual quality objectives: 6,111 acres Retention 36% 5,646 acres Partial Retention 33% 4.233 acres Modification 25% 1,134 acres Maximum Modification 6%

2.1.3 Crossover Corridor

An additional study corridor, the Crossover Corridor, was included for analysis in this EIS based on public and tribal input received during the public scoping period and tribal consultations. The Crossover Corridor extends for an estimated 65.2 mi (105 km), from the South Substation to the U.S.-Mexico border. The estimated length of the Crossover Corridor within the Coronado National Forest would be 29.3 mi (47.2 km) and it would be 1.25 mi (2.0 km) on BLM land. The Crossover Corridor would follow or cross the EPNG pipeline for 17 mi (27.4 km). The Crossover Corridor would require an estimated 431 support structures, including 196 within the Coronado National Forest and 8 on BLM land. Table 4.1–1 lists the estimated areas of land that would be displaced by structures and structure construction sites. TEP would use existing access where feasible as described for the Western Corridor. An estimated 20.7 mi (33.3 km) of temporary new roads would be built for construction of the Crossover Corridor on the Coronado National Forest (URS 2003a); spur roads off existing access roads to adjacent TEP transmission lines would provide project access on BLM land. Transmission line tensioning and pulling and fiber-optic splicing sites would also temporarily disturb land (see Section 2.2.3). These sites would range in area from 0.5 to 1.5 acres (0.2 to 0.6 ha). There would be an estimated 12 sites outside of national forest lands occupying a total of 18 acres (7 ha), and an estimated 12 sites on the Coronado National Forest occupying a total of 7.6 acres (3.1 ha). The total new temporary area of disturbance on the Coronado National Forest during construction of the Crossover Corridor would be an estimated 238 acres (96.3 ha) (URS 2003a).

The Crossover Corridor is identical to the Western and Central Corridors from where it exits the TEP South Substation in Sahuarita to where it separates from the Western and Central Corridors in the Coronado National Forest. Refer to Section 2.1.2 for a description of this common segment.

When the Crossover Corridor separates from the Western Corridor, it turns east through Peck Canyon for an estimated 7 mi (11.3 km). Within this 7 mi (11.3 km) stretch, the Crossover Corridor passes through approximately 3 mi (4.8 km) of an IRA. The Crossover Corridor joins the Central Corridor and the existing EPNG pipeline ROW upon exiting Peck Canyon on the east side of the Tumacacori Mountains. From here, the Crossover Corridor continues south, following the existing EPNG pipeline ROW. Upon reaching the 1.9-mi (3.1-km) stretch that is designated as an IRA, there would be two optional sub-routes: (1) a route that follows the existing EPNG pipeline ROW in the Coronado National Forest and (2) a route that avoids a 1.9-mi (3.1-km) stretch of the existing EPNG pipeline ROW that is also designated as an IRA (see Figure 2.1-6).

The Crossover Corridor is identical to the Western and Central Corridors from the point where they rejoin in the Coronado National Forest to the Gateway Substation and the U.S.-Mexico border. Refer to Section 2.1.1 for a discussion of this common segment.

With respect to the Crossover Corridor (Option 1), the Forest Supervisor proposes to issue an authorization that would allow TEP to construct, operate, and maintain a 345-kV transmission line along the route designated in this EIS as the Crossover Corridor (Option 1). This route traverses National Forest System lands located in the Tumacacori Ecosystem Management Area. Portions of the Crossover Corridor (Option 1) route crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish new utility corridor, establish utility corridor width, and change visual quality objectives. The proposed Crossover Corridor (Option 1) route would establish a new utility corridor through the Tumacacori EMA that joins, and then follows the existing utility corridor as depicted in Figure 2.1-6. The width of this new utility corridor would be approximately 660 ft (201 m) on either side of the centerline, or approximately ¼-mi (0.40 km). The total length of this corridor through the Tumacacori EMA is approximately 29.3 mi (47.1 km), encompassing approximately 4,688 acres (1,894 ha).

With respect to the Crossover Corridor (Option 2), the Forest Supervisor proposes to issue an authorization that would allow TEP to construct, operate, and maintain a 345-kV transmission line along the route designated in this EIS as the Crossover Corridor (Option 2). This route traverses National Forest System lands located in the Tumacacori Ecosystem Management Area. Portions of the Crossover Corridor (Option 2) route crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish new utility corridor, establish utility corridor width, and change visual quality objectives. The proposed Crossover Corridor route would establish a new utility corridor through the Tumacacori EMA that joins, and then follows the existing utility corridor as depicted in Figure 2.1-6. The width of this new utility corridor would be approximately 660 ft (201 m) on either side of the centerline, or approximately ¼-mi (0.40 km). The total length of this corridor through the Tumacacori EMA is approximately 29.3 mi (47.1 km), encompassing approximately 4,688 acres (1,894 ha). On National Forest System lands, the Crossover Corridor and its associated facilities would be located in Pima and Santa Cruz Counties, Arizona.

Use of the Crossover Corridor (Option 1 or Option 2) as a utility corridor would not be consistent with the governing Forest Plan for the Coronado National Forest (USFS, 1986, as amended). Compliance with the consistency requirements of the NFMA would be achieved through simultaneous adoption of the Forest Plan amendments described below.

AMENDMENT TO ESTABLISH NEW UTILITY TRANSPORTATION CORRIDOR

As shown on Figure 2.1-6, the Crossover Corridor is divided into five segments:

1. Segment A: Crossover Corridor Segment A is approximately 10.7 mi (17.2 km) in length and encompasses approximately 1,712 acres (692.8 ha). For this segment, the Forest Plan would be amended by modifying the Transportation System and Utilities Corridor Map to establish new utility corridor in the Tumacacori EMA where none existed before. The mapped location would be as depicted for Crossover Corridor, Segment A, in Figure 2.1-6 and the corridor width would be established as ¼-mi (0.40 km). Additionally, management direction in the Forest Plan regarding visual quality objectives would be changed.

2. Segment B: Crossover Corridor Segment B is approximately 7 mi (11.3 km) in length and encompasses approximately 1,120 acres (453.2 ha). For this segment, the Forest Plan would be amended by modifying the Transportation System and Utilities Corridor Map to establish new utility corridor in the Tumacacori EMA where none existed before. The mapped location would be as depicted for Crossover Corridor Segment B, in Figure 2.1-6 and the corridor width would be established as ¼-mi (0.40 km). Additionally, management direction in the Forest Plan regarding visual quality objectives would be changed.

3. Segment C: Crossover Corridor Segment C is approximately 3.2 mi (5.2 km) in length and encompasses approximately 1,072 acres (433.8 ha). This segment is concurrent with route of an existing utility corridor in the Tumacacori EMA depicted on the Transportation System and Utilities Corridor Map in the Forest Plan. For this segment, the Forest Plan would be amended to establish a corridor width of ¼-mi (0.40 km). Corridor width was not previously specified in the Forest Plan. Additionally, management direction in the Forest Plan regarding visual quality objectives would be changed.

4. Segment D (Option 1): Crossover Corridor Segment D (Option 1) is approximately 1.9 mi (3.1 km) in length and encompasses approximately 304 acres (123.0 ha). For this segment, the Forest Plan would be amended by modifying the Transportation System and Utilities Corridor Map to establish new utility corridor in the Tumacacori EMA where none existed before. The mapped location would be as depicted for Crossover Corridor Segment D (Option 1), in Figure 2.1-6 and the corridor width would be established as ¼-mi (0.40 km). Additionally, management direction in the Forest Plan regarding visual quality objectives would be changed.

5. Segment D (Option 2): Crossover Corridor Segment D (Option 2) is approximately 1.9 mi (3.1km) in length and encompasses approximately 304 acres (123.0 ha). This segment is concurrent with the route of an existing utility corridor in the Tumacacori EMA depicted on the Transportation System and Utilities Corridor Map in the Forest Plan. For this segment, the Forest Plan would be amended to establish a corridor width of ¼-mi (0.40 km). Corridor width was not previously specified in the Forest Plan. Additionally, management direction in the Forest Plan regarding visual quality objectives would be changed.

6. Segment E: Crossover Corridor Segment E is approximately 6.5 mi (10.5 km) in length and encompasses approximately 1,040 acres (420.8 ha). This segment is concurrent with the route of

an existing utility corridor in the Tumacacori EMA depicted on the Transportation System and Utilities Corridor Map in the Forest Plan. For this segment, the Forest Plan would be amended to establish a corridor width of ¼-mi (0.40 km). Corridor width was not previously specified in the Forest Plan. Additionally, management direction in the Forest Plan regarding visual quality objectives would be changed.

To make the Crossover Corridor consistent with the Forest Plan, the Forest Plan Transportation System and Utilities Corridor Map would be modified to include the new utility corridor shown on Figure 2.1-6.

AMENDMENT TO CHANGE VISUAL QUALITY OBJECTIVES IN MANAGEMENT AREAS 1, 4, AND 7B

Installation of a fully aboveground facility such as the proposed transmission line and associated facilities in the Crossover Corridor route would not be consistent with Forest Plan direction for visual quality objectives. Specifically, the Forest Plan would require amendment to change the visual quality objectives in Management Areas 1, 4, and 7B on 1,549 acres of the Tumacacori EMA. Table 2.1-3 details the changes to Forest Plan text required to bring the proposed action into compliance with Forest Plan direction. For each row in the table, the existing text in the Forest Plan would be deleted and replaced by the amended text.

Table 2.1-3. Comparison of Existing and Amended Forest Plan Text for Proposed Crossover Corridor

Forest Plan Reference	Existing Text	Amended Text
Management Area 1 Page 47 Visual Resource Management	Manage the following acres at the indicated visual quality objectives: 12,710 acres Retention 13% 51,819 acres Partial Retention 53% 33,265 acres Modification 33% 978 acres Maximum Modification 1%	Manage the following acres at the indicated visual quality objectives: 12,710 acres Retention 13% 51,818 acres Partial Retention 53% 33,265 acres Modification 33% 979 acres Maximum Modification 1%
Management Area 4 Page 62 Visual Resource Management	Manage the following acres at the indicated visual quality objectives: 135,201 acres Retention 12% 406,144 acres Partial Retention 36% 440,208 acres Modification 39% 146,736 acres Maximum Modification 13%	Manage the following acres at the indicated visual quality objectives: 135,161 acres Retention 12% 405,840 acres Partial Retention 36% 439,372 acres Modification 39% 147,916 acres Maximum Modification 13%
Management Area 7B Page 71 Visual Resource Management	Manage the following acres at the indicated visual quality objectives: 6,165 acres Retention 36% 5,651 acres Partial Retention 33% 4,281 acres Modification 25% 1,027 acres Maximum Modification 6%	Manage the following acres at the indicated visual quality objectives: 6,165 acres Retention 36% 5,651 acres Partial Retention 33% 3,957 acres Modification 23% 1,351 acres Maximum Modification 8%

2.1.4 No Action Alternative

CEQ regulations require that an agency "include the alternative of no action" as one of the alternatives it considers (40 CFR 1502.14[d]). In the context of this EIS, "no action" means that TEP's proposed transmission line is not built. For DOE and the cooperating agencies, "no action" would be achieved by any one of the Federal agencies declining to grant TEP its permission to build in its respective jurisdiction. Thus, in the case of DOE, "no action" means denying the Presidential Permit. For USFS, "no action" means denying the authorization. Because the action alternatives would require amendment of the Forest Plan, "no action" is further defined to mean that the Forest Plan, including the

Transportation System and Utilities Corridor Map, would remain unchanged. Without authorization and associated Forest Plan amendments, the 345-kV transmission line and associated structures would not be constructed on National Forest System lands. Management of lands and resources in the Tumacacori EMA would progress as expected under current management direction. For BLM, "no action" means denying access to BLM-managed Federal lands. Each agency makes its own decision independently, so that it is possible that one or more agencies could grant permission for the proposal while another could deny permission. Thus, if any agency denied permission for the proposed transmission line, it would not be built.

2.1.5 Alternatives Considered But Eliminated From Further Analysis

Among the alternatives considered for inclusion in the impacts analysis in this EIS are the following: Eastern, Southeast, and I-19 aboveground 345-kV transmission line routes (see Figure 2.6-1); construction of an underground 345-kV transmission line; construction of a 115-kV transmission line instead of a 345-kV line; siting, construction, and operation of a new power generating facility in Santa Cruz County; construction of a 345-kV line along the same path as existing lower voltage lines in Pima and Santa Cruz Counties; conservation; and upgrade of existing 115-kV transmission line. As discussed in this section, for the purpose of impacts analysis in this EIS, the Federal agencies dismissed each of the preceding alternatives from further evaluation.

When a Federal agency is the proponent of a proposed project, it is responsible, under CEQ regulations at 40 CFR 1502.14, to explore a range of reasonable foreseeable alternatives that meet the underlying purpose and need for the agency to take action. By their very nature, the Federal authorizations that comprise the proposed actions addressed in this EIS inherently constrain the alternatives available to the agencies; that is, the only reasonable alternatives available to DOE, USFS, BLM, and USIBWC are simply choices to approve or deny an authorization. Based on TEP's alternative identification process, stakeholder input, and consideration by DOE and the cooperating agencies, the following alternatives, as shown in Figure 2.1–7 were eliminated from further analysis.

Eastern Corridor. The Eastern Corridor extends for an estimated 60.3 mi (97.0 km) from the South Substation to the international border, including an estimated 12.4 mi (20.0 km) within the Coronado National Forest. The Eastern Corridor exits the South Substation to the east for an estimated 6.0 mi (9.7 km), where it turns south along Wilmot Road and parallels the existing Citizens 115-kV transmission line (east of the community of Sahuarita and west of the community of Corona de Tucson). The Eastern Corridor continues south for another 6.5 mi (10 km) before reaching the turning point of the Citizens Communication Company (Citizens) existing transmission line alignment. At this point, the Eastern Corridor continues to parallel the Citizens transmission line southwest for an estimated 18.4 mi (29.6 km) to the vicinity of Amado-Montosa Road. Leaving the Citizens transmission line, the Eastern Corridor turns southwest for an estimated 2.9 mi (4.7 km) and crosses I-19. At this point, the Eastern Corridor joins TEP's Central Corridor and turns south along the existing EPNG pipeline ROW an estimated 1.0 mi (1.6 km) west of I-19 through Tubac and Tumacacori before entering the Coronado National Forest. Within the Coronado National Forest, the Eastern Corridor is identical to the proposed Central Corridor and would require adoption of the same Forest Plan amendments described for the Central Corridor in Section 2.1.2 to be in compliance with the NFMA. The Eastern Corridor follows the EPNG pipeline ROW through the Tumacacori and Atascosa Mountains, and turns southeast an estimated 2.8 mi (4.5 km) north of Peña Blanca Lake. At a point northwest of the Gateway Substation, the Eastern Corridor rejoins the Western Corridor. From the point of intersection, the Eastern Corridor follows the Central and Western Corridors to the Gateway Substation and the international border approximately 0.62 mi (1.0 km) west of Arizona State Highway 189 in Nogales, Arizona.

On July 3, 2002, TEP wrote a letter to DOE requesting that the Eastern Corridor alternative, originally proposed by TEP and included in the Notice of Intent (see Section 1.3, Public Participation), be removed from further analysis in the EIS (TEP 2002a). The following summarizes the reasons TEP gave for its request:

1. The route does not provide sufficient reliability for a second feed into Nogales, Arizona. Because the Eastern Corridor parallels the existing Citizens transmission line to Nogales, Arizona for approximately 20 mi (32 km), a single event such as a wildfire could cause the loss of both transmission lines, completely cutting off electricity transmission to Nogales, Arizona.

2. Encroachment along this route would necessitate many property condemnations to develop an adequate ROW. A combined ROW of at least 300 ft (91 m) would be required where the Eastern Corridor parallels the existing Citizens transmission line. Given the houses near the existing transmission line, approximately thirty or more parcels of land would be purchased and condemned.

3. Construction of the Eastern Corridor would require many lengthy outages of the existing Citizens transmission line, given its proximity, thereby cutting off transmission to Nogales during construction.

4. This route is more visually obtrusive than the Western or Central Corridors as expressed by residents of Green Valley, Tubac, and Tumacacori at DOE public scoping meetings and Arizona Corporation Commission (ACC) hearings for the proposed project.

TEP's decision not to pursue the Eastern Corridor alternative renders it infeasible, and DOE, in consultation with the cooperating agencies, has removed this alternative from further consideration in the EIS.

Council on Environmental Quality (CEQ) regulations (40 CFR 1502.14) require Federal agencies to analyze only alternatives that are reasonable, that is, technically and economically practical and feasible. The rule of reason governs which alternatives the agency must discuss and the extent to which it must discuss them. Where a Federal Agency is the proprietor of a proposed project, it will consider the range of reasonable alternatives. However, where a proposed action is advanced by a non-Federal applicant, such as TEP, seeking a permit for a project, an agency ordinarily need not redefine the applicant's proposal or select alternatives that change the applicant's goals (*Citizens Against Burlington, Inc. v. Busey*, 938F.2d 190 [D.C. Cir.], *cert denied*, 502 U.S. 994 [1991]).

Because TEP has asserted that it does not want to pursue a given alternative route and DOE will not decide otherwise, it would be a waste of time and resources to evaluate an alternative that the applicant rejects. Accordingly, DOE has removed the Eastern Corridor from further analysis in the EIS. The applicant bears the risk that if it changes its mind in the future and again proposes the Eastern Corridor alternative, additional environmental review would be required.

I-19 Corridor. The I-19 Corridor leaves the South Substation westerly adjacent to the existing TEP 345-kV transmission line until it crosses I-19, where it turns south and continues approximately 46 mi (74 km) to the Mariposa Road exit in Nogales, Arizona, and then turns west to the Gateway Substation. The predominant considerations for eliminating this alternative from further analysis centered on the visual impacts through densely populated areas, and the potential impacts to cultural resources, given the proximity of a majority of the alternative route to the Santa Cruz River. Other considerations included safety and the interruption of I-19 traffic during construction.

East Central Corridor. The East Central Corridor follows the existing TEP 138-kV transmission line from the South Substation to the east and south until it reaches the Green Valley Substation at

Whitehouse Canyon Road and the Old Nogales Highway, where it continues south along the railroad to the Pima County and Santa Cruz County boundary. At this point, it turns away from the railroad and proceeds to the southeast until it intersects the existing Citizens 115-kV transmission line at the turning point east of Amado. The alternative then proceeds southeasterly adjacent to the 115-kV line for an estimated 5 mi (8 km) before heading southeast toward Solero Canyon Road skirting the recreation area at Lake Patagonia an estimated 1.2 mi (1.9 km) west of the dam. The alternative proceeds south parallel to the eastern city limit of Nogales, until reaching State Route 82, where it turns and parallels the highway to the southwest for an estimated 2.5 mi (4.0 km) into Nogales. The predominant considerations for eliminating this alternative from further analysis were the impacts on the agricultural areas in the northern segments as the transmission lines would restrict aerial pollination and pest control, the close proximity to existing and proposed residential developments in the Sahuarita, Green Valley, Solero Ranch, and Nogales suburbs, and the hazard potential and height restriction adjacent to the Nogales International Airport.

Southeast Corridor. The Southeast Corridor leaves the South Substation to the east for an estimated 6.5 mi (10 km) before heading south along Wilmot Road, where it meets and parallels the existing Citizens 115-kV transmission line. The corridor follows this alignment for an estimated 5 mi (8 km) before both turn southwest for another 18.2 mi (29.3 km) then turn southeast. From this point, the corridor follows the East Central Corridor. This corridor was eliminated from further analysis for the same considerations as the East Central Corridor except that the impact to the agricultural areas was somewhat less and there were fewer residences in the Sahuarita and Green Valley area.

South 115-kV Connection. The South 115-kV Connection route provided an alternative within the southern portion of the study area. It could be a sub-route for any of the preceding routes from the point where the existing Citizens 115-kV transmission line turns southeast east of Amado. From the turning point, it goes approximately 5 mi (8 km) south by southeast and then turns south immediately adjacent to the 115-kV transmission line through low-density residential areas east of Tubac and Tumacacori. Further to the south, the route intersects the railroad and bears to the southeast as it enters Rio Rico. From this point, approximately 14.2 mi (22.8 km) north of Nogales, the route alternatively traverses residential development and riparian areas adjacent to the Santa Cruz River. This route was dismissed from further analysis because of the anticipated difficulty in acquiring adequate ROW within the Rio Rico and Nogales areas due to the potential impacts to the riparian areas and habitat, along with the visual impact to the areas east of Tubac and Tumacacori.

Construction of a Power Generating Station Near Nogales. This alternative would involve the construction of a new power generating facility within Santa Cruz County, in the proximity of Nogales and the I-19 corridor. A new power plant in Santa Cruz County is not a viable alternative to a new, second transmission line because a new power plant would not satisfy either element of TEP's dual purpose and need for the proposed action. First, a new electrical generating plant would not meet the international aspect of TEP's proposal, in that it would not provide for an interconnection with the Mexican electrical grid. Furthermore, the Arizona Corporation Commission (ACC) has determined that a new power plant would not resolve the electrical reliability problems in Santa Cruz County that led the ACC to issue its decisions mandating the construction of a new transmission line (see Section 1.1.2). As explained in ACC staff comments on the DEIS (ACC 2003a), "new local generation does not pre-empt the need for a second transmission line. This is because the system deficiency is not a supply problem but rather a delivery problem that new generation can not solve. New local generation would be susceptible to tripping off line for a transmission line outage just like the existing Valencia units until a second transmission line connects Nogales to the Arizona grid." It also takes longer to recover from outages when there is only one transmission line connection. Furthermore, the ACC staff comments point out that a second transmission line connection would improve the utilities' ability to maintain consistent voltage in Santa Cruz County. For these reasons, the ACC staff consistently requires that two transmission lines emanate from a power plant. There would be negative environmental impacts associated with construction and operation of a new power plant. The major impacts would be to air quality, water resources, and visual resources, along with impacts from land disturbance at the generating facility site and along required infrastructure such as connecting transmission lines or fuel supply lines. Impacts from land disturbance could affect biological, cultural, and soil resources. Depending upon the type of power plant, and the size, the major impacts would be: land use (approximately 100-200 acres of land could be disturbed), air quality (most power plant types would emit criteria pollutants), water resources (cooling water would be required for most power plant types), and visual resources. Land disturbance from the power plant could also affect biological resources, including the loss of existing native plant communities. Potential adverse effects to wildlife would include some mortality of individual wildlife, interference with breeding, loss of habitat, and loss of forage plants. Cultural resources could also be affected by land disturbance.

Combining the Proposed 345-kV Transmission Line with Existing Lower Voltage Transmission Lines. This alternative would involve combining the proposed 345-kV transmission line with existing lower voltage transmission lines onto a single set of support structures to minimize the creation of new utility ROWs. The existing lower voltage transmission lines in the vicinity of TEP's proposed project, as detailed in the existing infrastructure map shown in Figure 3.11-1, include TEP's 46-kV and 138-kV transmission lines, Arizona Electric Power Company's 230-kV transmission line, TRICO Electric Cooperative, Inc.'s 69-kV transmission line, and Citizens' 115-kV transmission line. This alternative was eliminated from further analysis for the following reasons. The lower voltage transmission lines would be "underbuilt" beneath the 345-kV transmission lines, thus requiring the height of the proposed 345-kV structures to increase at least 30 ft (9.2 m), resulting in increased impacts to the viewshed. Combining different transmission lines onto a single set of support structures would mean that a problem with one structure would affect multiple transmission lines, thus potentially decreasing electrical reliability. This alternative would require adoption of Forest Plan amendments as described in Sections 2.1.1, 2.1.2, and 2.1.3, as appropriate for the route selected for implementation.

Upgrading Existing 115-kV Transmission Line. Upgrading the existing 115-kV transmission line (e.g., increasing voltage, replacing structures, replacing conductors) would not alleviate the reliability issues that a second set of transmission lines are intended to alleviate, nor satisfy TEP's dual purpose and need to benefit both southern Arizona and Mexico.

Conservation of Electricity. As discussed in Section 1.5, Citizen's has committed to the purchase of 100 MW of transmission capacity from TEP to meet expected future load growth above Citizen's current Santa Cruz County load of approximately 65 MW. Conservation would not pre-empt the need for a second transmission line because the system deficiency is a delivery problem, not a supply/quantity problem. Additionally, electricity conservation would not satisfy TEP's dual purpose and need to benefit both southern Arizona and Mexico.

Underground Transmission Lines. It is technically feasible to bury both the 345-kV and 115-kV transmission lines. Burying transmission lines reduces the visual impacts of the transmission lines at ground level to only the disturbances associated with the cleared ROW, and aboveground level to facilities that are required along the transmission line for operational reasons. For approximately every 14 mi (22.5 km) of buried transmission line, intermediate facilities are required to boost the conductor cables' current-carrying ability. There are disadvantages to burying transmission lines, including technical difficulties (reliability and implementation) and potential impacts to environmental resources other than visual resources. A major disadvantage of burying transmission lines is that reliability can be greatly reduced through lengthening power outages, as experience has shown that a failure underground is difficult to locate, and once located, is relatively more difficult to repair. Implementation difficulties include working with geologic conditions such as bedrock (necessitating explosives blasting), and needing to avoid existing underground utilities such as gas, sewer, phone, and electrical distribution lines in more populated areas. The primary utility to be avoided by TEP's proposed project would be the existing natural gas pipeline in the vicinity of portions of each of TEP's proposed corridors. Given these implementation difficulties, the cost of burying transmission lines can be an estimated 7.5 to 12 times higher than traditional overhead construction for a given project (EEI 2003). Increased environmental impacts result from trenching for the length of the transmission line, resulting in disturbance to soils, biological, and cultural resources. The resulting disturbance is larger than that associated with support structures and access roads for traditional overhead transmission lines. Because of the disadvantages and cost differential associated with burying transmission lines, this alternative is not evaluated in detail in the EIS.

Reroute the Western and Crossover Corridors to avoid the Caterpillar Facility. Commentors on the Draft EIS suggested rerouting the Western and Crossover Corridors north of the Coronado National Forest to avoid impacts to the Caterpillar Corporation testing and demonstration facility. The suggested alternative route, shown in Figure 2.1-1, would also be on land owned or leased by Caterpillar Corporation. However, this route is outside the Western Corridor that the ACC directed TEP to use. Accordingly, new ACC approval would be needed in order to reroute the line as suggested. The ACC declined to accommodate Caterpillar's request for rerouting at the January 3, 2002 hearing on the CEC. Because of this limitation and because the agencies have less information about the environmental characteristics of this route than about the corridor alternatives, the suggested reroute option is not available for selection by the agencies at this time. Therefore this suggested reroute was eliminated from detailed analysis in this EIS. However, a field survey conducted by Harris Environmental Group indicates that environmental conditions on this route are similar to those on the portion of the Western or Crossover Corridor that this route would replace (HEG 2004e). Thus, it is likely that the impacts that would occur along the proposed re-route are consistent with those already identified in the assessment for these corridors. If, following the issuance of Federal agency RODs, TEP were to propose use of this alternative route, the Federal agencies would evaluate the need for additional NEPA review.

Construction of a 115-kV line in lieu of the proposed 345-kV line. TEP's purpose and need for the proposed project, as provided to DOE in TEP's Presidential Permit Application, is "…to construct a double-circuit 345 kV, alternating current ("AC") transmission line to interconnect the existing electrical systems of TEP and Citizens Utilities ("Citizens") in Nogales, Arizona, with a further interconnection to be made from Nogales, Arizona to the CFE [Comisión Federal de Electricidad, the national electric utility of Mexico] transmission system…" In an applicant-initiated process, such as TEP's proposed project, the range of reasonable alternatives analyzed in detail in the EIS is directly related to the applicant's purpose and need. A smaller transmission line in lieu of the proposed 345-kV line (e.g., a 115-kV line) would not meet the international interconnection aspect of TEP's purpose and need.

2.2 ACTIVITIES COMMON TO ALL ACTION ALTERNATIVES

2.2.1 Substation Upgrades and Additions and Fiber-Optic Regeneration Sites

The expansion of the existing TEP South Substation, installation of additional equipment to the existing Valencia Substation, and construction of the Gateway Substation and fiber-optic regeneration sites, would be the same for each proposed corridor. The South Substation in Sahuarita (see Figure 1.1–4) would be upgraded and expanded to provide interconnection between a new TEP 345-kV transmission line and the new Gateway Substation west of Nogales. The South Substation would be expanded by an estimated 1.3 acres (0.53 ha) to add a switching device that would connect to the proposed transmission line by moving the fenceline 100-ft (30-m) to the east.

The new Gateway Substation (see Figure 1.1–4) would include a 345-kV to 115-kV power transformer to provide power to the local area. The new Gateway Substation would be constructed within a developed industrial park north of Mariposa Road (State Route 189), an estimated 0.5 mi (0.8 km) east of the Coronado National Forest boundary (Northeast ¼ Section 12, Township 24 South, Range 13 East). The TEP portion of the site (the area that would be graded) is an estimated 18 acres (7.3 ha) and is within the City of Nogales, Arizona. TEP has purchased the substation site and preliminary construction activities have been completed.

Preparation of the new substation and substation expansion would require the following:

- Cut-and-fill grading to level the construction area to a smooth surface using existing soil
- Placement and compaction of soil brought in from offsite, as needed, to serve as a foundation for equipment
- Subsurface grounding grids (buried system of conductors to provide safety for workers)
- Grading to maintain drainage patterns
- Oil spill containment facilities
- Gravel-covered parking areas approximately 20 by 40 ft (6 by 12 m)
- Fences and gates
- Revegetation with native plants, leaving a 10-ft (3-m) clear zone around the outside perimeter of the fence for safety and security personnel
- Erosion control, such as placement of gravel within the fenced area

The maximum height of structures in the substations would be approximately 100 ft (30 m). The substation yard would be open-air and would include transformers, circuit breakers, disconnect switches, lightning/surge arresters, reactors (for voltage regulation), capacitors, bus (conductor) structures, and a microwave antenna. Each substation would have a new switchyard control shelter that would be a structure approximately 40 ft (12 m) wide by 60 ft (18 m) long, and approximately 20 ft (6 m) high, and it would be constructed of prefabricated material. Substation facilities would be enclosed by a chain-link fence with a locking gate with night lighting for security that would be shielded to prevent light from spilling offsite.

The substations would be designed and constructed to prevent and control accidental spills from affecting adjacent land uses and from reaching any waterbodies or courses in the vicinity of the switchyard. Containment structures would be constructed at the base of oil-filled equipment to contain spills. If a large volume of oil were to leak from a piece of electrical equipment, an alarm or a failure would occur notifying the operations center of the problem and a trained maintenance crew would be dispatched to the substation immediately to begin repairs and cleanup. Oil Spill Contingency plans and/or Spill Prevention Countermeasure and Control plans would be updated for the expansion of the existing substation. These plans explain clean-up and emergency notification procedures specific to each substation.

The ground level of the substation yard would be graded to direct the flow of water runoff. The yard would be covered with a layer of gravel (4 in [10 cm] or more thick) that would help inhibit erosion from stormwater runoff and discourage vegetation growth in the substation. Berms, or other barriers, also would be used around the perimeter of the yard (along the fence-line) to control runoff. Where needed, stormwater mitigation measures, such as retention ponds would be designed and constructed to contain runoff.

Fiber optic facilities (e.g., a fiber optic line and splice boxes) will be placed along the transmission line on the proposed transmission structures. In addition, one separate fiber optic facility site, a regeneration site, will be required. The regeneration facility will be placed on private land. The precise location of this regeneration facility site has not been determined, but TEP states that it will likely be located in the area of Township 18 South, Range 12 East, approximately 10 mi (16 km) southwest of Sahuarita. The fiber optic regeneration site will consist of an estimated 0.5-acre (0.2-ha) fenced yard, containing a 10 by 20 ft (3 by 6 m) concrete pad with an equipment house. The cleared area for the equipment house will be approximately 20 by 30 ft (6 by 9 m).

At the existing Valencia Substation, TEP would install the following additional equipment: two 115-kV terminations, three 115-kV power circuit breakers and associated switches, bus, fittings, relay metering, and communication equipment. However, TEP would not expand the facility beyond the existing footprint.

2.2.2 115-kV Interconnection of the Gateway and Valencia Substations

As shown on Figure 1.1-5, TEP would construct a new 115-kV transmission interconnection line from the proposed Gateway Substation to the existing Valencia Substation in Nogales. The length of the 115-kV transmission line would be approximately 3.0 mi (4.8 km) and would include an estimated 20 support structures. The proposed 115-kV transmission line would be built as a single circuit for the majority of the route, and a double circuit for approximately 0.4 mi (0.6 km) between Milepost 2.6 and the Valencia Substation.

The proposed route does not overlap with any proposed TEP corridors for the 345-kV transmission lines. The 115-kV interconnection between the Valencia Substation and the Gateway Substation would be located on privately-owned land and existing right-of-ways. The site of the Valencia Switchyard is owned by UNS, and TEP owns the site for the proposed Gateway Substation. The interconnection would originate at the proposed Gateway Substation and travel south for approximately 0.4 mi (0.6 km) on the west side of an industrial park. The interconnection then continues east through the industrial area for approximately 0.5 mi (0.8 km) before crossing Mariposa Road. The interconnection then follows an existing utility ROW on the south side of an industrial park for approximately 1.1 mi (1.7 km) before crossing I-19. The interconnection continues to parallel an existing 13.5-kV distribution line for approximately 0.6 mi (1.0 km) to meet the existing 115-kV transmission line. The remaining approximately 0.4 mi (0.6 km) would be built as a double circuit transmission line and follow the existing ROW. The interconnection terminates at the Valencia Substation.

2.2.3 Transmission Line Structures and Wires

The proposed project would utilize primarily self-weathering steel single pole structures (monopoles), depicted in Figure 1.1–1. Dulled, galvanized steel lattice tower structures, depicted in Figure 1.1–2, would be used in specified locations for engineering reasons or to minimize overall environmental impacts (for example, impacts to soils or archaeological sites), as explained in Section 2.2.3 (ACC 2002). Monopoles occupy less acreage at the foundation than lattice towers, and monopoles generally allow a narrower ROW. The typical span between lattice tower structures is 1,000 to 1,200 ft (305 to 365 m), compared to 800 to 900 ft (244 to 274 m) between single pole structures, thus requiring fewer lattice tower structures to support a given distance of transmission line route. However, the overall height and breadth of the lattice towers would be greater for increased span lengths. For the proposed project, the distance between transmission line structures would be between 600 and 1,200 ft (183 and 365 m). Three slight variations of the monopole (the tangent structure, the turning structure, and the deadend structure) that are visually very similar to the monopole in Figure 1.1–3 would be used at various points along the route based on the turning angle of the transmission line and the elevation change between towers. Likewise, a slight variation of the lattice tower structure (the turning structure) that is visually similar to Figure 1.1–4, would be used at various points along the route. The final footprint of each monopole is approximately 25 ft^2 (2.3 m^2) the final footprint of each lattice tower structure is approximately 3,600 ft^2 (334 m^2).

The monopoles would be a low reflectance steel material that self-weathers (oxidizes, or rusts) to form a protective surface coating resulting in a color similar to wooden utility poles. The lattice structures would be steel with a galvanized, dulled finish. Self-weathering monopoles require very little ongoing maintenance following construction, aside from initial inspections to ensure that all joints and surfaces are weathering properly. Self-weathering steel is not an option for lattice towers, as the joints on lattice towers could collect moisture that would interfere with the protective coating that prevents corrosion. Galvanized or painted finishes can be used on lattice towers to darken and reduce shine, but the dulling process shortens the life of the finish and painted towers require more access for ongoing maintenance. (Refer to Section 4.2 for a complete discussion of visual impacts and pole treatment options.)

The double-circuit structures would support two 345-kV, three-phase lines. Each circuit of a double-circuit transmission line consists of three phases; each phase consists of two sub-conductors (for a total of twelve transmission line wires). The circuits are each thermally capable of supplying 1,000 MW, but the double circuit path would be operated to transmit a total of 500 MW for operational and reliability considerations.

Under normal circumstances each circuit would carry 250 MW, but in an emergency situation where one circuit is out of service, the remaining circuit could carry the full 500 MW. Operation in this manner is in accordance with Western Electric Coordinating Council's reliability guidelines (WECC 2003). (The Western Electric Coordinating Council is one of ten electric reliability councils in North America composed of electric utilities that promote a reliable electric power system.)

The single pole structures would be approximately 140 ft (43 m) tall with four arms on each side approximately 28 ft (8.5 m) apart to support the conductors and the neutral ground wire. Lattice tower structures would be approximately 140 ft (43 m) tall and would have four arms extending on either side. The minimum height of the conductor above the existing grade would be 32 ft (9.8 m) at maximum expected operating temperature. The neutral ground wire that provides for lightning protection and fiber-optic communications would be supported on the smaller of the four arms above the conductor arms. The proposed fiber-optic ground wires would contain at least 48 fibers each. Splicing sites would be required at certain points along the corridor (to be determined during final project design), and splicing boxes would be attached to the transmission line structures (TEP 2003).

2.2.4 Transmission Line Construction

Construction of the proposed transmission lines would include the following roughly sequential major activities performed by small crews progressing along the length of line:

- Surveying
- Staging area development
- Structure site clearing/access way establishment

- Foundation excavation
- Construction of tower base
- Structure assembly/erection
- Conductor stringing/tensioning
- ROW cleanup and restoration

The approximate number of personnel and type of equipment required for construction of the transmission lines are shown in Table 2.2–1. Figure 2.2–1 depicts some of the equipment required during construction. TEP anticipates an average construction workforce of 30 individuals, with peak workforce levels reaching 50 individuals for short periods of time. The project would be completed approximately 12 to 18 months after construction begins.

Table 2.2–1. Typical Personnel and Equipment for Transmission Line Construction

Activity	No. of Persons	Equipment
Clearing and grubbing	23	Flatbed truck, crawler bulldozer, jeep with auger, backhoe, side boom crane, equipment trailer, water spray truck
Foundation excavation/ construction	21	Flatbed truck, digger truck, loader, track air drill, tractor trailer, side boom crane, rough terrain crane, concrete truck
Structure erection	28	All terrain crane, tractor trailer, boom truck, concrete ready-mix truck, crew cab truck, line truck (bin body), lace boom crane
Conductor stringing	37	Crew cab flatbed, wire puller (truck mounted), crawler dozer, splicing buggy, wire tensioner (truck mounted), tractor and tandem axle reel trailer, pilot wire stringing truck, tractor trailer, truck mounted crane, aerial lift
Cleanup and road closures	9	Flatbed truck, crawler bulldozer, farm tractor with disc harrow

Source: TEP 2001.

ROW Access. Access to the selected ROW for construction, operation, and maintenance of the proposed transmission lines would be on existing utility maintenance roads, ranch access roads and trails, and, where no access currently exists, new access ways. Construction access ways would be approximately 12 ft (3.7 m) wide to provide safe workspace for vehicle and construction equipment movement. Construction vehicle access would be along local roads, then along existing and new access roads as described in Sections 3.12 and 4.12. Siting of access roads would be coordinated with the affected property owners, USFS, U.S. Section of the International Boundary and Water Commission (USIBWC), and BLM to establish the most appropriate access to the structure sites. The Roads Analysis (RA) (URS 2003a) for the proposed project reflects TEP's consultations with USFS for siting and closing roads, including the criteria used by TEP to site proposed roads (see Section 4.13, Transportation). Practices to prevent the introduction or spread of invasive species (nonnative species transferred by human activity) would be established and followed in coordination with state and Federal agencies. Once access routes are selected, vegetation along the edge of the access way would be pruned back to reduce damage during construction operations. Where the slopes are within appropriate limits for the safe operation of the construction equipment, no ground leveling would be done, in order to preserve the natural landform to near pre-construction conditions. Explosives blasting may be used as needed based on local geologic conditions.

Access by heavy construction equipment would be required to the site of each new structure. In the most sensitive or difficult terrain conditions, the access by construction workers may be by foot, and the materials and heavy equipment may be inserted by helicopter. Survey work would locate the transmission centerline, determine accurate profiles along the centerlines, and determine the exact location and rough profiles of access roads.

ROW and Structure Site Clearing and Grading. Preparation of the ROW would vary with ground cover and slope. In areas with a gentle slope and low vegetative cover, vegetation would be pruned to ground level. This method would keep the roots intact and maximize the restoration potential for areas not needed for ongoing maintenance access. This pruning would occur where such vegetation falls within the boundaries of a proposed access way. Cacti would be transplanted or held in designated holding areas along the edges of the access way for later use in revegetation. In areas with uneven terrain, construction crews would blade the ROW as necessary to ensure safe working conditions. All rocks and cut vegetation would be temporarily stockpiled along the ROW edges. This method of limiting the complete removal of vegetation improves the success of reclamation, increases habitat preservation, and decreases the potential for erosion. The placement or scattering of the collected vegetative debris to create habitat or reduce surface erosion would be instituted where the collected vegetative debris would not be considered a potential fire danger. The areas near structure sites would be prepared by the "mobilization and environmental site preparation team" and delineated by flagging or degradable paint where appropriate.

Construction Yard and Material Handling Sites. Construction materials would be hauled to the construction yards from the local highways and then transported to structure sites using the methods previously described under ROW and Structure Site Cleaning and Grading. At each new structure site, an area would be disturbed by the movement of vehicles, assembly of structure elements, and other operations. The estimated area required for each monopole during construction is a 100 ft (30 m) radius circle, and each lattice tower would require an estimated 200 by 400 ft (61 by 122 m) area, more than twice the construction area required for monopoles.

Three temporary construction yards of no more than 3.0 acres (1.2 ha) each, and one temporary construction lay down yard of no more than 80 acres (32 ha) would be required. For each proposed corridor, the 3-acre (1.2-ha) yards would be located at the Gateway and South Substation sites, and near the Arivaca Road exit from I-19 in Amado. The 80-acre (32-ha) temporary construction lay down yard would also be located near the Arivaca Road/I-19 interchange in Amado. No construction yards would be located on national forest lands or lands managed by BLM. Temporary construction yards would serve as reporting locations for workers, parking space for vehicles, and storage for equipment and materials.

Foundation Excavation and Installation. The pole foundation would depend on the local geologic conditions. In areas of relatively intact bedrock near the ground surface, the poles would be supported on a rock bolted base, in which small holes (less than 6 in [15 cm] in diameter) are drilled into the bedrock and the tower is attached with large bolts. Areas with significant soil horizons would require direct embedment poles. This type of pole installation requires excavation of a shaft wider than the pole using a caisson-drilling rig, and then subsequent backfilling around the pole. In soils with large cobbles (rocks) or soils that tend to collapse, a large pit would be excavated and the pole would be placed in the pit. In such cases, a lean-concrete slurry may be required for backfill of the pit because soils with large cobbles are difficult to compact adequately (Terracon 2002). In extremely sandy areas, water or a gelling agent could be used to stabilize the soil before excavation.

Explosives blasting may be used in any of the three proposed corridors (including portions of each on the Coronado National Forest) as needed depending on geologic conditions. Typically, the depth to which a charge would be placed is approximately 3 ft (0.9 m) below ground level. The charge is limited to fracturing rock in a very localized area. Discharge of material is limited by proper charge design and use of blasting mats, which TEP would place over the excavation to further limit material and dust dispersion. Once the fractured material is removed from the excavation, an additional 3 ft (0.9 m) would be drilled, charged, and blasted. This process would be continued until the desired depth is attained.

Spoil material (excavated soil) would be used for fill where suitable and the remainder would be spread at the tower site. Foundation excavation and installation may require a power auger or drill, crane, material truck, and ready-mix concrete trucks.

Structure Assembly/Erection. Erection crews would assemble the structures and, using a large crane, position them in foundation excavations or set them on the rock bolted base. In the event a structure location is not readily accessible by road, TEP would utilize helicopter construction techniques where feasible to install the structure. While tangent monopoles could be installed in sections by helicopter, the heavier angle and dead-end monopole structures exceed the weight capacities of even the largest helicopters. In the event that an angle or dead-end monopole structure would be needed in an inaccessible location, lattice towers would be used in place of the monopole because the lattice tower can be broken into several smaller sections light enough to helicopter to the site. Foundations for the tower could be hand dug using smaller equipment that could also be flown to the site by helicopter. When structures are brought in by helicopter, TEP could bring in equipment and personnel on a less improved road (narrower and requiring less construction disturbance to minimize steep grades and sharp turns). Note that TEP will use monopoles whenever possible. In situations where it is not possible to use monopoles, as discussed above, or where environmental impacts may be reduced due to the increased span between towers, then lattice towers would be constructed.

In accordance with ACC Decision No. 64356 (ACC 2002) requiring the use of lattice towers where their use would minimize overall environmental impacts, the primary criteria that TEP would use to identify locations for lattice towers would be whether the location is readily accessible by road. By using helicopter access to bring in structures where access by road is not available, and using lattice towers where necessary to make helicopter delivery feasible, TEP would minimize the need for new access roads or improvements to existing access roads. This would limit the area of disturbance and reduce potential impacts to a number of environmental resources (for example, soils, biological, cultural, and visual resources). In areas that are readily accessible by road, TEP would generally not use lattice towers as they disturb a larger area (see Section 2.2.2) and require increased ongoing maintenance access. TEP may use lattice towers at locations such as road crossings where their use would allow a longer span between structures. This would allow the structures to be placed farther away from the road, out of the immediate foreground for travelers on the road.

An estimated 20 to 25 structures would be brought in by helicopter for the Peck Canyon portion of the Crossover Corridor because of its topography and inaccessibility, but no structures are currently planned to be brought in by helicopter for the other alternatives (TEP 2003).

Shield Wire and Conductor Stringing. Reels of conductor and overhead shield wire would be delivered to wire-handling sites (ranging from approximately 0.5 to 1.5 acres [0.2 to 0.6 ha]) spaced about every 6 to 8 mi (10 to 13 km) along the ROW. Level locations would be selected so little or no earth moving would be required. These sites may have to be cleared of vegetation and would be disturbed by the movement of vehicles and by other activities. The conductors and shield wires would then be pulled into place from these locations. Stringing and tensioning sites and fiber-optic splicing sites would be selected to avoid environmentally sensitive resources, in coordination with land owners and managers. TEP has identified such potential sites on the Coronado National Forest in consultation with USFS (URS 2003a).

Helicopters would be used to install conductors on the support structures once in place. The process of pulling in conductors involves first pulling in small diameter ropes and placing the ropes in the stringing blocks (all done from the air), which are attached at the ends of the support arms and insulators. Once the small diameter ropes are pulled in at each conductor or phase location, the rest of the process is conducted from the ground at each end of the section to be strung. Use of helicopter for this operation would eliminate the need to cross terrain with vehicles to pull in the ropes between each structure, reducing impacts to the terrain between the pulling sites. The shield or fiber-optic ground wire would be installed in the same manner as described for the conductors.

All construction activities would be coordinated with the appropriate agencies on each side of the border. At a minimum, TEP expects the U.S. Border Patrol to be included. TEP anticipates that this effort would be coordinated with the CFE and does not anticipate any ground disturbing activities within the reserved strip of land (a total of 120 ft [36.6 m]) along the international border (see Section 3.1.1, Land Use). The preliminary design of the project has the last U.S. pole on top of a hill and the first pole on the Mexico side also on top of a hill to adequately span the border (TEP 2003).

ROW Cleanup and Restoration. After construction and reclamation are complete, access to the permanent ROW would be on access roads approximately 12 ft (3.7 m) wide, in locations as specified in Sections 3.12 and 4.12, Transportation. TEP would restore access and construction areas not required for maintenance in accordance with agreements with land owners and managers. All construction areas not needed for normal maintenance would be graded to their original contour or to blend with adjacent landforms. Waste construction materials and rubbish from all construction areas would be collected, hauled away, and disposed of at approved sites, such as the Pima County Sahuarita Landfill. All areas to be revegetated would be reseeded with state-certified native seed mix meeting the requirements of native plant ordinances in Santa Cruz and Pima Counties to minimize erosion and to meet the requirements of native plant ordinances. Any damaged gates and fences would be repaired. To restrict access to maintenance roads, TEP would place barriers, boulders, fences, or locked gates across the maintenance roads as needed to meet the requirements of USFS, BLM, or private landowners.

Safety Program. TEP would require the transmission line contractor to prepare and conduct a safety program (subject to TEP's approval) in compliance with all applicable Federal, state, and local safety standards. The safety program would include, but not be limited to, procedures for accident prevention, use of protective equipment, medical care of injured employees, safety education, fire protection, and general health and safety of employees and the public. TEP would also establish provisions for taking appropriate actions in the event the contractor fails to comply with the approved safety program.

2.2.5 Operation and Maintenance

Use of the land in the ROW by the landowners would be permitted for any purpose that does not create a safety hazard or interfere with the rights of TEP. The day-to-day operation of the transmission line would be directed by system dispatchers in a power control center in Tucson. These dispatchers use communication facilities to operate circuit breakers that control the transfer of power through the lines. These circuit breakers also operate automatically to ensure safety in the event of a system incident such as a structure failure or a conductor failure.

An Annual Plan of Operations, that would be included as part of a USFS Special Use Permit, and a Plan of Development for BLM land, would require regular inspections for access control measures, drainage control, etc. TEP's preventative maintenance program for transmission lines would include routine aerial and ground patrols. Aerial patrols would be conducted twice a year, or upon operation of safety equipment that takes the transmission line out of service. Ground patrols would be conducted as necessary to detect equipment needing repair or replacement. Maintenance may include repairing damaged conductors and replacing damaged and broken insulators. Transmission lines are sometimes damaged by storms, floods, vandalism, or accidents and require immediate repair. Emergency repair would involve prompt movement of crews to repair damage and replace any unrepairable equipment. If access roads are damaged as a result of the transmission line repair activities, TEP would repair them as required.

Various practices would be utilized by TEP, in accordance with recommendations in this EIS, to prevent the introduction or spread of noxious weeds (invasive species which displace native species). Because of the arid nature of the proposed project area, very minor and infrequent measures would be necessary to control vegetation. TEP would not use any types of herbicides during the construction or long-term maintenance of the proposed transmission line ROW. TEP would continue their standard practice of using herbicides at substations as needed (TEP 2002b).

2.2.6 Standard Mitigation

TEP's Standard Mitigation Practices are documented in TEP's Environmental Protection Provisions submitted to the ACC (TEP 2001). Additional mitigation, if required, would be in agreements, permits, or ROW grants from land owners or managers (for example, in the Plan of Development agreement with BLM), in stipulations by the ACC, and in the U.S. Fish and Wildlife Service (USFWS) Biological Opinion. Table 2.2–2 presents the mitigation practices included in the proposed action.

Table 2.2–2. TEP Mitigation Practices Included in the Proposed Action

1. All construction vehicle movement would be restricted to the ROW, designated access, contractor-acquired access, or public roads. Widening or upgrading of existing access roads would be limited as necessary for TEP to implement the selected alternative. New road construction would be minimized as practicable.

2. Structures would be placed to avoid sensitive features such as riparian areas, water courses, and cultural resource sites, or to allow electric wire conductors to clearly span the features within limits of standard structure design. This would minimize the amount of disturbance to the sensitive features.

3. Construction activities would be limited to the pole construction areas, staging areas, laydown area, and access described in this EIS, with activity restricted to and confined within those limits. TEP would develop a system of colored identification flags or survey markers to identify restricted areas such as wildlife zones, archaeological sites, or ROW boundaries. TEP would arrange mandatory preconstruction seminars and training sessions to acquaint field personnel with these provisions. No paint or permanent discoloring agents would be applied to rocks or vegetation to indicate limits of survey or construction activity.

4. In construction areas where recontouring is not required, vegetation would be left in place wherever possible and original contour would be maintained to avoid excessive root damage and allow for resprouting.

5. In construction areas (e.g., construction yards, tower sites, spur roads from existing access roads) where ground disturbance is substantial or where recontouring is required, surface restoration would occur as required by the landowner or land management agency. The methods of restoration normally would consist of returning disturbed areas to their natural contour or to blend with adjacent landforms, reseeding (if required), installing cross drains for erosion control, placing water bars in the road, or filling ditches. These instances would be reviewed on a case-by-case basis to limit access into the area and visual disturbance.

6. Watering facilities and other range improvements would be repaired or replaced, if they are damaged or destroyed by construction activities, to their condition prior to disturbance as agreed to by the parties involved.

7. Towers and/or ground wire would be marked with highly visible devices, such as colored balls or lights, if required by governmental agencies (e.g., Federal Aviation Administration, U.S. Air Force). Consultations with these agencies regarding required visual markers for each corridor are ongoing, as documented in Appendix A. It is currently anticipated that no visual markers such as colored balls or lights would be required for the proposed project. Per FAA direction, TEP would comply with all State of Arizona tower requirements.

Table 2.2–2. TEP Mitigation Practices Included in the Proposed Action (*continued*)

8. Prior to construction, all supervisory construction personnel would be instructed on the protection of cultural, paleontological, and ecological resources, including mitigation measures required by Federal, state, and local agencies. To assist in this effort, the construction contract would address (a) Federal and state laws regarding antiquities, fossils, plants and wildlife, including collection and removal; and (b) the importance of these resources and the purpose and necessity of protecting them.

9. Cultural resources would be treated during post-EIS phases of project implementation according to the Programmatic Agreement regarding Historic Properties. Historic properties inventory of the selected transmission line corridor and associated facilities and access routes will be completed in a manner consistent with the Secretary of the Interior's Standards and Guidelines for Identification of Historic Properties. In consultation with appropriate land managing agencies such as USFS and BLM, and the State Historic Preservation Officer (SHPO), specific mitigation measures would be developed and implemented for National Register of Historic Places (NRHP)-eligible resources to mitigate any identified adverse impacts. Wherever possible, power poles, access roads and any other ground-disturbing activities would be placed to avoid direct impacts to cultural resources. A professional archaeologist would assist the pole-siting crew in avoiding impacts to archaeological and historic sites. In cases where avoidance of sites is not feasible, a site-specific Treatment Plan and Data Recovery Plan would be developed in consultation with tribes, the appropriate land-managing agencies, and the Arizona SHPO. These plans will include an appropriate Plan of Action to implement the Native American Graves Protection and Repatriation Act. A Discovery Plan would be developed to establish procedures to be followed in the event of discovery of unanticipated cultural resources, and a Monitoring Plan would address issues of site protection and avoidance. Native American groups, tribes, and communities would be consulted to determine whether there are effective or practical ways of addressing impacts on traditional cultural properties and archaeological sites.

10. TEP would respond to and resolve individual complaints of radio or television interference generated by the transmission line.

11. TEP would apply mitigation needed to eliminate problems of induced currents and voltages onto conductive objects sharing an ROW to the mutual satisfaction of the parties involved.

12. All construction and maintenance activities would be conducted in a manner that would minimize disturbance to vegetation, soils, drainage channels, and intermittent or perennial streambanks in accordance with the Coronado National Forest Annual Maintenance Plan, BLM requirements, and all state, county, and local requirements. TEP would follow Best Management Practices (BMPs) for the construction of the entire length of the selected corridor. In addition, all construction activities would include dust-control measures. All existing roads would be left in a condition equal to or better than their condition prior to the construction of the transmission line, in accordance with USFS or BLM.

13. All requirements of those entities having jurisdiction over air quality matters would be adhered to and any permits needed for construction activities would be obtained.

14. Fences and gates would be repaired or replaced to their original condition prior to project disturbance as required by the landowner or the land management agency if they are damaged or destroyed by construction activities. Temporary gates would be installed only with the permission of the landowner or the land managing agency.

15. No non-biodegradable debris would be deposited anywhere in the project vicinity. Slash and other biodegradable debris would be left in place or disposed of in accordance with agency and/or landowner requirements.

16. If required, mitigation measures developed during the consultation period under Section 7 of the *Endangered Species Act* (ESA) would be adhered to as specified in the Biological Opinion of the USFWS. Also, TEP would adhere to mitigation developed in conjunction with state and tribal authorities.

Table 2.2–2. TEP Mitigation Practices Included in the Proposed Action (*continued*)

17. Regulated materials would not be released onto the ground or into streams or drainage areas. Totally enclosed containment would be provided for all trash. All construction waste including trash and litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials would be sent to a disposal facility authorized to accept these materials, such as the Pima County Sahuarita Landfill.

18. The ROW would be aligned to the extent practicable to reduce impact on the residences and inhabitants nearby.

19. Special status species or other species of concern would continue to be considered during post-EIS phases of project implementation in accordance with management policies set forth by the appropriate land managing agency. This may entail TEP conducting surveys for plant and wildlife species of concern along the proposed transmission line route and associated facilities (i.e., access and spur roads, staging areas) as agreed upon by USFS, BLM, USFWS, Arizona State Game and Fish Department, and TEP. In cases where such species are identified, appropriate action would be taken to avoid adverse impacts on the species and its habitat and may include altering the placement of roads or towers as practicable, monitoring construction activities or seasonal restrictions such as not constructing during breeding seasons. The project would be designed and constructed in accordance with raptor protection guidelines, as referenced in Section 4.3, Biological Resources.

20. The alignment of any new access roads would be designed to minimize overall impacts, including ground disturbance and visual impacts.

21. As smoke is a conductor of electric current, when a fire is in the vicinity of the proposed 345-kV transmission lines, firefighters would monitor for possible fire starts outside the fire perimeter. Firefighters would remain at a distance that would not leave them vulnerable to the electric current or shock.

22. Practices such as cleaning of construction equipment, to prevent the introduction or spread of invasive species, would be developed and followed in accordance with applicable requirements.

23. As a condition of the Certificate of Environmental Compatibility issued by the ACC to TEP in January 2002, TEP would be obligated to “meet and confer with landowners who are within or adjacent to the Route Corridor and other interested parties in order to develop a plan for specific pole locations that will mitigate the environmental and visual impact of the Project transmission lines within the Route Corridor.” TEP would meet with each landowner and discuss impacts to their particular property, including any issues that a particular landowner has before finalizing the alignment of the transmission line and the location of access roads. During any such discussions, it is possible that TEP will propose locating the transmission line or access roads outside of the 0.25-mi (0.40-km) wide study corridor that is analyzed in this EIS. If that were to happen, TEP would be required to consult with the Federal agencies to determine if additional NEPA review and/or NFMA review is necessary. In addition, if the ultimate location is outside the ACC’s 2-mile approved corridor, then ACC approval would be necessary.

24. Use water or a gelling agent in sandy areas prior to excavation.

25. Use blasting mats to reduce and control dust emissions.

26. Transplant cacti and agave.

27. In revegetation efforts, use approved native seed mixes.

28. The transmission line would be included on the Forest Flight Hazard Map, which is provided to pilots working on USFS projects in the area, and visual flight rules would apply in the area.

2.3 COMPARISON OF ALTERNATIVES

Table 2.3–1 presents a comparison of the alternatives based on the analysis in Chapter 4.

The resource areas evaluated for potential impacts are:

- Land use
- Recreation
- Visual resources
- Biological resources
- Cultural resources
- Socioeconomics
- Geology and soils
- Water resources
- Air quality
- Noise
- Human health and environment
- Infrastructure
- Transportation
- Minority and low-income populations (environmental justice)
- Cumulative impacts

The following discussion emphasizes the environmental implications of choosing among alternatives, organized by resource area. Where impacts are similar among the Western, Central, and Crossover Corridors, these alternatives are referred to collectively as the action alternatives (as compared to the No Action Alternative). Impacts during construction (approximately 12 to 18 months) and operation of the project are considered. This discussion is followed by Table 2.3–1, which provides a more quantitative look at the differences among alternatives. Discussions below for the Central and Crossover Corridor are based on detailed analysis of Option 1, the subroute that avoids the Inventoried Roadless Area in the Coronado National Forest. For most resource areas (visual resources, socioeconomics, water resources, air quality, noise, human health, infrastructure, and environmental justice), no potential for differences in impacts between Options 1 and 2 has been identified. Differences between the subroutes are described in the table for those resource areas for which there is a potential for the choice of subroute to affect impacts (land use and recreation, biological resources, cultural resources, geology and soils, and transportation). In general, the No Action Alternative has the least impact on the environment as it does not involve ground disturbing activities or introduction of a transmission line into the visual landscape.

Land Use. The Central Corridor is shorter than the Western and Crossover Corridors. The Western and Crossover Corridors each have a longer segment on the Coronado National Forest than the Central Corridor. All three corridors are identical with respect to BLM land and cross the U.S.-Mexico border in the same location.

Temporary land use impacts would occur as a result of support structure construction areas, staging areas, and temporary access roads that would be re-vegetated in accordance with agreements with land owners or managers and closed following construction. Besides physically changing the use of the land either temporarily or permanently, land use changes can impact all other resource areas as described below. Monopoles, which would be the primary support structure used by TEP, require a smaller area of disturbance (25 ft^2 [2.3 m^2]) than lattice tower structures (3,600 ft^2 [334 m^2]), and lattice towers require more ongoing access for maintenance. The temporary area of new disturbance on the Coronado National Forest would be greatest for the Crossover Corridor, followed by the Western Corridor and the Central Corridor. The total land area occupied by the final footprint of the towers for the entire corridor is less than 0.3 acres (0.12 ha) for each action alternative. In addition, access roads would be required to some support structures.

Management direction in the Forest Plan is not consistent with some aspects of each of the routing corridors discussed in this EIS. Therefore, one or more Forest Plan amendments, including amendments to change land use allocations by establishing a new utility corridor, are associated with each of the alternative routing corridors as described in Sections 2.1.1, 2.1.2, and 2.1.3 of the Final EIS.

Because the Central Corridor has the longest segment that follows or crosses an existing EPNG pipeline ROW, fewer new access roads would be required than for the other alternatives, although considerable upgrade would be required for some existing pipeline ROW access roads. On BLM land, the project is adjacent to existing transmission lines within a utility corridor. Outside the Coronado National Forest, each proposed corridor is compatible with current land use and land use plans.

Recreation. Activities in the project area include hiking, biking, birding, photography, rock climbing, horseback riding and off-road vehicle use. These activities are mostly concentrated within portions of the Coronado National Forest, and along the east side of the Tumacacori Mountains where the Central Corridor follows outside of the Coronado National Forest boundary. Off-road vehicle use occurs more broadly throughout the project area. The primary impact to these activities would be a change in the visual setting where recreation occurs. None of the three corridors are visible from Peña Blanca Lake on the Coronado National Forest, a popular location for recreation.

DOE, in consultation with USFS performed a USFS Recreation Opportunity Spectrum (ROS) analysis for the proposed project on national forest land evaluating the project's impact on seven setting indicators (characteristics) established by USFS that contribute to a recreation experience. All alternative corridors would negatively impact ROS settings. The Central Corridor has the least impact on ROS settings, mainly because it would minimize the total mileage on National Forest System lands. The Western and Crossover Corridors have higher total mileage on the Coronado National Forest, and therefore have greater overall impacts to ROS settings on the Coronado National Forest.

Visual. Visual impacts would occur from the introduction of steel support structures, access roads, and transmission line wires into the landscape. Structures would be primarily 140-ft (43-m) high self-weathering monopoles, similar in color to wood utility poles. With the exception of a reduction in existing High Scenic Integrity (degree of intactness and wholeness of the landscape) associated with the Western and Crossover Corridors near the Pima and Santa Cruz County line, the existing Moderate to Low Scenic Integrity would not be reduced for the area crossed by each corridor outside of the Coronado National Forest, including the BLM land. The Central Corridor has the longest length outside of the

Coronado National Forest, and would be visible to more residents than the other corridors given its closer proximity to the towns of Amado, Tubac, and Tumacacori.

On the Coronado National Forest, per analysis using the USFS Scenery Management System (SMS), the area of land that would have reduced Scenic Integrity as a result of construction and operation of the Western or Crossover Corridors is approximately double the area of reduced Scenic Integrity for the Central Corridor. The Western Corridor would be in wide-open view from a longer stretch of Concern Level 1 (primary) travelways on and nearby the Coronado National Forest than the Central or Crossover Corridors would be. While siting the Western Corridor transmission line immediately adjacent to portions of Ruby Road would have a maximum visual impact along Ruby Road, it would protect the viewshed to the south (towards the Pajarita Wilderness) for the public (including photographers) and would eliminate the need for highly visible access roads in this portion of the Western Corridor.

The Central Corridor would minimize the total mileage on national forest land resulting in reduced Scenic Integrity of approximately 9,668 acres (3,912 ha) on national forest land. The Western and Crossover Corridors would have higher total mileage on national forest lands than the Central Corridor, and the Western and Crossover Corridors would result in approximately 18,511 to 18,736 acres (7,491 to 7,582 ha) of reduced Scenic Integrity on national forest lands. Accordingly, the Western and Crossover Corridors would have greater overall visual impact on the Coronado National Forest than the Central Corridor.

Biological Resources. There is a potential for impacting habitat of existing native plant communities located within the ROW and new access road areas during construction. Clearing would be limited to areas required for access roads and structures. Because the proposed project would be in an arid area, where vegetation recovers very slowly, disturbances due to construction could have long-term impacts.

The Western Corridor has the highest potential for adverse effects to special status species. All three proposed corridors cross federally designated Critical Habitat for the Mexican spotted owl. There are approximately 54,881 acres (22,210 ha) of designated Critical Habit within the Coronado National Forest. The corridors include the current range and habitat types for 7 to 10 species listed under the ESA. The federally listed endangered Pima pineapple cactus is known to occur in each of the three proposed corridors. Additional species-specific surveys would be conducted for the selected corridor before construction activities begin. DOE has initiated formal consultation under Section 7 (a)(2) of the ESA with the U.S. Fish and Wildlife Service (USFWS). The formal consultation process between DOE, USFS, BLM, and USFWS began when DOE tendered its biological assessment of the alternatives to USFWS (see Appendix A). To date, the USFWS has issued a Biological Opinion for the Western Corridor concurring with the analysis in the Biological Assessment (see Appendix D), which concluded that the proposed action may affect special status species, but is not likely to have adverse effects.

Cultural Resources and Tribal Concerns. The Federal agencies have initiated consultation under Section 106 of the NHPA with the State Historic Preservation Officer (SHPO) and Native American tribes. The Federal agencies are preparing a Programmatic Agreement that will guide the treatment of cultural resources under provisions of Section 106 of the NHPA. The Arizona SHPO and the Advisory Council on Historic Preservation are expected to participate in the Agreement; Native American tribes will be invited to participate. Although only a small percentage of each corridor has been surveyed, multiple prehistoric and historic archaeological sites have been identified within each alternative. The highest density of cultural resource sites is anticipated along the Central Corridor segment near the Santa Cruz River. The impacts could include direct disturbance by construction activities, and the alteration of the landscape.

Prior to ground-disturbing activities in any approved corridor, a complete on-the-ground inventory would be conducted by professional archaeologists. Efforts to identify cultural resources would also include historical document research and continued consultation with Native American tribes regarding potential traditional cultural properties and sacred sites. Identified cultural resources would be evaluated in terms of National Register eligibility criteria and potential project effects in consultation with all parties who are participants in the Programmatic Agreement. Cultural resource sites identified during pre-construction inventory would be avoided to the extent possible.

DOE initiated Government-to-government consultation with the tribal governments of the 12 Native American tribes that have traditional ties to the area: Ak-Chin Indian Community, Fort Sill Apache Tribe, Gila River Indian Community, Hopi Tribe, Mescalero Apache Tribe, Pascua Yaqui Tribe, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Tohono O'Odham Nation, White Mountain Apache Tribe, Yavapai Apache Nation, and Pueblo of Zuni. Consultation has included information-sharing meetings with DOE and its representatives, and site visits arranged at the tribes' requests. The initial tribal consultations were for the Western, Central, and Eastern Corridors, originally proposed by TEP.

Representatives of several tribes have stated that they are opposed to the project, but they would prefer that the project be constructed along the Central Corridor, if it is to be built at all. The Hopi Tribe has stated objection to the Central Corridor based on the probable greater density of archaeological sites in that alternative. No specific traditional cultural properties have been identified along any of the alternatives to date. During meetings and field trips tribal representatives from the Tohono O'Odham Nation, Gila River Indian Community, Salt River Pima Maricopa and Ak-Chin Indian Communities have stated objections to the Crossover Corridor because it is in largely undisturbed territory.

Socioeconomics. The construction costs of each of the three action alternatives are roughly similar, approximately $70 million plus or minus $7 million. The construction of any of the three proposed corridors would create approximately 30 direct (construction) jobs, and approximately 31 indirect (service-related) jobs, which would benefit Santa Cruz and Pima Counties. No influx of population or stress to community services would be expected from project construction. No socioeconomic impacts would be expected from project operation because most jobs created would be filled by current residents.

During the public scoping process for the Draft EIS, several commentors expressed concern that existence of the proposed transmission line would negatively impact real property values. In this context, any decrease in property values would be perception-based impact, that is, an impact that does not depend on actual physical environmental impacts resulting directly from the proposed project, but rather upon the subjective perceptions of prospective purchasers in the real estate market at any given time. Courts have long recognized that such subjective, psychological factors are not readily translatable into quantifiable impacts. See, for example, *Hanly v. Kleindienst*, 471 F.2d 823, 833 n.10 (2d Cir. 1972), *cert. denied*, 412 U.S. 908, (1973). People do not act consistently in accordance with negative perceptions, and one person's negative perception might be another's positive. Also, perceptions of value may change over time, and perceptions of value are affected by a host of other factors that have nothing to do with the proposed project. Accordingly, any connection between public perception of a risk to property values and future behavior would be uncertain or speculative at best, and therefore would not inform decision making.

There have been studies of the impact of transmission lines and property values in other geographic areas. See, for example, discussion of these studies in the *Environmental Impact Statement for Schultz-Hanford Area Transmission Line Project* (DOE 2002). Based on these studies, DOE can conclude only that, at worst, it is possible that there might be a small negative economic impact of short duration to some properties from the project, and that the impact on value would be highly variable, individualized, and unpredictable. The studies at most conclude that other factors, such as general location, size of property, and supply and demand factors, are far more important criteria in determining the value of residential real estate.

Accordingly, while DOE recognizes that a given property owner's value could be affected by the project, DOE has not attempted to quantify theoretical public perceptions of property values should the proposed project be built.

Geology and Soils. The construction of any of the three proposed corridors would not impact geologic resource availability or mine tailing piles west of Interstate 19 in the northern portion of the project. Slope stability analysis for potential tower locations in mountainous areas would prevent slope failure. Low to moderate seismic risk would be considered in structure design. Direct embedment pole construction techniques (requiring excavation) would be used in unconsolidated soils, while rock bolted bases would be used in areas of relatively intact bedrock near the ground surface. Best Management Practices (BMPs) to minimize soil and water impacts would be developed in coordination with USFS, BLM, and Arizona Department of Environmental Quality (ADEQ) before construction, and would be implemented for the entire corridor selected.

All three proposed corridors cross small areas of soils considered to be prime farmland when irrigated.

Water Resources. No adverse impacts to surface water or groundwater resources from any of the three action alternatives or the no action alternative. Each of the three proposed corridors would span across a number of drainages and washes, and TEP would avoid placing structures in and near these areas where feasible.

Some corridor access roads would be within 100-year floodplains and the South Substation expansion is conservatively assumed to be in the 500-year floodplain of the Santa Cruz River and could result in increases in flood elevation, potentially leading to an increase in downstream flood loss and a long-term negative impact on lives and property. Impacts resulting from pole placement and construction of laydown areas would be negligible. Impacts to floodplains would be avoided to the extent possible by siting access roads and laydown areas outside floodplains, spanning floodplains where feasible and floodproofing measures at the South Substation. The Western and Crossover Corridors would have the greatest potential to impact floodplains in the project area.

There may be small areas of wetlands within the proposed corridors that are associated with manmade stockponds and impoundments. TEP would site the transmission line to avoid such areas. None of the corridors cross any eligible or designated Wild and Scenic Rivers.

Restrictions on refueling locations would protect groundwater from contamination from fuel, lubricants and other fluids during construction. BMPs would be implemented along the length of the line for erosion control.

Air Quality. There are no significant differences in air quality impacts from any of the three action alternatives or the no action alternative. Temporary, localized fugitive dust emission impacts from construction activities would occur. Impacts from operation and maintenance activities would be limited to dust from occasional access by TEP. A conformity review of the proposed project (required under Section 176[c] of the *Clean Air Act*) was conducted in accordance with EPA and DOE guidance (DOE 2000). The review shows that construction project emissions of PM_{10} (particulate matter with an aerodynamic diameter less than or equal to 10 microns) and CO (carbon monoxide) for each alternative are below regulatory thresholds and would not constitute a regionally significant action.

Noise. There are no significant differences in noise impacts from any of the three action alternatives or the no action alternative. Noise levels would increase above background during construction of any action alternative. Temporary construction noise increases would primarily impact residents in Sahuarita and Nogales for all three corridors, and also Amado, Tubac, and Tumacacori for the Central Corridor. Temporary construction noise would also impact recreationalists, especially in more remote areas of the

Western and Crossover Corridors. Long-term noise from the corona effect on transmission lines would generally be lost in background noise. Gateway and South Substations operational noise would be near background levels for the nearest receptors.

Human Health and Environment. Long term electric and magnetic field (EMF) exposure at the nearest residences, schools, and commercial establishments would be well below average daily exposure to maximum magnetic fields (0.8 milligauss) from some common household appliances. There would be no health effects from this exposure. Though each proposed corridor passes primarily through undeveloped land, the Central Corridor would have the highest number of houses in close proximity to the transmission line. The project would be designed to minimize EMF and prevent electrical field effects. A minimum distance of 100 ft (30 m) would be maintained between any of the proposed transmission line structures and the edge of the existing EPNG pipeline ROW.

Infrastructure. There are no significant differences in infrastructure impacts from any of the three action alternatives. The proposed project would increase electric transmission facilities to Nogales, Arizona and Mexico, but would not otherwise affect existing infrastructure. Minimal municipal solid waste generated during construction and operation would be taken to appropriate landfill facilities. No hazardous waste would be generated from substation operation.

Transportation. Project access would be on existing utility maintenance roads, ranch access roads and trails, and new access ways where no access currently exists. Because the Central Corridor has the longest segment following the EPNG pipeline ROW, fewer temporary new access roads would be required than for the other alternatives, although considerable upgrade would be required for existing pipeline ROW access roads. Access to the proposed project on BLM land would be the same for all three action alternatives, on existing access from Mission Road to TEP's current transmission lines, with new spur roads to the proposed project. Short-term traffic disruptions on major roads such as I-19 or Ruby Road could occur during construction.

On the Coronado National Forest, the Crossover Corridor passes through approximately 3 mi (4.8 km) of an IRA along Peck Canyon. No roads would be constructed along that portion of the route; instead, helicopters would be used to insert structures as needed for the Crossover Corridor. Traveling south along the existing utility corridor, both the Central Corridor and the Crossover Corridor consider two optional routes: (1) a route that follows the existing utility corridor in the Coronado National Forest and (2) a route that avoids around a 1.9-mi (3.1-km) stretch of the existing utility corridor that is designated as an IRA. TEP would build more miles of temporary new roads for the Western or Crossover Corridors than for the Central Corridor. In addition, more areas on existing roads would require minor repairs for the Western and Crossover Corridors than for the Central Corridor. Under Option 2 of the Central and Crossover Corridors, some upgrades to existing roads would be required to access the 1.9 mi (3.1 km) IRA. By siting the Western Corridor immediately adjacent to Ruby Road for approximately 4 mi (6 km), the need for new project access and ongoing maintenance access for this segment would be reduced. There would be no net increase in roads in the Coronado National Forest.

Environmental Justice. Neither the three action alternatives nor the No Action Alternative would cause disproportionately high and adverse impacts to the minority or low-income populations. No means were identified for minority or low-income populations to be disproportionately affected from impacts to any of the resource areas.

Cumulative Impacts. This EIS includes analysis of cumulative impacts, as required under NEPA, that could occur as a result of the potential impacts of TEP's proposed project when added to impacts from other past, present, and reasonably foreseeable future actions. The potential effects are evaluated both for the period of project construction (anticipated to be 12 to 18 months), and for the post-construction (operation) period of the project. The region of influence (ROI) varies for each resource area, primarily depending on the distance a potential effect can reach.

The following actions have been evaluated as reasonably foreseeable and are included in the analysis of cumulative impacts: other transmission line projects in the project area, industrial development, other activities under special use permits on the Coronado National Forest, and more generally defined possible actions in the project area such as residential development, increased operations of the U.S. Border Patrol, ongoing activity of undocumented immigrants near the U.S.-Mexico border, and local initiatives to protect biological resources, such as are found in the Sonoran Desert Conservation Plan.

The cumulative impacts from the combination of TEP's proposed project and other past, present, and reasonably foreseeable actions could affect land use (including recreation), visual resources, biological resources, cultural resources, socioeconomic resources, geology and soils, water resources, air quality, noise, human health and environment, and transportation. These potential cumulative impacts are primarily related to long-term development of land that is currently undisturbed or used for other activities such as ranching and recreation. In the short term, if multiple projects are under construction simultaneously, an increased amount of land could be used temporarily for construction lay down yards and staging areas, and an increased amount of airborne dust could be generated. The cumulative change in land use could affect natural habitats, special status species, and cultural resources, and could lead to an increase in soil erosion and local water use. The cumulative impacts to human health and environment could be an increase in background EMF exposure to residents in the immediate vicinity of overlapping transmission line projects. No long-term cumulative human health impacts are expected to occur. No means were identified for disproportionately high and adverse impacts to minority or low-income populations, and TEP's proposed project would not contribute cumulatively to any environmental justice impacts.

CHAPTER 3
AFFECTED ENVIRONMENT

This chapter describes the existing natural resources and the environmental characteristics of the proposed Tucson Electric Power Company (TEP) transmission corridors. The information and data presented in this chapter provide a baseline description of the environment against which the various alternatives from Chapter 2 are evaluated in Chapter 4. The information presented in this chapter serves as the reference point to compare the potential changes to the environment, both positive and negative.

This chapter presents information on land use and recreation, visual resources, biological resources, cultural resources, socioeconomics, geology and soils, water resources, air quality, noise, human health and environment, infrastructure, transportation, and minority and low-income populations.

The Federal agencies recognize that many people value certain areas along the alternative transmission corridors as wild places and have a holistic concern for the natural beauty, undisturbed landscape features, and abundant plant and animal wildlife that characterize those areas. These unique natural characteristics give such wild areas their "sense of place," which includes peoples' visual and aural perceptions of the area's undisturbed sky, natural landscape, water resources, and plant and animal populations. The sense of place also includes the spiritual value that many people associate with these wild areas because of their cultural and religious significance.

The agencies recognize that the natural and cultural characteristics that contribute to a sense of place cannot be measured in the same manner as some other resources in an environmental analysis. However, in order to analyze potential impacts effectively and document the analysis, it is necessary to consider the resource areas individually. Thus, the EIS discussions of affected environment in Chapter 3 and potential impacts in Chapter 4 are divided into distinct resource areas (e.g., visual resources, biological resources, cultural resources). For the Central and Crossover Corridors, unless otherwise indicated, the descriptions provided here are based on Option 1, the sub-route that avoids the Inventoried Roadless Area in the Coronado National Forest.

3.1 LAND USE AND RECREATION

This section discusses the existing land use resources in the vicinity of the proposed project. The discussion includes land use planning, current land use, land ownership, and recreational resources.

3.1.1 Land Use

The following discussion of land use planning, current land use, and land ownership applies to all three proposed corridors. Information specific to the Western, Central, and Crossover Corridors is described separately following the general discussion.

Figure 1.1–2 shows the land ownership or management in the vicinity of the proposed project. The land ownership in the northern portion of all three corridors is primarily private and state trust land, with 1.25 mi (2.01 km) of the proposed corridors on Federal lands managed by the Bureau of Land Management (BLM).

The Arizona State Land Department manages approximately 9.3 million acres of State owned "Trust" lands. Figure 1.1-2 shows the State Trust Lands in the project area. These lands were granted to the State of Arizona under provisions in the federal Enabling Act that provided for Arizona's statehood in 1912. The lands are held in trust for fourteen public beneficiaries including Arizona's public schools and several state supported institutions. The Department functions as the trustee of the State Land and its natural resources. The Department's management of the trust is governed by extensive and detailed provisions in the Enabling Act (Sections 24-30), Act June 20, 1910, (c). 310,36 U.S. Stat. 557, 568-579), the Arizona Constitution (Article 10), and statutes in A.R.S. Titles 27 and 37. In addition there is extensive case law which governs the Department's procedures and management of the Trust. The Department's mission is to manage State Trust Lands and resources to enhance value and optimize economic return for the Trust's beneficiaries consistent with sound stewardship, conservation and business management principles. The role, in this instance, of the State Land Department is to determine whether to approve an easement for the preferred right of way alignment for a power transmission line as well as a fiber optic communication line incorporated in the power line. In processing an application for a right of way, the Department will consider land status, current uses, existing lessees, affected resources, environmental issues, local and regional land use plans and comments from interested parties as well as other issues that may present themselves in the application process.

The proposed corridors do not cross any Indian reservations or lands reserved under treaty rights by Native American nations, tribes, or communities. The San Xavier District of the Tohono O'Odham Nation is located approximately 1 mi (1.6 km) north of the proposed corridors as they exit the South Substation. The southern portion of all three corridors includes public lands administered by the U.S. Department of Agriculture Forest Service (USFS).

TEP has not finalized the placement of the 125-ft (38-m) right-of-way (ROW) within the 0.25 mi (0.40 km)-wide study corridors. The precise siting of the ROW would involve input from cultural, biological, and visual specialists, after each agency has issued a Record of Decision (ROD), to identify and minimize impacts to each area of land to be disturbed.

Northern Portion. The northern portion of the three proposed corridors, including the South Substation, is located in Pima County. Pima County land development and conservation is guided by policies of the Pima County Comprehensive Plan, implemented by the County Zoning Code within unincorporated areas. The Board of Supervisors adopted the current 2001 Pima County Comprehensive Plan on December 18, 2001, in accordance with the requirements of the Growing Smarter Plus legislation, the preliminary Sonoran Desert Conservation Plan, and requirements provided for in the county Zoning Code (Pima 2003). Within the town of Sahuarita, the Planning Commission oversees a comprehensive long-term General Plan and associated zoning regulations.

All three corridors cross the same Federal lands managed by the BLM, an estimated 1.25 mi (2.01 km) of lands located 1.3 mi (2.1 km) north of the existing TEP Cyprus Sierrita Substation (see Figure 1.1–2, Township 17 South, Range 12 East). These lands are designated as disposal lands under the current Resource Management Plan (BLM 1988).

Coronado National Forest. Each of the three proposed corridors cross the Tumacacori Ecosystem Management Area (EMA), as shown in Figure 3.1–1, which consists of all of the Coronado National Forest land west of Interstate 19 (I-19) adjacent to the U.S.-Mexico border (approximately 203,800 acres [82,475 ha]). The USFS manages this land for sustained multiple use of forest and rangeland resources including fuelwood, grazing, recreation, and mining (USFS 2001a). The specific direction for managing the Coronado National Forest is contained in the *Land and Resource Management Plan for the Coronado National Forest, 1986 as amended* (USFS 1986). The Forest Plan provides for integrated multiple use and sustained yield of goods and services from National Forest System lands and resources in a way that maximizes long-term net public benefits in an environmentally sound manner.

- Portions of the Western Corridor crossing the Coronado National Forest are not consistent with the management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.1.

- Portions of the Central Corridor (Option 1) crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.2.

- Portions of the Central Corridor (Option 2) crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor width and change visual quality objectives as fully described in Section 2.12.

- Portions of the Crossover Corridor (Option 1) crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.3.

- Portions of the Crossover Corridor (Option 2) crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.3.

See Appendix H for more details on the Forest Plan amendment process.

Invertoried Roadless Areas (IRAs) on National Forest System lands provide protection for all natural resources, including water, soil, flora, fauna, and air quality, and protect visual resources while providing a potential for unroaded recreation experiences. IRAs encompass approximately 52,788 acres (21,363 ha) within the Tumacacori EMA and are shown in Figure 3.1–1. The Western Corridor is located less than 1 mi (1.6 km) west and south of an IRA, and the Central Corridor (Option 1) passes within 0.25 mi (0.40 km) of an IRA. The Crossover Corridor passes through approximately 3 mi (4.5 km) of an IRA as it goes through Peck Canyon. Under Option 2, both the Central Corridor and the Crossover Corridor would pass through approximately 1.9 mi (3.1 km) of an IRA within the existing EPNG pipeline ROW.

The Roadless Area Conservation Final Rule (36 CFR 294) was published in the Federal Register on January 12, 2001, with an effective date of March 13, 2001. The effective date was extended to May 12, 2001 to allow the incoming Bush Administration time to review these newly adopted regulations. On May 4, 2001, the Secretary of Agriculture announced that U.S. Department of Agriculture (USDA) would implement the Final Rule with the caveat that USDA would consider amending the Final Rule to address concerns expressed by communities, States, and tribes.

Upon adoption, the 2001 Final Rule was challenged in nine lawsuits filed in the District Courts; ultimately, in May 2001, the Idaho Federal District Court issued a preliminary injunction order prohibiting USDA and USFS from implementing the 2001 Final Rule. In July 2001, USFS published an Advance Notice of Proposed Rulemaking in the Federal Register requesting public comment on the long-term protection and management of inventoried roadless areas in the National Forest System. While the Court-ordered injunction was in place, the Chief of the Forest Service instituted interim agency direction for the protection of roadless values in inventoried roadless areas. The interim direction expired in June 2003.

Following several legal challenges, and decisions rendered by the Ninth Circuit Court of Appeals in April 2003 requiring dissolution of the preliminary injunction from the Idaho Court, the Roadless Area Conservation Final Rule (36 CFR 294) was officially effective and binding on management of National Forest System lands. Nevertheless, USDA announced in June 2003 it would implement the 2001 Final

Rule, but would continue pursuing amendments to the rule to address State concerns and requests for limited exceptional circumstances received from several Governors. At the same time, a lawsuit from the State of Alaska were settled with an agreement to exempt the Tongass National Forest from the requirements of the 2001 Final Rule; and a challenge in the District Court for Wyoming found the 2001 Final Rule to be unlawful and permanently enjoined it from implementation. The ruling to permanently enjoin the 2001 Final Rule is under appeal to the Tenth Circuit Court.

In December 2003, USDA adopted a 2003 Final Rule that amended the 2001 Final Rule by exempting the Tongass National Forest from the Rule's prohibitions. In May 2004, the Tenth Circuit agreed to hear appeals on the Wyoming Court's permanent enjoinment of the 2001 Final Rule. In July 2004, USDA published a Proposed Rule for public comment and review to replace the 2001 Final Rule. This new version contains as petition process that would allow Governor's an opportunity to seek establishment of management requirements for inventoried roadless areas on National Forest System lands in their States.

At the same time, USFS announced reinstatement of the Chief of the Forest Service's interim protection measures for inventoried roadless areas. This interim direction is expected to be in effect until January 16, 2006. The July 2004 interim direction (WO-ID-1920-2004-1) establishes policy for the implementation of several aspects of the 2001 Final Rule. With respect to TEP's proposal, the relevant policy affects authorities for approval of certain proposed road construction or reconstruction activities in inventoried roadless areas.

TEP has stipulated that the structure locations, construction areas, and proposed access roads for all three corridors would not enter the following specially designated areas within the Tumacacori EMA (as shown in Figure 3.1–1): Pajarita Wilderness, Chiltipene Botanical Area, and Peña Blanca Lake Recreation Area (TEP 2003). The Pajarita Wilderness is a congressionally designated area comprised of approximately 7,400 acres (3,000 ha), including Sycamore Canyon and Goodding Research Natural Area, designated for its pristine nature and wilderness values, and utilized for recreation. The Chiltipene Botanical Area is an estimated 2,840 acre (1,150 ha) reserve established for the protection and study of Chiltepin wild chilies (*Capiscum annum* var. *glabriusculum*). Peña Blanca Lake Recreation Area is used for year-round water recreation.

Current land use within the Tumacacori EMA includes diverse and dispersed recreational uses, which are described in Section 3.1.2, Recreation. The U.S. Border Patrol conducts routine surveillance in the vicinity of the U.S.-Mexico border, specifically focused on the area south of Ruby Road between the Pajarita Wilderness and Nogales, mostly within the Tumacacori EMA. U.S. Border Patrol activities generally involve accessing the ridgetops to get an open view of the area. A large portion of the Tumacacori EMA (an estimated 164,000 acres [66,400 ha]) is classified by USFS as able to support livestock grazing, and some is currently under permit for livestock grazing. A majority of this capable rangeland is in satisfactory condition (a USFS measure of the health of the vegetation and soil relative to their combined potential to produce a sound and stable biotic community) (USFS 2001b).

- The Western Corridor passes almost entirely through satisfactory rangeland within the Tumacacori EMA.

- The Central and Crossover Corridors pass through a combination of satisfactory and unsatisfactory rangeland within the Tumacacori EMA.

There are an estimated 320 mi (515 km) of USFS system roads within the Tumacacori EMA, both paved and unpaved. There are also numerous unofficial travelways used by recreational and other users of the area, known as wildcat roads, as described in Transportation Section 3.12 and the Roads Analysis (RA)(URS 2003a) for the proposed project. There are approximately 31 vehicular access points to the EMA. The current configuration of the road system serves as a "limiter" to the EMA in accordance with the Forest Plan. Ruby Road is the primary access point to the EMA, as shown in Figure 3.1–1.

Nogales Border Area. The proposed crossing of the U.S.-Mexico border would be the same for all three corridors. In the City of Nogales, where the proposed corridors connect to the proposed Gateway Substation and continue to the U.S.-Mexico border, the City of Nogales Planning and Zoning Department oversees land use. On June 25, 1897, a Presidential Proclamation was signed by President William McKinley to keep lands free from obstruction as protection against smuggling of goods between the United States and Mexico. The proclamation reserved a strip of land 60 ft (18 m) wide, parallel with and adjacent to the U.S.-Mexico border, extending 1 mi (1.6 km) east and 1 mi (1.6 km) west of Monument No. 122 within the City of Nogales, Arizona. Following a recommendation that additional lands be reserved along the boundary, President Theodore Roosevelt signed a Presidential Proclamation on May 27, 1907, reserving a 60 ft (18 m)-wide strip of land parallel with and adjacent to the U.S.-Mexico border on all lands that were not already patented (that is, Indian Reservations, National Parks, Monuments, etc.) to the United States to ensure the integrity of the 60-ft (18-m) strip of reserved land. Similar lands are also designated by Mexico along its side of the land border. The 60-ft (18-m) strip of reserved land is continuous along the United States side of the border from Nogales, Arizona westward to the Colorado River, including the area of the proposed project border crossing (USIBWC 2003). The preservation of the reserved land's integrity is a requirement for TEP to cross the U.S.-Mexico border. TEP has committed that it would avoid construction of project structures within the 60 ft (18 m)-wide reserved lands along the U.S.-Mexico border. TEP's proposed project design is for the transmission line to cross the U.S.-Mexico border using monopole structures located at least 400 ft (120 m) away from the U.S.-Mexico border (TEP 2003).

3.1.1.1 *Western Corridor*

The Western Corridor extends for an estimated 65.7 mi (105 km), from the South Substation to the U.S.-Mexico border, including 9.3 mi (15.0 km) that follows or crosses the EPNG pipeline ROW, as shown in Figure 1.1–2. The length of the Western Corridor within the Coronado National Forest is 29.5 mi (47.5 km).

The Western Corridor, together with the Central and Crossover Corridors, exits the TEP South Substation located within the incorporated area of the Town of Sahuarita and proceeds westerly for an estimated 1.0 mi (1.6 km) before turning south for 1.5 mi (2.4 km). Land use in this area is a mix of undeveloped land and ranch land. The nearest residences to the proposed Western Corridor ROW are a group of about five houses at a distance of approximately 1,000 ft (305 m) from the ROW centerline, south of Sahuarita Road, west of the Town of Sahuarita. Sahuarita High School and Middle School are approximately 4,000 ft (1,200 m) south of the ROW centerline. The corridor turns west across I-19 and continues through Pima County to the southwest, intersecting the existing EPNG pipeline ROW. This area contains industrial properties, a low density residential area (0.2 to 0.4 residents per acre), ranch land, rural undeveloped land, and multiple expansive mine tailings piles from past and ongoing mining operations. On BLM lands, the proposed project would follow parallel to two existing TEP transmission lines (138-kV and 345-kV). The Western Corridor centerline passes approximately 0.19 mi (0.3 km) from a small group of homes along South Avenida Cinco, south of Sahuarita Road, and also approximately 0.19 mi (0.3 km) from a nearby house on West Camino del Toro. The Western Corridor turns south to parallel the

EPNG pipeline ROW for an estimated 5.8 mi (9.3 km) and passes near the existing TEP Cyprus Sierrita Substation.

The Western Corridor continues south past the Cyprus Sierrita Substation then separates from the Central Corridor, continuing southwest and south and enters Santa Cruz County after approximately 10 mi (16 km), passing through primarily undeveloped land, with portions of ranch land and commercial and industrial areas. As shown in Figure 2.1-1, the Western Corridor passes through State Trust lands that are leased to the Caterpillar Corporation, as well as Caterpillar-owned land. The Western Corridor enters the Coronado National Forest 6.0 mi (9.7 km) south of the Santa Cruz County line. The National Forest System lands along the Western Corridor are characterized by natural vegetation set in rolling hills with steep sloped canyons. Paralleling the Pima and Santa Cruz County lines on the National Forest System lands, the Western Corridor passes south along the west side of the Tumacacori and Atascosa Mountains, then meets and runs along the south side of Ruby Road as it turns gradually east at the Pajarita Wilderness. The Western Corridor centerline passes within approximately 1 mi (2 km) of the Pajarita Wilderness, including Goodding Research Natural Area and Sycamore Canyon. The Western Corridor centerline is approximately 2 mi (3 km) from the Chiltipene Botanical Area, and is an estimated 1.5 mi (2.5 km) south of the Peña Blanca Lake Recreation Area. The Western Corridor separates from Ruby Road west of Castle Rock, continuing south of Ruby Road until the Western Corridor intersects the Central and Crossover Corridors.

The Western Corridor, together with the Central and Crossover Corridors, continues through the National Forest System lands, following or crossing the EPNG pipeline ROW to the southeast for several miles to the Coronado National Forest boundary. The proposed corridors exit the Coronado National Forest onto private land containing some commercial and residential development and proceed 0.5 mi (0.8 km) east to the Gateway Substation. From the Gateway Substation, the proposed corridors return to the west through private land then turn south to parallel the Coronado National Forest boundary through an area containing primarily warehouses associated with trucking operations. The proposed corridors pass within 0.35 mi (0.6 km) of a warehouse and apartments on North Mariposa Ranch Road off Arizona State Highway 189. The proposed corridors meet the U.S.-Mexico border approximately 0.62 mi (1.0 km) west of Arizona State Highway 189 in Nogales, Arizona.

3.1.1.2 *Central Corridor*

The Central Corridor extends for an estimated 57.1 mi (91.9 km), from the South Substation to the international border, including 43.2 mi (69.5 km) that follows or crosses the EPNG pipeline ROW, as shown in Figure 1.1–4. The estimated length of the Central Corridor within the Coronado National Forest is 15.1 mi (24.3 km). The Central Corridor follows the same route as the Western Corridor from the South Substation in Sahuarita to an estimated 3 mi (5 km) south of the existing TEP Cyprus Sierrita Substation. Refer to Section 3.1.1.1, Western Corridor, for a discussion of the current land use in this common segment.

The Central Corridor separates from the Western and Crossover Corridors and continues to follow the existing EPNG pipeline ROW to the south. This section passes primarily through grazing areas and land that is undeveloped.

The Central Corridor continues south following or crossing the EPNG pipeline ROW, approaching to within approximately 1.0 mi (1.6 km) west of I-19, passing Amado, Tubac, and Tumacacori. The areas in the vicinity of these towns contain housing developments and some commercial establishments. The Central Corridor centerline passes approximately 0.19 mi (0.3 km) from a house northwest of Tubac (south of Agua Linda Road), and approximately 0.1 mi (0.2 km) from approximately eight houses and a distribution station north of Aliso Springs Road in Tubac. The Central Corridor continues approximately

2.0 mi (3.2 km) south of Tumacacori through undeveloped land, and then enters the Coronado National Forest, adjacent to the EPNG pipeline ROW. Under Option 1, the Central Corridor centerline diverges from the EPNG pipeline ROW for an estimated 1.9 mi (3.1 km) to avoid the IRA, passes along the eastern edge of the Tumacacori and Atascosa Mountains, and then crosses Ruby Road and reaches a point northwest of the Gateway Substation where it rejoins the Western Corridor. Under Option 2, the Central Corridor follows the existing EPNG pipeline ROW and passes through approximately 1.9 mi (3.1 km) of an IRA. National Forest System lands along the Central Corridor (Options 1 and 2) are characterized by natural vegetation set in rolling hills with frequent visible intrusions from the access roads and markers delineating the location of the existing EPNG underground pipeline. The 1.9 mi (3.1 km) deviation from the pipeline route in Option 2 is similar in topography and vegetation.

The Central Corridor centerline passes approximately 6 mi (10 km) east of the Pajarita Wilderness, including Goodding Research Natural Area and Sycamore Canyon. The Central Corridor centerline is approximately 1.0 mi (1.6 km) from the Chiltipene Botanical Area, and is approximately 3.0 mi (4.8 km) northeast of the Peña Blanca Lake Recreation Area.

The Central Corridor is identical to the Western Corridor from the point where they join in the Coronado National Forest to the Gateway Substation and the U.S.-Mexico border. Refer to Section 3.1.1.1, Western Corridor, for the current land use along this common segment.

3.1.1.3 *Crossover Corridor*

The Crossover Corridor extends for an estimated 65.2 mi (105 km), from the South Substation to the U.S.-Mexico border, including an estimated 17 mi (27 km) along the EPNG pipeline ROW, as shown in Figure 1.1–4. The estimated length of the Crossover Corridor within the Coronado National Forest is 29.3 mi (47.2 km). The Crossover Corridor is identical to the Western Corridor from where it exits the TEP South Substation in Sahuarita to where it separates from the Western Corridor in the Coronado National Forest. Refer to Section 3.1.1.1, Western Corridor, for a description of land use within this area.

The Crossover Corridor separates from the Western Corridor and turns east through Peck Canyon for an estimated 7 mi (11.3 km). Lands within the Peck Canyon segment are characterized by a steep-sided canyon, and natural vegetation. An intermittent stream with perennial pools meanders through the bottomland in Peck Canyon. Current land use within Peck Canyon is primarily for recreational use, as described in Section 3.1.2. The Crossover Corridor joins the Central Corridor and the EPNG pipeline ROW upon exiting Peck Canyon on the east side of the Tumacacori Mountains. The distances from the Crossover Corridor to the specially designated areas within the Tumacacori EMA, as shown in Figure 3.1–1, are the same as the distances for the Central Corridor, except the Crossover Corridor is an estimated 3.0 mi (4.8 km) south of the Chiltipene Botanical Area. The Crossover Corridor is identical to the Central Corridor from the point where they rejoin in the Coronado National Forest to the Gateway Substation and the U.S.-Mexico border. Refer to Section 3.1.1.2, Central Corridor, for a discussion of the current land use along this common segment.

3.1.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The proposed 115-kV interconnection would be the same for all three corridors. The 115-kV interconnection between the Valencia Substation and the Gateway Substation would be located on privately-owned land and existing right-of-ways. UNS owns the site of the Valencia Substation, and TEP owns the site for the proposed Gateway Substation. The following summarizes land uses within 2 mi (3.2 km) of the proposed 115-kV interconnection

The existing land uses within the project area for the 115-kV interconnection include residential, commercial, industrial, agricultural, parks/recreational, and undeveloped land uses. Residential land use includes low, medium, and high- density residential areas, as well as mobile home parks within and surrounding the city of Nogales. A series of apartment complexes are the closest residences to the proposed interconnection and are located approximately 200 ft (61 m) north at Milepost 2.7. A mobile home park is located approximately 900 ft (274 m) north of the proposed 115-kV interconnection at Milepost 1.5.

Commercial land uses are located throughout the area and are often found in mixed-use areas (commercial, light industrial, residential). The largest concentrations of commercial areas are along US 89 and Mariposa Road. Link 10 (Figure 1.1-5) of the proposed interconnection parallels a commercial area for approximately 0.6 mi (1 km).

Industrial uses in the study area are primarily associated with trade and distribution and are located along US 189 and Mariposa Road. These industrial uses are often associated with mixed-use areas (commercial, light industrial, residential). The proposed Gateway Substation is located directly north of an industrial area and the proposed connection to the Valencia Substation parallels an industrial area on the west and south for 1.3 mi (2.1 km).

Agriculture land uses within the 115-kV transmission line project area include a small corral and associated farm complex and animal grazing in the western portion of the project area. The corral and farm complex are located within 150 ft (46 m) of the proposed interconnection near where it turns to the west. The majority of the area west of the project is either used for grazing or is undeveloped.

The Coronado National Forest is located approximately 0.5 mi (0.8 km) west of the proposed interconnection, and a small (approximately 0.5 square mi [1.3 km^{2}]) area of State Trust Land is located approximately 1.25 mi (2.0 km) southeast of the proposed route.

3.1.2 Recreation

The following discussion of existing recreational resources applies to all three proposed corridors. A discussion of information specific to the Western, Central, and Crossover Corridors on the Coronado National Forest is presented separately in order that the USFS Recreation Opportunity Spectrum (ROS) tool for recreation planning and management can be used (USFS 1990).

There are no state parks, national parks, or national monuments in any of the proposed corridors. The nearest state park is the Tubac Presidio State Historic Park, located off I-19 in Tubac, approximately 6.0 mi (9.7 km) east of the Western and Crossover Corridors, and an estimated 1.5 mi (2.4 km) east of the Central Corridor, as shown in Figure 1.1–4. This park occupies 10 acres (4 ha) and is a day use only facility featuring remnants of a Spanish military fort and other historic and archaeological resources. Tumacacori National Historic Park is located off I-19 south of Tubac. This park occupies 360 acres and has three separate components focused on the former Spanish Colonial missions of Tumacacori, Guevavi, and Calabasas. The Tumacacori unit is closest to the proposed alternatives, located 4.6 mi (7.4 km) east of the Western and Crossover Corridors, and approximately 0.8 mi (1.3 km) east of the Central Corridor, as shown in Figure 1.1-4. There are no designated Wild and Scenic Rivers within the project vicinity. USFS determined a 5-mi (8-km) segment of Sycamore Canyon mostly within the Pajarita Wilderness to be eligible for designation as a Wild and Scenic River (USFS 2004b), although no designation has been made to date. This eligible segment of Sycamore Canyon is outside the three proposed corridors, although the Western Corridor crosses Sycamore Creek north of the potentially eligible segment (see Figure 3.7–2).

Recreation activities in the vicinity of the proposed project outside the Tumacacori EMA are generally similar to those within the Tumacacori EMA, as described in the following sections. These include hiking, biking, birding, photography, rock climbing, horseback riding, and off-highway vehicle use. Birding is recognized as a frequent recreation activity in the proposed project vicinity. A number of trails leading onto the National Forest System lands east of the Tumacacori Mountains are used for recreation. The southeastern Arizona Bird Observatory has identified 25 birding hotspots in southeastern Arizona. The two nearest to the proposed project are San Xavier del Bac Mission, approximately 10 mi (16 km) north of the South Substation, and the Buenos Aires National Wildlife Refuge, approximately 25 mi (40 km) west of the Western and Crossover Corridors, and approximately 30 mi (48 km) west of the Central Corridor (SABO 2001).

The setting in which recreation activities take place in the Coronado National Forest is analyzed using the ROS. By recognizing that people desire specific settings for recreational activities, the ROS provides a framework for understanding the characteristics that contribute to specific recreational settings. In applying the ROS, USFS classifies National Forest System lands into one of seven major classes: (1) Urban, (2) Rural, (3) Roaded Natural, (4) Roaded Modified, (5) Semi-Primitive Motorized, (6) Semi-Primitive Non-Motorized, and (7) Primitive. Based on these classifications, the ROS identifies seven characteristics that contribute to the experiences provided by a recreational area and indicate the limits of acceptable change to each characteristic within a recreational class. These characteristics, or setting indicators, are shown in the following text box (USFS 1990).

The Tumacacori EMA is one of twelve sky island mountain ranges that comprise the Coronado National Forest in Southwestern Arizona. “Sky Islands” or “sky island mountains” are terms used to denote mountain ranges that are isolated from each other by intervening valleys of grassland or desert (USFS 1999). USFS has classified all areas of the Tumacacori EMA as either Rural, Roaded Natural, Roaded Modified, Semi-Primitive Motorized, Semi-Primitive Non-Motorized, or Primitive, as shown in Figure 3.1–2. Within the Tumacacori EMA, the ROS class Semi-Primitive Motorized comprises the greatest total area, an estimated 128,519 acres (52,010 ha), out of a total of 203,799 acres (82,475 ha).

Certain setting indicators such as remoteness, access, and social encounters are impacted by operations of U.S. Border Patrol in the project vicinity. For instance, an otherwise remote area may be a common location for U.S. Border Patrol vehicle activity. Therefore, to ensure a complete ROS analysis, a general treatment of U.S. Border Patrol operations is included in this section, although these operations are not classified as a recreational activity.

Recreation Opportunity Spectrum Definitions

Urban

A setting characterized by easy access (usually paved roads), many built elements, and often lots of people. Urban settings generally have structures (such as visitor centers or astrophysical complexes) or others facilities (such as electronic sites) that dominate the natural setting. Urban areas on national forest lands are usually small in size and constitute a very small percentage of the land.

Rural

Rural settings include most developed recreation areas (such as campgrounds and picnic areas) as well as many other minor developed sites. The natural setting is the attraction but there are rustic facilities such as restrooms, roads (often paved), walkways, and picnic tables. Rural areas on national forest lands are generally small in size and constitute a very small percentage of the Forest.

Roaded Natural

Roaded Natural settings are corridors along major forest roadways where visitors drive to enjoy the scenery and are often on their way to a developed recreation site such as a campground or picnic area. The natural setting is the focus, but nodes of ROS Urban and Rural are commonly found along these corridors. There are generally some encounters with other visitors occur along roads. Individual buildings and structures (such as very small administrative sites or individual summerhomes) are occasionally encountered within these corridors.

Roaded Modified

Roaded Modified settings are corridors along less-used but well-maintained forest roads where visitors drive to enjoy the scenery and get away from other people and developed sites. The natural setting is the focus and visitors are often looking for a place to set up their own camp, explore the backcountry, or find solitude.

Semi-Primitive Motorized

Semi-Primitive Motorized settings are areas with primitive roads (i.e., high clearance and/or 4-wheel drive). In this setting visitors find more risk and isolation, and encounters with other people are uncommon. People use these areas for a wide variety of activities, both recreational and other, including horseback riding, mountain biking, hunting, mining, and cutting firewood. Generally the only facilities in these areas are primitive roads and trails.

Semi-Primitive Non-Motorized

Semi-Primitive Non-Motorized settings are roadless natural areas that visitors use for a wide variety of dispersed recreation activities. These areas have no facilities other than trails and are similar to Primitive areas except that they can be small areas. Encounters with other people are rare.

Primitive

These are the most remote parts of the forest. Primitive settings are large (over 5,000 acres) wilderness or wilderness-like areas where visitors seek a totally natural setting, challenge, discovery, and solitude. These areas have no facilities other than trails and encounters with other people are rare.

Recreation Opportunity Spectrum Setting Indicators

Access: The type and mode of travel, such as trails or roads, with more difficulty designed into travel as one moves towards the Primitive end of the spectrum.

Remoteness: The extent to which individuals perceive themselves as removed from the sights and sounds of human activity, such as transmission lines, with primitive areas being farther removed from indications of human activity.

Social Encounters: The number and type of other recreationalists met along travelways, or camped within sight or sound of others, such as a group of hikers, with fewer interactions towards the Primitive end of the spectrum.

Visitor Management: The degree to which visitors are regulated and the level of information and services provided for visitor enjoyment, such as interpretive signs, with little or no regulation and on-site information towards the Primitive end of the spectrum.

Facilities and Site Management: The level of site development, such as foot bridges across washes, with little or no user comfort and site protection facilities towards the Primitive end of the spectrum.

Naturalness: The degree of human alterations such as trail clearings in the landscape versus undisturbed nature, with settings that are visually more natural towards the Primitive end of the spectrum. Naturalness is indicated by the Scenery Management System (SMS) Scenic Integrity Level.

Visitor Impacts: The degree of visitor use impacts on the environment, such as alterations to wildlife habitat, with little or no impacts towards the Primitive end of the spectrum.

3.1.2.1 Western Corridor

The Western Corridor includes approximately 30.0 mi (48.2 km) within the Coronado National Forest, as shown by the 0.25 mi (0.40 km)-wide study corridor in Figure 3.1–2. As described in this section, the entire length of the Western Corridor on National Forest System lands provides opportunities for recreation, which is currently utilized to varying degrees, including hiking, hunting, birding, photography, rock climbing, biking, horseback riding, all-terrain vehicle use, camping, picnicking, fishing, metals claim prospecting, and scenic driving on Ruby Road.

The Western Corridor crosses two areas of Semi-Primitive Motorized land (west of the Tumacacori Mountains and near Nogales) for a total of an estimated 21.3 mi (34.3 km). Along Ruby Road, the Western Corridor crosses Roaded Modified land for approximately 7 mi (11 km) and Roaded Natural land for an estimated 1.7 mi (2.7 km). The Western Corridor passes within 0.25 mi (0.40 km) of Semi-Primitive Non-Motorized land on the west side of the Tumacacori Mountains. The number of recreational users is highest in the Roaded Natural areas, decreases beyond Peña Blanca Lake in the Roaded Modified areas, and is lowest in the Semi-Primitive Motorized areas along the western side of the Atascosa and Tumacacori Mountains. However, as described below, attributes such as the remoteness of certain areas provide a unique, highly valued experience for visitors that venture into such areas. For each ROS classified area, the current setting indicators and recreational uses are described below.

Western Corridor Roaded Natural Area. The destination of a majority of visitors to the Tumacacori EMA is Peña Blanca Lake Recreation Area, accessed by traveling west on Ruby Road to the west end of the Roaded Natural area. Roaded Natural settings are road corridors where people drive to enjoy the scenery and are often on their way to a developed site such as a picnic area. Activities at Peña Blanca Lake Recreation Area include year-round picnicking and fishing. A large percentage of the visitors to this location are from Sonora, Mexico. The resort at Peña Blanca Lake was closed in 1997, resulting in a decreased number of visitors in recent years compared to when the resort was operating. The nearby Calabasas Group Area offers camping and picnicking and is used several times a year (USFS 2002a).

Full access is provided to this area for low-clearance vehicles by the paved section of Ruby Road connecting to I-19. The remoteness of this area is limited by human activities such as other automobiles at the Peña Blanca Lake parking area and along Ruby Road. Social encounters, both on Ruby Road and at the developed lake area, are moderate to high on weekends, with encounters between multiple parties likely. Social encounters tend to decrease during the week. There are rustic facilities and evidence of site management, such as paved parking areas, picnic tables, and an electric distribution line that parallels Ruby Road east of Peña Blanca Lake. The existing naturalness of the lake area is moderate, rated per the ROS in terms of Scenic Integrity. Outside of the lake area, the existing naturalness or scenic integrity is high, as the landscape appears intact. Visitor management is slight but noticeable, with simple natural signs identifying locations such as Upper Thumb Picnic Area. Visitor impacts to the area consist of soil impacts from automobiles on roads and parking areas, and disturbances in vegetation due to footpaths.

Western Corridor Roaded Modified Area. West of Peña Blanca Lake, the area surrounding this unpaved portion of Ruby Road is classified as Roaded Modified. On the Coronado National Forest, Roaded Modified is similar to the Semi-Primitive Motorized setting, but with easier access (better roads). A large majority of visitors that go beyond Peña Blanca Lake travel on Ruby Road to destinations such as Sycamore Canyon, within the Pajarita Wilderness, and California Gulch. Activities in this area include sightseeing, birding, hiking, and rock climbing. Several smaller roads that intersect Ruby Road, such as Bear Valley Ranch Road, offer opportunities for all-terrain vehicle use. The Roaded Modified area also attracts a few herpetologists (people studying reptiles and amphibians) (USFS 2002a).

Ruby Road provides dirt road access to this Roaded Modified Area. Four-wheel drive vehicles are sometimes needed for travel on this road, depending on road and weather conditions, but generally the road does not limit access. This area is more remote than along Ruby Road east of Peña Blanca Lake, as the only evidence of human activity is the dirt road and occasional foot trails. Social encounters in this area are limited, with occasional encounters between parties likely to occur. The operations of U.S. Border Patrol agents in this area increase the likelihood of having at least a few social encounters during a visit. The only evidence of facilities or site management is the maintenance of Ruby Road. The naturalness of this area along Ruby Road is high, with human alterations limited to Ruby Road, several side roads, and foot trails. Limited road signs are the primary indication of visitor management, which is generally low in this area. Visitor impacts to the area consist of soil impacts from automobiles and all-terrain vehicles on roads, and occasional footpaths disturbing vegetation.

Western Corridor Semi-Primitive Motorized Area. Upon turning north from Ruby Road, the Western Corridor runs west of the Atascosa and Tumacacori Mountains through Semi-Primitive Motorized land to the northern boundary of the Tumacacori EMA. It also runs through Semi-Primitive Motorized land south and east of Ruby Road. Semi-Primitive Motorized settings are areas with primitive roads (that is, high clearance and four wheel drive) and trails. About 30 percent of the use of this area is by backcountry hunters. Hunting season is from August to February and includes deer, mountain lion, and quail hunting. Some all-terrain vehicles are used in this area, and the area is used daily by range permittees. The remaining recreational use includes hikers, horseback riders, and others who come to enjoy the scenery and find solitude (USFS 2002a). In addition, the U.S. Border Patrol conducts routine surveillance in this area, often accessing the ridgetops to get an open view of the area.

Access to this area is limited to roads assigned for use by high-clearance vehicles, on which traffic is normally minor, consisting of administrative, permitted, or dispersed recreation uses. This results in significantly lower visitor numbers than along Ruby Road (USFS 2002a). This area is more remote than along Ruby Road, as the only evidence of human activity are dirt roads and occasional foot trails. Social encounters in this area are very limited, with a high likelihood of not having any social encounters on some days. There is a decrease in U.S. Border Patrol activity as distance from the U.S.-Mexico border increases. The only evidence of facilities or site management is the maintenance of dirt roads and trails. The naturalness is very high, with human alterations limited to dirt roads and foot trails. Visitor management is very low in this area, limited to a few road signs. Visitor impacts to the area consist of soil impacts from automobiles and all-terrain vehicles on roads, and occasional footpaths disturbing vegetation.

Western Corridor Semi-Primitive Non-Motorized Area. The Western Corridor and/or its potential new access roads pass within 0.25 mi (0.40 km) of a Semi-Primitive Non-Motorized Area. Semi-Primitive Non-Motorized settings are areas without roads that people use for a wide variety of activities, but primarily for dispersed recreation uses. Access to this area is limited to trails, used occasionally by recreationalists such as hikers and hunters. This area is more remote than the Semi-Primitive Motorized areas, as the only evidence of human activity is occasional foot trails. Social encounters in this area are very limited, with a high likelihood of not having any social encounters on some days. U.S. Border Patrol activities in this area are likely to be reduced given the limited access. The only evidence of facilities or site management is the maintenance of trails. The naturalness is very high, with human alterations limited to trails. Visitor management is virtually non-existent, and visitor impacts to the area consist of soil impacts and vegetation disturbances from footpaths.

3.1.2.2 *Central Corridor*

The Central Corridor includes an estimated 15.1 mi (24.3 km) within the Coronado National Forest, as shown by the 0.25 mi (0.40 km)-wide study corridor in Figure 3.1–2. The Central Corridor crosses Semi-

Primitive Motorized land for an estimated 14 mi (23 km), and crosses Roaded Natural land for an estimated 1.1 mi (1.8 km) upon crossing Ruby Road and then runs through Semi-Primitive Motorized land to the Coronado National Forest boundary. The Central Corridor passes briefly within 0.25 mi (0.40 km) of a Semi-Primitive Non-Motorized Area north of Ruby Road. A number of roads leading onto the National Forest System lands east of the Tumacacori Mountains are used for recreation such as hiking, birding, photography, biking, horseback riding, and all-terrain vehicle use. Rock Corral Canyon Road, popular for biking, is crossed by the Central Corridor an estimated 1.0 mi (1.6 km) outside (east) of where the road enters the national forest. Beyond these roads, there is limited use of the national forest land east of the Tumacacori Mountains, especially compared to the use along Ruby Road and at Peña Blanca Lake farther to the south (USFS 2002a). For each ROS classified area, the current setting indicators and recreational uses along the Central Corridor are described below.

Central Corridor Roaded Natural Area. The Roaded Natural Area crossed by the Central Corridor is a 1.0 mi (1.6 km) strip of land at the crossing of Ruby Road. Full access is provided to this area for low-clearance vehicles by the paved section of Ruby Road leading from I-19, and by dirt access roads to the EPNG pipeline ROW. The remoteness of this area is limited by the automobiles on Ruby Road. Social encounters on Ruby Road are moderate to high, increasing on weekends, with encounters between multiple parties likely. The rustic facilities and evidence of site management are the Ruby Road and signs along the road, and an electrical distribution line on wooden poles paralleling Ruby Road. The existing naturalness is high, as the landscape appears intact. Visitor management is slight but noticeable, with simple natural signs identifying locations such as the national forest boundary. Visitor impacts to the area consist of soil impacts from automobiles on side roads, and disturbances in vegetation due to footpaths.

Central Corridor Semi-Primitive Motorized Areas. Access to the Semi-Primitive Motorized Area comprising most of the Central Corridor is limited to primitive roads assigned for use by high clearance and four wheel drive vehicles, on which traffic is normally minor, consisting of administrative, permitted, or dispersed recreation uses. Many of these roads also provide access to the existing EPNG pipeline ROW within the Central Corridor. The remoteness of this area is limited by the overlooking views of the Santa Cruz Valley and I-19 that is within 1.0 mi (1.6 km) of the Central Corridor where it enters the Coronado National Forest, and a maximum of approximately 5.0 mi (8.0 km) from the Central Corridor. Social encounters in this area are limited, with the likelihood of having a few social encounters increasing on the weekends. There is a decrease in U.S. Border Patrol activity as the distance from the U.S.-Mexico border increases. The only evidence of facilities or site management is the maintenance of dirt roads and trails. The naturalness is very high, with human alterations only apparent along the EPNG pipeline ROW, and limited dirt roads and foot trails. Visitor management is very low in this area, limited to a few signs. Visitor impacts to the area consist of soil impacts from automobiles and all-terrain vehicles on roads, and occasional footpaths disturbing vegetation.

Central Corridor Semi-Primitive Non-Motorized Area. The Central Corridor (Option 1) and/or its potential new access roads pass briefly within 0.25 mi (0.40 km) of a Semi-Primitive Non- Motorized Area. Option 2 passes through approximately 1.9 mi (3.1 km) of this area. Semi-Primitive Non-Motorized settings are areas without roads that people use for a wide variety of activities, but primarily for dispersed recreation uses. Access to this area is limited to trails, used occasionally by recreationalists such as hikers. This area is more remote than the Semi-Primitive Motorized areas, as the only evidence of human activity is occasional foot trails. Social encounters in this area are very limited, with a high likelihood of not having any social encounters on some days. U.S. Border Patrol activities in this area are reduced given the limited access. The only evidence of facilities or site management is the maintenance of trails. The naturalness is very high, with human alterations limited to trails. Visitor management is virtually non-existent, and visitor impacts to the area consist of soil impacts and vegetation disturbances from footpaths.

3.1.2.3 *Crossover Corridor*

The Crossover Corridor includes an estimated 29.7 mi (47.8 km) within the Coronado National Forest, as shown by the 0.25 mi (0.40 km)-wide study corridor in Figure 3.1–2. The Crossover Corridor crosses Semi-Primitive Motorized land for an estimated 25.2 mi (40.6 km) on the east and west sides of the Tumacacori Mountains and south and east of Ruby Road, Semi-Primitive Non-Motorized land for an estimated 3.3 mi (5.3 km) within Peck Canyon, and Roaded Natural land for an estimated 1.1 mi (1.8 km) upon crossing Ruby Road. On the west side of the Tumacacori Mountains (in the segment common with the Western Corridor), recreational use consists of backcountry hunters, hikers, horseback riders and others who come to enjoy the scenery and find solitude. The U.S. Border Patrol conducts routine surveillance in this area, often accessing the ridgetops to get an open view of the area. Within Peck Canyon, recreation is more limited, but offers a favorite setting for some hikers, birders, hunters, horseback riders, and all-terrain vehicle users (USFS 2002a). On the east side of the Tumacacori Mountains, a number of trails and roads (for high clearance and four wheel drive vehicles) offer recreation, as described above for the Central Corridor. For each ROS classified area, the current setting indicators and recreational uses along the Crossover Corridor are described below. The information in Section 3.1.2.2 regarding Options 1and 2 are applicable to the Crossover Corridor.

Crossover Corridor Roaded Natural Area. The Roaded Natural Area crossed by the Crossover Corridor is a 1.0 mi (1.6 km) strip of land at the crossing of Ruby Road. This segment is common with the Central Corridor Roaded Natural Area, and the ROS setting indicators are the same as previously described for this area.

Crossover Corridor Semi-Primitive Motorized Areas. Access to the Semi-Primitive Motorized Areas on the west and east sides of the Tumacacori Mountains is limited to primitive roads assigned for use by high clearance and four wheel drive vehicles, on which traffic is normally minor. Many of the roads on the east side of the Tumacacori Mountains also provide access to the existing EPNG pipeline ROW within the Crossover Corridor. The area west of the Tumacacori Mountains is very remote, given the distance to major roads such as Ruby Road and Arivaca Road. Sights and sounds of human activity are limited or non-existent. On the east side of the Tumacacori Mountains, the remoteness is limited by the overlooking views of the Santa Cruz Valley and I-19, as described for the Central Corridor. West of the Tumacacori Mountains, social encounters are very limited, with a high likelihood of not having any social encounters on some days, whereas social encounters would be more likely east of the Tumacacori Mountains. U.S. Border Patrol activities along the Crossover Corridor are limited given the distance from the U.S.-Mexico border. The only evidence of facilities or site management is the maintenance of dirt roads and trails. The naturalness is very high, with human alterations only apparent along the EPNG pipeline ROW. Visitor management is very low in this area, limited to a few signs. Visitor impacts to the area consist of soil impacts from automobiles and all-terrain vehicles on roads, and occasional footpaths disturbing vegetation.

Crossover Corridor Semi-Primitive Non-Motorized Area. The Crossover Corridor and its potential new access roads pass through Semi-Primitive Non-Motorized land in Peck Canyon. Within Peck Canyon, recreation is limited, but offers a favorite setting for some hikers, birders, hunters, horseback riders, and all-terrain vehicle users (USFS 2002a). Access to this area is on a trail that goes several miles into Peck Canyon from the east side. There are also remnants of a trail from a water pipe that used to supply water to the town of Ruby located several miles west of the proposed project. This area is more remote than the Semi-Primitive Motorized areas east of the Tumacacori Mountains, as the only evidence of human activity is occasional foot trails. Social encounters in this area are very limited, with a high likelihood of not having any social encounters on some days. U.S. Border Patrol activities in this area are likely to be reduced given the limited access and distance to the U.S.-Mexico border. The only evidence of facilities or site management is the maintenance of trails. The naturalness is very high, with human alterations limited to trails. Visitor management is virtually non-existent, and visitor impacts to the area consist of soil impacts and vegetation disturbances from footpaths.

3.1.2.4 *115-kV Interconnection of the Gateway and Valencia Substations*

There are no state parks, national parks, or national monuments in the vicinity of the proposed interconnection project area. The nearest park/recreation area, Sergeant Manuel Tapia Recreational Trail, is located approximately 0.5 mi (0.8 km) north of the proposed interconnection.

3.2 VISUAL RESOURCES

This section discusses the existing visual resources in the vicinity of the proposed project. The discussion includes a description of the terminology and concepts used to characterize visual resources for the entire length of the proposed project, including Bureau of Land Management (BLM), Coronado National Forest, state, and private land. The terminology and concepts are consistent with the U.S. Department of Agriculture Forest Service (USFS) Scenery Management System (SMS) used by USFS for the inventory and analysis of aesthetic values of National Forest System lands, as outlined in *Landscape Aesthetics: A Handbook for Scenery Management* (USFS 1995).

It should be noted that the Coronado National Forest has recommended use of the SMS for visual analysis of the proposed project, rather than the former USFS Visual Resource Management System. In the early 1980s, the Coronado National Forest was mapped by USFS using the Visual Resource Management System, which included Visual Quality Objectives. In the early 1990s, the SMS was developed as a new system for managing scenic resources, including new terminology, different end products, increased public involvement, and mapping using Geographic Information Systems (GIS) technology. In 1994, the Deputy Chief of the USFS directed National Forests to use the SMS (Reynolds, 2380, August 22, 1994), and in 1996, the Chief directed the same (USFS 1995).

The SMS is more appropriate for the proposed project analysis because it takes into account increased public awareness and involvement in protecting scenic resources on National Forest System lands, and increased public use of the area, which has changed how the landscapes are viewed (e.g., the SMS considers viewsheds from trails). The Coronado National Forest has completed an inventory of its scenic resources using the SMS, and has developed new criteria for defining Scenic Attractiveness, a major component in mapping scenic resources. This information will be considered during the Forest Plan revision, and Scenic Integrity Objectives will be established through that process. Until then, the SMS inventory will be used for project-level analysis and design, such as the analysis that follows for the TEP Sahuarita-Nogales Transmission Line Project (USFS 2002b). However, this EIS also provides an assessment of impacts to visual resources using the Visual Quality Objectives (VQO) consistent with the *Coronado National Forest Plan*. Appendix I provides that information.

The SMS is a tool for integrating benefits, values, desires, and preferences regarding aesthetics and scenery for all levels of land management planning. The SMS recognizes that high-quality scenery, especially scenery with natural-appearing landscapes, enhances people's lives and benefits society. By establishing a terminology for managing scenery, USFS has developed a systematic approach for determining the relative value and importance of scenery that can be applied in concept for the entire proposed project. The visual resource attributes outlined by the SMS include the following:

- **Landscape Character** – a description of the overall visual and cultural impression of landscape attributes and the physical appearance and cultural context of a landscape that gives it an identity and "sense of place."

- **Scenic Attractiveness** – ratings based on the SMS scale of Distinctive (A), Typical or Common (B), and Undistinguished (C) that indicate the uniqueness of landscapes in the region or human perceptions of the intrinsic beauty of landform, rockform, waterform, and vegetation patterns.

- **Concern Levels and Landscape Visibility** – ratings based on the SMS scale for Concern Levels, indicating the degree of public importance placed on the landscape viewed from travelways and use areas, and the visibility of lands in each distance zone. Concern Levels are based on the number of visitors and the interest of visitors in the scenery, and distance zones are based on the distance from the viewer, defined as foreground within 0.5 mi (0.8 km), middleground between 0.5 mi (0.8 km) and 4 mi (6 km), and background beyond 4 mi (6 km) from the observer. The visibility of lands is affected by the degree of discernible detail and perceptible visual range, or farthest distance a person can see without being clouded by haze, especially in the background distance zone. Perceptible visual range is attributable to the amount and size of particles in the air, depending on pollution levels, naturally occurring dust, and meteorological factors such as wind and humidity. Visibility is normally much better in dry climates, such as in southeastern Arizona, than in humid climates, although wind-suspended dust can significantly reduce visibility in drier periods. For further discussion of climate refer to Section 3.8, Air Quality.

- **Scenic Class** – a composite rating that indicates the relative importance of a landscape, based on the Scenic Attractiveness, Concern Level, and Landscape Visibility classifications of an area. Scenic Classes 1 and 2 have high public value, Classes 3 through 5 have moderate value, and Classes 6 and 7 have low value.

- **Scenic Integrity** – rating that indicates the degree of intactness and wholeness of the landscape character. Human alterations can lower, maintain, or raise Scenic Integrity. Scenic Integrity is rated as Very High, High, Moderate, Low, Very Low, or Unacceptably Low.

While the entire proposed project is described here in terminology and concepts consistent with the SMS, the quantitative rating and mapping of the visual attributes described above applies only to National Forest System land, and includes travelways both on and off the National Forest System land from which the proposed project may be viewed, such as I-19. The following sections describe the existing visual environment in the vicinity of the proposed project for each alternative, with separate sections addressing the National Forest System land. The Scenic Class ratings were originally determined by USFS on a Coronado National Forest-wide scale, then verified through field visits to the proposed project area.

3.2.1 Western Corridor

Coronado National Forest. The Western Corridor crosses an estimated 29.5 mi (47.5 km) of the Coronado National Forest, primarily through a landscape of undisturbed vegetation set in steep sloped canyons, foothills, and mountains. The Western Corridor passes south along the west side of the Tumacacori and Atascosa Mountains (passing through Bear Valley just north of the Pajarita Wilderness), then meets and runs along the south side of Ruby Road as it turns gradually east at the Pajarita Wilderness (see Figures 3.1–1 and 3.2–2). The Western Corridor separates from Ruby Road west of Castle Rock, continuing south of Ruby Road until the Western Corridor intersects the El Paso Natural Gas (EPNG) pipeline right-of-way (ROW) and the Central and Crossover Corridors. Upon rejoining, the three corridors continue together through a landscape of natural vegetation, following the EPNG pipeline ROW along the eastern foothills of the Atascosa and Pajarito Mountains to the Coronado National Forest boundary.

The proposed project is set within the Sky Island Landscape Character Type that encompasses southeastern Arizona and the entire Coronado National Forest. This region is characterized by strong contrasts of massive mountain ranges rising abruptly from arid desert floors, with areas of rugged foothills, cliffs, and canyons in between. “It is this mosaic of low deserts and high mountains that results in an incredible diversity of plants and animals and awesome scenery” (USFS 1999). Specifically within the Tumacacori Ecosystem Management Area (EMA) in the vicinity of the Western Corridor, the northern portion to the west of the Tumacacori Mountains is desert grasslands with sparse, short, well-spaced vegetation that is gray-green to blue-green in color, set in grasses that are typically golden brown, as shown in Figure 3.2–1. During the summer months after the monsoon rains, the grasses become bright green in color. As the Western Corridor turns gradually east near the Pajarita Wilderness and continues along Ruby Road, the project corridor includes an increasing number of oak trees (Broadleaf Woodland Evergreen vegetation type) and rocky outcrops. Castle Rock, a prominent rocky outcrop topographic

Figure 3.2–1. Typical Desert Grasslands Vegetation in the Coronado National Forest.

feature, is located in this area, to the southwest of Peña Blanca Lake. The area also includes numerous desert washes, mountain meadows, and canyon bottoms with riparian vegetation, green from seasonal water availability. The vegetation, topography, rock form, and water combine to create three categories of Scenic Attractiveness, as shown in Figure 3.2–2. This figure shows that the Western Corridor passes primarily through Distinctive (A) landscapes 21.2 mi (34.1 km), with 7.7 mi (12 km) of Typical or Common landscape (B), and 0.6 mi (1 km) of Undistinguished (C) landscape. Scenic Attractiveness and other visual attributes described in the following text are quantified for each proposed corridor in Table 3.2–1.

Table 3.2-1. Visual Attributes of the Western, Central, and Crossover Corridors On the Coronado National Forest

Corridor	Total length	Length on the CNF	Scenic Attractiveness: A Distinctive	B Typical	C Undistinguished	Scenic Classes (Public Value): High 1	High 2	Moderate 3	Moderate 4
Western (mi)	65.7	29.5	21.2	7.7	0.6	10.5	11.1	2.6	5.3
Central (mi)	57.1	15.1	5.4	9.6	0.1	1.8	13.3	-	-
Crossover (mi)	65.2	29.3	14.7	14.0	0.6	5.5	15.2	3.3	5.3

Source: USFS 2001b.

The degree of public importance placed on the landscape viewed from travelways and use areas is indicated by the Concern Levels defined in the SMS. Concern Level 1 roads and trails include primary travelways that receive a moderate to high amount of use by people that are likely to have high interest in the surrounding landscape. Figure 3.2–3 shows that the Concern Level 1 travelways in the vicinity of the Western Corridor are Ruby Road, I-19, and Arivaca Road. The Concern Level 2 areas near the Western Corridor shown on the map are secondary travelways and use areas that receive a moderate amount of use, including several roads off Ruby Road, Forest Road 684, and trails to Atascosa Lookout and into the Pajarita Wilderness. The shadings on the map represent a broad-brush definition of foreground and middleground distance zones from the Concern Level 1 and 2 travelways. Note that these broad-brush definitions of distance zones were used as the starting point for evaluating project visibility. The hilly terrain and canyons of the area provide wide-open views of the Western Corridor in some areas while blocking views of the Western Corridor in other areas. The Western Corridor would be most visible in the immediate foreground to travelers on Ruby Road in the area west of Peña Blanca Lake and northwest of the Pajarita Wilderness. The Western Corridor would be west of the Tumacacori and Atascosa Mountains and thus not visible in the national forest from I-19 until near Nogales.

Based on Scenic Attractiveness, Concern Levels, and distance zones, USFS has determined Scenic Class ratings for the Coronado National Forest. Scenic Class indicates the relative importance of landscapes when comparing the value of scenery to other resources. Scenic Classes 1 and 2 have high public value, Classes 3 to 5 have moderate value, and Classes 6 and 7 have low value. Figure 3.2–4 shows the Scenic Class ratings of the Coronado National Forest Tumacacori EMA. The figure shows that the Tumacacori EMA is predominantly Classes 1 and 2, with portions of Classes 3 and 4. The Western Corridor passes through 10.5 mi (16.9 km) of Class 1, 11.1 mi (17.9 km) of Class 2, 2.6 mi (4.2 km) of Class 3, and 5.3 mi (8.5 km) of Class 4.

The human alterations to the natural landscape are minimal along the Western Corridor within the Coronado National Forest, as shown by the map of existing Scenic Integrity in Figure 3.2–5. Especially to the south and west of the Tumacacori and Atascosa Mountains, the landscape is pristine as far as the eye can see, resulting in very high Scenic Integrity (the landscape is intact). For a 1-mi (1.6-km) strip of land following Ruby Road through the Tumacacori EMA, the Scenic Integrity is high (appears to be intact). Although Ruby Road is a human alteration, because it provides visitor access and provides viewing platforms for the public, it is generally considered a fairly neutral element in the landscape (that is, it has a minimal impact on Scenic Integrity). Peña Blanca Lake Recreation Area, which includes visitor facilities, and the town of Ruby, approximately 3 mi (4.8 km) west of the proposed project, both have moderate Scenic Integrity (appears slightly altered). Subtle alterations to the area landscape include roads and trails off Ruby Road, and an electric distribution line on wooden poles near Peña Blanca Lake.

Outside the Coronado National Forest. Approximately 36.2 mi (58.3 km) of the Western Corridor (out of a total of 65.7 mi [106 km]) is outside of the Coronado National Forest. The landscape of this portion of the Western Corridor is characterized primarily by desert grassland set in scattered foothills, as depicted in Figure 3.2–1. Upon leaving the existing South Substation and crossing I-19, the Western Corridor passes a low-density residential area, and upon exiting Sahuarita passes several commercial properties. There are multiple mine tailings piles that dominate the landscape in this area. This section of the Western Corridor follows existing TEP transmission lines including a 345-kV and 138-kV line on BLM lands, and meets up with an EPNG pipeline ROW that passes by the existing TEP Cyprus Sierrita Substation, as depicted in Figure 3.2–6 showing existing utilities.

The Western Corridor separates from the Central Corridor and EPNG pipeline ROW at an estimated 3 mi (5 km) south of the Cyprus Sierrita Substation, turning to the southwest through desertscrub vegetation and crossing into the Coronado National Forest. The human alterations to the natural landscape such as utilities, multiple expansive mine tailings piles, and buildings in the northern portion of the Western Corridor reduce the Scenic Integrity of the landscape to Moderate to Low (the visual landscape appears slightly to moderately altered, and the mine tailings piles dominate some areas of the landscape). The Scenic Integrity of the BLM land is Moderate to Low given the two existing transmission lines. Upon separating from the Central Corridor, the Scenic Integrity increases to High (the landscape begins to appear unaltered). As the Western Corridor crosses I-19 and passes roads and residences, the proposed project would be visible to residents, travelers, and recreationalists in the foreground and middleground distance zones, until it is hidden behind mine tailings piles. Upon separating from the Central Corridor, the Western Corridor would be almost entirely obscured from view from I-19 by mine tailings piles and natural foothills. The town of Arivaca is approximately 10.5 mi (17 km) west of the Western Corridor.

Upon exiting the Coronado National Forest to the southeast, the three proposed corridors run together through a landscape of undeveloped land with natural vegetation, following the EPNG pipeline ROW. The corridors go along the eastern foothills of the Atascosa and Pajarita Mountains and into the edge of the City of Nogales and the proposed Gateway Substation. The corridors then continue south to the Mexico border through an area of industrial and limited residential development.

3.2.2 Central Corridor

Coronado National Forest. The Central Corridor crosses an estimated 15.1 mi (24.3 km) of the Coronado National Forest, all of which is within or near an existing Forest Transportation Systems and Utilities Corridor containing a buried EPNG pipeline within a 50 ft (15 m) ROW. The Central Corridor runs south along the east side of the Tumacacori Mountains and Atascosa Mountains, then turns southeast, crosses Ruby Road, and intersects the Western Corridor. Upon rejoining, the three corridors continue together through a landscape of natural vegetation, following the pipeline ROW along the eastern foothills of the Atascosa and Pajarito Mountains to the Coronado National Forest boundary.

The proposed project is set within the Sky Island Landscape Character Type, as described above for the Western Corridor. Within the Tumacacori EMA, the Central Corridor passes through desert grasslands with sparse, short, well-spaced vegetation that is gray-green to blue-green in color, set in golden brown grasses. Vegetation within the EPNG pipeline ROW and access roads leading to the ROW is cleared, as shown in Figure 3.2–7. The area also includes some rocky outcrops, desert washes, and canyon bottoms with riparian vegetation, green from seasonal water availability. The vegetation, topography, rock form, and water combine to create three categories of Scenic Attractiveness, as shown in Figure 3.2–2. This figure shows that the Central Corridor passes primarily through Typical or Common (B) landscape (9.6 mi [15.4 km]), with 5.4 mi (8.7 km) passing through Distinctive (A) landscape, and 0.1 mi (0.2 km) passing through Undistinguished (C) landscape.

The degree of public importance placed on the landscape viewed from travelways and use areas is indicated by the Concern Levels defined in the SMS. Concern Level 1 roads and trails include primary travelways that receive a moderate to high amount of use by people that are likely to have high interest in the surrounding landscape. Figure 3.2–3 shows that the Concern Level 1 travelways in the vicinity of the Central Corridor are Ruby Road and I-19. The Concern Level 2 areas near the Central Corridor shown on the map are secondary travelways on the east side of the Atascosa Mountains that receive a moderate amount of use, such as Rock Corral Canyon Road. San Cayetano Elementary School at Peck Canyon Road and I-19 is also a Concern Level 2 area. The shadings on the map represent a broad-brush definition of foreground and middleground distance zones from the Concern Level 1 and 2 travelways. Note that these broad-brush definitions of distance zones were used as the starting point for evaluating project visibility; refined project maps showing actual project visibility based on screening created by the area's terrain and vegetation are included in Section 4.2, Visual Impacts.

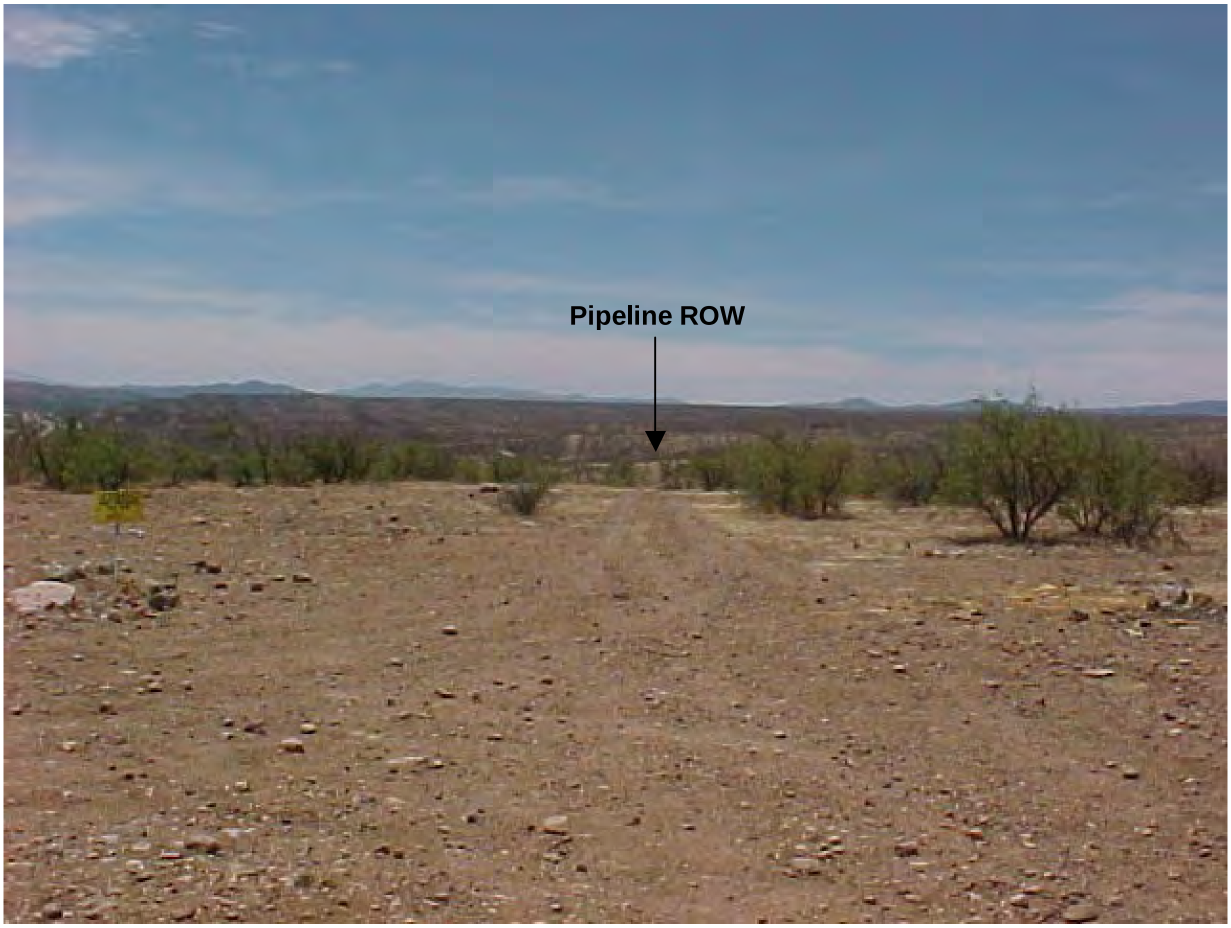

Figure 3.2–7. El Paso Natural Gas Pipeline ROW.

The elevated landforms that run directly along the west side of I-19 block views of the Central Corridor from most of I-19 as the Central Corridor approaches and traverses the Coronado National Forest. A number of Concern Level 2 travelways in the area enter the foothills and provide more open vantage points of the Central Corridor, with segments of the Central Corridor evident in foreground, middleground, and background where it crosses the tops of ridges and foothills. As shown in Figure 3.2–4, the Central Corridor is in the foreground as it crosses Ruby Road. The Central Corridor is not visible from Peña Blanca Lake Recreation Area.

Based on Scenic Attractiveness, Concern Levels, and Distance Zones, USFS has determined Scenic Class ratings for the Coronado National Forest, as described above for the Western Corridor. The Central Corridor passes through 1.8 mi (2.9 km) of Class 1 and 13.3 mi (21.4 km) of Class 2.

Figure 3.2–5 is a map of existing Scenic Integrity within the Tumacacori EMA. The human alterations to the natural landscape along the Central Corridor within the Coronado National Forest are the linear disturbances of the EPNG pipeline ROW and access and recreational roads. The Scenic Integrity along the Central Corridor within the Tumacacori EMA is very high, except for a 1-mi (1.6-km) strip of land crossing Ruby Road where the Scenic Integrity is high. Peña Blanca Lake Recreation Area, which includes visitor facilities, and the town of Ruby west of the proposed project, both have moderate Scenic Integrity.

Outside of the Coronado National Forest. Approximately 42 mi (68 km) of the Central Corridor (out of a total of 57.1 mi [91.9 km]) is outside of the Coronado National Forest. The landscape of this portion of the Central Corridor is characterized primarily by desert grassland set in scattered foothills, as depicted in Figure 3.2–1. Upon leaving the existing South Substation and crossing I-19, the Central Corridor passes a low-density residential area and several commercial properties. There are multiple mine tailings piles that dominate the landscape in this area. This section of the Central Corridor follows existing TEP transmission lines, including a 345-kV and 138-kV BLM land, and meets up with an EPNG pipeline ROW that passes by the existing TEP Cyprus Sierrita Substation, as depicted in Figure 3.2–6 showing existing utilities.

The Central Corridor separates from the Western Corridor at approximately 3 mi (4.8 km) south of the Cyprus Sierrita Substation, continuing to follow the pipeline ROW south through primarily undeveloped land. The Central Corridor approaches to within approximately 1.0 mi (1.6 km) of I-19 near Amado, Tubac, and Tumacacori, passing adjacent to areas of low-density residential development. The Central Corridor passes within 0.25 mi (0.40 km) of several Tubac residences. The Central Corridor continues south until it enters the Coronado National Forest south of Tumacacori.

Given the human alterations to the natural landscape such as utilities, multiple very large mine tailings piles, and buildings in the northern portion of the Central Corridor, the existing Scenic Integrity of the landscape is Moderate to Low (the visual landscape appears slightly to moderately altered, and the mine tailings piles dominate some areas of the landscape). The Scenic Integrity of the BLM land is Moderate to Low, given the two existing transmission lines. Upon separating from the Western Corridor, the Scenic Integrity is Moderate as the landscape appears slightly altered due to residences, commercial establishments, and roads in the area connecting with I-19. In Sahuarita, the Central Corridor would be visible to residents, travelers, and recreationalists in the foreground and middleground distance zones, until it is hidden behind mine tailings piles. Upon separating from the Western Corridor, the Central Corridor would be intermittently visible and blocked by the elevated terrain that runs directly along the west side of I-19. The Central Corridor would be visible from a number of residences in Amado, Tubac, and Tumacacori, especially those on the west side of I-19.

Upon exiting the Coronado National Forest to the southeast, the three proposed corridors run together through a landscape of undeveloped land with natural vegetation, following the EPNG pipeline ROW. The corridors follow the eastern foothills of the Atascosa and Pajarita Mountains and into the edge of the City of Nogales and the proposed Gateway Substation. The corridors then continue south to the Mexico border through an area of industrial and limited residential development.

3.2.3 Crossover Corridor

Coronado National Forest. The Crossover Corridor crosses an estimated 29.3 mi (47.2 km) of the Coronado National Forest, part of which is within or near an existing Forest Transportation Systems and Utilities Corridor containing a buried EPNG pipeline within a 50-ft (15-m) ROW. The Crossover Corridor is the same as the Western Corridor upon entering the Coronado National Forest from the north, running along the west side of the Tumacacori Mountains. The Crossover Corridor then turns to the east, goes approximately 7 mi (11 km) through Peck Canyon, and joins the Central Corridor on the east side of the Tumacacori Mountains. The Crossover Corridor continues south along the east side of the Atascosa Mountains, then turns to the southeast, crosses Ruby Road, and intersects the Western Corridor. Upon rejoining, the three corridors continue together through a landscape of natural vegetation, following the

EPNG pipeline ROW along the eastern foothills of the Atascosa and Pajarito Mountains to the Coronado National Forest boundary.

The proposed project is set within the Sky Island Landscape Character Type, as described for the Western Corridor. Within the Tumacacori EMA, the northern portion of the Crossover Corridor west of the Tumacacori Mountains passes through desert grasslands with sparse, short, well-spaced vegetation that is gray-green to blue-green in color, set in golden brown grasses. Figure 3.2–1 shows typical desert grassland vegetation. As the Crossover Corridor approaches Peck Canyon, the project corridor includes an increasing number of oak trees (Broadleaf Woodland Evergreen vegetation type) and rocky outcrops. Within Peck Canyon there are many areas with riparian vegetation, green from seasonal water availability. The vegetation, topography, rock form, and water combine to create three categories of Scenic Attractiveness, as shown in Figure 3.2–2. This figure shows that the Crossover Corridor passes primarily through Distinctive (A) landscape (14.7 mi [23.7 km]), with 14.0 mi (22.5 km) passing through Typical or Common landscape (B), and 0.6 mi (1 km) passing through Undistinguished (C) landscape.

The degree of public importance placed on the landscape viewed from travelways and use areas is indicated by the Concern Levels defined in the SMS. Concern Level 1 roads and trails include primary travelways that receive a moderate to high amount of use by people that are likely to have high interest in the surrounding landscape. Figure 3.2–3 shows that the Concern Level 1 travelways in the vicinity of the Crossover Corridor are Ruby Road, I-19, and Arivaca Road. The Concern Level 2 areas near the Crossover Corridor shown on the map are secondary travelways and use areas that receive a moderate amount of use, such as Rock Corral Canyon Road and roads on the east side of the Atascosa Mountains. San Cayetano Elementary School at Peck Canyon and I-19 is also a Concern Level 2 area. The shadings on the map represent a broad-brush definition of foreground and middleground distance zones from the Concern Level 1 and 2 travelways. The elevated landforms that run directly along the west side of I-19 block views of the Crossover Corridor from most of I-19 on the National Forest System lands. A number of Concern Level 2 travelways in the area enter the foothills and provide more open vantage points of the Crossover Corridor south of Peck Canyon, with segments of the Crossover Corridor evident in foreground, middleground, and background where it crosses the tops of ridges and foothills. The Crossover Corridor is in the foreground as it crosses Ruby Road. The Crossover Corridor is not visible from Peña Blanca Lake Recreation Area.

Based on Scenic Attractiveness, Concern Levels, and Distance Zones, the USFS has determined Scenic Class ratings for the Coronado National Forest, as described above for the Western Corridor. As shown in Figure 3.2–4, the Crossover Corridor passes through 5.6 mi (9.0 km) of Class 1, 15.3 mi (24.6 km) of Class 2, 3.4 mi (5.5 km) of Class 3, and 5.4 mi (8.7 km) of Class 4.

Figure 3.2–5 is a map of existing Scenic Integrity within the Tumacacori EMA. The human alterations to the natural landscape along the Crossover Corridor within the Coronado National Forest are the linear disturbances of the EPNG pipeline ROW and access and recreational roads. The Scenic Integrity along the Crossover Corridor within the Tumacacori EMA is very high, except for a 1-mi (1.6-km) strip of land crossing Ruby Road where the Scenic Integrity is High. Peña Blanca Lake Recreation Area, which includes visitor facilities, and the town of Ruby west of the proposed project, both have moderate Scenic Integrity.

Outside of the Coronado National Forest. An estimated 35.9 mi (57.7 km) of the Crossover Corridor is outside of the Coronado National Forest. The Crossover Corridor outside of national forest land is identical to the Western Corridor, and thus the affected environment is identical to the Western Corridor in this overlapping segment, as described in Section 3.2.1.

3.2.4 115-kV Interconnection of the Gateway and Valencia Substations

The topographic character within and surrounding the study area can be characterized as scattered foothills with desertscrub vegetation. The visual character in the vicinity of the project area includes a mix of residential, commercial, and industrial development. Permanent modification to the viewshed in the vicinity of the project area include SR 189, I-19, an existing 115-kV transmission line, numerous overhead distribution lines, and numerous commercial and industrial land uses with highly visible signs.

3.3 BIOLOGICAL RESOURCES

This section discusses the existing biological resources in the vicinity of the proposed project alternatives on lands administered by the Forest Service (USFS) and Bureau of Land Management (BLM), Arizona State Trust Lands, and private lands. Biodiversity, vegetation communities, wildlife, species afforded protection under the *Endangered Species Act* (ESA) of 1973, as amended, migratory birds, USFS Management Indicator Species (MIS), USFS and BLM sensitive species, Wildlife of Special Concern in Arizona, Arizona Department of Agriculture listed Plants, and invasive species are addressed. The discussions of the Central and Crossover Corridors are based on investigations that included the Option 1 sub-route. Because the sub-routes are near one another and both cross Semidesert Grassland, vegetation and wildlife, biodiversity, and special status species would be the same for both options. Option 2 would be expected to have more habitat disturbance and fragmentation than Option 1, however, because of the presence of the existing gasline in the Option 2 sub-route.

3.3.1 Biodiversity

All of the proposed transmission line corridors cross a portion of an area known as the Sky Island Region, which includes portions of southern Arizona and New Mexico and northern Mexico. The term "sky island"[1] is used to describe isolated mountain ranges that are separated by grasslands or desert, which to varying degrees, are barriers to the movement of species found at higher elevations. This region is at the point of convergence of the tropical, subtropical, and temperate climatic zones. As a result, many plant and animal species' ranges overlap in this region resulting in a relatively high degree of biodiversity.

Other important local features that influence biodiversity in the region include topographic relief and geology. Precipitation increases and temperature decreases with elevation creating vertical range of habitat for various species. According to the Wildlands Project (Wildlands Project 2000), "Species with broadly similar climatic preferences or tolerances tend to sort themselves along the elevational gradient where the blend of temperature and aridity (and other factors) best supports them. This results in a stacking or layering of biotic communities varying with latitude, size, and elevation of each range."

Although numerous species in the region are considered "rare," many are at the limits of their normal range and may be more common elsewhere in the United States or Mexico. These species may or may not have been identified by the U.S. Fish and Wildlife Service (USFWS), USFS, Arizona Game and Fish Department (AGFD), or the Arizona Department of Agriculture (ADA) as requiring legal protection or requiring special management practices to prevent listing under the ESA. Plant and animal species listed for special protection or management considerations by USFWS, USFS, BLM, AGFD, and ADA are provided in Section 3.3.3, Special Status Species. Refer to Section 3.1.1 for discussion of the Chiltipene Botanical Area within the northeastern portion of the Tumacacori Ecosystem Management Area (EMA) established by USFS as an in-situ botanical reserve. It is not possible to quantitatively distinguish the levels of biodiversity in the three corridors because no studies have been completed. Therefore, a qualitative assessment has been made.

The Tumacacori EMA, as shown in Figure 3.1–1, is part of the Coronado National Forest located in southeastern Arizona and bordered to the south by Mexico. It encompasses 203,800 acres (82,475 ha) and ranges in elevation from 3,200 to 6,200 ft (975 to 1,890 m). It is an ecologically rich area with nine

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[1] The term "sky island" was coined by Weldon Heald in 1967 based on his observations of the Chiricahua Mountains (Warshall 1994).

distinctive vegetative community types, numerous deciduous and coniferous watersheds, and a variety of special interest plant and animal species.

3.3.1.1 *Western, Central, Crossover Corridors and 115-kV Itnerconnection*

Biodiversity is expected to be highest in the Crossover Corridor due to diverse terrain and vegetation, relatively few disturbances, and presence of water in portions of Peck Canyon (see Section 3.1, Figure 3.1–1). Biodiversity is expected to be high in the Western Corridor because this corridor crosses the Atascosa Mountains at a higher elevation than the Central Corridor. Biodiversity within the Central Corridor is still considered to be high due to its proximity to the Atascosa Mountains. The 115-kV interconnection between the Gateway and Valencia Substations would have the lowest biodiversity because of prior development in the area.

3.3.2 Vegetation and Wildlife

In January 2001, Harris Environmental Group completed a preliminary Biological Evaluation (BE) of the proposed corridors (HEG 2001). This preliminary BE was prepared for all three corridors and described the major vegetation communities, or biomes (Figure 3.3–1), and identified special status species (see Section 3.3.3, Special Status Species, for further discussion) that may potentially occur. Special status species were subsequently evaluated in greater detail in four Biological Assessments (HEG 2004a, 2004b, 2004c, 2004d) that are included as Appendices D, E, F, and K of this Environmental Impact Statement (EIS).

Wildlife surveys were conducted in the corridors for special status species as part of the preparation of the Biological Assessments in support of the proposed project.

According to Harris Environmental Group, all three corridors cross the following four distinct biotic communities (Figure 3.3–1) or biomes as defined by Brown (Brown 1994): (1) Sonoran Desertscrub, (2) Semidesert Grassland, (3) Madrean Evergreen Woodland, and (4) Sonoran Riparian Deciduous Forest. No wetlands were found in the proposed project corridors during field surveys conducted by Harris Environmental Group and none have been identified by USFS (USFS 2003). However, wetland vegetation may be present in portions of all corridors in small areas associated with perennial water or cattle tanks (manmade earthen dams in washes). Topography in the northern portion of the proposed corridors is relatively flat throughout the low-lying desert valleys with small rises from hills and dips from ephemeral (short-lived) washes. The elevation begins to rise in the southern portion of the proposed corridors in the Tumacacori EMA.

Arizona Upland/Sonoran Desertscrub. This biome occurs in the northern portion of all of the corridors. Vegetation typically includes saguaro (*Carnegiea gigantean*), cholla and prickly pear (*Opuntia* spp. [multiple species]) cacti, ocotillo (*Fouquieria splendens*), mesquite (*Prosopis* spp.), acacia (*Acacia* spp.) and paloverde (*Cercidium* spp.) trees. Associated shrubs within this biome include creosote bush *(Larrea tridentata)*, triangle-leaf bursage (*Ambrosia deltoidea*), and brittlebush (*Encelia farinosa*) (HEG 2004a, 20034, 2004c).

Semidesert Grassland. This biome occurs in the central portions of the corridors. This biome is typically dominated by grama grass (*Bouteloua* spp.), lovegrass (*Eragrostis* spp.), and three-awn grass (*Aristida* spp.). Codominant plant species (sharing in the controlling influence of a biotic community) include low-stature mesquite (*Prosopis* spp.) and acacia (*Acacia* spp.) trees, agave (*Agave* spp.) and yucca (*Yucca* spp.) (HEG 2004a, 2004b, 2004c).

Madrean Evergreen Woodland. This biome occurs at the upper elevations of the corridors above 3,500 ft (1,066 m) above mean sea level. Representative plants within the corridors included Mexican blue oak (*Quercus oblongifolia*) and emory oak (*Q. emoryi*) trees, side-oats grama (*Bouteloua curtipendula*) and fluff grass (*Erioneuron pulchelum*) (HEG 2004a, 2004b, 2004c).

Sonoran Riparian Deciduous Forest. This biome is located along larger washes and drainage ways such as Sopori Wash and Peck Canyon. Higher water tables in these areas typical support large stands of cottonwood (*Populus fremonti*) and willow (*Salix* spp.) trees with canopy layers greater than 50 ft (15 m) in height (HEG 2004a, 2004b, 2004c).

The area of the above vegetation types occurring in each corridor was determined using Geographic Information Systems (GIS) software (ArcInfo) to map the corridors on the Arizona Gap Analysis Vegetation Study map (1999). The length of the corridor in each biome, as calculated by ArcInfo, was multiplied by the proposed corridor width (0.25 mi [0.4 km]). The resolution of this map is adequate for analysis of areas up to approximately 98 ft (30 m). This resolution is considered sufficient for large areas such as those portions of the corridors occurring in Sonoran Desertscrub, Semidesert Grassland, and Madrean Evergreen Woodland. However, this resolution is not sufficient to adequately map small areas such as those where Sonoran Riparian Deciduous Forest occurs. Therefore, Sonoran Riparian Deciduous Forest was identified on aerial photography and the amount of this habitat present in each corridor was estimated. Harris Environmental Group confirmed these estimations by visiting areas containing Sonoran Riparian Deciduous Forest. The acreage of each vegetation type, by corridor, is provided in the following discussion.

USFS Classified Riparian. This classification system was developed by USFS and *only* applies to riparian areas administered by USFS. Riparian areas outside lands administered by USFS are discussed above. USFS has rated riparian areas as "satisfactory" or "unsatisfactory" depending on three primary factors: (1) the percent of woody plant composition present, (2) age classes, and (3) natural shrub and tree crown cover. Watersheds rated as "unsatisfactory" in the Forest Plan (USFS 1986) are given priority for watershed improvement projects.

The USFS Classified Riparian category uses vegetation classes different from those used by Harris Environmental Group. The acreage of this vegetation in each corridor was based on GIS data provided by USFS. Although "Classified Riparian" includes "Deciduous Riparian," these areas were not mapped by Harris Environmental Group; therefore, these areas were not counted more than once.

Wildlife. Wildlife surveys were conducted in the corridors only for special status species. However, diversity and densities of wildlife in all of the corridors are expected to be typical of the Sky Island region (see discussion in Section 3.3.1). Large mammals, such as mule deer, javelina, black bear, mountain lion (cougar), coyote and kit fox can be expected to occur, as well as several species of small mammals such as ground squirrel, desert cottontail, black-tailed jackrabbit, and kangaroo rat. Amphibian and reptile species expected to occur include a variety of snake, lizard, toad, and frog species. Similarly, a wide variety of birds are expected throughout all of the corridors.

Habitat Fragmentation. Habitat fragmentation of varying degrees is present within all three corridors. Habitat fragmentation is considered to be the division of large, contiguous areas of habitat into smaller patches isolated from one another. Results of studies on habitat fragmentation can be difficult to interpret because of issues of scale (patch size vs. landscape). Most studies "measure fragmentation in ways that do not distinguish between habitat loss and habitat fragmentation per se, i.e., the breaking apart of habitat after controlling for habitat loss" (Farhig 2003). Fragmentation may result from human disturbances (e.g., land development) or natural events (e.g., forest fires).

3.3.2.1 *Western Corridor*

Table 3.3–1 lists the approximate acreage of each vegetation community present in the Western Corridor.

USFS Classified Riparian. On lands administered by USFS in the Western Corridor, approximately 0.8 acres (0.3 ha) of deciduous riparian, 1.1 acres (0.4 ha) of evergreen riparian, and 0.3 acres (0.1 ha) of dry desert riparian have been mapped (Table 3.3–2). Note that the "evergreen riparian" is unique to the USFS classification system in the context of this EIS. Furthermore, this vegetation type is not found outside National Forest System lands in any of the alternatives, and therefore, not analyzed for other land administration or ownerships.

Table 3.3–1. Biotic Communities Present in the Western Corridor

Vegetation Type	Entire Corridor (acres)	Coronado National Forest (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	548	0	0	548
Semidesert Grassland	7,350	2,640	82	4,628
Madrean Evergreen Woodland	2,070	2,070	0	0
Sonoran Riparian Deciduous Forest	0.9	0.8	0	<0.1
Disturbed (agriculture, urban, or unvegetated)	634	0	0	634
USFS Classified Riparian	2	2	NA	NA
TOTAL	10,605	4,713	82	5,810

NA = not applicable.

Table 3.3–2. USFS Classified Riparian Areas in the Western Corridor

Vegetation Type	Area (acres)	Area Name	Condition[a]
Deciduous Riparian	0.2	East Fork Apache	Unsatisfactory
Deciduous Riparian	0.3	Sycamore	Satisfactory
Deciduous Riparian	0.3	Peña Blanca	Satisfactory
Evergreen Riparian	1.0	Peña Blanca	Satisfactory
Evergreen Riparian	0.1	Alamo	Unsatisfactory
Dry Desert Riparian	0.3	Alamo	Unsatisfactory

[a] Note that these ratings may be biased so that dry desert riparian vegetation types are more likely to be rated as unsatisfactory due to infrequent water flows.

3.3.2.2 *Central Corridor*

Table 3.3–3 lists the approximate acreage of each vegetation community present in the Central Corridor.

Table 3.3–3. Biotic Communities Present in the Central Corridor

Vegetation Type	Entire Corridor (acres)	Coronado National Forest (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	548	0	0	548
Semidesert Grassland	7,634	2,226	82	5,326
Madrean Evergreen Woodland	180	180	0	0
Sonoran Riparian Deciduous Forest	4.4	4.4	0	<0.1
Disturbed (agriculture, urban, or unvegetated)	748	0	0	748
USFS Classified Riparian	4	4	NA	NA
TOTAL	9,118	2,414	82	6,622

NA = not applicable.

USFS Classified Riparian. On lands administered by USFS in the Central Corridor, approximately 0.9 acres (0.4 ha) of deciduous riparian, 0.9 acres (0.4 ha) of evergreen riparian, and 2.2 acres (0.9 ha) of dry desert riparian have been mapped (Table 3.3–4).

Table 3.3–4. USFS Classified Riparian Areas in the Central Corridor

Vegetation Type	Area (acres)	Area Name	Condition
Deciduous Riparian	0.1	Rock Corral	Unsatisfactory
Deciduous Riparian	0.8	Agua Fria	Satisfactory
Evergreen Riparian	0.9	Peck	Satisfactory
Dry Desert Riparian	1.3	Negro	Not rated
Dry Desert Riparian	0.6	Tinaja	Not rated
Dry Desert Riparian	0.3	Lost Dog	Not rated

3.3.2.3 *Crossover Corridor*

Table 3.3–5 lists the approximate acreage of each vegetation community present in the Crossover Corridor.

Table 3.3–5. Biotic Communities Present in the Crossover Corridor

Vegetation Type	Entire Corridor (acres)	Coronado National Forest (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	548	0	0	548
Semidesert Grassland	8,847	4,136	82	4,629
Madrean Evergreen Woodland	572	572	0	0
Sonoran Riparian Deciduous Forest	4.4	4.4	0	<0.1
Disturbed (agriculture, urban, or unvegetated)	634	0	0	634
USFS Classified Riparian	48	48	NA	NA
TOTAL	10,653	4,760	82	5,811

NA = not applicable.

USFS Classified Riparian. On lands administered by USFS in the Crossover Corridor, approximately 1.3 acres (0.5 ha) of deciduous riparian, 13.3 acres (5.4 ha) of evergreen riparian, and 33.6 acres (13.5 ha) of dry desert riparian have been mapped (Table 3.3–6).

Table 3.3–6. USFS Classified Riparian Areas in the Crossover Corridor

Vegetation Type	Area (acres)	Area Name	Condition
Deciduous Riparian	1.3	East Fork Apache	Unsatisfactory
Evergreen Riparian	13.3	Peck	Satisfactory
Dry Desert Riparian	19.3	Negro	Not rated
Dry Desert Riparian	9.5	Tinaja	Not rated
Dry Desert Riparian	4.8	Lost Dog	Not rated

3.3.2.4 *115-kV Interconnection of the Gateway to Valencia Substations*

The vegetation character of the undeveloped portion of the study area is typical of a semi-desert grassland community. It is characterized by shrubby mesquite and desert broom. Shrub species include acacia and velvet-pod mimosa. Along marginal riparian areas, desert willow and scrubby mesquite are common. Semidesert grassland is present on the east side of I-19 along the proposed interconnection route, except for a short distance of urban development immediately west of the Valencia Substation. West of I-19, semidesert grassland is present on most of the proposed route, except for an urbanized area of warehouses and parking lots west of Mariposa Road. Vegetation in the semidesert grassland is dominated by velvet mesquite (*Prosopis velutina*), white-thorn acacia (*Acacia constricta*), catclaw acacia (*Acacia greggii*), and a variety of grass species.

Some of the mammal species that might be common in this habitat include eastern cottontail (*Sylvilagus floridanus*), rock squirrel (*Spermophilus variegates*), white-throated woodrat (*Neotoma albigula*), and coyote (*Canis latrans*). Common bird species in this area could include red-tailed hawk (*Buteo jamaicensis*), mourning dove (*Zenaida macroura*), western kingbird (*Tyrannus verticalis*), Chihuahuan raven (*Corvus cryptoleucus*), and house finch (*Carpodacus mexicanus*). Amphibians and reptiles that could occur in this habitat include red-spotted toad (*Bufo punctatus*), eastern fence lizard (*Sceloporus undulates*), side-blotched lizard (*Uta stansburiana*), western whiptail (*Cnemidophorus tigris*), gopher snake (*Pituophis melanoleucus*), and western diamondback rattlesnake (*Crotalus atrox*).

3.3.3 Special Status Species

Special status species include those species that are listed or being considered for listing as threatened or endangered by USFWS (Federal endangered, threatened, proposed, or candidate species); that are given sensitive species status by USFS or BLM; that are considered Wildlife of Special Concern in Arizona by the AGFD; or that are listed by the ADA.

Federally listed threatened and endangered species, and their designated critical habitat, are afforded protection under the ESA. Potential impacts to threatened and endangered species are evaluated for every land jurisdiction under each alternative. Impacts to species that are proposed to be listed, or are candidates for listing, are also evaluated in case they are listed during the *National Environmental Policy Act* (NEPA) process. USFS and BLM sensitive species are evaluated within their respective land jurisdiction under each alternative. Species designated as Wildlife of Special Concern in Arizona and plants listed by the ADA are not afforded special status on Federal lands. However, both USFS and BLM consider potential impacts to these species during the analysis for this EIS.

The USFS Sensitive category as reported in this document includes all federally protected and candidate species, plus species formerly included on USFWS Category 2 candidate species list (now discontinued, USFWS 1996). The USFS Sensitive status does not confer legal protection to a species; however, it does identify species that may need special management consideration to prevent population declines, which could necessitate listing under the ESA. USFS sensitive species are defined (FSM 2607.5) as “those plant and animal species identified by the Regional Forester for the Southwestern Region for which population viability is a concern, as evidenced by:

a. Significant current or predicted downward trends in population numbers or density, or

b. Significant current or predicted downward trends in habitat capability that would reduce a species’ existing distribution.”

Criteria for BLM Sensitive species include those:

a. That are under status review by the USFWS,

b. Whose numbers are declining so rapidly that Federal listing may become necessary,

c. That typically have small and widely dispersed populations, or

d. That inhabit ecological refugia (a type of sensitive and relatively unaltered habitat) or other specialized habitats.

Designation as a Wildlife of Special Concern in Arizona protects a species in the State of Arizona against take (harm or harassment) as authorized under Arizona statute ARS Title 17-309. Plants listed by the ADA are regulated under the Arizona Native Plant Law (Arizona Revised Statutes Title 3, Chapter 7).

Harris Environmental Group completed a preliminary BE for the entirety of all of the proposed corridors (HEG 2001). Subsequently, Harris Environmental Group completed final Biological Assessments for the entirety of each of the action alternatives (the Western, Central, and Crossover Corridors, contained in Appendices D, E, and F, respectively) (HEG 2004a, 2004b, 2004c), as well as the 115-kV Interconnection (Appendix K, HEG 2004d). During the preparation of the Biological Assessment, Harris Environmental Group contacted USFWS, AGFD (which queried Heritage Data Management System), USFS, and BLM to obtain updated records and information of potential habitat of special-status species for Pima and Santa Cruz Counties.

A total of 100 special status species were identified by the above-referenced agencies as potentially occurring in the corridors (HEG 2004a, 2004b, 2004c) (Table 3.3–7). The Harris Environmental Group evaluated all 27 species listed by USFWS (Table 3.3–8), 43 USFS Sensitive, 13 BLM Sensitive, 11 Wildlife Species of Concern in Arizona, and 6 Arizona Department of Agriculture species (all of which are also USFS sensitive species). All three proposed corridors cross recently designated critical habitat for the Mexican spotted owl. There are approximately 54,881 acres (22,210 ha) of designated critical habitat within the Coronado National Forest. The Western Corridor crosses a portion of the Sycamore Canyon watershed upstream of critical habitat for Sonora chub.

Table 3.3–7. Comparison of Special Status Species Potentially Occurring in Each of the Corridors

Special Status Species	**Corridor[a]**			
	Western	**Central**	**Crossover**	**115-kV Interconnection**
Federal Threatened and Endangered Species				
Plants				
Canelo Hills Ladies' Tresses	-	-	-	-
Huachuca Water Umbel	-	-	-	-
Kearney's Blue Star	-	-	-	-
Nichol's Turk's Head Cactus	-	-	-	-
Pima Pineapple Cactus	X	X	X	X
Mammals				
Jaguar	X	X	X	-
Jaguarundi	-	-	-	-
Lesser Long-nosed Bat	X	X	X	X
Mexican Gray Wolf	X	X	X	-
Sonoran Pronghorn	-	-	-	-
Ocelot	-	-	-	-

Table 3.3–7. Comparison of Special Status Species Potentially Occurring in Each of the Corridors (*continued*)

Special Status Species	Corridor[a]			
	Western	Central	Crossover	115-kV Interconnection
Federal Threatened and Endangered Species (*continued*)				
Birds				
Cactus Ferruginous Pygmy-owl	X	X	X	X
Masked Bobwhite	-	-	-	-
Northern Aplomado Falcon	-	-	-	-
Southwestern Willow Flycatcher	X	X	X	-
Bald Eagle	-	-	-	-
Brown Pelican	-	-	-	-
Yellow-billed Cuckoo[b]	X	X	X	-
Mexican Spotted Owl	X	-	X	-
Mountain Plover	-	-	-	-
Amphibians				
Sonoran Tiger Salamander	-	-	-	-
Chiricahua Leopard Frog	X	-	X	-
Fish				
Loach Minnow	-	-	-	-
Desert Pupfish	-	-	-	-
Gila Topminnow	X	X	X	-
Sonora Chub	X	X	-	-
Spikedace	-	-	-	-
Gila Chub	-	-	-	-
USFS Sensitive				
Plants				
Alamos Deer Vetch	X	X	X	-
Arid Throne Fleabane	X	X	X	-
Arizona Giant Sedge	X	X	X	-
Bartram's Stonecrop	X	X	X	-
Beardless Chinch Weed	X	X	X	-
Broad-leaf Ground Cherry	-	X	X	-
Catalina Beardtongue	X	X	X	-
Chihuahuan Sedge	X	X	X	-
Chiltepine	X	X	X	-
Chiricahua Mt. Brookweed	X	X	X	-
Foetid Passionflower	X	X	X	-
Gentry Indigo Bush	X	X	X	-
Large-Flowered Blue Star	X	X	X	-
Lumholtz Nightshade	X	X	X	-
Mock-Pennyroyal	X	X	X	-
Nodding Blue-eyed Grass	X	X	X	-
Pima Indian Mallow	-	X	X	-
Santa Cruz Beehive Cactus	X	X	X	-
Santa Cruz Star Leaf	X	X	X	-
Santa Cruz Striped Agave	X	X	X	-
Seeman Groundsel	X	X	X	-
Sonoran Noseburn	X	X	X	-
Superb Beardtongue	X	X	X	-
Supine Bean	X	X	X	-
Sweet Acacia	X	X	X	-
Three-nerved scurf-pea	-	-	X	-
Thurber Hoary Pea	X	X	X	-

Table 3.3–7. Comparison of Special Status Species Potentially Occurring in Each of the Corridors (*continued*)

Special Status Species	Corridor[a]			
	Western	Central	Crossover	115-kV Interconnection
USFS Sensitive				
Thurber's Morning-glory	X	X	X	-
Virlet Paspalum	X	X	X	-
Weeping Muhly	X	X	X	-
Wiggins Milkweed Vine	X	X	X	-
Wooly Fleabane	X	X	X	-
Mammals				
Cave Myotis	X	X	X	-
Southern Pocket Gopher	X	X	X	-
Birds				
Northern Gray Hawk	X	X	X	-
Five-Stripped Sparrow	X	X	X	-
American Peregrine Falcon	X	X	X	-
Yellow-billed Cuckoo	X	X	X	-
Amphibians				
Lowland Leopard Frog	X	X	X	-
Western Barking Frog	X	X	X	-
Reptiles				
Giant Spotted Whiptail	X	X	X	-
Mexican Garter Snake	X	X	X	-
Invertebrates				
Arizona Metalmark	X	X	X	-
BLM Sensitive				
Plants				
Balloonvine	X	X	X	-
False Grama	X	X	X	-
Tumamoc Globeberry	X	X	X	-
Mammals				
California Leaf-nosed Bat	X	X	X	-
Underwood's Mastiff Bat	X	X	X	-
Fringed Myotis	X	X	X	-
Pocketed Free-Tailed Bat	X	X	X	-
Big Free-Tailed Bat	X	X	X	-
Spotted Bat	X	X	X	-
Birds				
Western Burrowing Owl	X	X	X	-
Loggerhead Shrike	X	X	X	-
Rufous-winged sparrow	X	X	X	-
Reptiles				
Texas Horned Lizard	X	X	X	-
Wildlife of Special Concern In Arizona				
Mammals				
Mexican Long-tongued Bat	X	X	X	-
Birds				
Black-bellied Whistling Duck	X	X	X	-
Elegant Trogon	X	X	X	-
Osprey	X	X	X	-
Crested Caracara	X	X	X	-
Thick-billed Kingbird	X	X	X	-
Rose-throated Becard	X	X	X	-

Table 3.3–7. Comparison of Special Status Species Potentially Occurring in Each of the Corridors (*continued*)

Special Status Species	Corridor[a]			
	Western	Central	Crossover	115-kV Interconnection
Wildlife of Special Concern In Arizona (*continued*)				
Tropical Kingbird	X	X	X	-
Amphibians				
Great Plains narrow-mouthed Toad	X			-
Reptiles				
Desert Tortoise (Sonoran)	X			-
Mexican Vine Snake	X	X	X	-
Arizona Department of Agriculture Plants				
Bartram's Stonecrop	X	X	X	-
Gentry Indigo Bush	X	X	X	-
Santa Cruz Striped Agave	X	X	X	-
Catalina Beardtongue	X	X	X	-
Santa Cruz Beehive Cactus	X	X	X	-
Pima Indian Mallow	-	X	X	-

[a] An X in the "Corridor" denotes that a special status species may potentially occur in that corridor.
Note: "-" denotes no potential occurrence of Special Status Species.
[b]Indicates that the species is a candidate species and is not a listed special status species.
Source: HEG 2004a, 2004b, 2004c.

Table 3.3–8. Federally Listed Species Potentially Occurring in Pima and Santa Cruz Counties

Common Name	Status [a]	Corridor Species May Occur in:	Preferred Habitat
Plants			
Canelo Hills Ladies' Tresses	E	None	Occurs in finely grained, highly organic, saturated soils of Cienegas below 5,000 ft. Known range is located well outside the three corridors.
Huachuca Water Umbel	E	None	Cienegas, perennial low gradient streams, and wetlands between 3500-6500 ft
Kearney's Blue Star	E	None	Known only from west-facing drainages in the Baboquivari Mountains.
Nichol's Turk's Head Cactus	E	None	Found in unshaded microsites in Sonoran desertscrub on dissected alluvial fans at the foot of limestone mountains.
Pima Pineapple Cactus	E	All	Occurs in alluvial basins or on hillsides in Semidesert Grassland in a wide range of soils on land with less than 10-15% slope.
Mammals			
Jaguar	E	All	Typically occurs in large canyon bottoms where surface water occurs and is also found in Sonoran Desertscrub up through subalpine conifer forest.
Jaguarundi	E	None	Occurs in humid tropical and sub-tropical forests, savannahs, and semi-arid thornscrub.

Table 3.3–8. Federally Listed Species Potentially Occurring in Pima and Santa Cruz Counties (*continued*)

Common Name	Status [a]	Corridor Species May Occur in:	Preferred Habitat
Lesser Long-nosed Bat	E	All	Desertscrub habitat with agave and columnar cacti present as food plants; day roosts in caves and abandoned tunnels.
Mexican Gray Wolf	E	None (however, potentially suitable habitat is present in all three corridors)	Historically occurred in chaparral, woodland, and forested areas. Only known population is an “experimental nonessential population” introduced in the Blue Primitive Area in eastern Arizona.
Ocelot	E	None	Occurs in humid tropical and sub-tropical forests, savannahs, and semi-arid thornscrub.
Sonoran Pronghorn	E	None	Found in broad intermountain alluvial valleys with creosote-bursage and palo verde-mixed cacti associations. Known range is located well outside the three corridors.
Birds			
Cactus Ferruginous Pygmy-owl	E	All	Mature cottonwood/willow, mesquite bosque, and Sonoran Desertscrub.
Masked Bobwhite	E	None	Desert grasslands with diversity of dense native grasses, forbs, and brush. Presently only known from reintroduced populations on Buenos Aires National Wildlife Refuge. Known range is located well outside the three corridors.
Northern Aplomado Falcon	E	None	Occurs in grassland and savannah. Known range is located well outside the three corridors.
Southwestern Willow Flycatcher	E	All	Occurs and nests in dense riparian habitats along streams where cottonwood, willow, boxelder, tamarisk are present.
Bald Eagle	T	None	Large trees or cliffs near water (reservoirs, rivers, and streams) with abundant prey.
Brown Pelican	T	None	Coastal land and islands; species found around many Arizona lakes and rivers
Mexican Spotted Owl	T	Western Crossover	Occurs in mature forest and woodland, shady wooded canyons and steep canyons.
Mountain Plover	P	None	Sporadically occurs in open arid plains, short-grass prairies, and cultivated farms.
Yellow-billed Cuckoo	C	All	Occurs in riparian areas dominated by tall cottonwood and willow trees.
Fish			
Desert Pupfish	E	None	Occurs below 5,000 ft. in shallow springs, small streams, and marshes. Tolerates saline and warm water. Known range is located well outside the three corridors.
Gila Chub	E	None	Small streams and cienegas; Prefer deeper pods with cover.
Gila Topminnow	E	All	In Arizona, most of the remaining populations occur in the Santa Cruz River system.

Table 3.3–8. Federally Listed Species Potentially Occurring in Pima and Santa Cruz Counties (*continued*)

Common Name	Status [a]	Corridor Species May Occur in:	Preferred Habitat
Loach Minnow	T	None	A benthic species of small to large perennial streams with swift shallow water over cobble and gravel.
Sonora Chub	T	Western	Occurs in perennial and intermittent small to moderate streams with boulders and cliffs.
Spikedace	T	None	Occurs in moderate to large perennial streams with gravel cobble substrates and moderate to swift velocities over sand and gravel substrates.
Amphibians			
Sonoran Tiger Salamander	E	None	Lives in moist or damp areas such as rodent burrows and rotting logs. Breeds in stock tanks. Known range is located well outside the three corridors.
Chiricahua Leopard Frog	T	Western Crossover	Typically occurs in a wide variety of water sources in deserts, grasslands, chaparral, and oak woodlands.

[a] USFWS Endangered (E), Threatened (T), Proposed (P), Candidate (C).
Source: HEG 2004a, 2004b, 2004c.

Detailed evaluations of threatened and endangered species are provided in the Biological Assessments in Appendices D, E, and F.

3.3.3.1 *Western Corridor*

ESA Listed Species

Relative to the Western Corridor, either: (1) these species are known to occur, (2) these species have the potential to occur, (3) suitable habitat exists, or (4) these species could be indirectly impacted. Below is the status, a description and distribution of the species, relative to the Western Corridor.

Cactus Ferruginous Pygmy-owl (*Glaucidium brasilianum cactorum*)-Endangered. Habitat for cactus ferruginous pygmy-owl, as defined by the USFWS, is present throughout the majority of the Western Corridor. However, no cactus ferruginous pygmy-owls are known to occur in the Western Corridor and none were detected during surveys by biologists at 142 call points in 2001 and 140 call points in 2002 (HEG 2004a). Historically cactus ferruginous pygmy-owls have been known to occur in Sycamore Canyon on the Nogales Ranger District of the Coronado National Forest (HEG 2004a), but USFS surveys in 1997 and 1998 failed to detect any individuals. In 1999 USFS biologists conducted 58 cactus ferruginous pygmy-owl habitat assessments in the Tumacacori EMA and identified four areas west and southwest of all of the corridors that warranted cactus ferruginous pygmy-owl surveys. As a result, approximately 2,300 acres (931 ha) were surveyed. No cactus ferruginous pygmy-owls were detected in these four areas (HEG 2004a).

Chiricahua Leopard Frog (*Rana chiricahuensis*)-Threatened. Chiricahua leopard frogs are known to presently occur at four locations within the Tumacocori EMA and there are 17 historical records in the Pajarito and Atascosa Mountains (HEG 2004a). None of these populations are located in the Western Corridor. No surveys for Chiricahua leopard frog have been completed in the Western Corridor.

Gila Topminnow (*Poeciliopsis occidentalis occidentalis*)- Endangered. Gila topminnows are currently known from 14 natural locations in Arizona. Historically, this species occurred in the Santa Cruz River and other major drainages throughout Arizona and Mexico. The nearest known present-day population is approximately 12 mi (19 km) northeast of Nogales, Arizona (approximately 12 mi [19 km] east of any of the corridors). No Gila topminnow occur in the Tumacacori EMA (HEG 2004a), or any other portion of the Western Corridor, and there are no plans for introductions in any locations.

Jaguar (*Panthera onca*)- Endangered. Jaguars have been documented within 2 mi (3.2 km) of the Western Corridor. It is likely that resident breeding populations occurred in the southwestern United States into the 20th century; however, there are presently no known breeding populations of jaguar in the United States. There have been numerous confirmed and unconfirmed sightings during the 1980s and 1990s of individuals along the Arizona-Mexico border. The most recent sightings of jaguar occurred in the Tumacacori EMA and this area is the most likely to provide habitat and support the future existence of this species in the United States (HEG 2002a). It is unknown how many, if any, jaguar occur in the southwestern United States year round. Jaguars typically inhabit large canyon bottom habitats with surface water but occur in a wide variety of habitats.

Lesser Long-nosed Bat (*Leptonycteris curasoae yerbabuenae*) - Endangered. No lesser long-nosed bat roosts are known to exist in the Western Corridor. However, numerous caves, crevices, and abandoned mines, which may be suitable lesser long-nosed bat roosts, are present in the Tumacocori-Atascosa Mountains (HEG 2004a). The Corridor is within foraging distance of two known roost sites in southern Arizona and food plants (agave and saguaro) are present throughout portions of the Western Corridor.

Mexican Gray Wolf (*Canis lupus baileyi*)- Endangered. Mexican gray wolves are believed to have been extirpated (killed off completely) from Arizona by 1960 and from Mexico by 1980 by intensive predator control programs (Hoffmeister 1986). Historically, this species inhabited most non-desert areas above 4,000 ft (1,220 m) in oak, pine/juniper savannahs, and mixed conifer woodlands (USFWS 1998). Mexican gray wolf may have historically occurred in portions of the Western Corridor.

Mexican Spotted Owl (*Strix occidentalis lucida*) - Threatened. There are five Protected Activity Centers in the Tumacacori EMA (HEG 2004a). Although the Western Corridor does not cross any Protected Activity Centers, it is within 1 mi (1.6 km) of two different Protected Activity Centers south of Ruby Road. Much of the remaining Western Corridor lacks habitat for Mexican spotted owl.

On August 31, 2004, the USFWS designated critical habitat under the Endangered Species Act of 1973, as amended, for the Mexican spotted owl (69 FR 51382). The owl inhabits canyon and forest habitats across a range that extends from southern Utah and Colorado, through Arizona, New Mexico, and west Texas, to the mountains of central Mexico. The USFWS designated approximately 8.6 million acres (3.5 million hectares) of critical habitat in Arizona, Colorado, New Mexico, and Utah, on Federal lands. One of the critical habitat areas designated by the USFWS for the Mexican spotted owl is located in the Coronado National Forest, west of Nogales. With respect to the proposed action in this EIS, the proposed Western Corridor crosses the recently designated critical habitat for the Mexican spotted owl. Figure 3.3-2 shows the critical habitat designation with respect to the Western Corridor. Under Section 7 of the ESA, Federal agencies are required to ensure that actions they authorize, fund, or carry out are not likely to destroy or adversely modify designated critical habitat (see Appendices D, E, and F).

Pima Pineapple Cactus (*Coryphantha scheeri* var.*robustispina*)- Endangered. Pima pineapple cacti occur in patches throughout most of the northern portion of the Western Corridor. A total of 70 Pima pineapple cacti were located during surveys conducted from July 17, 2002, through March 31, 2003 (HEG 2004a). Within the Western Corridor, Pima pineapple cacti were located only between the boundary of the Coronado National Forest and the South Substation. Of the 70 Pima pineapple cacti found in the Western Corridor, three were found on the BLM land (two were within the proposed 125-ft [38.1-m] right-of-way [ROW]).

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)- Endangered. Southwestern willow flycatchers are not known to occur in the Western Corridor. However, Harris Environmental Group (2004a) identified potential habitat (that is, broad-leaved deciduous riparian habitat) where the Western Corridor crosses Sopori Wash. Individuals could use this area during migration but not for breeding.

Sonora Chub (*Gila ditaenia*)- Threatened. No Sonora chubs are known to occur within the Western Corridor. However, populations are known to occur in several streams and springs within the Tumacacori EMA, and critical habitat has been designated approximately 1 mi (1.6 km) downstream of the Western Corridor. Sonora chub populations fluctuate widely in response to wet/dry periods. This species expands from pools into runs and riffles as they become available during rainy seasons.

USFS Sensitive Species

Forty USFS sensitive species were identified as potentially occurring in the Western Corridor (HEG 2004a) (see Table 3.3-9). A description of these species and habitat requirements can be found in the Biological Assessment for the Western Corridor, Appendix D.

Table 3.3-9. USFS Sensitive Species Potentially Occurring in the Western Corridor

Plants		
Alamos Deer Vetch	Gentry Indigo Bush	Supine Bean
Arid Throne Fleabane	Large-Flowered Blue Star	Superb Beardtongue
Arizona Giant Sedge	Lumholtz Nightshade	Sweet Acacia
Bartram's Stonecrop	Mock-Pennyroyal	Thurber Hoary Pea
Beardless Chinch Weed	Nodding Blue-eyed Grass	Thurber's Morning-glory
Catalina Beardtongue	Santa Cruz Beehive Cactus	Virlet Paspalum
Chihuahuan Sedge	Santa Cruz Star Leaf	Weeping Muhly
Chiltepene	Santa Cruz Striped Agave	Wiggins Milkweed Vine
Chiricahua Mt. Brookweed	Seeman Groundsel	Wooly Fleabane
Foetid Passionflower	Sonoran Noseburn	
Mammals		
Cave Myotis	Southern Pocket Gopher	
Birds		
American Peregrine Falcon	Northern Gray Hawk	Yellow-billed Cuckoo
Five-Stripped Sparrow		
Reptiles/Amphibians		
Giant Spotted Whiptail	Lowland Leopard Frog	Mexican Garter Snake
Western Barking Frog		
Invertebrates		
Arizona Metalmark		

BLM Sensitive Species

Thirteen BLM sensitive species were identified as potentially occurring in the Western Corridor (HEG 2004a) (see Table 3.3-10). A description of these species and habitat requirements can be found in the Biological Assessment for the Western Corridor, Appendix D.

Table 3.3-10. BLM Sensitive Species Potentially Occurring in the Western Corridor

Plants		
Balloonvine	False Grama	Tumamoc Globeberry
Mammals		
Big Free-Tailed Bat	Californian leaf-nosed Bat	Fringed Myotis
Pocketed Free-Tailed Bat	Spotted Bat	Underwood's Mastiff Bat
Birds		
Rufous-winged sparrow	Loggerhead Shrike	Western Burrowing Owl
Reptiles		
Texas Horned Lizard		

Wildlife of Special Concern In Arizona

Eleven AGFD Wildlife of Special Concern in Arizona were identified as potentially occurring in the Western Corridor (HEG 2004a) (see Table 3.3-11). A description of these species and habitat requirements can be found in the Biological Assessment for the Western Corridor, Appendix D.

Table 3.3-11. AGFD Wildlife of Special Concern in Arizona Potentially Occurring in Western Corridor

Mammals		
Mexican Long-tongued Bat		
Birds		
Black-bellied Whistling Duck	Crested Caracara	Elegant Trogon
Osprey	Thick-billed Kingbird	Tropical Kingbird
Rose-throated Becard Great Plains		
Reptiles/Amphibians		
Desert Tortoise (Sonoran)	Mexican Vine Snake	Narrow-mouthed Toad

Arizona Department of Agriculture Plants

Five plants afforded protection under the Arizona Native Plant Law were identified as potentially occurring in the Western Corridor (see Table 3.3-12). Plants that are classified as "Salvage Restricted" are plants that have a high potential for theft or vandalism of the whole plant. Collection, salvage, or harvesting requires a permit from the ADA. Plants that are classified as "Highly Safeguarded" are those species of native plants and parts of plants, including the seeds and fruit, whose prospects for survival in Arizona are in jeopardy or which are in danger of extinction.

Table 3.3-12. Plants Protected by Arizona Native Plant Law that are Potentially Occurring in the Western Corridor

Common Name	Status
Bartram's Stonecrop	Salvage Restricted
Catalina Beardtongue	Highly Safeguarded
Gentry Indigo Bush	Highly Safeguarded
Santa Cruz Beehive Cactus	Highly Safeguarded
Santa Cruz Striped Agave	Highly Safeguarded

3.3.3.2 *Central Corridor*

ESA Listed Species

According to the Harris Environmental Group (2004b), seven federally listed species could potentially be impacted under this alternative. These species include: cactus ferruginous pygmy-owl, Pima pineapple cactus, southwestern willow flycatcher, lesser long-nosed bat, jaguar, Gila topminnow, and Mexican gray wolf. With the exception of Pima pineapple cactus, descriptions of these species, their status, and distribution are provided above. The distribution of Pima pineapple cactus within the Central Corridor is provided below.

Mexican Spotted Owl (*Strix occidentalis lucida*) -Threatened. The proposed Central Corridor crosses approximately 2 mi (3 km) of the federally designated critical habitat for the Mexican spotted owl. Figure 3.3-3 shows the critical habitat designation with respect to the Central Corridor.

Pima Pineapple Cactus (*Coryphantha scheeri* var.*robustispina*) -Endangered. Pima pineapple cacti occur in patches throughout most of the Central Corridor. A total of 78 Pima pineapple cacti were located during surveys conducted from July 17, 2002 through March 31, 2003 (HEG 2004a). Within the Central Corridor, Pima pineapple cacti were only found between the Coronado National Forest boundary and the South Substation. Of the 78 Pima pineapple cacti found in the Central Corridor, three were found on the BLM land (two were within the proposed 125-ft [38.1 m] ROW).

USFS Sensitive Species

Forty-two USFS sensitive species were identified as potentially occurring in, or within 3 mi (4.8 km) of the Central Corridor (HEG 2004b). In addition to those species listed above under Section 3.3.3.1, Pima Indian mallow (*abutilon parishii*)and broad-leaf ground cherry (*physalis latiphysa*) potentially occur in the Central Corridor. A description of these species and habitat requirements can be found in the Biological Assessment for the Central Corridor, Appendix E.

BLM Sensitive Species

BLM sensitive species are identical to those addressed in Section 3.3.3.1 (HEG 2004b).

Wildlife of Special Concern In Arizona

Wildlife of Special Concern in Arizona species are identical to those addressed in Section 3.3.3.1 (HEG 2004b).

Arizona Department of Agriculture Plants

In addition to the five ADA plants listed under Section 3.3.3.1, Pima Indian mallow may occur in the Central Corridor. Pima Indian mallow is considered “Salvage Restricted” under the Arizona Native Plant Law (HEG 2004b).

3.3.3.3 *Crossover Corridor*

ESA Listed Species

According to the Harris Environmental Group (2004c), nine federally listed and one candidate species could potentially be impacted under this alternative. The listed species include: Pima pineapple cactus, cactus ferruginous pygmy-owl, Mexican spotted owl, southwestern willow flycatcher, lesser long-nosed bat, jaguar, Gila topminnow, Chiricahua leopard frog, and Mexican gray wolf. The candidate species is the yellow-billed cuckoo. With the exception of Mexican spotted owl, the descriptions of these species, their status, and distribution are provided above under Section 3.3.3.1. The survey results for Pima pineapple cactus are identical to those under Section 3.3.3.1 because all of the individuals found were located within the portion of the Crossover Corridor shared with the Western Corridor.

Mexican Spotted Owl (*Strix occidentalis lucida*) -Threatened. There is one Protected Activity Center within 0.6 mi (0.9 km) of the Crossover Corridor near Peck Canyon (HEG 2004c). The Crossover Corridor crosses approximately 2 mi (3 km) of the recently designated critical habitat for the Mexican spotted owl. Figure 3.3-4 shows the critical habitat designation in relation to the Central Corridor.

USFS Sensitive Species

Forty-three USFS sensitive species were identified as potentially occurring in, or within 3 mi (4.8 km) of the Crossover Corridor (HEG 2004c). In addition to those species listed above under Section 3.3.3.2, three-nerved scurf-pea (*pediomelum pentaphyllum)* potentially occurs in the Crossover Corridor. A description of these species and habitat requirements can be found in the Biological Assessment for the Crossover Corridor, Appendix F.

BLM Sensitive Species

BLM sensitive species are identical to those addressed in Section 3.3.3.1 (HEG 2004c).

Wildlife of Special Concern In Arizona

Wildlife of Special Concern in Arizona species potentially occurring in the Crossover Corridor are identical to those addressed above in Section 3.3.3.1 (HEG 2004c).

Arizona Department of Agriculture Plants

The six ADA plants listed under Section 3.3.3.2 may also occur in the Crossover Corridor (HEG 2004c).

3.3.3.4 *115-kV Gateway and Valencia Substations Interconnection*

ESA Listed Species

Three threatened, or endangered species may potentially occur on or near the proposed interconnection. Descriptions of these species, their status and distribution are provided below.

Lesser long-nosed bat *(Leponycteris curasoae yerbabuenae)*. The lesser long-nosed bat uses caves and mines as roost sites. No potential roost sites were observed in the vicinity of the proposed interconnection area. However, a few agaves plants in the vicinity may provide some foraging habitat for this species.

Cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*). Suitable habitat for this federally listed, endangered species include riparian vegetation, Sonoran desertscrub, and semidesert grassland with drainages containing mesquite, hackberry, cottonwood, willow, and ash. The proposed transmission line crosses areas of semidesert grassland with mesquite, cottonwood, oak, and willow near ephemeral stream channels, and the entire corridor is below 4,000 feet.

Pima pineapple cactus (*Coryphantha scheeri robustispina)*. This species occurs in alluvial valleys or hillsides in desert, grasslands, or woodlands, between 2,300 and 5,000 feet in elevation. Suitable habitat for this species is present in the semidesert grassland along the proposed interconnection route. Surveys for these cacti should be conducted after the final route has been determined and before construction activities have begun.

3.3.4 Migratory Birds and Raptors

The *Migratory Bird Treaty Act* of 1918 (MBTA) governs the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests. The take of all migratory birds is governed by MBTA's regulation of taking migratory birds for educational, scientific, and recreational purposes and requiring harvest to be limited to levels that prevent over-utilization. Section 704 of MBTA states that the Secretary of the U.S. Department of Interior is authorized and directed to determine if, and by what means, the take of migratory birds should be allowed and to adopt suitable regulations permitting and governing take. The Secretary in adopting regulations is to consider such factors as distribution and abundance to ensure that take is compatible with the protection of the species (SWCA 2002a). Raptors are birds of prey including various types of hawks, falcons, eagles, vultures, and owls. Most raptors occurring in the study area are covered under MBTA.

Potential impacts of the proposed project on birds protected under the MBTA (migratory birds) were evaluated for all of the action alternatives (SWCA 2002a). This evaluation included a review of the migratory birds potentially occurring within the entire length of all of the corridors by habitat type preference.

There are no designated Important Bird Areas (IBA) within the proposed corridors. IBAs are sites designated by the Audubon Society that provide essential habitat for one or more species of bird. IBAs include sites for breeding, wintering, and/or migrating birds (Audubon 2001). IBAs may be a few acres or thousands of acres, but usually they are discrete sites that stand out from the surrounding landscape. IBAs may include public or private lands, or both, and they may be protected or unprotected. This is not a regulatory program.

The nearest IBAs are Sycamore Canyon, Arivaca Cienega/Arivaca Creek, and the Santa Rita Mountains. There is alos the proposed Tumacacori Highlands IBA that may include portions of one or more of the proposed corridors. The Santa Cruz River Valley retains many of the characteristics of the San Pedro

River, especially in reaches of the Santa Cruz River that currently receive treated sewage effluent (approximately 2 mi [3.2 km] east of the Central Corridor). For this reason, this feature may serve migratory birds in a similar manner to the San Pedro River.

Other features that are important to migratory birds include stock tanks, springs, and cliffs. Field surveys prior to the final design of the selected route could allow avoidance of these features.

3.3.4.1 *Western, Central, Crossover Corridors, and 115-kV Interconnection*

Table 3.3–13 lists migratory birds expected to occur regularly in the Western, Central, and Crossover Corridors. It is possible that any migratory bird listed under the MBTA could occur in these corridors, as well as the 115-kV interconnection, because of the high degree of mobility of birds.

Table 3.3–13. Bird Species Listed under the Migratory Bird Treaty Act that Are Likely to Occur in the Western, Central, and Crossover Corridors by Vegetation Type. [a]

Vegetation Type	Species
Sonoran Desertscrub	Harris' hawk, elf owl, Gila woodpecker, verdin, cactus wren, curve-billed thrasher, black-throated sparrow great-horned owl, red-tailed hawk, phainopepla, Lucy's warbler, and black-tailed gnatcatcher
Semidesert Grassland	Swainson's hawk, prairie falcon, loggerhead shrike, grasshopper sparrow, Savannah sparrow, lark bunting, and western kingbird
Madrean Evergreen Woodland	Arizona woodpecker, Mexican jay, bridled titmouse, Hutton's vireo, and black-throated gray warbler
Sonoran Riparian Deciduous Forest	yellow-billed cuckoo; violet-crowned, Lucifer, broad-billed, and blue-throated hummingbirds; zone-tailed, gray hawk, and black hawks; Mississippi kite; sulphur-bellied flycatcher; cliff swallow; yellow warbler; Bullock's oriole; summer tanager; rose-throated becard; and elegant trogon

[a] This list is not comprehensive, but is provided to indicate the diversity of birds potentially occurring in the corridors.

3.3.5 Coronado National Forest Management Indicator Species

All of the proposed transmission line corridors cross a portion of the Sky Island Region, which includes portions of southern Arizona, New Mexico, and northern Mexico. The term "Sky Islands" is used to describe isolated mountain ranges that are separated by grasslands or desert, which to varying degrees, are barriers to the movement of species that inhabit higher elevations. This region is located where the tropical, subtropical, and temperate climatic zones all converge. The resulting biological communities that inhabit the region include numerous plant and animal species that overlap at the edge of their ranges; thus these assemblages are relatively diverse in terms of the number and types of species present in specialized ecosystems within close proximity of each other.

Other locally important features include the unique topographic relief and geology of the region. Precipitation increases and temperature decreases with rising elevation creating a vertical range of habitat for various species. The proposed project area intercepts Forest Service lands that include the Tumacacori, Atascosa, and Pajarito Mountains. Elevations range from approximately 4,500 to 6,400 ft (1,372 to 1,951 m) above mean sea level. Major drainages in the subject portions of the Forest include Murphy Canyon, Peck Canyon, Sycamore Canyon, and Walker Canyon. Forest System Land types that fall within the proposed study corridors include Semidesert grassland, Madrean Evergreen Woodland, and Sonoran Desertscrub. Although numerous species in the region are considered "rare", many are at the limits of their normal range and may be more common elsewhere in the United States or Mexico. This is true of several of the Management Indicator Species (MIS) in the project area.

Management Indicator Species Identification

Of the 33 total MIS on the Forest, 11 species and one group (cavity nesters) were selected for analysis as management indicators at the project level based on their known occurrence within or near the project area or presence of suitable habitats (Table 3.3-14). The remaining species were eliminated from consideration in this analysis because their known distributions are well outside of the project area or the project area does not contain suitable habitats for those species (USFS 2004d).

Table 3.3-14. Management Indicator Species (MIS) occurring on the Coronado National Forest and reasons for selecting project-level MIS.

Species	Evaluation for Analysis
Coues White-tailed deer	Occurs within analysis area; widespread suitable habitat.
Black bear	Occurs within analysis area; suitable habitat available
Elegant trogon	Occurs near analysis area; uncommon summer resident in riparian canyons in Atascosa and Pajarito Mountains.
Northern Gray hawk	Documented in the project area; limited suitable habitat.
Bell's vireo	Documented at Tumacacori Monitoring Avian Productivity and Survivorship (MAPS) station 1997-2001 (Turner 2002). No suitable habitat in analysis area.
Montezuma quail	Occurs within analysis area; suitable habitat available
Peregrine falcon	Known eyrie in analysis area.
Primary and secondary cavity nesters	Occur within analysis area; suitable habitat available
Western barking frog	Status in the project area unknown; limited suitable habitat. A single 1965 record from Pajarito Mts.
Gila topminnow	Does not occur within analysis area; proposed reintroduction site in Peck Canyon.
Gila chub	Does not occur within analysis area; proposed reintroduction site in Peck Canyon.
Sonora chub	Does not occur within analysis area; occupied habitats downstream in Sycamore Canyon.

Primary and Secondary Cavity Nesters

Population status. Primary cavity nesters are those species that excavate and nest in cavities, whereas secondary cavity nesters use cavities excavated by primary cavity nesters. Six primary cavity nesters and twenty-six secondary cavity nesters have potential to occur in the study area. On the Forest, cavity nesters occur primarily within forested areas including riparian habitats, Madrean evergreen woodlands, coniferous forests, and in Sonoran desert habitats that contain saguaro cactus (*Carniegia gigantea*). Within the greater Tumacacori Ecosystem Management Area (EMA) Woodland, coniferous forest and riparian vegetation types comprise approximately 117,800 acres (47,672 ha) of suitable habitat for cavity nesters. Although the species in this group specifically nest in cavities, some of them make use of many other habitats in completing their life cycles (USFS 2004d).

3.3.6 Invasive Species

Under Executive Order (EO) 13112, Invasive Species (February 3, 1999), projects which occur on Federal lands or are federally funded must: "subject to the availability of appropriations, and within Administration budgetary limits, use relevant programs and authorities to: (1) prevent the introduction of invasive species; (2) detect and respond rapidly to, and control, populations of such species in a cost-effective and environmentally sound manner; (3) monitor invasive species populations accurately and reliably; and (4) provide for restoration of native species and habitat conditions in ecosystems that have been invaded." Invasive species are most likely to occur in areas that have existing disturbances to soil. None of the proposed corridors have been specifically surveyed for the presence of invasive species and no standard management practices have been implemented at this time. However, the Coronado National Forest has completed the Environmental Assessment (EA) for the Invasive Exotic Plant Management Program (Coronado National Forest 2004) for all lands under their administration. The Decision Notice and Finding of No Significant Impact (FONSI) was signed on September 8, 2004 (USFS 2004c).

3.3.6.1 *Western, Central, and Crossover Corridors*

Given the vast expanse of land in all of the Corridors, it is likely that some invasive species listed in *EO 13112* occur. In the EA completed by the Coronado National Forest, three invasive species have been identified on lands administered by USFS: tree of heaven (*Ailanthus altissima)*, salt cedar (*Tamarix L*.), and Lehman lovegrass (*Eragrotis lehmanniana)* (Coronado National Forest 2004). However, it is possible that other invasive species are present on, and adjacent to, the Coronado National Forest. No noxious weeds listed under *EO 13112* are known to occur on lands administered by BLM. However, BLM has identified that buffelgrass (*Cenchrus ciliaris)* is considered as a noxious weed and is located on BLM-administered lands.

3.4 CULTURAL RESOURCES

This section discusses the cultural resources in the vicinity of the proposed Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line project. The discussion is divided into Section 3.4.1, Archaeological and Historical Sites, and Section 3.4.2, Native American Concerns and traditional cultural properties.

Federal agency responsibilities with regard to cultural resources are addressed by a number of laws, implementing regulations, Executive Orders (EOs), programmatic agreements, and other requirements, including the *National Historic Preservation Act* of 1966 (NHPA), *Native American Graves and Repatriation Act* (NAGPRA), *American Indian Religious Freedom Act* (AIRFA), EO 13007 "Native American Religious Practices," and EO 13175 "Consultation and Coordination With Indian Tribal Governments." This protection extends to sites on private land potentially affected by actions requiring Federal approval. The principal Federal law addressing cultural resources is the NHPA, as amended (16 USC 470), with its implementing regulations (36 CFR Part 800). NHPA describes the process for identifying and evaluating historic properties; assessing the effects of Federal actions on historic properties; and consulting to avoid, reduce, or minimize adverse effects. The term "historic properties" refers to cultural resources that meet specific criteria for eligibility for listing on the National Register of Historic Places (NRHP). Section 106 of the NHPA requires that Federal agency decisions affecting these places consider cultural and historic values and the options available to protect these properties. Section 106 also requires consultation with Indian tribes whose traditional lands may be affected by "undertakings," and EO 13175 delineates the Government-to-Government Relationship between Native American Tribal Governments and Federal agencies through which these consultations must occur. NAGPRA was enacted in 1990 to protect Native American burials, associated funerary objects, and objects of cultural patrimony encountered on Federal land. The AIRFA and EO 13007 both pertain to Native American sacred sites. EO 13007 states that Federal agencies must "to the extent practicable and not clearly inconsistent with essential agency functions, accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites."

The U.S. Department of Energy (DOE), as the lead Federal agency, is responsible for identifying, evaluating, and assessing effects of construction and operation of the TEP Sahuarita-Nogales Transmission Line proposed project on cultural resources, in concurrence with the State Historic Preservation Officer (SHPO) and other consulting parties. The exact locations of cultural resources (including historical sites, archaeological sites, and traditional cultural properties) are not disclosed in an effort to help preserve the integrity of the sites. The descriptions below focus on known densities of sites within the corridors. Throughout this discussion, all federally recognized American Indian political entities consulted in this project are collectively termed the "tribes," even though many are Nations or Communities. DOE and the cooperating agencies recognize that each tribe is an individual, sovereign nation with a unique trust relationship to the U.S. Government.

3.4.1 Archaeological and Historical Sites

DOE and Arizona State Museum personnel conducted record searches at the Arizona State Museum using Arizona Online Database of Archaeological Projects and Sites (AZSITE) in order to determine the number and type of previously documented archaeological and historical sites within the 0.25-mi (0.40-km) study corridor for each alternative. The Forest Service (USFS) provided information on known sites within the study corridors on the Coronado National Forest. DOE determined the degree to which each of the corridors had been previously surveyed for archaeological and historical sites by using AZSITE and data provided by USFS. Three 20th century sites are known to be crossed by all three of the proposed corridors: the historic alignment of Ruby Road (see Figure 3.1–1), the Potrero erosion control features constructed by the Civilian Conservation Corps (approximately 1.25 mi [2 km] northwest of Nogales), and a water conveyance feature known as the Ruby Pipeline that runs west from the Santa Cruz River through Peck Canyon to the town of Ruby. These three sites are included below in discussions of the total sites documented within the individual proposed corridors. The Atascosa Lookout Tower, an historic property northeast of the Western Corridor in the Atascosa Mountains, is outside the right-of-way (ROW) of the three proposed corridors. Additional sites that have been documented but have yet to be registered with the Arizona State Museum, USFS, or SHPO may also be located within each of the proposed corridors.

3.4.1.1 *Western Corridor*

The Western Corridor would involve the construction of a new transmission line that runs from the South Substation, located on the west bank of the Santa Cruz River in Sahuarita, across the eastern descent of the Sierrita Mountains, eventually passing through the Tumacacori and Atascosa Mountains to the U.S.-Mexico border west of Nogales, Arizona (all locations noted on Figure 1.1–4, unless otherwise noted below).

Twenty-two previously identified archaeological and historical sites have been documented within this corridor, including six sites on the Coronado National Forest. Archaeological terms and site types are defined in the text box that follows. Recorded Native American sites include five artifact scatters, two artifact scatters with rock features, one site with potential habitation features, three rock shelters with artifact scatters, one bedrock mortar site, and one pictograph site. Historical sites include two habitation sites, the historic alignment of Ruby Road, Peña Blanca Civilian Conservation Corps Camp F-64-A, a set of erosion control features constructed by the Civilian Conservation Corps, and a water conveyance feature known as the Ruby Pipeline. Additional sites include a multicomponent site containing a prehistoric artifact scatter and a historical ranch, a site consisting of two rock walls of unknown age, and an isolated check dam of unknown age. None of these sites are currently listed in the NRHP; however, all should be considered potentially eligible for listing until further work is done to evaluate their eligibility.

Site density varies directly with the intensity of survey, with greater number of sites located in the areas more intensively surveyed. Fourteen of the 22 known sites are located on the descent of the Sierrita Mountains west of Sahuarita and Green Valley, 2 are located near the intersection of the Western Corridor and Sopori Wash (see Figure 3.7–1), and the remaining 6 are located in the mountainous areas of the Tumacacori and Atascosa Mountains on the Coronado National Forest. Data collected from AZSITE and USFS indicate that less than 15 percent of the Western Corridor has been previously surveyed for cultural resources. The area around Sahuarita and a portion of the eastern descent of the Sierrita Mountains represent the majority of previously surveyed land. Because only a small percentage of the Western Corridor has been previously surveyed for cultural resources, it is extremely likely that additional prehistoric and historic sites exist within it. Based upon the varied terrain of the Western Corridor, a wide range of archaeological site types are expected. Prehistoric and historic habitation sites are commonly located along river and wash corridors, whereas the mountainous segment may contain Native American rock art sites and shrines, as well as Historic Period ranching and mining-related sites. Intermontane valleys (valleys between mountains) are expected to contain a wide variety of prehistoric and historic sites.

Archaeological Terms and Site Types

Artifact Scatter	Archaeological site resulting from often undetermined past activity, represented only by artifacts on the present ground surface; often, there is little or no depth to the site deposits. These may represent the only visible remains of a long-term habitation site, or, in contrast, a limited activity site (pot break, flint knapping) or agricultural field where miscellaneous artifacts were included in field mulch.
Bedrock Mortar	Place where grinding or crushing of food or other materials took place on a large rock; these are not movable artifacts.
Cave Site	An archaeological site in a cave; the entrance of a cave is generally smaller than the depth into the rock cliff of the cave, as opposed to a rock shelter (see below).
Check Dam	Rocks aligned to form a small dam, constructed in a gully or on a slope, to decrease the water flow velocity and promote deposition of sediment.
Multicomponent Site	An archaeological site that contains the remains of more than one culture and often includes archaeological remains from more than one time period.
Petroglyph	An engraving on a rock produced by grinding, pecking, or incising.
Pictograph	A painting on rock.
Prehistoric	Of or pertaining to the time before written history in a given region.
Protohistoric	Of or pertaining to the time immediately preceding the advent of written documents in a given region. In practice, this is the period of time (from the arrival of Europeans in North America) until the time when written records of the area in question were produced.
Rancheria	A settlement of dispersed, unconnected houses common to historic groups in southern Arizona and California; as opposed to “pueblo,” which is a settlement made up of connected, multi-household rooms.
Rock Art	A general term for figures or designs painted or engraved on rock or formed through the placement of boulders.
Rock Feature	A human-made line, ring, cairn, or pile of rocks that could have been used for a number of different purposes in the past, including agricultural and religious uses.
Rock Shelter	A shallow overhang in a rock face, with an "entrance" wider than it is deep. When mentioned in archaeology, the shelter of the rock overhang was generally used by people in the past.
Tinajas	Rock tanks in which rain water collects.

3.4.1.2 *Central Corridor*

The Central Corridor runs from the South Substation, located on the west bank of the Santa Cruz River in Sahuarita, across the eastern descent of the Sierrita Mountains, eventually passing between the Santa Cruz River and the Tumacacori and Atascosa Mountains to the U.S.-Mexico border west of Nogales, Arizona (locations noted on Figure 1.1–4). Most of the Central Corridor would follow or cross an existing El Paso Natural Gas Company (EPNG) pipeline alignment. Three nationally significant historical sites are located near the Central Corridor: Tumacacori National Historical Park (in Tumacacori), Tubac Presidio State

Historic Park (in Tubac), and the Juan Bautista de Anza National Historic Trail (immediately adjacent to the Santa Cruz River in the proposed project area).

Six previously identified archaeological and historical sites have been documented within this corridor, including four sites on the Coronado National Forest. Recorded Native American sites include one artifact scatter and one partially excavated cave site. Historical sites include the historic alignment of Ruby Road, a set of erosion control features constructed by the Civilian Conservation Corps, and a water conveyance feature known as the Ruby Pipeline. One isolated check dam of unknown age has also been documented within this corridor. Additionally, several historical O'Odham rancherias are known to have existed along the Santa Cruz River south of Tumacacori and may lie within the Central Corridor. None of these sites are currently listed in the NRHP; however, all should be considered potentially eligible for listing until further work is done to evaluate their eligibility.

Site density is low within the Central Corridor probably because very little of the corridor has been intensively surveyed. Two sites have been documented on the eastern descent of the Sierrita Mountains west of Sahuarita and Green Valley. The remaining four documented sites are located on the Coronado National Forest.

Data collected from AZSITE and USFS indicate that less than 15 percent of the Central Corridor has been previously surveyed for cultural resources. The area around Sahuarita and a portion of the eastern descent of the Sierrita Mountains west of Green Valley represent the majority of previously surveyed lands. Because only a small percentage of the Central Corridor has been previously surveyed for cultural resources, it is extremely likely that additional prehistoric and historic sites exist within this corridor. No significant difference in site density is expected between the Option 1 and 2 sub-routes. However, because Option 2 follows an existing utility corridor, any resources on this route are slightly more likely to have been discovered. Based upon available data, site density south of Tucson is highest along the Santa Cruz River and along major washes that flow into the Santa Cruz River. These are, however, the areas that have been most intensively surveyed in the past.

3.4.1.3 *Crossover Corridor*

The Crossover Corridor would involve the construction of a new transmission line from the South Substation, located on the west bank of the Santa Cruz River in Sahuarita, across the eastern descent of the Sierrita Mountains, eventually passing through the Tumacacori Mountains (locations noted on Figure 1.1–4). The corridor turns eastward and follows Peck Canyon, located between the Tumacacori and Atascosa Mountains, and turns south again running between the Santa Cruz River and the Atascosa Mountains to the U.S.-Mexico border west of Nogales, Arizona.

Twenty-seven previously identified archaeological and historical sites have been documented within this corridor, including 11 on the Coronado National Forest. The prehistoric to historic Native American sites include seven artifact scatters, two artifact scatters with rock features, one site with potential habitation features, six rock shelters with artifact scatters (three rock shelters contain rock art), one bedrock mortar site, and one partially excavated cave site. Historical sites include two habitation sites, the historic alignment of Ruby Road, a set of erosion control features constructed by the Civilian Conservation Corps, a water conveyance feature known as the Ruby Pipeline, and a stone monument and historical artifact scatter marking the location of the historic Peck's Ranch. Additional sites include a multi-component site consisting of a prehistoric artifact scatter and a historical Euro-American ranch, a site consisting of two rock walls of unknown age, and an isolated check dam of unknown age. None of these sites are currently listed in the NRHP; however, all should be considered potentially eligible for listing until further work is done to evaluate their eligibility.

Site density varies directly with the intensity of survey, with greater number of sites located in the areas more intensively surveyed. Fourteen of the 27 known sites are located on the descent of the Sierrita Mountains west of Sahuarita and Green Valley, 2 are located near the intersection of the Crossover Corridor and Sopori Wash, and the remaining 11 are located on the Coronado National Forest. The majority of the sites on the Coronado National Forest are located along Peck Canyon. Data collected from AZSITE indicate that less than 15 percent of the Crossover Corridor has been previously surveyed for cultural resources. The area around Sahuarita and a portion of the eastern descent of the Sierrita Mountains west of Green Valley represent the majority of previously surveyed land. Because only a small percentage of the Crossover Corridor has been previously surveyed for cultural resources, it is extremely likely that additional prehistoric and historic sites exist within the corridor. Based upon the varied terrain of the Crossover Corridor, a wide range of archaeological site types are expected. Prehistoric and historic habitation sites are commonly located along river and wash corridors, whereas the mountainous segment may contain Native American rock art sites and shrines, as well as Historic Period ranching and mining related sites.

3.4.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

To date there has been no review of inventoried cultural resource sites in the vicinity of the proposed 115-kV Gateway and Valencia Substations interconnection. The 115-kV interconnection route has been moderately developed and significant cultural resources are not expected.

3.4.2 Native American Concerns

The proposed project is within the traditional territories of 12 Native American tribes. Four of these tribes are culturally closely related, all speak O'Odham, and work closely together in cultural resources consultation; they are referred to here as the "Four Southern Tribes" and are the Ak-Chin Indian Community, Gila River Indian Community, Salt River Pima-Maricopa Indian Community and the Tohono O'Odham Nation. Culturally, the Four Southern Tribes are also referred to as "O'Odham" which is their name for themselves, as well as their language, and literally means "people."

3.4.2.1 *Consultation Conducted*

DOE initiated formal government-to-government consultation in a November 20, 2001, letter (DOE 2001b) sent to tribal governments of the 12 Native American communities/tribes/nations that are likely to have traditional concerns in the area: the Ak-Chin Indian Community, Fort Sill Apache Tribe, Gila River Indian Community, Hopi Tribe, Mescalero Apache Tribe, Pascua Yaqui Tribe, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Tohono O'Odham Nation, White Mountain Apache Tribe, Yavapai Apache Nation, and the Pueblo of Zuni (listed in Table 3.4–1). Seven of the 12 tribes contacted have indicated to DOE representatives that they have concerns about the proposed project and that portions of the project's Area of Potential Effect (APE) are important to them. These include the Four Southern Tribes, the Hopi Tribe, the Mescalero Apache Tribe, and the Pascua Yaqui Tribe. Consultation is ongoing with all tribes, but the O'Odham tribes and Pascua Yaqui have communicated their concerns in several meetings as well as during site visits on January 23, 2002 and February 4, 2003 (SWCA 2002c). Representatives of the Tohono O'Odham Nation have also met directly with DOE representatives in Washington, DC, to discuss their cultural concerns. Concerns discussed during these site visits and in meetings are presented in Section 3.4.2.2.

Table 3.4–1. Tribal Officials Contacted by DOE in Project Scoping.

Tribe	Name	Title
Ak-Chin Indian Community	Mrs. Delia Carlyle[a]	Chairperson
	Ms. Elaine Peters	Ak-Chin Him Dak Museum Director
	Mr. Jon Shumaker[b]	Tribal Archaeologist
Fort Sill Apache Tribe	Mrs. Ruey Darrow[c]	Chairperson
	Mr. Michael Darrow	Tribal Historian
Gila River Indian Community	Mr. Donald Antone	Governor
	Dr. John Ravesloot	CulturalResources Coordinator
	Mr. Barnaby Lewis[d]	Cultural Resources Specialist
Hopi Tribe	Mr. Wayne Taylor	Chairman
	Mr. Leigh Kuwanwisiwma	Hopi Cultural Preservation Office Director
Mescalero Apache Tribe	Ms. Sara Misquez	President
	Ms. Donna Stern-McFadden	Tribal Historic Preservation Officer
Pascua Yaqui Tribe	Mr. Robert Valencia	Chairman
	Ms. Amalia Reyes	Language and Culture Specialist
Salt River Pima-Maricopa Indian Community	Mr. Ivan Makil[e]	President
	Mr. Ron Chiago[f]	Cultural Resources Coordinator
San Carlos Apache Tribe	Mr. Raymond Stanley[g]	Chairman
	Ms. Vernelda Grant	Director, Historic Preservation and Archaeology
	Mrs. Jeanette Cassa	Elders Cultural Advisory Council
	Mr. Seth Pilsk	Ethnobotanist, Assistant to Elders Advisory Council
Tohono O'Odham Nation	Mr. Edward Manuel	Chairman
	Mr. Tony Burrell[h]	Chairman, Cultural Committee
	Mr. Peter Steere	Cultural Affairs Program Manage
	Mr. Joe Joaquin	Cultural Resrouces Specialist and NAGPRA Coordinator
White Mountain Apache Tribe	Mr. Dallas Massey, Sr.	Chairman
	Mr. Ramon Riley	Cultural Resources Director
	Dr. John Welch	Tribal Historic Preservation Officer
Yavapai-Apache Nation	Mr. Aaron Russell	Chairman
	Mr. Don Decker	Director, Apache Cultural Program
Pueblo of Zuni	Mrs. Katherine Marquez	Director, Yavapai Cultural Program
	Mr. Malcolm Bowekaty[i]	Governor
	Dr. Jonathan Damp	Tribal Historic Preservation Officer

[a] Terry O. Enos replaced Delia Carlyle as Chairman in 2002.
[b] Jon Shumaker no longer is employed by the Ak Chin Indian Community (as of July 2002). Nancy Nelson is now Cultural Resource Manager and Deborah Baptisto is Cultural Resources Specialist. Both have been consulted with on this project to follow up previous work with Jon Shumaker.
[c] Ruey Darrow is deceased (2002); current chairperson is Jeff Houser.
[d] Angela Garcia is now assistant cultural resources specialist and is assisting Barnaby Lewis with consultation on this project, as are other staff members.
[e] Ivan Makil is no longer President of the Community; Joni Ramos is the current President (2003).
[f] Mr. Chiago is no longer Cultural Resource Manager for the Salt River Pima Maricopa Indian Community. Other staff members, specifically Mr. Gary Gilbert, are communicating the Community's concerns on this project.
[g] Raymond Stanley is no longer Chairman; Kathleen Wesley-Kitcheyan was elected Chairwoman in Fall 2002.
[h] Tony Burrell is no longer on the Legislative Council and no longer serves as Chairman of the Cultural Preservation Committee. Mary Flores is now Chair of the Cultural Preservation Committee, and further consultation has been conducted with her, as well as other committee members: Felicia Nuñez, Jerome Joaquin, Emilio Lewis, and Frances Miguel.
[i] Malcolm Bowekaty is no longer Governor; Arlen Quetawki, Sr. was elected in Fall 2002.

The Hopi Tribe, on December 4, 2001, requested the opportunity to review both the project EIS and all archaeological inventories prepared for this project (SWCA 2002c). Mescalero Apache Tribe representatives have also stated that they would like to consult further on this project and that they hope to set up a meeting and site visit with USFS Coronado National Forest (SWCA 2002c). The Four Southern Tribes Consulting Group requested further site visits and presentations on the project, and they wish to review all project documents, including all archaeological and cultural resource reports, the Draft and Final EIS, as well as any biological reports prepared that may present information about plants and animals traditionally used by the O'Odham. The Pascua Yaqui Tribe also wishes to be included on future site visits and to review cultural resource reports and the Draft EIS and Final EIS. Dates are pending for continued consultation between the Mescalero and DOE and cooperating agencies, as well as between the O'Odham and DOE and cooperating agencies.

3.4.2.2 *Cultural Concerns and Traditional Cultural Properties*

Traditional cultural information is often confidential and sensitive, and many tribal representatives are reluctant to divulge information about traditional localities. A lack of response to tribal notification should neither be interpreted as a lack of concern nor an indication that there are no sensitive localities within the proposed project area. The Coronado National Forest has provided a very useful summary of the published literature on O'Odham use of the Forest through which portions of the three proposed corridors would cross (USFS 2002d). This document details the ethnography, occupation, and traditional O'Odham uses of the Tumacacori Uplands region (region including Tumacacori and surrounding higher ground, see Figure 1.1–4), and also references the Apache and Yaqui presence in the Tumacacoris during historic times. O'Odham plant use and the kinds of landmarks that are culturally significant to traditional O'Odham are also very well summarized in this document, and together this provides valuable background for assessing the potential cultural impacts to USFS land in this project.

An issue of concern to all responding tribes is the possibility that project construction would disturb previously undiscovered human remains (SWCA 2002c; USFS 2002d). Procedures for consultation with the tribes regarding unavoidable or unanticipated disturbance of human remains and funerary objects located on non-Federal land in Arizona are specified in amendments to the *Arizona Antiquities Act* (Arizona Revised Statutes [ARS] §41-844 and §41-865). Any remains located on Federal land are subject to the provisions established by NAGPRA, and procedures for handling any discoveries would be specified in a project Memorandum of Agreement and Plan of Action. No discoveries of human remains are expected on this project because care would be taken to minimize archaeological site disturbance through careful location of project facilities.

A second issue of concern is the disturbance of localities or natural features named in traditional stories, the "Cultural Landscape." Some of these localities may also serve as shrine or ritual sites and may still be in use. To date, none of the tribes consulted have identified or named specific localities, natural features, or other landscape features that may be affected by this project, beyond the suggestion that protohistoric O'Odham villages may be impacted (SWCA 2002c). The known locations of these villages are not in any of the proposed project corridors (SWCA 2002c; USFS 2002d) and efforts would be made to identify any previously unknown villages that are located within the proposed corridors. Furthermore, none of the tribes consulted have yet identified stories or oral traditions that may relate to the project area (SWCA 2002c; USFS 2002d). That stated, individual communities often have local interpretations of landscape features, and these sometimes "place widely known creation-time events at local landmarks" (USFS 2002d); only further discussion with American Indian elders is likely to identify oral traditions identifying local landmarks.

Third, a great concern to most responding groups is the natural landscape of the Western Corridor (SWCA 2002c). Because there has been minimal disturbance to this area, the tribes believe that there may be many previously unrecorded archaeological features within the route's APE, as well as culturally significant plants and animals (SWCA 2002c, USFS 2002d). The undisturbed nature of the Western Corridor is significant to the tribes because it is one of the few areas still existing in southern Arizona where the pre-European contact landscape can be encountered (SWCA 2002c).

The consulted Native American groups recommend avoiding the Western Corridor entirely. They believe construction of the proposed transmission line (including the ROW and access roads) has the potential both to reveal cultural resources (prehistoric, historic, or modern) and to adversely impact such resources. Avoidance of both known and newly discovered cultural resources is the mitigation recommended by all responding Native American tribes to date; however, if avoidance is not possible, it would be necessary to develop and implement plans to mitigate potential adverse effects. The O'Odham representatives request that these mitigation plans include both archaeological recovery and an ethnographic cultural landscape study. This evaluation of the cultural landscape would include interviews with elders to enhance the inclusive analyses of geographic landscape features and archaeological/historical data using a geographic information system (GIS) mode of analysis to portray the links between landscape and cultural features.

O'Odham. As described previously, the O'Odham are represented by four modern tribes: the Ak-Chin Indian Community, Gila River Indian Community, Salt River Pima-Maricopa Indian Community, and the Tohono O'Odham Nation. The eastern boundary of the main portion of the Tohono O'Odham Nation is approximately 27 mi (43 km) west of the intersection of the Western Corridor and Arivaca Road (Figure 3.1–1). The southern boundary of the San Xavier District of the Tohono O'Odham Nation, which is not contiguous with the main reservation, is approximately 1.0 mi (1.6 km) north of all three project corridors as they exit the South Substation. The area of O'Odham traditional land use extends east of the Tohono O'Odham Nation boundary across the Santa Cruz and San Pedro River Valleys, and almost to the New Mexico border. All alternative corridors for the project are within O'Odham traditional lands (SWCA 2002c), and the Tohono O'Odham Nation is taking the lead in consultation on behalf of other O'Odham groups because of the proximity of the project to the Tohono O'Odham Nation.

The Tohono O'Odham Nation regards the lands involved in the proposed transmission line corridors as "culturally sensitive since they contain many significant cultural sites including traditional cultural places, archaeological sites, sacred sites, religious sites, plant collection areas for basket materials, and medicines and burial sites" (SWCA 2002c). Background research on the area, though not identifying any specific localities, also suggests that such culturally sensitive localities may occur within the proposed corridors (USFS 2002d). The Tumacacori Uplands support a number of plant taxa that were traditionally important to the O'Odham and many of these are relatively rare in the desert lowlands to the west and north where the majority of O'Odham reservation land is located (SWCA 2002c, USFS 2002d). These taxa include but are not limited to: oaks (*Quercus*), agaves (*Agavaceae*), banana yucca (*Yucca baccata*), beargrass (*Agave schottii)*, walnuts (*Juglans nigra)*, mulberry (*Morus)*, chiltepines (*Capsicum annuum* var.*glabriusculum*), and sayas (*Amoreuxia sp*.) (USFS 2002d). Specific information about the location of such places or resources has not yet been provided to DOE by the Tohono O'Odham Nation.

Of the known archaeological sites described in the previous section, none are identified as sacred sites, religious sites, or burial sites (SWCA 2002c, USFS 2002d). Peaks, caves, shrines, burials, rock art sites, and sacred object caches have been recognized as culturally important places to the O'Odham within the greater region (USFS 2002d). Some of these types of places (rock art sites, caves) are present in the Tumacacori Uplands, but their specific cultural significance has not been established (SWCA 2002c, USFS 2002d). Archaeological sites within O'Odham traditional lands are important to the preservation of O'Odham heritage because the sites are the remains of their ancestors (SWCA 2002c, USFS 2002d). Burial areas are considered shrines (SWCA 2002c). Traditionally, rock art panels and *tinajas* (rock tanks in which rain water collects) are also important sites; many are active shrines that are not disclosed to outsiders. The area known as Tinajas Hills near the Western Corridor and the Sierrita Mountains is particularly important to the O'Odham (SWCA 2002c).

Although archaeological remains are very significant to the O'Odham, they also place high regard and value on native plants and animals, and the natural landscape of their traditional use area (SWCA 2002c, USFS 2002d). All native plants and animals are linked and considered significant in O'Odham tradition (SWCA 2002c, USFS 2002d). "Many authors have noted the close connection between O'Odham religion and the landscape they live in" and "every part of the natural environment is also personified and must be treated with circumspection and respect" (USFS 2002d). O'Odham representatives stated that they do not want plants and animals affected by this project, but they have not yet named species or specific locations in the project areas other than National Forest System lands. The preservation of relatively undisturbed landscapes similar to those used by the O'Odham prior to European contact is important to the O'Odham, especially in areas where people traditionally collected subsistence foods and lived in villages (SWCA 2002c). According to the NRHP, eligibility of such an ethnographic landscape that does "not contain, or connect, specific special places or landmarks is tenuous at best" (USFS 2002d). Nevertheless, the Tohono O'Odham Nation's preference for undisturbed landscapes gives added weight to the general visual quality concerns.

The Tohono O'Odham Nation is also concerned about the cumulative impacts to both "the cultural and physical landscapes and view sheds of the proposed transmission line corridors, including possible impacts to National Forest System lands; the Pajarita Wilderness Area, the Goodding Research Natural Area, the riparian zones in Sycamore Canyon and many unique plant and animal species found in the area" (SWCA 2002c). The Pajarita Wilderness, Goodding Research Natural Area, and Sycamore Canyon are shown in Figure 3.1–1.

Tohono O'Odham representatives were consulted about a specific published passage regarding the effects of constructions (such as power lines) that disrupt the space between significant landmarks, and thus disrupt the forces that hold the earth together (quoted in USFS 2002d, SWCA 2002c). The issue of disruption of space must be considered from the standpoint of the American Indian Religious Freedom Act (AIRFA; Public Law 95-341, enacted in 1978), Executive Order 13007 signed in 1996, and the First Amendment to the Constitution of the United States of America.

All issues raised concerning NHPA, AIRFA, as well as all relevant EOs are being evaluated during this NEPA process. Following the ROD, mitigation would be identified as part of ongoing tribal consultation.

Tohono O'Odham representatives, speaking on behalf of the four Southern Tribes, have stated that they oppose the Western Corridor because it would affect a relatively pristine area and it may also affect archaeological sites and possibly culturally-sensitive sites as well (SWCA 2002c). No specific traditional cultural properties (TCPs) have been identified along the proposed corridors to date. All comments have been made during telephone conversations, meetings, site visits, or in a submitted letter (SWCA 2002c).

Pascua Yaqui. The Pascua Yaqui have deep ties to both the Western and Central Corridors because these areas were used by their ancestors during their wide-ranging food-gathering excursions in the distant past. More recently, during the 1889-1921 Mexican Wars (sometimes referred to as the "Yaqui Wars"), direct ancestors of the Pascua Yaqui traveled through this corridor of land between Nogales and Tucson as they fled political persecution. Traveling near and along the Santa Cruz River, the Yaqui refugees-turned-immigrants also transported guns and ammunition to their relatives struggling against the Mexican government. Many of these refugees bore wounds, and it is likely that some died and were buried in the countryside. The Pascua Yaqui Tribe considers these Yaqui burials and campsites as TCPs. During consultation on this project, Yaqui representatives stated that some TCPs may be located along project corridors, but none have been specifically identified to date (SWCA 2002c). If any are encountered in the project area, these sites must be evaluated for inclusion in the NRHP and discussed as part of compliance with the NHPA.

No specific Yaqui TCPs have yet been identified along this or any of the proposed corridors by representatives of the Pascua Yaqui tribe. All comments from the Pascua Yaqui tribe have been made during telephone conversations or the January 2002 site visit.

Hopi. The Hopi view archaeological sites as proof of their oral traditions, specifically as evidence of their Covenant of Natwani. Sacred Hopi oral traditions describe migrations of many clans to the Hopi mesas from all directions prior to the arrival of Euro-Americans in Arizona. A distinct and significant area named in Hopi traditional history is referred to as Palatkwapi, located to the south of present-day Hopi reservation. Some believe that Palatkwapi is in southeastern Arizona. Because of the importance of archaeological remains to Hopi culture and religion, the Hopi wish to be informed about any disturbances to archaeological materials or human remains encountered on the proposed project. Hopi representatives have stated that all archaeological sites eligible for the NHRP are of cultural importance and are potentially Hopi TCPs. To date, the Hopi tribe has not specifically identified any Hopi TCPs within the proposed project area. All comments have been made in either telephone calls or in the submitted letter (SWCA 2002c).

Apache and Yavapai. The Fort Sill Apache Tribe, San Carlos Apache Tribe, White Mountain Apache Tribe, and Yavapai-Apache Nation have not yet stated their cultural concerns in response to requests for consultation, nor have they expressed their intention to consult on this project. The Mescalero Apache Tribe wishes to consult on this project because it is concerned about the project's impacts on their heritage sites (SWCA 2002c).

Zuni. No concerns have been stated.

3.5 SOCIOECONOMICS

This section describes current socioeconomic conditions within a region of influence (ROI) where the majority of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project workforce is expected to reside, including the Gateway to Valencia Substations interconnection area, based on proximity to the proposed corridors and historic employment patterns. The ROI is a two-county area in Arizona comprised of Pima and Santa Cruz Counties (see Figure 1.1–3). The ROI covers an area of 10,424 mi^2 (26,998 km^2) around the proposed corridors (Census 2000a, 2000b). The ROI would be the same, regardless of the project alternative selected, because the workforce required to construct each alternative is expected to reside within these two counties.

3.5.1 Population and Housing

The City of Tucson comprises a small portion (223 mi^2 [577.6 km^2] or 2.4 percent) of Pima County, yet is home to the majority of the population (57.6 percent) in the county (Census 2000c, Tucson 2001). The majority of Pima County outside of Tucson and all of Santa Cruz County are largely rural in character. Over the last 40 years, the population of Arizona has grown at an extremely accelerated rate, and has nearly quadrupled in number. Though the ROI has not experienced quite the same level of population growth as the state, the ROI has also experienced a high rate of population growth with the population more than tripling over the past 40 years. During the 1990s, Arizona's population increased by 40 percent, while the population of the ROI increased by 26.6 percent. Future population predictions show that the rapid population growth throughout Arizona is expected to continue in the near future. The population of the ROI is expected to grow at a higher rate than the state, 22.2 percent compared to 19.8 percent, over the next 10 years. Table 3.5–1 presents the historic and projected populations in the ROI and the state.

Table 3.5–1. Historic and Projected Population

	1960	1970	1980	1990	2000	2010
Pima County	256,660	351,667	531,443	666,880	843,746	1,031,623
Santa Cruz County	10,808	13,966	20,459	29,676	38,381	46,246
ROI (Pima and Santa Cruz)	267,468	365,633	551,902	696,556	882,127	1,077,869
Arizona	1,302,160	1,770,900	2,718,215	3,665,228	5,130,632	6,145,108

Source: Census 2000a, 2000b.

Tucson is the largest city in the ROI with a population of 486,699 in the year 2000. Other cities include Green Valley in Pima County, with a population of 17,283 in 2000, and Nogales and Rio Rico in Santa Cruz County with populations of 20,878 and 10,413 in 2000 respectively (Census 2000c).

Table 3.5–2 presents housing characteristics in the ROI. There was a total of 379,773 housing units in the ROI in 2000.

In 2000, the median value of owner-occupied housing in the ROI was $85,000 in Santa Cruz County and $154,000 in Pima County. In 2000, median monthly rent was $475 in Santa Cruz County and $544 in Pima County. The rental vacancy rate in the ROI is equivalent to the state level of 9.2 percent. Based on the number of occupied rental units and the vacancy rate in the ROI, over 12,000 rental units are estimated to be currently vacant (Census 2000b).

Table 3.5–2. Region of Influence Housing Characteristics

	Total Number of Housing Units	Number of Owner-Occupied Units	Owner-Occupied Vacancy Rates	Median Value	Number of Occupied Rental Units	Rental Vacancy Rates
Pima County	366,737	213,603	1.8%	$154,000	118,747	9.2%
Santa Cruz County	13,036	11,809	2.1%	$85,000	3,783	8.2%
ROI (Pima and Santa Cruz)	379,773	225,412	1.8%	NA	122,530	9.2%
Arizona	2,189,189	1,293,556	2.1%	NA	607,771	9.2%

Source: Census 2000c.

3.5.2 Employment and Income

Employment by sector over the last decade has changed slightly, as shown in Table 3.5–3. The services sector provides the highest percentage of the employment in the ROI, with 34.5 percent, followed by the wholesale and retail trade and government sectors with 21.2 percent and 17.9 percent, respectively. Farm employment has decreased over the last decade, providing 0.4 percent of employment in 1990 but only 0.3 percent in 1997 (BEA 1999). Table 3.5–3 presents employment levels for the major sectors of the ROI economy.

Table 3.5–3. Employment by Sector (Percent)

Sector	1990	1997
Services	32.2	34.5
Wholesale and retail trade	22.2	21.2
Government and government enterprises	18.0	17.9
Manufacturing	8.7	7.6
Construction	5.8	6.1
Finance, insurance, and real estate	7.6	6.4
Transportation and public utilities	3.3	4.2
Farm employment	0.4	0.3
Mining	0.8	0.7
Other Sectors	1.0	1.2

Source: BEA 1999.

The ROI experienced slight changes to the labor force throughout the late 1990s. The labor force decreased from 399,475 in 1995 to 397,175 in 2000, a 5-year growth rate of -0.6 percent. Employment experienced growth despite the decline in the labor force, increasing from 383,725 in 1995 to 384,425 in 2000, a 5-year growth rate of 0.2 percent. The ROI unemployment rate was 3.9 percent in 1995, falling to 3.2 percent in 2000, as shown in Table 3.5–4. Santa Cruz County experienced a large decrease in its unemployment rate during this period, with the rate dropping from 19.6 percent in 1995 to 13.8 percent in 2000. The average unemployment rate for the State of Arizona was 3.9 percent in 2000 (ADES 2001).

Per capita income in the ROI was $26,248 in 1999, more than a 19 percent increase from the 1995 level of $22,013. Per capita income was $20,855 in Santa Cruz County and $26,440 in Pima County. The per capita income in Arizona averaged $28,807 in 1999, while the U.S. average was $32,109 (CBP 1995a, 1995b, 1999a, 1999b, 1999c, 1999d).

Table 3.5–4. Region of Influence Unemployment Rates (Percent)

	1995	2000
Pima County	3.3	2.8
Santa Cruz County	19.6	13.8
ROI Total (Pima and Santa Cruz)	3.9	3.2
Arizona	5.1	3.9

Source: ADES 2001.

3.5.3 Community Services

This subsection presents the availability of community services in the project's ROI. Tucson is located approximately 15 mi (24 km) north of the northern end of the proposed project and large fire and police services associated with major metropolitan areas can be found there. Other fire and police stations are located along the various routes analyzed. In Pima County, there are 13 police stations and 24 fire stations, and in Santa Cruz County, there is one police station and 7 fire stations.

There are approximately 45 school districts serving the ROI, with the majority of them located in the Tucson metropolitan area in Pima County. These districts utilize over 7,200 teachers to educate over 139,000 students (EDU 2001a, 2001b). There are also 37 private schools in the ROI educating approximately an additional 9,800 students (EDU 2001c, 2001d). There are a number of institutions of higher learning in the ROI, including the University of Arizona, the University of Phoenix-Tucson Campus, Tucson University, and Pima Community College.

Although public transportation services exist in Pima and Santa Cruz counties, workers would not be able to take public transportation to construction staging areas.

Thirteen major hospitals are located in the ROI, 12 in Tucson and 1 in Nogales. There are 2,532 beds in these hospitals and over 2,500 physicians throughout the ROI (AHA 1995, AMA 1995). The majority of the hospital beds and physicians are located in the city of Tucson in Pima County.

3.5.4 Revenues for Forest-Based Activities

Revenues generated from activities on Federal lands are shared with local governments through various regulations, including the *25 Percent Fund Act* (Public Law 60-136) and Payments in Lieu of Taxes (PILT) (Public Law 94-565, Public Law 97-258). The majority of the revenues are generated by timber sales; however, mineral resources, grazing fees, and recreation also contribute to the total revenue generated by National Forest System land. In 1997, USFS, through the 25 Percent Fund, paid the State of Arizona $2,214,865, of which $43,676 and $46,815 were paid to Pima and Santa Cruz Counties respectively. Additionally, PILT payments totaling $9,439,156 were made to Arizona during 1997, including $954,001 to Pima County and $305,255 to Santa Cruz County. This total does not include payments made through the Minerals Management Service of the Department of the Interior.

Recently, these laws were amended by the *Secure Rural Schools and Community Self Determination Act* of 2000 (Public Law 106-393). Counties that have received payments previously are now eligible to collect either the traditional amount (usually 25 percent for USFS land) or an amount equal to the average of the three highest years' payments between 1986 and 1999. If the latter amount is requested (referred to as the "full payment"), the counties must use 80 to 85 percent of the total for traditional payments to support roads and schools (the percentage depends on the total amount received). The balance of the payment would be used for public land projects or county-level projects as determined by a resource advisory council in the local area. This new law went into effect for the fiscal year 2001 payments to states.

3.5.5 Tourism

Tourism in Arizona contributes approximately $16 billion annually in direct visitor spending~~,~~ and approximately $30 billion annually in total direct economic impact. Arizona's natural tourist attractions (e.g., outdoor parks and recreation areas) were visited by approximately 17.5 million people in 2002, compared with 11.5 million visitors to other tourist attractions within the state. The Coronado National Forest was Arizona's fifth most popular natural tourist attraction in 2002, with approximately 1.5 million visitors, about 9 percent of the state's total visitors to natural tourist attractions (AZOT 2002).

The Arizona State Parks Draft 2003 Statewide Comprehensive Outdoor Recreation Plan Outdoor Recreation Analyses indicates a general increasing trend in outdoor recreation in Arizona, by both Arizona residents and visitors on vacations (SCORP 2003). In particular, the University of Arizona's Department of Agriculture has stated that ecotourism offers a very "promising niche market for rural areas in Arizona" because "an economic study in Southeastern Arizona showed that nature tourists spent more money on average than other types of visitors to the area" (AREC 2004).

Much of the existing tourism in the project area is ecotourism in the form of bird-watching ("birding"). Southern Arizona is a very popular destination for birding because the "year-round temperate climate and diverse habitats combine to attract hundreds of bird species seasonally" (Birding 2004).

Specifically within the Coronado National Forest, USFS collects fees for Special Use Permits issued for a wide range of activities, including outfitter and guide operations that cater to tourists who seek outdoor activities. The destination of a majority of visitors to the Tumacacori EMA is Peña Blanca Lake Recreation Area. See Section 3.5.4 for further discussion of recreational revenues for Forest-based activities.

3.6 GEOLOGY AND SOILS

This section describes the existing geologic and soil environment in the vicinity of the proposed project. Discussions of geology and soils that apply to all three proposed corridor are followed, respectively, by information specific to the Western, Central, and Crossover Corridors.

3.6.1 Geology

The proposed project area is located within the Basin and Range Physiographic Province that is characterized by alternating mountain ranges and broad valleys, most of which were formed by block faulting during the last part of the Cenozoic Era, 5 to 15 million years ago (NRCS 2001).

Elevations in the vicinity of the three proposed corridors range from 2,675 ft (815 m) above mean sea level (AMSL) at the South Substation to the high point in the Coronado National Forest of 6,244 ft (1,903 m) AMSL at the Atascosa Fire Lookout. The elevation at the U.S.-Mexico border is 4,085 ft (1,245 m) AMSL. Ground slope within the Tumacacori Ecosystem Management Area (EMA) varies from nearly flat to over 40 percent, with over half the land at 15 to 40 percent slope, and steeper slopes within the Tumacacori and Atascosa Mountains (USFS 2001b).

Several geologic units are present along the three proposed corridors, such as unconsolidated sediments (surficial alluvium deposited by running water), sedimentary rock, and volcanics (Figure 3.6–1). The unconsolidated sediments include young alluvium and older surficial deposits. The young alluvium consists of sediments carried from the mountains and deposited in present-day rivers and stream channels, floodplains, and playas. The older surficial deposits consist of alluvial and aeolian (wind-deposited) deposits found in present-day valleys and piedmonts (bases of mountains).

Geologic Resources. As is common in many areas of Arizona, the Santa Cruz Valley contains abundant geologic resources, including copper, molybdenum, silver, and gold, that are mined along the common northern segments of the three proposed corridors.

Sand and gravel mining operations do not occur within the three proposed corridors, and there are no significant coal or oil and gas resources in the immediate area. Inactive mine tailing areas are located adjacent to the common northern segments of the three proposed corridor west of Sahuarita, in Township 17 South, Range 13 East.

Geologic Hazards. The geologic hazards that could affect the project include faults and seismic activity, and ground failures such as slumping, landslides, debris flows, and subsidence causing ground fissures.

Faults and Seismic Hazards. In order to assess earthquake hazards, historical earthquakes are described and faults along which movement has occurred in the past 2 million years (the Quaternary Period) are mapped and characterized. The historical record of earthquakes in Arizona dates to about 1776, but records are sparse prior to the late 1800s. The following discussion of earthquake hazard is primarily summarized from an Arizona Geological Survey publication, *Arizona Geology* (Arizona 2000).

Since 1850, over 20 earthquakes with magnitudes greater than 5 on the Richter Scale have occurred in or near Arizona. A table of the Richter scale and its description is shown in Table 3.6–1. Most earthquakes have occurred in northern Arizona and in California, adjacent to the southwest corner of Arizona. The largest earthquake recorded in the region was the magnitude 7.4 (on the Richter Scale) Sonoran earthquake of 1887. It was centered about 125 mi (205 km) southeast of Sahuarita, and caused 51 deaths in Sonora and extensive property damage throughout southeastern Arizona. The fault that generated the 1887 Sonoran earthquake probably had not caused a similar earthquake for at least 100,000 years (Arizona 2000).

Table 3.6–1. Richter Scale

Magnitude	Descriptor
Less than 3.0	Very minor-generally not felt
3-3.9	Minor-generally felt, no damage
4-4.9	Light-felt widely, slight damage near epicenter
5-5.9	Moderate-damage to poorly constructed buildings
6-6.9	Strong-can be destructive in areas up to approximately 100 km across where people live
7-7.9	Major-can cause serious damage over larger areas
8 and higher	Great-can cause serious damage in areas several hundred km across

Source: Richter 2003, USGS 2003.

Potentially active faults that could generate magnitude 6.5 to 7.2 earthquakes are scattered throughout southeastern and central Arizona, including much of the Phoenix and Tucson areas. Earthquakes of this magnitude are considered to be destructive to major ones. All of the potentially active faults in the Phoenix and Tucson areas have low slip rates, long intervals between ruptures, and have had little historic activity. Because of this, the Arizona Geological Survey places these areas in the low to moderate hazard category.

Slumping, Landslides, and Debris Flows. Almost any steep or rugged terrain is susceptible to slope failure under certain conditions. Flash floods, however, can occur in the numerous narrow washes that cross the valley floor of the proposed project area.

Subsidence. Extensive and long-term groundwater withdrawal can in some areas cause ground subsidence. Over time, this can lead to ground fissures given the right geologic conditions. This geologic hazard is a concern in the Tucson area and areas north of Tucson, as substantial ground subsidence with resultant fissures has occurred in these areas of Arizona. Subsidence hazards have not been documented along the three proposed corridors, and are therefore not expected.

3.6.1.1 *Western Corridor*

As part of the analysis of roads required by the Forest Service (USFS), Terracon conducted a geotechnical evaluation of the proposed project area on the Coronado National Forest (Terracon 2002). Relatively intact bedrock is near to or exposed at the ground surface along the majority of the Western Corridor on the western side of the Tumacacori Mountains, as shown by the areas of tertiary conglomerate and sandstone in Figure 3.6–2 on national forest land (Terracon 2002). The photograph in Figure 3.6–3 shows exposed bedrock along the Western Corridor. The bedrock would be suitable for supporting poles on a rock bolted base, in which small holes are drilled into the bedrock and the tower is attached with large bolt, as described in Section 4.6, Geology and Soils.

Areas of the Western Corridor that are relatively flat (much of the northern half of the corridor) may be considered too flat to be affected by mass movements such as slumping, landslides, and debris flows. The terrain along the Western Corridor has relatively mild slopes, except where it crosses occasional drainages and steep mountain slopes (Terracon 2002). The mountainous areas of the Western Corridor, primarily located in the Coronado National Forest, can be considered areas where mass movements could occur. The U.S. Geological Survey (USGS) has mapped much of the Coronado National Forest as general areas susceptible to debris flows, although none have been documented in the project area (USGS 1999).

Castle Rock is a prominent topographical feature at the edge of the Western study corridor south of Peña Blanca Lake (as shown in Figure 3.2–2). TEP's preliminary siting of the 125-ft (38-m) right-of-way (ROW) avoids this rocky outcrop.

Figure 3.6–3. Exposed Bedrock Along the Western Corridor.

3.6.1.2 *Central Corridor*

A majority of the Central Corridor near and on the Tumacacori EMA has exposed soil at the surface rather than bedrock, as depicted by areas of Quaternary alluvium in Figure 3.6–1, and as shown in Figure 3.6–4. The foundations for towers along the Central Corridor in these exposed soil areas would most likely require embedment poles, as described in Section 4.6, Geology. The terrain along the Central Corridor is generally defined by a series of hills separated by washes (Terracon 2002). There are no meaningful differences in geology between the Option 1 and 2 sub-routes for either the Central Corridor or the Crossover Corridor.

3.6.1.3 *Crossover Corridor*

The discussion of geology for the Western and Central Corridors also applies to the Crossover Corridor in segments where these corridors overlap. Where the Crossover Corridor passes through Peck Canyon for approximately 7 mi (11 km), the majority of the land has bedrock exposed at the surface. The terrain along Peck Canyon is rough and jagged, with steeply sloping canyon walls and a narrow winding canyon bottom (Terracon 2002).

3.6.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The proposed interconnection would be located within the northwestern portion of the City of Nogales. The topographic character within and surrounding the proposed interconnection route can be characterized as scattered foothills. Geologic units present are unconsolidated alluvial sediments and sedimentary rock. None of the area is actively mined for any geologic resource.

3.6.2 Soils

This section describes the existing soil environment in the vicinity of the proposed project. Depending on the type of soil present in each proposed corridor, foundations used in the area would differ as described in Section 4.6, Geology and Soils.

Figure 3.6–4. Exposed Soil Along the Central Corridor.

Soil Map Units. The three proposed corridors would cross five soil associations, as mapped by the Natural Resources Conservation Service (NRCS) and shown in Figure 3.6–5. None of the soils identified have any characteristics that would present any obstruction to standard construction techniques. Brief summaries of the soil associations in the corridors are provided below (USDA 1979).

Comoro-Pima Association. This soil association consists of well-drained sandy and clay loams (an easily crumbled mixture of clay and sand) to a depth of 60 in (152 cm) or more. These soils are on floodplains with slopes ranging from 1 to 3 percent and alluvial fans (fan-shaped deposits that are dropped by a stream) with slopes from 1 to 10 percent. The permeability (quality of soil that enables water or air to move through it) is moderate to rapid. The soil erosion hazard is generally slight, but soils in narrow drainages can be susceptible to gully erosion. Soils in floodplains can be subject to seasonal flooding.

Continental-Sonoita Association. This soil association consists of well-drained gravelly sandy loams to a depth of 60 in (152 cm) or more. Continental soils are typically found on older alluvial fans and terraces with slopes ranging 1 to 15 percent. Sonoita soils are found on reworked fan remnants with slopes typically ranging from 1 to 20 percent; although some short terrace breaks (raised embankment with a leveled top) have slopes as great as 45 percent. Permeability is moderately slow to moderate. The erosion hazard is generally slight in the different series comprising this association. The exception is the gravelly loams of the Rillino Series. These soils occur on the ends and sides of long narrow ridge remnants of dissected alluvial fans where runoff is rapid, and the erosion potential is high.

Bernardino-White House-Hathaway Association. This soil association consists of deep gravelly clay loams, gravelly sandy loams, gravelly loams, or clays to a depth of 60 in (152 cm) or more. This soil association is typically found on fans or piedmont plains (formed at the base of mountains) with slopes ranging from 0 to 45 percent. The erosion hazard is generally slight to moderate, except in two series that occur on steep slopes on either long, narrow sides of ridges or on strongly dissected upper old alluvial fans.

Caralampi-White House-Hathaway Association. This soil association consists of deep gravelly loams or gravelly sandy loams to a depth of 60 in (152 cm) or more. This soil association is typically found on dissected fans and piedmonts with slopes ranging from 10 to 60 percent. Permeability is moderate or slow. The erosion hazard is slight to high, and is primarily dependent upon slope, with the steeper slopes and vertical scarps (a line of cliffs produced by faulting or erosion) posing a higher erosion potential.

Lampshire-Chiricahua-Graham Association. This soil association consists of very cobbly (coarse) loams, very cobbly clay loams, or cobbly sandy loams with shallow to very shallow depths. Lampshire soils are 4 to 20 in (10 to 51 cm) deep and occur on mountains. Chiricahua are 20 in (50 cm) deep and are found on foothills and low mountains. Graham Soils are 10 to 20 in (25 to 51 cm) deep and on lower parts of mountains. Slopes range from 0 to 60 percent. Permeability above bedrock (solid rock beneath loose surface material) is moderate or slow. The erosion hazard is primarily slight to moderate, but is high on some steep slopes in the Atascosa and Tumacacori Mountains.

Prime Farmland. The NRCS has designated certain soil types as “prime farmland” subject to protection under the *Farmland Protection Policy Act.* Soils that are classified as prime farmland derive their value from their general advantage as cropland due to soil and water conditions. These soils are best suited for producing food, feed, fiber, forage, and crops. They have favorable growing seasons and receive sufficient quantities of moisture to produce yields on average of 8 out of every 10 years. The only soil types found in the corridors that are classified as prime farmland are the Comoro soil series (0 to 5 percent slope only, and referred to as Comoro soils in this document) and the Pima soil series. These soils are found within the Continental-Sonoita and Comoro-Pima soil associations, and are considered prime farmland only when irrigated.

Coronado National Forest Soil Classifications. USFS has classified the soil condition of the Tumacacori EMA, based on the vegetation, slope, and soil type combination, or on the watershed condition rating where the former were unavailable. Satisfactory soil condition indicates the current soil loss is below the tolerance level, and unsatisfactory soil condition indicates the current soil loss is above the tolerance level.

3.6.2.1 *Western Corridor*

The Western Corridor begins on the Comoro-Pima soil association and crosses the Bernardino-White House-Hathaway, Continental-Sonoita, and Lampshire-Chiricahua-Graham associations before separating from the Central Corridor. It continues on the Lampshire-Chiricahua-Graham association and crosses areas of the Comoro-Pima and Continental-Sonoita associations before entering the Coronado National Forest.

On the Coronado National Forest, the Western Corridor crosses primarily the Lampshire-Chiricahua-Graham association, and crosses the Caralampi-White House-Hathaway association for the remainder of the route to Nogales. The Western Corridor passes through unsatisfactory soil conditions upon entering the Tumacacori EMA from the north, then passes through satisfactory soil conditions as it turns east at Ruby Road, and exits the Tumacacori EMA near Nogales again in unsatisfactory soil conditions (USFS 2001b).

In Santa Cruz County, the Western Corridor would cross approximately 1,900 linear ft (580 m) of prime farmland soils located in the far northwest corner of the county. These soils are Comoro soils and are grouped within the Continental-Sonoita soil association. These soils are found in the area of the Sopori and Batamote Washes and are considered prime farmland only when irrigated. Some of the area of Sopori and Batamote Washes are irrigated and farmed.

Specific locations of prime farmland soils in the corridors within Pima County have not been determined. Staff from the local NRCS office indicated that there are little, if any, prime farmland soils (when irrigated) in the project area of Pima County (NRCS 2003).

3.6.2.2 *Central Corridor*

After separating from the Western Corridor, the Central Corridor continues on the Lampshire-Chiricahua-Graham association, crosses a small area of the Comoro-Pima association, and continues on the Continental-Sonoita association to the Coronado National Forest boundary, as shown in Figure 3.6–4. The soils in the Central Corridor primarily consist of gravelly sands with a high percentage of cobbles and boulders (Terracon 2002).

On the Coronado National Forest, the Central Corridor (Options 1 and 2) crosses primarily the Caralampi-White House-Hathaway association, with a short section of the Lampshire-Chiricahua-Graham association just north of the crossing of Ruby Road. The Central Corridor passes almost entirely through unsatisfactory soil conditions, as described in Section 3.6.2.1, within the Tumacacori EMA (USFS 2001b).

In Santa Cruz County, the Central Corridor would cross approximately 5,600 linear ft (1,700 m) of prime farmland soils located near Amado and Tubac. Near Tubac, approximately 1,000 linear ft (305 m) of prime farmland soils would be crossed in the vicinity of Puerto Canyon and Tubac Creek. These soils are Comoro soils and are grouped within the Continental-Sonoita soil association. In the Amado area, approximately 4,600 linear ft (1,400 m) of prime farmland soils would be crossed in the area of the Toros, Sopori, Diablo, and Las Chivas Washes. These soils are Comoro soils (grouped within the Continental-Sonoita and Comoro-Pima soil associations), and Pima soils (within the Comoro-Pima association). All prime farmland soils within the project area are considered as such only when irrigated.

Specific locations of prime farmland soils in the corridors within Pima County have not been determined.

3.6.2.3 *Crossover Corridor*

The portion of the Crossover Corridor that is not common to one of the other corridors crosses primarily the Lampshire-Chiricahua-Graham association, plus a small area of the Caralampi-White House-Hathaway association. The Crossover Corridor passes almost entirely through unsatisfactory soil conditions, as described in Section 3.6.2.1, except for the east-west crossing through Peck Canyon, where the soil conditions are satisfactory (USFS 2001b).

There are no prime farmland soils located within the Crossover Corridor, except for where it is common with the Western Corridor, as described in Section 3.6.2.1.

3.6.2.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The proposed 115-kV transmission corridor would cross the Caralampi-White House-Hathaway and Lampshire Chiricahua-Graham soil associations. These associations are briefly discussed above. These soils do not have any characteristics that would present any obstruction to standard construction techniques.

3.7 WATER RESOURCES

This section discusses the existing water resources in the project area, including surface water, floodplains, wetlands, and groundwater.

3.7.1 Floodplains, Wetlands, and Surface Water

The following discussion of surface water, floodplains, and wetlands applies to all three proposed corridors. Information specific to the Western, Central, and Crossover Corridors is presented separately following the general discussion.

Surface Water. There are numerous small perennial surface waterbodies (present at all seasons of the year) in the proposed project area, some of which would be spanned by the proposed transmission line. The largest intermittent surface water feature, the Santa Cruz River, would not be crossed by any of the three proposed corridors. The Santa Cruz River, as shown in Figure 3.7–1, flows northward from Mexico into the project area. Historical data from the U.S. Geological Survey over 76 years (water years 1913-22, 1930-95) indicate that the average discharge near Nogales is 28.3 cubic feet per second (ft^3/s) (0.801 cubic meters per second [m^3/s]), or 20,500 acre-feet per year (acre-ft/yr). The median of yearly mean discharges is 20 ft^3/s (0.57 m^3/s), or 14,500 acre-ft/yr (USGS 2001).

Northern Portion. All three proposed corridors would cross one drainage in the vicinity of land managed by the Bureau of Land Management (BLM). There are no major washes on the BLM land.

Tumacacori Ecosystem Management Area. In the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest, there are many ephemeral and three perennial streams and washes. One of the perennial streams is Sycamore Creek. A section of Sycamore Creek and its surrounding environment were nominated in 1993 as a Wild and Scenic River under the *National Wild and Scenic Rivers System Act* of 1968 (USFS 2001b). In 2004, a five-mile segment of Sycamore Canyon was determined to be eligible for the National Wild and Scenic Rivers System under the *National Wild and Scenic Rivers Act* of 1968, but it has not been designated as such. As shown in Figure 3.7–2, the proposed project (Western Corridor) crosses the Sycamore Canyon watershed, but is north of the eligible section, which is south of Ruby Road to the U.S.-Mexico border (see Figure 3.12–1). Arivaca Lake and Peña Blanca Lake, also shown in Figure 3.7–2, are man-made lakes within the Coronado National Forest, although not crossed by any of the three proposed corridors. Surface water uses within the Coronado National Forest include wildlife, livestock, recreation, mining, and domestic use.

The Forest Service (USFS) has classified the Tumacacori EMA according to a number of parameters evaluating the area's watersheds and surface water. Water quality is based on analysis of parameters such as fecal coliform, bacteria, dissolved oxygen, pH, salinity, and temperature at points downstream from the Coronado National Forest. Watershed condition and function is based on soil condition, soil productivity, riparian condition, water quality, and how water cycles through the ecosystem. Satisfactory watershed condition and function denote a watershed functioning at a sustainable desired level with no long-term changes predicted and a very low risk of management-induced deterioration. Unsatisfactory watershed condition and function would require capital investment to bring the watershed to the desired condition (USFS 2001b).

Nogales U.S.-Mexico Border Area. The proposed crossing of the U.S.-Mexico border would be the same for all three corridors. TEP's proposed project design is for the transmission line to cross the U.S.-Mexico border using monopole structures located at least 400 ft (120 m) away from the U.S.-Mexico border

(TEP 2003). No transmission line structures are proposed within 400 ft (120 m) of the U.S.-Mexico border, either in U.S. by TEP, or in Mexico by the CFE. The United States Section of International Boundary Water Commission, U.S.-Mexico (USIBWC) will not approve any construction in the United States that increases, concentrates, or relocates overland drainage flows into either the United States or Mexico. Surface drainage must be handled so that there is no increase of volume, peak runoffs, or flow concentration across the border in either direction (USIBWC 2003). Prior to construction of the selected corridor, Tucson Electric Power Company (TEP) would provide site-specific drawings to USIBWC for approval along with any hydrological or hydraulic studies for work proposed in the vicinity of the U.S.-Mexico border. This would include review of any structures proposed to be constructed in any drainage courses that cross the border. No structures are currently proposed to be constructed in drainage courses that cross the border.

Floodplains and Wetlands. Under Executive Order 11988 (May 24, 1977), *Floodplain Managemen*t, and Executive Order 11990 (May 24, 1977), *Protection of Wetland*s, Federal agencies are required to consider the impact of proposed actions on wetlands and floodplains. The Executive Orders are intended to be used by Federal agencies to implement floodplain and wetland requirements through existing procedures, such as those established to implement the *National Environmental Policy Act* of 1969 (NEPA). The U.S. Department of Energy (DOE) requirements for compliance with Executive Orders 11988 and 11990 are found in Title 10, *Code of Federal Regulations* (CFR), Part 1022, “Compliance with Floodplain/Wetlands Environmental Review Requirements.” A Floodplain and Wetland Assessment, in compliance with Title 10 CFR 1022, has been prepared and is included in Appendix C of this Draft Environmental Impact Statement (EIS). A floodplain/wetlands assessment consists of a description of the proposed action, a discussion of its effects on the floodplain and wetlands, and consideration of the alternatives.

If DOE determines that there is no alternative to implementing a proposed project in a floodplain, a brief statement of findings must be prepared. This statement of findings would include a description of the proposed action, an explanation indicating why the project must be located in a floodplain, a list of alternatives considered, measures that will be taken to comply with state and local floodplain protection standards, and a description of the steps to be taken to minimize adverse impacts to the floodplain.

Floodplains are delineated (that is, mapped and classified) by the Federal Emergency Management Agency (FEMA). When maintained in a natural state, floodplains provide valuable services by moderating the extent of flooding, thereby (1) reducing the risk of downstream flood loss; (2) minimizing the impacts of floods on human safety, health, and welfare; and (3) providing support to wetlands, fish, and wildlife. For the purposes of this assessment, the 500-year and 100-year floodplains along the Santa Cruz River and its tributaries were taken from Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), which are based on 2002 digital FIRM files for Pima and Santa Cruz counties. The FIRM files for Pima and Santa Cruz counties do not cover tribal or U.S. Forest Service (USFS) lands, and do not include delineations for a large portion of the "Southlands" area of Pima County, which are recently annexed lands in Pima County located south of Interstate-10 and east of Interstate-19. The FIRM maps indicate that the following tributaries occurring in the project area could have associated 100-year floodplains: Santa Cruz River, Sopori, Toros, Diablo, Las Chivas, Mariposa Canyon Wash, and several unnamed washes (see Figure 3.7–3, and Figures 2 through 5 in Appendix C). Delineated 500-year floodplains within the study areas are associated with the Santa Cruz River, Sopori, and Mariposa Canyon Wash. Additional unmapped 100-year and 500-year floodplains may also occur in the project area. In those areas where the 100- or 500-year floodplains have not been delineated, the county engineer or Federal agency may require the project proponent to establish the regulatory floodplain and floodway limits through a hydrologic and hydraulic study prepared by an Arizona registered professional civil engineer.

Wetlands are defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (40 CFR 230.3[t]). Wetlands serve a variety of functions within the ecosystem, including water quality preservation, flood protection, erosion control, biological productivity, fish and wildlife habitat, cultural values, aesthetic values, economic values, and scientific values.

Wetlands are a subset of waters of the United States. Waters of the United States are defined in the *Clean Water Act* (CWA) as "surface waters, including streams, streambeds, rivers, lakes, reservoirs, arroyos, washes, and other ephemeral watercourses and wetlands." Waters of the United States on the project area are under the jurisdiction of the U.S. Army Corps of Engineers (USACE), and activities that result in impacts to waters of the United States (including wetlands) must be permitted by USACE under Section 404 of the CWA. TEP is currently in consultation with USACE on a preliminary jurisdictional delineation for the South Substation. Upon final selection of an alternative, TEP would apply to USACE for either a nationwide permit or individual permit for the proposed corridor. TEP would site the transmission line structures and new access roads, to the extent feasible, such that they would span across (rather than be located within) any jurisdictional waters.

No wetlands (either within or outside of the USACE jurisdiction) were found in the proposed project corridors during field surveys conducted by Harris Environmental Group for the Biological Assessments (HEG 2003a, b, and c) and none were identified by USFS (USFS 2003). There may be small areas of potential wetlands within the proposed corridors that are associated with manmade stock ponds and impoundments; TEP would site the transmission line to avoid such areas.

3.7.1.1 *Western Corridor*

The Western Corridor would cross numerous very small dry washes and approximately 15 large washes (TEP 2001). Outside of the Coronado National Forest, the larger washes crossed, starting from west of Sahuarita and going south, include Demetries, Esperanza, Escondido, Proctor, Batamote, Sopori, and Saucito Wash as shown in Figure 3.7–1. Within the Coronado National Forest, the Western Corridor passes through the watersheds of the perennial surface waters of Sycamore, and Peck Canyons, shown in Figure 3.7–2, along with numerous smaller tributaries to these waterbodies. The following drainages are crossed by the Western Corridor in the Coronado National Forest: Alamo Canyon Creek, Pesqueria Canyon Creek, Calabasas Canyon Creek, Walker Canyon Creek, Peña Blanca Canyon Creek, Apache Canyon Creek, Murphy Canyon Creek, Lobo Canyon Creek, Sardina Canyon Creek, Sycamore Canyon Creek, and Cedar Canyon Creek. The Western Corridor approaches within 2 mi (3 km) of a total of 10 mapped springs (URS 2003a).

The USFS has classified (as described in Section 3.7.1) watershed and surface water parameters (watershed condition and function) within the Tumacacori EMA. The water quality is Satisfactory for Sycamore Canyon and the portion of the Western Corridor south of Ruby Road, and Unsatisfactory for the remaining portion of the Western Corridor north of Ruby Road. The areas with Unsatisfactory water quality also generally have Unsatisfactory watershed condition and function. Likewise, those areas with Satisfactory water quality also have Satisfactory watershed condition and function.

3.7.1.2 *Central Corridor*

The Central Corridor would cross numerous very small dry washes and approximately 14 large washes. Outside of the Coronado National Forest, the larger washes crossed, starting from west of Sahuarita and going south, include Demetries, Esperanza, Escondido, Sopori, Toros, Diablo, and Las Chivas Washes, and Tubac Creek, Aliso Canyon, and Rock Corral Canyon, as shown in Figure 3.7–1. Within the

Coronado National Forest, the Central Corridor passes through the watershed of the perennial surface waters of Peck Canyon, shown in Figure 3.7–2, along with numerous smaller tributaries. The following drainages are crossed by the Central Corridor in the Coronado National Forest: Potrero Canyon Creek, Alamo Canyon Creek, Pesqueria Canyon Creek, Bellotosa Canyon Creek, Calabasas Canyon Creek, Caralampi Canyon Creek, Agua Fria Canyon Creek, Peck Canyon Creek, Negro Canyon Creek, Tinaja Canyon Creek, Rock Corral Canyon Creek, Aliso Canyon Creek, Luback Creek, and Puerto Canyon Creek. The Central Corridor does not approach within 2 mi (3 km) of any mapped springs (URS 2003a).

USFS has classified the Tumacacori EMA according to a number of parameters evaluating the area's watersheds and surface water parameters (watershed condition and function). The water quality and watershed function is Unsatisfactory for the northern portion of the Central Corridor within the Tumacacori EMA, and is Satisfactory from just north of crossing Ruby Road to exiting the Forest near Nogales. The watershed condition is Unsatisfactory for almost the entire length of the Central Corridor within the Tumacacori EMA.

3.7.1.3 *Crossover Corridor*

The Crossover Corridor would cross numerous very small dry washes and approximately 15 large washes. Outside of the Coronado National Forest, the larger washes crossed, starting from west of Sahuarita and going south, include Demetries, Esperanza, Escondido, Proctor, Batamote, Sopori, and Saucito Wash, as shown in Figure 3.7–1. Within the Coronado National Forest, the Crossover Corridor passes through the watersheds of the perennial surface water of Peck Canyon, shown in Figure 3.7–2, along with numerous smaller tributaries. Agua Fria (Peña Blanca) Canyon is another perennial surface waterbody crossed by the Crossover Corridor in the Tumacacori EMA. The following drainages are crossed by the Crossover Corridor in the Coronado National Forest: Alamo Canyon Creek, Pesqueria Canyon Creek, Bellotosa Canyon Creek, Calabasas Canyon Creek, Caralampi Canyon Creek, Agua Fria Canyon Creek, Peck Canyon Creek, Lost Dog Canyon Creek, Pine Canyon Creek, Apache Canyon Creek, Murphy Canyon Creek, Lobo Canyon Creek, Cedar Canyon Creek, Sardina Canyon Creek, and Potrero Canyon Creek. The Crossover Corridor approaches within 2 mi (3 km) of 4 mapped springs (URS 2003a).

USFS has classified the Tumacacori EMA according to a number of parameters evaluating the area's watersheds and surface water parameters (watershed condition and function). The water quality and watershed function is classified as Unsatisfactory for the northern portion of the Crossover Corridor within the Tumacacori EMA, and is classified as Satisfactory from just north of crossing Ruby Road to exiting the Coronado National Forest near Nogales. The watershed condition has been classified as Satisfactory for the portion of the Crossover Corridor traversing Peck Canyon, and Unsatisfactory for remaining portions of the Crossover Corridor within the Tumacacori EMA.

3.7.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

There are several perennial streams and washes in or near the interconnection project area. The interconnection route parallels and crosses Mariposa Canyon Wash, which flows into Nogales Wash, located east of the Valencia Substation (see Figure 5 in Appendix C).

3.7.2 Groundwater

3.7.2.1 *Western Corridor*

The project area is located within two Active Management Areas (AMAs) for groundwater as identified by the State of Arizona, Department of Water Resources. The Santa Cruz AMA is located in the southern portion of the project area, while the Tucson AMA covers the northern part. These areas (and three others) were established to aid in the proper management of groundwater resources in Arizona.

In the Santa Cruz AMA, basin-fill sediments along the Santa Cruz River between Nogales and Amado form three aquifer units in the area. In ascending order, they are the Nogales Formation, the Older Alluvium, and the Younger Alluvium. Both of the latter alluvial units are generally unconfined and hydraulically connected, although the Older Alluvium does exhibit semi-confined and confined conditions in some places. The Nogales Formation is not a good aquifer (that is, does not produce useable quantities of water) and is best considered as “hydrologic bedrock” (ADWR 1999a).

The aquifer closest to the surface, the Younger Alluvium, is comprised of coarse-grained stream channel and floodplain deposits, and is typically found at depths from 40 to 150 ft (12 to 46 m). Hydraulic conductivities are quite large and some wells yield over 1,000 gallons per minute (3,785 liters per minute). The amount of groundwater in storage in the Younger Alluvium is estimated at 159,500 acre-ft (ADWR 1999a).

The Tucson AMA consists of two hydrogeologic subbasins; the Avra Valley Subbasin and the northern part of the Upper Santa Cruz Valley Subbasin. The uppermost aquifers in these subbasins are the Upper Alluvial Unit and the Recent Alluvial Deposits, respectively. The former is composed of silt and gravel, while the Recent Alluvial Deposits are predominately unconsolidated sand and gravel (ADWR 1999b).

Depth to groundwater in the Tucson AMA varies greatly, from less than 100 ft (30 m) to over 600 ft (183 m). In general, depths to water tend to be shallower near rivers and major washes and deeper near mountain fronts where land surface elevations are higher (ADWR 1999b).

Groundwater levels have declined substantially in the Tucson AMA in the last 50 years as a result of groundwater pumping for municipal, agricultural, and industrial uses. In some areas outside of the project area, significant land subsidence has occurred.

The amount of groundwater in storage to a depth of 1,000 ft (3,785 m) in the Tucson AMA is estimated at 12.7 million acre-ft (ADWR 1999b).

The U.S. Environmental Protection Agency (EPA) designated the aquifers in the Tucson and Santa Cruz AMAs as Sole Source Aquifers. Under this program, the aquifers present in this area are collectively referred to as the Upper Santa Cruz and Avra Basin Aquifer. The Sole Source Aquifer program was created under the *Safe Drinking Water Act* of 1974 to protect drinking water supplies in areas with few or no alternative sources to the groundwater resource.

A small number of private wells are scattered throughout the proposed project area.

3.7.2.2 *Central Corridor*

The groundwater resources described above for the Western Corridor also apply to the Central Corridor.

3.7.2.3 *Crossover Corridor*

The groundwater resources described above for the Western Corridor also apply to the Crossover Corridor.

3.7.2.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The groundwater resources described above for the Western Corridor also apply to the Interconnection Corridor.

3.8 AIR QUALITY

This section discusses the climatic regime and existing air quality in the area between Tucson and Nogales, Arizona. Because this information applies to each alternative in the same manner, including the project area of the 115-kv Gateway and Valencia Substations Interconnection, the discussion is combined rather than repeated separately for each alternative. Refer to Section 3.10.2, Corona Effects, for a discussion of potential photochemical reactions in the air surrounding transmission lines.

3.8.1 Climate

The climate in the vicinity of the project is an arid desert characterized by hot temperatures, large daily air temperature ranges, and sparse precipitation. Table 3.8–1 presents the climatological data for the Tucson area normalized over a period of 30 years.

Table 3.8–1. Climate Data for Tucson, Arizona

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature												
Average Daily Maximum Temperature (°F)	63.9	67.8	72.8	81.2	89.9	99.6	99.4	96.8	93.3	84.3	72.7	64.3
Average Daily Minimum Temperature (°F)	38.6	41.0	44.6	50.4	58.7	67.9	73.6	72.1	67.5	56.6	45.6	39.8
Average Monthly Temperature (°F)	51.3	54.4	58.7	65.8	74.0	83.8	86.6	84.5	80.4	70.4	59.2	52.0
Precipitation												
Maximum Monthly Precipitation (in)	4.81	2.90	2.26	1.66	1.11	1.46	6.17	7.93	5.11	4.98	1.90	5.02
Average Monthly Precipitation (in)	0.87	0.70	0.72	0.30	0.18	0.20	2.37	2.19	1.67	1.06	0.67	1.07
Minimum Monthly Precipitation (in)	T	0.00	0.00	0.00	0.00	0.00	0.01	0.23	0.00	0.00	0.00	0.00
Mean number of days of precipitation (0.1 in or more)	4.6	3.8	4.3	2.0	1.6	1.7	10.1	9.4	4.6	3.3	3.0	4.7
Percent of Possible Sunshine	80	82	86	92	93	93	78	80	87	88	85	79
Wind												
Mean Speed (mph)	7.9	8.1	8.6	8.9	8.8	8.7	8.4	7.9	8.3	8.2	8.1	8.3
Prevailing Wind Direction	SE	SE	SE	SE	SE	SSE	SE	SE	SE	SE	SE	SE

T = trace amount.
Source: Climate 2003.

The data show a mean annual temperature of 68.4ºF (20.2ºC) with average maximum temperatures ranging from 63.9ºF (17.7ºC) in January to 99.6ºF (37.6ºC) in June. The average annual precipitation for the period of record is 12.0 in (30.5 cm), peaking from July through September, with a second lower peak in the winter months. The average maximum precipitation ranges from 1.11 in (2.8 cm) in May to 7.93 in (20.1 cm) in August, with the minimum precipitation ranging from 0.0 in (0 cm) to 0.23 in (0.58 cm) in August. The mean number of days receiving 0.1 in (0.25 cm) or more of precipitation ranged from 1.6 days in May to 10.1 days in July. The percent of possible sunshine ranges from 78 percent to 93 percent.

The mean wind speed ranges from 7.9 mi per hour (13 km per hour) to 8.9 mi per hour (14 km per hour) with the direction of prevailing wind blowing from the southeast. Figure 3.8–1 is a "wind rose" of surface wind measurements taken in 1990 at the National Weather Station at Tucson International Airport (NOAA 2003).

The Coronado National Forest portion of each corridor is higher in elevation and has lower average temperatures and higher levels of precipitation than the rest of the corridors. For example, mean annual precipitation in evergreen woodland communities is 20 in (51 cm).

3.8.2 Air Quality

The U.S. Environmental Protection Agency (EPA) established air quality standards for six different pollutants, referred to as criteria pollutants, based on the protection of public health and the environment. These National Ambient Air Quality Standards (NAAQS) set limits for the following criteria pollutants: nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), sulfur dioxide (SO_2), lead (Pb), and inhalable particulate matter (PM_{10}), or particles with an aerodynamic diameter less than or equal to 10 microns. (The diameter of a human hair is approximately 70 microns.) In addition, in 1997 EPA finalized new air quality standards for ozone and $PM_{2.5}$ (particles with an aerodynamic diameter less than or equal to 2.5 microns). A series of legal challenges in the U.S. Court of Appeals ensued, culminating with the U.S. Supreme Court upholding the NAAQS for ozone and $PM_{2.5}$ on February 27, 2001. Based on the ambient (outdoor) levels of the criteria pollutants, EPA evaluates individual Air Quality Control Regions (AQCRs) to establish whether or not they meet the NAAQS. Areas that meet the NAAQS are classified as attainment areas, and areas that exceed the NAAQS for a particular pollutant(s) are classified as non-attainment areas for the pollutant(s). Areas that have been redesignated by EPA as attainment areas within the last 10 years are classified as maintenance areas.

There are over 100 ambient air quality monitoring sites located throughout Arizona (ADEQ 2002). These sites monitor air pollutants and other parameters on a continuous or periodic basis. The air pollutants monitored include: CO, hazardous air pollutants (metals), nitrogen oxides (NO_x), SO_2, O_3, specific Volatile Organic Compounds (VOCs), PM_{10}, and $PM_{2.5}$.

The proposed project is located within portions of Pima and Santa Cruz Counties. Table 3.8–2 shows the attainment status of the project area and vicinity. The project area is designated as being in attainment or unclassifiable for all criteria pollutants, with the exception of the Nogales area in Santa Cruz County, which is designated as a moderate non-attainment area for PM_{10}, and for which the state has set specific emissions and permitting requirements. The Tucson area is a CO maintenance area. Figure 3.8–2 shows the location of the proposed project relative to the Nogales PM_{10} non-attainment area and the Tucson CO maintenance area. EPA has not yet classified areas as being in attainment or non-attainment for $PM_{2.5}$ standards, as states are still collecting data to establish these classifications.

Table 3.8–2. Criteria Pollutant Attainment Status in the Proposed Project Area

Area	Pollutant	Attainment Status[a]
Pima County (excluding Rillito and Ajo)[b]	NO_2	Unclassifiable
	SO_2	Better than national standards
	PM_{10}	Unclassifiable
	CO	Attainment[c]
	Pb	Attainment
	O_3	Unclassifiable/Attainment
Santa Cruz County (excluding Nogales for PM_{10})	NO_2	Unclassifiable
	SO_2	Better than national standards
	PM_{10}	Unclassifiable
	CO	Unclassifiable/Attainment
	Pb	Attainment
	O_3	Unclassifiable/Attainment
Santa Cruz County – Nogales	PM_{10}	Non-attainment (moderate)

[a] Unclassifiable areas are areas that cannot be classified on the basis of available information as meeting or not meeting the NAAQS for a particular pollutant.
[b] Rillito and Ajo are non-attainment areas northwest of Tucson, outside the area of study for the proposed project.
[c] The Tucson area was redesignated as a CO attainment area in 2000 and is thus classified as a CO maintenance area.
Source: EPA 2003.

The primary sources of PM_{10} in the project area are large copper mines, traffic on unpaved roads, construction activities, and significant natural events such as windstorms. Another potential source of PM_{10} associated with the Nogales area's non-attainment status is activities on the Mexican side of the international border (Yockey 2001). The Pima County Department of Environmental Quality (PDEQ) and Arizona Department of Environmental Quality (ADEQ) monitor air quality and regulate emissions of air pollutants from industrial and commercial facilities as required under the *Clean Air Act* (CAA) and state and local regulations. Attainment and maintenance of the NAAQS in the project area are governed by a federally enforceable air quality management plan, called a State Implementation Plan (SIP).

The CAA provides special protection for visibility and other air quality related values in specially designated areas such as National Parks and Wilderness Areas, officially designated as "Class I" areas. Special visibility modeling analysis must be performed for major new sources and modifications that may affect a Class I area under the CAA's Prevention of Significant Deterioration (PSD) program. The nearest Class I area to the proposed project is the Saguaro National Monument East, an estimated 18 mi (29 km) north of TEP's South Substation in Sahuarita (Yockey 2001). See Section 3.2 for discussion of visual range.

3.9 NOISE

This section discusses the existing noise levels in the vicinity of the proposed TEP Sahuarita-Nogales Transmission Line Project and describes the basic measurements used for sound.

3.9.1 Background

With regard to this Environmental Impact Statement (EIS), noise concerns are associated primarily with construction activities. Noise is also a potential concern for the operation of transmission lines, as described in Section 3.10.2, Corona Effects. The description of the existing sound environment requires a general understanding of how sound is measured and its effects on the human environment. Because this background information applies to each alternative in the same manner, the discussion is combined rather than repeated separately for each alternative.

Noise is defined as sound that is undesirable because it interferes with speech, communication, or hearing; is intense enough to damage hearing; or is otherwise annoying. The measurement and human perception of sound involve two basic physical characteristics: intensity and frequency. Intensity is a measure of the sound energy of the vibrations, and frequency is the measure of the tone or pitch of the sound.

The physical unit most commonly used to measure sounds is the decibel (dB). The higher the energy carried by the sound, the louder the perception of that sound, and thus, the higher the dB rating of the sound. A sound level of just above 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. The dB scale is logarithmic, meaning that a 60 dB sound is not perceived as twice as loud as a 30 dB sound. Rather, a 60 dB sound is perceived as approximately twice as loud as a 50 dB sound. Humans typically can barely perceive loudness changes of less than 2 to 3 dB.

The second important characteristic of sound is its tone or frequency, which is the number of times per second the air vibrates, measured in Hertz (Hz). The human ear is most sensitive to frequencies in the 1,000 to 4,000 Hz range. To account for the variable response of the human ear to different tones, decibels may be adjusted to A-weighted decibels. The adjusted A-weighted decibels (dBA) represent the human hearing response to sound. The maximum sound levels of typical events are shown in Table 3.9–1.

In addition to measuring a single sound event, a time-average sound level can be calculated (also in dBA) to represent the average sound over a specified length of time. For the evaluation of community noise effects, and particularly construction noise effects, the Day-Night Average Sound Level (DNL) is often used. The DNL averages construction sound levels at a location over a complete 24-hour period, with a 10 dB adjustment added to those noise events that take place between 10:00 p.m. and 7:00 am. This 10 dB "penalty" represents the added intrusiveness of sounds that occur during normal sleeping hours, both because of the increased sensitivity to noise during those hours and because ambient (background) sound levels during nighttime are typically about 10 dB lower than during daytime hours.

It is important to distinguish between the measurement of a single sound event and the calculation of a time-averaged DNL, both of which are often represented in dBA. Because the DNL is a measurement of an average, a DNL of 50 dBA could result from a few noisy events or a large number of quieter events. DNL does not represent the sound level heard at any particular time, but rather represents the total sound exposure.

The U.S. Department of Housing and Urban Development established a DNL standard of 65 dBA for homes that are funded through federally guaranteed loans. In 1974, the U.S. Environmental Protection

Agency (EPA) identified noise levels that could be used to protect public health and welfare, including prevention of hearing damage, sleep disturbance, and communication disruption. Outdoor DNL values of 55 dBA were identified as desirable to protect against activity interference and hearing loss in residential areas and at educational facilities.

Table 3.9–1. Comparative A-Weighted Sound Levels

Common Outdoor Sound Levels	Sound Level (dBA)	Common Indoor Sound Levels
	110	
Jet flyover at 1,000 feet		Rock band
	100	
Gas lawnmower at 3 feet		Inside subway train
	90	
Diesel truck at 50 feet		Food blender at 3 feet
		Garbage disposal at 3 feet
Noisy urban daytime	80	
		Shouting at 3 feet
Gas lawnmower at 100 feet	70	Vacuum cleaner at 10 feet
		Normal speech at 3 feet
Commercial area	60	
Heavy traffic at 300 feet		
		Large business office
		Dishwasher in next room
	50	
		Small theater, large conference room (background)
Quiet urban nighttime	45	
		Library (background)
Quiet suburban nighttime	40	
		Bedroom at night
		Concert hall (background)
Quiet rural nighttime	30	
		Broadcast and recording studio (background)
	10	
	0	Threshold of hearing

Source: Canter 1977.

3.9.2 Western, Central, and Crossover Corridors

The proposed transmission line corridors cross primarily rural undeveloped land. Thus, current noise levels along each corridor are predominately low, typically with a DNL near 30 dBA. The DNL may increase to 45 to 60 dBA in suburban residential areas and near industry, major roads, and I-19. In wilderness locations the DNL is typically on the order of 20 dBA (Canter 1977).

All existing noise levels are below what is normally considered compatible with residential land uses and other noise impact guidelines. The primary sources of noise are (1) everyday vehicular traffic along nearby roadways, such as I-19; (2) minor construction activities related to maintenance of roadways, bridges, and the other structures and facilities; and (3) noise associated with industrial activity.

Within the Coronado National Forest, the existing noise sources are minor and are primarily associated with recreation (for example, hikers, off-road vehicle users, and picnickers at Peña Blanca Lake Recreation Area). Existing noise derived from construction and recreation is generally intermittent and highly variable depending on the time of day and year. In addition, the proposed project area, including portions of the Coronado National Forest, is part of a Military Operating Area in which the U.S. Air Force conducts periodic low-level flights.

3.9.3 115-kV Interconnection of the Gateway and Valencia Substations

Since the proposed interconnection project area consists of a mix of residential, commercial, and industrial land uses, and crosses SR 189 and I-19, the DNL ranges from 45 to 60 dBA that is typical for this setting.

3.10 HUMAN HEALTH AND ENVIRONMENT

This section discusses existing background information regarding electric and magnetic field (EMF) effects and corona effects. Because this background information applies to each alternative in the same manner, including the project area of the 115-kV Gateway and Valencia Substations Interconnection, the discussion is combined rather than repeated separately for each alternative.

Both current and voltage are required to transmit electrical energy over a transmission line. The current, a flow of electrical charge, measured in amperes (A), creates a magnetic field. The voltage, the force or pressure that causes the current to flow, measured in units of volts (V) or thousand volts (kV), creates an electric field. Both fields occur together whenever electricity flows, hence the general practice of considering both as EMF exposure.

The possibility of deleterious health effects from EMF exposure has increased public concern in recent years about living near high-voltage lines. The available data have not revealed any conclusive evidence that EMF exposure from power lines poses a hazard to animal or human health. However, while such a hazard has not been established from the available evidence, the same evidence does not serve as proof of a definite lack of a hazard. In light of the present uncertainty, this section and Appendix B contain a summary of the existing credible scientific evidence relevant to evaluating the potential impacts of EMF, as required by the *National Environmental Policy Act* of 1969 (NEPA) implementing regulations (40 CFR 1502.22).

This section also discusses the safety considerations in the immediate vicinity of transmission lines. Additionally, the potential for corona effects on the human environment from transmission lines is discussed. Corona is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors, the wires that carry electricity. Corona effects are of concern for potential radio and television interference, audible noise, and production of visible light.

3.10.1 Electric and Magnetic Fields

Magnetic Field Health Studies. The focus of the EMF health studies for power lines has been on the magnetic fields created by the power lines. Electric fields were studied in previous years, and were not found to be a concern for levels typical of power lines. A 60 Hz magnetic field is created in the space around transmission line conductors by the electric current flowing in the conductors. This is the frequency of ordinary household current, usually referred to as 60 cycle. The strength of the magnetic field produced by an electric transmission line depends on the electrical load, the configuration of the conductors (spacing and orientation), the height of the conductors, the distance from the line, and the proximity of other electrical lines. As the load on a transmission line varies continually on a daily and seasonal basis, the magnetic fields likewise vary throughout the day and year. Physical structures, such as buildings (unless of metal construction), are usually transparent to magnetic fields created by power lines (that is, buildings do not generally have a shielding effect), thus fueling the interest in potential health effects.

Existing EMF levels in the project vicinity are primarily dominated by EMF from common household appliances. EMF levels of some common household appliances are listed in Table 3.10–1. This table shows that the magnetic fields at a distance of 3 ft (1 m) range from less than 0.1 milligauss (mG) to 18 mG. Existing transmission and distribution lines also contribute to EMF levels. Figure 3.11–1 shows existing transmission lines in the project vicinity. As an example of maximum existing EMF, Tucson Electric Power Company (TEP) has modeled existing EMF levels on Bureau of Land Management (BLM) land (reference Figure 1.1–4) from the two existing transmission lines that run adjacent to the north of the proposed project. At a distance of 280 ft (85 m) south of the existing southernmost transmission line (which coincides with the proposed location of TEP's new transmission line), the existing magnetic field is 1.1 mG and the existing electric field is 0.01 kV/m. At a distance of 340 ft (104 m) south of the existing southernmost transmission line (which coincides with the southern edge of the right-of-way [ROW] of TEP's proposed transmission line), the existing magnetic field is 0.76 mG and the existing electric field is 0.006 kV/m (TEP 2003). The existing EMF level at the southern edge of the proposed ROW is below an average daily exposure to magnetic fields from some common household appliances (approximately 0.8 mG) (NIEHS 1999).

Table 3.10–1. EMF Level of Some Common Household Appliances

Appliance	**Magnetic Field at 3 ft (mG)**
Clothes dryers	0.0-1
Clothes washers	0.2-0.48
Electric shavers	Less than 0.1-3.3
Fluorescent desk lamp	0.2-2.1
Hair dryers	Less than 0.1-2.8
Irons	0.1-0.2
Portable heaters	0.1-2.5
Television	Less than 0.1-1.5
Toasters	Less than 0.1-0.11
Vacuum cleaners	1.2-18.0

Source: Waveguide 2003.

No Federal regulations have been established specifying environmental limits on the strengths of fields from power lines. However, the Federal government continues to conduct and encourage research necessary for an appropriate policy on EMF. Several states have opted for design-driven regulations ensuring that fields from new lines are generally similar to those from existing lines. For instance, Florida and New York require ROWs for new power lines 500-kV and higher to be wide enough so that the magnetic field at the edge of the ROW is equivalent to the magnetic field of lower voltage (345-kV) lines. Some states have set specific environmental limits on one or both fields in this regard. Florida and New York limit the magnetic field at the edge of a ROW to 200 mG. These limits are, however, not based on any specific health effects. Most regulatory agencies believe that health-based limits are inappropriate at this time. They also believe that the present knowledge of the issue does not justify any retrofit of existing lines.

Safety. The potential safety considerations in the immediate vicinity of electric power lines include the potential for electric shock, the clearance of the power lines aboveground, low-level military flights in the area, measures to prevent unauthorized climbing of the poles, and the proximity of the transmission lines to other utilities such as the El Paso Natural Gas Company (EPNG) pipeline. The proposed project area includes portions that are part of a Military Operating Area in which the U.S. Air Force conducts periodic low-level flights (see Chapter 10 for the U.S. Department of Energy [DOE] consultation with the U.S. Air Force).

The electric field created by a high-voltage transmission line extends from the energized conductors to other conducting objects such as the ground, towers, vegetation, buildings, vehicles, and persons. Potential field effects can include induced currents, steady-state current shocks, spark discharge shocks, and in some cases field perception and neurobehavioral responses.

- *Induced Currents* – When a conducting object, such as a vehicle or person, is placed in an electric field, currents and voltages are induced. For example, it is not unusual for a fluorescent light tube to glow in the vicinity of high voltage lines. The magnitude of the induced current depends on the electric-field strength and size and shape of the object. The induced currents and voltages represent a potential source of nuisance shocks near a high-voltage transmission line.

- *Steady-State Current Shock* – Steady-state currents are those that flow continuously after a person contacts an object, such as a vehicle, and provides a path to ground for the induced current. The effects of these shocks range from involuntary movement in a person to direct physiological harm. Steady-state current shocks occur in instances of direct or indirect human contact with an energized transmission line.

- *Spark-Discharge Shocks* – Induced voltages appear on objects such as vehicles when there is an inadequate ground. If the voltage is sufficiently high, a spark-discharge shock will occur as contact is made with the ground. Spark-discharge shocks that create a nuisance occur in instances of carrying or handling conducting objects, such as irrigation pipe, under transmission lines.

- *Field Perception and Neurobehavioral Responses* – When the electric field under a transmission line is sufficiently strong, it can be perceived by hair raising on an upraised hand. This is the effect of harmless levels of static electricity, similar to the effect of rubbing stocking feet on a carpet.

An additional safety concern in the immediate vicinity of electric power lines is the potential for climbing of poles. Poles can be designed in a manner to prevent the unauthorized climbing of the poles by members of the public. In addition, sufficient clearance height must be considered to avoid contact with the lines either directly or by contact with other objects.

The Amended “Certificate of Environmental Compatibility” issued to TEP on October 29, 2001, by the Arizona Corporation Commission (ACC) (ACC 2001), includes a provision that all transmission structures must be at least 100 ft (30 m) away from the edge of the existing EPNG pipeline ROW. TEP would follow this provision in the precise siting of the proposed project.

Smoke is a conductor of electrical current. When a fire is in the vicinity of a 345-kV transmission line, the transmission line could start fires outside the fire perimeter. From 1986 through 1999 there were 67 human-caused fires (burning 13,747 acres [5,563 ha]), and 24 lightning-caused fires (burning 5,692 acres [2,303 ha]) within the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest. Of these fires, 53 were less than 10 acres (4 ha), 23 were between 10 and 300 acres (4 and 121 ha), and 5 were over 300 acres (121 ha). The fires were dispersed throughout the EMA, with a higher concentration near high-use areas such as along Ruby Road (USFS 2001a).

3.10.2 Corona Effects

Corona is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors. Corona is of concern for potential radio and television interference, audible noise (60-cycle hum), and photochemical reactions. Corona can occur on the conductors, insulators, and hardware of an energized high-voltage transmission line. Corona on conductors occurs at locations where the field has been enhanced by protrusions, such as nicks, insects, or drops of water. During fair weather, the number of these sources is small and the corona effect is insignificant. However, during wet weather, the number of these sources increases and corona effects are much greater (DOE 2001a).

The Electric Power Research Institute (EPRI) reports that “corona and arcing activity may occur at numerous points in overhead transmission, substation, and distribution power systems. This activity may result in audio noise or radio interference complaints or indicate a defective component that may be close to failure. If the offending component can be located, it can be replaced. EPRI’s daytime corona and arcing visual inspection technology (DayCor) lets the exact position, type, and magnitude of corona activity be determined, thus enabling the identification of the offending component and the possibility of failure. DayCor observations are totally unaffected by sunlight and allow corona inspection to become part of everyday inspections" (EPRI 2001).

- *Audible Noise* – Corona-generated audible noise from transmission lines is generally characterized as a cracking/hissing noise. The noise is most noticeable during wet weather conditions. There are no noise codes applicable to transmission lines in Arizona. Audible noise from transmission lines is often lost in the background noise at locations beyond the edge of the ROW. Refer to Section 3.9, Noise, for a complete description of existing noise in proposed project area.

- *Radio and Television Interference* – Corona-generated radio interference is most likely to affect the amplitude modulation (AM) broadcast band (535 to 1,605 kilohertz); frequency modulation (FM) radio is rarely affected. Only AM receivers located very near to transmission lines have the potential to be affected by radio interference. The potential for interference from corona effects is more severe during damp or rainy weather.

- *Visible Light* – Corona may be visible at night as a bluish glow or as bluish plumes. On the transmission lines in the area, the corona levels are so low that the corona on the conductors usually is observable only under the darkest conditions with the aid of binoculars.

- *Photochemical Reactions* – When coronal discharge is present, the air surrounding the conductors is ionized and many chemical reactions take place producing small amounts of ozone and other oxidants. Approximately 90 percent of the oxidants are ozone, while the remaining 10 percent are composed principally of nitrogen oxides. Refer to Section 3.8, Air Quality, for a complete description of existing air quality.

3.11 INFRASTRUCTURE

This section discusses the existing infrastructure in the project area, including utilities and facilities. Also discussed are current waste management issues. Roads are discussed in Section 3.12, Transportation. Because this background information applies to each alternative in the same manner, including 115-kV Gateway and Valencia Substations Interconnection project area, the discussion is combined rather than repeated separately for each.

3.11.1 Utilities and Facilities

Figure 3.11–1 depicts the existing utility infrastructure in the project area. Tucson Electric Power Company's (TEP's) existing South Substation is located at 500 East Pima Mine Road (Section 36, Township 16 South, Range 13 East). The site is an estimated 26.4 acres (10.7 ha) and is wholly within the incorporated town of Sahuarita, Arizona. Two existing transmission lines provide most of the power to the substation: a 345-kV transmission line from Westwing Substation near Phoenix enters from the west and another 345-kV line from Springerville, via Vail Substation, enters from the east. The proposed project would utilize existing power on the Western electric grid, and would not require development of new power generating facility or the expansion of the Palo Verde Nuclear Generating Station located approximately 50 mi (80 km) west of Phoenix, Arizona.

TEP currently has two transmission lines in the Sahuarita area both of which cross Federal land managed by the Bureau of Land Management (BLM): 345-kV and 138-kV. Arizona Electric Power Company has three transmission lines in the Sahuarita area: 345-kV, 230-kV, and 115-kV. The remaining transmission line in the area belongs to TRICO Electric Cooperative, Inc., and is a 69-kV line. Citizens Communications Company (Citizens) has a 115-kV transmission line from the vicinity of Sahuarita to Nogales, Arizona. An electrical distribution line runs east from Peña Blanca Lake Recreational Area following Ruby Road and exiting National Forest System land.

There are facilities at Peña Blanca Lake including a boat launch, fishing dock, picnic area, and a campground at Calabasas Group Area.

An El Paso Natural Gas Company (EPNG) pipeline is present in the project area. It is buried within a 50-ft (15-m) right-of-way (ROW) and runs from Nogales west of Interstate 19 (I-19) to just west of Sahuarita. This pipeline, shown in Figure 3.11–1, is 6 in (15 cm) in diameter and transports natural gas at a pressure of 650 lbs/in^2 (46 kg force/cm^2), delivering approximately 500,000 ft^3 (14,158 m^3) per day. There is a road of varying width above portions of the pipeline. A railroad line also runs between Nogales and Sahuarita as shown in Figure 3.11–1.

3.11.2 Waste Management

TEP's existing South Substation generates minor quantities of municipal waste, usually limited to paper and plastic wrapping materials from new equipment. Municipal waste generated is disposed of in an approved county landfill. No hazardous waste is generated from substation operation.

There are no significant waste management issues associated with the existing transmission lines in the area. There are several solid waste disposal facilities located in the project area. The Los Reales Solid Waste Facility is in Pima County, about 8 mi (13 km) north and 4 mi (6.4 km) east of the South Substation. Two solid waste landfills are located near the proposed Central Corridor: the northern most is in Section 25, Township 20 South, Range 12 East and is an estimated 0.75 mi (1.2 km) south of Amado; the southerly landfill is in the NW4 of Section 16, Township 22 South, Range 13 East, an estimated 1.6 mi (2.6 km) east of the Central Corridor.

3.12 TRANSPORTATION

This section discusses the existing transportation system in the vicinity of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line proposed project. The discussion includes a description of the existing roads and access for each alternative corridor in Pima and Santa Cruz Counties, and quantification of existing traffic patterns. Figure 3.11–1 shows most of the roads and railroad lines in the vicinity of the project.

On a Forest-wide basis, Forest Plan Amendment No. 8 (June 1996, replacement page 34) limits the density of existing roads and new road construction to one mile of road or less per square mile. Existing road density on the CNF is not easy to calculate accurately at this time due to the proliferation of unclassified roads on the Forest and the lack of validation of the geo-spatial data and the tabular data. As area and project scale road analyses are conducted in the future, geo-spatial and tabular data will be refined, and a more precise calculation of density can be obtained. Using the current data contained in the tabular INFRA database, the road density on the Coronado can be approximated to be between 0.8 and 1.1 miles per square mile.

This estimate was calculated in the following way: Using the gross land area of 1,788,266 acres (*FS 383 – Land Areas as of 9/2000*) and the 3035.21 total miles in the inventory, density is calculated to be 1.1 miles/mi^2 This calculation does not discount the private lands within the forest boundaries and it includes some roads outside the boundary. Using the area of National Forest System Lands of 1,717,857 acres and 2187.25 miles of FS jurisdiction road in the inventory, density is calculated to be 0.8 miles/mi^2. This calculation does not include non-Forest Service jurisdiction roads within the Forest boundary. Of course, neither of these calculations takes into consideration unclassified roads, which are known to exist on the Forest, especially on the districts bordering Mexico.

Unclassified roads, some of which are referred to as “wildcat” roads, are user-created roads not likely needed to meet Forest resource management objectives. Such roads are not considered part of the official Forest transportation system. These roads pose the greatest threat to public safety and contribute most to environmental degradation because they were not designed or constructed to any acceptable standards. Decommissioning of these roads will require roads analysis per FSM 7712.12b. The unclassified road inventories will be conducted using existing data and other readily available sources of information, such as aerial photographs, as allowed by FSM 7712.14 (see USFS 2003a for additional information).

3.12.1 Western Corridor

As shown in Figure 1.1–4, Interstate 19 (I-19) is the primary continuous transportation link running north to south between Sahuarita and Nogales, with approximately 70 exits to collector roadways. In addition, the transportation system in the proposed project vicinity consists of ranch trails and graded dirt roads that provide access to cattle tanks, are utilized for construction and maintenance of existing utility rights-of-way (ROWs), or are utilized for fire suppression.

The three exits from I-19 that would be the primary points of access to the Western Corridor mobilization and reporting sites are (1) Pima Mine Road exit in Sahuarita to access the South Substation, (2) Arivaca Road exit in Amado for the central access point, and (3) Mariposa Road exit to access the southern mobilization yard at the Gateway Substation in Nogales. The average daily traffic numbers for the year 2000 on I-19 at the segment north of Mariposa Road (milepost 2.95) are 18,744 vehicles, at the Arivaca Road exit (milepost 30.95) are 17,919 vehicles, and at the Pima Mine Road exit (milepost 49.62) are 25,271 vehicles. The percentage of commercial traffic is fairly uniform, at approximately 10.5 percent (ADOT 2000).

Access to the proposed ROW within the Western Corridor would be on existing utility maintenance roads, ranch access roads and trails, and new access ways where no access currently exists. Access to the South Substation would be on existing electric utility maintenance dirt roads. On non-Federal land west of I-19, access to the Western Corridor would be from paved section line roads and along short dirt radial trails that range in length from 75 ft (23 m) to 200 ft (60 m).

On the land managed by the Bureau of Land Management (BLM), west of Sahuarita, an existing access road to TEP's 345-kV Westwing-South transmission line would be utilized by turning off Mission Road. In this area, two short access road segments would be developed for construction of the transmission line. The first new access road, located west of Mission Road, would provide access to four structure sites and would be an estimated 0.63 mi (1.0 km) in length. The second would provide access to one pole east of Mission Road and would be an estimated 0.13 mi (0.21 km) in length. These two new access road segments would be an estimated 12 ft (3.7 m) wide and would primarily provide adequate clearance for delivery of long pole segments in an area that has steep inclines on the existing access road. Access to the remaining structures on BLM land would be accomplished by creating spurs to each structure from the existing access road, totaling an estimated 0.14 mi (0.23 km) (TEP 2003).

Upon reaching Continental Road west of Green Valley, the Western Corridor joins the El Paso Natural Gas Company (EPNG) pipeline ROW. At this point, the paved road to the south has a series of access points to the EPNG pipeline ROW which would be used as much as possible to access the proposed structure locations. As the Western Corridor turns to the southwest, the access points would be coordinated with the operations of the land owner and would be sited on previously disturbed terrain as much as possible, including many dirt trails which have been established by ranching and hunting interests over the past 50 years. In the vicinity of Amado and south of Arivaca Road, the ROW access would shift to the Arivaca Road mobilization site and utilize the same trail access as much as possible. Radial access trails or paths to structures would cross open desert scrub and avoid trees and shrubs where feasible.

Within the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest, approximately 320 mi (515 km) of Forest Service (USFS) classified roads exist, both paved and unpaved (USFS 2001b). Classified roads are those under the jurisdiction of USFS that are determined to be necessary for the protection, administration, and use of the National Forest System land and are intended for long-term use. Classified roads are inventoried, maintained, and managed by USFS. In addition to USFS classified roads there are unclassified roads, known as wildcat roads, which are roads on National Forest System lands that are not needed and not managed as part of the USFS transportation system. Unclassified roads include unplanned roads, abandoned travelways, off-road vehicle tracks which have not been designated and managed as a trail, and those roads no longer under permit or authorization. Wildcat roads have resulted from the increasing numbers of users on Coronado National Forest. Because most wildcat roads have not been subjected to the USFS planning process, and therefore may not meet technical or environmental protection standards, they may pose a threat to both the environment (for example, increased sedimentation in riparian corridors) and to user safety (URS 2003a).

There are approximately 31 vehicular access points to the EMA. Ruby Road, a USFS classified road, is one of the primary access points. The current configuration of the road system serves as a "limiter" to the EMA in accordance with the Forest Plan (USFS 1986). The Forest Plan gives direction to "Limit density of existing and new road construction to one mile of road or less per square mile" (0.62 km of road per km^2); USFS has indicated that current road density is estimated to be near this level (USFS 2001b). Within the vicinity of the Western Corridor, approximately 54 percent of the existing roads are wildcat roads, with the remaining 46 percent being USFS classified roads (URS 2003a).

Figure 3.12–1 shows existing roads within the Tumacacori EMA, some of which would provide access to the Western Corridor. This inventory of existing roads is based on the Roads Analysis (RA) for the proposed project for which data were obtained from USFS, agency and public input; interpreted from recent aerial imagery; and documented during extensive field reviews (URS 2003a). Below is a description of the USFS Road Maintenance Levels for the existing roads shown in Figure 3.12–1.

USFS Road Maintenance Levels

- Level 1 Roads: Closed for more than one year to motorized use, but may be open for non-motorized use. Roads are physically closed (for example, with gates) and have basic maintenance such as drainage facilities, but dirt surfaces.
- Level 2 Roads: Open for use by high-clearance vehicles, with normally minor traffic including dispersed recreation uses, with dirt surfaces.
- Level 3 Roads: Open and maintained for low-speed, single lane driving in standard passenger cars, with either native (dirt) or processed material (for example, gravel) surfaces.
- Level 4 Roads: Open for moderate travel speeds in standard passenger cars, typically with smooth aggregate surfaces and double lanes.
- Level 5 Roads: Roads maintained to the highest standards. Provide a high level of user comfort, and are typically double lane paved facilities.

Figure 3.12–1 shows there is an existing network of Level 2 and wildcat roads on the west side of the Tumacacori Mountains. The yellow markers on the map indicate locations where minor repairs, such as repairing erosion damage, breaking rocks, removing brush, or reducing a hump, would be necessary for project construction. Where the Western Corridor runs along Ruby Road, this graded gravel Level 3 road would provide primary construction access. East of Peña Blanca Lake, Ruby Road becomes a Level 4 paved asphalt two-lane road heading northeast for 9.5 mi (15 km) to I-19. As Ruby Road bears to the northeast away from the proposed ROW, the access would be indirect using existing wildcat roads that follow the canyons which intersect the proposed ROW.

The Western Corridor joins the Central and Crossover Corridors, and the EPNG pipeline ROW, where the access again would follow the pipeline access dirt road. At the point the corridors separate from the EPNG pipeline ROW (approximately 0.75 mi [1.2 km] west of the proposed Gateway Substation), project access would be primarily on existing dirt trails in the area. Public roads within Nogales would be utilized to access the structures from the Gateway Substation to the U.S.-Mexico border.

3.12.2 Central Corridor

The primary points of access along the Central Corridor would be similar to those for the Western Corridor. The Central Corridor parallels the Western Corridor from the South Substation to the point where the Western Corridor separates from the EPNG pipeline ROW. Continuing to follow or cross the EPNG pipeline ROW, access to the Central Corridor would be on existing pipeline access trails, many of which would require upgrade to meet TEP's construction needs. There are several washes where the access for the proposed ROW may diverge from the pipeline ROW access to reduce the need for grading and mitigate impact to the wash areas.

To the south of Arivaca Road near Amado, the Central Corridor access would be from I-19 and the frontage roads which access the ranch or canyon roads leading to the pipeline ROW. The existing dirt access roads would be used wherever possible.

Within the Tumacacori EMA, as shown in Figure 3.12–1, existing Level 2 roads and wildcat roads would provide access to a majority of the Central Corridor. This would continue as the preferred method of access to the point where the Central Corridor rejoins the Western Corridor west of Nogales. Within the vicinity of the Central Corridor, approximately 65 percent of the existing roads are wildcat roads, with the remaining 35 percent being USFS classified roads (URS 2003a).

Access to the three overlapping corridors from the point of overlap to Nogales and the U.S.-Mexico border would be the same as described for the Western Corridor.

3.12.3 Crossover Corridor

The primary points of access along the Crossover Corridor would be similar to those for the Western Corridor. The Crossover Corridor parallels the Western Corridor from the South Substation to the point within the Tumacacori EMA where the Crossover Corridor turns east at Peck Canyon, and access in this common segment would be as described above for the Western Corridor. Within Peck Canyon on the segment unique to the Crossover Corridor, existing access is limited to wildcat roads. This area is within an IRA, as described in Section 3.1, Land Use. Upon joining with the EPNG pipeline ROW and Central Corridor, access to the Crossover Corridor would be on existing pipeline access trails. This would continue as the preferred method of access to the point where the Crossover Corridor rejoins the Western Corridor west of Nogales. Within the vicinity of the Crossover Corridor, approximately 58 percent of the existing roads are wildcat roads, with the remaining 42 percent being USFS classified roads (URS 2003a).

Access to the three overlapping corridors from the point of overlap to Nogales and the U.S.-Mexico border would be the same as described for the Western Corridor.

3.12.4 115-kV Interconnection of the Gateway and Valencia Substations

The majority of the proposed 115-kV transmission line interconnection passes through lands classified by Arizona Department of Transportation (ADOT) as planned Transportation Corridor areas. There are a number of existing arterial roads including I-19, US 89, and Mariposa Road (Highway 189) within the project area. The proposed interconnection crosses both Mariposa Road and I-19.

3.13 MINORITY AND LOW-INCOME POPULATIONS

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629, 16 February 1994), directs each Federal agency to "make…achieving environmental justice part of its mission" and to identify and address "…disproportionate high and adverse human health or environmental effect of its programs, policies, and activities on minority and low-income populations." The Presidential Memorandum that accompanies EO 12898 emphasized the importance of using existing laws, including the *National Environmental Policy Act* (NEPA), to identify and address environmental justice concerns, "including human health, economic, and social effects, of Federal actions."

The Council on Environmental Quality (CEQ), which oversees the Federal government's compliance with EO 12898 and NEPA, has subsequently developed guidelines to assist Federal agencies in incorporating the goals of EO 12898 into the NEPA process. This guidance, published in 1997, was intended to "…assist Federal agencies with their NEPA procedures so that environmental justice concerns are effectively identified and addressed" (CEQ 1997a). Pursuant to EO 12898, this section identifies possible minority or low-income populations that might be subject to disproportionately high and adverse environmental impacts or health effects from the proposed Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project.

Methodology

The following discusses the methodology that the U.S. Department of Energy (DOE) used to identify possible minority and low-income populations in the project area.

Minority Populations. Environmental justice guidance defines "minority" as individual(s) who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic (CEQ 1997a). The Council identifies these groups as minority populations when either (1) the minority population of the affected area exceeds 50 percent or (2) the minority population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or appropriate unit of geographical analysis.

For this Environmental Impact Statement (EIS), DOE followed the environmental justice methodology used in the Durango Area Drainage Master Plan (ADMP) that was prepared for the Flood Control District of Maricopa County, Arizona, and submitted to the Federal Emergency Management Agency and the U.S. Army Corps of Engineers (Dibble 2000). This methodology is based on CEQ's definition of minority populations, and expands upon the second criterion above by defining a "meaningfully greater" minority population if:

- It has proportions of ethnic minority groups that are at least an additional 10 percent greater than that tabulated for the United States in the 2000 census (i.e., minority percentage plus an additional 10 percent). Using this formula, the following are the specific ethnic minority thresholds used for this evaluation: (1) African American – 22.3 percent or greater, (2) American Indian, Eskimo, Aleut – 10.9 percent or greater, (3) Asian, Pacific Islander – 13.7 percent or greater, (4) Persons of Hispanic Origin – 22.5 percent or greater, and (5) Other race – 15.5 percent or greater (Census 2000d).

Since the Durango ADMP project was located in one of the most disadvantaged sections of Phoenix, Arizona, and the Durango ADMP was accepted by several Federal agencies, DOE determined that the Durango ADMP environmental justice methodology would be suitable for this EIS.

Applying the previously discussed criterion to identify minority populations, the following section details the minority composition of the area in close proximity to the proposed transmission corridors utilizing census block group data (data available from the 2000 Census that divide counties into census block groups for analysis).

Low-Income Populations. Environmental justice guidance defines "low-income" using statistical poverty thresholds from the Bureau of Census Current Population Reports, Series P-60 on Income and Poverty, by household (Census 2001). In identifying low-income populations, a community may be considered either as a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effects.

For this EIS, DOE followed the environmental justice methodology used in the Durango ADMP (Dibble 2000), for the reasons previously discussed. The methodology for identifying low-income populations in the Durango ADMP is based on CEQ's definition of low-income households, and establishes a threshold above which a population is considered to be a low-income population if:

- It has proportions of low-income households that are at least an additional 10 percent greater than that tabulated for the United States in the 2000 Census (i.e., incomes less than or equal to the official 2000 poverty rate of $17,463 for a family of four). Using this formula, the specific low-income threshold used for this evaluation is 23.3 percent (i.e., the national poverty level of 13.3 percent plus an additional 10 percent) (Census 2000d).

Applying the above criterion to identify low-income populations, the following section details the low-income composition of the area in close proximity to the proposed transmission corridors utilizing census block group data (similar to the Durango ADMP) from the 2000 Census.

3.13.1 Western, Central, Crossover Corridors, and 115-kV Interconnection of the Gateway and Valencia Substations

Figures 3.13–1 and 3.13–2 present the census block groups in the project area and identify which of these census block groups have meaningfully greater minority and low-income populations, respectively. (Figure 3.13–3 shows the detail of block group boundaries for populated areas.) Tables 3.13–1 and 3.13–2 present the census block group data for Pima County and Santa Cruz Counties, respectively, that DOE used to prepare Figures 3.13–1 and 3.13–2. As shown in these figures, ten census block groups are intersected by the Central Corridor, and eleven census block groups are intersected by the Western and Crossover Corridors. Four of the intersected census block groups are in Santa Cruz County, and the remaining intersected census block groups are in Pima County.

Figure 3.13–1 shows that five of the intersected census block groups for the Central Corridor, and six of the intersected block groups for the Western and Crossover Corridors, exceed the meaningfully greater minority population percentage (of 22.5 percent for Hispanics, or of 10.9 percent of American Indians in the case of the block group on the San Xavier District Tohono O'Odham Reservation). None of the census block groups exceed the meaningfully greater minority population percentages for other minorities listed in the Methodology section.

Figure 3.13–2 shows that the one census block group that is intersected by all three proposed corridors exceeds the low-income population threshold value of 23.3 percent of households.

Table 3.13–1. Pima County Census Block Groups On and Near the Corridors

Block Group ID	Total Pop	One Race: White	One Race: African American	One Race: American Indian	One Race: Asian	One Race: Pacific Islander	One Race: Other	Two or More Races	Hispanic: Non-Hispanic	Hispanic: Hispanic	Below Poverty Level	Intersect Corridor?: Western	Intersect Corridor?: Crossover	Intersect Corridor?: Central	Percent Minority[a]	Percent Below Poverty Level
9409001	1940	548	0	1294	0	0	16	82	1502	438	479				67%	25%
0043131	4701	3241	64	70	15	0	1108	203	2804	1897	1050				40%	22%
0041091	1588	1386	15	77	8	0	78	24	1342	246	60				15%	4%
0041061	7804	4818	647	285	19	13	1538	484	4045	3759	892				48%	11%
0043163	1247	1091	0	24	5	0	70	57	908	339	260	Y	Y		27%	21%
0043162	366	362	0	0	0	0	4	0	359	7	72	Y	Y	Y	2%	20%
0043142	526	377	0	12	0	0	134	3	293	233	53	Y	Y	Y	44%	10%
0043161	753	612	0	40	0	0	93	8	577	176	55	Y	Y	Y	23%	7%
0043164	1513	1170	0	0	16	0	226	101	702	811	304	Y	Y	Y	54%	20%
0041071	2944	2562	27	64	14	0	206	71	2203	741	304				25%	10%
0041081	2411	2109	12	3	0	0	217	70	1713	698	244				29%	10%
0043141	3073	2805	4	7	27	0	179	51	2433	640	182				21%	6%
0043181	1226	1142	0	0	0	0	24	60	1122	104	72				8%	6%
0043171	839	839	0	0	0	0	0	0	839	0	34				0%	4%
0043071	1144	1113	5	0	4	0	22	0	1084	60	26				5%	2%
0043172	859	859	0	0	0	0	0	0	838	21	18				2%	2%
0043182	2025	2020	0	0	5	0	0	0	1952	73	39				4%	2%
0043183	1024	987	0	14	0	0	0	23	1004	20	47				2%	5%
0041072	145	141	0	0	3	0	0	1	121	24	27				17%	19%
0043072	733	733	0	0	0	0	0	0	721	12	6				2%	1%
0043173	1223	1195	7	0	0	0	13	8	1196	27	52				2%	4%
0043151	2349	2313	0	5	10	0	17	4	2227	122	26	Y	Y	Y	5%	1%
0043152	2666	2656	0	0	0	0	0	10	2646	20	70				1%	3%
0043184	718	714	0	0	0	0	4	0	709	9	0				1%	0%
0043073	772	772	0	0	0	0	0	0	723	49	15				6%	2%
0043074	649	649	0	0	0	0	0	0	642	7	46				1%	7%
0043153	982	953	17	0	0	0	12	0	964	18	50				2%	5%

[a]Percent minority is based on percent Hispanic, as this is the largest minority, except in Block Group 9409001 on the San Xavier District Tohono O'Odham Reservation, where American Indians are the largest minority.
Source: Census 2000d.

Table 3.13–2. Santa Cruz County Census Block Groups On and Near the Corridors

Block Group ID	Total Pop	One Race: White	One Race: African American	One Race: American Indian	One Race: Asian	One Race: Pacific Islander	One Race: Other	Two or More Races	Hispanic: Non-Hispanic	Hispanic: Hispanic	Below Poverty Level	Intersect Corridor?: Western	Intersect Corridor?: Crossover	Intersect Corridor?: Central	Percent Minority[a]	Percent Below Poverty Level
9960001	858	792	4	8	3	0	34	17	748	110	42				13%	5%
9960002	854	763	0	13	3	0	67	8	541	313	214				37%	25%
9960003	318	272	0	4	0	0	25	17	245	73	61				23%	19%
9961011	402	339	0	0	13	0	26	24	297	105	65	Y	Y	Y	26%	16%
9961012	598	598	0	0	0	0	0	0	587	11	19	Y	Y	Y	2%	3%
9961013	766	627	0	16	0	8	108	7	335	431	73				56%	10%
9961021	5375	3692	67	15	44	0	1337	220	1441	3934	532				73%	10%
9961022	5900	3862	12	32	163	0	1681	150	914	4986	803	Y	Y	Y	85%	14%
9961023	1278	930	0	0	17	0	320	11	57	1221	448				96%	35%
9961024	322	296	2	0	0	0	22	2	149	173	22				54%	7%
9962001	296	289	0	0	0	0	0	7	26	270	85	Y	Y	Y	91%	29%
9962002	2627	2122	0	10	0	0	484	11	100	2527	1210				96%	46%
9963001	889	687	0	0	2	0	200	0	134	755	120				85%	13%
9963002	2872	2143	11	0	0	0	634	84	103	2769	554				96%	19%
9963003	1546	1212	0	0	0	0	334	0	38	1508	564				98%	36%
9963004	2425	1670	12	8	8	0	705	22	131	2294	1207				95%	50%
9964011	1529	1249	0	0	0	0	149	131	103	1426	392				93%	26%
9964012	2116	1566	5	14	17	0	438	76	69	2047	766				97%	36%
9964021	2274	1793	0	54	39	0	319	69	237	2037	637				90%	28%
9964022	2725	2055	6	58	0	0	529	77	91	2634	1279				97%	47%

[a]Percent minority is based on percent Hispanic, as this is the largest minority.
Source: Census 2000d.

This chapter describes the potential environmental effects, or impacts, of Tucson Electric Power Company (TEP) constructing the proposed project in one of its three proposed transmission corridors, and also describes the No Action Alternative. The Council on Environmental Quality's (CEQ's) regulations require that an Environmental Impact Statement (EIS) contain a description of the environmental effects (both positive and negative) of the proposed alternatives. CEQ's regulations (40 CFR 1508.8) distinguish between direct and indirect effects. Direct effects are caused by an action and occur at the same time and place as the action. Indirect effects are reasonably foreseeable effects caused by the action that occur later in time or farther in distance. Both direct and indirect effects are addressed in this chapter.

CEQ's regulations also require that an EIS contain a description of the cumulative impacts (40 CFR 1508.7) of the proposed alternatives. CEQ's regulations define cumulative impacts as those that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts are addressed in Chapter 5 of this Draft EIS.

As discussed in Chapter 3, many people have a holistic concern for the natural beauty, undisturbed landscape features, abundant plant and animal wildlife, and cultural resources that contribute to the "sense of place" along portions of the alternative transmission corridors. Clearly, the natural and cultural characteristics that contribute to this sense of place transcend the consideration of individual resource areas in a NEPA document. However, in order to analyze potential impacts effectively and document the analysis, it is necessary to consider the resource areas individually. Thus, the discussion of potential impacts in this chapter is divided into distinct resource areas.

This chapter presents information on the potential environmental effects on land use and recreation, visual resources, biological resources, cultural resources, socioeconomics, geology and soils, water resources, air quality, noise, human health and environment, infrastructure, transportation, and minority and low-income populations. Note that impact discussions for the Central and Crossover Corridors are based on detailed analysis of Option 1, the sub-route that avoids the Inventoried Roadless Area in the Coronado National Forest. However, for most resource areas (visual resources, socioeconomics, water resources, air quality, noise, human health, infrastructure, and environmental justice), no potential for differences in impacts between Options 1 and 2 has been identified. Differences between the sub-routes are discussed for those resource areas where there is a potential for meaningful differences in impacts.

4.1 LAND USE AND RECREATION

This section discusses the potential effects of the proposed project on land use and recreation in the project vicinity. The methodology for determining impacts is presented, along with a description of the impacts for each alternative.

4.1.1 Land Use

Methodology

The land use resource impact analysis consists of an evaluation of the effects caused by the construction and operation of the proposed alternatives on specific land use resources and recreational resources within the vicinity of the project. Impacts to land use are determined relative to the context of the affected environment for each alternative described in Section 3.1.

To determine if an action may cause a significant impact, both the land area displaced by the transmission line right-of-way (ROW) and the compatibility of transmission line ROW with land use plans are considered. Land use impacts associated with construction of new access roads and improvement to existing roads are described in Section 4.12, Transportation. The context for the project is the area along each corridor from Sahuarita to Nogales, continuing south to the international border. Special consideration is given to any unique characteristics of the area (for example, recreational opportunities or resource conservation zones), and the degree to which the project may adversely affect such unique resources. The land use evaluation includes both temporary land use impacts during construction and permanent changes to land use resources.

Impacts Common to the Western, Central and Crossover Corridors

The following potential land use impacts are common to all three proposed corridors. The existing TEP South Substation in Sahuarita, located as shown in Figure 1.1–4, would be upgraded and expanded approximately 100 ft (30 m) beyond the existing fenceline, impacting an area of an estimated 1.3 acres (0.53 ha). A new Gateway Substation, with a total graded area of approximately 18 acres (7.3 ha) would be constructed west of Nogales, Arizona, located as shown in Figure 1.1–4. For the Gateway and South Substations, the equipment area would be fenced with a locked gate, and the area outside the fence would be revegetated with native plants following construction. The existing gravel parking area at the South Substation, and a new gravel parking area at the Gateway Substation, would serve as the construction staging areas (TEP 2001). In addition, one estimated 0.5-acre (0.2-ha) fiber-optic regeneration site would be required, which would be placed on private land in the area of Township 18 South, Range 12 East, approximately 10 mi (16 km) southwest of Sahuarita, for any proposed corridor. A temporary construction laydown yard of approximately 80 acres (32 ha) would be sited near the Arivaca Road and Interstate 19 (I-19) interchange on previously disturbed land, and three temporary 3-acre (1.2-ha) staging areas would also be required, as described in Section 2.2.3, Transmission Line Construction. Temporary line tensioning and pulling sites ranging from 0.5 to 1.5 acres (0.2 to 0.6 ha) would also be required along the corridor, as described in Sections 2.1.1 through 2.1.3 for each corridor.

The proposed project would utilize primarily self-weathering steel tubular monopoles, depicted in Figure 1.1–3. Dulled, galvanized steel lattice tower structures, depicted in Figure 1.1–4, would be used in specific locations for engineering reasons to minimize overall environmental impacts (for example, to soils or archeological sites), in accordance with Arizona Corporation Commission (ACC) Decision No. 64356 (ACC 2002) (as explained in Section 2.2.3). Monopoles occupy less acreage at the foundation than lattice towers. However, the typical span between lattice tower structures is 1,000 to 1,200 ft (305 to 355 m), compared to 800 to 900 ft (244 to 275 m) between monopoles, thus requiring fewer lattice tower structures to support a given distance of transmission line route. For the proposed project, the distance between transmission line structures would be between 600 and 1,200 ft (183 and 366 m), with spans generally shorter at the substations and interconnection points. Three slight variations of the monopole (the tangent structure, the turning structure, and the dead-end structure) that are visually very similar to the monopole in Figure 1.1–1 would be used at various points along the route based on the turning angle of the transmission line and the elevation change between towers. Likewise, a slight variation of the lattice tower structure (the turning structure) that is visually similar to Figure 1.1–4 would be used at various points along the corridor.

The final footprint (area beneath each tower) of each monopole is 25 ft^2 (2.3 m^2); the final footprint of each lattice tower is approximately 3,600 ft^2 (334 m^2). The tower construction site required for each monopole is an approximately 100 ft (30 m)-radius circle, and for each lattice structure is a 200 by 400 ft (61 by 122 m) area, more than double the construction area required for monopoles. Assuming that primarily monopoles are used, the approximate number of structures and land displaced by structures and structure construction sites has been estimated for each proposed corridor. These estimates, listed in Table

4.1–1, are broken down to distinguish land use impacts on the Coronado National Forest and Federal lands managed by the Bureau of Land Management (BLM) separately, and are described in the text for each corridor. In addition to the area disturbed by the footprint of the tower structures, the area to be disturbed by access roads, transmission line tensioning and pulling sites, fiber-optic splicing sites, and laydown yards is addressed separately in Section 4.12, Transportation, and is not reflected in the structure site disturbance estimates in Table 4.1–1.

Table 4.1–1. Approximate Structure Land Use.[a]

	Number of Structures	Structure Construction Site Area (acres)	Final Structure Footprint Area (acres)
For Entire Corridor			
Western Corridor	429	309	0.25
Central Corridor	373	269	0.21
Crossover Corridor	431	311	0.25
On the Coronado National Forest			
Western Corridor	191	138	0.11
Central Corridor	102	74	0.06
Crossover Corridor	196	141	0.11
On BLM Land			
Western, Central, and Crossover Corridors	8	5	0.004
Non-Federal Land			
115-kV Interconnection	20	14	0.012

[a] Land use area does not include structure access roads. See Section 4.12, Transportation.

Northern Portion. Several areas along the common northern area of all three corridors have unique designations in local land use plans. The Pima County Comprehensive Plan (Pima 2003) indicates a Resource Productive Zone intermixed with Low Intensity Rural in the area west of I-19 near Sahuarita. Resource Productive Zones designate cultivated ranching and mining lands for their productive capabilities. Approximately 6 mi (10 km) north of Arivaca Road, the corridors cross a Resource Conservation Zone designed to protect open land space for environmental quality, public safety, recreation, and cultural heritage. Given the limited area of land to be used by the proposed project, the proposed project would not be expected to interfere with these unique land uses.

The proposed corridors do not cross any Indian reservations or lands reserved under treaty rights by Native American nations, tribes, or communities. The San Xavier District of the Tohono O'Odham Nation is located approximately 1 mi (1.6 km) north of the proposed corridors as they exit the South Substation.

The BLM lands crossed by the proposed project are designated as disposal land under the current Resource Management Plan. The land crossed by the proposed project would need to be redesignated to a utility corridor as described in Section 1.2.2, Federal Agencies' Purpose and Need and Authorizing Actions. TEP applied to BLM for ROW rights on an estimated 19 acres (7.7 ha) of land. This ROW would run immediately adjacent and parallel to existing transmission lines as described in Section 3.11, Infrastructure.

State Trust Lands. Each of the corridors would have some degree of impact on trust land. The following information was provided by the Arizona State Land Department:

> The central alignment would have the greatest impact on the monetary value/income producing ability of the trust land. This is the land closer to the highway, portions of which are anticipated

to be developed in the foreseeable future. However, the Western and Crossover Corridors cross approximately five miles of trust land and the Central Corridor crosses approximately 6.5 mi (10.5 km) of trust land in the Tinaja Hills area (Pima County) identified as “conservation option lands" under the proposed State Trust Land Reform package that is currently under consideration by the Arizona legislature. A goal of the State Trust Land Reform package is to improve management and planning of trust lands and to conserve significant lands.

There are a number of existing leases within the three alternative corridors. Most of them are grazing leases and the transmission corridor should be able to co-exist with these without any major impacts. Minor accommodations for fencing, ranch roads, water facilities and similar grazing improvements may need to be considered during the implementation phase of the project.

The Arizona State Land Department currently leases approximately 4,500 acres (1,821 ha) of land to Caterpillar Corporation for use as proving grounds and training. The majority of the buildings and other significant improvements are on Caterpillar-owned land. The leased land is utilized in conjunction with the Caterpillar-owned land for testing and demonstration purposes. This lease could be jeopardized if the power lines create a physical restriction/constraint on the use of the facility or if the aesthetic view corridor Caterpillar uses as a backdrop for its facility were to be severely impacted by the power lines. In either case, the income producing ability of the lease would be jeopardized, as well as the significant financial benefit to the local community.

As discussed in the Comment Response Document (Volume II of this EIS), the Federal agencies have not attempted to quantify theoretical public perceptions of property values should the proposed project be built.

Coronado National Forest. TEP has not finalized the precise placement of the 125-ft (38-m) ROW within the 0.25 mi (0.40 km)-wide study corridors. These sitings would involve input from cultural, biological, and visual specialists, after each agency has issued a Record of Decision (ROD), to identify and minimize impacts to each area of land to be disturbed. TEP has stipulated that the structure locations, construction areas, and proposed access roads for all three corridors would not enter the following specially designated areas within the Tumacacori Ecosystem Management Area (EMA) (as shown in Figure 3.1–1): Pajarita Wilderness, Chiltipene Botanical Area, and Peña Blanca Lake Recreation Area.

The total new area of land (currently undisturbed) on the Coronado National Forest that would be temporarily disturbed during construction activities would be as follows: 197 acres (79.8 ha) for the Western Corridor, 105 acres (42.5 ha) for the Central Corridor (options 1 and 2), and 238 acres (96.4 ha) for the Crossover Corridor (options 1 and 2). In addition to the new proposed roads, this acreage includes support structure sites, transmission wire tensioning and pulling sites, fiber optic splicing sites, and laydown construction yards, as described in Section 2.2. The permanent area to be disturbed by the proposed project would consist primarily of the footprint of the support structures and roads to fiber-optic splicing sites. For the Western Corridor, the permanent area disturbed would be an estimated 29.3 acres (11.9 ha). For the Central Corridor (options 1 and 2), the permanent area disturbed would be an estimated 23.1 acres (9.3 ha). For the Crossover Corridor (options 1 and 2) , the permanent area disturbed would be an estimated 36.4 acres (14.7 ha). The roads that would remain open for use by TEP (administratively controlled special use roads) following construction would be administratively closed (URS 2003a).

A large portion of the Tumacacori EMA (approximately 164,000 acres [66,400 ha]) is classified by the Forest Service (USFS) as able to support livestock grazing, some of which is currently under permit for livestock grazing. A majority of this capable rangeland is in satisfactory condition, a measure of the health of the vegetation and soil relative to their combined potential to produce a sound and stable biotic community. Both short-term and long-term effects could occur to livestock grazing from the proposed project. In the short-term, the operations of permittees could be disrupted by construction equipment and activities. In the long-term, the forage base on livestock lands would be reduced by up to an estimated 0.11 acres (0.04 ha) occupied by support structure bases, plus land converted to access roads. New traffic and human use patterns could also cause disturbance to grazing operations.

The lands traversed by the proposed transmission line are typified by low fire occurrence from natural ignition sources. Human-caused fires occur at a more frequent rate in the area immediately west of Nogales, Arizona, and south of the Ruby Road (State Highway 289).

Impacts to the power line from natural fires are expected to be minimal. This assessment is based on several factors. The first issue of consideration is the low frequency of natural ignitions. The second factor is that the primary carrier fuel is grass which would result in low to moderate flame heights. A rapid dispersal of smoke could also be expected since there would be minimal smoldering of material after the passage of the fire front. Natural ignitions (lightning) are also frequently associated with light to moderate rainfall which would also temper the impacts from this source.

Human-caused fires in the Nogales area and other areas of public travel are of somewhat greater concern because of the increased number of starts and the fact that these ignitions occur without the benefit of rainfall. Because grass is the primary carrier fuel, significant impacts are not expected to the proposal.

Although heat from natural and human-caused fires is not anticipated to be an impact to the transmission corridor, smoke from a fire as small as several acres could generate enough concern to cause arcing problems. Smoke from wildfires is known to cause arcing if it becomes dense enough. This creates a significant hazard to firefighters attempting to suppress the fire. There is also a potential risk to the power line itself and adjacent structures. During the summer of 2004, power lines of a similar nature to the proposal were shut down while crews conducted burnout operations on the Willow Fire north of Phoenix, Arizona. During the same time period, a power line crossing the Coconino National Forest was also shut down for a brief period while crews completed burnout operations along the power line ROW. Similar shutdowns could be expected for transmission lines associated with the TEP proposal.

At the present time, the majority of the power line proposal lies in areas where we are not likely to conduct prescribed burning. The USFS has not identified the area associated with the power line as needing immediate fuels treatment. One exception would be the area associated with Potrero Canyon in the vicinity of the Gateway Substation. This area is currently being treated as a Wildland Urban Interface area with values at risk relating to the adjacent private land subdivisions. The initial fuels reduction treatment in this area is scheduled for completion in 2005. Future treatment options will be necessary to further reduce the risk to private land development and the planned power line and substation.

Nogales Border Area. TEP has committed that it would avoid construction of project structures within the 60 ft (18 m)-wide reserved lands along the U.S.-Mexico border. TEP's proposed project design is for the transmission line to cross the U.S.-Mexico border using monopole structures located at least 400 ft (120 m) away from the U.S.-Mexico border (TEP 2003). Thus, TEP would not construct project structures that could limit access to the international boundary monuments and markers. Section 3.1, Land Use, describes U.S. Border Patrol activities in the vicinity of the U.S.-Mexico border near the proposed project. U.S. Department of Energy (DOE) has contacted the U.S. Border Patrol regarding potential impacts to ongoing activities in the vicinity of the U.S.-Mexico border. A copy of DOE's consultation letter and U.S. Border Patrol response are included in Appendix A. The Border Patrol indicated that they expect an increase in the amount of patrol operations that would occur in the area. There are plans to expand the current Remote Video Surveillance System (RVSS), consisting of 60 to 80 ft high towers, to the west of Nogales and onto the Coronado National Forest.

In the U.S.-Mexico border area, construction activities would be coordinated with the appropriate agencies on each side of the border. At a minimum, TEP expects the U.S. Border Patrol to be included. TEP anticipates that this effort would be coordinated with the Mexican proponent for the project, and does not anticipate any ground disturbing activities within the reserved strip of land (a total of 120 ft [36.6 m]) along the international border. The preliminary design of the project has the last U.S. pole on top of a hill and the first pole on the Mexico side also on top of a hill to adequately span the border (TEP 2003).

Impacts to specific land uses within the corridor would be mitigated by the precise siting of the ROW. Since the length of the ROW for this project would not be fenced or otherwise separated from adjacent lands, except as required by land owners and managers, and primarily monopoles would be used, the land area affected by the ROW would be minimized. Access roads, as discussed in Section 4.12, Transportation, would need to be constructed, and certain access roads would remain for ongoing access by TEP. The long-term impacts of access roads would be to increase the acreage of the affected lands, and create the potential for biological impacts, such as the distribution of noxious weeds, and other soil, water, recreation, and visual impacts (URS 2003b), as summarized for each resource area within this EIS.

During construction, temporary impacts to land uses within the ROW may occur due to movement of workers and materials through the area. Construction noise and dust, as well as temporary disruption of traffic flow on local roads, may also temporarily affect residents, recreationalists, and farmers in the area immediately adjacent to the ROW. Coordination among TEP, its contractors, and landowners and managers regarding access to the ROW and construction scheduling would minimize any such disruptions.

4.1.1.1 *Western Corridor*

For the Western Corridor, there would be an estimated 429 support structures, with 191 of these on the Coronado National Forest, and 8 of these on Federal lands managed by BLM. The total structure construction site area would be approximately 309 acres (125 ha) for the entire Western Corridor, 138 acres (56 ha) on the Coronado National Forest, and 6.5 acres (2.6 ha) on BLM land. The total land area occupied by the final footprint of the structures would be an estimated 0.25 acres (0.1 ha) for the entire Western Corridor, 0.11 acres (0.04 ha) on the Coronado National Forest, and 0.005 acres (0.002 ha) on BLM land.

The section of the Western Corridor that joins the El Paso Natural Gas Company (EPNG) pipeline ROW and exits the Coronado National Forest an estimated 2 mi (3.2 km) to the southeast is within an existing Forest Transportation System and Utilities Corridor. Portions of the Western Corridor crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.1. The Western Corridor would not pass through any IRAs.

4.1.1.2 *Central Corridor*

For the Central Corridor, there would be an estimated 373 support structures, with 102 of these on the Coronado National Forest, and 8 of these on Federal lands managed by BLM. The total structure construction site area would be an estimated 269 acres (109 ha) for the entire Central Corridor, 74 acres (30 ha) on the Coronado National Forest, and 6.5 acres (2.6 ha) on BLM land. The total land area occupied by the final footprint of the structures would be an estimated 0.21 acres (0.09 ha) for the entire

Central Corridor, 0.06 acres (0.02 ha) on the Coronado National Forest, and 0.005 acres (0.002 ha) on BLM land. Table 4.1–1 shows that the Central Corridor displaces less land than the other alternatives for the transmission line structures.

Under Option 1, where the Central Corridor deviates from the EPNG pipeline ROW to avoid an IRA for approximately 1.9 mi (3.1 km), the Central Corridor is not within an existing Forest Transportation System and Utilities Corridor. Portions of the Central Corridor Option 1 crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.2. With respect to Central Corridor Option 2, the Forest Plan would be amended to establish utility corridor width and change visual quality objectives as fully described in Section 2.1.2.

4.1.1.3 *Crossover Corridor*

For the Crossover Corridor, there would be approximately 431 support structures, with 196 of these on the Coronado National Forest, and 8 of these on Federal lands managed by BLM. The total structure construction site area would be an estimated 311 acres (126 ha) for the entire Crossover Corridor, 141 acres (57 ha) on the Coronado National Forest, and 6.5 acres (2.6 ha) on BLM land. The total land area occupied by the final footprint of the structures would be an estimated 0.25 acres (0.1 ha) for the entire Crossover Corridor, 0.11 acres (0.05 ha) on the Coronado National Forest, and 0.005 acres (0.002 ha) on BLM land.

The Crossover Corridor is not within an existing Forest Transportation System and Utilities Corridor, except where it follows or crosses the EPNG pipeline ROW. Portions of the Crossover Corridor Options 1 and 2 crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.3. The Crossover Corridor would pass through approximately 3 mi (4.8 km) of an IRA in Peck Canyon, as shown in Figure 3.1-1, and approximately 1.9 mi (3.1 km) of an IRA under Option 2.

4.1.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The majority of the land crossed by the proposed 115-kV interconnection route is planned by Arizona Department of Transportation (ADOT) as a transportation corridor and zoned as Light Industrial or General Commercial. The proposed corridor parallels the southern border of land designated as Residential Cluster (zoned Motor Home Residential) for approximately 0.25 mile (0.4 km). Planning is currently underway for a commercial center to be located in this area, southwest of Valencia Substation. There is currently no development in that portion of the land crossed by the proposed route. Construction of the transmission line would avoid direct conflicts with residential, educational facilities, houses of worship, and other potentially sensitive land uses. It is anticipated that the proposed 115-kV transmission line interconnection would have minimal impacts on existing land uses. Approximately 4.3 acres (1.7 ha) of non-Federal land would be disturbed during construction for the 20 support structures associated with this 3.0 mi (4.8 km) transmission line segment.

4.1.1.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission lines and the associated facilities as proposed in this EIS. There would be no land use impacts associated with the No Action Alternative. Current land use trends would be expected to continue in accordance with local land use plans.

4.1.2 Recreation

As discussed in Sect. 3.1.2, the USFS Recreation Opportunity Spectrum (ROS) evaluation methodology (USFS 1990) was used to generally assess the potential for the TEP project to impact recreational opportunities both on and off the Coronado National Forest. The USFS employs the ROS methodology to evaluate the nature and significance of potential impacts to recreation settings. Maintaining a broad spectrum of ROS classes is essential to the management of National Forest System lands, as it affords users a wide variety of choices. The ROS includes matrices that establish the limit of acceptable changes in the following setting indicators─access, remoteness, naturalness, facilities and site management, social encounters, visitor impacts, and visitor management (see Text Box below)─for each ROS classification (see Sect. 3.1.2 and Figure 3.1-2).

Compatibility of Changes in Setting Indicators with ROS Area Classifications*

Each setting indicator has a matrix, such as the one shown in Table 4.1–2, which establishes conditions that are fully compatible, normal, inconsistent, or unacceptable within a given ROS area classification. These terms are defined as follows:

- **Fully Compatible -** conditions that meet or exceed expectations within an ROS area classification.
- **Normal -** normal conditions found within the recreation setting.
- **Inconsistent -** conditions that are not generally compatible with the norm, but may be necessary under some circumstances or to meet management objectives.
- **Unacceptable -** conditions that, under any circumstance, do not fall within the maintenance of a given class. When unacceptable conditions for one or more of the 7 setting indicators are unavoidable, an analysis is necessary to determine whether the overall recreation setting has been altered to the point of changing to another ROS classification.

*A change in ROS setting does not necessarily require a Forest Plan amendment.

Source: USFS 1990.

Table 4.1-2 provides an example of how such a matrix is used to evaluate changes in an ROS setting indicator; this matrix is for Facilities and Site Management. The matrix illustrates that, in the Semi-Primitive Non-Motorized ROS class (see Sect. 3.1.2 for class definitions), the setting of ‘no facilities for user comfort and rustic and rudimentary ones for site protection only’ is *fully compatible*, ‘rustic and rudimentary facilities primarily for site protection and no evidence of synthetic materials’ is *normal*, ‘rustic facilities providing some comfort for the user as well as site protection and refined native materials’ is *inconsistent*, and ‘facilities designed for user comfort and convenience and synthetic materials’ is *unacceptable*.

Recreational activities, such as biking, birding, hiking, photography, rock climbing, horseback riding and off-vehicle highway use, would be directly impacted by the construction and presence of transmission lines in areas common to all corridors. The most obvious impact to each of these recreation activities would be a change in the visual setting (see Section 4.2) of the recreational area. Other potential impacts to specific activities would result indirectly from decreased opportunities to observe birds and other wildlife of interest (see Section 4.3).

Sources of impacts would include the physical presence of the transmission line structures, which would impact the remoteness and naturalness of the area; the permanent closure of construction access and maintenance roads to vehicles or other public uses, and the increased use of transmission line corridors by illegal immigrants and the U.S. Border Patrol. The following sections describe the effects of the TEP project on ROS setting indicators and the compatibility of that change with the ROS classes affected in each transmission line corridor and the 115-kV interconnection.

Table 4.1–2. Example of ROS Indicator Matrix for Facilities and Site Management

	No facilities for user comfort. Rustic and rudimentary ones for site protection only.	Rustic and rudimentary facilities primarily for site protection. No evidence of synthetic materials.	Rustic facilities providing some comfort for the user as well as site protection. Synthetic materials should not be evident.	Some facilities designed for user comfort and convenience. Some synthetic but harmonious materials.	Facilities mostly designed for comfort and convenience. Synthetic materials are commonly used.
Primitive	Normal	Inconsistent			
Semi-Primitive Non Motorized		Normal	Inconsistent	Unacceptable	
Semi-Primitive Motorized	Fully Compatible		Inconsistent		
Roaded Modified				Inconsistent	
Roaded Natural				Inconsistent	
Rural					Inconsistent
Urban					Normal

The degree of user access to recreational areas would be changed by the project because of the closure of some roads and the new construction of others. As described in Sections 3.12 and 4.12, both classified and unclassified roads are present along each corridor. Newly constructed access roads for the project are proposed to consist of spur roads from existing roads and would range from 500 to 1,000 ft (152 to 305 m) in length for each segment. Following construction of transmission lines, roads to fiber-optic splicing sites would be administratively closed by installing bollards, heavy pipe posts with a locked gate or chain, or a locked pipe barricade. All other roads not required by TEP for future maintenance would be impassable because of the placement of boulders, natural impediments, or trenches across the path to ensure long-term closure. Closed roads would be planted with native vegetation (at a minimum at the beginning segment visible from connecting roads) to effectively obscure all signs of the former roadway.

4.1.2.1 *Western Corridor*

This section describes the potential impacts of placing the transmission line in the Western Corridor on recreational resources, within the framework of the ROS setting indicators.

Roaded Natural Area. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–3. The table shows that all of the predicted setting indicator impacts are compatible with the Roaded Natural Area classification, except for Facilities and Site Management, for which the proposed project would result in changes inconsistent with the current ROS classification.

Roaded Modified Area. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–4. This table shows that the predicted setting indicator impacts for Remoteness are inconsistent with the current Roaded Modified Area classification. The Facilities and Site Management and Naturalness impacts from the proposed project would be unacceptable within the current Roaded Modified classification.

Table 4.1–3. Impacts to Setting Indicators in the *Roaded Natural* ROS Class in the Western Corridor

ROS Setting Indicator	Impact of the Western Corridor	Compatibility with ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Where visible, the proposed project would be evidence of human activity, thus decreasing Remoteness.	Yes (Normal)
Naturalness	Project towers, transmission lines, and roads would impact Scenic Integrity.	Yes (Normal)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Inconsistent)
Social Encounters	Would remain moderate to high.	Yes (Normal)
Visitor Impacts	Subtle site hardening would occur on new access roads.	Yes (Normal)
Visitor Management	No additional visitor management would occur.	Yes (No change)

Definitions of compatibility are in the text box in Section 4.1.2.

Table 4.1–4. Impacts to Setting Indicators in the *Roaded Modified* ROS Class in the Western Corridor

ROS Setting Indicator	Impact of the Western Corridor	Compatibility with ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Would be evidence of human activity where visible between Ruby Road and the Pajarita Wilderness, thus decreasing Remoteness.	No (Inconsistent)
Naturalness	Would decrease from high to very low where visible along Ruby Road.	No (Unacceptable)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Unacceptable)
Social Encounters	Minor increase based on limited new roads for recreationalists.	Yes (Normal)
Visitor Impacts	Impacts or visitor use would not change.	Yes (No change)
Visitor Management	No additional visitor management would occur.	Yes (No change)

Definitions of compatibility are in the text box in Section 4.1.2.

Semi-Primitive Motorized Area. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–5. This table shows that the predicted setting indicator impacts for Remoteness and Naturalness are inconsistent with the current Semi-Primitive Motorized Area classification. Retaining access roads in addition to those leading to fiber-optic splicing sites would be unacceptable with Naturalness. The Facilities and Site Management impacts are unacceptable within the current classification of the area.

Table 4.1–5. Impacts to Setting Indicators in the *Semi-Primitive Motorized* ROS Class in the Western Corridor

ROS Setting Indicator	Impact of the Western Corridor	Compatibility with ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Would introduce sights and occasional sounds (maintenance crews) of human activity in the immediate area of some recreationalists, thus decreasing Remoteness.	No (Inconsistent)
Naturalness	Would decrease from very high to moderate and low with minimum access roads, or to moderate, low, and very low with full access roads.	No (Inconsistent) for limited access, No (Unacceptable) for full access
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Unacceptable)
Social Encounters	May slightly increase along tower access roads.	Yes (Normal)
Visitor Impacts	Impacts of visitor use would not change.	Yes (No change)
Visitor Management	No additional visitor management would occur.	Yes (No change)

Definitions of compatibility are in the text box in Section 4.1.2.

Semi-Primitive Non-Motorized Area. The Western Corridor passes within 0.25 mi (0.41 km) of a Semi-Primitive Non-Motorized Area. Because Semi-Primitive Non-Motorized areas are usually at least 0.5 mile (0.8 km) away from all roads, potential impacts were analyzed. The potential impacts on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–6. This table shows that the predicted setting indicator impact for Remoteness is inconsistent with the current Semi-Primitive Non-Motorized Area classification.

4.1.2.2 *Central Corridor*

This section describes the potential impacts of the Central Corridor on recreational resources, within the framework of the ROS setting indicators. As evidenced in the analysis below, the ROS impacts of the Central Corridor are reduced because of the existing access to the EPNG pipeline ROW that provides access to the Central Corridor, thus limiting the need for new project access. For each ROS setting, the potential impact to the setting indicators and recreational uses are described below:

Roaded Natural Area. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–7. The table shows that all of the predicted setting indicator impacts are compatible with the Roaded Natural Area classification, except for Facilities and Site Management, which would have inconsistent changes introduced by the proposed project, and Naturalness, which would have unacceptable changes introduced by the proposed project.

Semi-Primitive Motorized Areas. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–8. This table shows that the predicted setting indicator impacts are compatible with the Semi-Primitive Motorized Area classification, except for Remoteness and Naturalness, which would have changes that are inconsistent, and Facilities and Site Management, which would have unacceptable changes introduced by the proposed project.

Table 4.1–6. Impacts to Setting Indicators in the *Semi-Primitive Non-Motorized* ROS Class Area ¼ Mile from the Western Corridor.

ROS Setting Indicator	Impact of the Western Corridor	Compatibility with ROS Class?
Access	Construction and maintenance roads to support towers within 0.5 mi of the SPNM Area could increase foot traffic off the roads into the SPNM Area.	Yes (Normal)
Remoteness	Would introduce sights and occasional sounds (maintenance crews) of human activity within 0.5 mi of the SPNM Area, thus decreasing Remoteness.	No (Inconsistent)
Naturalness	Would remain very high.	Yes (No change)
Facilities and Site Management	No new materials would be introduced into SPNM Areas.	Yes (No change)
Social Encounters	May slightly increase to the extent that increased footpaths develop into the SPNM Area.	Yes (Normal)
Visitor Impacts	No site hardening would occur from occasionally used footpaths in the SPNM Area.	Yes (No change)
Visitor Management	No additional visitor management would occur.	Yes (No change)

SPNM = Semi-Primitive Non-Motorized.
Definitions of compatibility are in the text box in Section 4.1.2.

Table 4.1–7. Impacts to Setting Indicators in the *Roaded Natural* ROS Class in the Central Corridor.

ROS Setting Indicator	Impact of the Central Corridor	Efect on ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Where visible, the proposed project would be evidence of human activity, thus decreasing Remoteness.	Yes (Normal)
Naturalness	Would change to very low at the Ruby Road crossing.	No (Unacceptable)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Inconsistent)
Social Encounters	Would remain moderate to high.	Yes (Normal)
Visitor Impacts	Subtle site hardening would occur on new access roads.	Yes (Normal)
Visitor Management	No additional visitor management would occur.	Yes (No change)

Definitions of compatibility are in the text box in Section 4.1.2.

Semi-Primitive Non-Motorized Area. The Central Corridor (Option 1) passes within 0.25 mi (0.41 km) of a Semi-Primitive Non-Motorized Area. Because Semi-Primitive Non-Motorized areas are intended to be located at least 0.5 mi (0.8 km) away from all roads, potential impacts were analyzed. The potential impacts on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–9. This table shows that all of the predicted setting indicator impacts are compatible with the Semi-Primitive Non-Motorized Area classification, except for Remoteness, which would have changes introduced by the proposed project that are inconsistent with the current area classification. Option 2 would have similar impacts to Option 1.

Table 4.1–8. Impacts to Setting Indicators in the *Semi-Primitive Motorized* ROS Class in the Central Corridor.

ROS Setting Indicator	Impact of the Central Corridor	Compatibility with ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Project would introduce nearby sights and occasional sounds (maintenance crews) of human activity.	No (Inconsistent)
Naturalness	Would decrease to moderate and low.	No (Inconsistent)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Unacceptable)
Social Encounters	Increase in social encounters limited to occasional maintenance crews.	Yes (No change)
Visitor Impacts	Impacts of visitor use would not change.	Yes (No change)
Visitor Management	No additional visitor management would occur.	Yes (No change)

Definitions of compatibility are in the text box in Section 4.1.2.

Table 4.1–9. Impacts to Setting Indicators in the *Semi-Primitive Non-Motorized* ROS Class ¼ Mile From the Central Corridor.

ROS Setting Indicator	Impact of the Central Corridor	Compatibility with ROS Class?
Access	Given existing access to the pipeline ROW, few new project access roads would be needed in the brief section within 0.5 mi of the SPNM Area, resulting in few new foot trails into the SPNM Area.	Yes (Normal)
Remoteness	Would introduce sights and occasional sounds (maintenance crews) of human activity within 0.5 mi of the SPNM Area, thus decreasing Remoteness.	No (Inconsistent)
Naturalness	Would remain very high.	Yes (No change)
Facilities and Site Management	No new materials would be introduced into SPNM Areas.	Yes (No change)
Social Encounters	Limited likelihood of new footpaths into the SPNM Area.	Yes (Normal)
Visitor Impacts	No site hardening would occur from limited new footpaths into the SPNM Area.	Yes (No change)
Visitor Management	No additional visitor management would occur.	Yes (No change)

SPNM = Semi-Primitive Non-Motorized.
Definitions of compatibility are in the text box in Section 4.1.2.

4.1.2.3 *Crossover Corridor*

This section describes the potential impacts of the Crossover Corridor on recreational resources, within the framework of the ROS setting indicators. Options 1 and 2 would have similar impacts. For each ROS setting, the potential impact to the setting indicators and recreational uses as follows:

Roaded Natural Area. The impacts of the Crossover Corridor on setting indicators upon crossing Ruby Road through the Roaded Natural Area would be the same as described above for the Central Corridor's crossing of Ruby Road. Table 4.1–7 shows that all of the predicted setting indicator impacts are compatible with the Roaded Natural Area classification, except for Facilities and Site Management, which would have inconsistent changes introduced by the proposed project and Naturalness which would have unacceptable changes introduced by the proposed project.

Semi-Primitive Motorized Areas. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–10. The predicted setting indicator impacts for Remoteness and Naturalness are inconsistent, and the impacts for Facilities and Site Management are unacceptable within the current Semi-Primitive Motorized Area classification.

Semi-Primitive Non-Motorized Area. The Crossover Corridor and its potential new access roads pass through Semi-Primitive Non-Motorized land in Peck Canyon. The potential impacts on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–11. This table shows that the predicted setting indicator impacts for Remoteness, Naturalness, and Facilities and Site Management are unacceptable for the current Semi-Primitive Non-Motorized Area classification.

Table 4.1–10. Impacts to Setting Indicators in the *Semi-Primitive Motorized* ROS Class in the Crossover Corridor

ROS Setting Indicator	Impact of the Crossover Corridor	Compatibility with ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Project would introduce nearby sights and occasional sounds (maintenance crews) of human activity.	No (Inconsistent)
Naturalness	Would decrease to moderate to low.	No (Inconsistent)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Unacceptable)
Social Encounters	Increase in social encounters limited to occasional maintenance crews.	Yes (No change)
Visitor Impacts	Impacts of visitor use would not change.	Yes (No change)
Visitor Management	No additional visitor management would occur.	Yes (No change)

Definitions of compatibility are in the text box in Section 4.1.2.

Table 4.1–11. Impacts to Setting Indicators in the *Semi-Primitive Non-Motorized* ROS Class in the Crossover Corridor

ROS Setting Indicator	Impact of the Crossover Corridor	Compatibility with ROS Class?
Access	Helicopter access would be used.	Yes (No change)
Remoteness	Would introduce nearby sights and occasional sounds (maintenance crews) of human activity in and around Peck Canyon.	No (Unacceptable)
Naturalness	Would decrease from very high to very low.	No (Unacceptable)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Unacceptable)
Social Encounters	Limited likelihood of new footpaths into the SPNM Area.	Yes (Normal)
Visitor Impacts	No change.	Yes (No change)
Visitor Management	No additional visitor management would occur.	Yes (No change)

SPNM = Semi-Primitive Non-Motorized.
Definitions of compatibility are in the text box in Section 4.1.2.

4.1.2.4 *ROS Impacts Summary for Western, Central, and Crossover Corridors*

Table 4.1–12 shows that the presence of the proposed transmission line would affect one or more ROS setting indicators on each of the alternative corridors.

With respect to the Access, Social Encounters, Visitor Impacts, and Visitor Management setting indicators, there would be no inconsistent or unacceptable effects from the presence of the transmission line. Because permanent access roads constructed for the project would be gated or otherwise blocked so they are not open for public use, recreational access to the area, and associated social encounters and impacts from visitors would not be significantly affected by the proposed project, and additional visitor management would not be necessary.

With respect to Naturalness, Remoteness, and Facilities and Site Management setting indicators, at least one aspect of the transmission line would have either an *inconsistent* or *unacceptable* effect in every corridor. An estimate of the degree of potential impacts to recreation could be inferred based on the total miles that each corridor affects on the Coronado National Forest: Western Corridor: 30.0 mi (48.2 km), Central Corridor: 15.1 mi (24.3 km), Crossover Corridor: 29.7 mi (47.8 km). To illustrate,

- the Western Corridor would have an unacceptable impact on Naturalness where it runs adjacent to Ruby Road for an estimated 6 mi (10 km) southwest of the Atascosa Mountains. Naturalness would become very low in this section of the Western Corridor.

- the Crossover Corridor would have a higher impact on Remoteness than the other alternatives, as an estimated 3.3 mi (5.3 km) of the Crossover Corridor at Peck Canyon would have unacceptable impacts on Remoteness. The Crossover Corridor would also have unacceptable impacts on Naturalness within Peck Canyon, and for a brief stretch as it crosses Ruby Road then continues over nearby ridgetops.

- the Central Corridor would have unacceptable impacts on Naturalness where it crosses Ruby Road, in the same location as the Crossover Corridor.

The ROS methodology, however, does not establish a specific number of setting indicators that are allowed to be rated as *inconsistent* or *unacceptable* before a change in an area's ROS classification is necessary. Rather, the USFS bases its conclusions on the significance of effects on a recreational experience on qualitative factors and professional judgment. Although the proposed action would introduce inconsistent or unacceptable changes in one or more setting indicators from an ROS perspective, the overall compatibility of the transmission line within each ROS class must be considered. In this context, the overall character of the recreational experience within the ROS classes of most of the National Forest System lands affected by the transmission lines would not be impacted to the extent that a change in ROS classification would be necessary. As an example, for the Western Corridor, although the TEP project would cause *inconsistent* and *unacceptable* changes in the Remoteness, Naturalness, Facities and Site Management setting indicators for the Semi-Primitive Motorized ROS area classification, these changes would not, in themselves, require a change in the ROS area classification upward to the Roaded Natural classification. The only ROS classification for which there is any possibility of a necessary change is the Semi-Primitive Non-Motorized (SPNM) area within the Crossover Corridor. A change in ROS classification of the area may be needed if any access roads remain in this area following line construction (either permanent roads or temporary construction roads that cannot be fully naturalized); this setting would likely require a change of the ROS classification from SPNM to Semi-Primitive Motorized.

The Central Corridor would have the least impact on ROS settings of the three corridors, because it crosses the least distance on National Forest System lands used for recreational purposes.

4.1.2.5 *115-kV Interconnection of the Gateway and Valencia Substations*

There are no state parks, national parks, or national monuments in the vicinity of the proposed interconnection project area, thus, the potential impacts to recreational resources would be minimal. Although the Sergeant Manuel Tapia Recreational Trail is located approximately 0.5 mi (0.8 km) north of the proposed interconnection, the presence of the 115-kV transmission line would not significantly affect the recreation experience along this trail.

Table 4.1–12. ROS Impacts Summary for the Western, Central, and Crossover Corridors on the Coronado National Forest

	Western Corridor (30.0 mi on CNF)				Central Corridor (15.1 mi on CNF)*			Crossover Corridor (29.7 mi on CNF) *		
	Compatibility with ROS Class?				Compatibility with ROS Class?			Compatibility with ROS Class?		
Setting Indicator	**Roaded Natural (1.7 mi)**	**Roaded Modified (7.0 mi)**	**Semi-Primitive Motorized (21.3 mi)**	**Semi-Primitive Non-Motorized (passes within 0.5 mi of area)**	**Roaded Natural (1.1 mi)**	**Semi-Primitive Motorized (14 mi)**	**Semi-Primitive Non-Motorized (passes within 0.5 mi of area)**	**Roaded Natural (1.1 mi)**	**Semi-Primitive Motorized (25.2 mi)**	**Semi-Primitive Non-Motorized (3.3 mi)**
Access	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Remoteness	Yes	No	No	No	Yes	No	No	Yes	No	No
Naturalness	Yes	No	No	Yes	No	No	Yes	No	No	No
Facilities and Site Management	No	No	No	Yes	No	No	Yes	No	No	No
Social Encounters	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Visitor Impacts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Visitor Management	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*Central and Crossover Corridors do not go through the Roaded Modified area.
CNF = Coronado National Forest.
There would be no change to any setting indicators under the No Action Alternative
Although the Proposed Project is not compatible with setting indicators, it would not change ROS settings. See Section 4.1.2.4 for additional information.

4.1.2.6 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. There would be no impacts from the proposed project on recreation. Current recreation activities described in Section 3.1.2, Recreation, would continue.

4.2 VISUAL RESOURCES

This section discusses the potential effects on visual resources in the vicinity of the proposed project. The methodology for determining impacts is presented, along with a description of the impacts for each alternative. The terminology and concepts used for the proposed project's potential impacts on National Forest System, Bureau of Land Management (BLM), state, and private land are consistent with the U.S. Department of Agriculture Forest Service (USFS) Scenery Management System (SMS), as described in Section 3.2. The potential impacts for the Coronado National Forest and lands outside of the Coronado National Forest including BLM land are discussed separately, concluding with a summary of visual impacts. Unless otherwise noted, Figure 3.1–1 identifies locations on the Coronado National Forest, and Figure 1.1–4 identifies locations outside the Coronado National Forest.

Methodology

The following project-level SMS steps have been taken for evaluation of visual impacts of the proposed project on the Coronado National Forest. The same steps were taken for evaluation of visual impacts outside of the Coronado National Forest, including Federal lands managed by BLM, except for those items related to scenic classes (for example, in step 2 below), which have not been established for lands outside the National Forest System.

1. Description of the physical changes associated with the proposed project, such as transmission line support structures, access roads, conductor wires, clearing required for the right-of-way (ROW), and substations. This description is supported by photo simulations selected to represent what the alternatives would look like from the most likely viewing areas. For the project on National Forest System land, the most likely viewing areas are Concern Level 1 (primary) and Concern Level 2 (secondary) travelways, and recreational use areas, determined in consultation with USFS. For the project on private and BLM lands, the most likely viewing areas are from residences and major roads (Interstate-19 [I-19]) in nearby towns such as Sahuarita, Green Valley, Amado, and Tubac. The photo simulations portray the range of visual impacts, from wide-open views of the project in the foreground, to partially blocked views of the project, to background views of the project where it is difficult to detect in the landscape. Two maps for each corridor (on and off the Coronado National Forest) depicting the project visibility from travelways and use areas, based on site visits and elevation mapping software, provide a key to understanding the visibility of the project and the location of each photo simulation.

2. Project-level verification of the Scenic Class ratings presented in Figure 3.2–4. Impacts from the proposed project would be most noticeable in locations where the proposed transmission line structures contrast with a landscape in which scenic resources are relatively important (for example, in areas rated as Scenic Class 1 or 2). The Scenic Attractiveness and Concern Level 1 and 2 viewsheds were also verified. The most significant impacts of a proposed project are where the project contrasts with a landscape in an area where scenic resources are relatively important (for example, in Scenic Class 1 or 2 Areas).

3. Evaluation of how the Scenic Integrity would change if the proposed project were implemented, including the potential impacts from proposed access roads and support towers.

4. Discussion of short-term construction impacts, and proposed short-term and long-term visual mitigation measures and the expected effectiveness of these mitigation measures.

This EIS also provides an assessment of impacts to visual resources using the Visual Quality Objectives (VQO) consistent with the *Coronado National Forest Plan*. Appendix I provides that information.

Physical Changes Associated with the Proposed Project

Long-term impacts to visual resources from the proposed project would occur from the introduction of transmission line support structures, access roads, transmission line wires, and clearing required for the ROW. TEP anticipates that a majority of the structures would be self-weathering steel single poles (monopoles), depicted in Figure 1.1–3, with a low reflectance steel material that self-oxidizes, or rusts, to form a reddish-brown protective surface coating, similar in appearance to wood poles of other electrical lines. TEP would use dulled, galvanized steel lattice structures (Figure 1.1–4) in locations where their use would minimize environmental impacts (including visual), in accordance with Arizona Corporation Commission (ACC) Decision No. 64356.

From a visual impact perspective, the primary advantage of monopoles over lattice towers is that monopoles require very little ongoing maintenance following construction, which would allow the obliteration and revegetation of all but a few critical access roads. Another disadvantage of the lattice towers is that self-weathering steel is not an option, as the joints on lattice towers could collect moisture that would interfere with the protective coating that prevents corrosion. Galvanized or painted finishes can be used on lattice towers to darken and reduce shine, but the galvanizing process shortens the life of the finish and painted towers require more access for ongoing maintenance. On the other hand, the primary advantage of lattice towers is that under certain conditions they tend to blend better into the background when viewed from a distance against mountains or vegetation. Also, lattice towers can be spaced farther apart thus requiring fewer towers, although the overall height and breadth of the lattice towers would be greater for increased span lengths.

Because the photo simulations have shown the importance of minimizing access roads to mitigate visual impacts, the advantage of the monopoles in requiring fewer access roads has made them the preferred support structure option of TEP (and USFS on National Forest System land) for the proposed project in terms of minimizing visual impacts. The recommendation from USFS for monopoles on National Forest System lands is given provided that all non-critical access roads (see Section 4.12, Transportation) are obliterated and revegetated following construction. An additional consideration that favors monopoles is that they create less contrast with the natural environment in the foreground when viewed against the sky, such as at road crossings, compared to the very urban, structural look of lattice towers.

The proposed project would utilize conductors (transmission line wires) with a non-specular (not shiny) surface. Non-specular conductors are dipped in an acid bath that takes the shine off the conductors, reducing their visibility. The typical height of the structures would be 140 ft (43 m). The span length between structures would range from 600 to 1,200 ft (183 to 366 m). The support structures would create vertical lines in the landscape, much more pronounced for monopoles than for lattice towers, and the conductors would create horizontal lines that would be visible depending on viewing distance and lighting conditions. Structures located so that viewers would see land or vegetation (such as a mountain) behind the structure rather than sky (that is, skylined) would create less of a visual impact. The text box on the following page describes preparation of the photo simulations to accurately depict the project visibility.

Access roads, which would require a clearing of vegetation and potential reshaping of land contours, would introduce a light-colored linear feature into the landscape. Access roads are most visible during the summer months when monsoon rains turn the landscape green, creating a strong contrast with the light-colored roadways. A number of the photo simulations in this Environmental Impact Statement (EIS) were taken in August, thus depicting a worst-case scenario (most visible) for the access roads.

Preparation of the Photo Simulations

Computer Aided Design (CAD) equipment and Global Positioning Systems (GPS) were used to prepare photo simulations. This allows life-size modeling and ensures a high degree of visual accuracy in the photo simulation. This translates to using real world scale and coordinates (that is, what the viewer would see if they were looking at the view from the location of the camera) to locate facilities, other site data, and the actual camera locations corresponding to three dimensional (3-D) simulation viewpoints. The degree of accuracy of the CAD equipment is absolute; the accuracy for the GPS location data is to within approximately 3.3 ft (1 m).

A CAD site map was imported as a background reference. Microstation CAD drawings of proposed structures and conductors were placed on top of the site map to register and orient the correct locations of photo simulation viewpoints. The 3-D model of the proposed structures and conductors was generated in real world scale. The GPS camera positioning information was then referenced to the 3-D data set.

A 35-mm camera with a 50-mm lens was used consistently throughout the process, with a matching electronic camera lens to allow for viewing of the computer-generated model in the same way that the proposed project would be viewed in the field.

Next, the photographic negative was scanned into the 3-D database and loaded as an environment within which the view of the 3-D model is generated. To generate the correct view relative to the actual photograph, the electronic camera was placed at a location (within the computer) identical to where the photograph was taken. This was supported by the GPS location. Then, the 3-D wire frame model was displayed so that proper alignment, scale, angle, and distance could be verified.

When all lines of the wire frame model exactly matched the photograph, the camera target position was confirmed. To complete this phase, the sun angle was set, materials and textures were applied, and the composite image was rendered through a computer image process known as Ray Tracing. Any additional filters required for appropriate atmospheric conditions, such as blur, focus, and haze were applied at this time.

The photo simulations developed for this project were designed to be viewed 14 in (36 cm) from the viewer’s eye. This distance portrays the most realistic life-size image from the location of the simulations viewpoints.

It should be noted that an infinite number of variations related to camera angle, viewer location, distance, and atmospheric conditions exist. The simulations developed for this project incorporated additional mitigating factors such as structure color, structure placements, and use of non-specular (not shiny) conductors. Variations in mitigation measures applied to the simulations, when coupled with camera angle, viewer location, and atmospheric conditions can exponentially increase the variations of even “typical” viewing conditions. The simulations developed for this project captured a variety of viewing conditions under different atmospheric conditions. Dependent on the angle of the sun and viewer, cloud cover, backdropping available, type of facility simulated, and distance from the project, the facility features (such as conductors, cross arms, roads, etc.) may be more or less visible within each simulation (URS 2003b).

4.2.1 Western Corridor

Coronado National Forest. A key factor in evaluating the visual impacts of the Western Corridor is the visibility of the proposed support towers and access roads from travelways and recreation areas utilized by the public, and the distance zone in which the proposed project would be visible. The terrain of the area provides wide-open views of the Western Corridor in some areas, while partially or completely blocking views of the Western Corridor in other areas. Figure 4.2–1 shows the visibility of the Western Corridor on the Coronado National Forest from Concern Level 1 and 2 travelways, with each travelway shaded as follows: red for wide-open views of the Western Corridor; blue for partially-blocked, views of the Western Corridor; and green where the Western Corridor is not visible from the travelway. The following is a discussion of the project visibility as depicted in Figure 4.2–1, illustrated by photo simulations from the locations indicated.

The Concern Level 1 travelways on or nearby National Forest System lands are Ruby Road, Arivaca Road, and I-19. The Western Corridor would not be visible from an estimated 48 mi (77 km) of Concern Level 1 roads (sections shaded green, including all of I-19). There would be partially-blocked views of the Western Corridor from approximately 5 mi (8 km) of Concern Level 1 travelways (shaded in blue), and there would be wide-open views of the Western Corridor from approximately 9.0 mi (15 km) of Concern Level 1 travelways (shaded in red).

Peña Blanca Lake Recreation Area is Concern Level 1, based on its popularity for recreation. As shown in Figure 4.2–1, the proposed project would not be visible from the lakeshore. Visual Simulation 1 (All Visual Simulations are located at the end of Section 4.2 [URS 2002]) shows that the Western Corridor would be difficult to see from Upper Thumb Picnic Area overlooking Peña Blanca Lake. The view from Upper Thumb Picnic Area represents the worst-case view of the proposed project from Peña Blanca Lake Recreation Area. In this view, the proposed project would be in the middleground to background and would not be skylined.

A typical view from Ruby Road west of the Calabasas Group Area (east of Peña Blanca Lake) is depicted in Visual Simulation 2, in which the proposed project is visible in the foreground, partially shielded by terrain and set against the backdrop of a mountain. The most visible portion of the Western Corridor would be along Ruby Road west of Peña Blanca Lake, especially in an estimated 4-mi (6-km) stretch along Ruby Road, where the project would be highly visible in the immediate foreground. This worst-case visibility from Ruby Road is depicted in Visual Simulation 3. This alignment was developed by TEP in coordination with USFS as a means of protecting the viewshed from Ruby Road looking south towards the Pajarita Wilderness. Although siting the transmission line immediately adjacent to Ruby Road in this segment has a maximum visual impact along Ruby Road, it protects the viewshed to the south for the public (including photographers) and eliminates the need for highly visible access roads in this portion of the project area. Visual Simulation 4 depicts the view of Castle Rock looking southeast from Ruby Road. The Western Corridor is partially visible in the middleground, screened by topography. Both the typical and worst-case scenarios from Ruby Road depicted in these simulations are within Scenic Class 1 Areas, which have high public value as described in Section 3.2.

The other wide-open view of the Western Corridor would be where it crosses Ruby Road, as depicted in Visual Simulation 5. After crossing Ruby Road, the Western Corridor continues north along the west side of the Tumacacori Mountains, extending through the foreground, middleground, and background distance zones to viewers on Ruby Road, as shown in Visual Simulation 6, depicting monopoles with minimum access roads that would be required for this type of structure. For comparison purposes, Visual Simulation 7 shows the same view as in Visual Simulation 6, but with lattice towers and the access roads that would be required for lattice towers.

The remaining views of the Western Corridor from Concern Level 1 roads would be partially obscured views of the project from Ruby Road, and views of the proposed project on National Forest System land in the background distance zone from Arivaca Road. (See the next subsection, Outside of the Coronado National Forest, which describes the impact of the proposed project as it crosses overhead of Arivaca Road, off the National Forest System land). By siting proposed pole locations in areas of lower elevation between ridgetops, the visibility of the Western Corridor from Ruby Road east of Peña Blanca Lake is reduced to several locations with open views of the area. Visual Simulation 8 shows an example of terrain and vegetation shielding looking towards the Calabasas Group Area from Ruby Road (east of Peña Blanca Lake), showing the side profile of a viewer, a proposed structure location, and a hill between the viewer and the structure. Because the Town of Ruby is approximately 3 mi (5 km) west of the Western Corridor, no visual impacts would be expected.

The Concern Level 2 travelways in the proposed project are secondary travelways that intersect either Ruby Road, Arivaca Road, or I-19, and receive a moderate amount of use. As shown in Figure 4.2–1, the Western Corridor would be visible from the segments of Concern Level 2 travelways highlighted in red (approximately 14 mi [22 km]), would be partially blocked from the segments highlighted in blue (7.5 mi [12 km]), and would not be visible from the segments highlighted in green (39 mi [63 km]). The Western Corridor crosses five Concern Level 2 roads and would dominate views in the foreground at each of these crossings. The Western Corridor would be visible from portions of the road leading to the Pajarita Wilderness, but would be mostly obscured by terrain from the Pajarita Wilderness, and specifically from Sycamore Canyon. The project would be also highly visible from higher elevations on trails leading to Atascosa Lookout and Castle Rock.

The existing Scenic Integrity of the Tumacacori Ecosystem Management Area (EMA) is depicted in Figure 3.2–5. Construction of the proposed project within the Western Corridor would reduce the Scenic Integrity of a 1.0-mi (1.6-km) wide strip of land along the length of the Western Corridor within the Tumacacori EMA, as depicted in Figure 4.2–2. The portion of the Western Corridor west of the Tumacacori Mountains would change from Very High to a combination of Moderate, Low, and Very Low, depending on the amount of access roads selected and the proximity to Concern Level 2 roads where the proposed project would be in the foreground. Where the Western Corridor crosses and remains south of Ruby Road, the Scenic Integrity would change from High to Very Low. The Scenic Integrity of Peña Blanca Lake Recreation Area and Ruby Road to the east would not change, and the Scenic Integrity where the Western Corridor joins the El Paso Natural Gas Company (EPNG) pipeline and exits the Coronado National Forestwould change from Very High to Moderate. In terms of area, the Scenic Integrity of approximately 13,870 acres (5,613 ha) would be lowered from High or Very High to Moderate or Low, and 4,641 acres (1,878 ha) would be lowered from Very High to Very Low. The existing Scenic Integrity of the Pajarita Wilderness would not change. The reduced acreages of Scenic Integrity on the Coronado National Forest are presented in this EIS as one measure of visual impact. The USFS Scenery Management System (SMS) does not provide guidance on the significance of visual impacts. Mitigation of long-term visual impacts is ongoing in TEP's project development process. Mitigation includes the precise siting of the ROW at lower elevations between ridgetops, to the extent feasible, to avoid skylining of the structures. The project design process incorporates minimizing the mileage of construction access roads and maintenance roads needed following construction. Existing access roads or trails would be used where feasible, as described in the Section 4.12, Transportation. The type of structure to be used (monopoles or lattice towers) would be selected to minimize overall environmental impacts, including visual, biological, cultural, and other impacts, as determined by an outside party such as USFS in accordance with ACC Decision No. 64356.

These mitigation measures would lessen the overall visual impact of the project, but would not fully eliminate the visual impact. Mitigation measures would be least effective along Ruby Road west of Peña Blanca Lake, where the transmission line would be in the immediate foreground for travelers on Ruby Road. A previous alignment of the Western Corridor originally considered by TEP was to site the ROW an estimated 0.5 mi (0.8 km) south of Ruby Road, between the road and Pajarita Wilderness. For this alignment, the high vantage point of Ruby Road prevented siting the Western Corridor behind terrain features, and the additional impact of access roads in this area added significantly to the visual impacts. Thus, TEP worked in consultation with USFS to realign the Western Corridor immediately adjacent to Ruby Road, in order to minimize impacts to the pristine viewshed south towards the Pajarita Wilderness, and to minimize the need for new access roads to the structures. While the previous alignment would have kept the transmission line out of the immediate foreground of viewers on Ruby Road, the modified alignment along Ruby Road preserves the pristine viewshed of the Pajarita Wilderness (including opportunities for photography), and parallels an existing linear modification to the landscape (Ruby Road).

A short-term visual impact would be generated during construction from dust and equipment. Dust control measures such as watering of access roads would be implemented by TEP to minimize impacts, as discussed in Section 4.8, Air Quality Impacts. Access used for construction that would not be used for ongoing operation and maintenance would be restored to near pre-construction conditions (see Section 4.12, Transportation).

Outside of the Coronado National Forest. An estimated 35.5 mi (57.1 km) of the Western Corridor is outside of the Coronado National Forest. The landscape of the northern portion of the Western Corridor (common with the Central and Crossover Corridors), including 1.25 mi (2.01 km) of lands managed by BLM, is characterized by desert grasslands, a low density of residences and commercial establishments, multiple mine tailings piles and electrical transmission lines (refer to Figure 3.11–1 showing existing utilities). A key factor in evaluating the visual impacts in this area is the visibility of the proposed project from residences and travelways, and the distance zone in which the proposed project would be visible. The terrain of the area provides wide-open views of the proposed project in some areas, while partially or completely blocking views of the proposed project in other areas. Figure 4.2–3 shows the visibility of the Western and Crossover Corridors along I-19 and in the areas shaded around I-19 that contain the highest density of residences. The map is shaded to indicate the visibility of the Western and Crossover Corridors as follows: red for wide-open views; blue for partially-blocked, intermittent views; and green for areas from which the Western and Crossover Corridors are not visible. The following is a discussion of the project visibility as depicted in Figure 4.2–3, illustrated by photo simulations from the locations indicated.

As the Western Corridor crosses I-19 and continues southwest, residents, travelers, and recreationalists would have views of the proposed project in the foreground and middleground, with views from many areas in lower terrain obscured by the hills and mine tailings piles in the area. The views of the Western Corridor in Sahuarita, Nogales, and on BLM land, would be in areas already containing development. Visual Simulation 9 shows a foreground view of the proposed project from Mission Road adjacent to BLM land, with TEP's existing and proposed transmission lines. As the Western Corridor separates from the Central Corridor, the Western Corridor (together with the Crossover Corridor) would continue to be almost entirely obscured from view from I-19 by mine tailings piles and natural foothills, but would be visible in the foreground from Arivaca Road as it passes overhead. This worst-case foreground view of the Western (and Crossover) Corridor is depicted in Visual Simulation 10, and represents a point of maximum impact in this central portion of the project. Because the characteristic desertscrub vegetation in the project vicinity is low to the ground, this would result in the proposed project being maximally visible where not obscured by the terrain. However, the vegetation clearing required for the ROW and access roads would have a reduced impact in this type of relatively low vegetation. Figure 4.2–4 shows a visual assessment of the entire project area strictly based on residential density and topography, with areas visible to higher numbers of residents indicated in pink. Because the Town of Arivaca is approximately 10.5 mi (17 km) west of the Western Corridor, no visual impacts would be expected.

Based on the human alterations to the natural landscape, such as utilities, multiple expansive mine tailings piles, and buildings in the northern portion of the Western Corridor, the existing Scenic Integrity of the landscape, including BLM land, is Moderate to Low (the mine tailings piles and transmission lines dominate some areas of the landscape). The Scenic Integrity of this area would not be lowered as result of the proposed project. In the vicinity of the Pima-Santa Cruz County line, the existing Scenic Integrity is High, and would change as a result of the Western Corridor to Moderate to Low, depending on the feasibility of siting the support structures in low terrain.

Mitigation measures and short-term visual impacts would be as described above for the Western Corridor on National Forest System land. In relatively flat landscapes such as the BLM land, it is not possible to site towers between ridgetops to minimize their visibility. However, structure type would be selected as described above.

4.2.2 Central Corridor

Coronado National Forest. A key factor in evaluating the visual impacts of the Central Corridor is the visibility of the proposed support towers and access roads from travelways and recreation areas utilized by the public, and the distance zone in which the proposed project would be visible. The terrain of the area provides wide-open views of the Central Corridor in some areas, while blocking views of the Central Corridor in other areas. Figure 4.2–5 shows the visibility of the Central Corridor from Concern Level 1 and 2 travelways, with each travelway shaded as follows: red for wide-open views of the Central Corridor; blue for partially-blocked, intermittent views of the Central Corridor; and green where the Central Corridor is not visible from the travelway. The following is a discussion of the project visibility as depicted in Figure 4.2–5, illustrated by photo simulations from the locations indicated.

The Concern Level 1 travelways on or nearby National Forest System lands are Ruby Road, Arivaca Road, and I-19. The Central Corridor would not be visible from approximately 56 mi (90 km) of Concern Level 1 travelways (sections shaded green, including most of Ruby Road). There would be partially-blocked, intermittent views of the Central Corridor from approximately 3.0 mi (4.8 km) of Concern Level 1 travelways (shaded in blue), and there would be wide-open views of the Central Corridor from approximately 3.0 mi (4.8 km) of Concern Level 1 travelways (shaded in red).

The primary Concern Level 1 travelway from which the Central Corridor on National Forest System land would be visible is Ruby Road where it is crossed by the Central Corridor. The Central Corridor is visible in the foreground as it crosses Ruby Road, within a Scenic Class 1 area. Given that the towers at this location are skylined and in the foreground for viewers on Ruby Road as shown in Visual Simulation 11, monopoles are currently recommended at this location by USFS as they create less of a contrast with the natural environment in this setting. For comparison purposes, Visual Simulation 12 depicts the same location with lattice towers. Because ridges follow both sides of Ruby Road at the crossing point, the transmission line would disappear over the ridges to either side rather than extending into the middleground. Although views of the Central Corridor on the National Forest System land from Arivaca Road would be in the background distance zone, refer to the next subsection, outside of the Coronado National Forest, which describes the impact of the proposed project as it crosses overhead of Arivaca Road, not on National Forest System land. The Central Corridor is not visible from Peña Blanca Lake Recreation Area, Calabasas Group Area, or White Rock Campground, all located along Ruby Road west of the crossing of the Central Corridor.

The Concern Level 2 travelways from which portions of the Central Corridor would be visible are roads connecting to Ruby Road and I-19, as shown in Figure 4.2–5. The Central Corridor would be visible from the segments of Concern Level 2 travelways highlighted in red (approximately 13 mi [21 km]), would be partially blocked from the segments highlighted in blue (9.8 mi [16 km]), and would not be visible from the segments highlighted in green (37 mi [60 km]). A number of Concern Level 2 roads, such as Rock Corral Canyon (Figure 3.7–2), extend into the foothills and provide intermittent open vantage points of the Central Corridor. From more elevated viewpoints, segments of the Central Corridor are evident in foreground, middleground, and background where it crosses the tops of ridges and foothills, all within a Scenic Class 2 area. San Cayetano Elementary School at Peck Canyon and I-19 is also a Concern Level 2 area, with views of the Central Corridor in the background as shown in Visual Simulation 13.

The existing Scenic Integrity of the Tumacacori EMA is depicted in Figure 3.2–5. Construction of the proposed project within the Central Corridor would reduce the Scenic Integrity of a 1-mi (1.6-km) wide strip of land along the length of the Central Corridor within the Tumacacori EMA, as depicted in Figure 4.2–6. The Scenic Integrity in the viewshed east of the Tumacacori Mountains would change from Very High to a combination of Moderate and Low, with Low Scenic Integrity where the Central Corridor crosses Concern Level 2 roads in the foreground. Where the Central Corridor crosses Ruby Road, the Scenic Integrity would change from High to Very Low, and south of this crossing the Scenic Integrity would change from Very High to Moderate. In terms of area, the Scenic Integrity of an estimated 8,992 acres (3,639 ha) would be lowered from Very High to Moderate or Low, and 676 acres (274 ha) would be lowered from High to Very Low at the Ruby Road crossing. The existing Scenic Integrity of Peña Blanca Lake Recreation Area and the Pajarita Wilderness would not change. There would be no significant differences in visual impacts between options 1 and 2.

Short-term construction impacts, and proposed short-term and long-term visual mitigation measures for the Central Corridor would be the same as described for the Western Corridor in Section 4.2.1.

Outside of the Coronado National Forest. Approximately 42 mi (68 km) of the Central Corridor is outside of the Coronado National Forest. The landscape of the northern portion of the Central Corridor (common with the Western and Crossover Corridors), including 1.25 mi (2.01 km) of land managed by BLM, is characterized primarily by desert grasslands, a low density of residences and commercial establishments, multiple mine tailings piles and electrical transmission lines. For discussion and simulation of this common portion of the Central Corridor, refer to Section 4.2.1, Western Corridor.

The Central Corridor parallels I-19 within approximately 1.0 mi (1.6 km) near Amado, Tubac, and Tumacacori, passing adjacent to areas of low intensity residential development, before entering the Coronado National Forest. Figure 4.2–7 shows the visibility of the Central Corridor along I-19 and in the areas shaded around I-19 that contain the highest density of residences. The map is shaded to indicate the visibility of the Central Corridor as follows: red for wide-open views; blue for partially-blocked, intermittent views; and green for areas from which the Central Corridor is not visible. The following is a discussion of the project visibility as depicted in Figure 4.2–7, illustrated by photo simulations from the locations indicated. The Central Corridor has the longest length outside of the Coronado National Forest, and would be visible to more residents than the other corridors given its closer proximity to the towns of Amado, Tubac, and Tumacacori.

Upon separating from the Western Corridor, the Central Corridor would be intermittently visible and blocked by the elevated terrain that runs directly along the west side of I-19, with some open views from nearby residences in Amado, Tubac, and Tumacacori depending on the terrain setting of each individual house. The Central Corridor would be visible in the foreground from Arivaca Road as it passes overhead. This worst-case foreground view of the Central Corridor is depicted in Visual Simulation 14.

Northwest of Tubac, at the Burro Inn (a bed and breakfast establishment), the Central Corridor would be visible in the foreground, partially with a partial backdrop of mountains given the terrain of the area, as shown in Visual Simulation 15. As the Central Corridor passes near Tubac, it would be mostly screened by topography from the Barrio de Tubac subdivision on the east side of I-19, as shown by Visual Simulation 16. The worst-case view of the Central Corridor from residences would occur in Tubac near Piedra Drive. To mitigate the visual impacts to the extent practicable in this location (and for the entire length of the project), TEP considered different pole types and finishes, as shown in Visual Simulation 17. This simulation shows that the lattice towers have an overbearing structural look when viewed against the sky such as would be the case for nearby residents. The monopoles introduce a simpler, narrower change to the landscape in a color similar to wooden utility poles that better blends with the surrounding environment. Thus, the self-weathering steel monopoles in Visual Simulation 17 were selected by TEP to minimize visual impacts for residential locations such as this one in Tubac. Refer to Section 4.4.1.2, Cultural Resources, for potential visual impacts on historic parks in Tumacacori and Tubac.

Because the characteristic desert grassland vegetation in the project vicinity is low to the ground, the proposed project would be maximally visible where not obscured by the terrain. However, the vegetation clearing required for the ROW and access roads would have a reduced impact in this type of relatively low vegetation. Figure 4.2–4 shows a visual assessment of the entire project area strictly based on residential density and topography, with areas visible to higher numbers of residents indicated in pink.

Given the human alterations to the natural landscape such as utilities, multiple expansive mine tailings piles, and buildings in the northern portion of the Central Corridor, the existing Scenic Integrity of the landscape, including BLM land, is Moderate to Low (the mine tailings piles and transmission lines dominate some areas of the landscape). Upon separating from the Western Corridor, the Scenic Integrity is Moderate, as the landscape appears slightly altered due to residences, commercial establishments, and roads in the area connecting with I-19. The Scenic Integrity of the vicinity of the Central Corridor off the Coronado National Forest would not change as a result of construction of the Central Corridor.

Mitigation measures and short-term visual impacts would be as described above for the Central Corridor on National Forest System land. In relatively flat landscapes such as the BLM land, it is not possible to site towers between ridgetops to minimize their visibility. However, structure type would be selected as described above.

4.2.3 Crossover Corridor

Coronado National Forest. A key factor in evaluating the visual impacts of the Crossover Corridor is the visibility of the proposed support towers and access roads from travelways and recreation areas utilized by the public, and the distance zone in which the proposed project would be visible. The terrain of the area provides wide-open views of the Crossover Corridor in some areas, while blocking views of the Crossover Corridor in other areas. Figure 4.2–8 shows the visibility of the Crossover Corridor from Concern Level 1 and 2 travelways, with each travelway shaded as follows: red for wide-open views of the Crossover Corridor; blue for partially-blocked, intermittent views of the Crossover Corridor; and green where the Crossover Corridor is not visible from the travelway. The following is a discussion of the project visibility as depicted in Figure 4.2–8, as illustrated by the photo simulations from the locations indicated.

The Concern Level 1 travelways on or nearby National Forest System lands are Ruby Road, Arivaca Road, and I-19. The Crossover Corridor would not be visible from approximately 75 mi (120 km) of Concern Level 1 travelways (sections shaded green, including most of Ruby Road). There would be partially-blocked, intermittent views of the Crossover Corridor from approximately 40 mi (65 km) of Concern Level 1 travelways (shaded in blue), and there would be wide-open views of the Crossover Corridor from approximately 7.9 mi (13 km) of Concern Level 1 travelways (shaded in red).

The Concern Level 1 roads from which portions of the Crossover Corridor on the National Forest System land would be visible are Ruby Road, I-19, and Arivaca Road, as shown in Figure 4.2–8 by the road segments highlighted in red. The Crossover Corridor would be visible in two locations from Ruby Road: (1) along the west side of the Tumacacori Mountains where the Crossover Corridor turns east into Peck Canyon, the Crossover Corridor would be visible in the far middleground, set against mountains rather than skylined, with partial shielding provided by the terrain, and (2) the Crossover Corridor would be visible in the foreground as it crosses Ruby Road, the same as depicted in Visual Simulations 11 and 12. The Crossover Corridor is not visible from Peña Blanca Lake Recreation Area. From Arivaca Road, views of the Crossover Corridor on National Forest System land would be in the background distance zone (but refer to the next subsection outside of the Coronado National Forest, for the impact of the proposed project as it crosses overhead of Arivaca Road, not on National Forest System land). From I-19, the Crossover Corridor would be just visible from Peck Canyon, in the same view as the Central Corridor shown in Visual Simulation 13, set against the backdrop of the Tumacacori Mountains and foothills. This view of the Crossover Corridor from I-19 is in a Scenic Class 2 area.

The Concern Level 2 travelways from which portions of the Crossover Corridor would be visible are roads connecting to Ruby Road and I-19, as shown in Figure 4.2–8. The Crossover Corridor would be visible from the segments of Concern Level 2 travelways highlighted in red (approximately 13 mi [21 km]), would be partially blocked from the segments highlighted in blue (16 mi [26 km]), and would not be visible from the segments highlighted in green (20 mi [32 km]). A Concern Level 2 road connects Ruby Road to the west end of Peck Canyon, from which the Crossover Corridor would be in the foreground. A number of Concern Level 2 roads also extend into the foothills from I-19 and provide intermittent open vantage points of the Crossover Corridor. From more elevated viewpoints, segments of the Crossover Corridor are evident in foreground, middleground, and background where it crosses the tops of ridges and foothills, all within a Scenic Class 2 area. San Cayetano Elementary School at Peck Canyon and I-19 is also a Concern Level 2 area, with views of the Crossover Corridor in the background as shown in Visual Simulation 13. Within Peck Canyon, there are recreational trails as described in Section 3.1.2, Recreation, from which the Crossover Corridor would be in the foreground, though none of these have been identified as Concern Level 2 travelways.

The existing Scenic Integrity of the Tumacacori EMA is depicted in Figure 3.2–5. Construction of the proposed project within the Crossover Corridor would reduce the Scenic Integrity of a 1-mi (1.6-km) wide strip of land along the length of the Crossover Corridor within the Tumacacori EMA, as depicted in Figure 4.2–6. The Scenic Integrity in the viewshed east of the Tumacacori Mountains would change from the existing Very High to a combination of Moderate and Low, with Low Scenic Integrity where the Crossover Corridor crosses Concern Level 2 roads and would thus be in the foreground. Where the Crossover Corridor crosses Ruby Road, the Scenic Integrity would change from High to Very Low, and south of this crossing the Scenic Integrity would change from Very High to Moderate. In terms of area, the Scenic Integrity of an estimated 18,060 acres (7,307 ha) would be lowered from Very High to Moderate or Low, and 676 acres (274 ha) acres would be lowered from Very High to Very Low at the Ruby Road crossing. The existing Scenic Integrity of Peña Blanca Lake Recreation Area and the Pajarita Wilderness would not change. There would be no significant differences in visual impacts between options 1 and 2.

Short-term construction impacts, and proposed short-term and long-term visual mitigation measures for the Crossover Corridor would be the same as described for the Western Corridor in Section 4.2.1.

Outside of the Coronado National Forest. An estimated 35.5 mi (57.1 km) of the Crossover Corridor is outside of the Coronado National Forest. The Crossover Corridor outside of National Forest System land is identical to the Western Corridor, and thus the impacts would be identical to the Western Corridor in this overlapping segment, as described in Section 4.2.1. Mitigation measures and short-term visual impacts would also be as described above for the Western Corridor on National Forest System land.

4.2.4 115-kV Interconnection of the Gateway and Valencia Substations

The maximum height of the structures for the 115-kV line would be approximately 55 to 65 feet (1.7 km to 2 km) with a minimum ground clearance for conductors of 32 to 37 feet (0.98 and 1.1 km).

There are no predicted high visual impacts resulting from the proposed interconnection. Visual impacts would be reduced in areas where the interconnection would be built adjacent to existing transmission or distribution lines and other linear facilities such as roads. The application of mitigation measures, in combination with the strategic siting of the interconnection, would result in less impact than would otherwise occur. Potential visual impacts for the proposed route are described in the following sections.

Visual Impacts to Scenic Quality and Mitigation Measures

The elements of scenic quality include the character and diversity of landform, vegetation, water, color, and cultural or man-made features. These features become the basis for separating the study area into units, which identify the relative scenic value of a landscape. Impacts to scenic quality indicate the change in the landscape with the introduction of the proposed project.

Impacts to scenic quality indicate change in the value of the landscape, regardless of how it is viewed. Impacts to scenic quality in the project area are anticipated to be low where the transmission line route is located along existing industrial and commercial areas (approximately 1.8 miles [2.9 km]). To minimize vegetation removal, construction methods would include using a crane to set the poles from the existing access road. Such mitigation would be effective in reducing visual impacts. In addition, the interconnection would be double-circuited with an existing 115-kV transmission line for the last 0.4 mile (0.6 km) and would parallel numerous distribution lines.

Visual Impacts to Sensitive Viewers and Mitigation Measures

Sensitive viewers were identified through field reconnaissance, previous studies, and aerial photograph interpretation. Sensitive viewers were assigned a visual sensitivity level of high or moderate. The sensitivity of a viewpoint reflects the degree of viewer concern. Sensitivity is measured by evaluating the type of viewpoint in the landscape, volume of use, viewing duration, public and agency management concerns, and influence of adjacent land use. High levels of visual sensitivity were assigned to residences. Moderate levels of sensitivity were assigned to SR 189, I-19, and the Sgt. Manuel H. Tapia Recreational Trail.

Residences - Low visual impacts would occur from a majority of the residences inventoried within the project area. Residences north of the proposed interconnection would be screened from the view of the proposed route by changes in terrain and existing industrial structures resulting in low impacts. Residential areas located where the line runs north-south between I-19 and the Valencia Substation would also have low impacts as a result of changes in terrain and underbuilding of the existing 115-kV transmission line.

Travel Routes - Visual impacts to travelers along SR 189 and I-19 are anticipated to be low because of short viewing duration, screening from variations in topography, and existing distribution lines currently crossing these roads.

Recreational Areas - Impacts to Sgt. Manuel H. Tapia Recreational Trail are expected to be low. Much of the proposed route is not visible from the recreational area because of variations in topography and its distance from the proposed project (about 0.75 mile [1.3 km]). However, in areas where it would be visible, the proposed interconnection would be backdropped by the existing terrain. In addition, the visible areas of the proposed interconnection would follow existing distribution lines. Proposed mitigation methods such as use of non-specular conductors and dulled finish structures would lessen the impact of the proposed transmission line.

Construction of the proposed 115-kV transmission line interconnection would have a minimal effect on visual resources. The existing linear features (i.e., roads and existing distribution and transmission lines) in the area in combination with the industrial nature of the area would minimize any impact the project would have on the landscape. In addition, the proposed mitigation would decrease impacts to visual resources in the area.

4.2.5 Summary of Visual Impacts

Coronado National Forest. The areas of land that would have reduced Scenic Integrity as a result of construction and operation of the proposed project for each action alternative are as shown in Table 4.2–1. As stated previously, the reduced acreages of Scenic Integrity on the Coronado National Forest are presented in this EIS as one measure of visual impact. The USFS SMS does not provide guidance on the significance of visual impacts. From approximately 9.0 mi (14 km) of Concern Level 1 travelways (out of a total of 62 mi [99 km]) on and nearby the Tumacacori EMA, the Western Corridor would be in wide-open view on National Forest System lands. From approximately 3.0 mi (4.8 km) of Concern Level 1 travelways on and nearby the Tumacacori EMA, the Central and Crossover Corridors would each be in wide-open view on National Forest System lands.

Table 4.2–1. Summary of Reduced Scenic Integrity on the Coronado National Forest

Western Corridor		Central Corridor		Crossover Corridor	
Change	**Acres**	**Change**	**Acres**	**Change**	**Acres**
From Very High or High to Moderate or Low	13,870	From Very High to Moderate or Low	8,992	From Very High to Moderate or Low	18,060
From High to Very Low	4,641	From High to Very Low	676	From High to Very Low	676
Total Reduced Scenic Integrity:	18,511	Total Reduced Scenic Integrity:	9,668	Total Reduced Scenic Integrity:	18,736

The Central Corridor would minimize the total mileage on National Forest System land resulting in reduced Scenic Integrity of an estimated 9,668 acres (3,912 ha) on National Forest System land. The Western and Crossover Corridors would have higher total mileage on National Forest System lands than the Central Corridor, and the Western and Crossover Corridors would result in an estimated 18,511 to 18,736 acres (7,491 to 7,582 ha) of reduced Scenic Integrity on National Forest System lands. Accordingly, the Western and Crossover Corridors would have greater overall visual impact on the Coronado National Forest than the Central Corridor (USFS 2002c).

Outside of the Coronado National Forest. The proposed project outside of the Coronado National Forest would cross an estimated 36 mi (51 km) of land for the Western and Crossover Corridors, and an estimated 42 mi (68 km) of land for the Central Corridor. With the exception of a reduction in Scenic Integrity associated with the Western and Crossover Corridors near the Pima and Santa Cruz County line, the existing Moderate to Low Scenic Integrity would not be reduced for the area crossed by each corridor outside of the Coronado National Forest, including the BLM land. The Central Corridor has the longest length outside of the Coronado National Forest, and would be intermittently visible to more residents than the other corridors given its closer proximity to the towns of Amado, Tubac, and Tumacacori.

4.2.6 No Action Alternative

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. The existing landscape and Scenic Integrity, as described in Section 3.2, Visual Resources, would be expected to continue, subject to visual impacts from potential development in the project area (see Chapter 5, Cumulative Impacts). No amendment to the Forest Plan for the Coronado National Forest would be adopted. Existing management direction and land and resource allocations in the Forest Plan would remain unchanged.

4.3 BIOLOGICAL RESOURCES

This section discusses the potential effects on biological resources of the construction and operation of the proposed Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project within each alternative corridor. The methodology for determining impacts is presented, followed by a description of the impacts from each alternative.

Methodology

The biological resource impact analysis consists of an evaluation of the effects generated by the construction and operation of the proposed action, for all land jurisdictions on specific biological resources (for example, vegetation communities). Additional analysis of the National Forest System lands and Bureau of Land Management (BLM) land has been included to assist those agencies in evaluating impacts to unique or specific resources under their administration. This additional analysis is not appropriate for resources outside of their jurisdiction because their authority only covers land under their administration. Impacts to biological resources are described relative to the affected environment in Section 3.3. As discussed in that section, no meaningful differences in existing biological resources have been identified between Options 1 and 2 for the Central or Crossover Corridors, except for higher habitat disturbance and fragmentation for Option 2. Impacts described in this section would be qualitatively the same for these two sub-routes, but slightly lower in magnitude for Option 2.

To determine if an action may cause a significant impact, both the context of the proposed action and the intensity of the impact are considered. For actions such as those proposed in this document, the context is the locally affected area and significance depends on the effects in the local area. The intensity of the impact is primarily considered in terms of any unique characteristics of the area (for example, presence of special-status species) and the degree to which the proposed action may adversely affect such unique resources. Impacts would be significant if the proposed action or alternatives change the biological resources in the long term.

4.3.1 Biodiversity

Biodiversity in the area results from the convergence of climatic zones, topographic relief (range of elevations), variable geology, and precipitation patterns (Wildlands Project 2000). The proposed project would not alter these factors on a scale that would cause a regional decline in biodiversity. Potential impacts to species listed by the U.S. Fish and Wildlife Service (USFWS), USFS, BLM, Arizona Department of Agriculture (ADA), or the Arizona Game and Fish Department (AGFD) are provided in the remainder of Section 4.3.

4.3.1.1 *Western, Central, and Crossover Corridors*

Impacts to biodiversity for the three proposed corridors would be similar. Individual plant and animal species whose occurrences are considered rare in the proposed corridors may be directly or indirectly impacted through the construction, maintenance, and/or operation of the proposed powerline. No decline in the biodiversity of the region is anticipated as a result of building the transmission lines in any of the three proposed corridors.

4.3.1.2 *No Action Alternative*

No impacts to biodiversity would result under this alternative. Existing biodiversity would continue as described in Section 3.3.1.

4.3.2 Vegetation and Wildlife

Impacts to vegetation would be similar under all action alternatives. Potential impacts to vegetation and wildlife, as a result of the construction of the transmission line include loss or disturbance to existing native plant communities and potential adverse effects to wildlife including some mortality of individual wildlife, interference with breeding, loss of habitat, and loss of forage plants. Impacts would result from construction of temporary access roads and lay down yards, construction of poles and permanent access roads, clearing of vegetation, and line maintenance. No changes in wildlife distribution are expected to occur on a regional scale as a result of the proposed project although small animal species (e.g., small mammals, reptiles, amphibians) may be excluded from areas that are cleared for support structures or access roads as a result of loss of habitat. Because the ROW would not be fenced or otherwise separated from surrounding lands, no changes in live-stock distribution would be expected as a result of the project. Mortality of wildlife from collision with vehicles is possible, although the number of collisions would be minimal due to limited access to new roads. Impacts to vegetation were calculated based on preliminary siting of access roads that are approximately 12 ft (3.7 m) wide and a 100 ft (30 m) radius around each pole location (see Section 4.12, Transportation, for discussion on revegetation with native species). Short-term disturbances of previously undisturbed biological habitats from the construction of the transmission line and substations could cause long-term reductions in the biological productivity of an area. These long-term effects tend to be more pronounced in arid areas such as the proposed project area where biological communities recover very slowly from disturbances. Refer to Figure 3.3–1 for a map of the vegetation types in the following sections.

Potential direct effects to wildlife as a result of blasting may include: increased noise and visual disturbances, loss of foraging, cover, and nesting habitats, mortality due to collisions with construction equipment accessing the blasting sites, and mortality due to blasting. These impacts are unlikely to lead to a downward population trend or loss of population viability for any wildlife or migratory bird populations occurring in the project area. No blasting would occur during peak breeding times for migratory birds (April through August) to minimize the impacts to migratory birds.

Habitat Fragmentation. There would be an increase in habitat fragmentation in the immediate vicinity of any of the action alternatives This increase would be the least for the Central Corridor since it follows an existing utility corridor to a greater extent than the other alternatives do and, thus, would require the least clearing of vegetation.

The increase in habitat fragmentation would be mitigated in all proposed corridors by road closures and subsequent habitat restoration following construction (see Section 2.1). On the Coronado National Forest official road densities would not increase (see Section 4.12 for discussion of road closures and changes in road densities), so there would be no *net* increase in habitat fragmentation in the Coronado National Forest under any of the alternatives. However, if roads that have been officially closed continue to be used (e.g., by off-road vehicles or hikers), then the proposed project could result in a net increase in habitat fragmentation.

Construction of the transmission line through areas of Madrean Evergreen Woodland would have the greatest potential to increase habitat fragmentation as it would create a linear opening that would separate two parts of a forest. Most vegetation in the region is, however, low-growing (e.g., desertscrub, semidesert grassland). In such habitats, vegetation would normally be pruned to ground level during construction, keeping the roots intact to maximize restoration potential in areas not needed for ongoing maintenance access (see Section 2.2.4). Once operational, low-growing vegetation would remain intact under the transmission lines, reducing habitat fragmentation. Tall vegetation, however, would occasionally need to be trimmed to maintain a safe distance between the tops of trees and the conductors so as to not interfere with safe operation of the transmission line (see Section 4.10.1). However, because of the arid nature of the region, vegetation grows slowly so that its removal after construction would be minor and only be needed at infrequent intervals.

Fragmentation of riparian habitat could occur where the proposed transmission line crosses it. However, the amount of such habitat that would be disturbed is minimal, and the habitat tends to be narrow so that it could often be spanned. Thus, impacts to it would be minimal.

This shift in habitat fragmentation is not likely to result in the decrease of biodiversity on a regional scale. However, local disturbances may alter use of the area by wildlife. These disturbances are not likely to cause a decline in populations or a loss of viability of any Special Status species (see Section 4.3.3).

4.3.2.1 *Western Corridor*

Potential impacts to vegetation in the Western Corridor are summarized in Table 4.3–1.

Table 4.3–1. Estimated Area of Vegetation Communities Potentially Disturbed in the Western Corridor

Vegetation Type	Entire Corridor (acres)	Coronado National Forest[a] (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	119	0	0	119
Semidesert Grassland	165	102	8	55
Madrean Evergreen Woodland	95	95	0	0
Sonoran Riparian Deciduous Forest	0.14	0	0	0
Disturbed (agriculture, urban, or unvegetated)	3	0	0	3
USFS Classified Riparian	0.3	0.3	NA	NA
Total	**382**	**198**	**8**	**177**

[a] Source: Roads Analysis (URS 2003a).

USFS Classified Riparian. Impacts to USFS Classified Riparian only apply to riparian vegetation on lands administered by USFS because this classification system is unique to that agency. Impacts to USFS Classified Riparian areas are based on those identified in the Roads Analysis for the proposed project (URS 2003a). Under this alternative, an estimated 0.3 acres (0.12 ha) of dry desert riparian habitat would be impacted. No impacts to deciduous riparian or evergreen riparian are anticipated. This is considered to be a minor impact because only a relatively small percentage of this vegetation would be disturbed compared to the overall amount present on National Forest System lands.

Wildlife. Impacts to wildlife as a result of construction would include mortality of smaller species such as rodents, reptiles, and amphibians. Additional impacts to wildlife include the loss of food, cover, and breeding sites. The construction of new access roads would also increase public access into new areas that may result in disturbances to wildlife and their habitat by human use. Construction of the line in the Western Corridor would be unlikely to impede the movements of animals because it would not present a major barrier. However, construction of access roads, pole sites, and lay down areas would alter microclimatic conditions. These impacts are unlikely to substantially reduce wildlife populations in the region because of the relatively small areas impacted. Additional impacts would include the potential for mortality of birds and bats resulting from collisions with the lines. Impacts to migratory birds and raptors are discussed further in Section 4.3.4.

4.3.2.2 *Central Corridor*

Potential impacts to vegetation in the Central Corridor are summarized in Table 4.3–2.

Table 4.3–2. Estimated Area of Vegetation Communities Potentially Disturbed in the Central Corridor

Vegetation Type	Entire Corridor (acres)	Coronado National Forest[a] (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	119	0	0	119
Semidesert Grassland	109	67	8	34
Madrean Evergreen Woodland	38	38	0	0
Sonoran Riparian Deciduous Forest	0	0	0	0
Disturbed (agriculture, urban, or unvegetated)	3	0	0	3
USFS Classified Riparian	0.1	0.1	NA	NA
Total	**269**	**105**	**8**	**156**

[a] Source: Roads Analysis (URS 2003a).

USFS Classified Riparian. Under this alternative, an estimated 0.1 acres (0.04 ha) of dry desert riparian habitat would be impacted. No impacts to deciduous riparian or evergreen riparian are anticipated. This is considered to be a minor impact because only a relatively small percentage of this vegetation would be disturbed compared to the overall amount present on National Forest System lands.

Wildlife. Impacts to wildlife would generally be the same as those listed above under Section 4.3.2.1. However, differences in the impacts to wildlife could vary as a result of different amounts of vegetation types disturbed in each corridor.

4.3.2.3 *Crossover Corridor*

Potential impacts to vegetation in the Crossover Corridor are summarized in Table 4.3–3.

USFS Classified Riparian. Under this alternative, an estimated 0.05 acres (0.02 ha) of dry desert riparian habitat would be impacted. No impacts to deciduous riparian or evergreen are anticipated. This is considered to be a minor impact because only a relatively small percentage of this vegetation would be disturbed compared to the overall amount present on USFS system lands.

Wildlife. Impacts to wildlife would be the same as those listed above under Section 4.3.2.1. However, differences in the impacts to wildlife could vary as a result of different amounts of vegetation types disturbed in each corridor.

Table 4.3–3. Estimated Area of Vegetation Communities Potentially Disturbed in the Crossover Corridor

Vegetation Type	Entire Corridor (acres)	Coronado National Forest[a] (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	119	0	0	119
Semidesert Grassland	97	66	8	23
Madrean Evergreen Woodland	72	72	0	0
Sonoran Riparian Deciduous Forest	0	0	0	0
Disturbed (agriculture, urban, or unvegetated)	3	0	0	3
USFS Classified Riparian	0.05	0.05	NA	NA
Total	**291**	**138**	**8**	**145**

[a] Source: Roads Analysis (URS 2003a).

4.3.2.4 *115-kV Interconnection of the Gateway and Valencia Substations*

Construction of the proposed 115-kV transmission line interconnection would require some clearing of mesquite scrub in the semidesert grassland. This clearing is expected to be minimal in areas where the new transmission line follows an existing line or in areas that have been converted to urban uses. The greatest impacts on vegetation along the proposed route would be in relatively undisturbed areas of semidesert grassland on the south side of Mariposa Canyon and between the canyon and the west end of the new substation site.

Impacts to vegetation are not expected to be significant because of the limited amount of disturbance needed to construct a transmission line and because of the extensive distribution of semidesert grassland in southern Arizona. Potential impacts to vegetation on the south side of Mariposa Canyon would be mitigated through the use of a crane to construct the line from an existing access road.

Wildlife. Construction of the proposed transmission line interconnection could have direct impacts on reptiles and small rodents. These impacts are expected to be minimal because of the limited area that would be affected. Larger and more mobile mammals and birds could avoid the construction area and would not be subject to direct impacts. Potential indirect impacts to wildlife include disturbances related to construction activities, including clearing, heavy equipment use, noise, and dust emissions. These impacts are expected to be temporary and minimal.

4.3.2.5 *No Action Alternative*

There would be no impact to vegetation and wildlife associated with the No Action Alternative. Existing conditions would continue as described in Section 3.3.2. No amendments to the Forest Plan for the Coronado National Forest would be adopted. Existing management direction and land and resource allocations in the Forest Plan would remain unchanged.

4.3.3 Special Status Species

Harris Environmental Group prepared the Final Biological Assessment for each of the proposed corridors and the 115-kV interconnection in accordance with the USFWS Section 7 Handbook (USFWS 1988). The complete text of the Final Biological Assessments is provided in Appendices D (Western Corridor), E (Central Corridor), F (Crossover Corridor), and K (115-kV interconnection). All of the action alternatives would have the potential to impact species listed under the *Endangered Species Act* (ESA), as amended. Therefore, the U.S. Department of Energy (DOE) has initiated consultation with USFWS under Section 7(a)(2) of the ESA. The formal consultation process between DOE, USFS, BLM, and USFWS began when DOE requested it and sent its biological assessment of the alternatives to the USFWS (see letters in Appendix A). During formal consultation USFWS: (1) reviews all relevant information provided by DOE, USFS, and BLM; (2) evaluates the current status of the listed species and critical habitat; (3) evaluates the effects of the action and cumulative effects on the listed species or critical habitat; and (4) formulates a Biological Opinion as to whether the action, taken together with cumulative effects, is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

Upon completion of the review and evaluation, USFWS presents its Biological Opinion and discusses its findings with DOE, USFS, BLM, and TEP. USFWS also identifies the availability of any reasonable and prudent alternatives, including mitigation, that DOE, USFS, BLM, and TEP can implement to avoid "take" (harm or harassment of a threatened or endangered species) as defined in the ESA.

In response to DOE's request for formal consultation on the Western Corridor (DOE's identified preferred alternative in the draft EIS), the USFWS provided a Biological Opinion on that alternative on April 26, 2004 (see Appendix D). On September 21, 2004, DOE initiated consultation with USFWS to prepare a Biological Opinion for the Central Corridor (see Appendix A). If a BA is needed for the Crossover Corridors, it would be obtained through consultation with the USFWS prior to construction.

The main impact on special status species would result from the destruction or alteration of a species' habitat and the increase in human activity. Additionally, the increased potential for wildfires as a result of sparks from vehicles is a potential impact common to all of the action alternatives (HEG 2004a, 2004b, 2004c, 2004d). Wildfires that start as a result of the proposed project have the potential to impact one or more special status species, including threatened and endangered species. Additionally, ground disturbances could facilitate the establishment of nonnative species, such as Lehman's lovegrass, which could alter the natural fire regime. Wildfires could also remove ground cover that is important in dissipating rainfall energy and reducing erosion (HEG 2004a, 2004b, 2004c, 2004d). Increased erosion as a result of wildfires could harm all of the fish and frog species listed in Table 4.3–4.

For threatened and endangered species, three types of effects determinations were made:

1. *No effect* determinations were not quantified. No effect means that there are no effects of the project, positive or negative, on a species.

2. *May affect/not likely to adversely affect* determinations mean that all impacts are beneficial, insignificant, or discountable. Such determinations require concurrence from the USFWS. These determinations were not quantified because "based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur" (USFWS 1998).

3. *May affect/likely to adversely affect* determinations were evaluated according to the primary action causing the indirect adverse effect (for example, erosion from roads increasing sediment load into watersheds). While this may not realistically reflect the magnitude of effect to individual species, the consistency of evaluation across the three corridors allows for comparisons between them. This determination means that there is at least one adverse effect of the proposed action and requires formal consultation with the USFWS.

Table 4.3–4 summarizes the determination of effects for all species considered in the Biological Assessments for all of the corridors. These determinations were made based on contact with the USFWS, USFS, BLM, and AGFD regarding all species potentially affected by the project. Determinations were made after reviewing the current status of each species, the environmental baseline of each alternative, and the effects of the proposed actions (including the cumulative effects) (HEG 2004a, 2004b, 2004c). Species for which it was determined that the project "may affect" are discussed below in Sections 4.3.3.1 to 4.3.3.3. Detailed discussions are included in the Biological Assessments (see Appendices D, E, F, and K) appended to this EIS.

With the exception of Sonora chub and the Mexican Spotted Owl (see Section 3.3), no impacts to critical habitat, either proposed or currently designated at the time this EIS is published, would occur under any of the alternatives. All three alternative corridors cross the recently-designated critical habitat for the Mexican Spotted Owl (see Figures 3.3-2, 3.3-3, and 3.3-4).

Harris Environmental Group (HEG 2004a, 2004b, 2004c) evaluated potential impacts to USFS sensitive species to determine if there is: (1) a downward trend in population numbers, or (2) a downward trend in habitat capability that would reduce a species' existing distribution. With the exception of supine bean, the potential impacts under the Western, Central, and Crossover Corridor Alternatives would not result in a downward trend in population numbers or a downward trend in habitat capability. This determination was made by reviewing each species' population, distribution, and habitat requirements and the proposed impacts. Generally, no downward population or habitat trends are expected for one or more of the following reasons:

- Other viable populations are present outside of the corridors but within the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest, or within other mountains in southern Arizona;
- Only a small percentage of the total population would potentially be impacted;
- Minimal suitable habitat is present in the corridor;
- Only a small percentage of foraging habitats would potentially be impacted;
- Some of the plant species are adapted to disturbed habitat; or
- The only known populations are outside of the corridors.

Because of the recent decline in monitored populations of supine bean and drought conditions in 2002, additional surveys would need to be conducted prior to construction in potential supine bean habitat (HEG 2004a, 2004b, 2004c, and 2004d). If populations are found in the vicinity of construction, consultation with USFS biologists would be initiated to minimize impacts. Once surveys and additional consultation are completed, impacts are likely to be limited to individual plants and not whole populations. Therefore, impacts are not likely to result in a trend toward Federal listing or loss of population viability.

Table 4.3–4. Effects Determination of Threatened and Endangered Species Potentially Occurring in Pima and Santa Cruz Counties, Arizona

Species	Western Corridor	Central Corridor	Crossover Corridor
Plants			
Canelo Hills Ladies' Tresses	No Effect	No Effect	No Effect
Huachuca Water Umbel	No Effect	No Effect	No Effect
Kearney's Blue Star	No Effect	No Effect	No Effect
Nichol's Turk's Head Cactus	No Effect	No Effect	No Effect
Pima Pineapple Cactus	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**
Mammals			
Jaguar	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**
Jaguarundi	No Effect	No Effect	No Effect
Lesser Long-nosed Bat	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**
Mexican Gray Wolf	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**
Sonoran Pronghorn	No Effect	No Effect	No Effect
Ocelot	No Effect	No Effect	No Effect
Birds			
Bald Eagle	No Effect	No Effect	No Effect
Brown Pelican	No Effect	No Effect	No Effect
Cactus Ferruginous Pygmy-owl	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**
Mexican Spotted Owl	**May affect, *not* likely to adversely affect**	No Effect	**May affect, *not* likely to adversely affect**
Masked Bobwhite	No Effect	No Effect	No Effect
Mountain Plover	No Effect	No Effect	No Effect
Northern Aplomado Falcon	No Effect	No Effect	No Effect
Southwestern Willow Flycatcher	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**
Amphibians			
Chiricahua Leopard Frog	**May affect, likely to adversely affect**	No Effect	**May affect, *not* likely to adversely affect**
Sonoran Tiger Salamander	No Effect	No Effect	No Effect
Fish			
Desert Pupfish	No Effect	No Effect	No Effect
Gila Top Minnow	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**
Loach Minnow	No Effect	No Effect	No Effect
Sonora Chub	**May affect, likely to adversely affect; may affect, not likely to adversely modify critical habitat**	No Effect	No Effect
Spikedace	No Effect	No Effect	No Effect
Gila Chub	No Effect	No Effect	No Effect

Source: HEG 2004a, b, and c.

Table 4.3–5 summarizes the potential impacts to USFS sensitive species under each alternative.

Wildlife surveys were conducted in the proposed corridors only for the special status species as part of the preparation of the Biological Assessments in support of the proposed project.

Table 4.3–5. Impacts to Forest Service Sensitive Species

Common Name	Present in Corridor	Effects Determination By Corridor
Plants		
Alamos Deer Vetch	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Arid Throne Fleabane	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Arizona Giant Sedge	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Bartram's Stonecrop	All	Western - May impact individuals but not likely to result in trend toward listing or loss of population viability. Crossover & Central - No effects are anticipated.
Beardless Chinch Weed	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Broad-leaf ground cherry	Central, Crossover	Central & Crossover - No effects are anticipated.
Catalina Beardtongue	All	Western - May impact individuals but not likely to result in trend toward listing or loss of population viability. Crossover & Central - No effects are anticipated.
Chiltepin	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Chihuahuan Sedge	All	Central & Crossover - May impact individuals but not likely to result in trend toward listing or loss of population viability. Western - No effects are anticipated.
Chiricahua Mountain Brookweed	All	All - No effects are anticipated.
Foetid Passionflower	All	All - Minimal or no effects are anticipated. Not likely to result in trend toward listing or loss of population viability.
Gentry Indigo Bush	All	Central & Crossover - Minimal or no effects are anticipated. Western – May impact individuals but not likely to result in trend toward listing or loss of population viability.
Large-Flowered Blue Star	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Lumholtz Nightshade	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Mock-Pennyroyal	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Nodding Blue-eyed Grass	All	All - No effect is anticipated.
Pima Indian Mallow	Central, Crossover	Central - No effects are anticipated. Crossover - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Santa Cruz Beehive Cactus	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Santa Cruz Star Leaf	All	Western & Crossover - May impact individuals but not likely to result in trend toward listing or loss of population viability. Central - No effects are anticipated.
Santa Cruz Striped Agave	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.

Table 4.3–5. Impacts to Forest Service Sensitive Species (*continued*)

Common Name	Present in Corridor	Effects Determination By Corridor
Seeman Groundsel	All	Western - May impact individuals but not likely to result in trend toward listing or loss of population viability. Central & Crossover - No effects are anticipated.
Sonoran Noseburn	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Superb Beardtongue	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Supine Bean	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability. Given recent population declines, additional surveys may be warranted upon selection of a preferred alternative. USFS would be consulted prior to impacting any known populations.
Sweet Acacia	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Three-nerved scurf-pea	Crossover	Crossover - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Thurber Hoary Pea	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Thurber's Morning-glory	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Virlet Paspalum	All	All - No effects are anticipated.
Weeping Muhly	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Wiggins Milkweed Vine	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Wooly Fleabane	All	Western - May impact individuals but not likely to result in trend toward listing or loss of population viability. Central & Crossover - No effects are anticipated.
Mammals		
Cave Myotis	All	All - Forage habitat may be disturbed but not likely to result in trend toward listing or loss of population viability.
Southern Pocket Gopher	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Birds		
American Peregrine Falcon	All	All - Not likely to impact nesting sites and not likely to result in trend toward listing or loss of population viability.
Five-Stripped Sparrow	All	All - No effects are anticipated.
Northern Gray Hawk	All	All – May impact individuals but not likely to result in a trend towards Federal listing.
Western Yellow-billed Cuckoo	All	All - May impact individuals but not likely to result in a trend towards Federal listing.
Reptiles/Amphibians		
Giant Spotted Whiptail	All	All - No effects are anticipated.
Lowland Leopard Frog	All	All - No effect on population status and is not likely to result in a trend towards Federal listing.
Mexican Garter Snake	All	All - May impact individuals if riparian areas are impacted. Not likely to result in a trend towards Federal listing.
Western Barking Frog	All	All - No effects are anticipated.

Table 4.3–5. Impacts to Forest Service Sensitive Species (*continued*)

Common Name	Present in Corridor	Effects Determination By Corridor
Invertebrates		
Arizona Metalmark	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.

Source: HEG 2004a, b, and c.

Arizona Department of Agriculture Species. On private lands, such as those within the proposed project area landowners are not required to salvage species on the ADA List of Protected Native Plants (State of Arizona 1997). Under state law, landowners have the right to destroy or remove plants growing on their land including all cacti, yucca, and other succulent species. Because the proposed project is a Federal action, the ADA would be notified if plants within the ROW would be removed and later transplanted or permanently destroyed. An ADA Notice of Intent (NOI) to clear land is required 20 to 60 days prior to the destruction of any plants. Further study would be performed as needed upon precise siting of the ROW.

4.3.3.1 *Western Corridor*

ESA Listed Species

Impact to 10 of the 27 species listed by USFWS would occur under this alternative and are detailed in the Biological Assessment (Appendix D). A summary of impacts to these species are discussed below.

Cactus Ferruginous Pygmy-owl (*Glaucidium brasilianum cactorum*) -Endangered. Construction of the Western Corridor may affect, and is likely to adversely affect cactus ferruginous pygmy-owls (HEG 2004a). Although no cactus ferruginous pygmy-owls are known to occur in surveyed areas in the Western Corridor, habitat for this species is present (see section 3.3.3.1). A preliminary assessment of construction-related impacts indicates the following cactus ferruginous pygmy-owl habitat types would be altered: 34 acres (9 ha) of Sonoran Desertscrub, 46 acres (18 ha) of Desert Riparian Scrub, and 0.14 acres (0.06 ha) of Deciduous Riparian. According to the Harris Environmental Group (HEG 2004a), "short term noise disturbance and human activity associated with construction may temporarily discourage cactus ferruginous pygmy-owl use of habitat within and immediately adjacent to the proposed right-of-way." Further impacts include modification of habitat due to clearing vegetation and building project structures and an increase in human activities as a result of new access. Due to these potential impacts, construction of the Western Corridor may affect, and is likely to adversely affect, cactus ferruginous pygmy-owls (HEG 2004a).

To minimize potential adverse impacts to cactus ferruginous pygmy-owls, construction activities during the breeding season would only occur following additional surveys, and the Conservation Measures outlined in Section 1.4 of the Biological Assessment (HEG 2004a) would be used. If these measures were employed, impacts to cactus ferruginous pygmy-owls would not be expected to rise to the level of take.

According to Harris Environmental Group (HEG 2004a), "No take of CFPO [cactus ferruginous pygmy-owl] is anticipated for the following reasons: (1) construction activities during breeding season would only occur following protocol surveys; (2) the Conservation Measures outlined in Section 1.4 (of the Biological Assessment) will minimize disturbance to potential habitat and prevent disturbance to nesting CFPO within the action area should any be detected in the future."

Chiricahua Leopard Frog (*Rana chiricahuensis*) -Threatened. Construction of the Western Corridor may affect, and is likely to adversely affect Chiricahua leopard frogs (HEG 2004a). No direct impacts to Chiricahua leopard frog habitat (i.e., stock tanks or other aquatic habitats) would occur under this alternative because no construction activities would occur in these habitats. Individuals could be present, however, on land some distance away from these areas, and construction traffic could result in fatalities from vehicle collisions. Indirect impacts could occur from removal of vegetation due to construction that could increase surface runoff and sediment into Chiricahua leopard frog habitat. Additional impacts may include the spread of the chytrid fungus, known to cause mortality in frogs, into areas that are not currently accessible by vehicle. Due to these potential impacts, construction of the Western Corridor may affect, and is likely to adversely affect, Chiricahua leopard frogs (HEG 2004a).

To minimize potential adverse impacts to Chiricahua leopard frogs: (1) no construction activities would occur within occupied streams, stock tanks, or other Chiricahua leopard frog habitat; (2) BMPs would be implemented to minimize erosion; and (3) equipment cleaning stations would be established at appropriate sites to prevent the spread of disease. If these measures were employed, impacts to Chiricahua leopard frogs would not be expected to rise to the level of take.

Gila Topminnow (*Poeciliopsis occidentalis occidentalis*)-Endangered. Construction of the Western Corridor may affect, but is not likely to adversely affect Gila topminnows (HEG 2004a). No direct effects to Gila topminnows are anticipated because no construction would occur within occupied habitat. The closest populations are about 12 mi (19 km) east of any of the corridors (see section 3.3.3.1). Some indirect effects to topminnow habitat are possible due to erosion that could result from project construction. Increased surface runoff and sediment transport into Gila topminnow habitat in the Santa Cruz River watershed could occur. Any such effects would be relatively small due to the distance of the proposed project from occupied habitat; BMPs to minimize sediment transport would also be used (HEG 2004a). Due to the real but limited potential for impacts to Gila topminnow, construction of the Western Corridor may affect, but is not likely to adversely affect, this species (HEG 2004a). Any such effects would not be expected to rise to the level of take.

Jaguar (*Panthera onca*)- Endangered. Construction of the Western Corridor may affect, but is not likely to adversely affect jaguars (HEG 2004a). Impacts to jaguars may result from noise disturbance associated with construction activities, especially during early morning or late evening hours. However, these impacts would be widely distributed because of the linear nature of the project. Additional impacts would result from habitat modification and fragmentation, and subsequently impacts to prey species, due to the construction of roads and poles. The primary prey of jaguars include deer, which have relatively large home ranges. The proposed project would be unlikely to result in a decline in the regional deer population. In the event that remote monitoring of the Arizona-Mexico border to be undertaken by the Jaguar Conservation Team documents a female jaguar or cubs within the Tumacacori EMA, consultation with USFWS would be reinitiated (HEG 2004a).

Lesser Long-nosed Bat (*Leptonycteris curasoae yerbabuenae*) -Endangered. Construction of the Western Corridor may affect and is likely to adversely affect lesser long-nosed bats (HEG 2004a). According to the Biological Assessment (HEG 2004a), "indirect effects to lesser long-nosed bats may result from disturbance (removal) of agaves and saguaro cacti during construction of temporary access roads or the installation of poles." Agaves and saguaro are distributed in patches, and the loss of significant numbers of either species may alter foraging patterns or roost selection, or reduce individual survivorship. These impacts, however, would be widely distributed and relatively minor because of the linear nature of the project. Furthermore, forage plants would be transplanted, thereby further lessening impacts, although there could be some impacts from transplantation failure. Any resulting project impacts to lesser long-nosed bats would not be expected to rise to the level of take.

Mexican Gray Wolf (*Canis lupus baileyi*)-Endangered. Construction of the Western Corridor may affect, but is not likely to adversely affect lesser Mexican gray wolves (HEG 2004a). The proposed action would not affect individual Mexican gray wolves because the species is not present in the project area, and there are no plans by USFWS to re-introduce it to the region. A small amount of potential wolf habitat would be permanently affected, however, by project construction. In the event any Mexican gray wolves moved into or through the project area, they could be impacted by project effects on their prey or by project operations such as patrols by helicopter (HEG 2004a). Any such effects should be small because the project is unlikely to reduce prey on a regional basis, and operational disturbances would be infrequent. Nevertheless, because there could be future impacts due to the project, construction of the Western Corridor may affect, but is not likely to adversely affect, Mexican gray wolves.

Mexican Spotted Owl (*Strix occidentalis lucida*) -Threatened. Construction of the Western Corridor may affect, but is not likely to adversely affect Mexican spotted owls (HEG 2004a). Direct effects on Mexican spotted owls could result from disturbance by construction activities that could discourage nesting in suitable habitat. The greatest likelihood of noise disturbance would be from use of helicopters during construction of the transmission lines (HEG 2004a). To minimize potential for disturbance from construction, no construction would occur within 1 mi (1.6 km) of the two Protected Activity Centers identified south of Ruby Road (see section 3.3.3.1) during the breeding season of March 1 to August 31 (HEG 2004a). In addition, construction during non-breeding season would be short term. Surveys would be performed in advance of construction in Sycamore Canyon where Mexican spotted owls have been reported but where there are no Protected Activity Centers. Should the species be present, USFWS would be consulted for further guidance.

All of the corridor alternatives would cross the recently designated critical habitat for the Mexican spotted owl. Figures 3.3-2, 3.3-3 and 3.3-4 shows the corridors in relation to the critical habitat designation. A short section of access road [0.07 mi (0.113 km)] would be constructed within one of the Protected Activity Centers. Associated impacts should be minor because the only deciduous vegetation present is not of sufficient size to function as structural Mexican spotted owl habitat, and no trees greater than 9 inches (23 cm) in diameter at breast height would be removed (HEG 2004a).

Therefore, the construction-related activities outlined above may affect non-breeding Mexican spotted owls, but would not be likely to adversely affect the species, because construction would occur during a non-critical life stage, would be short term, and should not affect structural habitat function.

Pima Pineapple Cactus (*Coryphantha scheeri* var.*robustispina*)-Endangered. Construction of the Western Corridor may affect, and is likely to adversely affect, Pima pineapple cacti through hindering seedling establishment (HEG 2004a). Although no individual Pima pineapple cacti would be directly impacted because the locations of poles and access roads would be modified to avoid sensitive areas (HEG 2004a), indirect impacts could occur. These would include new access roads to Pima pineapple cacti populations, thereby exposing these populations to illegal collection. Any adverse effects to this species would be mitigated by purchase of mitigation bank credits (HEG 2004a).

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)-Endangered. Construction of the Western Corridor may affect, but is not likely to adversely affect, southwestern willow flycatchers (HEG 2004a). No direct effects are anticipated because no breeding habitat would be altered under this alternative. Indirect impacts may result from disturbance of approximately 0.14 acres (0.06 ha) of Deciduous Riparian habitat that may be used by migratory individuals (HEG 2004a) for temporary roosting or foraging. Disturbed cottonwood and willow habitat within this area would be mitigated at a 2:1 ratio. Thus, this disturbance would be unlikely to adversely affect the species because it would be small in area and temporary in nature.

Sonora Chub (*Gila ditaenia*)-Threatened. Construction of the Western Corridor may affect, but is not likely to adversely affect the Sonora chub (HEG 2004a). No individuals would be directly impacted under this alternative because no construction activities would occur within occupied streams. Construction of the Western Corridor may, however, affect, and is likely to adversely affect, the Sonora chub indirectly through the transport of sediments into Casita Spring and upper Sycamore Canyon. These indirect effects would not be expected to rise to the level of take because BMP erosion control measures would be used to minimize sediment transport (HEG 2004a).

Similarly, no critical habitat for Sonora chub would be directly impacted by project construction. The project is located 1 mi (1.6 km) upstream of Sycamore Creek and Hank and Yank Spring, the closest designated critical habitat. There would be no adverse modification or destruction of Sonora chub critical habitat because of the distance from project structures, and because BMPs would be in place to minimize erosion (HEG 2004a).

USFS Sensitive Species. Construction of the transmission line in the Western Corridor may adversely impact 31 of the 40 USFS sensitive species potentially occurring there (Table 4.3–5). However, with the exception of supine bean, these impacts are not likely to result in trend toward listing under the ESA or loss of population viability (HEG 2004a). Surveys for supine bean are recommended to determine potential impacts under this alternative. Surveys for supine bean would need to be conducted prior to construction in potential supine bean habitat (HEG 2004a). If populations are found in the vicinity of construction, consultation with USFS biologists would be initiated to determine appropriate mitigation to avoid impacts that would result in a trend toward listing under the ESA or loss of population viability. Once surveys and additional consultation are completed, if impacts are not limited to individual plants, mitigation measures would be developed to prevent impacts to the whole populations. Therefore, impacts are not likely to result in a trend toward Federal listing or loss of viability.

BLM Sensitive Species. Individuals of 12 BLM sensitive species (see Section 3.3.3.1) potentially occurring in the Western Corridor could be adversely impacted. Specific impacts have not been evaluated because of insufficient survey information. However, these impacts are not likely to result in trend toward listing under the ESA or loss of population viability (HEG 2004a).

Wildlife of Special Concern in Arizona. Effects of construction of the transmission line in the Western Corridor on the majority of the Wildlife of Special Concern in Arizona (see Section 3.3.3.1)would be avoided or minimized through mitigation efforts stipulated for federally listed species. No adverse impacts would be expected to six of these 11 species (HEG 2004a). Because no construction would occur in perennial aquatic habitats, there would be no adverse impacts to the black-bellied whistling duck and the osprey. There would also be no adverse impacts to the crested caracara, Mexican vine snake, rose-throated becard, and thick-billed kingbird because known populations occur outside the project area. Construction may adversely impact individuals of the other five species, but these impacts are not likely to result in trend toward listing or loss of population viability. Because five Sonoran Desert tortoises were located during field surveys of the proposed right-of-way (ROW), additional mitigation is recommended for that species.

Arizona Department of Agriculture Plants. Construction of the transmission line in the Western Corridor may adversely impact all of the five plant species listed by the ADA (see Section 3.3.3.1) that potentially occur there. Specific impacts have not been evaluated because of insufficient survey information. These impacts are not likely to result in trend toward listing under the ESA or loss of population viability (HEG 2004a).

Total number of special status species impacted. Construction of the transmission line in the Western Corridor may adversely impact 10 species listed under the Federal ESA, 31 USFS sensitive species, 13 BLM sensitive species, 5 species listed as Wildlife of special concern in Arizona, and 5 plants listed by the Arizona Department of Agriculture (all of these plants are also listed by the USFS as sensitive species). Thus, 59 different special status species may be adversely impacted by construction in this corridor.

4.3.3.2 *Central Corridor*

ESA Listed Species

Impacts to 7 of the 27 species listed by USFWS would occur under this alternative. Impacts to the following six species would be the same as those described under Section 4.3.3.1 cactus ferruginous pygmy-owl, Gila topminnow, jaguar, lesser long-nosed bat, Mexican gray wolf, and Pima pineapple cactus. Impacts to southwestern willow flycatcher are described below.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)-Endangered. Construction of the Central Corridor may affect, but is not likely to adversely affect, southwestern willow flycatchers (HEG 2004b). Similar to the impacts described in Section 4.3.3.1, no direct effects to breeding habitat would be anticipated because no breeding habitat would be altered under this alternative. Indirect impacts would be unlikely to result from disturbance of Deciduous Riparian habitat where the proposed transmission line crosses Peck Canyon. This habitat is patchy and lacks surface water; thus, it likely would not be used as habitat by migratory individuals of this species (HEG 2004b).

The Central Corridor would pass within 0.5 mi (0.8 ha) of the Santa Cruz River where migratory southwestern willow flycatchers have been documented (HEG 2004b). It is possible that noise from helicopter flights associated with construction activities would disturb southwestern willow flycatchers using suitable habitat along the Santa Cruz River. Any increase in noise would, however, be short term and minimal because of ambient noise levels from nearby Interstate 19. Therefore, the species would not likely be adversely affected (HEG 2004b).

USFS Sensitive Species. Construction of the transmission line in the Central Corridor may adversely impact 26 of the 42 USFS sensitive species (Table 4.3–5) that potentially occur in this corridor. Impacts would be similar to those listed under Section 4.3.3.1.

BLM Sensitive Species. Impacts to BLM sensitive species would be similar to those described under Section 4.3.3.1 (HEG 2004b).

Wildlife of Special Concern in Arizona. Impacts to Wildlife of Special Concern in Arizona would be similar to those described under Section 4.3.3.1 (HEG 2004b).

Arizona Department of Agriculture Plants. Construction of the transmission line in the Central Corridor may impact six plant species listed (see Section 4.3.3.2) by the ADA as potentially occurring there. These impacts are not likely to result in trend toward listing under the ESA or loss of population viability.

Total number of special status species impacted. Construction of the transmission line in the Central Corridor may adversely impact 7 species listed under the Federal ESA, 26 USFS sensitive species, 13 BLM sensitive species, 5 species listed as Wildlife of special concern in Arizona, and 6 plants listed by the Arizona Department of Agriculture (all of these plants are also listed by the USFS as sensitive species). Thus, 51 different special status species may be adversely impacted by construction in this corridor.

4.3.3.3 *Crossover Corridor*

ESA Listed Species

Impacts to 9 of the 27 species listed by USFWS would occur under this alternative. Impacts to the following nine species would be the same as those described under Section 4.3.3.1: cactus ferruginous pygmy-owl, Chiricahua leopard frog, Gila topminnow, jaguar, lesser long-nosed bat, Mexican gray wolf, Mexican spotted owl, Pima pineapple cactus, and southwestern willow flycatcher.

USFS Sensitive Species. Construction of the transmission line in the Crossover Corridor may adversely impact 28 of the 43 USFS sensitive species potentially occurring there (see Table 4.3–5). Impacts would be similar to those listed under Section 4.3.3.1.

BLM Sensitive Species. Impacts to BLM sensitive species would be similar to those described under Section 4.3.3.1 (HEG 2004c).

Wildlife of Special Concern in Arizona. Impacts to Wildlife of Special Concern in Arizona would be similar to those described under Section 4.3.3.1 (HEG 2004b).

Arizona Department of Agriculture Plants. Impacts would be the same as those described under Section 4.3.3.2.

Total number of special status species impacted. Construction of the transmission line in the Crossover Corridor may adversely impact 9 species listed under the Federal ESA, 28 USFS sensitive species, 13 BLM sensitive species, 5 species listed as Wildlife of special concern in Arizona, and 6 plants listed by the Arizona Department of Agriculture (all of these plants are also listed by the USFS as sensitive species). Thus, 52 different special status species may be adversely impacted by construction in this corridor.

4.3.3.4 *115-kV Interconnection of the Gateway to Valencia Substations*

Potential habitat for seven threatened, endangered, or sensitive species of plants and animals is present in the vicinity of the proposed transmission line interconnection (see Section 3.3.3.4). However, impacts to these species or their habitats are not expected to be significant because of the potential to avoid direct disturbance of such habitats. Additional surveys for cactus ferruginous pygmy-owl, lesser long-nosed bat, and Pima pineapple cactus would be conducted before construction began following specified protocols. Appropriate mitigation measures would be implemented according to state and federal guidelines to minimize potential disturbances to special status species and habitats.

4.3.3.5 *No Action Alternative*

There would be no impact to special-status species associated with the No Action Alternative. The existing conditions as described in Section 3.3.3 would continue.

4.3.4 Migratory Birds and Raptors

Local movements of birds are difficult to predict since they vary seasonally and annually and are often linked to climatic conditions. For this reason, the number of potential collisions with towers and/or transmission lines cannot be specifically quantified or predicted. Habitat adjacent to specific portions of each of the corridors determines bird abundance and the species present within that portion of the corridor

(SWCA 2004). The estimated acreage of vegetation available to migratory birds is provided in Section 3.3.2.

Some mortality resulting from bird collisions within the transmission line corridor is considered unavoidable. However, anticipated mortality levels are not expected to result in long-term loss of population viability in any individual species or lead to a trend toward listing under the ESA for any of the proposed corridors because mortality levels are anticipated to be low and spread over the life of the transmission line. Electrocution is not expected to be a substantial hazard because the lines would be spaced wider than the largest local raptor's (golden eagle) wingspan. Furthermore, TEP would follow the guidelines outlined in *Suggested Practices for Raptor Protection on Powerlines: the State of the Art in 1996* (APLIC 1996). None of the towers are anticipated to require lights for aircraft avoidance, which has been associated with nighttime collisions (Kerlinger 2000).

Additional impacts to birds listed under the *Migratory Bird Treaty Act* would include impacts to vegetation, an important habitat component. Some areas would be cleared entirely to facilitate construction; in other areas, vegetation may be crushed but left onsite; and in other areas, relatively minimal disturbance would occur due to helicopter placement of towers. At the conclusion of construction, temporary access roads would be closed and revegetated; however, maintenance of the transmission line would require some permanent access roads. In addition, some tall trees and shrubs may need to be removed in portions of the corridor to allow maintenance access.

4.3.4.1 *Western, Central, and Crossover Corridors*

Potential direct and indirect effects to migratory birds and raptors as a result of the proposed project could include:

- Increased anthropogenic (manmade) noise and visual disturbances during construction
- Disturbance to and loss of foraging, cover, and nesting habitats related to removal of vegetation during construction
- Direct mortality due to collisions with equipment during construction and during maintenance activities after construction is complete
- Increased probability of mortality or harm due to collisions with towers and lines
- Temporary loss of prey during construction
- Reduction in the amount of foraging, cover, and nesting habitats for various species
- Permanent degradation and fragmentation of habitat for various species related to construction of the line and potential for introduction and colonization by nonnative species
- Displacement of some species (including prey base species) that could result in increased competition for resources in nearby populations

Increased perch site for raptors during nesting and hunting and increase in potential nest platforms. This may lead to an imbalance in the prey base due to increased utilization by one or more raptor species. Additionally, some studies have confirmed that some species (grassland birds) abandon habitat within 1 mi (1.6 km) or more of tall artificial structures.

4.3.4.2 *No Action Alternative*

There would be no impact to migratory birds and raptors associated with the No Action Alternative.

4.3.5 Coronado National Forest Management Indicator Species

Implementation of the proposed project has the potential to adversely impact Management Indicator Species (MIS) that occur within the Tumacacori EMA of the Coronado National Forest by both direct and indirect impacts. Potential direct impacts include direct mortality or harm and removal of foraging, cover, and breeding habitats during construction. Indirect impacts include degradation of habitats including an increase in fragmentation, displacement of wildlife into nearby populations resulting in increased competition for resources, and an increased probability of roadkills and tower strikes by bird species.

Potential nest sites within the Coronado National Forest that could be affected by this project are present throughout each of the proposed corridors. Direct effects would involve disturbance of nesting birds as a result of construction activities and the loss of cavity-bearing trees within construction zones. No blasting would occur during the peak breeding times for migratory birds (April – August) in order to minimize impacts to migratory birds (see Section 4.3.2). Impacts to this group could occur as result of clearing trees large enough to accommodate nest cavities.

Within the Western Corridor an estimated 95 acres (38 ha) of Madrean evergreen woodland and 0.3 acre (0.12 ha) of riparian vegetation would be lost or modified as a result of construction activities. Within the Central Corridor, an estimated 38 acres (15.4 ha) of woodland and 0.1 acre (0.04 ha) of riparian habitat would be lost or modified. Within the Crossover Corridor, an estimated 72 acres (26 ha) of woodland and 0.05 acres (0.026 ha) of riparian vegetation would be lost or modified (Tables 4.3-1, 4.3-2 and 4.3-3). These figures represent less than 0.001 percent of the available woodland and riparian habitats in the Tumacacori EMA. The least amount of disturbance of potential habitat would occur by selecting the Central Corridor. However, in light of the large amount of available habitat in the project area, the differences between alternatives would likely be insignificant in terms of impacts to cavity nesters.

Avoidance of large trees and saguaros during the site selections for the location of the towers and access roads would minimize any reduction in the number of potential cavity sites that are available for this species group. The potential effects under any of the three alternatives are not expected to result in changes in population trends for cavity-nesting species forest-wide. The amount of habitat lost or modified would be small compared to the total available in the EMA. Further, suitable forest, woodland and riparian habitats are abundant throughout the Forest and are sufficient to maintain viable populations of cavity nesters throughout the Forest.

Summary of MIS Impacts. Implementation of the proposed alternatives has the potential to affect Management Indicator Species as a result of both direct and indirect impacts. Direct impacts would include the potential for direct mortality, displacement or disturbance of individuals as a result of construction-related disturbance and long-term maintenance activities. Indirect effects include small changes in habitat suitability for some species as a result of woody vegetation, and potential increases in erosion into riparian habitats as a result of ground disturbance. There would be an increased probability of bird strikes with transmission lines and towers. The direct, indirect and cumulative impacts would be mitigated by design and construction features designed to minimize impacts.

For all species considered, no downward population trends are expected for one or more of the following reasons: 1) viable populations are present elsewhere in the Tumacacori EMA or within other suitable habitats elsewhere on the Forest; 2) only a small percentage of the species population or habitat would be affected; or 3) known populations in the project area would not be affected by project activities.

4.3.6 Invasive Species

Colonization of land by invasive species typically occurs gradually and inconspicuously. By the time that public awareness develops, the effects are often irreversible, and resources may be irretrievably committed, productivity lowered, and biodiversity reduced (BLM 1994, Nelson 1995). The expansion of the range of invasive species is largely caused by human activities, which disturb native ecosystems (Sheley 1994, BLM 1994, Harrod 1994). Vegetation removal and ground-disturbing activities create opportunities for colonization by alien plants (Orians 1986, Bazzaz 1983). Additionally, the transportation of seeds can occur inadvertently through human activities or livestock grazing (Nelson 1995). Colonization of invasive species may result in significant ecological effects by disrupting the natural functions and values of an ecosystem.

4.3.6.1 *Western, Central, and Crossover Corridors*

All action alternatives would require clearing of land for access roads, tower pads, and lay down areas, as described in Section 4.1, Land Use. Impacts of the alternatives are described by the area of anticipated new disturbance associated with construction of new access roads, poles locations, and lay down pads. New disturbances would provide a potential point of entry onto the landscape, which could lead to colonization of undisturbed surrounding land. Measures outlined in the Invasive Management Plan (see the Biological Assessments in Appendices D, E, F, and K of this EIS) would minimize the introduction and spread of invasive species. Furthermore, invasive species within the Coronado National Forest would be managed per the decision made in the Decision Memo/Finding of No Significant Impact for the Environmental Assessment for the Invasive Exotic Plant Management Program (CNF 2004b).

4.3.6.2 *No Action Alternative*

No new ground disturbance would occur; therefore, no invasive species would colonize any of the proposed routes as a result of the No Action Alternative. Existing conditions described in Sections 3.3.6 would continue.

Table 4.3–6. Comparison of Potential Impacts to Habitat Within Coronado Forest Lands for Management Indicator Species for Each Alternative[a]

Alternative	Cavity Nesters	Riparian Species	Species Needing Diversity	Species Needing Herbaceous Cover	Game Species
Western Corridor	Estimated maximum permanent loss of habitat that has potential to support cavity nesters is as follows: 95 acres of Madrean evergreen woodland, 0.6 acres of desert riparian scrub, and 3 acres of deciduous riparian habitats.	Disturbance or loss of an estimated 0.6 acres of desert riparian scrub and approximately 3 acres of deciduous riparian habitats.	Conversion of approximately 95 acres of Madrean Evergreen Woodland to grass and forb dominated habitats. No overall loss of diversity is anticipated.	Conversion of approximately 95 acres of Madrean Evergreen Woodland to grass and forb dominated habitats.	Potential increases in forage and decrease in cover and uninterrupted travel corridors due to conversion of woodlands to grass and forb-dominated habitats.
Central Corridor	Estimated maximum permanent loss of habitat that has potential to support cavity nesters is as follows: 38 acres of Madrean evergreen woodland, 0.1 acres of desert riparian scrub, and 0.05 acres of deciduous riparian habitats.	Disturbance or loss of an estimated 0.1 acres of desert riparian scrub and an estimated 0.05 acres of deciduous riparian habitats.	Conversion of approximately 38 acres of Madrean Evergreen Woodland to grass and forb dominated habitats. No overall loss of diversity is anticipated.	Conversion of approximately 38 acres of Madrean Evergreen Woodland to grass and forb dominated habitats.	Potential increases in forage and decrease in cover and uninterrupted travel corridors due to conversion of woodlands to grass and forb-dominated habitats.
Crossover Corridor	Estimated maximum permanent loss of habitat that has potential to support cavity nesters is as follows: 72 acres of Madrean evergreen woodland.	Disturbance or loss of approximately 20 acres of desert riparian scrub and an estimated 0.05 acres of deciduous riparian habitats.	Conversion of approximately 72 acres of Madrean Evergreen Woodland to grass and forb dominated habitats. No overall loss of diversity is anticipated.	Conversion of approximately 72 acres of Madrean Evergreen Woodland to grass and forb dominated habitats.	Potential increases in forage and decrease in cover and uninterrupted travel corridors due to conversion of woodlands to grass and forb-dominated habitats.

[a] Estimates of potential impact are based on an estimated 125-ft (38-m) wide construction corridor. In some areas, access would be attained through the use of helicopters, and placement of the towers would require fewer disturbances to habitat.

4.4 CULTURAL RESOURCES

This section discusses the potential adverse effects on cultural resources associated with the construction and operation of the proposed action and each alternative. This section also addresses potential Native American concerns.

4.4.1 Archaeological and Historical Sites

This section discusses the potential adverse effects on archaeological and historical sites associated with the construction of transmission lines and associated access roads within the three alternative corridors. Construction of transmission line structures and associated access roads has the potential to adversely affect archaeological and historical sites, based on the area of land disturbed, as described in Section 4.1, Land Use, and Section 4.12, Transportation. Access roads would be placed to avoid or minimize impacts to archaeological and historical sites. It is anticipated that additional cultural resources exist within all of the corridors. The Federal agencies are developing a Programmatic Agreement with the Arizona State Historic Preservation Office (SHPO), interested tribes, and TEP guiding the treatment of cultural resources if an action alternative is selected. Inventory, evaluation, and treatment of cultural resources would be in accordance with the terms specified in the Programmatic Agreement regarding Historic Properties. Prior to ground-disturbing activities in any approved corridor, a complete on-the-ground inventory would be conducted by professional archaeologists in accordance with provisions of Section 106 of the National Historic Preservation Act (NHPA). Efforts to identify cultural resources would also include historical document research and continued consultation with Native American tribes regarding potential traditional cultural properties and sacred sites. Identified cultural resources would be evaluated in terms of National Register eligibility criteria and potential project effects in consultation with all parties to the Programmatic Agreement.

Wherever possible, power poles, access roads, and any other ground-disturbing activities would be placed to avoid direct impacts to cultural resources. A professional archaeologist would assist the pole-siting crew in avoiding impacts to cultural resource sites. In cases where avoidance of sites is not feasible, a site-specific Treatment Plan and Data Recovery Plan would be developed in consultation with tribes, the, appropriate land- managing agencies, and the Arizona SHPO. These plans will include an appropriate Plan of Action to implement the Native American Graves Protection and Repatriation Act. A Discovery Plan would be developed to establish procedures to be followed in the event of discovery of unanticipated cultural resources, and a Monitoring Plan would address issues of site protection and avoidance.

Avoidance of cultural resources would be the primary means of mitigation: where possible, transmission line structures, access roads, and other ground-disturbing activities would be located so as to avoid cultural resources and preserve them in place. There is a high probability for site avoidance in areas where site density is expected to be low, such as in upland areas away from the Santa Cruz River. In cases where avoidance would not be feasible, site-specific mitigation plans would be developed.

4.4.1.1 *Western Corridor*

Twenty-two previously identified archaeological and historical sites have been documented within the Western Corridor. As described in Section 3.4.1, less than 15 percent of the Western Corridor has been previously surveyed for cultural resources. Previous investigations have focused on areas along the Santa Cruz River where site densities are generally high. Although appreciably fewer studies have taken place in the mountainous areas of the Tumacacori and Atascosa Mountains (see Figure 1.1–4), it is likely that fewer sites are located in these areas. Archaeological site densities are usually higher along rivers and washes where a wider variety of resources were available and agriculture could have been practiced. Rivers and washes commonly served as important prehistoric and historical transportation corridors. Although less studied, the mountainous segment may contain Native American rock art sites, rock shelters, and shrines, as well as Historic Period ranching and mining related sites. Valleys between mountains are expected to contain a wide variety of prehistoric and historic sites. The Atascosa Lookout Tower, an historic property outside the ROW northeast of the Western Corridor in the Atascosa Mountains (see Figure 1.1–4), would have visual impacts as portions of the Western Corridor would be visible from this location, altering the visual character of the area (also see Section 4.2, Visual Impacts).

4.4.1.2 *Central Corridor*

Six archaeological and historic sites have been documented within the Central Corridor. As described in Section 3.4.1, less than 15 percent of the Central Corridor has been previously surveyed for cultural resources. Previous investigations have focused more on areas along the Santa Cruz River where site densities are generally high. Few previous archaeological studies have taken place along the central portion of this corridor south of Amado. Because the central portion of this corridor lies close to the Santa Cruz River, there is a high likelihood for the discovery of previously unrecorded sites.

Much of this alignment (including Option 2, but not Option 1) follows or crosses an existing EPNG pipeline alignment. Keeping construction activities to previously disturbed areas limits adverse impacts to cultural resources. Therefore, it is likely that Option 1 has the potential to cause greater impacts to cultural resources than Option 2, which follows the existing EPNG pipeline. The visual impacts to nearby historical sites such as the Tumacacori Mission Historic District in Tumacacori, the Tubac Presidio State Historic Park in Tubac, and the Juan Bautista de Anza National Historic Trail immediately adjacent to the Santa Cruz River in the proposed project area (see Figure 1.1–4) would be minimal. The I-19 area is already significantly altered from its previous state, and the proposed project would not reduce the Scenic Integrity of the area (see Section 4.2, Visual Impacts). Impacts to views from the historic parks in Tumacacori and Tubac would be minimal. Currently, views from both sites are blocked largely by vegetation, structures, I-19, and topography. It is unlikely that the proposed transmission line would be seen from either site (see the report, “Proposed TEP Powerline - Visibility from Tumacacori and Tubac Historic Sites” in Appendix I for more information).

4.4.1.3 *Crossover Corridor*

Twenty-seven archaeological and historic sites have been documented within the Crossover Corridor. As described in Section 3.4.1, less than 15 percent of the Crossover Corridor has been previously surveyed for cultural resources. Previous investigations have focused on areas along the Santa Cruz River where site densities are generally high. Although appreciably fewer studies have taken place in the mountainous portions of this corridor, it is likely that fewer sites are located in these areas. Archaeological site densities are usually higher along rivers and washes where a wider variety of resources were available and agriculture could have been practiced. Rivers and washes commonly served as important prehistoric and historical transportation corridors. Peck Canyon, in particular, may contain a high density of sites. Although less studied, the mountainous segment may contain previously unrecorded Native American rock art sites, rock shelters, and shrines, as well as Historic Period ranching and mining related sites. The Crossover Corridor may be visible in the background (approximately 5 mi [8 km] away) from the Atascosa Lookout Tower, an historic property northeast of the Western Corridor in the Atascosa Mountains (see Figure 1.1–4). The visual impact on this location would be minimal as the character of the area would not be significantly altered (also see Section 4.2, Visual Impacts). It is likely that option 1 has the potential to cause greater impacts to cultural resources than option 2, which follows the existing EPNG pipeline.

4.4.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The potential for impacts to cultural resources associated with the construction and operation of the Gateway to Valencia 115-kV transmission line corridor would be significantly less than the impacts presented for the Western, Central, and Crossover Corridors. The Gateway to Valencia transmission line corridor would be less than one-tenth the length of the shortest proposed corridor, would require less than one-tenth as much construction, and is expected to contain fewer cultural resources due to past development within the corridor.

4.4.1.5 *Archaeological and Historic Site Impact Summary*

It is very likely that as yet unreported cultural resources would be discovered in each corridor. Based on the varied terrain, a wide range of archaeological site types is expected. Prehistoric and historic habitation sites are commonly located along river and wash corridors, whereas the mountainous segments may contain Native American rock art sites and shrines, as well as Historic Period ranching and mining-related sites. Intermontane valleys may contain a wide variety of prehistoric and historic sites (Gillespie and Spoerl 2004).

Within the Coronado National Forest, the Crossover Corridor has the highest density of known archaeological sites. Compared to other areas in the Tumacacori Mountains, the density of archaeological sites in Peck Canyon is very high and it is likely that a large number of unreported cultural resources would be located in this corridor.

Outside the Forest, the expectation based on known distribution of archaeological sites is that the Central Corridor will have the greatest complexity of cultural resource issues, given the long history of settlement in the Santa Cruz Valley. The Central Corridor also passes in the vicinity of Tumacacori National Historic Park and Tubac Presidio State Historic Park. All three alternatives cross lower Sopori Wash where extensive archaeological sites may be difficult to avoid.

In summary, it appears that the Crossover Corridor will contain the highest density of archaeological and historical sites and is the corridor where site avoidance and preservation in place will be the most difficult. The Central Corridor would likely be the least sensitive in terms of significant archaeological and historical sites on the Forest, but most sensitive off the Forest (USFS 2004).

4.4.1.6 *No Action Alternative*

Under the No Action Alternative, no construction would occur. No archaeological and historical sites would be disturbed under this alternative. No additional archaeological surveys or Native American consultation would be undertaken in a systematic study of these areas in the foreseeable future. The Coronado National Forest and Bureau of Land Management (BLM) would still allow access to public lands, and that could result in the discovery and/or the destruction of cultural sites.

4.4.2 Native American Concerns

4.4.2.1 *Western Corridor*

Indian tribal representatives have expressed opposition to this corridor, but have not (to date) named specific locations of any traditional cultural properties (TCPs) or sacred sites. Several tribes (Tohono O’Odham Nation, Gila River Indian Community, Ak-Chin Indian Community, Salt River Pima Maricopa Indian Community and the Pascua Yaqui Tribe) have stated that they value the landscape through which the Western Corridor passes.

4.4.2.2 *Central Corridor*

The tribes have not identified any specific TCPs along this corridor to date. On the January 2002 site visit, representatives of several tribes (Tohono O’Odham Nation, Gila River Indian Community, Salt River Pima Maricopa Indian Community, and the Pascua Yaqui Tribe) stated that they would prefer that the project be constructed along the Central Corridor, if it was built at all. They view the Central Corridor as an already-disturbed area. None of the tribes wished to express approval of the project overall when stating this preference. Similar statements favoring the Central Corridor, if any is to be built, were made in January 2003 meetings and a site visit (February 4, 2003) with Tohono O'Odham Nation, Gila River Indian Community, Salt River Pima Maricopa, and Ak Chin Indian Communities. The Hopi Tribe has expressed opposition to the Central Corridor because of the expected high density of important archaeological sites there.

4.4.2.3 *Crossover Corridor*

This alternative has been presented to tribal representatives from the Tohono O'Odham Nation, Gila River Indian Community, Salt River Pima Maricopa and Ak-Chin Indian Communities (SWCA 2002c). Official tribal concerns have not yet been stated, and no specific TCPs have yet been identified along this corridor by any tribes consulted.

4.4.2.4 *No Action Alternative*

Under the No Action Alternative no construction would occur. No archaeological and historical sites would be disturbed under this alternative. No additional archaeological surveys or Native American consultation would be undertaken in a systematic study of these areas in the foreseeable future. The Coronado National Forest and BLM would still allow access to public lands, which could result in the discovery and/or the destruction of cultural sites.

4.4.2.5 *Native American Concerns Summary*

Seven of the 12 tribes contacted expressed interest or concern about the project. Field reviews and meetings took place during preparation of the DEIS. Little site or area-specific information was provided by tribes (USFS 2004a).

The three corridors lie within traditional lands of the Tohono O'odham Nation, Gila River Indian Community, AkChin Indian Community, and Salt River Pima-Maricopa Indian Community. These tribes, often known as the Four Southern Tribes for purposes of cultural considerations, participated in field reviews and meetings. The Tohono O'odham Nation is considered the lead for this project.

Tohono O'odham Nation (and the three tribes deferring to them) opposes the Western Corridor and the Crossover Corridor because of concerns over the cultural and ethnographic landscape and the lack of disturbance in these areas. If a transmission line must be built, the Central Corridor is considered acceptable although they prefer the No Action Alternative.

The Hopi Tribe prefers the No Action Alternative. They consider the Central Corridor the least acceptable because of the higher density of cultural resource sites in the Santa Cruz River Valley.

Other tribes expressing concerns, although not as specific as the above, are the Pascua Yaqui Tribe and Mescalero Apache Tribe (USFS 2004a).

The Preliminary Native American Consultation has been completed. However, further consultation under Section 106 of the National Historic Preservation Act will be conducted after the issuance of the Record of Decisions (RODs), during siting of the transmission line and the conduct of archeological surveys.

4.5 SOCIOECONOMICS

Any sudden influx of capital or employment, such as a large construction project, to a region will impact the existing socioeconomic environment to some degree. The response of socioeconomic factors, such as employment, income, population, housing, and community services are interrelated. This section describes the potential effects of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project on the existing socioeconomic environment of the region of influence (ROI) for Pima and Santa Cruz Counties.

Methodology

Socioeconomic impacts are addressed in both direct and indirect impacts. Direct impacts are changes that can be directly attributed to the proposed action, such as changes in employment and expenditures from the construction and operation of the proposed action. Indirect impacts to the ROI occur based on the direct impacts from the proposed action. For example, for this analysis, the term “direct jobs” refers to the employment created by the project and “direct income” refers to project workers’ salaries. The term “indirect jobs” refers to the jobs created in other employment sectors as an indirect result of new employment at the construction site and “indirect income” refers to the income generated by the new indirect jobs. Two factors indirectly lead to changes in employment levels and income in other sectors throughout the ROI: (1) the changes in site purchase and non-payroll expenditures from the construction and operation phases of the project, and (2) the changes in payroll spending by new employees. The total economic impact is the sum of the direct and indirect impacts.

The direct impacts estimated in the socioeconomic analysis are based on project summary data developed by the U.S. Department of Energy (DOE) in conjunction with TEP’s contractors and representatives. Total employment and earnings impacts were estimated using Regional Input-Output Modeling System multipliers developed specifically for the TEP Sahuarita-Nogales Transmission Line Project ROI by the U.S. Bureau of Economic Analysis (BEA). BEA is part of the U.S. Department of Commerce’s Economics and Statistics Administration and is responsible for providing Gross Domestic Product and economic accounts data for the country. These multipliers are developed from national input-output tables maintained by BEA and adjusted to reflect regional trading patterns and industrial structure. The tables show the distribution of the inputs purchased and the outputs sold for each industry for every county in the United States. The multipliers for this analysis were developed from the input-output tables for the two counties comprising the ROI. The multipliers are applied to data on initial changes in employment levels and earnings associated with the proposed project to estimate the total (direct and indirect) impact of the project on regional earnings and employment levels.

During the public scoping process for the Draft Environmental Impact Statement (EIS), several commentors expressed concern that existence of the proposed transmission line would negatively impact real property values. In this context, any decrease in property values would be a perception-based impact, that is, an impact that does not depend on actual physical environmental impacts resulting directly from the proposed project, but rather upon the subjective perceptions of prospective purchasers in the real estate market at any given time. Courts have long recognized that such subjective, psychological factors are not readily translatable into quantifiable impacts. See, for example, *Hanly v. Kleindienst*, 471 F.2d 823, 833 n.10 (2d Cir. 1972), *cert. denied*, 412 U.S. 908, (1973). People do not act consistently in accordance with negative perceptions, and one person’s negative perception might be another’s positive. Also, perceptions of value may change over time, and perceptions of value are affected by a host of other factors that have nothing to do with the proposed project. Accordingly, any connection between public perception of a risk to property values and future behavior would be uncertain or speculative at best, and therefore would not inform decision making.

There have been studies of the impact of transmission lines and property values in other geographic areas. See, for example, discussion of these studies in the *Environmental Impact Statement for Schultz-Hanford Area Transmission Line Project* (DOE 2002). Based on these studies, DOE can conclude only that, at worst, it is possible that there might be a small negative economic impact of short duration to some properties from the project, and that the impact on value would be highly variable, individualized, and unpredictable. The studies at most conclude that other factors, such as general location, size of property, and supply and demand factors, are far more important criteria in determining the value of residential real estate.

Accordingly, while DOE recognizes that a given property owner's value could be affected by the project, DOE has not attempted to quantify theoretical public perceptions of property values should the proposed project be built.

The importance of the actions and their impacts is determined relative to the context of the affected environment, or project baseline, established in Section 3.5. The baseline conditions provide the framework for analyzing the importance of potential economic impacts that could result from the project.

4.5.1 Western, Central, and Crossover Corridors

The construction costs of each of the three action alternatives would be roughly similar, approximately $70 million plus or minus $7 million. The labor costs would be approximately the same regardless of the alternative selected, and each route would require approximately the same average and peak workforce and the same period of time to construct (TEP 2003). The majority of the impacts to regional social and economic resources would be directly attributable to the size of the workforce and the total income earned. The number of jobs and amount of income indirectly created by a project is determined by the amount of new direct income spent within the ROI. The model analyzes the financial transfers associated with the action and provides the impacts in terms of income and employment. Therefore, the majority of the socioeconomic impacts from each alternative would be the same. The differences in overall project cost would affect the amount of tax revenue generated by each alternative. The greatest amount of tax revenue would be generated by the Crossover Corridor, while the Central Corridor would generate the least amount of tax revenue for local communities.

As discussed above, the majority of the socioeconomic impacts from each alternative would be the same. The construction of the proposed transmission line, the modification of the existing South Substation, and the construction of the new Gateway Substation would require an average construction workforce of 30 individuals, with peak workforce levels reaching 50 individuals for short periods of time. The project is currently scheduled to be completed 12 to 18 months after construction begins. The most recent data available indicate that the average annual salary for construction workers employed in electrical transmission line construction within the ROI was $38,327 (CBP 1999a). Total new direct income generated by the proposed transmission line construction would range from an estimated $1.7 million to $2.9 million. The final figure would depend on the duration of peak workforce employment. Should the average level of 30 individuals be used throughout, the amount of new direct income would be an estimated $1.7 million. For each month that peak construction levels of 50 individuals are employed, total new direct income would increase by an estimated $64,000. The scenario generating the greatest economic benefit to the ROI would be employment of peak construction levels for the 18-month duration of the project. In this scenario, an estimated $2.9 million in new direct income would be generated.

The average number of direct jobs created by the project, 30, would lead to the indirect creation of approximately 31 additional jobs in other sectors throughout the ROI for the duration of the project. The majority of these new indirect jobs would be created in the service and retail sectors of the local economy as most of the disposable income generated by the project would be spent in these sectors. Peak construction levels of 50 workers could increase the number of indirect jobs created to 52; however, the short duration of construction and the inherent temporary nature of the use of peak workforces would most likely keep the number of indirect jobs created closer to 31. These new indirect jobs would generate an additional $1.5 million in income during the 18-month construction period. New indirect income could reach a maximum of $2.6 million, should peak construction levels be used for the full duration of the project.

Depending on the length of time that peak construction levels are utilized, the total number of jobs created by construction of the TEP Sahuarita-Nogales Transmission Line Project would range from 61 to 102 jobs. The total income generated by the project would be at least $3.2 million with the maximum possible being $5.5 million. The additional revenue would benefit the region with an influx of capital.

Though the unemployment levels of the ROI are comparatively low at 3.2 percent, no difficulties would be experienced in filling the jobs generated by this project. The unemployment level for Santa Cruz County is 13.8 percent, which is very high, and the majority of the jobs could be filled from unemployed residents of this county. Also, the size of the workforce throughout the ROI shows that approximately 12,750 people are unemployed, which is sufficient to fill the maximum of 102 jobs that could be created by this project. Therefore, it is expected that no permanent influx of population to the ROI would be required to staff the jobs generated by this project. Since no population influx is expected to result, no new stresses would be applied to community services in the area. Existing services would be sufficient to accommodate any needs generated by this project.

Upon completion of the construction, the construction workforce would no longer be employed by this project and all indirect jobs that would be attributable to the project would no longer exist. This would not be a problem, however, for two reasons. The first is that it would be a return to current employment levels in the ROI with the exception of the extra revenue generated by the project. The second is that construction, by nature, is a temporary form of employment. Construction workers only work on a job until the project is completed and then they move on to the next project.

Operation of the facilities would require between one and five employees for maintenance, including repairs, and inspection of the facilities. The inspection and maintenance work would only occur on an occasional basis and the employees required would already be employed in this capacity within the company. No new jobs would be generated, therefore no socioeconomic impacts are expected from the operation of the facility.

The presence of a new transmission line in the Coronado National Forest would impact current uses to a certain degree. Presently, the USFS generates revenue from goods and services generated from National Forest System lands and allocates 25 percent of that revenue to the State of Arizona under the 25 Percent Fund payments to states (PTS). USFS also provides Payment in Lieu of Taxes (PILT) to the state since Federal lands are not obligated to pay property taxes. The state then allocates the money to the counties based on the locations of the forests. Any impact to the Coronado National Forest that could affect the amount of revenue generated would affect the amount that counties receive from PTS and PILT. The proposed transmission line would increase revenue. This could have a minor influence on the overall revenue generated and slightly increase the amount the Pima and Santa Cruz Counties receive.

There is a potential for negative impacts to tourism-generated revenues in the project area as a result of the visual and recreational changes introduced by the project. This is especially true for the growing ecotourism industry in southern Arizona, which in the project area is focused primarily on birding. However, because there are so many factors that can affect tourism, it would be speculative to quantify any potential decrease in direct visitor spending or total direct economic impact to the project area as a result of the proposed project. Conversely, increased electrical reliability from the proposed project in

Santa Cruz County may also contribute to the area's ability to attract tourists, but a quantitative assessment of such impacts in this EIS would also be speculative. There would be no differences in socioeconomic impacts between options 1 and 2 for either the Central Corridor or the Crossover Corridor.

New Transmission Line ROW and Access Roads

The TEP construction alternatives include acquiring easements for approximately 57 to 65 mi (92 to 105 km) of a new 345-kV transmission line right-of-way (ROW). The new ROW would either follow existing utility corridors or be routed in a new corridor location and would be 125 ft (38 m) in width. TEP would utilize existing access roads where possible; however, it is anticipated that additional access road easements would need to be acquired for each corridor.

Affected landowners would be offered market value established through the appraisal process for the transmission line and/or access road perpetual easements. The appraisal process takes all factors affecting value into consideration including the impact of transmission lines on property value. The appraisals may reference studies conducted on similar properties to add support to valuation considerations. The strength of any appraisal is dependent on the individual analysis of the property, using neighborhood-specific market data to determine market value.

TEP's transmission line easements would encumber the ROW area with land use limitations. Typical transmission line easements require the right to clear the ROW and to keep it clear of all trees, brush, vegetation, other structures, and fire and electrical hazards. The landowner can usually grow most crops with certain height restrictions or graze livestock. Tree and crop height and access to the ROW must be controlled to maintain safe distances.

The impact of introducing a new ROW for transmission towers and lines can vary dramatically depending on the placement of the ROW in relation to the property's size, shape, and location of existing improvements. A transmission line may diminish the utility of a portion of property if the line effectively severs this area from the remaining property (severance damage). Whether a transmission line introduces a negative visual impact is dependent on the placement of the line across a property as well as each individual landowner's perception of what is visually acceptable or unacceptable.

If the transmission line crosses a portion of the property in agricultural use such as pasture or cropland, little utility is lost between the towers, but 100 percent of the utility is lost within the base of the tower. Towers may also present an obstacle for operating farm equipment, and controlling weeds at tower locations. To the extent possible, new transmission lines are designed to minimize the impact to existing and proposed (if known) irrigation systems. If the introduction of a transmission line creates a need to redesign irrigation equipment or layout, TEP would compensate the landowner for this additional cost. These factors as well as any other elements unique to the property are taken into consideration to determine the loss in value within the easement area, as well as outside the easement area in cases of severance.

If TEP acquires an easement on an existing access road and the landowner is the only other user, market compensation is generally 50 percent of full fee value or something less than 50 percent if other landowners share the access road use. For fully improved roads, the appraiser may prepare a cost analysis to identify the value of the access road easement. If TEP acquires an easement for the right to construct a new access road and the landowner has equal benefit and need of the access road, market compensation is generally 50 percent of full fee value. If the landowner has little or no use for the new access road to be constructed, market compensation for the easement is generally close to full fee value. If TEP acquires an easement of Federal or state land, TEP might be required to pay a usage fee. For National Forest System lands, USFS typically assesses a use fee for authorizations to use a powerline ROW. USFS does not generally assess fees for the use of access roads crossing National Forest System lands to access a ROW.

4.5.2 No Action Alternative

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. No changes to the existing employment levels would occur beyond the existing trends (described in Section 3.5); no new income or tax revenue would be generated beyond existing trends; and no additional demands would be placed on community services in the ROI beyond existing trends as a result of the proposed project.

4.6 GEOLOGY AND SOILS

The geology and soil resource impact analysis consists of an evaluation of the potential effects generated by the construction and operation of the proposed project on specific geologic and soil resource attributes. Construction activities represent the principal means by which an effect to geologic resources (for example, limiting access to mineral or energy resources) and soil resources would occur. The principal element in assessing the effect on the geologic and soil resources is the amount and location of land disturbed during construction of the alternative, including proposed access roads, tower sites and construction areas, and project staging areas. The slope, depth below the ground surface to bedrock, and attributes of the soil within each corridor are evaluated to assess the potential construction techniques and the associated degree of land disturbance.

Methodology

Aerial and ground surveys of representative sections of each corridor were conducted to observe surficial soil and rock conditions (Terracon 2002). To determine if an action may cause a significant impact, both the context of the action and the intensity of the impact are considered. For actions such as those proposed in this document, the context is the locally affected area and significance depends on the effects in the local area. The intensity of the impact is primarily considered in terms of the relative land area disturbance based on the required construction technique, and on any unique characteristics of the area (for example, mineral resources), and the degree to which the proposed project may adversely affect such unique resources.

Geology. Impact analysis on the geologic resource by the proposed project involves the evaluation of potential effects to critical geologic attributes such as access to mineral and energy resources, destruction of unique geologic features, vibratory ground motion induced by seismic activity, subsidence induced by groundwater withdrawal, and mass movement or ground shifting induced by the construction of facilities associated with an alternative. The impact analysis includes the analysis of large-scale geological conditions such as earthquakes, volcanism, and geological resources. These conditions tend to effect broad expanses of land and typically are not restricted to smaller discrete areas of land.

Soil. Impact analysis on the soil resource by the proposed project involves the evaluation of potential effects to specific soil attributes, such as increasing the potential for erosion and compaction by construction activities. Unlike the large scale geologic conditions discussed above, effects to the soil resource occur on discrete areas of land. Surface erosion is most prevalent in areas where a highly erodible material is exposed to concentrated surface runoff.

4.6.1 Geology

4.6.1.1 *Western Corridor*

The placement of the transmission line structures and access roads would require some disturbance and removal of near-surface material, as described in Section 3.6, Geology and Soils. In siting the proposed access roads and tower locations, Tucson Electric Power Company's (TEP's) preliminary design of the project avoids prominent topographic features (such as the Castle Rock outcrop south of Peña Blanca Lake, located as shown in Figure 3.2–2). Avoiding such prominent topographic features prevents scarring of the land, and contributes to mitigation of potential visual impacts (see Section 4.2, Visual Impacts).

Because of the low relief (relatively flat landform) of most of the northern portion of the Western Corridor, the potential for slope failure would be insignificant. However, in the mountainous areas in the southern portion of the corridor (primarily in the Coronado National Forest), as discussed in Section

3.6.1, Geology, there is potential for ground failure (for example, a landslide) where the corridor crosses steep mountain ridges. Relatively intact bedrock, which is not subject to ground failure, is near to or exposed at the ground surface along the majority of the Western Corridor on the west side of the Tumacacori Mountains. These conditions should be suitable for supporting poles on a rock bolted base, in which small holes (less than 6 in [15 cm] in diameter) are drilled into the bedrock and the tower is attached with large bolts. To ensure structure stability, TEP would conduct detailed geotechnical studies at the potential locations for tower structures to determine the suitability of specific areas, once a corridor has been selected. The Western Corridor would cross limited areas where significant soil horizons would be encountered, which would require direct embedment poles. This type of pole installation requires excavation of a shaft wider than the pole using a caisson-drilling rig, and then subsequent backfilling around the pole. In soils with large cobbles (rocks) or soils that tend to collapse, a large pit is often excavated, in which the pole is placed. In such cases, a lean-concrete slurry may be required for backfill of the pit because soils with large cobbles are difficult to compact adequately (Terracon 2002). However, the total land area disturbed by either construction method is similar (an approximate 100-ft [30.5-m] radius).

Based on the Roads Analysis (URS 2003a) required by the U.S. Department of Agriculture Forest Service (USFS) on National Forest System lands, the proposed roads that would be constructed by TEP for the Western Corridor would be on bedrock for approximately 53 percent of their length, and would be on unconsolidated alluvium (soil) for the remaining 47 percent of their length. Roads located on bedrock would be subject to neither erosion nor compaction and no impacts to the geologic environment would be expected. Potential impacts from roads constructed on unconsolidated alluvium are discussed in Section 4.6.2, Soils.

No sand or gravel mining occurs within the Western Corridor and no active surface mines are crossed. No impact to geologic resource availability would be expected from implementation of the proposed project.

The Western Corridor is located adjacent to inactive mine tailing areas west of Sahuarita (Township 17 South, Range 13 East). Since the proposed corridor alignments are within currently existing electric transmission corridor alignments in the vicinity of the mine tailing areas, it is not expected that the mine tailing areas would be expanded into these areas in the future. Therefore, no impact to the tailing areas would be expected from implementation of the proposed project.

Although seismic risk is low to moderate, given the seismic history of the area, locations of active faults and typical recurrence intervals discussed in Section 3.1, it is unlikely that the proposed project would be threatened significantly. However, design of the proposed project would take local seismic risk into consideration to mitigate any potential damage.

4.6.1.2 *Central Corridor*

The potential impacts described above for the Western Corridor would also generally apply to the Central Corridor.

Similar to the Western Corridor, because of the low relief (relatively flat landform) of most of the northern portion of the Central Corridor, the potential for slope failure would be insignificant. A majority of the Central Corridor near and on the Coronado National Forest (approximately 10 mi [16 km] on Quaternary alluvium, as shown in Figure 3.6–1) has exposed soil at the surface rather than bedrock. Foundations for structures along the Central Corridor in these areas would most likely require direct embedment poles. The unconsolidated gravelly and cobbly soils would make excavation of the embedment zone (hole) challenging, requiring excavation of a large pit. A lean-concrete slurry would likely be required for backfill of the pit because soils with large cobbles are difficult to compact adequately. Where the southern portion of the Central Corridor intersects areas of relatively intact bedrock, rock bolting would be appropriate (Terracon 2002). To ensure structure stability, TEP would conduct detailed geotechnical studies at the potential locations for tower structures to determine the suitability of specific areas, once a corridor has been selected.

Based on the Roads Analysis (URS 2003a) required by USFS for National Forest System land, the proposed roads that would be constructed by TEP for the Central Corridor would be on bedrock for approximately 15 percent of their length, and would be on unconsolidated alluvium (soil) for the remaining 85 percent of their length. Roads located on bedrock would be subject to neither erosion nor compaction and no impacts to the geologic environment would be expected. Potential impacts from roads constructed on unconsolidated alluvium are discussed in Section 4.6.2, Soils.

Similar to the Western Corridor, no impact to geologic resource availability or adjacent mine tailing areas west of Sahuarita would be expected from implementation of the Central Corridor. The design of the proposed project would take local seismic risk into consideration to mitigate any potential damage. There would be no significant differences in impacts between option 1 and option 2.

4.6.1.3 *Crossover Corridor*

The potential impacts described above for the Western Corridor would also generally apply to the Crossover Corridor.

In the vicinity of Peck Canyon and upon crossing other steep mountainous areas, as discussed in Section 3.6.1, Geology, there is potential for ground failure in areas where bedrock is not exposed. Where the Crossover Corridor passes through Peck Canyon for approximately 7 mi (11 km), the majority of the land has bedrock exposed at the surface. It would be expected that these conditions would be suitable for supporting rock bolted poles (Terracon 2002). To ensure structure stability, TEP would conduct detailed geotechnical studies at the potential locations for tower structures to determine the suitability of specific areas, once a corridor has been selected.

Based on the Roads Analysis (URS 2003a) required by USFS for National Forest System land, the proposed roads that would be constructed by TEP for the Crossover Corridor would be on bedrock for approximately 53 percent of their length, and would be on unconsolidated alluvium (soil) for the remaining 47 percent of their length. Roads located on bedrock would be subject to neither erosion nor compaction and no impacts to the geologic environment would be expected. Potential impacts from roads constructed on unconsolidated alluvium are discussed in Section 4.6.2, Soils.

As for the Western Corridor, no impact to geologic resource availability or adjacent mine tailing areas west of Sahuarita would be expected from implementation of the Crossover Corridor. The design of the proposed project would take local seismic risk into consideration to mitigate any potential damage. There would be no significant differences in impacts between option 1 and option 2.

4.6.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

There would no impacts to geological features or geologic resources of economic value in the immediate interconnection project area.

4.6.1.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and the associated facilities as proposed in this Environmental Impact Statement (EIS). Therefore, there would be no potential impact to geologic resources. Current geologic conditions as described in Section 3.6.1, Geology, would continue.

4.6.2 Soils

4.6.2.1 *Western Corridor*

The soils of the project area would be impacted in areas of proposed access roads, support structure sites, construction areas, and project staging areas, as described in Section 4.1, Land Use. No cultivated areas would be disturbed. The major impact would occur during construction. An increased potential for erosion and soil compaction would occur as large equipment, including heavy trucks and cranes as listed in Section 2.2, are used to install the transmission line. Clearing of the right-of-way (ROW), where necessary, would decrease vegetation cover and may increase erosional factors, while extended and continued use of large equipment may compact the soil. Compaction of the soil can lead to rutting of the road surfaces.

Based on the Roads Analysis (URS 2003a) required by USFS for National Forest System land, for the Western Corridor, the new temporary area of disturbance during construction would be approximately 197 acres (78.5 ha), and the new permanent area of disturbance would be approximately 29.3 acres (11.9 ha). Information regarding site-specific conditions where individual roads are planned would be used during design and construction of the new roads to calculate and minimize erosion. Only spot repairs would be necessary on existing Forest System roads, as shown in Figure 3.12–1. Repairs of existing roads would likely have a positive impact because the upgrades would reduce erosion potential. On new proposed access roads, these soils would be compacted from vehicles and erosion potential could increase over the non-developed condition. In areas where slopes are mild, soil erosion impacts are expected to be minor.

In accordance with USFS "Soil and Water Conservation Practices Handbook" (USFS 1990), TEP has consulted with USFS regarding development of BMPs that would reduce or minimize impacts on geologic, soil, and water resources resulting from the proposed project. Additional consultation to determine specific BMPs would occur following determination of the specific routing location within a corridor if one is selected for implementation. Specific BMPs would be identified after coordination with the Arizona Department of Environmental Quality (ADEQ) and before implementation of the project, for the entire length of the selected corridor. TEP's ongoing consultation with land owners and managers includes parameters for new road construction (URS 2003a). These road parameters include issues such as sideslopes, grades, water bars and rolling dips (to divert water off the roads), width, and road closure. Erosion control measures included in the BMPs would also address areas where slopes are such that soil erosion is a potential concern, and areas where wind related erosion is a concern.

The Western Corridor would cross soils considered to be prime farmland when irrigated. Although the exact placement of the structures cannot be determined at this time, much of the potential prime farmland soils would be spanned by the power line, as opposed to being directly converted to land within the structures footprint. As shown on Table 4.1–1, the estimated total footprint of the structures for the Western Corridor is 0.25 acres (0.1 ha). Thus, the total acreage of prime farmland soils potentially affected by the structures is less than 0.25 acres (0.1 ha).

4.6.2.2 *Central Corridor*

The expected impacts to soil resources and erosion control mitigation for the Central Corridor would be similar to those discussed above for the Western Corridor. The Central Corridor would disturb an area cultivated as permanent pasture for an estimated 0.5 mi (0.8 km) near where it crosses Sopori Wash (see

Figure 3.7–1). The primary difference from the Western Corridor would be in the area of land affected by construction and operation of the Central Corridor. For the Central Corridor on the Coronado National Forest, the new temporary area of disturbance during construction would be approximately 105 acres (42.5 ha), and the new permanent area of disturbance would be an estimated 23.1 acres (9.35 ha) (URS 2003a). Spot repairs of existing roads would likely have a positive impact, as erosion potential would be expected to decrease as a result of the upgrade. Specific BMPs would be identified after coordination with USFS and ADEQ, and before implementation of the project, for the entire length of the selected corridor.

The potential for impacts to prime farmland soils along the Central Corridor is the same as discussed in Section 4.6.2.1 for the Western Corridor. The estimated total footprint of the structures, as shown on Table 4.1–1, for the Central Corridor is 0.21 acres (0.08 ha). Thus, the total acreage of prime farmland soils potentially affected by the structures is less than 0.21 acres (0.08 ha).

4.6.2.3 *Crossover Corridor*

The expected impacts to soil resources and erosion control mitigation for the Crossover Corridor would be similar to those discussed above for the Western Corridor. No cultivated areas would be disturbed. The primary difference would be in the area of land affected by construction and operation of the Crossover Corridor. For the Crossover Corridor on the Coronado National Forest, the new temporary area of disturbance during construction would be an estimated 238.4 acres (96.5 ha), and the new permanent area of disturbance would be an estimated 36.4 acres (14.7 ha) (URS 2003a). Spot repairs of existing roads would likely have a positive impact, as erosion potential would be expected to decrease as a result of the upgrade. Specific BMPs would be identified after coordination with USFS and ADEQ, and before implementation of the project, for the entire length of the selected corridor.

The potential for impacts to prime farmland soils along the Crossover Corridor is the same as discussed in Section 4.6.2.1 for the Western Corridor. The estimated total footprint of the structures, as shown on Table 4.1–1, for the Crossover Corridor is 0.25 acres (0.1 ha). Thus, the total acreage of prime farmland soils potentially affected by the structures is less than 0.25 acres (0.1 ha).

4.6.2.4 *115-kV Interconnection of the Gateway and Valencia Substations*

Impacts to soils in the 115-kV interconnection project would be minimal. The major impact would occur during construction. Clearing of vegetation for the placement of transmission structures would decrease cover and increase the potential for erosion, while extended and continued use of large equipment may compact the soil. The design implementation details would be modified to account for the geotechnical soil conditions.

Since most of the land use in the interconnection project area is industrial, soils have been previously disturbed and therefore, there would be little to no impact to prime agricultural soils.

4.6.2.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. No cultivated areas or prime farmland soils would be disturbed and erosion and resultant sediment transport would continue naturally in undisturbed areas.

4.7 WATER RESOURCES

This section discusses the potential impacts of the proposed Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line project to water resources in the project area for each alternative. The discussion is divided into potential impacts to surface water and groundwater.

4.7.1 Floodplains, Wetlands, and Surface Water

The following discussion of floodplains and wetlands applies to all three proposed corridors. Information specific to surface water impacts and floodplains and wetlands impacts in the Western, Central, and Crossover Corridors is presented separately following the general discussion.

As the proposed location for the transmission line structures for any of the three alternatives is over 400 ft (122 m) from the U.S.-Mexico border, surface drainage would not be affected and no increase in volume, peak runoff, or flow, in either direction across the border would occur from the proposed construction.

Floodplains and Wetlands. A Floodplains and Wetlands Assessment, per Title 10, *Code of Federal Regulations* (CFR), Part 1022, *Compliance with Floodplain/Wetlands Environmental Review Requirements*, has been conducted for the proposed project and is included in Appendix C of this Final Environmental Impact Statement (EIS). A summary of potential impacts and mitigation follows; refer to Appendix C for more information.

The following discussion evaluates the potential impacts of each alternative to floodplains in the project area. No wetlands were found in the proposed corridors during field surveys and none have been identified by Forest Service (USFS) (USFS 2003). Additionally, because there are no major washes on BLM land, no wetland impacts are expected. There may be small areas of wetlands within the proposed corridors that are associated with manmade stock ponds and impoundments. TEP would site the transmission line to avoid such areas. Therefore, no wetlands are expected to be impacted by the proposed project. The discussion of impacts to floodplains is organized by geographic area in order to take advantage of geographic overlap between the three corridor alternatives: Western, Crossover, and Central. These geographic areas are the North Segment, North Central Segment, South Central Segment, East-West Segment, South Segment, and the 115-kV interconnection (labeled on Figure 3.7–3). Common to all three corridor alternatives are the North Segment, the South Segment, and the 115-kV interconnection.

For the purposes of this assessment, the 500-year and 100-year floodplains along the Santa Cruz River and its tributaries were taken from Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), which are based on 2002 digital FIRM files for Pima and Santa Cruz counties. The FIRM maps indicate that the following tributaries occurring in the project area could have associated 100-year floodplains: Santa Cruz River, Sopori, Toros, Diablo, Las Chivas, Mariposa Canyon Wash, and several unnamed washes (see Figure 3.7-3). Delineated 500-year floodplains within the study areas are associated with the Santa Cruz River, Sopori, and Mariposa Canyon Wash. Additional unmapped 100-year and 500-year floodplains may also occur in the project area. In those areas where the 100- or 500-year floodplains have not been delineated, the county engineer or Federal agency may require the project proponent to establish the regulatory floodplain and floodway limits through a hydrologic and hydraulic study prepared by an Arizona registered professional civil engineer.

All three proposed corridors involve some construction in floodplains. The four activities that would be conducted in floodplains are pole placement, the construction of pole laydown areas, access roads, and the South Substation expansion (located in the North Segment of all three corridors). For the purposes of this assessment, the following assumptions were made regarding these potential impacts: (1) the impact of individual pole placement would be 25 ft^2 (2.3 m^2) (see Table 4.1–1 for overall pole footprints); (2) pole laydown areas would each require about 1,850 ft^2 (172 m^2); (3) access roads would be 12 ft (3.7 m) wide; and (4) the South Substation expansion would require 58,500 ft^2 (5,440 m^2). Projected impacts to floodplains were based on maps provided by Electrical Consultants Inc. showing locations of poles, pole laydown areas, and access roads (ECI 2003).

As permanent structures in floodplains, the South Substation expansion and corridor access roads could directly impact floodplain functions and values by increasing flood elevation and frequency. An increase in flood elevation could result in an increase in downstream flood loss and a long-term negative impact on lives and property. Impacts resulting from pole placement and construction of laydown areas would be negligible. Neither activity would negatively impact flood elevation or flood frequency. Consequently, there would be no direct or long-term effects on floodplain values or lives and properties.

Table 4.7–1 shows the estimated area of each proposed corridor that could be in the delineated 100-year and 500-year floodplain (refer to Appendix C for additional details). The Western and Crossover Corridors would have the greatest potential impact on floodplains in the project area. For these two alternative corridor routes, total potential impact within the delineated 100-year floodplain is estimated at about 1.97 acres (0.80 ha). The Central Corridor would have the least impact to the delineated 100-year floodplain (an estimated 1.58 acres [0.64 ha]).

Table 4.7–1. Estimated Impacts to Floodplains by Alternative.

Segment	Western (acres)	Crossover (acres)	Central (acres)
North	1.34	1.34	1.34
North Central	0.54	0.54	0.15
South Central	0.00	0.00	0.00
East-West	-	0.00	-
South	0.09	0.09	0.09
TOTAL	**1.97**	**1.97**	**1.58**

"-" means corridor does not pass through this segment.

Impacts to floodplains would be avoided to the extent possible by siting access roads and pole laydown areas outside floodplains, and spanning floodplains where feasible. Impacts to floodplains resulting from the South Substation expansion could result because the South Substation was originally constructed in the delineated 100-year floodplain. However, TEP completed a study to determine engineering measures that could be implemented to provide flood protection to the South Substation (TEP 2002c). The results of that study indicate a variety of protective measures (ranging from reducing erosion with soil cement to building a structural concrete retaining wall) that can be implemented to better protect the South Substation from flooding. TEP would take appropriate measures to maintain the reliability of the electric transmission system.

In the case of Sopori Wash (see Figure 3.7–3), for any of the three corridors TEP would place one structure within the 100-year floodplain, though outside the normal flow line, as this wash is too wide to span across. The structure would be engineered to withstand a 100-year flood. In addition, for the Crossover Corridor an estimated two structures would be placed in the bottom of Peck Canyon, as described in Section 4.7.1.3.

TEP would be required to comply with Pima and Santa Cruz County floodplain protection standards. These standards require that all structures associated with the power line installation be flood-proofed or elevated at least 1 ft (0.3 m) above the base flood elevation. In the project area, this would apply to the South Substation expansion and corridor access roads that cross the floodplain. The support structures, though permanent structures, would not require any specific mitigation since they would not have an effect on flood elevations. Similarly, the pole laydown areas would not affect flood elevations because they would be temporary. Finally, obtaining a Floodplain Permit for this project would be contingent on concurrent acquisition of any *Clean Water Act* (CWA) Section 401 (state certification) and 402 (National Pollutant Discharge Elimination System) permits, if necessary.

Placement of roads within the floodplain can restrict transport of organic and inorganic materials, divert streamflow, and constrain natural channel migration. These factors can result in alteration or degradation of stream habitats, as well as physical damage to the landscape as a whole. Because the location and physical attributes of drainage channels are dynamic, appropriate placement of roads and other structures must account for movement of geomorphic (surface) features within the floodplain. Information regarding site-specific conditions on where proposed roads would approach floodplains would be used during the design and construction of these roads in order to ensure that the design best protects the integrity of channel and floodplain dynamics. Although flash floods could occur in narrow washes, they would not be expected to impact the transmission towers, as the towers would be located to span across such washes.

Surface Water. The following discussion describes potential surface water impacts and mitigation for each of the three proposed corridors. Surface waters include the tributaries identified in the previous section (Floodplains and Wetlands) that could be part of the 100-year floodplain.

4.7.1.1 *Western Corridor*

The Western Corridor would cross numerous dry washes, many very small, and approximately 15 large washes, both within and outside of the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest, including one minor drainage on Bureau of Land Management (BLM) land. Potential impacts to surface waterbodies would be from increased erosion and subsequent siltation due to construction activities around these areas. Although the exact placement of the structures has not yet been identified, TEP would span the surface water features and avoid placing structures adjacent to surface water features where feasible, except as noted previously for Sopori Wash.

Access roads to the proposed project, both for construction and ongoing maintenance, would traverse numerous washes, including approximately 134 drainages and washes on the Coronado National Forest along the Western Corridor. Proposed access roads would be designed in accordance with Best Management Practices (BMPs) (and USFS guidance on National Forest System lands) to minimize impacts to washes (URS 2003a). Potential effects related to stream crossings include increased sedimentation, changes in stream morphology including substrate composition, and changes in the ability of the stream to support vegetation and wildlife. Because drainage along the corridor is intermittent and the road use would also be intermittent, roads would generally not need culverts or bridges where they cross streams. Therefore, stream crossings should not interfere with material transport (wood, fine organic matter, sediment) in streams. The road system could create a potential for pollutants (primarily from motorized vehicles) to reach surface waters, when water flow occurs at stream crossings in locations where road drainage flows directly into a stream. However, as the stream network is intermittent, road-stream crossings are limited, and expected vehicle use is infrequent, the potential for pollutants to enter surface waters as a result of the proposed project is negligible. All construction equipment would be refueled no closer than 500 ft (150 m) from a wash or drainage (URS 2003a).

Road effects on the surface and subsurface hydrology of a given area include potential diversion and concentration of flow. Road design including water bars, rolling dips, and hardened crossings would be developed in coordination with the land owners and managers.

TEP consulted with USFS regarding development of BMPs for minimizing impacts on geologic, soil, and water resources from the proposed project on National Forest System lands, in accordance with the USFS "Soil and Water Conservation Practices Handbook" (FSH 2509.22, R-3 Transmittal, USFS 1990). Specific BMPs would be identified after coordination with Arizona Department of Environmental Quality (ADEQ) and before implementation of the project, to mitigate potential impacts for the entire length of the selected corridor. BMPs would include standard erosion control methods such as silt fencing and hay bales in areas where erosion into surface water drainages could occur. For specific mitigation measures, see Table 2.2-2 Mitigation Common to All Alternatives.

Application of BMPs for road and tower construction, revegetation for roads not needed for ongoing maintenance, and spot repairs of existing roads would mitigate the potential for impacting USFS water resource parameters (see Section 3.7) on the Coronado National Forest.

The potential impacts to surface waterbodies would be from increased erosion and subsequent siltation due to construction activities. Although the exact placement of the structures has not yet been identified, TEP would span surface water features and avoid placing structures adjacent to surface waterbodies where feasible. BMPs would be used to reduce impact to surface water bodies.

4.7.1.2 *Central Corridor*

The potential impacts to surface water resources and mitigation discussed in Section 4.7.1.1 for the Western Corridor also generally apply for the Central Corridor. The Central Corridor would cross numerous dry washes, many very small, and approximately 14 large washes, both on and off the Coronado National Forest. On the Coronado National Forest, access roads to the proposed project, both for construction and ongoing maintenance would traverse numerous washes, including approximately 21 drainages and washes along the Central Corridor (URS 2003a). No significant differences in impacts are expected between options 1 and 2 because there are no significant water resources in this 1.9- mi (3.1-km) stretch of land.

Application of BMPs for road and tower construction, revegetation for roads not needed for ongoing maintenance, and spot repairs of existing roads would mitigate the potential for impacting USFS water resource parameters (see Section 3.7) on the Coronado National Forest.

4.7.1.3 *Crossover Corridor*

The potential impacts to surface water resources and mitigation discussed in Section 4.7.1.1 for the Western Corridor also generally apply for the Crossover Corridor. The Crossover Corridor would cross numerous dry washes, many very small, and approximately 14 large washes, both on and off the Coronado National Forest. Two proposed towers within the Peck Canyon segment would be located in the bottom of the wash due to the steep terrain of the area limiting potential structure base locations. The tower foundations and associated sediment deposition and streambed vegetation could disrupt channel hydraulics during flood debris flow events. This would force flow against the valley walls, potentially resulting in increased erosion. The probability of this occurring should be evaluated in more detail if the Crossover Corridor is selected for construction (URS 2003a). On the Coronado National Forest, access roads to the proposed project, both for construction and ongoing maintenance would traverse numerous washes, including approximately 86 drainages and washes along the Crossover Corridor (URS 2003a). No significant differences in impacts are expected between options 1 and 2 because there are no significant water resources in this 1.9- mi (3.1-km) stretch of land.

Application of BMPs for road and tower construction, revegetation for roads not needed for ongoing maintenance, and spot repairs of existing roads would mitigate the potential for impacting USFS water resource parameters (see Section 3.7) on the Coronado National Forest.

4.7.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The potential impacts to surface water resources and mitigation discussed in Section 4.7.1.1 for the Western Corridor also generally apply to the 115-kV interconnection. There would be structures located within the 100-year floodplain. TEP would be required to comply with Santa Cruz County floodplain protection standards. These standards require that all structures associated with the power line installation be flood-proofed or elevated at least 1 ft (0.3 m) above the base flood elevation. The support structures, though permanent structures, would not require any specific mitigation since they would not have an effect on flood elevations. Similarly, the pole laydown areas would not affect flood elevations because they would be temporary.

4.7.1.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. Current water resource patterns would continue, as described in Section 3.7.1.

4.7.2 Groundwater

4.7.2.1 *Western Corridor*

During construction of the project, water would be required primarily for dust control. Groundwater may be used, with the specific water sources to be determined upon precise siting of the right-of-way (ROW). It is estimated that approximately 1 acre-ft would be used during construction. This water would be obtained from various sources and aquifers within the project area. Although the exact sources are not known, removal of this minimal quantity of groundwater would not have a noticeable effect on groundwater supply in the region. For comparison, the total groundwater demand in the Santa Cruz Active Management Area in 2000 was 54,100 acre-ft.

During construction of the project, the storage and use of fuel, lubricants, and other fluids during the construction phase of the facilities and access roads could create a potential contamination hazard. Spills or leaks of hazardous fluids could contaminate groundwater and affect aquifer use. This impact would be minimized or avoided by restricting the location of refueling activities and by requiring immediate clean-up of spills and leaks of hazardous materials. In this manner any potentially contaminating materials would be removed before they could migrate downward to the groundwater. In addition, the generally large depth to groundwater in the project area further limits the potential for groundwater contamination from surface spills. In the event of a spill, TEP would notify the appropriate state (ADEQ) and local officials, and the affected landowner, while initiating emergency response actions.

Oil and diesel fuel would be stored in clearly marked tanks onsite that would be provided with secondary containment structures. Construction equipment would be maintained regularly, and the source of leaks would be identified and repaired. Any soil contaminated by fuel or oil spills would be removed and disposed by a contractor to an approved disposal site. Lubricating oils, acids for equipment cleaning, and concrete curing compounds are potentially hazardous wastes that may be associated with construction activities. These would be placed in containers within secondary containment structures onsite and disposed of at a licensed treatment and/or disposal facility in accordance with local or state regulations and in compliance with manufacturer's recommendations. Paint containers would be tightly sealed to prevent leaks or spills. Excess paint would be disposed of consistent with the manufacturer's recommendations and according to applicable governmental regulations.

4.7.2.2 *Central Corridor*

The groundwater issues described for the Western Corridor also apply to the Central Corridor.

4.7.2.3 *Crossover Corridor*

The groundwater issues described for the Western Corridor also apply to the Crossover Corridor.

4.7.2.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The groundwater issues described for the Western Corridor also apply to the 115-kV Interconnection of the Gateway and Valencia Substations.

4.7.2.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. TEP would generate no additional wastes and the potential for effects on local groundwater would be eliminated. Current trends in groundwater usage and subsidence would continue, as described in Section 3.7.2.

4.8 AIR QUALITY

This section includes discussion of the potential effects of the emissions of the proposed project on air quality, the conformity analysis required under the *Clean Air Act* (CAA), and the potential particulate matter contributions to the United States that could result from construction of Mexico's connecting portion of the transmission line to be built in Mexico. The methodology for determining impacts is presented, along with a description of the construction and operation impacts for each alternative.

4.8.1 Emissions

Methodology

The air quality impacts discussion focuses on the construction phase of the project as the primary activity with the potential to impact air quality. This evaluation includes potential air emissions that could occur during construction of each alternative from fugitive dust (dust which escapes from a construction site) and equipment exhaust. Potential air impacts are evaluated for both project construction in the U.S. and for impacts in the U.S. that could be caused by air emissions transported to the U.S. from construction of Mexico's connecting portion of the transmission line to be built in Mexico. The projected construction progression, local climate and soil conditions, and project area land use are considered in assessing the significance of air quality impacts associated with the proposed project. Mitigation measures to avoid potential nuisance dust conditions and minimize construction equipment impacts to nearby residents are also described.

4.8.1.1 *Western Corridor*

The potential for impacts on air quality associated with the Western Corridor would occur primarily during the construction phase. Fugitive dust emissions would result from construction along the transmission line right-of-way (ROW) at the South and Gateway Substations and staging areas, and at other construction areas as described in Section 2.2.3, Transmission Line Construction. The major sources of dust emissions would be construction equipment traffic, land clearing, drilling, excavation, and earth moving. Tucson Electric Power Company (TEP) anticipates that some explosives blasting would be required depending on geological conditions. Dust emissions would vary substantially from day to day, depending on the level of activity, the specific operation, and the prevailing meteorological conditions. The use of construction equipment would also result in the emission of air pollutants associated with diesel combustion (NO_x [nitrogen oxides], CO [carbon monoxide], SO_x [sulfur oxides], PM_{10} [particulate matter with an aerodynamic diameter less than or equal to 10 microns] and reactive organic gases [ROG] from the fuel). All construction vehicle movements would be limited to the ROW or to pre-designated staging areas or public roads. Roads and active areas would have watering requirements appropriate for dust control in arid regions. An Activity Permit would be obtained from the Pima County Department of Environmental Quality for construction activities. The Arizona Administrative Code (AAC) contains dust control requirements for activities in Santa Cruz County, although no "dust control permit" would be required for activities in Santa Cruz County (Yockey 2001). Given the limited emissions of the project, it would not be subject to New Source Review (NSR) permitting under the CAA.

The Western Corridor crosses primarily undeveloped land. A limited number of residents in the vicinity of the ROW may be affected by a temporary adverse impact on their local air quality during construction. The average duration a construction site would be active adjacent to any one residence or business is 2 to 3 months. Construction is estimated to be completed in 10 months; however, due to potential restrictions on construction during fauna breeding and nesting seasons, construction could be spread over 12 to 18 months. No air quality impact associated with construction at any Class I Areas, or impacts to overall climate, would be expected from the proposed project. Construction generated dust would settle out of the air within a distance of several miles from the project, thus avoiding visibility impacts at the Saguaro

National Monument East Class I area, 18 mi (29 km) north of TEP's South Substation in Sahuarita. Given that the construction would be temporary and the adjacent land is primarily undeveloped, no significant impacts are expected to occur from construction.

No significant air impacts are expected from ongoing operation and maintenance of the Western Corridor. An occasional maintenance vehicle would be required to perform maintenance activities. Where maintenance access roads are not required, restoration of the ROW to natural vegetation would mitigate any fugitive dust emissions. The potential would exist for trace amounts of ozone production resulting from corona effects, the electrical breakdown of air into charged particles around the conductors, as explained in Section 3.10.2, Corona Effects. During damp or rainy weather (the peak conditions for corona effects), the ozone produced from similar transmission lines is less than 1 part per billion (ppb) (DOE 2001a). Background ozone measurements under the direction of the Arizona Department of Environmental Quality (ADEQ) in similar rural areas show 8-hour average ozone levels in the range of 70 to 80 ppb, considerably higher than levels generated by corona effects (Yockey 2001). Thus, no significant effects to air quality would be associated with the operation along the Western Corridor. Corona would be mitigated by using proper line design and by incorporating line hardware shielding.

4.8.1.2 *Central Corridor*

The potential for impacts to air quality associated with the construction and operation of the Central Corridor would be very similar to those for the Western Corridor. An increased number of residents may be temporarily affected by fugitive dust during construction of the Central Corridor. Given the temporary nature of construction and the limited impacts during operation, no significant effects to air quality would be associated with the Central Corridor, and it would not be subject to NSR permitting under the CAA. Air quality impacts would be the same for both Options 1 and 2.

4.8.1.3 *Crossover Corridor*

The potential for impacts to air quality associated with the construction and operation of the Crossover Corridor would be very similar to those for the Western Corridor. Given the temporary nature of construction and the limited impacts during operation, no significant effects to air quality would be associated with the Crossover Corridor, and it would not be subject to NSR permitting under the CAA.

Air quality impacts would be the same for both options 1 and 2.

4.8.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The potential for impacts to air quality associated with the construction and operation of the Gateway to Valencia 115-kV transmission line corridor would be significantly less than the impacts presented for the Western, Central, and Crossover Corridors. The Gateway to Valencia transmission line corridor would be less than one-tenth the length of the shortest proposed corridor and would require less than one-tenth as much construction. The only NAAQS that could be significantly affected would be PM_{10} , which is assessed in detail in Section 4.8.2.3.

4.8.1.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and the associated facilities as proposed in this Environmental Impact Statement (EIS). Current air quality trends would be expected to continue, as described in Section 3.8, Air Quality.

4.8.2 *Clean Air Act* Conformity Requirements

Section 176(c) of the CAA requires Federal agencies to ensure that their actions conform to applicable implementation plans (in most cases, the State Implementation Plan [SIP]) for achieving and maintaining the National Ambient Air Quality Standards (NAAQS) for criteria pollutants. The State of Arizona General Conformity regulations (R18-2-1438) contain procedures and criteria for determining whether a proposed Federal action would conform to the SIP required by the CAA. (Arizona's General Conformity regulations are identical to, and reference, 40 CFR Part 93, Subpart B.) The regulations apply to a proposed Federal action that would cause emissions of criteria air pollutants above certain levels for the emitted pollutants, in non-attainment or maintenance areas (areas redesignated as attainment within the last 10 years). DOE's guidance document, *CAA General Conformity Requirements and the NEPA Process* (DOE 2000), outlines the specific steps for addressing CAA conformity requirements in *National Environmental Policy Act* (NEPA) documents such as this EIS.

For the proposed Sahuarita-Nogales Transmission Line project, the potential actions of Federal agencies included in this EIS (see Section 1.2.2) are as follows:

- U.S. Department of Energy (DOE) – the granting of a Presidential Permit
- U.S. Department of Agriculture Forest Service (USFS) – issue an authorization to construct, operate, and maintain a 345-kV electrical transmission line and associated support facilities and access roads; and amend the Forest Plan to establish utility corridor, establish utility corridor width, or change visual quality objectives
- Bureau of Land Management (BLM) – the approval of TEP's application to cross Federal lands managed by BLM
- U.S. Section of the International Boundary and Water Commission (USIBWC)- concur on the engineering design and technical studies that support TEP's proposal relative to activities that will occur at and near the international border with the Republic of Mexico

There are two phases to addressing CAA conformity requirements. In the first phase, the conformity *review* process, the Federal agency evaluates whether the conformity regulations would apply to an action (which, in turn, determines if the second phase of analysis is required). The second phase of analysis is the conformity *determination* process, in which the Federal agency demonstrates (often through extensive analyses) how an action would conform to the applicable implementation plan. For the proposed project, DOE, as the lead Federal agency, has conducted a conformity review for each analyzed alternative (the Western, Central, and Crossover Corridors), and has determined that a conformity determination would not be required for implementation of any of these alternatives. To the extent that the final alternative selected differs significantly from the assumptions utilized in the conformity review, the conformity review may need to be revisited before construction of the alternative.

There are two areas for which a conformity review is required, as shown in Figure 3.8–2: (1) the Nogales area, designated as being in moderate non-attainment of the NAAQS for PM_{10}, and (2) a CO maintenance area located near Tucson. The PM_{10} non-attainment area encompasses Township 23 South, Ranges 13 to 14 East, and Township 24 South, Ranges 13 to 14 East, and includes portions of the proposed transmission line, project access, and the Gateway Substation. The CO maintenance area includes Township 16 South, Ranges 12 to 16 East, and runs adjacent to the north of a segment of the proposed transmission line and the South Substation. As stated in Section 4.8.1, both PM_{10} (a component of fugitive dust) and CO would be emitted under each alternative. Thus, PM_{10} and CO are identified as the pollutants of concern for the conformity review.

For the conformity review of each alternative, the total emissions were estimated for each pollutant of concern within the non-attainment or maintenance area for that pollutant. Because the project emissions during operation would be limited to those from occasional maintenance vehicles or equipment, the maximum year of project emissions calculated for the conformity review are those that would occur during a full year of project construction. (Construction is estimated to be completed in 10 months; however, due to potential restrictions on construction during fauna breeding and nesting seasons, construction could be spread over 12 to 18 months). To be conservative in terms of estimating the maximum emissions that could possibly occur, a one-year period for project construction was assumed, with scheduled 6-day work-weeks and with no allowance for work-days lost to bad weather, time off, or holidays. The emissions included within the conformity review are as follows: (1) PM_{10} fugitive dust emission from construction and use of project access (including access road grading), staging areas, and tower and substation areas, (2) PM_{10} and CO vehicle emissions from construction access vehicles and heavy construction equipment, (3) PM_{10} and CO emissions from explosives blasting for tower and access construction, (4) emissions from the personal vehicles of construction workers traveling to and from the project staging sites, and (5) emissions from any increase in recreational use (for example, by off-highway vehicles) of the project area as a result of the proposed project.

In accordance with 40 CFR 93.153 (b), the total emissions estimates of each alternative were compared to the applicable threshold emissions rates for the pollutants of concern, as listed in Table 4.8–1. For both PM_{10} and CO, the applicable threshold emission rate is 100 tons per year (tpy) (91 metric tons, or tonnes, per year [mtpy]). If the total emissions estimates are equal to or greater than the threshold emission rates for any pollutant of concern, a conformity determination would be required.

In addition, according to 40 CFR 93.153 (i) and (j), the total emissions estimates of each alternative are compared to the non-attainment and maintenance area's total emissions (that is, the listing of air pollutant emissions in the U.S. Environmental Protection Agency [EPA]-approved SIP) for the pollutants of concern. If the total emissions estimates are equal to or greater than 10 percent of the emissions inventory for a pollutant of concern, the proposed project would be considered a "regionally significant action" and a conformity determination would be required.

For the Nogales PM_{10} non-attainment area, the SIP that ADEQ submitted to EPA in 1993 did not contain air pollutant emissions estimates, and thus EPA has not taken action to approve this portion of the SIP. Therefore, there is no PM_{10} emissions inventory available for the Nogales PM_{10} non-attainment area (ADEQ 2003a) that would allow a regionally significant level to be formally derived.

For the Tucson CO maintenance area, the EPA-approved SIP includes a Limited Maintenance Plan that does not establish an emissions inventory for CO. The Limited Maintenance Plan was developed with the support of the Pima Association of Governments, that estimated the mobile source emissions of CO (that is, from personal and commercial vehicles), constituting a majority of the CO emissions in the maintenance area. The estimated CO mobile source emissions for the maintenance area for 2003 are 325.1 tons per day, or 118,661 tpy (107,647 mtpy) (EPA 2000a). Therefore, 10 percent of 118,661 tpy (107,647 mtpy), that is, 11,866 tpy (10,765 mtpy), may be regarded as the emissions level above which the proposed project may be considered a regionally significant action. This regionally significant level for the Tucson maintenance area CO emissions is listed in Table 4.8–2.

Table 4.8–1. Regulatory Threshold Emission Rates for PM_{10} and CO

Criteria Pollutant and Air Quality Classification	Threshold Emission Rates (tons per year)
PM_{10} Moderate Non-attainment Area	100
CO Maintenance Area	100

Source: 40 CFR 93.153[b].

Table 4.8–2. Regionally Significant Action Level of PM_{10} and CO

Criteria Pollutant	Emission Rates (tons per year)
PM_{10}	(no EPA-approved SIP)
CO	11,866

EPA = U.S. Environmental Protection Agency; SIP = State Implementation Plan
Source: EPA 2000a, EPA 2003b

The following background assumptions were made for estimating the fugitive dust emissions, equipment and vehicle emissions, and explosives blasting emissions for the Western, Central, and Crossover Corridors. Where precise information is not known conservative assumptions (potential overestimates) are used.

- There would be an estimated 18.8 mi (30.3 km) of unpaved project access roads for the Western Corridor, and 11.6 mi (18.7 km) for the Central and Crossover Corridors, within the Nogales non-attainment area. Access roads would be 12 ft (3.6 m) wide.

- There would be 57 support structures in the Western Corridor within the Nogales PM_{10} non-attainment area, and 65 support structures in the Central and Crossover Corridors within the Nogales PM_{10} non-attainment area.

- Each structure site would require a 100 by 200 ft (30 by 60 m) assembly area, which in some cases would overlap with the tower construction areas described in the following bullet item.

- Ten percent of the structures would be lattice towers (requiring 80,000 ft^2 [7,400 m^2] per tower for construction), and the remaining 90 percent would be monopoles (requiring 31,415 ft^2 [2,920 m^2] per tower for construction). Given the overlap of these tower construction areas with some of the tower assembly areas (in the previous bullet item), the net tower construction areas are reduced by 25 percent each for use in the emissions calculations.

- There would be a total of two tensioning/pulling sites (each 150 by 250 ft [46 by 76 m]) under active construction or use at any one time within the Nogales non-attainment area for any of the three proposed corridors.

- Construction along the Western, or Central, or Crossover Corridors would last one full year and would proceed at a steady rate along the entire length of the transmission line that is selected. There would be two construction crews within the Nogales PM_{10} non-attainment area, and one construction crew within the Tucson CO maintenance area, that would be working a maximum of 6 days a week throughout a year, or 313 days per year. Down time from bad weather, holidays or time off is conservatively assumed to be zero. Thirteen percent of the segment of the Western Corridor within the Nogales PM_{10} non-attainment area would be under construction at any one time, and 17 percent of that segment of the Central and Crossover Corridors that lies within the Nogales PM_{10} non-attainment area would be under construction at any one time.

- Construction at the Gateway Substation would last for 7 months of 6 day work-weeks.

- Of the 18 acres (7.3 ha) of the TEP portion of the Gateway Substation,10 acres (4 ha) would be fenced for construction, and 50 percent (that is, 5 acres [2 ha]) would be under construction at any one time during the 7 month construction period.

- An additional 3 acres (1.2 ha) at the staging area adjacent to the Gateway Substation would be engaged in construction activities for 3 months of 6 day work-weeks.

- Each construction crew would utilize the following equipment continuously for 8 hours each day: one planer or bulldozer, one scraper, one wheeled loader, one off-highway truck, one loader, one excavator, one concrete paver, one crane, and one water spray truck (see Figure 2.2–1 for representative photographs of the proposed construction equipment).

- All emissions estimates and assumptions, unless otherwise stated, are based on EPA's Compilation of Air Pollutant Emission Factors (AP-42, EPA 1995). To calculate the fugitive dust emissions rate, the daily emissions rate of 80 pounds of total suspended particulate matter (TSP) per acre of active construction per day (90 kg per ha per day) was multiplied by the percentage of PM_{10} in TSP, which varies with soil type (Wild 1993). The proposed project would cross a range of soil types, as shown in Figure 3.6–5, from sandy loams (10 to 30 percent PM_{10}) to clay loams (30 to 50 percent PM_{10}). The highest possible percentage of PM_{10} was conservatively assumed to be the 50 percent maximum.

- TEP would employ dust control measures on unpaved roads and in work areas. A control efficiency of 50 percent was assumed for typical dust control measures, such as watering roads and work areas, in an arid climate. This conservative estimate is based on EPA dust control efficiency assumptions for similar climates, ranging from 54 to 75 percent dust control (EPA 2002).

- In addition to the construction crews, there would be two 0.75-ton (0.68-metric ton) trucks that would each travel approximately 30 mi (48 km) per day on unpaved roads within the PM_{10} non-attainment area for coordination and completion of construction.

- The 80-acre (32-ha) construction lay down yard would be near the Arivaca Road and I-19 interchange, approximately 20 mi (32 km) outside of both the Nogales PM_{10} non-attainment area and the Tucson CO maintenance area.

The emissions estimates for the pollutants of concern, and the results of the comparisons of the emissions to the threshold emissions rates and the area's emissions inventory, are presented in the following sections.

4.8.2.1 *Western Corridor*

The length of the Western Corridor within the Nogales PM_{10} moderate non-attainment area would be approximately 8.3 mi (13.4 km) and would include an estimated 57 support structures. Also within the Nogales PM_{10} moderate non-attainment area would be the Gateway Substation. TEP owns 18 acres (7.3 ha) at the Gateway Substation of which a subset of 10 acres (4 ha) would be fenced off for construction; of these 10 fenced acres a maximum of only 50 percent (that is, 5 acres [2 ha]) would be under construction at any one time. There would also be a 3-acre (1.2-ha) staging area adjacent to the Gateway Substation that would be used for 3 months. The South Substation and approximately 1 mi (1.6 km) of the project corridor common to all three alternatives are just inside the Tucson CO maintenance area.

Based on the previously stated assumptions, the construction area under active construction at any one time for the transmission line in the Western Corridor within the PM_{10} non-attainment area would be approximately 12 acres (5 ha). This area would include support structure construction and access roads. This would result in maximum PM_{10} emissions of approximately 37.1 tpy (33.6 mtpy). Maximum PM_{10} emissions from 5 acres (2 ha) within the 10-acre (4-ha) fenced area of the Gateway Substation under continuous construction for seven months are estimated to be approximately 9.2 tpy (8.3 mtpy). Maximum PM_{10} emissions from the Gateway staging area are estimated to be approximately 2.3 tpy

(2.1 mtpy). The maximum PM_{10} emissions from construction vehicle and equipment engines are estimated to be approximately 4.0 tpy (3.6 mtpy) within the Nogales PM_{10} non-attainment area.

TEP anticipates that some explosives blasting may be required during construction depending on geologic conditions. While CO is the pollutant produced in the greatest quantities from explosives detonation, some PM_{10} is also generated (EPA 1995). Explosives blasting would be limited to one or two blasts per day on average, as needed, in areas of tower or access construction. As explosives are most efficiently used by containing the blast energy in the ground to fracture the rock, the fugitive dust (and PM_{10}) generated at the ground surface from explosives blasting would be minimal. The charge would be limited to fracturing rock in a small area and discharge of material would be limited by proper charge design and use of blasting mats, which TEP would place over the excavation to further limit material and dust. The typical depth of explosives charges that would be utilized by TEP would be approximately 3 ft (0.9 m) below ground level. The ground disturbance associated with explosives blasting operations would be captured in the fugitive dust calculations previously described for the PM_{10} non-attainment area.

Maximum PM_{10} emissions from two 0.75-ton (0.68-metric ton) trucks that would each travel approximately 30 mi (48 km) per day on unpaved roads within the PM_{10} non-attainment area for coordination and completion of construction are estimated to be approximately 7.3 tpy (6.6 mtpy). Emissions from the personal vehicles of construction workers traveling to and from the project staging sites would be minimal given that access to the staging sites is primarily paved. The maximum number of construction workers would be approximately 50. Assuming workers would travel 0.5 mi (0.8 km) each way on unpaved roads to reach one of the three staging sites, there would be 17 vehicle miles (27 vehicle km) traveled each day at a particular staging site. Given an AP-42 estimate of 1.74 lbs PM_{10} per vehicle mile (0.79 kg per vehicle kilometer) traveled, worker vehicle PM_{10} emissions would be an estimated 2.3 tpy (2.1 mtpy) within the Nogales PM_{10} non-attainment area. Any increase in indirect emissions associated with increased recreational use of the project area would be minimal given the existing opportunities for recreational vehicle use in the project area (see Section 4.1.2).

Helicopters would be used to install conductors on the support structures once in place. Approximately 8.3 mi (13.4 km) of transmission line would be installed using helicopters within the Nogales PM_{10} non-attainment area. This work would be accomplished in one day (assume 10 hours). The helicopter movement generally would cause some dust to be generated by downwash from the rotor blades. Such dust generation is similar to that from wind erosion and would be expected to cause entrainment of the loose surface material. The amount of dust generated would be small and would impact only the localized areas. For the helicopter operations within the Nogales PM_{10} non-attainment area, an emission factor of 21.3 lb (9.7 kg) of fugitive PM_{10} per hour may be assumed (South Coast 1993). Thus, maximum fugitive dust emissions from helicopter operations would be 213 lb (97 kg) or 0.11 tons (0.10 t).

Thus, the total PM_{10} emissions would be approximately 62 tpy (56 mtpy) within the Nogales PM_{10} non-attainment area. This calculated maximum yearly PM_{10} emissions rate would be below the emissions threshold rate of 100 tpy (91 mtpy). Therefore, a conformity determination for the proposed project within the Nogales PM_{10} non-attainment area would not be required. Although conservative assumptions were used for estimating PM_{10} emissions in this conformity review, there is some uncertainty in the estimated annual emissions because final project-specific input data were not available at the time of this analysis. Therefore, upon selection of an alternative to be implemented and preparation of final construction plans, the assumptions used in this review would be re-examined, and, if necessary, project PM_{10} emissions in the Nogales PM_{10} non-attainment area would be recalculated to assure that emissions are below the 100 tpy (91 mtpy) threshold emission rate.

For the CO maintenance area, the direct emissions sources included in the calculations are from equipment and vehicle emissions and explosives blasting. Assuming that one construction crew is active all year within or adjacent to the CO maintenance area, and based on AP-42 construction vehicle emission factors and the equipment and usage factors given in the assumptions, the CO emissions would be an estimated 11.5 tpy (10.4 mtpy).

CO is the pollutant produced in the greatest quantities from explosives detonation. For ammonium nitrate and fuel oil, the explosives commonly used for construction work, approximately 67 pounds of CO would be emitted for each ton of rock blasted (EPA 1995). Assuming that TEP performs 25 blasts of 10 tons (9.1 metric tons) of rock each, in the area within or adjacent to the CO maintenance area, the resulting CO emissions would be an estimated 8.4 tpy (7.6 mtpy).

Emissions from construction workers' personal vehicles reporting to one of the three project staging sites could also contribute CO to the Tucson maintenance area depending on where the workers live. Assuming that the construction workers reporting to the South Substation staging area would drive 15 mi (24 km) each way in the Tucson CO maintenance area, and given EPA's factor of 0.046 lbs CO per mi (0.013 kg per km), maximum annual emissions of CO would be an estimated 4.3 tpy (3.9 mtpy) (EPA 2000b). Thus, the maximum year of emissions could result in an estimated 24.2 tpy (21.9 mtpy) of CO emissions immediately adjacent to or within the Tucson CO maintenance area. This emissions rate would be below the emissions threshold rate of 100 tpy (91 mtpy) that would trigger a conformity determination. This emissions rate would also be below the regionally significant source emissions threshold rate of 11,866 tpy. Therefore, a conformity determination for the proposed project within the Tucson CO maintenance area would not be required.

4.8.2.2 *Central and Crossover Corridors*

The Central and Crossover Corridors are identical within the Nogales PM_{10} non-attainment area, and are addressed by a single conformity review that follows for the PM_{10} non-attainment area. The Central and Crossover Corridors are the same as the Western Corridor with respect to the Tucson CO maintenance area; therefore, the assumptions, emissions estimates, and conclusion described in Section 4.8.2.1 that a conformity determination would not be required for the proposed project adjacent to the CO maintenance area also apply for the Central and Crossover Corridors. Additionally, Options 1 and 2 for either the Central or Crossover Corridor would have similar air emissions and therefore are not analyzed separately.

The Central and Crossover Corridors within the Nogales PM_{10} moderate non-attainment area would be approximately 10.5 mi (16.9 km) long and would include 65 support structures. TEP owns 18 acres (7.3 ha) at the Gateway Substation of which a subset of 10 acres (4 ha) would be fenced off for construction, and, of these 10 fenced acres, a maximum of only 50 percent (that is, 5 acres [2 ha]) would be under construction at any one time. There would also be a 3-acre (1.2-ha) staging area adjacent to the Gateway Substation that would be used for 3 months.

Based on the previously stated assumptions, the construction area under active construction at any one time for the transmission line in the Central Crossover Corridor within the PM_{10} non-attainment area would be approximately 15 acres (6 ha). This area would include support structure construction and access roads. This would result in maximum emissions of approximately 47.6 tpy (43.2 mtpy). Maximum PM_{10} emissions from five acres under continuous construction for seven months within the 10-acre (4-ha) fenced area of the Gateway Substation are estimated to be approximately 9.2 tpy (8.3 mtpy). Maximum PM_{10} emissions from the Gateway staging area are estimated to be approximately 2.3 tpy (2.1 mtpy). The maximum PM_{10} emissions from construction vehicle and equipment engines are estimated to be approximately 4.0 tpy (3.6 mtpy) within the Nogales PM_{10} non-attainment area.

TEP anticipates that some explosives blasting may be required during construction depending on geologic conditions. While CO is the pollutant produced in the greatest quantities from explosives detonation, some PM_{10} is also generated (EPA 1995). Explosives blasting would be limited to one or two blasts per day on average, as needed, in areas of tower or access construction. As explosives are most efficiently used by containing the blast energy in the ground to fracture the rock, the fugitive dust (and PM_{10}) generated at the ground surface from explosives blasting would be minimal. The charge is limited to fracturing rocks in a localized area and discharge of material would be limited by proper charge design and use of blasting mats, which TEP would place over the excavation to further limit material and dust. The typical depth of explosives charges that would be utilized by TEP would be approximately 3 ft (0.9 m) below ground level. The ground disturbance associated with explosives blasting operations would be captured in the fugitive dust calculations previously described for the PM_{10} non-attainment area.

An estimated 20 to 25 structures would be brought in by helicopter for the Peck Canyon portion of the Crossover Corridor because of its topography and inaccessibility. Helicopters would be used to install conductors on the support structures once in place. Approximately 10.5 mi (16.9 km) of transmission line would be installed using helicopters within the Nogales PM_{10} non-attainment area. This work would be accomplished in one day (assume 10 hours). The helicopter movement generally would cause some dust to be generated by downwash from the rotor blades. Such dust generation is similar to that from wind erosion and would be expected to cause entrainment of the loose surface material. The amount of dust generated would be small and would impact only the localized areas. For the helicopter operations within the Nogales PM_{10} non-attainment area, an emission factor of 21.3 lb (9.7 kg) of fugitive PM_{10} per hour may be assumed (South Coast Air Quality Management District 1993). Thus, maximum fugitive dust emissions from helicopter operations would be 213 lb (97 kg) or 0.11 tons (0.10 t).

Maximum PM_{10} emissions from two 0.75-ton (0.68-metric ton) trucks that would each travel approximately 30 mi (48 km) per day on unpaved roads within the PM_{10} non-attainment area for coordination and completion of construction are estimated to be approximately 7.3 tpy (6.6 mtpy). Emissions from the personal vehicles of construction workers traveling to and from the project staging sites would be minimal given that access to the staging sites is primarily paved. The maximum number of construction workers would be approximately 50. Assuming workers would travel 0.5 mi (0.8 km) each way on unpaved roads to reach one of the three staging sites, there would be 17 vehicle miles (27 vehicle km) traveled each day at a particular staging site. Given an AP-42 estimate of 1.74 lbs PM_{10} per vehicle mile (0.79 kg per vehicle km) traveled, worker vehicle PM_{10} emissions would be an estimated 2.3 tpy 2.1 mtpy) within the Nogales PM_{10} non-attainment area. Any increase in indirect emissions associated with increased recreational use of the project area would be minimal given the existing opportunities for recreational vehicle use in the project area (see Section 4.1.2).

Thus, the total PM_{10} emissions would be approximately 73 tpy (66 mtpy) within the Nogales PM_{10} non-attainment area. This calculated maximum yearly PM_{10} emissions rate would be below the emissions threshold rate of 100 tpy (91 mtpy). Therefore, a conformity determination for the proposed project within the Nogales PM_{10} non-attainment area would not be required. Although conservative assumptions were used for estimating PM_{10} emissions in this conformity review, there is some uncertainty in the estimated annual emissions because final project-specific input data were not available at the time of this analysis. Therefore, upon selection of an alternative to be implemented and preparation of final construction plans, the assumptions used in this review would be re-examined, and, if necessary, project PM_{10} emissions in the Nogales PM_{10} non-attainment area would be recalculated to assure that emissions are below the 100 tpy (91 mtpy) threshold emission rate.

4.8.2.3 *115-kV Interconnection of the Gateway and Valencia Substations*

The length of the Gateway to Valencia 115-kV Transmission Line within the Nogales PM_{10} moderate non-attainment area would be approximately 3.0 miles (4.8 km) and would include an estimated 20 support structures. Based on the previously stated assumptions, the construction area under active construction at any one time for the transmission line within the PM_{10} non-attainment area would be approximately 4.3 acres (1.7 ha). This area would include support structure construction and access roads. This would result in maximum PM_{10} emissions of approximately 13.3 tpy (12.0 mtpy). The maximum

PM_{10} emissions from construction vehicle and equipment engines are estimated to be approximately 1.4 tpy (1.3 mtpy) within the Nogales PM_{10} non-attainment area.

Helicopters would be used to install conductors on the support structures once in place. Approximately 3.0 miles (4.8 km) of transmission line would be installed using helicopters within the Nogales PM_{10} non-attainment area. This work would be accomplished in one day (assume 10 hours). The helicopter movement generally would cause some dust to be generated by downwash from the rotor blades. Such dust generation is similar to that from wind erosion and would be expected to cause entrainment of the loose surface material. The amount of dust generated would be small and would impact only the localized areas. For the helicopter operations within the Nogales PM_{10} non-attainment area, an emission factor of 21.3 lb (9.7 kg) of fugitive PM_{10} per hour may be assumed (South Coast Air Quality Management District 1993). Thus, maximum fugitive dust emissions from helicopter operations would be 213 lb (97 kg) or 0.11 tons (0.10 t).

Thus, the total PM_{10} emissions would be approximately 14.8 tpy (13.4 mtpy) within the Nogales PM_{10} non-attainment area. This calculated maximum yearly PM_{10} emissions rate would be below the emissions threshold rate of 100 tpy (91 mtpy). Therefore, a conformity determination for the proposed project within the Nogales PM_{10} non-attainment area would not be required. Although conservative assumptions were used for estimating PM_{10} emissions in this conformity review, there is some uncertainty in the estimated annual emissions because final project-specific input data were not available at the time of this analysis. Therefore, upon selection of an alternative to be implemented and preparation of final construction plans, the assumptions used in this review would be re-examined, and, if necessary, project PM_{10} emissions in the Nogales PM_{10} non-attainment area would be recalculated to assure that emissions are below the 100 tpy (91 mtpy) threshold emission rate.

4.8.3 PM_{10} Contributions from Transmission Line Construction in Mexico

Emissions that could be generated in Mexico from the construction of Mexico's connecting portion of the transmission line were assumed to occur simultaneously with TEP's construction of the proposed project in the U.S., as a scenario to predict maximum annual emissions. Given the lack of available information on project design and construction in Mexico (as TEP would not construct this portion of the project), the conservative assumptions stated previously for project access, support structure type and span length, and construction progression and equipment in the U.S. were also applied for construction on the Mexico portion of the project. Project-generated emissions for Mexico could be transported to the U.S. by tropospheric dispersion. As shown in Figure 3.8–1, surface winds are predominately southeasterly, and blow from Mexico in the south to the U.S. in the north (including to the north, north-northeast, and north-northwest) approximately 25 percent of the time (NOAA 2003). Emissions from the project connecting to TEP's proposed border crossing into Nogales, Mexico, were considered for the first 10 mi (16 km) of Mexico's project south of the border, mirroring the approximate 10 mi (16 km) of TEP's proposed project within the Nogales, Arizona PM_{10} non-attainment area. As estimated for the approximate 10 mi (16 km) of TEP's proposed project within the Nogales, Arizona PM_{10} non-attainment area, approximately 15 acres (6 ha) in Mexico near the U.S. border may be under active construction at any one time and approximately 61 tpy (56 mtpy) of PM_{10} emissions may result. If 25 percent of these emissions were transported to the Nogales, Arizona, PM_{10} non-attainment area in the U.S., this would correspond to a contribution of approximately 15 tpy (14 mtpy) of PM_{10} emissions from Mexico.

4.9 NOISE

This section discusses the potential noise impacts of the construction and operation of the proposed Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project along each alternative corridor. The methodology for determining impacts is presented below, followed by a description of the impacts from each alternative.

Methodology

The noise impact analysis evaluates the potential noise levels generated during construction and operation of the proposed project, and identifies potential receptors along each alternative corridor. The analysis includes quantification of projected noise levels and assesses the potential for corona effects from transmission lines. Specific noise impacts would be mitigated by limiting the daily hours of construction of the proposed project.

As explained in Section 3.9, noise levels are measured as a composite decibel (dB) value. The adjusted decibels (dBA) represent the human hearing response to sound for a single sound event. Day-Night Average Sound Level (DNL) represents the average sound level over a complete 24-hour period, which is often used for the evaluation of community noise effects.

For construction of the proposed project, both an average noise level (DNL) and a single sound event noise level (dBA) have been evaluated. The single sound event analysis shows the peak noise levels near the right-of-way (ROW), while the DNL predicts average community noise levels near the ROW. For this analysis, the calculation of the DNL assumes that no construction would occur between the hours of 10 p.m. and 7 a.m. The noise levels are calculated for the nearest residences and businesses to the ROW. Noise levels would be reduced for receptors further removed from the ROW by approximately 6 dBA for each doubling of distance from the source. For example, a 75 dBA noise heard at 50 ft (15 m) from the source would be reduced to 69 dBA at 100 ft (30 m) away from the source (Canter 1977).

The potential for construction noise to impact wildlife is addressed in the Biological Assessments prepared for the proposed project, included as Appendices D, E, and F of this Environmental Impact Statement (EIS) (HEG 2003a, 2003b, 2003c). The species that may be affected are described in this section and in Section 4.3, Biological Resources.

In determining the significance of the calculated DNL, results for each alternative are compared to established standards. In 1974, the U.S. Environmental Protection Agency (EPA) identified noise levels that could be used to protect public health and welfare, including prevention of hearing damage, sleep disturbance, and communication disruption. Outdoor DNL values of 55 dBA were identified as desirable to protect against activity interference and hearing loss in residential areas and at educational facilities.

The determination as to whether the impact of a single sound event (or series of single events) is significant is a qualitative assessment of the increase in noise level above background as experienced by receptors near the source. A subjective response to changes in sound levels based upon personal judgements of sound presented within a short timespan indicate that a change of ±5 dBA may be quite noticeable, although changes that take place over a long period of time of this magnitude or greater may be “barely perceptible.” Changes in sound levels of ±10 dBA within a short timespan may be perceived by humans as “dramatic” and changes in sound levels of ±20 dBA within a short timespan may be perceived as “striking.” In qualitative terms, these types of changes in sound level could be considered significant (DOE 2001a).

The construction schedule of each alternative would likely involve several areas under active construction concurrently. As construction of the project progresses, the areas impacted by noise would follow the active construction areas. Construction for the proposed project would be completed in a period of 12 to 18 months.

4.9.1 Western Corridor

Construction Impacts. The acoustical environment would be impacted during construction of the Western Corridor. Construction activities would generate noise produced by heavy construction equipment and trucks used along the access roads and ROW. Explosives blasting may be used as needed, based on local geologic conditions, and thus could contribute to noise impacts. Construction noise levels would be variable and intermittent, as equipment is operated on an as-needed basis. Construction activities normally would be limited to daytime hours, and thus would not impact existing background noise levels at night. While relatively high peak noise levels in the range of 80 to 103 dBA would occur on the active construction sites, these noise levels would be temporary and intermittent. Table 4.9–1 presents the peak noise levels (dBA) expected for a single sound event from various equipment during construction.

Table 4.9–1. Peak Attenuated Noise Levels (dBA) Expected from Construction Equipment[a].

Source	Peak Noise Level	Distance from Source						
		50 ft	100 ft	200 ft	400 ft	1,000 ft	1,700 ft	2,500 ft
Heavy Trucks	95	84-89	78-83	72-77	66-71	58-63	54-59	50-55
Dump trucks	108	88	82	76	70	62	58	54
Concrete mixer	108	85	79	73	67	59	55	51
Jackhammer	108	88	82	76	70	62	58	54
Scraper	93	80-89	74-82	68-77	60-71	54-63	50-59	46-55
Bulldozer	107	87-102	81-96	75-90	69-84	61-76	57-72	53-68
Generator	96	76	70	64	58	50	46	42
Crane	104	75-88	69-82	63-76	55-70	49-62	45-48	41-54
Loader	104	73-86	67-80	61-74	55-68	47-60	43-56	39-52
Grader	108	88-91	82-85	76-79	70-73	62-65	58-61	54-57
Pile driver	105	95	89	83	77	69	65	61
Forklift	100	95	89	83	77	69	65	61

[a] Attenuation with distance is dependent on the frequency of the sound and thus varies as shown for the following sources of varying frequencies.
Source: Golden et al. 1980.

The combined effect of several equipment types operating simultaneously is not represented by the sum of the individual noise levels, but rather is calculated based on the logarithmic scale of decibels (see explanation in Section 3.9). Table 4.9–2 presents the results of a sample calculation assuming a scenario of a bulldozer, jackhammer, and scraper operating simultaneously, which is highly unlikely.

Table 4.9–2. Example of Maximum Combined Peak Noise Level from Bulldozer, Jackhammer, and Scraper

	Distance from Source				
	50 ft	**100 ft**	**200 ft**	**1,000 ft**	**2,500 ft**
Combined Peak Noise Level	103 dBA	97 dBA	91 dBA	77 dBA	69 dBA

For tower sites where workers or equipment are to be inserted by helicopter or sky crane, the approach, landing, and takeoff of a helicopter would be an additional noise source. Noise from medium-lift helicopters typical of those that would be used is in the range of 90 to 100 dBA at 100 ft (31 m). Helicopters are most likely to be used within the Coronado National Forest, where fewer access roads currently exist.

Explosives blasting may be required at tower locations founded on bedrock in steep terrain, in order to level the base prior to rock bolting the tower. The projected peak noise levels associated with explosives blasting would be in the range of the construction equipment listed in Table 4.9–1 (Golden et al. 1980). As blasting is accomplished most efficiently by directing the blasting energy into the ground, the noise associated with blasting would be mitigated by the noise absorbing effects of the ground.

The potential construction noise impacts of the Western Corridor would primarily affect the residences and commercial areas in the immediate vicinity of the ROW, as described in Land Use, Section 3.1. The existing background noise in residential and commercial areas is typically 45 dBA or higher. Table 4.9–2 shows that peak construction noise at a distance of approximately 1,000 ft (305 m) from the ROW would be an estimated 77 dBA. The residences nearest to the ROW (an estimated 1,000 ft [305 m] away), as described in Section 3.1, would experience construction noise levels that may be perceived as striking or very loud, comparable to a lawn mower or a leaf blower. These peak noise levels would be localized and intermittent. The average total duration that any construction area may be active is 2 to 3 months. In addition to residences and businesses, intermittent peak noise levels would be experienced by nearby hikers and participants in other recreation within the Coronado National Forest, as described in Section 3.1.2.

Impacts to sensitive species that are discussed in Section 4.3 result from noise disturbance associated with construction activities. See Section 4.3, Biological Resources for a discussion of noise impacts to sensitive species.

A second measure of construction noise is the 24-hour average noise level, represented by the DNL to gauge average community noise effects. The DNL would decrease to near the background noise level of 48 dBA for receptors beyond 325 ft (99 m) from the ROW.

In evaluating the potential for hearing damage (both Temporary Threshold Shift and Noise-Induced Permanent Threshold Shift), the noise level and duration of exposure are considered. For example, Noise-induced Permanent Threshold Shift would be produced by unprotected exposures of 8 hours per day for several years to noise above 105 dBA. Similarly, Temporary Threshold Shift would be based on exposure to a steady noise level of 80 to 130 dBA, increasing with duration of exposure (Canter 1977). The intermittent peak construction noise levels would not create the steady noise level conditions for an extended duration that could lead to Temporary Threshold Shift or Noise-induced Permanent Threshold Shift hearing damage.

Operational Impacts. Upon completion of construction, the potential for noise impacts associated with the project would be from three major sources: (1) corona from the transmission lines (a crackling or hissing noise); (2) operation of the transformers at the substations; and (3) maintenance work and vehicles.

Corona is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors. Corona-generated audible noise from transmission lines is generally characterized as a crackling or hissing noise. During dry weather conditions, audible noise from transmission lines is often lost in the background noise at locations beyond the edge of the ROW. Modern transmission lines are designed, constructed, and maintained so that during dry conditions they will operate below the corona-inception voltage, meaning that the line will generate a minimum of corona-related noise. Sound level measurements taken during fair weather at existing TEP 345-kV transmission lines indicate only a 2 to 3 dB difference between background noise levels and levels beneath the transmission lines (Meyer 2001b). In foul weather conditions corona discharges can be produced by water droplets and fog. Given the arid climate in the project area and the distance of receptors from the ROW, the impact of corona-generated audible noise is not expected to be significant.

Transformers at the existing South Substation in Sahuarita and the new Gateway Substation in Nogales would generate minimal noise during operation. There are no residences within 0.5 mi (0.8 km) of either substation and the substation noise would not be discernible from background noise at any residences. Measurements at an existing TEP substation similar to those proposed indicate sound levels to be typically 40 to 55 dBA, within the existing background range (Meyer 2001b). Occasional maintenance activities on the transmission lines and substations would be required. Noise impacts from these activities would be intermittent and are not expected to be significant.

Based upon the noise impacts analyses of the Western Corridor, the primary effect of noise generated would probably be one of annoyance to the residents nearest to the ROW during the construction period. Construction workers would be located closer to the noise sources, would experience longer exposure durations than the public, and would follow standard industry and Federal Occupational Safety and Health Administration (OSHA) procedures for hearing protection.

4.9.2 Central Corridor

Construction Impacts. The acoustical environment would be impacted during construction of the Central Corridor similarly to the Western Corridor as described in Section 4.9.1. While relatively high peak noise levels in the range of 80 to 103 dBA would occur on the active construction sites, these noise levels would be temporary and intermittent. As there is increased development along the I-19 corridor compared to the Western Corridor, as described in Section 3.1, Land Use, a few more residences may experience temporary construction noise impacts. Noise impacts would be the same for both options 1 and 2.

Table 4.9–1 presents the peak noise levels (dBA) expected for a single sound event from various equipment during construction. Table 4.9–2 presents the results of a sample calculation assuming a scenario of a bulldozer, jackhammer, and scraper operating simultaneously, which is highly unlikely.

The potential construction noise impacts of the Central Corridor would primarily affect the residences and commercial areas in the immediate vicinity of the ROW. The residences nearest to the ROW (at a distance of approximately 500 ft [150 m]), as described in Section 3.1, would experience construction noise levels that may be perceived as “striking” or very loud. Peak noise levels experienced by Tubac residents would be comparable to a street sweeper at a distance of 30 ft (9 m). These peak noise levels would be localized, temporary, and intermittent. In addition to residences and businesses, intermittent peak noise levels would be experienced by nearby hikers and participants in other recreation along the limited segment of the Central Corridor in the Coronado National Forest, as described in Section 3.1.2.

A second measure of construction noise is the 24-hour average noise level, represented by the DNL to gauge average community noise effects. The DNL would decrease to near the background noise level of 48 dBA for receptors beyond 325 ft (99 m) from the ROW. As described for the Western Corridor the intermittent peak construction noise levels would not create the steady noise level conditions for an extended duration that could lead to Temporary Threshold Shift or Noise-induced Permanent Threshold Shift hearing damage (Canter 1977).

Operational Impacts. Upon completion of construction, the potential for noise impacts associated with the project would be from three major sources: (1) corona from the transmission lines (a crackling or hissing noise); (2) operation of the transformers at the substations; and (3) maintenance work and vehicles. As with the Western Corridor in Section 4.9.1, the potential corona effects and substation operational noise would be comparable to background noise levels for receptors, and thus not significant. Noise impacts from maintenance activities would be intermittent and not expected to be significant.

Based upon the noise impacts analyses of the Central Corridor, the primary effect of noise generated would probably be one of annoyance to the residents nearest to the ROW during the construction period. Construction workers would be located closer to the noise sources, would experience longer exposure durations than the public, and would follow standard industry and OSHA procedures for hearing protection.

4.9.3 Crossover Corridor

Construction Impacts. The acoustical environment would be impacted during construction of the Crossover Corridor similarly to the Western Corridor as described in Section 4.9.1. While relatively high peak noise levels in the range of 80 to 103 dBA would occur on the active construction sites, these noise levels would be temporary and intermittent.

Table 4.9–1 presents the peak noise levels (dBA) expected for a single sound event from various equipment during construction. Table 4.9–2 presents the results of a sample calculation assuming a scenario of a bulldozer, jackhammer, and scraper operating simultaneously, which is highly unlikely. Noise impacts would be the same for both options 1 and 2.

The potential construction noise impacts of the Crossover Corridor would primarily affect the residences and commercial areas in the immediate vicinity of the ROW. The residences nearest to the ROW (the same as described for the Western Corridor) would experience construction noise levels that may be perceived as “striking” or very loud, comparable to a lawn mower or a leaf blower. These peak noise levels would be localized, temporary and intermittent. In addition to residences and businesses, intermittent peak noise levels would be experienced by nearby hikers and participants in other recreation along the Crossover Corridor in the Coronado National Forest, as described in Section 3.1.2.

A second measure of construction noise is the 24-hour average noise level, represented by the DNL to gauge average community noise effects. The DNL would decrease to near the background noise level of 48 dBA for receptors beyond 325 ft (99 m) from the ROW. As described for the Western Corridor in Section 4.9.1, the intermittent peak construction noise levels would not create the steady noise level conditions for an extended duration that could lead to Temporary Threshold Shift or Noise-induced Permanent Threshold Shift hearing damage (Canter 1977).

Operational Impacts. Upon completion of construction, the potential for noise impacts associated with the project would be from three major sources: (1) corona from the transmission lines (a crackling or hissing noise); (2) operation of the transformers at the substations; and (3) maintenance work and vehicles. As with the Western Corridor the potential corona effects and substation operational noise would be comparable to background noise levels for receptors, and thus not significant. Noise impacts from maintenance activities would be intermittent and not expected to be significant.

Based upon the noise impacts analyses of the Crossover Corridor, the primary effect of noise generated would probably be annoyance to the residents nearest to the ROW during the construction period. Construction workers would be located closer to the noise sources, would experience longer exposure durations than the public, and would follow standard industry and OSHA procedures for hearing protection.

4.9.4 115-kV Interconnection of the Gateway and Valencia Substations

Construction Impacts. The acoustical environment would be impacted during construction of the 115-kV Gateway to Valencia Substations interconnection to the Western Corridor as described in Section 4.9.1, but would be shorter in duration.

The potential construction noise impacts of the 115-kV Gateway to Valencia Substations Interconnection would primarily affect the residences, commercial and industrial areas in the immediate vicinity of the ROW. The residences nearest to the ROW (at a distance of approximately 200 ft [61 m]), as described in Section 3.1, would experience construction noise levels that may be perceived as “striking” or very loud .

Operational Impact. Upon completion of construction, the potential for noise impacts associated with the project would be from three major sources: (1) corona from the transmission lines (a crackling or hissing noise); (2) operation of the transformers at the substations; and (3) maintenance work and vehicles. As with the Western Corridor the potential corona effects and substation operational noise would be comparable to background noise levels for receptors, and thus not significant. Noise impacts from maintenance activities would be intermittent and not expected to be significant.

Based upon the noise impacts analyses, the primary effect of noise generated would probably be annoyance to the residents nearest to the ROW during the construction period. Construction workers would be located closer to the noise sources, would experience longer exposure durations than the public, and would follow standard industry and OSHA procedures for hearing protection.

4.9.5 No Action Alternative

Under the No Action Alternative, TEP would not build the proposed transmission line and the associated facilities as proposed in this EIS. Potential noise impacts associated with the construction and operation of the Sahuarita-Nogales Transmission Line Project would not occur. The local noise conditions would continue according to current patterns, as described in Section 3.9.

4.10 HUMAN HEALTH AND ENVIRONMENT

This section discusses the potential human health and environment effects of the proposed project. The methodology for determining effects is presented, followed by a description of the effects for each alternative. Potential impacts on human hearing are addressed in Section 4.9, Noise Impacts.

Methodology

The electric and magnetic field (EMF) effects of the transmission lines were calculated for a range of distances from the transmission line. In general, the farther removed a person is from the transmission line, the lower the EMF strength. A number of different scenarios were tested in the calculations. Because the magnetic field varies with the current carried on the transmission line, magnetic field strength was calculated for both the normal anticipated current load of 250 million volt-amperes (MVA) per circuit, and the maximum anticipated current load of 500 MVA per circuit. Calculations were also performed for a number of different transmission line configurations (vertical optimized phasing orientation or vertical non-optimized phasing orientation) that can affect the EMF strength. In the optimized phasing orientation, the phases of the two circuits are offset to minimize the EMF strength. As described in Section 3.10, the focus of EMF health studies and the focus of the following impacts analysis is on magnetic fields, although electric fields are included for completeness.

Since Tucson Electric Power Company's (TEP) policy is to minimize EMF exposure levels to the extent practicable, TEP would use the vertical optimized phasing orientation for the double-circuit line. Results from the non-optimized phasing orientation are included for comparison purposes only. The calculations evaluate EMF strength at a range of distances from the centerline of the transmission line, both within and outside the approximate 125-ft (38-m) right-of-way (ROW). The magnetic field is expressed in units of milligauss (mG); the electric field is expressed in units of kilovolt per meter (kV/m).

The potential for corona effects and effects on safety is also evaluated. The nearest potential receptors to the transmission line based on the proposed corridors are listed for each alternative, including residences, schools, and commercial establishments.

4.10.1 Electric and Magnetic Fields

4.10.1.1 *Western Corridor*

Electric and Magnetic Field Effects. The Western Corridor would consist primarily of single steel pole double-circuit structures strung with 345-kV conductors. The spacing of the structures would be in the range of 600 to 1,000 ft (183 to 305 m) apart. The minimum ground clearance of the conductors would be 32 ft (9.8 m).

Table 4.10–1 lists the EMF strength under normal anticipated load conditions for the 345-kV double-circuit transmission line. Table 4.10–2 lists this same information for maximum anticipated load conditions. EMF strength is given for both the optimized phasing configuration that would be used by TEP, and for the non-optimized phasing configuration for comparison purposes. Figures 4.10–1 and 4.10–2 graphically illustrate the EMF strengths, respectively, for the optimized phasing configuration of the transmission line (Meyer 2001a). The distances given represent the distance of a receptor from the centerline of the transmission line. At a given distance, the electric and magnetic field strength would be nearly identical on both sides of the transmission line.

Table 4.10–1. EMF Strength for Normal Operating Conditions (250 MVA Current, 345-kV Double Circuit)

	Optimized Phase Configuration		Non-optimized Phase Configuration (for comparison purposes only)	
Distance from Centerline (feet)	Magnetic Field Strength (mG)	Electric Field[a] Strength (kV/m)	Magnetic Field Strength (mG)	Electric Field[a] Strength (kV/m)
1500	0.002	0.001	0.102	0.004
1250	0.004	0.001	0.146	0.006
1000	0.007	0.002	0.228	0.009
750	0.017	0.003	0.405	0.015
500	0.056	0.007	0.904	0.034
450	0.076	0.009	1.112	0.041
400	0.108	0.012	1.401	0.051
350	0.159	0.016	1.817	0.065
300	0.248	0.021	2.448	0.084
250	0.418	0.030	3.467	0.113
200	0.777	0.042	5.257	0.153
175	1.114	0.048	6.698	0.175
150	1.667	0.050	8.785	0.192
125	2.627	0.032	11.934	0.183
100	4.403	0.054	16.897	0.084
90	5.520	0.129	19.667	0.054
80	6.999	0.252	23.055	0.214
70[a]	8.973	0.448	27.198	0.497
60	11.612	0.753	32.223	0.946
50	15.108	1.203	38.171	1.630
45	17.228	1.486	41.440	2.078
40	19.598	1.799	44.821	2.601
35	22.190	2.122	48.196	3.186
30	24.936	2.418	51.400	3.812
25	27.713	2.638	54.233	4.438
20	30.351	2.729	56.508	5.014
15	32.653	2.659	58.117	5.492
10	34.433	2.450	59.081	5.838
5	35.552	2.206	59.544	6.042
0	35.934	2.093	59.673	6.108

[a] Beyond edge of 125 ft ROW.
Source: Meyer 2001a.

Table 4.10–2. EMF Strength for Maximum Operating Conditions (500 MVA Current, 345-kV Double Circuit)

Distance from Centerline (feet)	Optimized Phase Configuration		Non-optimized Phase Configuration (for comparison purposes only)	
	Magnetic Field Strength (mG)	Electric Field [a] Strength (kV/m)	Magnetic Field Strength (mG)	Electric Field[a] Strength (kV/m)
1500	0.004	0.001	0.203	0.004
1250	0.007	0.001	0.293	0.006
1000	0.014	0.002	0.457	0.009
750	0.034	0.003	0.810	0.015
500	0.112	0.007	1.807	0.034
450	0.153	0.009	2.224	0.041
400	0.216	0.012	2.801	0.051
350	0.318	0.016	3.364	0.065
300	0.497	0.021	4.897	0.084
250	0.835	0.030	6.934	0.113
200	1.553	0.042	10.514	0.153
175	2.227	0.048	13.396	0.175
150	3.334	0.050	17.570	0.192
125	5.254	0.032	23.868	0.183
100	8.807	0.054	33.795	0.084
90	11.040	0.129	39.334	0.054
80	13.998	0.252	46.109	0.214
70[b]	17.945	0.448	54.395	0.497
60	23.223	0.753	64.446	0.946
50	30.217	1.203	76.343	1.630
45	34.455	1.486	82.881	2.078
40	39.196	1.799	89.643	2.601
35	44.381	2.122	96.393	3.186
30	49.871	2.418	102.800	3.812
25	55.425	2.638	108.466	4.438
20	60.702	2.729	113.017	5.014
15	65.306	2.659	116.234	5.492
10	68.866	2.450	118.163	5.838
5	71.105	2.206	119.088	6.042
0	71.867	2.093	119.346	6.108

[a] Electric field strength is not affected by the current load. Thus, electric field strength values given for normal and maximum operating conditions are the same.
[b] Beyond edge of 125 ft ROW.
Source: Meyer 2001a.

Beyond the edge of a 125-ft (38-m) ROW, the magnetic field strength of the optimized phasing configuration under normal operating conditions would be 8.9 mG. This would diminish to 4.4 mG at a distance of 100 ft (30 m) from the centerline, 0.78 mG at a distance of 200 ft (61 m) from the centerline, and 0.25 mG at a distance of 300 ft (91 m) from the centerline. For comparison purposes only, the non-optimized phasing configuration would result in a magnetic field of 27 mG at the edge of a 125-ft (38-m) ROW, three times the magnetic field from the optimized phasing configuration. Temporary exposure to magnetic fields on this level of magnitude are similar to being 1 ft (0.3 m) away from common household appliances such as a mixer or hair dryer (Waveguide 2003).

The electric field strength at the edge of a 125-ft (38-m) ROW under normal operating conditions for the optimized phasing configuration would be 0.45 kV/m. This would diminish to 0.054 kV/m at a distance of 100 ft (30 m) from the centerline, 0.042 kV/m at a distance of 200 ft (61 m) from the centerline, and 0.021 kV/m at a distance of 300 ft (91 m) from the centerline.

Tables 4.10–1 and 4.10–2 demonstrate the EMF strength reductions that would be achieved by TEP's use of the optimized phasing configuration, compared to the non-optimized phasing configuration. Two shield wires, which provide necessary shielding for lightning protection, would be placed near the top of each pole to shield the 12 345-kV phase subconductors. Each circuit of a double-circuit transmission line consists of three phases; each phase consists of two subconductors. Phasing between the two circuits would be configured in a way that would minimize EMF strength.

Magnetic field levels would be elevated in the vicinity of the proposed ROW on Bureau of Land Management (BLM) land and in other areas where TEP's proposed project would be adjacent to existing transmission lines, west of Sahuarita and Green Valley as shown in Figure 3.11–1. As an example of maximum combined EMF from existing transmission lines and the proposed project, TEP has modeled EMF levels from the proposed project on BLM land, where the proposed project runs adjacent to the south of 345-kV and 138-kV transmission lines. At the southern edge of the ROW of TEP's proposed transmission line (340 ft [104 m] south of the existing 345-kV transmission line), the magnetic field would be 12.1 mG and the electric field would be 0.83 kV/m. At a distance of 200 ft (61 m) south of the proposed centerline, the magnetic field would be 0.9 mG and the electric field would be 0.045 kV/m. This would diminish to a magnetic field of 0.44 mG and an electric field of 0.024 kV/m at a distance of 300 ft (91 m) from the centerline (TEP 2003).

It is the policy of TEP that no residences would be within the ROW. The nearest residences to the proposed Western Corridor ROW are a group of about five houses at a distance of approximately 1,000 ft (305 m) from the ROW centerline, south of Sahuarita Road, west of the Town of Sahuarita. Sahuarita High School and Middle School are approximately 4,000 ft (1,200 m) south of the ROW centerline.

In the segment from Gateway Substation to the U.S.-Mexico border, there are warehouses and apartments approximately 1,000 ft (305 m), from the corridor centerline. Mary Welty Elementary School is located more than 1 mi (1.6 km) to the east of the ROW near the U.S.-Mexico border.

Long-term EMF exposure at these nearest residences, schools, and commercial establishments would be well below 0.8 mG, an average daily exposure to maximum magnetic fields from some common household appliances (NIEHS 1999). The EMF strengths conform to those normally found in comparable lines.

Safety. As described in Section 3.10.1, the electric field created by a high-voltage transmission line extends from the energized conductors to other conducting objects such as the ground, towers, vegetation, buildings, vehicles, and persons. Potential field effects can include induced currents, steady-state current shocks, spark discharge shocks, and in some cases field perception and neurobehavioral responses. The following describes the potential for effects on safety, and design mitigation measures that would be incorporated.

Induced Currents. The 345-kV transmission lines would have a minimum ground clearance of 32 ft (9.8 m) to reduce the potential for induced current shocks. In addition, permanent structures in the ROW, such as fences, gates, and metal buildings would be grounded.

Steady-State Current Shocks. Features reducing the level of potential for induced current in objects near the transmission line also reduce the level of a possible induced current shock. The proposed lines would be constructed in accordance with industry and TEP standards to minimize hazardous shocks from direct or indirect human contact with an overhead, energized line. These lines are not expected to pose any such hazards to humans.

Spark Discharge Shocks. In accordance with TEP's transmission line standards, the magnitude of the electric field would be low enough that spark discharge shocks would occur rarely, if at all. The potential for nuisance shocks would be minimized through standard grounding procedures. Carrying or handling conducting objects, such as irrigation pipe, under transmission lines can result in spark discharges that are a nuisance. The primary hazard with irrigation pipes or any other long objects, however, is electrical flashover from the conductors if the section of pipe is inadvertently tipped up near the conductors. The transmission lines would be constructed with adequate ground clearance to minimize these effects.

Field Perception and Neurobehavioral Responses. Perception of the field associated with the transmission lines would not be felt beyond the edge of the ROW. Persons working under the ROW might feel the field. Studies of short-term exposure to electric fields have shown that fields may be perceived (for example, felt as movement of arm hair) by some people at levels of about 2 to 10 kV/m, but studies of controlled, short-term exposures to even higher levels in laboratory studies have shown no adverse effects on normal physiology, mood, or ability to perform tasks (DOE 2001a). The International Commission on Non-Ionizing Radiation Protection Guidelines recommend that short-term exposures be limited to 4.2 kV/m for the general public. The exposures associated with the proposed action are below this recommended limit, reaching a maximum of less than 2.8 kV/m within the ROW (ICNIRP 2003).

The single pole steel structures that would be used are non-climbable. The ground clearance of the conductors would be a minimum of 32 ft (9.8 m), adequate clearance for safety considerations as related to most recreational activities.

The Amended Certificate of Environmental Compatibility issued to TEP on January 15, 2002, by the ACC (ACC 2001) includes a provision that all transmission structures must be at least 100 ft (30 m) away from the edge of the existing 50 ft (15 m) El Paso Natural Gas Company (EPNG) pipeline ROW. TEP would comply with this provision.

Smoke is a conductor of electrical current. When a fire is in the vicinity of a 345-kV transmission line, firefighters would monitor smoke near the transmission line for possible fire starts outside of the fire perimeter. Firefighters would remain at a distance that would not leave them vulnerable to the electric current or shock.

Power Line Hazards are identified in the Forest Service Fireline Handbook (NWCG Handbook 3, PMS 410-1, NFES 0065). If possible, the power company should deactivate lines in the fire area that may endanger firefighters. All personnel should be cautioned against directing water streams or aerial retardant into high-tension lines. They should also be made aware that the smoke may become charged and conduct the electrical current. Deactivated transmission and distribution lines may continue to pose a hazard due to induction. TEP and any involved firefighting personnel would follow the mitigation and safety requirements on pages 53 and 54 of the Fireline Handbook, and additional mitigation and safety requirements in Forest Service Handbook (FSH) 6709.11 (Health and Safety Code Handbook) on pages 30-29 and 30-30.

4.10.1.2 *Central Corridor*

The Central Corridor would involve the construction of 345-kV double-circuit transmission lines. The EMF strengths calculated for the Western Corridor would also apply for the Central Corridor. However, the list of nearest receptors to the transmission lines would be different for the Central Corridor. Options 1 and 2 would have the same impacts.

Table 4.10–1 lists the EMF strength under normal anticipated load conditions for the 345-kV double-circuit transmission lines. Table 4.10–2 lists this same information for maximum anticipated load conditions. Figures 4.10–1 and 4.10–2 graphically illustrate the electric and magnetic field strengths, respectively, for the optimized phasing configuration of the transmission lines. The distances given represent the distance of a receptor from the centerline of the transmission lines. At a given distance, the EMF strength would be nearly identical on both sides of the transmission line ROW.

The nearest receptors to the proposed Central Corridor ROW include all of those listed for the Western Corridor, with the following additions. In the Tubac area there are multiple residences between 1,200 and 1,800 ft (370 to 550 m) from the centerline of the ROW. The nearest residences to the Central Corridor are three houses approximately 500 ft (150 m) from the centerline, north of Aliso Springs Road in Tubac. The Sopori School is located approximately 1 mi (1.6 km) east of the ROW in the town of Amado. The Cascabel School is approximately 2.2 miles (3.5 km) to the east of the ROW.

Long-term EMF exposure at these nearest residences, schools, and commercial establishments would be well below 0.8 mG, an average daily exposure to maximum magnetic fields from some common household appliances (NIEHS 1999). The EMF strengths conform to those normally found in comparable lines.

The potential for effects on safety and design mitigation measures for the Central Corridor are the same as those listed for the Western Corridor.

4.10.1.3 *Crossover Corridor*

The Crossover Corridor would involve the construction of 345-kV double circuit transmission lines. The EMF strengths calculated for the Western Corridor would also apply for the Crossover Corridor. The nearest potential receptors and the maximum long-term EMF exposure from the transmission lines would be the same as for the Western Corridor. Options 1 and 2 would have the same impacts.

The potential for effects on safety and design mitigation measures for the Crossover Corridor are the same as those listed for the Western Corridor.

4.10.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The EMF strength for the 115-kV transmission line would be bounded by the analysis for the 345-kV transmission lines discussed above.

4.10.1.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. There would be no EMF exposure associated with the project. EMF exposure from existing transmission lines and household appliances would be expected to continue according to current trends.

4.10.2 Corona Effects

4.10.2.1 *Western Corridor*

Corona is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors. As described in Section 3.10.2, corona is of concern for potential radio and television interference, audible noise, and photochemical reactions.

Audible Noise. Noise levels generated by the transmission lines would be greatest during damp or rainy weather. For the proposed lines, low-corona design established through industry research and experience would minimize the potential for corona-related audible noise. The proposed lines would not add substantially to existing background noise levels in the area. Research by the Electric Power Research Institute (EPRI) (EPRI 1982) has validated this by showing the fair-weather audible noise from modern transmission lines to be generally indistinguishable from background noise at the edge of a 100 ft (30 m) ROW. During rainy or damp weather, an increase in corona-generated audible noise would be balanced by an increase in weather-generated noise. For a complete assessment of the noise from the Proposed Action and alternatives, refer to the analysis of noise in Section 4.9.

Radio and Television Interference. Transmission line-related radio-frequency interference is one of the indirect effects of line operation produced by the physical interactions of transmission line electric fields. The level of such interference usually depends on the magnitude of the electric fields involved. The line would be constructed according to industry standards, which minimize the potential for surface irregularities (such as nicks and scrapes on the conductor surface), sharp edges on suspension hardware and other irregularities around the conductor surface that would increase corona effects. However, if such corona interference were to be generated, no interference-related complaints would be expected given the distance of residents from the transmission lines. Federal Communications Commission regulations require each project owner to ensure mitigation of any such interference to the satisfaction of the affected individual.

Visible Light. The corona levels associated with the proposed transmission lines would be similar to those of existing transmission lines. The visible corona on the conductors would be observable only under the darkest conditions with the aid of binoculars. There would be no effects on the operation of observatories in the project vicinity (Fred Lawrence Whipple and Kitt Peak Observatories) from the proposed project (Criswell 2002).

Photochemical Reactions. The maximum incremental ozone levels at ground level produced by corona activity on the proposed transmission lines would be similar to that produced by the existing lines in the area. During damp or rainy weather the ozone produced would be less than 1 ppb. This level is insignificant when compared to natural levels and their fluctuations (DOE 2001a).

Corona would be mitigated by using proper line design and by incorporating line hardware shielding. The design of electrical hardware and equipment considers the potential for corona effects.

4.10.2.2 *Central Corridor*

The corona effects generated under the Central Corridor would be the same as those described for the Western Corridor.

4.10.2.3 *Crossover Corridor*

The corona effects generated under the Crossover Corridor would be the same as those described for the Western Corridor.

4.10.2.4 *115-kV Interconnection of the Gateway and Valencia Substations*

Little or no corona activity is expected for the proposed 115-kV transmission line interconnection.

Audible Noise

For 115-kV lines, this noise is noticeable during fair weather. During rainy or very moist conditions, drops of water can form on the conductors, resulting in increased corona activity when a crackling or humming sound could be heard near the lines. The noise decreases with distance from the line.

Due to the low audible noise level, the relatively few hours of weather producing audible noise and location of the line with respect to neighboring land uses, no impacts are anticipated for the 115-kV transmission line interconnection.

Radio and Television Interference

Corona may affect AM radio reception adjacent to the line. However, radio interference from corona is not expected to be a problem since little or no corona activity is expected from the 115-kV line.

A much more likely source of radio and television interference arises through electrical equipment in the home itself. The line voltage and the distance of prospective line routes from residences minimize the likelihood of objectionable audible noise, radio interference, or television interference from the line. Should it occur, TEP or Citizens would record and investigate complaints of radio and television interference and take corrective action when necessary.

4.10.2.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. There would be no corona effects associated with the project.

4.10.3 Safety of Co-locating a Transmission Line and a Pipeline

4.10.3.1 *Western, Central and Crossover Corridor*

There are a number of potential safety issues associated with constructing a transmission line near a buried natural gas pipeline, related to electrical shock hazard and natural gas pipeline leaks and fire or explosion hazards should a natural gas leak occur.

A buried pipeline that shares a corridor with an alternating current (AC) transmission line, such as the one proposed for the project, could become energized by the EMF surrounding the power system in the air and soil. This AC interference may result in an electrical shock hazard for people touching the pipeline or metallic structures connected to the pipeline, and may cause damage to the pipeline coating, insulating flanges, or even damage to the pipeline's wall itself (Dawalibi 2004). However, the natural gas pipeline would not carry electricity or otherwise present a shock hazard to residential gas users.

A minimum distance of 100 ft (30 m) would be maintained between any of the proposed transmission line structures and the edge of the existing EPNG pipeline ROW, in compliance with the Amended Certificate of Environmental Compatibility issued to TEP on October 29, 2001, by the ACC. Additional mitigation measures may include applying protective coating to the gas pipeline and installing cathodic protection system to the gas pipeline to minimize shock hazard and damage to the pipeline. TEP has consulted with EPNG about the proposed project and once an exact location for the structures is determined, TEP will have detailed discussions with EPNG regarding pipeline damage and shock hazard protection for the gas pipeline. In addition, the transmission line would comply with all Federal and state regulations concerning co-locating transmission line near a buried gas pipeline (Dawalibi 2004).

There are potential safety issues associated with construction and maintenance vehicles driving over the gas pipeline. TEP would consult with El Paso after final siting of the transmission line structures regarding this issue.

4.10.3.2 *115-kV Interconnection of the Gateway and Valencia Substations*

This transmission corridor would not be co-located with a natural gas pipeline and thus, no potential safety issues would result.

4.10.3.3 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS and there would be no associated safety issues regarding co-location with a natural gas pipeline.

4.11 INFRASTRUCTURE

This section discusses the impacts of the project to the local infrastructure including the current utilities and facilities in the area of the proposed project. This section also discusses waste management issues. Roads are discussed in Section 4.12, Transportation.

4.11.1 Utilities and Facilities

4.11.1.1 *Western Corridor*

Construction of the proposed project in the Western Corridor would result in the following changes to the existing infrastructure:

- Tucson Electric Power Company's (TEP) existing South Substation would be expanded to accommodate the 345-kV line to the new Gateway Substation. The addition of the second 345-kV circuit would require a 100-ft (30-m) expansion to the existing fence-line.

- The new Gateway Substation would be constructed within a developed industrial park north of Mariposa Road (SR 189), an estimated 0.5 mi (0.8 km) east of the Coronado National Forest boundary (Northeast 4, Section 12, Township 24 South, Range 13 East). The TEP portion of the site is an estimated 18 acres (7.3 ha) and is within the City of Nogales, Arizona. TEP has already performed preliminary site grading to comply with permitting requirements dictated by the City of Nogales.

- A new 345-kV transmission line would be constructed for a length of an estimated 65.7 mi (106 km). The maximum height of the structures for the 345-kV transmission line would be 140 ft (42.7 m). The length of the new 345-kV transmission line would be an estimated 29.5 mi (47.5 km) on the Coronado National Forest, and an estimated 1.25 mi (2.0 km) on Federal lands managed by the Bureau of Land Management (BLM).

No additional impacts to existing infrastructure would be expected from implementation of the Western Corridor. The proposed transmission line is no greater a terrorist target than any other extra high voltage transmission line in the United States. The worst case terrorist scenario would be that several transmission line poles are felled and that it takes a few days to a couple of weeks to replace them and restring the conductors. The interconnected transmission system is designed with redundancy to accommodate such a situation (TEP 2003).

4.11.1.2 *Central Corridor*

The only difference to the changes to infrastructure described above for the Western Corridor compared to the Central Corridor is the length of the new transmission line. The new 345-kV transmission line would be constructed for a length of an estimated 57.1 mi (91.9 km). The length of the new 345-kV transmission line would be an estimated 15.1 mi (24.3 km) on the Coronado National Forest. Options 1 and 2 would have similar impacts.

No additional impacts to existing infrastructure would be expected from implementation of the Central Corridor, and the potential impacts from terrorism would be as described for the Western Corridor.

4.11.1.3 *Crossover Corridor*

The only difference to the changes to infrastructure described above for the Western Corridor compared to the Crossover Corridor is the length of the new transmission line. The new 345-kV transmission line would be constructed for a length of an estimated 65.2 mi (105 km). The length of the new 345-kV transmission line would be an estimated 29.3 mi (47.2 km) on the Coronado National Forest. Options 1 and 2 would have similar impacts.

No additional impacts to existing infrastructure would be expected from implementation of the Crossover Corridor, and the potential impacts from terrorism would be as described for the Western Corridor.

4.11.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

Construction of the proposed 115-kV Gateway and Valencia Substations interconnection would result in the construction of the new Gateway Substation as described in Section 4.11.1.1 and approximately 3 mi (5 km) of a new 115-kV transmission line. No additional impacts to existing infrastructure would be expected from implementation of the 115-kV interconnection, and the potential impacts from terrorism would be as described for the Western Corridor.

4.11.1.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. There would be no changes to the existing infrastructure in the project area.

4.11.2 Waste Management

4.11.2.1 *Western Corridor*

During construction of the project, the storage and use of fuel, lubricants, and other fluids during the construction phase of the facilities and access roads could create a potential contamination hazard. Spills or leaks of hazardous fluids could contaminate groundwater and affect aquifer use. This impact would be minimized or avoided by restricting the location of refueling activities and by requiring immediate cleanup of spills and leaks of hazardous materials. TEP would implement a Spill Prevention Control and Countermeasures Plan (SPCC) to prevent, control, and minimize impacts from a spill of fuels or other hazardous substances during construction of the transmission line. The following measures would be incorporated into the plan: preventative measures, spill response, and reporting procedures (TEP 2003).

Oil and diesel fuel would be stored in clearly marked tanks onsite that would be provided with secondary containment structures. Construction equipment would be maintained regularly, and the source of leaks would be identified and repaired. Any soil contaminated by fuel or oil spills would be removed and disposed of by a contractor to an approved disposal site. Lubricating oils, acids for equipment cleaning, and concrete curing compounds are potentially hazardous wastes that may be associated with construction activities. These would be placed in containers within secondary containment structures onsite, and disposed of at a licensed treatment and/or disposal facility in accordance with local or state regulations and in compliance with the manufacturer’s recommendations. Paint containers would be tightly sealed to prevent leaks or spills. Excess paint would not be discharged to the stormwater system but disposed of consistent with manufacturer’s recommendations and according to applicable governmental regulations.

Septic wastes generated during construction would be provided for by the use of temporary portable sanitary facilities. Vegetative debris collected during ROW and structure site clearing would be scattered adjacent to the ROW to create habitat or reduce surface erosion where it would not be considered a potential fire danger.

Operational wastes generated at substations would include minor quantities of municipal solid waste. This waste would usually be paper and plastic wrapping materials from new equipment. No hazardous waste would be generated from substation operation. The amount of wastes generated from construction and operation would be too small to affect the life expectancy of the many municipal solid waste facilities currently operated in the project area, as listed in Section 3.11.2.

4.11.2.2 *Central Corridor*

The waste management issues and the SPCC Plan described above for the Western Corridor also apply to the Central Corridor.

4.11.2.3 *Crossover Corridor*

The waste management issues and the SPCC Plan described above for the Western Corridor also apply to the Crossover Corridor.

4.11.2.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The waste management issues and the SPCC Plan described above for the Western Corridor also apply to the 115-kV interconnection.

4.11.2.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and the associated facilities as proposed in this EIS. TEP would generate no additional wastes and the potential for spills of hazardous materials or wastes from this project to affect local soils or groundwater would be eliminated. Waste management facilities in the area, as described in Section 3.11.2, Waste Management, would continue current operations.

4.12 TRANSPORTATION

This section discusses the potential impacts to transportation in the vicinity of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project. The discussion includes a description of the methodology of analysis and the impacts for each alternative. Because road use, construction, and closure can impact various resource areas, including biological, cultural, visual, geological, and recreational resources, the potential impacts to these resource areas are addressed in their respective impacts sections.

Methodology

The transportation impact analysis includes the potential effects generated by the construction and operation of the proposed project on transportation in the project area. The analysis is based on review of existing transportation in the project area and project access requirements during construction and operation. The analysis of the Coronado National Forest is supplemented by the Roads Analysis (RA) completed for the proposed project, based on data obtained from the U.S. Department of Agriculture Forest Service (USFS), agency and public input; interpreted from recent aerial imagery; and documented during extensive field reviews (URS 2003a). An RA must be completed for any road construction and reconstruction on national forest land, which would be required for all three proposed corridors. The conclusions of the RA are referenced within this Environmental Impact Statement (EIS), both in the transportation impacts section, and in other applicable resource impacts sections. Construction activities represent the principal means by which an impact on transportation (for example, building of new access roads, closing of existing wildcat roads, or traffic disruption) could occur. Impacts to transportation are determined relative to the context of the affected environment described in Section 3.12.

To determine if an action may cause a significant impact, both the context of the proposed project and the intensity of the impact are considered. The context of the proposed project is the locally affected area between Sahuarita and the U.S.-Mexico border, and the significance depends on the effects in the local area. The intensity of the impact is primarily considered in terms of any unique characteristics of the area (for example, a USFS inventoried roadless area [IRA] or special management area), and the degree to which the proposed project may adversely affect such unique characteristics. Impacts would be significant if the proposed project would change the transportation system permanently, or would have extensive short-term effects during construction.

4.12.1 Western Corridor

The proposed project would be constructed over a period of approximately 12 to 18 months. The construction would require an average construction workforce of 30 individuals, with peak workforce levels reaching 50 individuals for short periods of time. Most workers would come from within Pima and Santa Cruz Counties and would commute on Interstate 19 (I-19) to the three primary points of access: (1) Pima Mine Road in Sahuarita for the South Substation, (2) Arivaca Road exit in Amado for the central access point, and (3) Mariposa Road exit for the southern mobilization yard at the Gateway Substation in Nogales. The average daily traffic numbers for the year 2000 on I-19 at the segment north of Mariposa Road (milepost 2.95) are 18,744 vehicles, at the Arivaca Road exit (milepost 30.95) are 17,919 vehicles, and at the Pima Mine Road exit (milepost 49.62) are 25,271 vehicles (ADOT 2000). The project workforce would add up to 50 vehicles to I-19. Given the temporary and geographically disperse nature of the construction, no significant impact to the existing traffic patterns would be expected and no traffic disruptions on I-19 would occur. Short-term traffic delays may be encountered during construction when the proposed transmission line crosses major roads (such as Arivaca Road). No traffic delays are expected on I-19.

Access to the Western Corridor outside of the Coronado National Forest would be on existing utility maintenance roads, ranch access roads and trails, and new access ways where no access currently exists. Siting of access roads would be coordinated with the affected property owners and land managers to establish the most appropriate access to the structure sites. TEP would use helicopters for stringing conductors, but would not likely use helicopters to bring in poles along the Western Corridor (TEP 2003). On the land managed by the Bureau of Land Management (BLM) west of Sahuarita, an existing access road to TEP's 345-kV Westwing-South transmission line would be utilized by turning off Mission Road, with new 12 ft (3.7 m)-wide access road segments and spur roads to each structure to reduce the area of new disturbance, totaling an estimated 0.9 mi (1.4 km) (an estimated 1.3 acres [0.5 ha] from new access roads and spur roads) in accordance with the Plan of Development (POD) which is being completed concurrently with the EIS. The POD also addresses the revegetation of roads identified to be "retired" following construction, and the gating of roads to prevent off-highway vehicle use. TEP would comply with BLM road closing requirements (TEP 2003).

The U.S Border Patrol's typical operations on the Coronado National Forest between I-19 and Sycamore Canyon are comprised of normal operations and traffic operations on Ruby Road. The majority of the traffic in this area is foot traffic with limited vehicular traffic that exits onto Ruby Road and travels either east to I-19 or west to the town of Ruby and onto Arivaca. The Border Patrol expects an increase in the amount of patrol operations in this area. An increase in vehicular traffic is anticipated with the introduction of a North-South roadway system in the area and preliminary planning stages by the City of Nogales for a road project are underway to construct an East-West road out toward the Pena Blanca Lake area. There would be an increase in the amount of illegal traffic through the west side of the road construction necessary for the proposed project and the increase of Border Patrol resources in the West Desert (USBP 2004).

Within the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest, an existing network of Level 2 and wildcat roads would provide access to portions of the Western Corridor, as shown in Figure 3.12–1. Minor spot repairs (such as repairing erosion damage, breaking rocks, removing brush, or reducing a hump) would be required for existing roads including wildcat roads as indicated by the yellow markers on the map. An estimated 95 locations within the Western Corridor would require repair or improvement. Ruby Road and existing wildcat roads would provide some project access as the Western Corridor continues east and joins the El Paso Natural Gas Company (EPNG) pipeline right-of-way (ROW). The new roads that would need to be constructed by TEP for the proposed project are indicated as TEP Proposed Roads in Figure 3.12–1. For the Western Corridor, an estimated 20 mi (32 km) of temporary new roads would be built by TEP for project construction. All proposed roads to structure sites would be consistent with the Forest Plan, and would be classified as closed special use roads. Roads to access these maintenance roads would be Level 2 roads. Further, USFS classified roads currently at Level 2 would be reconstructed to no higher than Level 3 during construction of the proposed project, but allowed afterwards to revert back to their original level. Proposed roads would be approximately 12 ft (3.7 m) wide. No proposed roads in the Western Corridor would have a slope of over 30 percent (URS 2003a). Existing classified roads within the Tumacacori EMA would be closed to maintain existing road density.

TEP utilized the following criteria in the siting of proposed roads and other areas required for the construction, maintenance, and long-term operation of the proposed project (for more detail, see URS 2003a):

- Use existing roads wherever possible.
- Avoid identified biologically and culturally sensitive areas.

- Avoid sediment transport.
- Minimize erosion potential.
- Avoid areas with water features.
- Avoid prominent topographic features.
- Avoid sensitive viewsheds.
- Facilitate road closure.
- Avoid impacting ranching permittees.
- Comply with maximum road slopes.
- Use the most direct route.
- Facilitate roadway obliteration and restoration.
- Comply with roadway geometry standards such as a minimum turning radius.

Table 4.12–1 shows the total new area of land (currently undisturbed) on the Coronado National Forest that would be disturbed during construction activities. In addition to the new proposed roads, this acreage includes support structure sites, transmission wire tensioning and pulling sites, fiber optic splicing sites, and laydown construction yards, as described in Section 2.2. For the Western Corridor, the total new area temporarily disturbed by construction would be an estimated 197 acres (79.7 ha). Table 4.12–1 also indicates the permanent area to be disturbed by the proposed project, which would consist primarily of the footprint of the support structures and roads to fiber-optic splicing sites. For the Western Corridor, the permanent area disturbed would be an estimated 29.3 acres (11.9 ha). The roads that would remain open for use by TEP (administratively controlled special use roads) following construction would be administratively closed (see Section 4.1, Land Use) (URS 2003a).

Table 4.12–1. Temporary and Permanent Area Disturbed on the Coronado National Forest by the Proposed Project.

	Western Corridor (acres)	Central Corridor (acres)	Crossover Corridor (acres)
New temporary area of disturbance during construction	197	105	238
New permanent area of disturbance	29.3	23.1	36.4

Source: URS 2003a.

As described in Section 3.12, the Forest Plan gives direction to “Limit density of existing and new road construction to one mile of road or less per square mile” (0.62 km of road per km^2); USFS has indicated that current road density is estimated to be near this level (USFS 2001). Construction and operation of the proposed project would not affect the road density management plan directives because 1.0 mi (1.6 km) of classified road would be closed for every 1.0 mi (1.6 km) of proposed road to be used in the operation or long-term maintenance of the proposed project. USFS has established principles for identifying high-priority road closure areas including roads within or near specially designated areas (see Figure 3.1–1), roads that cross riparian areas, and wildcat roads.

Roads which would not be required for ongoing project maintenance and that are required to be closed by land owners or managers (BLM or USFS) would have boulders, natural impediments, or trenches across the travelway for long-term closure. On the Coronado National Forest, portions of the roadbed would be ripped, obliterated, and reseeded/revegetated in consultation with USFS, especially in the initial visible portion of the roadway to effectively obscure signs of the roadway. To the extent that remnants of closed roadways remain, these could be used by illegal immigrants although they would not provide a single continuous pathway from the U.S.-Mexico border. In addition, illegal immigrants may leave trash and waste behind as they pass through an area (House 2002). Revegetation would be limited to species found in the particular biome. Transmission line tensioning and pulling sites, fiber-optic sites, and laydown yard areas would be restored within 6 months of the project becoming fully operational (URS 2003a).

4.12.2 Central Corridor

The Central Corridor would require the same average and peak workforce and approximately the same period of time to construct as the Western Corridor. Also, the primary points of access for mobilization and reporting sites along the Central Corridor would be similar to those for the Western Corridor. Impacts to current traffic patterns from commuting workers would be as described for the Western Corridor.

Access to the Central Corridor would be on existing utility maintenance roads (for example, access to the EPNG pipeline ROW) which would require extensive upgrades, ranch access roads and trails, and new access ways where no access currently exists, as described for the Western Corridor. TEP would use helicopters for stringing conductors, but would not likely use helicopters to bring in poles along the Central Corridor for either Option 1 or 2 (TEP 2003).

Within the Tumacacori EMA of the Coronado National Forest, an existing network of Level 2 and existing unclassified roads would provide access to portions of the Central Corridor, as shown in Figure 3.12–1. For Option 1, an estimated 15 locations within the Central Corridor would require repair or improvement. For Option 1, an estimated 13.8 mi (22.2 km) of temporary new roads would be built by TEP for project construction. For Option 2, the existing EPNG pipeline roads would provide access to the transmission line structures. Consequently, minimal road construction would be required within the existing IRA. Upgrades to the existing EPNG pipeline roads and other existing access roads would be required, and would disturb approximately 2.6 acres (1.0 ha) of land. Approximately 0.20 miles (0.34 km) of spurs from existing roads would be constructed within the IRA, disturbing approximately 0.30 acres (0.12 ha). All proposed roads to structure sites would be consistent with the Forest Plan, as described for the Western Corridor. An estimated 1 percent of the total mileage of the proposed roads in the Central Corridor would have a slope of over 30 percent (URS 2003a). The criteria utilized by TEP in the siting of proposed roads and other areas required for the construction, maintenance, and long-term operation of the proposed project are as described above for the Western Corridor.

All proposed roads to structure sites would be consistent with the Forest Plan, and would be classified as closed special use roads. Roads to access these maintenance roads would be Level 2 roads. Further, USFS classified roads currently at Level 2 would be reconstructed to no higher than Level 3 during construction of the proposed project, but allowed afterwards to revert back to their original level.

Table 4.12–1 shows the total new area of land (currently undisturbed) on the Coronado National Forest that would be disturbed during construction activities. In addition to the new proposed roads, this acreage includes support structure sites, transmission wire tensioning and pulling sites, fiber optic splicing sites, and laydown construction yards. For the Central Corridor, the total new area temporarily disturbed by construction would be an estimated 105 acres (42.5 ha). Table 4.12–1 also indicates the permanent area to be disturbed by the proposed project, which would consist primarily of the footprint of the support structures and roads to fiber optic splicing sites. For the Central Corridor, the permanent area disturbed would be an estimated 23.1 acres (9.3 ha). The roads that would remain open for TEP use following construction would be administratively closed, and would be matched within an equal mileage of road closure to avoid affecting road density on national forest land, as described for the Western Corridor (URS 2003a).

Roads which would not be required for ongoing project maintenance and that are required to be closed by land owners or managers would be closed as described for the Western CorridorTransmission line tensioning and pulling sites, fiber-optic sites, and laydown yard areas would be restored within 6 months of the project becoming fully operational (URS 2003a).

4.12.3 Crossover Corridor

The Crossover Corridor would require the same average and peak workforce and approximately the same period of time to construct as the Western Corridor. Also, the primary points of access for mobilization and reporting sites along the Crossover Corridor would be similar to those for the Western Corridor. Impacts to current traffic patterns from commuting workers would be as described for the Western Corridor.

Access to the currently anticipated alignment of the ROW within the Crossover Corridor would be on existing utility maintenance roads, ranch access roads and trails, and new access ways where no access currently exists, as described for the Western Corridor.

Within the Tumacacori EMA of the Coronado National Forest, an existing network of Level 2 and wildcat roads would provide access to portions of the Crossover Corridor, as shown in Figure 3.12–1. Within Peck Canyon on the segment unique to the Crossover Corridor, existing access is limited to wildcat roads. Helicopter access would be used to bring in 20 to 25 structures in this segment as described in Section 2.2.4. For Option 2, the existing EPNG pipeline roads would provide access to the transmission line structures. Consequently, minimal road construction would be required within the existing IRA. Upgrades to the existing EPNG pipeline roads and other existing access roads would be required, and would disturb approximately 2.6 acres (1.0 ha) of land. Approximately 0.20 miles (0.34 km) of spurs from existing roads would be constructed within the IRA, disturbing approximately 0.30 acres (0.12 ha). Minor spot repairs would be required for existing roads, including wildcat roads, as indicated by the yellow markers on the map. An estimated 98 locations within the Crossover Corridor would require repair or improvement. For the Crossover Corridor, an estimated 20.7 mi (33.3 km) of temporary new roads would be built by TEP for project construction.

All proposed roads to structure sites would be consistent with the Forest Plan, and would be classified as closed special use roads. Roads to access these maintenance roads would be Level 2 roads. Further, USFS classified roads currently at Level 2 would be reconstructed to no higher than Level 3 during construction of the proposed project, but allowed afterwards to revert back to their original level. An estimated 2 percent of the total mileage of the proposed roads in the Crossover Corridor would have a slope of over 30 percent (URS 2003a). The criteria utilized by TEP in the siting of proposed roads and other areas required for the construction, maintenance, and long-term operation of the proposed project are as described above for the Western Corridor.

Table 4.12–1 shows the total new area of land (currently undisturbed) on the Coronado National Forest that would be disturbed during construction activities. In addition to the new proposed roads, this acreage includes support structure sites, transmission wire tensioning and pulling sites, fiber-optic splicing sites, and laydown construction yards. For the Crossover Corridor, the total new area temporarily disturbed by construction would be an estimated 238 acres (96.3 ha). Table 4.12–1 also indicates the permanent area to be disturbed by the proposed project, which would consist primarily of the footprint of the support structures and roads to fiber-optic splicing sites. For the Crossover Corridor, the permanent area disturbed would be an estimated 36.4 acres (14.7 ha). The roads that would remain open for TEP use following construction would be administratively closed, and would be matched with an equal mileage of road closure to avoid affecting road density on national forest land, as described for the Western Corridor (URS 2003a).

Roads which would not be required for ongoing project maintenance and that are required to be closed by land owners or managers would be closed as described for the Western Corridor.

4.12.4 115-kV Interconnection of the Gateway and Valencia Substations

The proposed 115-kV transmission line would cross SR 189 (Mariposa Road) and I-19. Construction of the proposed interconnection may result in temporary traffic disruptions and road closures along these transportation corridors. Construction activities may also disrupt traffic patterns and flow along smaller local roadways. Because of the short duration of construction (approximately 45 days), the impacts on transportation would be minimal.

4.12.5 No Action Alternative

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. There would be no transportation impacts associated with the No Action Alternative. Current traffic patterns and growth of unclassified roads on the Coronado National Forest would be expected to continue.

4.13 ENVIRONMENTAL JUSTICE

In Section 3.13, the DOE identified the minority and low-income populations in the project area pursuant to Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629, 16 February 1994). This section discusses the potential for environmental justice impacts to those populations.

Methodology

Environmental justice impacts can result if the proposed activities cause disproportionately high and adverse human health or environmental effects to minority or low-income populations. DOE assesses three factors to the extent practicable to identify disproportionately high and adverse environmental effects:

Whether there would be an impact on the natural or physical environment that significantly and adversely affects a minority population, low-income population, or Indian tribe. Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment.

Whether environmental effects would be significant and are or may be having an adverse impact on minority populations, low-income populations, or Indian tribes that appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group.

Whether such environmental effects occur or would occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards.

4.13.1 Western, Central, Crossover Corridors and 115-kV Interconnection

As shown in Section 3.13.1, five of the census block groups intersected by the Central Corridor, and six of the census block groups intersected by the Western and Crossover Corridors, exceed the meaningfully greater minority population percentage. Also, one of the ten census block groups intersected by the proposed corridors (where the corridors are common) exceeds the low-income population threshold. As shown in Figures 3.13–1 and 3.13–2, the census block groups that *would be* intersected by the proposed corridors are of a similar composition to those that *would not be* intersected by the proposed corridors (that is, the corridors do not pass through concentrated pockets of low-income or minority populations). Nonetheless, the following describes the potential environmental impacts of the proposed project in terms of any special circumstances or mechanisms through which low-income or minority populations may experience disproportionately high and adverse human health or environmental effects.

The main environmental impacts to minority and low-income residents within the proposed project area would be in the form of changes to the visual setting from the presence of the transmission line and supporting towers, and impacts to recreational resources. The area evaluated for potential effects on visual and recreational resources is the entire area (and viewshed) of the valleys and mountains from Tucson to Nogales, Arizona. Although a few residential areas in Sahuarita, Nogales, Amado, and Tubac would experience a change in visual setting, great parts of the corridors would run through uninhabited areas or would not be visible from residential or recreational areas. Some residences near Sahuarita and Nogales would experience a change in foreground (within 0.5 mi [0.8 km]) visual setting under any of the alternatives, while some residences near Amado and Tubac would experience a change in foreground visual setting for the Central Corridor only. The residences located further away from the proposed transmission line would likely experience less visual impact as the degree of discernible detail decreases with distance.

DOE has not attempted to quantify the visual impacts because of their subjective nature, and because they are likely to differ from one person to another as they each would view the proposed transmission line from their own vantage point.

The Coronado National Forest and trails and unpaved roads outside of the national forest lands provide recreational opportunities. The transmission line may impact recreational resources in the area of the corridor by disturbing the visual setting over the long term. Construction of the transmission line may cause temporary impacts to recreational resources, such as road closures. However, these impacts would be of short duration in any one location, and recreational resources are used by both the general population and low-income and minority residents.

Neither DOE nor its cooperating agencies are aware of any special circumstance that would disproportionately impact minority or low-income populations, such as unique exposure pathways or practices among the minority or low-income populations, or food gathering practices specific to low-income or minority populations.

The proposed project is within the traditional territories of several Native American tribes. DOE initiated formal government-to-government consultation in a letter sent to tribal governments of the 12 Native American tribes that have traditional connections to the area. Seven of the 12 tribes contacted have expressed objections to the proposed project.

Long-term electric and magnetic field (EMF) exposure from the proposed transmission line to the nearest residences, schools, and commercial establishment would be well below 0.8 milliGauss (mG) per day, which is equivalent to the average daily exposure to maximum magnetic fields from some common household appliances (see Table 3.10–1 for a list of EMF levels of some common household appliances). Therefore, the surrounding population would not be impacted by EMF exposure, and no mechanism has been identified for minority or low-income populations to be disproportionately affected.

The population in the regional airshed of southern Arizona would not be impacted by the temporary increase in air pollutant emissions during construction, and no mechanisms have been identified for minority or low-income population to be disproportionately affected during construction or operation of the project.

The potential noise impacts of the construction and operation of the proposed corridor alternatives would create annoyance primarily to the residents nearest to the right-of-way (ROW) during the construction period. The noise levels would be temporary and intermittent, and no construction would occur between the hours of 10 p.m. and 7 a.m. Therefore, the surrounding population would not be impacted by the noise generated from the proposed project, and no mechanism has been identified for minority or low-income populations to be disproportionately affected.

On the basis of the foregoing discussion, DOE concludes that no disproportionately high and adverse impacts, for the resource areas discussed above, would be expected for minority or low-income populations.

For all other resource areas (that is, land use, socioeconomics, biology, geology and soils, water resources, infrastructure, and transportation), DOE concludes that, because the proposed corridor alternatives would be purposely sited away from residential areas and in sparsely populated areas in order to avoid impact on large numbers of residences, no potential for disproportionately high and adverse impacts among minority or low-income populations would be expected.

The potential for cumulative impacts to minority or low-income populations from the proposed project in combination with other past, present, and reasonably foreseeable future actions is addressed in Chapter 5, Cumulative Impacts.

4.13.2 No Action Alternative

Under the No Action Alternative, Tucson Electric Power Company (TEP) would not build the proposed transmission line and the associated facilities as proposed in the Environmental Impact Statement (EIS). Santa Cruz County would continue to experience unreliable electric supply. Unreliable electric supply has the potential to cause health and safety impacts. However, these adverse impacts of No Action would not be experienced disproportionately by minority and low-income populations in the affected area.

CHAPTER 5 CUMULATIVE IMPACTS

The most significant environmental effects may result not from the direct effects of a particular action, but from the combination of the minor effects of multiple individual actions over time (CEQ 1997b). The Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of the *National Environmental Policy Act* (NEPA) define cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). The regulations further explain that "cumulative effects can result from individually minor but collectively significant actions taking place over a period of time."

5.1 METHODOLOGY

The cumulative impacts analysis presented in this document is based on the potential effects of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project when added to impacts from other actions in the region. The analysis in this chapter centers on the cumulative effects of past, present, and reasonably foreseeable future actions, and identifies where cumulative impacts may differ among the action alternatives evaluated in Chapter 4 (Western, Central, and Crossover Corridors). The potential effects are evaluated both for the period of project construction (anticipated to be 12 to 18 months), and for the post-construction (operation) period of the project.

The region of influence (ROI) varies for each resource area, depending on the geographic extent of a potential effect. For water and soil resources, the ROI comprises the watersheds described in Section 3.7, Water Resources; for biological resources, the ROI is the Sky Island Region as described in Section 3.3, Biological Resources; for land use, recreation, cultural, and visual, the ROI is the entire area (and viewshed) of the valleys and mountains between Tucson and Nogales, Arizona; for socioeconomics, the ROI is Pima and Santa Cruz Counties; for air quality, the ROI is the regional airshed in southern Arizona. The analysis contained in this chapter includes actions that could be reasonably anticipated to occur and have cumulative effects within the ROI. The cumulative impacts to air quality associated with development in the U.S-Mexico border area are included in the air quality cumulative impacts analysis. Following the discussion of potential cumulative impacts for each resource area for the entire ROI, potential cumulative impacts specific to the Coronado National Forest are discussed. Table 5.4-1 at the end of this chapter summarizes the cumulative impacts by resource area and notes the differences (if any) in cumulative impacts among the Western, Central, and Crossover Corridors.

5.2 REASONABLY FORESEEABLE ACTION IDENTIFICATION

The following potential actions have been evaluated to determine if they are reasonably foreseeable. Those actions determined to be reasonably foreseeable are included in the Section 5.3 analysis of cumulative impacts with this TEP Project.

5.2.1 Other Energy and Transmission Line Projects in Southern Arizona

Public Service Company of New Mexico. Several years ago, the Public Service Company of New Mexico (PNM) applied to the U.S. Department of Energy (DOE) for a Presidential Permit to construct an electric transmission line across the U.S.-Mexico border in Nogales, overlapping portions of the proposed TEP project. At approximately the same time, PNM submitted a special use application to the USFS Coronado National Forest requesting authorization to cross National Forest System lands in the Tumacacori EMA with its proposed transmission line. However, in October 2004, PNM indicated that it would be preparing a letter to the DOE withdrawing their Presidential Permit application. On November 16, 2004, PNM sent DOE a letter officially withdrawing their Presidential Permit application. As such, PNM's proposed project is not considered to be a reasonably foreseeable action and is no longer included in the cumulative impacts analysis that follows. As DOE was also the lead Federal agency for environmental review of the PNM proposal, USFS accepts the termination of DOE's environmental review of the PNM proposal as constituting cancellation of PNM's special use permit application and no longer considers the PNM proposal to be a reasonably foreseeable action on National Forest System lands.

New or Expanded Power Plants in Southern Arizona. A database of proposed electric power generation expansion within the Western Electricity Coordinating Council (WECC) region (which includes Arizona) does not identify any proposed projects within Pima and Santa Cruz Counties that are in active planning or currently under construction. The status of the Ambos Nogales Generating Station (listed with Maestros Group as the project proponent) in Santa Cruz County is shown as "cancelled, denied permit, or delayed indefinitely." Therefore, the construction or expansion of power plants in Pima and Santa Cruz Counties is not reasonably foreseeable.

5.2.2 Industrial Development

The U.S.-Mexico border is a developing center of commerce. Currently, more than $1 billion of Mexican produce crosses the U.S.-Mexico border at Nogales bound for the United States and Canada each year, and approximately 1,300 trucks from Mexico enter Nogales everyday from November through May. The U.S. 1998 *Transportation Equity Act for the 21st Century* allocates funding for the development and improvement of high priority corridors, including the CANAMEX corridor leading north from the U.S.-Mexico border along Interstate 19 (I-19). In Federal Fiscal Year 2003, it is estimated that the CANAMEX states will receive on average an estimated $277 million per year per state. On the high end, it is anticipated that Arizona will receive $462 million per year for the development and improvement of high priority corridors (CANAMEX 2001). The State of Arizona has pledged additional funding. The development and improvement of this high priority corridor would involve roadway improvements that could lead to an increase in industrial parks, manufacturing facilities, and truck traffic, especially in Nogales, Arizona. On a larger scale, improved electricity reliability in the Nogales region would be expected to produce long-term socioeconomic benefits. A reliable electricity supply would support business development and regional growth, but is not quantified.

5.2.3 Trade Corridor/Roadway Development

In January 2000, the City of Nogales, Arizona initiated an engineering and cost Feasibility Study (City of Nogales 2000) for trade corridors in its vicinity. Two roadways were proposed:

- North-South Interconnector – A 7.3-mi (11.7-km) partially access-controlled expressway or super-arterial roadway connecting State Highway 189, in the vicinity of the U.S.-Mexico border, to I-19 at Ruby Road (including an upgrade of Ruby Road). This project was depicted in the feasibility study as a four-lane highway with a median in a 150-ft (46-m) ROW.

- East-West Interconnector – A 3.5-mi (5.6 km), five-lane arterial roadway connecting the proposed North-South Interconnector with State Route 82 in the vicinity of Business 19.

The Draft EIS included this project as a reasonably foreseeable project for cumulative impact analysis. However, since issuance of the Draft EIS, the Trade Corridor/Roadway Development project has been deferred indefinitely and is no longer considered a reasonably foreseeable project in this EIS.

5.2.4 Additional Activities in the Project Area

In addition to the reasonably foreseeable actions that are distinct potential projects, there are more generally defined possible actions in the project area which may contribute to cumulative impacts. As further described below, such actions may include activities on the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest; an increase in U.S. Border Patrol operations, illegal immigrants, and smuggling; an increase in residential development in the project vicinity; and local initiatives to protect biological and cultural resources. To the extent that the potential environmental impacts of each of these possible activities can be identified, they are included in the cumulative impact analysis that follows.

Activities on the Coronado National Forest. Reasonably foreseeable actions in the Tumacacori EMA of the Coronado National Forest include livestock grazing; activities managed as special uses; other land use; off-road vehicle use (including use of unclassified roads, or roads that are not managed as part of the USFS transportation system); U.S. Border Patrol operations, illegal immigrants, and smuggling, and proposed wilderness designation in portions of the Tumacacori and Atascosa Mountains (see sub-section below).[1]

A large portion of the Tumacacori EMA (an estimated 164,000 acres [66,400 hectares (ha)]) is classified by USFS as able to support livestock grazing, and some is currently under permit for livestock grazing. A majority of this capable rangeland is in satisfactory condition (a USFS measure of the health of the vegetation and soil relative to their combined potential to produce a sound and stable biotic community) (USFS 2001b).

Off-road vehicles are used by visitors to the Tumacacori EMA in areas such as the west side of the Tumacacori Mountains (north of Ruby Road), and to a lesser extent in Peck Canyon. Off-road vehicle use occurs on both USFS system roads (for example, dirt roads for use by high-clearance vehicles such as Level 2 roads, as described in Section 4.12) and on unclassified roads (USFS 2002a).

USFS manages the Coronado National Forest for sustained multiple use of forest and rangeland resources including fuel wood, grazing, recreation, and mining (USFS 2001a). USFS issues special use permits for a wide range of activities, including but not limited to, outfitter and guide operations, to research permits and permits for utilities on the Coronado National Forest.

In 2003, a coalition of organizations, businesses, and landowners known as the Friends of the Tumacacori Highlands began developing a Federal legislative proposal to designate a large portion of the Tumacacori EMA as wilderness (Friends of the Tumacacori Highlands 2004). This group maintains that the area is eligible for wilderness designation and protection because: "the large, remote roadless lands offer visitors a unique opportunity to hike, hunt, and explore one of Arizona's remaining true wildlands. Home to magnificent species such as the jaguar, elegant trogon, and Chiricahua leopard frog, in addition to hosting a great diversity of cultural and historic sites, the Tumacacori Highlands are now threatened by off-road vehicle use and impacts from an expanding population . . ." (Friends of the Tumacacori Highlands 2004). The proposal would double the existing Pajarita Wilderness south of Ruby Road from 7,529 acres (3,047 ha) to 15,931 (6,447 ha) acres and create an entirely new wilderness area of 76,171 acres (30, 825 ha) north of that road. The Arizona Game and Fish Commission has not taken a position on the wilderness proposal, but it directed the state Game and Fish Department to work with interested parties to analyze all

[1] All known proposed actions anticipated for environmental review that are located in the Tumacacori EMA are published by the Nogales Ranger District in its quarterly Schedule of Proposed Actions.

options available for the area, including possible wilderness designation (Arizona Game and Fish Commission 2004). U.S. Representative Raul Grijalva has stated that he supports the Tumacacori Highlands Wilderness proposal (see comments in CRD).

U.S. Border Patrol Operations, Illegal Immigrants, and Smuggling. The Nogales Station of the U.S. Border Patrol conducts routine surveillance in the vicinity of the U.S.-Mexico border, specifically focused on the area south of Ruby Road between the Pajarita Wilderness and Nogales, mostly within the Tumacacori EMA. U.S. Border Patrol activities generally involve accessing the ridgetops to get an open view of the area. The Border Patrol has indicated that they expect an increase in the amount of patrol operations that will occur in this area. There are plans to expand the current Remote Video Surveillance System (RVSS), consisting of 60- to 80- ft (18- to 24- m) high towers, to the west of Nogales and onto the Coronado National Forest. Two of the proposed RVSS sites are on top of the ridgelines just west of the Mariposa commercial truck gate at State Highway 189 (shown on Figure 5.2-1). The Border Patrol also indicates that the preliminary stages of a road project are underway to construct an east-west road toward the Pẽna Blanca Lake area (USBP 2004).

Regional Residential and Economic Development. Section 3.5, Socioeconomics, documents the growing population of the ROI. This results in increased residential development of Pima and Santa Cruz Counties. For example, a proposed *Specific Plan Amendment* and rezoning have been submitted to the Town of Sahuarita Planning and Zoning Commission to expand an existing subdivision called Rancho Sahuarita by 275 acres (111 ha). The proposed area of expansion is located immediately south of the Pima Mine Road and west of the TEP South Substation (Figure 2.1-1). Of the 275 acres (111 ha) proposed for expansion, 265 acres (107 ha) are presently undeveloped and are proposed to be developed with 1,000 residential units and public facilities (Town of Sahuarita 2004). The Town of Sahuarita's recently updated *General Plan* includes the 275 acres (111 ha) of proposed expansion within a designated Growth Area (intended to encourage a high concentration of uses and a creative mix of uses to maximize the use of development infrastructure and make multi-modal transportation a possibility). If the proposal is approved by the Planning Commissioners, the area would be rezoned from Rural Homestead and Rural Residential to Specific Plan (Pima 2003).

Similarly, an application for rezoning has been submitted to the Pima County Planning Division to develop the southwest corner of the Canoa Land Grant from the Santa Cruz River Resource Conservation Area west to the Land Grant Boundary in Green Valley, Arizona. The proposed area of development is located on the west side of I-19, approximately 0.5 mi (0.8 km) south of the Canoa Ranch Interchange (Figure 2.1-1). The proposed area of rezoning is proposed to be developed with 300 single-family residences. If the proposed rezoning is approved, the 545-acre (221-ha) area would be rezoned from Rural Homestead to Single Residence (Green Valley 2004).

Local Initiatives to Protect Biological and Cultural Resources. There are a number of initiatives in various stages of planning at the local level to protect biological and cultural resources. For example, in December 2001 Pima County incorporated the Sonoran Desert Conservation Plan into the Pima County Comprehensive Plan (Pima 2001), although it has not yet been implemented. The Sonoran Desert Conservation Plan contains six areas of focus: Protection of Critical Habitat; Biological Corridors, Mountain Parks, Riparian Restoration, Historic and Cultural Preservation, and Ranch Land Conservation (Sonoran 2003). In the future, the county plans to apply for a multi-species Habitat Conservation Plan permit under the *Endangered Species Act* (ESA) to allow less specific protections for 55 federally listed species in exchange for habitat protection in the conservation reserve system under the Sonoran Desert Conservation Plan.

An example of an initiative to protect cultural resources is the ongoing process of designating the Santa Cruz River as a National Heritage Site. This process is expected to be completed in 2005. The significance of this designation is to gain recognition of the area as having a diverse natural and cultural heritage.

5.2.5 Power Plants in Mexico

This section discusses, in general terms, the growth of electricity demand in Mexico, the potential for new power plants, regulation of power plants in Mexico (including coordination between the U.S. and Mexico), potential fuel sources, and associated emissions. Demand for electricity in Mexico has increased steadily over the last decade and is forecast to grow at a rate of 5.6 percent between 2003 and 2012 (EIA 2004). Predicted growth will be faster in industrialized regions, such as the Northeast, Baja California, and the Yucatan Peninsula (the Arizona-Mexico border is not included in these regions). There is a growing need for power in both countries near the border (for example, associated with maquiladoras, or manufacturing plants located near the border). There are two state-owned utilities in Mexico, the largest of which is Comisíon Federal de Electricidad (CFE), that is obligated to supply electricity to most parts of Mexico. In addition, independent power producers (IPPs) are allowed to build and own power generation facilities, such as for exporting power to the United States. The potential projects of IPPs are not as easy to predict as are the centrally planned actions of CFE.

In 2002, Mexico’s installed electric power generating capacity was 42.3 gigawatts. In the same year, the country generated an estimated 198.6 billion kilowatthours (Bkwh) of electricity, of which thermal (oil, natural gas, and coal) electricity generation account for 81 percent. Oil-fired power plants accounted for the largest share of Mexico's thermal electricity generation, but many of these plants are being converted to natural gas. According to the Mexican government’s Secretary of Energy (Secretaría de Energía or SENER), fuel oil accounted for 49.4 percent of thermal feedstock in 2002. By 2012, natural gas is forecast to account for 63 percent of Mexico's power output while fuel oil's share is expected to drop to 24.2 percent. In 2002, hydropower accounted for 12 percent of Mexico's total electricity generation, followed by nuclear with 4.5 percent and geothermal with 2.5 percent. Mexico also has one wind-power installation in Oaxaca, which generated 0.005 percent of the country's total electricity generation. There are plans to increase Mexico's wind capacity (SENER 2004).

Based on the projected demand growth, CFE plans to add 25,757 MW in generation capacity between 2003 and 2012, of which over half is already under construction. Natural gas is expected to be the primary fuel to be used at new power plants in Mexico.

Based on the projections of the electric sector for 2003-2012, the nearest location to TEP’s proposed project for existing or projected power plant construction in Mexico is near Naco, Sonora, approximately 75 mi (121 km) east of Nogales (SENER 2004). Near Naco, Sonora, an approximately 267 MW natural gas-fired, combined-cycle power plant is currently under construction, and SENER projects that an additional 469 MW of capacity will be added to this power plant in approximately 2008.

The primary air pollutants of concern that are directly emitted from natural gas-fired power plants are nitrogen oxides (NO_x) and carbon monoxide (CO). Additional pollutants that can form under certain conditions in the atmosphere from NO_x and other airborne chemicals are ozone and particulate matter. Any of these pollutants would be well dispersed before reaching Nogales, Arizona which is approximately 75 mi (121 km) from Naco, Sonora.

Emissions of NO_x from natural gas-fired power plants are regulated in both Mexico and the U.S., although the allowable emissions level is lower in the U.S. Carbon monoxide emissions from natural gas-fired power plants are regulated in the U.S. but not in Mexico. The U.S. and Mexico have set similar standards (goals) for outdoor, ambient air quality (see a comparison of the National Ambient Air Quality Standards [NAAQS] in Section 5.3.8 below). The PM_{10} (particles with an aerodynamic diameter less than or equal to 10 microns) standard is exceeded in Nogales, Arizona, and Nogales, Mexico, for each country, respectively. As explained in Section 5.3.8, the U.S. Environmental Protection Agency (EPA) is working with the Mexican government in the Border 2012 program in partnership with other Federal agencies to address environmental issues in the border region. Section 5.3.8 provides an analysis of potential cumulative air quality impacts. No additional analysis of cumulative impacts of power plants in Mexico is appropriate because there is no reasonably foreseeable construction or expansion of power plants in Sonora, Mexico that would have potential cumulative environmental effects with TEP's proposed project.

5.3 CUMULATIVE IMPACTS ANALYSIS

The potential cumulative effects are evaluated both for the period of project construction (anticipated to be 12 to 18 months), and for the post-construction (operation) period of the project. Following the discussion of potential cumulative impacts for each resource area for the entire ROI, additional cumulative impact concerns specific to the Coronado National Forest are discussed. This section concludes with Table 5.4-1 that summarizes the cumulative effects by resource area and notes the differences (if any) in cumulative impacts for the Western, Central, and Crossover Corridors.

The primary cumulative impacts from the combination of TEP's proposed project and other past, present, and reasonably foreseeable actions could affect land use (including recreation), visual resources, biological resources, cultural resources, socioeconomic resources, geology and soils, water resources, air quality, noise, human health and environment, and transportation. As detailed in Chapter 4, the proposed project's impacts to air, noise, water, and socioeconomic resources are minimal, and primarily associated with project construction, thus minimizing the potential for cumulative effects.

5.3.1 Land Use and Recreation

Section 3.1.1 describes the existing land use and land use planning in the ROI. Section 3.1.2 describes the existing recreation and the USFS Recreation Opportunity Spectrum (ROS) tool for recreation planning and management. The Arizona State Parks *Draft 2003 Statewide Comprehensive Outdoor Recreation Plan Outdoor Recreation Analyses* indicates a general increasing trend in outdoor recreation in Arizona, by both Arizona residents and visitors on vacations (SCORP 2003). Recreational activities within the Coronado National Forest are expected to increase due to increased area populations (see Section 3.5, Socioeconomics) and the need to find climatic relief or relief from urban areas. Increases in recreation and land use changes associated with industrial, roadway, and residential growth (as described above) are stress factors on existing land use and recreation opportunities and facilities.

There may be adverse cumulative effects on land use as a result of past, present, and reasonably foreseeable projects. Potential industrial development and residential development would introduce land use changes. The cumulative result of TEP's proposed project combined with other transmission line projects and industrial, roadway, and residential growth could be development of land that is currently either undisturbed or used for other activities such as ranching and recreation. The activities of the U.S. Border Patrol and illegal immigrants may further contribute to disturbance of land that is currently in a relatively natural state. When implemented, the Sonoran Desert Conservation Plan may help in defining and protecting a balance of land uses.

In general, National Forest System lands have historically been less impacted by construction and development than other land because of USFS land management requirements. The cumulative impact of TEP construction outside of National Forest System lands would be part of a larger trend towards development, while construction of the TEP project on National Forest System lands would be in areas less cumulatively impacted by other development (except for other permitted uses).

If multiple projects are under construction simultaneously, an increased amount of land would be used temporarily for construction lay down yards and staging areas. For example, construction of the proposed TEP transmission lines and the potential residential construction would temporarily require land use changes in the ROI.

To the extent that changes in land use occur, areas that are currently used for recreation may no longer be available for recreation, or may provide a different recreation experience due to a more developed setting. Increased access on the Coronado National Forest from multiple projects, especially transmission line projects that require ongoing maintenance access, could accelerate the increase in recreational use of National Forest System lands. The cumulative impact of increased recreational use of National Forest System lands could be a change in aspects of the recreational experience such as remoteness, and a possible need for more facilities for visitor management.

5.3.2 Visual Resources

Section 3.2 describes the existing visual resources in the ROI, and the USFS Scenery Management System (SMS) tool for land management planning related to visual resources. Directly related to the potential for the cumulative impact of development of natural land uses and increased operations of the U.S. Border Patrol, the viewshed of the valleys and mountains between Tucson and Nogales, Arizona would continue to be altered from its natural state. For example, these actions could result in the addition of roads to the ROI. In arid climates such as southern Arizona, the recovery of land from disturbances such as unclassified roads tends to be slow, on the magnitude of years, such that the visual landscape is particularly susceptible to long-term cumulative effects.

The differences in cumulative visual impacts from TEP's proposed corridors would be based on the different visual impacts of each corridor (see Section 4.2). The definition and protection of land uses through the Sonoran Desert Conservation Plan could contribute to keeping cumulative visual impacts of development within designated areas. The introduction of construction equipment and staging areas from multiple projects under construction simultaneously would result in temporary increased visual impacts to the ROI. (Refer also to the discussion of cumulative impacts specific to the Coronado National Forest in Section 5.2.13.)

5.3.3 Biological Resources

Natural habitats and special status species could be impacted by many of the past, present, and reasonably foreseeable future actions. As a result of TEP's proposed project combined with industrial projects, roadway projects, and residential growth, a cumulative development of land that currently provides natural habitat could occur. The activities of the U.S. Border Patrol and illegal immigrants, along with increased recreational use described previously under Land Use, would further contribute to disturbance of land that currently provides natural habitat. The Sonoran Desert Conservation Plan, when implemented, would help in defining and protecting a balance of land uses.

The cumulative impact of disturbance of undeveloped native habitat, as described in Land Use, could result in pressures for animals to find new food sources and habitats, and a potential change in the species composition of the area. Increased access roads from multiple actions could result in increased disturbance of existing vegetation. Overall, within the entire ROI, the cumulative impacts are expected to be minimal given the availability of habitat to support the native species.

Cumulative impacts on biological resources could result in localized modification and fragmentation of habitat. These impacts could result in a decline of biodiversity in the Sky Island Region. Because the majority of the Sky Island habitats are under Federal management (for example, National Forest System land), any future proposals that have the potential to cause significant impact would be subject to analysis under NEPA.

Potential impacts to special interest species would occur under all of TEP's action alternatives (see Appendices D, E, F, and K). All potential impacts as a result of any of the action alternatives and any future actions involving a Federal decision would be subject to consultation requirements under Section 7 of the ESA. Thus, these actions would be subject to requirements and mitigation outlined by the U.S. Fish and Wildlife Service (USFWS). Therefore, impacts to threatened or endangered species would not accumulate without USFWS review. Likewise, all future actions on land administered by the USFS (for example, roadway development) would require Management Indicator Species analysis, and would not accumulate without USFS review (see Section 4.3.5, Management Indicator Species).

New disturbances from all past, present, and reasonably foreseeable future projects would provide a potential point of entry for invasive species onto the landscape, which could lead to adverse modification of the surrounding ecosystems. Colonization of an invasive species within the ROI would be a significant impact. The potential for introduction and spread of invasive species would be greatest during construction of one or more projects, and would continue to exist during project maintenance activities.

5.3.4 Cultural Resources

Directly related to the cumulative impact of natural land development caused by past, present, and reasonably foreseeable future projects, increased disturbance from multiple actions could result in cumulative adverse impacts to cultural resource sites. In addition to project-related disturbance, the increased accessibility created by new roads built for the project can cause cumulative impacts in the form of increased public visitation, recreational impacts, and vandalism. The U.S. Border Patrol stated that the roads associated with the construction and maintenance of the proposed project would contribute to an increase in illegal immigrant and narcotic smugglers in the area and affect U.S. Border Patrol operations. Increased vehicle and foot traffic related to illegal traffic and interdiction could cause damage to cultural resources. Special care would need to be taken to address these cumulative impacts with appropriate mitigation or evaluation measures.

In addition, Tribal representatives listed in Table 3.4–1 have expressed that they value the project area's natural landscape. The cumulative impact on the area landscape from multiple projects would be greater than from the TEP project alone, and would likely evoke a similar concern.

5.3.5 Socioeconomics

Section 3.5 describes the existing socioeconomic resources in the ROI, including population and housing, employment and income, community services, revenues for Forest-based activities, and tourism. As noted in Section 5.3.1 above, to the extent that changes in land use occur, areas that are currently used for recreation may no longer be available for recreation, or may provide a different recreation experience due to a more developed setting. Combined with the potential for other energy projects; industrial and residential development; and increased smuggling and illegal immigration, the cumulative impact could be a reduction in tourism revenue particularly associated with visits to outdoor natural tourist attractions. On the other hand, to the extent that local initiatives to protect biological and cultural resources are implemented (which may serve to protect the resources of outdoor natural tourist attractions), potential cumulative negative impacts on tourism revenue may be reduced.

In addition, future economic development in the region could bring economic benefits to Pima and Santa Cruz Counties. Improvements in roadways have the potential to significantly impact the economy of the border region near Nogales, leading to the creation of more jobs and revenue for the region. Improved electricity reliability in the Nogales region would be expected to contribute to long-term socioeconomic benefits by supporting business development and regional growth. The cumulative result of TEP's proposed project combined with industrial, roadway, and residential growth could generate more revenue and employment in both counties during and following their construction. However, any cumulative growth effect could also have the potential to stress community resources such as schools, police, and fire protection.

5.3.6 Geology and Soils

Section 3.6 describes the existing geology and soils in the ROI. Directly related to the potential for the cumulative impact of development of natural land uses, activities of the U.S. Border Patrol and illegal immigrants (including unclassified road creation and use), and off-road vehicle use, cumulative adverse impacts to soil resources could result from an increased area of disturbance for construction of multiple projects. These cumulative impacts would be similar to the potential impacts described in Section 4.6.2, Soils, but over a larger area of disturbance. These impacts include an increased potential for erosion and soil compaction from large equipment, and from decreased vegetation cover resulting from off-road vehicle use and clearing of proposed roads and ROWs where necessary. Specifically, illegal immigrant and U.S. Border Patrol activities in Sycamore Canyon and the Pajarita Wilderness adjacent to the U.S.-Mexico border, when combined with TEP's proposed Western Corridor, could result in increased erosion in the Sycamore Canyon Watershed. The contribution to this impact from TEP's proposed project would be minimal because best management practices (BMPs, see Section 4.6.2, Soils) would be employed by TEP for their proposed project. Construction of TEP's proposed project along the EPNG pipeline ROW would minimize the new area of soil disturbance.

5.3.7 Water Resources

Section 3.7 describes the existing water resources in the ROI, and the classification of the watersheds and surface waters in the Tumacacori EMA. The cumulative result of TEP's proposed project combined with other industrial, roadway, and residential growth could be an increase of water use in the ROI. This potential short-term impact would be greatest if multiple projects were constructed simultaneously, as water would be used for dust control and other purposes. In the long term, operation of transmission lines requires little if any water, so would not contribute to a cumulative long-term increase in water demand from potential residential and industrial growth.

In addition, the potential for increased erosion from the proposed project, activities of the U.S. Border Patrol and illegal immigrants (including unclassified road creation and use), and off-road vehicle use, as described above in Section 5.2.6, could negatively impact watershed conditions (explained in Section 3.7.1). Specifically, if the Western Corridor is implemented, the existing watershed quality, condition, and function in the Pajarita Wilderness and Sycamore Canyon (a perennial surface water currently classified as satisfactory) could be adversely affected. If the Central or Crossover Corridors are implemented, the portion of these corridors south of Ruby Road (which has Satisfactory water quality and watershed function) may have cumulative impacts that could affect this classification. In addition, the watershed condition in Peck Canyon (a perennial surface water currently classified as satisfactory) overlapping the Crossover Corridor could have cumulative impacts that could affect this classification. However, as noted above, the contribution to watershed conditions from TEP's proposed project would be minimal because BMPs (e.g., maintain vegetative cover to the extent possible in exposed soil areas during construction activities; minimize exposure of bare soil areas to precipitation following any new construction or other ground disturbing activities for the selected alternative; and slow down stormwater runoff by grading and berms, and provide drainage pathways for runoff) would be employed.

5.3.8 Air Quality

Section 3.8 describes the existing air quality in the ROI. With respect to the NAAQS, Pima and Santa Cruz Counties are designated as being in attainment or unclassifiable for all criteria pollutants, with the exception of the Nogales area in Santa Cruz County, which is designated as a moderate non-attainment area for PM_{10}. Pollutants from a number of sources including motor vehicles, power plants and industrial facilities, agricultural operations, mining, dust from unpaved roads, and open burning of trash have affected urban and regional air quality along the U.S.-Mexico border. The most common and damaging pollutants from these sources include sulfur dioxide, suspended particulate matter (PM-10 and PM-2.5), nitrogen dioxide, ground-level ozone, and carbon monoxide.

Under a bilateral agreement with Mexico signed in 1983 (officially: The 1983 Agreement on Cooperation for the Protection and Improvement of the Environment in the Border Area; hereafter, this agreement will be referred to as the "La Paz Agreement"), the United States and Mexico have developed and implemented a series of strategies to address environmental issues along their shared border. The La Paz Agreement is the legal basis for the Border 2012 Program, which has the stated mission, "To protect the environment and public health in the U.S.-Mexico border region, consistent with the principles of sustainable development."

With respect to air quality, the Border 2012 Program has two major objectives:

(1) By 2012 or sooner, reduce air emissions as much as possible; and

(2) By 2003, define baseline and alternative scenarios for emissions reductions along the border, and their impacts on air quality and human exposure.

Consistent with the Border 2012 Program, the United States and Mexico currently operate coordinated air monitoring networks, compile emission inventories, and conduct modeling analyses designed to support reasonable pollution control strategies to achieve national air quality standards on both sides of the border. One example resulting from this cooperative agreement is the U.S.–Mexico Border Information Center on Air Pollution (see http://www.epa.gov/ttn/catc/cica/geosel_e.html for more information).

Although substantial gains have been made, air quality is still a major concern throughout the border region. The pressures associated with industrial and population growth, the increase in the number of old vehicles, differences in governance and regulatory frameworks, and topographic and meteorological conditions present a challenging context in which to address air quality management. These same factors also present many opportunities for bi-national cooperation.

Table 5.3.8-1 lists the air quality standards for the U.S. and Mexico. The table includes the time period over which pollutant concentrations are averaged (*i.e.*, exposure time), and the numerical value of each standard. Values are in parts per million by volume (ppm) and micrograms per cubic meter of air ($\mu g/m^3$).

Table 5.3.8-2 depicts the current air quality data for the Mexico-U.S. border region near Nogales. As shown on that table, no pollutants exceed any air quality standards. The cumulative impact of TEP's proposed project combined with other industrial, roadway, and residential growth, and activities of the U.S. Border Patrol and illegal immigrants could be an increase in airborne dust and vehicle emissions within the ROI. This potential impact would be greatest if multiple projects were constructed simultaneously due to the potential for airborne dust generation. An additional source of air pollutants in the U.S. could be wind transport of airborne dust or pollutants from Mexican transmission line or roadway construction activities in or near Nogales, Mexico. Construction vehicle emissions (as described in Section 4.8) would be greatest if multiple projects were constructed simultaneously, but would tend to dissipate within a few days rather than accumulate in the air over time. In the long term, operation of transmission lines generates very little air emissions, so it would not contribute to a cumulative increase in air emissions. No cumulative impacts to the ROI's attainment status under the NAAQS are expected. With respect to the 267 MW natural gas-fired, combined-cycle power plant that is currently under construction in Naco, Sonora, any pollutants from this plant would be well dispersed before reaching Nogales, Arizona, which is approximately 75 mi (121 km) from Naco, Sonora.

5.3.9 Noise

Section 3.9 describes the existing noise environment in the ROI. The cumulative result of TEP's proposed project combined with other transmission line projects, and industrial, roadway, and residential growth could be an increase in noise levels during periods when construction projects occur simultaneously. Cumulative noise impacts would be short term and limited to daylight hours. No long-term cumulative noise impacts would occur.

5.3.10 Human Health and Environment

No Federal regulations have been established specifying environmental limits on the strengths of electric and magnetic fields (EMFs) from electric transmission lines. The cumulative impacts to human health and safety could be an increase in background EMF exposure to residents in the immediate vicinity of overlapping transmission line projects (for example, by TEP and PNM). Section 4.10 gives example EMF exposures of two 345-kV transmission lines operating adjacent to one another (on BLM land, in this case). The EMF levels in this example at a distance where residences would potentially be located are well below 0.8 milligauss (mG), the average daily exposure to maximum magnetic fields from some common household appliances (NIEHS 1999). While extensive research has been conducted to determine if exposure to electric or magnetic fields may cause or promote adverse health effects, the National Institute of Environmental Health Sciences (NIEHS) concluded that "The scientific evidence suggesting that ELF-EMF exposures pose any health risk is weak" and that "The probability that EMF exposure is truly a health hazard is currently small" (NIEHS 1999). Based on an assessment such as this, no long-term cumulative human health impacts are expected to occur. However, the subject remains controversial (see Appendix B).

Table 5.3.8-1. Health-Based Ambient Air Standards

POLLUTANT	STANDARD	
	United States	**Mexico**
Carbon monoxide (CO)		
8-hour Average	9 ppm	11 ppm
1-hour Average	35 ppm	
Nitrogen dioxide (NO_2)		
Annual Average	0.053 ppm	
1-hour Average		0.21 ppm
Ozone (O_3) (See note)		
8-hour Average	0.08 ppm	
1-hour Average	0.12 ppm	0.11 ppm
Sulfur dioxide (SO_2)		
Annual Average	0.030 ppm	0.030 ppm
24-hour Average	0.14 ppm	0.13 ppm
Particulate matter smaller than 2.5 micrometers ($PM_{2.5}$)		
Annual Average	15 µg/m^3	
24-hour Average	65 µg/m^3	
Particulate matter smaller than 10 micrometers (PM_{10})		
Annual Average	50 µg/m^3	50 µg/m^3
24-hour Average	150 µg/m^3	150 µg/m^3
Total suspended particulate matter (TSP)		
Annual Average		75 µg/m^3
24-hour Average		260 µg/m^3
Lead (Pb)		
Quarterly Average	1.5 µg/m^3	1.5 µg/m^3

Source: Source: Technology Transfer Network, U.S.-Mexico Border Information Center on Air Pollution; http://www.epa.gov/ttn/catc/cica/
Note: EPA is phasing out the U.S. 1-hour ozone standard and replacing it with an 8-hour standard that is more protective against longer-duration exposures to the pollutant.

Table 5.3.8-2. Border Air Quality Data – Monitor Values Report

Geographic Area: Nogales
Pollutant: Carbon Monoxide, Nitrogen Dioxide, Ozone, Sulfur Dioxide, Particulate (diameter <2.5 micrometers), Particulate (diameter <10 micrometers), Lead, Total Suspended Particulate
Year: 2004
EPA Air Quality Standars:
Carbon Monoxide: 35 ppm (1-hour average), 9 ppm (8-hour average)
Nitrogen Dioxide: 0.053 ppm (annual mean)
Ozone: 0.12 ppm (1-hour average), 0.08 ppm (8-hour average)
Sulfur Dioxide: 0.5 ppm (3-hour average), 0.14 ppm (24-hour average), 0.030 ppm (annual mean)
Particulate (diameter < 2.5 micrometers): 65 µg/m3 (24-hour average), 15.0 µg/m3 (annual mean)
Particulate (diameter < 10 micrometers): 150 µg/m3 (24-hour average), 50 µg/m3 (annual mean)
Lead: 1.5 µg/m3 (quarterly mean)
TSP: No EPA Standard
ppm = parts per million µg/m3 = micrograms per cubic meter

CO (ppm)		NO2 (ppm)	O3 (ppm)		SO2 (ppm)		PM2.5 (µg/m3)		PM10 (µg/m3)	
1-Hour Value	8-Hour Value	1-Hour Value	1-Hour Value	8-Hour Value	24-Hour Value	Annual	24-Hour Value	Annual	24-Hour Value	Annual
Max		Max	Max		Max	Mean	Max	Mean	Max	Mean
			0.080	0.073						
5.5	3.7		0.076	0.070						
									37	14
							17	6.2	119	29
			0.081	0.075						
									149	33
									50	29
3.4	1.4	0.059	0.078	0.073	0.003	0.001				
4.0	1.8									
			0.075	0.069					23	14
			0.078	0.071						
4.0	2.7									
									30	22
									37	22
2.2	1.4	0.063	0.077	0.071			10	5.9		
							12	6.9		
			0.075	0.071					127	15

Source: Technology Transfer Network, U.S.-Mexico Border Information Center on Air Pollution; http://www.epa.gov/ttn/catc/cica/

5.3.11 Transportation

Section 3.12 describes the existing transportation system in the ROI. As described in Section 5.2.4 above, off-road vehicles are used by visitors to the Tumacacori EMA, and a significant portion of off-road vehicle use in the project vicinity may be on unclassified roads. In addition, the Nogales Station of the U.S. Border Patrol conducts routine surveillance in the vicinity of the U.S.-Mexico border, specifically focused on the area south of Ruby Road between the Pajarita Wilderness and Nogales, mostly within the Tumacacori EMA. U.S. Border Patrol activities generally involve accessing the ridgetops to get an open view of the area. The Border Patrol has indicated that they expect an increase in the amount of patrol operations that will occur in this area.

The cumulative result of TEP's proposed project combined with other industrial, roadway, and residential growth, and activities of the U.S. Border Patrol and illegal immigrants could be a cumulative development of more roadways for project access and private and commercial use. The activities of the U.S. Border Patrol and illegal immigrants may further contribute to the development of new roadways and paths, which would be unclassified roads by default, although the U.S. Border Patrol has indicated that they are working with USFS to formally acknowledge and address the roads used by the U.S. Border Patrol. This change in land use has implications for a number of resources areas as previously described. In addition, multiple simultaneous construction projects could result in a temporary increase in traffic congestion. The TEP proposed project includes corridors with a segment on the Coronado National Forest, and would require construction and ongoing maintenance access on National Forest System lands. Construction of TEP's proposed project along the EPNG pipeline ROW would minimize the need for new project access. Cumulative traffic impacts would be short-term and limited to daylight hours. No long-term cumulative traffic impacts would occur. Multiple simultaneous construction projects could result in a temporary increase in traffic congestion and traffic accidents and a decrease in worker safety. No long term cumulative traffic impacts would occur.

5.3.12 Environmental Justice

The proposed project would not result in any disproportionately high and adverse impacts for the minority or low-income population, as described in Section 4.13. No means were identified for minority or low-income populations to be disproportionately affected, and the proposed project would not contribute cumulatively to any environmental justice impacts.

5.3.13 Additional Cumulative Impact Concerns Specific to the Coronado National Forest

In addition to the potential cumulative impacts described above for each resource area, which include impacts on National Forest System lands, the following discusses issues specific to the Coronado National Forest. The cumulative impacts from increased road access into any TEP corridor on the Coronado National Forest, combined with other past, present, and reasonably foreseeable projects, have the potential to adversely affect biological resources, visual resources, cultural resources, land use, and soil.

Cumulative adverse impacts to cultural resources could result from increased disturbance for construction of multiple projects that could disturb currently unknown cultural resource sites. Tribal consultations indicate that disturbance to the natural landscape would also be considered an adverse impact to cultural resources. If multiple actions occur, special care would need to be taken to address these cumulative impacts with appropriate mitigation or evaluation measures.

Cumulative adverse impacts to soil resources could also result from an increased area of disturbance for construction of multiple projects. These cumulative impacts would be similar to the potential impacts described in Section 4.6.2, Soils, but over a larger area of disturbance. These impacts include an increased potential for erosion and soil compaction from large equipment, and from decreased vegetation cover resulting from clearing of proposed roads and the ROW where necessary.

Recreational activities within the Tumacacori EMA are expected to increase due to increased area populations (see Section 3.5, Socioeconomics) and the need to find climatic relief or relief from urban stress. Increased access from multiple projects, especially transmission line projects that require ongoing maintenance access, could accelerate the increase in recreational use of National Forest System lands. This could adversely impact natural and cultural resources as described above. The cumulative impact of increasing development on National Forest System lands could be a change in the Recreation Opportunity Spectrum (ROS) settings. By causing a change in access, naturalness, and other ROS setting indicators, the range of possible ROS settings available for recreation could be narrowed.

The cumulative impact of TEP's proposed project and other past, present, and reasonably foreseeable future actions could be a loss over time of land that gives the overall visual impression of being relatively undisturbed by human activities (that is a natural landscape). This change in landscape character (see Section 3.2, Visual Resources) could especially occur in rapidly growing southeastern Arizona. Public lands, such as the Coronado National Forest, are some of the few remaining natural landscapes, and these natural landscapes on National Forest System lands have increasing impacts from development as time goes on. For example, in the neighboring Santa Rita Mountains southeast of Tucson, the Whipple Observatory complex and Melendrez Pass communication site impact otherwise natural lands. Other potential contributors to these cumulative impacts on National Forest System lands include roadways, housing, commercial development, livestock grazing, recreation activities, undocumented immigrant activities associated with the U.S.-Mexico border, mining projects, and other possible activities under special use permits.

5.4 CUMULATIVE IMPACTS ANALYSIS SUMMARY

Based on the reasonably foreseeable actions identified in Section 5.1, and the cumulative impacts analysis in Section 5.2, Table 5.4-1 provides a summary comparison of cumulative impacts by resource area and notes the differences (if any) in cumulative impacts for the Western, Central, and Crossover Corridors.

Table 5.4-1. Summary Comparison of Cumulative Impacts

Resource Area	Cumulative Impact	Major Differences Between the Western, Central, and Crossover Corridors
Land Use	Development of land that is currently either undisturbed or used for other activities such as ranching and recreation. Cumulative impact of TEP construction outside of National Forest System lands would be part of a larger trend towards development, while construction of the TEP project on National Forest System lands would be in areas less cumulatively impacted by other development.	Higher for the Western and Crossover Corridors since mileage through undisturbed areas is greater.
Recreation	Some areas that are currently used for recreation may no longer be available for recreation, or may provide a different recreation experience due to a more developed setting.	Higher for the Western and Crossover Corridors since mileage through undisturbed areas is greater.
Visual Resources	Viewshed of the valleys and mountains between Tucson and Nogales, Arizona would continue to be altered from its natural state. Off-road vehicle use and unclassified road creation and use would continue to contribute significantly to roads that are visible in the landscape.	Higher for the Western and Crossover Corridors, based on the different visual impacts of each corridor (see Section 4.2).
Biological Resources	Disturbance of native habitat could pressure animals to find new food sources and habitats. Localized modification and fragmentation of habitat is possible, and could result in a decline of biodiversity in the Sky Island Region and potential impacts to special interest species.	Higher for the Western and Crossover Corridors, based on greater acreage disturbed, but not significantly different among any action alternatives.
Cultural Resources	Land disturbance from multiple actions could result in cumulative adverse impacts to cultural resource sites. Increased accessibility created by cumulative new development could increase public visitation, recreational impacts, and vandalism.	None.
Socioeconomics	Potential reduction in tourism revenue particularly associated with visits to outdoor natural tourist attractions. Growth in the area could generate more revenue and employment, and stress community services.	None.

Table 5.4-1. Summary Comparison of Cumulative Impacts (*continued*)

Resource Area	Cumulative Impact	Major Differences Between the Western, Central, and Crossover Corridors
Geology and Soils	Increased potential for erosion and soil compaction.	Higher for the Western and Crossover Corridors since the total length of the corridors are longer than the Central Corridor.
Water Resources	Increase of water use in the ROI and negative impact on watershed conditions.	Higher for the Western and Crossover Corridors, based on proximity to Sycamore and Peck Canyons, respectively, since both canyons have perennial surface waters.
Air Quality	Increase in airborne dust and vehicle emissions, but no air quality standards expected to be exceeded.	None.
Noise	Short-term, temporary increase in noise levels during periods when construction projects occur simultaneously.	None.
Human Health and Environment	No long-term cumulative human health impacts are expected to occur. Multiple simultaneous construction projects could result in a temporary increase in traffic congestion and traffic accidents and a decrease in worker safety.	None.
Transportation	Cumulative development of more paths and roadways. Road density of official USFS roads on federal lands would not change.	Highest for the Western and Crossover Corridors since the mileage of new roads needed is greater. However, the cumulative impact on Federal lands would be unaffected because no net new roads would result.
Environmental Justice	No environmental justice impacts.	None.

CHAPTER 6
UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

The construction and operation of the proposed action or any of the alternatives would result in some unavoidable adverse environmental impacts. The following is a description of these impacts grouped by topic.

Land Use. Placement of physical structures and access roads would unavoidably change the nature of land use both on and outside of the Coronado National Forest.

Recreation and Visual. Because portions of each alternative would be visible to some local residents, visitors on and off the Coronado National Forest, and people traveling on portions of Interstate 19 (I-19) and other area roads, the proposed project would have an adverse long-term impact on the viewshed. This would alter the recreational setting in the vicinity of the proposed project.

Biological Resources. Increased access to the area has the potential to disturb biological resources. Where requested by landowners or land managers, Tucson Electric Power Company (TEP) would maintain locked gates to new roads required for project maintenance to limit public access. Construction and operation of the proposed project would cause temporary and permanent loss and disturbance to plant communities and loss of habitat for terrestrial animal populations.

Soils. Construction of the transmission line could potentially impact a small amount of prime farmland soils. This would include compaction of these soils and damaging the soil structure during excavation. The burying of soil and loss of soil productivity cannot be avoided by implementation of any action alternative. Increases in soil erosion could occur as a result of construction of all proposed facilities and access roads. During the construction phase localized erosion could increase above natural levels and soil would be deposited downslope. Best Management Practices (BMPs) would minimize erosion impacts during construction, and revegetation of construction roads would mitigate long-term impacts.

Water Resources. Potential increase in flood heights in the Santa Cruz River due to expansion of the South Substation within the 100-year floodplain would be unavoidable.

Air Quality. Vehicle and fugitive dust emissions would occur primarily during project construction. Effects on ambient air quality would be short-term and localized and would not exceed National Ambient Air Quality Standards. For all alternatives, vehicle emissions cannot be avoided from periodic motor vehicle access via maintenance roads.

Cultural Resources. Cultural resources could be adversely impacted by construction of the proposed project. Increased access to the proposed project area has the potential to disturb cultural resources. Where requested by landowners or land managers, TEP would maintain locked gates to new roads required for project maintenance to limit public access.

Noise. During construction, daytime noise would increase in residential areas located near the transmission line right-of-way (ROW) and in areas near the ROW used for recreation. Since this impact is associated with the construction phase, it would be short-term and temporary, and would not cause any significant impacts to human hearing. In the Forest, increased noise could disrupt wildlife foraging and breeding cycles. Therefore, construction would be scheduled to avoid the reproductive seasons of sensitive wildlife species.

Waste Management. Construction of the project would result in the generation of small quantities of solid and hazardous wastes that would minimally decrease the life of existing landfills and increase shipments to *Resource Conservation and Recovery Act* (RCRA)-permitted treatment and disposal facilities. Operation of the project would result in the generation of small quantities of municipal solid waste, such as paper and plastic wrapping materials from new equipment.

CHAPTER 7
IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This section describes the irreversible and irretrievable commitments of resources associated with implementation of the proposed action or any of the alternatives. A commitment of resources is irreversible when primary or secondary impacts limit the future options for a resource. It applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity or forest health, that are renewable only over long periods of time. An irretrievable commitment refers to the use or consumption of a resource that is neither renewable nor recoverable for use by future generations. It applies to the loss of production, harvest, or use of natural resources (USFS 1992).

Both irreversible and irretrievable commitments of resources would occur under the action alternatives. An irreversible commitment of land and visual resources would occur within and outside of the Coronado National Forest where relatively undisturbed land would be disturbed by the proposed project. The proposed project would introduce human alterations to the natural landscape in areas with currently high or very high Scenic Integrity (areas where the landscape is intact, or appears to be intact, with only minute deviations). The visual resources are irretrievable during the duration of the project because the visual quality would be lost. If the project were removed the area would eventually revert back to its original visual state and the habitat would revert to its original form and function. The Federal agencies do not expect this to occur. Each corridor would be visible from a number of recreation areas. These special use areas represent recreational opportunities where visitors likely have high concern for the landscape.

Placing of the poles and construction of the substations would have irretrievable and irreplaceable impacts on soils, vegetation, and cultural resources. Irreversible commitments of resources would include removal of small areas of farmland from potential use for agriculture. Some clearing of cropland may be required during construction of the proposed transmission line, but only the land directly beneath the foundations of the new towers would be irreversibly committed. The loss of soil and productivity would be irreversible where permanent structures are constructed.

The direct loss of vegetation due to clearing and construction is irretrievable but it could be reduced by application of conservation measures. Specific impacts to vegetation would be identified and mitigated upon precise siting of the right-of-way (ROW) within the chosen corridor.

Cultural resources are nonrenewable, and disturbance of a site is an irretrievable impact to that resource. Preservation of archaeological sites is possible through cultural resource site avoidance. Data recovery of historic properties eligible for the National Register of Historic Places may be a necessary mitigation measure; however, data recovery is an irreversible use of an historical property, effectively eliminating options for future preservation or study.

Construction of the transmission line structures and substations would require the irretrievable commitment of standard building materials and fuel for construction equipment. Approximately 1 acre-ft of water would be utilized during construction. The resources irretrievably committed for operation of this project would be relatively minor quantities of fuel for maintenance vehicles, operating supplies, and miscellaneous chemicals. Theoretically, construction of facilities (roads, electrical towers) is a reversible commitment of land and water. In practice it is an irretrievable commitment of land use, as the transmission line and its support structures would not be removed.

CHAPTER 8
SHORT-TERM USE AND LONG-TERM PRODUCTIVITY

This section discusses the proposed project's short-term use of man's environment and the maintenance and enhancement of long-term productivity. The impacts and utilization of resources associated with the proposed project are given in Chapter 4.

Although the alternatives do not require a major amount of land to be taken out of production, losses of terrestrial plants and animals and habitats from natural productivity to accommodate the new facilities and temporary disturbances during construction are possible. Land clearing and construction activities resulting in personnel and equipment moving about an area would disperse wildlife and temporarily eliminate habitats. Short-term disturbances of previously undisturbed biological habitats from the construction of the transmission line and other structures could cause long-term reductions in the biological productivity of an area. These long-term effects tend to be more pronounced in arid areas such as the proposed project area where biological communities recover very slowly from disturbances. Effects of long-term occupancy by the transmission line include negative effects of encounters between humans and wildlife, such as mortality from recreation or maintenance vehicles. Changes in types and patterns of recreation use can be positive or negative, depending on the personal values of the interested and affected public.

The proposed project's impacts on previously undisturbed land both within the Coronado National Forest and outside of National Forest System lands would affect long-term cultural and visual resources. A large portion of each alternative crosses undeveloped land, impacting long-term preservation of unaltered landscapes. While none of the three alternative rights-of-way (ROWs) traverse the Pajarita Wilderness (see Figure 3.1–1), portions of each alternative would be visible from many locations on and off national forest lands. Use, productivity, and resource commitment related to archaeological and historic properties cannot be determined at this time until a complete inventory and evaluation of archaeological and historic sites is carried out. Such a survey would be conducted in accordance with direction provided in a Programmatic Agreement as discussed in Section 2.2.6.

Improved electricity reliability to the Nogales region would be expected to contribute to long-term socioeconomic benefits, including business development and regional growth.

Permits and approvals would be needed before the proposed project could be constructed. Permits would regulate many aspects of facility construction and operations, including the quality of construction, fugitive dust control requirements, treatment and storage of hazardous waste, and discharges of effluents to the environment. These permits would be obtained as required from appropriate Federal, state, and local agencies. Table 9–1 contains a summary of the primary approvals that would be required to implement the proposed action or the alternatives.

The major Federal laws, regulations, Executive Orders (EOs), and other compliance actions that potentially apply to the proposed project, depending on the alternative, are identified in Table 9–2. There are a number of Federal environmental statutes that address environmental protection, compliance or consultation. In addition, certain environmental requirements have been delegated to state authorities for enforcement and implementation. It is Tucson Electric Power Company's (TEP) policy to conduct its operations in an environmentally safe manner and in compliance with all applicable statutes, regulations, and standards. Although this chapter does not address pending legislation or future regulations, TEP recognizes that the regulatory environment is in transition, and subject to many changes, and that the construction and operation of the proposed project must be conducted in compliance with all applicable regulations and standards.

Table 9–1. List of Potentially Required Permits/Approvals

Agency	Permit/Approval
ACC	Certificate of Environmental Compatibility
EPA	Aquifer Protection Permit
ADEQ	Hazardous Waste Permit
	Stormwater Permits
Arizona Department of State Lands	Right-of-way grant[1]
BLM	Right-of-way Grant and fiber optic line permit
ADA	Native Plant Permit
ADOT	Encroachment Permit
	Crossing Permit
	Boring Permit
	Class C Permit
DOE	Presidential Permit
Pima County Department of Environmental Quality	Activity Permit
Pima and Santa Cruz Counties	Zoning Approval
	Industrial Use Permit
	Excavation/Grading Permit
	Septic Permit
	Permit for Temporary Construction Facilities
	Permit for Temporary Power
	Building Permits
	Permit to Build in Roadway
USFWS	ESA Concurrence in a Biological Opinion
SHPO	NHPA Concurrence in a Programmatic Agreement (and Advisory Council if necessary with clearance stipulations)

[1] Only the Federal government may exercise its power of eminent domain and condemn State Trust lands. TEP does not have condemnation power on State Trust lands. It should also be noted that the Arizona Corporation Commission has no authority to require the Arizona State Land Department to issue a right of way across State Trust lands.

Table 9–1. List of Potentially Required Permits/Approvals (*continued*)

Agency	Permit/Approval
USACE	*Clean Water Act* Permits, Section 404
USFS	Cultural Resources Inventory Permit
	Special Use Authorization
	Cultural Resource Inventory Clearance Approval
USIBWC	Review and concur on construction plans upon issuance of ROD by the lead agency

ACC = Arizona Corporation Commission; ADA = Arizona Department of Agriculture; ADEQ = Arizona Department of Environmental Quality; ADOT = Arizona Department of Transportation; BLM = Bureau of Land Management; DOE = U.S. Department of Energy; EPA = U.S. Environmental Protection Agency; ESA = *Endangered Species Act*; NHPA = *National Historic Preservation Act*; SHPO = State Historic Preservation Officer; USACE = U.S. Army Corps of Engineers; USFS = U.S. Department of Agriculture Forest Service; USFWS = U.S. Fish and Wildlife Service; USIBWC = U.S. Section of the International Boundary and Water Commission, U.S. and Mexico.

Table 9–2. Federal Environmental Statutes, Regulations, and Orders

Resource Category	Statute/ Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Air Resources	CAA	42 USC §§ 7401 et seq.	EPA	Requires sources to meet standards and obtain permits to satisfy: National Ambient Air Quality Standards (NAAQS), State Implementation Plans (SIPs), New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and New Source Review (NSR). **Applicability:** No major source permit required under NESHAP or NSR. No NSPS requirements. SIP requirements may apply.
	CAA: NAAQS SIP	42 USC §§ 7409 et seq.	EPA	Requires compliance with primary and secondary ambient air quality standards governing sulfur dioxide, nitrogen oxide, carbon monoxide, ozone, lead, and particulate matter and emission limits/reduction measures as designated in each state's implementation plan. **Applicability:** SIP requirements may apply.
Noise	*Noise Control Act*	42 USC §§ 4901 et seq.	EPA	Requires facilities to maintain noise levels that do not jeopardize the health and safety of the public. **Applicability:** Applicable.
Water Resources	CWA	33 USC §§ 1251 et seq.	ADEQ	Requires EPA or state-issued permit(s) National Pollutant Discharge Elimination System (NPDES) and compliance with provisions of permits regarding discharge of effluents to surface waters and additional wetland protection requirements. **Applicability:** No NPDES permit required. Other requirements may apply.
	CWA	Section 404	USACE	Requires permit for discharge of dredge or fill material in waters of the U.S, and water quality certification. **Applicability:** Potentially applicable.
	Safe Drinking Water Act	42 USC §§ 300f et seq.	EPA/State of Arizona Department of Water Quality	Requires permits for construction/operation of underground injection wells and subsequent discharging of effluents to ground aquifers. **Applicability:** Sole-source Aquifer Protection Program Applicable.
	EO 11988: Floodplain Management EO 11990: Protection of Wetlands Management	42 FR 26951 May 24, 1977 42 FR 26961 May 24, 1977 10 CFR 1022 (implementing regulations)	Federal agencies	Where there is no practical alternative to development in floodplains and wetlands, Federal agencies are required to prepare a floodplains and wetlands assessment, design mitigation measures, and provide public review. For floodplain involvement, Federal agencies must issue a Floodplain Statement of Findings. **Applicability:** Applicable.

Table 9–2. Federal Environmental Statutes, Regulations, and Orders *(continued)*

Resource Category	Statute/ Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Soil Resources	*Farmland Protection Policy Act*	7 USC §§ 4201 et seq.	NRCS	Minimizes any adverse effects to prime and unique farmlands. **Applicability:** Applicable.
Biological Resources	*Bald and Golden Eagle Protection Act*	16 USC §§ 668 et seq.	USFWS	Consultations should be conducted to determine if any protected birds are found to inhabit the area. If so, TEP must obtain a permit prior to moving any nests due to construction or operation of project facilities. **Applicability:** Applicable.
	EO 13112: Invasive Species	64 FR 6183 February 8, 1999	Federal agencies	Requires agencies, to the extent practicable and permitted by law, to prevent the introduction of invasive species; to provide for their control; and to minimize the economic, ecological, and human health impacts that invasive species cause. **Applicability:** Applicable.
	MBTA	16 USC §§ 703 et seq.	USFWS	Requires consultation to determine if there are any impacts on migrating bird populations due to construction or operation of project facilities. If so, TEP will develop mitigation measures to avoid adverse effects. **Applicability:** Applicable.
	ESA/Section 7	16 USC §§ 1531 et seq.	USFWS	Requires consultation to identify endangered or threatened species and their habitats, assess impacts thereon, obtain necessary biological opinions, and, if necessary, develop mitigation measures to reduce or eliminate adverse effects of construction or operations. **Applicability:** Applicable.
Cultural Resources	NHPA/Sections 106 and 110	16 USC §§ 470 et seq.	DOE/Forest Supervisor of Coronado National Forest/BLM	Requires consultation with the SHPO, land management agencies, and in certain cases the Advisory Council on Historic Preservation prior to construction to ensure that no significant (that is, National Register-eligible properties, as defined in NHPA) historical properties would be affected. **Applicability:** Applicable.
	Archaeological and Historical Preservation Act	16 USC §§ 469 et seq.	DOI	Requires DOE to obtain permits for any disturbances of archaeological resources. **Applicability:** Applicable.
	Antiquities Act	16 USC §§ 431-433	DOI	Requires DOE to comply with all applicable sections of the Act. **Applicability:** Applicable.
	American Indian Religious Freedom Act	42 USC §§ 1996	DOI	Requires DOE to consult with local Native American Indian tribes prior to construction to ensure that their religious customs, traditions, and freedoms are preserved. **Applicability:** Applicable.

Table 9–2. Federal Environmental Statutes, Regulations, and Orders *(continued)*

Resource Category	Statute/ Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Cultural Resources *(continued)*	EO 13007: Protection and Accommodation of Access to "Indian Sacred Sites"	61 FR 26771 May 29, 1996	DOI	Requires DOE to consider the potential impact of its actions on Native American sacred sites, access to sacred sites, or use of sacred sites. **Applicability:** Applicable.
	EO 13175: Consultation and Coordination With Indian Tribal Governments	63 FR 67249 November 9, 2000	DOI	Requires DOE to consult on a government-to-government basis with tribes and Nations **Applicability:** Applicable.
Worker Safety and Health	*Occupational Safety and Health Act*	5 USC §§ 5108	OSHA	Requires Agencies to comply with all applicable work safety and health legislation (including guidelines of 29 CFR 1960) and prepare, or have available, Material Safety Data Sheets. **Applicability:** Applicable.
	Hazard Communication Standard	29 CFR 1910.1200	OSHA	Requires DOE to ensure that workers are informed of, and trained to handle all chemical hazards in the DOE workplace. **Applicability:** Applicable.
Visual Resources	*Wild and Scenic Rivers Act*	16 USC §§ 1271-1287	USDA and DOI	Provides for designation and administration of wild, scenic, or recreational rivers. **Applicability:** Eligible river in project area.
	Wilderness Act	16 USC 1131-1136	DOI and USDA	Establishes determination of suitability and establishment of restrictions on activities that can be undertaken in an area designated as wilderness area, including preservation of wilderness character and natural condition. **Applicability:** Applicable.
	National Trails System Act	16 USC §§ 1241-1249	DOI and USDA	Authorizes a national system of trails to provide additional outdoor recreation opportunities and to promote the preservation of access to the outdoor areas and historic resources of the nation. **Applicability:** Applicable.
	Environmental Quality Improvement Act	42 USC §§ 4371-4375	CEQ	Requires each Federal agency conducting or supporting public works activities affecting the environment to implement policies established under existing law, to provide for enhancement of environmental quality. **Applicability:** Applicable.

Table 9–2. Federal Environmental Statutes, Regulations, and Orders *(continued)*

Resource Category	Statute/ Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
	Public Rangelands Improvement Act	43 USC §§ 1901-1908	DOI and USDA	Establishes a national policy and commitment to improve the conditions on public rangelands, requires a national inventory and consistent federal management policies, and provides funds for range improvement projects, enhancing recreational and aesthetic purposes. **Applicability:** Applicable.
Other	NEPA	42 USC §§ 4321 et seq. 40 CFR 1500-1508	CEQ	40 CFR 1500-1508 directs all Federal agencies in the implementation of NEPA. DOE NEPA regulations are in 10 CFR Part 1021, USFS NEPA regulations are at 36 CFR 215, and BLM NEPA regulations are in BLM Manual and Handbook 1790-1 and DOI guidance (516 DM 1-7). **Applicability:** Applicable.
	Toxic Substances Control Act	42 USC §§ 2011	EPA	Requires TEP to comply with inventory reporting requirements and chemical control provisions of TSCA to protect the public from the risks of exposure to chemicals. TSCA imposes strict limitations on use and disposal of polychlorinated biphenyl-contaminated equipment. **Applicability:** Applicable.
	Hazardous Materials Transportation Act	49 USC §§ 1801 et seq.	DOT	Requires TEP to comply with the requirements governing hazardous materials and waste transportation. **Applicability:** Applicable.
	Emergency Planning and Community Right-To-Know Act	42 USC §§ 11001 et seq.	EPA	Requires the development of emergency response plans and reporting requirements for chemical spills and other emergency releases, and imposes right-to-know reporting requirements covering storage and use of chemicals which are reported in toxic chemical release forms. **Applicability:** Applicable.
	Pollution Prevention Act	42 USC §§ 11001-11050	EPA	Establishes a national policy that pollution should be reduced at the source and requires a toxic chemical source reduction and recycling report for an owner or operator of facility required to file an annual toxic chemical release form under Section 313 of the *Superfund Amendments and Reauthorization Act*. **Applicability:** Potentially applicable.

Table 9–2. Federal Environmental Statutes, Regulations, and Orders *(continued)*

Resource Category	Statute/ Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Other *(continued)*	*National Forest Management Act*	16 USC §§ 1600-1614	USFS	Directs USFS to use an interdisciplinary approach in the planning process. Governs the Forest Plan amendment process for those corridors that would require an amendment for implementation. **Applicability:** Applicable.
	Proposed Construction and/or Alteration of Objects that May Affect the Navigation Space	FAA Advisory Circular (AC) No. 70/460-2H	FAA	This circular informs each proponent of a project that could pose an aviation hazard of the need to file the "Notice of Proposed Construction or Alteration" (Form 7640) with the FAA. **Applicability:** Potentially applicable.
	Obstruction Marking and Lighting	FAA AC No. 70/460-1G	FAA	This circular describes the FAA standards for marking and lighting objects that may pose a navigation hazard as established using the criteria in Title 14, Part 77 of the CFR. **Applicability:** Potentially applicable.
	Radio Frequency Device, Kits	47 CFR 15.25	FCC	Provisions of these regulations prohibit operation of any devices producing force fields, which interfere with radio communications, even if (as with transmission lines) such devices are not intentionally designed to produce radio-frequency energy. The FCC requires each line operator to mitigate all complaints about interference on a case-specific basis. Staff usually recommends specific conditions of certification to ensure compliance with this FCC requirement. **Applicability:** Applicable.
	EO 12088: Federal Compliance with Pollution Control Standards	43 FR 47707 October 17, 1978	Office of Management and Budget	Requires Federal agencies to consult with EPA and state agencies regarding the best techniques and methods for the prevention, control, and abatement of environmental pollution. **Applicability:** Potentially applicable.

Table 9–2. Federal Environmental Statutes, Regulations, and Orders *(continued)*

Resource Category	Statute/ Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Other *(continued)*	EO 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	59 FR 7629 February 16, 1994	EPA	Requires Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. **Applicability:** Applicable.

AC = Advisory Circular; ADEQ = Arizona Department of Environmental Quality; BLM = Bureau of Land Management; CAA = *Clean Air Act*; CEQ = Council on Environmental Quality; CFR = Code of Federal Regulations; CWA = *Clean Water Act*; DOE = U.S. Department of Energy; DOI = Department of Interior; DOT = Department of Transportation; EO = Executive Order; EPA = U. S. Environmental Protection Agency; ESA = *Endangered Species Act*; FAA = Federal Aviation Administration; FCC = Federal Communications Commission; FR = *Federal Register*; MBTA = *Migratory Bird Treaty Act*; NAAQS = National Ambient Air Quality Standards; NEPA = *National Environmental Policy Act*; NHPA = *National Historic Preservation Act*; NPDES = National Pollutant Discharge Elimination System; NRCS = Natural Resources Conservation Service; OSHA = Occupational Safety and Health Administration; SHPO = State Historic Preservation Officer; SIP = state implementation plan; TEP = Tucson Electric Power Company; TSCA = *Toxic Substances Control Act*; USACE = U.S. Army Corps of Engineers; USC = United States Code; USDA = U.S. Department of Agriculture; USFS = U.S. Department of Agriculture Forest Service; USFWS = U.S. Fish and Wildlife Service.

CHAPTER 10
LIST OF AGENCIES/PERSONS CONTACTED

Certain statutes and regulations require Tucson Electric Power Company (TEP) to consider consultations with Federal, state, and local agencies and federally recognized Native American groups regarding the potential for the proposed project to disturb sensitive resources. The consultations are generally required before any land disturbance can begin. Most of these consultations are related to biological, cultural, and Native American resources. Biological resource consultations generally pertain to the potential for activities to disturb sensitive species or habitats. Cultural resource consultations pertain to the potential for destruction of important cultural or archaeological sites. Native American consultations are concerned with identifying tribal concerns and issues related to the proposed project, including the potential for disturbance of Native American ancestral sites or traditional practices or resources.

TEP, and U.S. Department of Energy (DOE) as the lead Federal agency, have initiated consultations with Federal and state agencies as well as federally recognized Native American groups regarding the potential alternatives for the Sahuarita-Nogales Transmission Line Project to disturb sensitive resources. Table 10–1 presents a summary of DOE and TEP consultation meetings. Table 10–2 presents a summary of the consultation letters sent by DOE to agencies and Native American groups. Appendix A contains copies of the consultation letters sent by DOE. All agencies and Native American groups were provided with a copy of the Draft Environmental Impact Statement (EIS). Information from the agencies and Native American groups responses are addressed in Chapters 3 and 4 as appropriate.

Table 10–1. DOE and TEP Consultations

Subject	Agency	Activity	Date
Land Management	BLM	Cooperating agency, contact Keith Moon	Ongoing
	USFS	Cooperating agency, contact Teresa Ann Ciapusci	Ongoing
	USIBWC	Cooperating agency, contact Doug Echlin	Ongoing
Biological Resources	Arizona Game and Fish Department	Meeting with Sherry Ruther, habitat Specialist	April 19, 2002
Water Resources	USACE	Meeting with Sallie McGuire, Los Angeles District, Arizona Regulatory Section	December 17, 2002
Cultural Resources	SHPO	Letter from Matthew Bilsbarrow, SHPO, to TEP	August 13, 2001

BLM = Bureau of Land Management; SHPO = State Historic Preservation Officer; USACE = U.S. Army Corps of Engineers; USFS = U.S. Forest Service; USIBWC = U.S. Section of the International Boundary and Water Commission, U.S. and Mexico.

Table 10–2. Summary of Consultation Letters

Subject	Consultation Letters To: Agency	Name	Date	Response
Native American Government-to-Government consultation	Tribal governments of the 12 Native American communities/tribes/nations that are likely to have traditional concerns in the area: the Ak-Chin Indian Community, Fort Sill Apache Tribe, Gila River Indian Community, Hopi Tribe, Mescalero Apache Tribe, Pascua Yaqui Tribe, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Tohono O'Odham Nation, White Mountain Apache Tribe, Yavapai Apache Nation, and the Pueblo of Zuni	Individual tribal government contacts listed in Table 3.4–1	Began on November 20, 2001	Seven tribes responded, as documented in SWCA 2002c.
Biological Resources	USFWS	David Harlow and Steven Spangle, Field Supervisor Arizona Ecological Services Field Office	April 5, 2002 Sept. 21, 2004	Biological Opinion for Western Corridor received on April 26, 2004 in Appendix D.
Other agencies or persons	Drug Enforcement Administration	Duty Agent, Phoenix Division	December 5, 2001	Response letter dated December 18, 2001, from Thomas W. Raffanello is in Appendix A
	U.S. Immigration and Naturalization Service	William N. Johnston, Tucson Sub-office	December 5, 2001	None
	U.S. Border Patrol	Rob Daniels, Public Information Officer	April 3, 2002	None
		Shawn Palmer, Tucson Sector	June 27, 2002	None
		David Aguilar	March 29, 2004	Response letter dated March 29, 2004 in Appendix A
	Federal Aviation Administration	Chuck Pearman, Tucson Office	January 16, 2002	Response letter dated January 28, 2002, is in Appendix A

Table 10–2. Summary of Consultation Letters (*continued*)

Subject	Consultation Letters To: Agency	Name	Date	Response
	U.S. Air Force	Rusty Arbeit, Airspace Management Office, Davis Monthan Air Force Base	January 16, 2002	Email response dated February 14, 2002 from Major David Von Brock is in Appendix A
		Lieutenant Colonel Allan Steffes, 162nd Fighter Wing, Davis Monthan Air Force Base	March 20, 2002	In a telephone conversation with Mark Blauer of Tetra Tech, Lieutenant Colonel Steffes requested to be added to the draft EIS mailing list (Steffes 2002)
	EPNG	Gayle Koeninger	November 15, 2001	In a telephone conversation with Mark Blauer of Tetra Tech on February 19, 2002, Gayle Koeninger provided specifics on EPNG's pipeline and stated that the ACC's requirement for at least 100 ft between the edge of the pipeline ROW and support structures is adequate (EPNG 2002)

ACC = Arizona Corporation Commission; EPNG = El Paso Natural Gas; ESA = *Endangered Species Act*; ROW = right-of-way; USFWS = U.S. Fish and Wildlife Service.

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LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Arizona Administrative Code
AADT	annual average daily traffic
AC	alternating current
ACC	Arizona Corporation Commission
ADA	Arizona Department of Agriculture
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADT	average daily traffic
ADWR	Arizona Department of Water Resources
AEPCO	Arizona Electric Power Company
AGFD	Arizona Game and Fish Department
AIRFA	*American Indian Religious Freedom Act*
AMA	Active Management Area
AMSL	above mean sea level
ANPL	Arizona Native Plant Law
APE	area of potential effects
APP	Aquifer Protection Permit
AQCR	Air Quality Control Region
ARS	Arizona Revised Statutes
AZSITE	Arizona Online Database of Archaeological Projects and Sites
BA	Biological Assessment
BE	Biological Evaluation
BEA	U.S. Bureau of Economic Analysis
BLM	Bureau of Land Management
BMP	Best Management Practices
BPA	Bonneville Power Administration
CAA	*Clean Air Act*
CEQ	Council on Environmental Quality
CFE	Comisión Federal de Electricidad
CFR	Code of Federal Regulations
CWA	*Clean Water Act*
DHS	U.S. Department of Health Services
DNL	Day-Night Average Sound Level

DOE	U.S. Department of Energy
DOE-FE	DOE Office of Fossil Energy
DOT	U.S. Department of Transportation
EIS	Environmental Impact Statement
ELF	extremely-low-frequency
EMA	Ecosystem Management Area
EMF	electric and magnetic field
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPCRA	*Emergency Planning and Community Right-to-Know Act*
EPNG	El Paso Natural Gas
EPRI	Electric Power Research Institute
ESA	*Endangered Species Act*
FAA	Federal Aviation Administration
FLPMA	*Federal Land Policy and Management Act*
FEMA	Federal Emergency Management Agency
Forest Plan	*Coronado National Forest Land and Resource Management Plan*
FR	*Federal Register*
GIS	Geographic Information Systems
HDMS	Heritage Data Management System
IBA	Important Bird Area
IRA	inventoried roadless area
MBTA	*Migratory Bird Treaty Act*
MIS	U.S.F.S. Management Indicator Species
MSA	Metropolitan Statistical Area
NAAQS	National Ambient Air Quality Standards
NAGPRA	*Native American Graves Protection and Repatriation Act*
NEPA	*National Environmental Policy Act*
NFMA	*National Forest Management Act*
NHPA	*National Historic Preservation Act*
NIEHS	National Institute of Environmental Health Sciences
NOI	Notice of Intent
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSR	New Source Review
NWI	National Wetlands Inventory

NWS	National Weather Service
OSC	Oil Spill Contingency
OSHA	Occupational Safety and Health Administration
PDEQ	Pima County Department of Environmental Quality
PILT	Payments in Lieu of Taxes
PNM	Public Service Company of New Mexico
PSD	Prevention of Significant Deterioration
PTS	Payments to States
RA	Roads Analysis of the Coronado National Forest
RCRA	*Resource Conservation and Recovery Act*
ROD	Record of Decision
ROG	reactive organic gases
ROI	region of influence
ROS	USFS Recreation Opportunity Spectrum
ROW	right-of-way
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SMS	USFS Scenery Management System
SPCC	Spill Prevention Countermeasure and Control
TCP	Traditional Cultural Property
TEP	Tucson Electric Power Company
TRICO	TRICO Electric Cooperative, Inc.
TSP	total suspended particulates
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFS	U.S. Department of Agriculture Forest Service
USFWS	U.S. Department of the Interior, Fish and Wildlife Service
USGS	U.S. Department of the Interior, Geological Survey
USIBWC	U.S. Section of the International Boundary and Water Commission, U.S. and Mexico
VOC	volatile organic compounds

CHEMICALS AND UNIT ABBREVIATIONS

A	amperes
ac-ft	acre foot or acre feet
AM	amplitude modulation
bcf	billion cubic feet
bsg	below surface grade
C^o	Celsius
cf/hr	cubic feet per hour
CO	carbon monoxide
dB	decibel
dBA	weighted sound levels
F^o	Fahrenheit
FM	frequency modulation
gm	gram
gpm	gallons per minute
ha	hectares
Hz	hertz
km	kilometer
kV	kilovolt
lbs	pounds
$\mu g/m^3$	micrograms per cubic meter
m	meter
mG	milligauss
mg/L	milligrams per liter
mi	miles
MMscf	million standard cubic feet
mmcf	million cubic feet
mtpy	metric tons, or tonnes, per year
MVA	million volt-amperes
MW	megawatt
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
O_3	ozone
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 microns
Pb	lead

ppb	parts per billion
ppm	parts per million
psig	pounds per square inch gauge
SO_2	sulfur dioxide
tpy	tons per year
v	volts
yr	year
µT	microtesla

CONVERSION CHART

To Convert Into Metric			To Convert Into English		
If You Know	**Multiply By**	**To Get**	**If You Know**	**Multiply By**	**To Get**
Length					
inch	2.54	centimeter	centimeter	0.3937	inch
feet	30.48	centimeter	centimeter	0.0328	feet
feet	0.3048	meter	meter	3.281	feet
yard	0.9144	meter	meter	1.0936	yard
mile	1.60934	kilometer	kilometer	0.62414	mile (Statute)
Area					
square inches	6.4516	square centimeter	square centimeter	0.155	square inch
square feet	0.092903	square meter	square meter	10.7639	square feet
square yard	0.8361	square meter	square meter	1.196	square yard
acre	0.40469	hectare	hectare	2.471	acre
square mile	2.58999	square kilometer	square kilometer	0.3861	square mile
acre-foot	1233.48	cubic meters	cubic meters	0.00081	acre-foot
Volume					
fluid ounce	29.574	milliliter	milliliter	0.0338	fluid ounce
gallon	3.7854	liter	liter	0.26417	gallon
gallon	0.0039	cubic meter	cubic meter	256.14	gallon
cubic feet	0.028317	cubic meter	cubic meter	35.315	cubic feet
cubic yard	0.76455	cubic meter	cubic meter	1.308	cubic yard
Weight					
ounce	28.3495	gram	gram	0.03527	ounce
pound	0.45360	kilogram	kilogram	2.2046	pound
short ton	0.90718	metric ton	metric ton	1.1023	short ton
Force					
dyne	0.00001	newton	newton	100,000	dyne
Temperature					
Fahrenheit	Subtract 32 then multiply by 5/9ths	Celsius	Celsius	Multiply by 9/5ths, then add 32	Fahrenheit

METRIC PREFIXES

Prefix	Symbol	Multiplication Factor		
exa-	E	1 000 000 000 000 000 000	=	10^{18}
peta-	P	1 000 000 000 000 000	=	10^{15}
tera-	T	1 000 000 000 000	=	10^{12}
giga-	G	1 000 000 000	=	10^{9}
mega-	M	1 000 000	=	10^{6}
kilo-	k	1 000	=	10^{3}
hecto-	h	l00	=	10^{2}
deka-	da	l0	=	10^{1}
deci-	d	0.1	=	10^{-1}
centi-	c	0.01	=	10^{-2}
milli-	m	0.001	=	10^{-3}
micro-	μ	0.000 001	=	10^{-6}
nano-	n	0.000 000 001	=	10^{-9}
pico-	p	0.000 000 000 001	=	10^{-12}
femto-	f	0.000 000 000 000 001	=	10^{-15}
atto-	a	0.000 000 000 000 000 001	=	10^{-18}

GLOSSARY

Acre-foot: The volume of water that will cover an area of 1 acre to a depth of 1 foot (326,000 gallons, 1,233.5 cubic meters).

Advisory Council on Historic Preservation: A body appointed to advise the President and Congress in the coordination of actions by Federal agencies on matters relating to historic preservation. This organization participates in NHPA Section 106 consultations that are controversial or precedent setting.

Aeolian: Borne, deposited, produced, or eroded by the wind.

Aesthetics: Referring to the perception of beauty.

Affected environment: Existing biological, physical, social, and economic conditions of an area subject to change, both directly and indirectly, as the result of a proposed human action.

Air pollutant: An airborne substance that could, in high enough concentrations, harm living things or cause damage to materials. From a regulatory perspective, an air pollutant is a substance for which emissions or atmospheric concentrations are regulated or for which maximum guideline levels have been established due to potential harmful effects on human health and welfare.

Air Quality Control Region (AQCR): Geographic subdivisions of the United States established to regulate pollution on a region or local level. Some regions span more than one state.

Air Quality Standards: The level of pollutants prescribed by regulation that may not be exceeded during a specified time in a defined area.

Alluvial deposits: Earth, sand, gravel, and other materials carried and deposited by moving surface water.

Ambient air: Any unconfined portion of the atmosphere; open air, surrounding air. That portion of the atmosphere, external to buildings, to which the general public has access.

Amperes: Measure of the flow of electric current; source of a magnetic field.

Aquifer: A body of rock or sediment in a formation, group of formations, or part of a formation that is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs.

Archaeological sites (resources): Any location where humans have altered the terrain or discarded artifacts during either prehistoric or historic times.

Archaeology: A scientific approach to the study of human ecology, cultural history, and cultural process.

Artifact: An object produced or shaped by human workmanship of archaeological or historical interest.

Attainment area: An area which the EPA has designated as being in compliance with one or more of the NAAQS for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. Any area may be in attainment for some pollutants but not for others.

Atmospheric dispersion: The dispersion of particulates or gaseous species (such as air pollutants) into the troposphere. It is a function of wind and atmospheric stability.

Background noise: The total acoustical and electrical noise from all sources in a measurement system that may interfere with the production, transmission, time averaging, measurement, or recording of an acoustical signal.

Blading: The use of a steel blade or steel fork attachment on a tracked or rubber-tired vehicle that removes vegetation through a combination of pushing and/uplifting motions.

Candidate species: Plants and animals for which the U.S. Fish and Wildlife Service has sufficient information on biological vulnerability and threats to justify proposing to add them to the threatened and endangered species list, but cannot do so immediately because other species have a higher priority for listing.

Capacity: The load for which a generator, turbine, transformer, transmission circuit, apparatus, station, or system is rated. Capacity is also used synonymously with capability.

Carbon monoxide (CO): A colorless, odorless gas that is toxic if breathed in high concentrations over a period of time. It is formed as the product of the incomplete combustion of hydrocarbons (fuel).

Class I, II, and III Areas: Area classifications, defined by the Clean Air Act, for which there are established limits to the annual amount of air pollution increase. Class I areas include international parks and certain national parks and wilderness areas; allowable increases in air pollution are very limited. Air pollution increases in Class II areas are less limited, and are least limited in Class III areas. Areas not designated as Class I start out as Class II and may be reclassified up or down by the state, subject to Federal requirements. Specified Federal lands, including certain national parks and wilderness areas, are mandatory Class I areas and may not be redesignated to another classification. All other PSD areas of the country are designated Class II areas. Currently there are no Class III areas.

***Clean Air Act* (CAA):** (42 USC 7401 et seq.) Establishes (1) national air quality criteria and control techniques (Section 7408); (2) National ambient air quality standards (Section 7409 defines the highest allowable levels of certain pollutants in the ambient air. Because EPA must establish the criteria for setting these standards, the regulated pollutants are called criteria pollutants); (3) state implementation plan requirements (Section 4710); (4) Federal performance standards for stationary sources (Section 4711); (5) national emission standards for hazardous air pollutants (Section 7412); (6) applicability of CAA to Federal facilities (Section 7418), (Federal Agency must comply with Federal, state, and local requirements respecting control and abatement of air pollution, including permit and other procedural requirements, to the same extent as any person); (7) Federal new motor vehicle emission standards (Section 7521); (8) regulations for fuel (Section 7545); (9) aircraft emission standards (Section 7571).

***Clean Air Act* Conformity Requirement:** Section 176 (c) of the CAA requires Federal agencies to ensure that their actions conform to applicable implementation plans (in most cases, the SIP) for achieving and maintaining the National Ambient Air Quality Standards (NAAQS) for criteria pollutants.

***Clean Water Act* (CWA):** (33 U.S. Code 1251 et seq.) Establishes requirements for (1) technology-based effluent limitations (Section 301); (2) water quality-based effluent limitations (Section 302); (3) individual control strategies for toxic pollutants (Section 304[l]); (4) new source performance standards (Section 306); (5) regulation of toxics (Section 307); (6) Federal facilities' pollution control (provisions for presidential exception) (Section 313); (7) thermal discharges (Section 316); (8) permits under the NPDES (Section 402); (9) permits for the discharge or dredged or fill materials into navigable waters (Section 404).

Climatology: The science that deals with climates and investigates their phenomena and causes.

Code of Federal Regulations (CFR): All Federal regulations in force are published in codified form in the Code of Federal Regulations.

Community (biotic): All plants and animals occupying a specific area under relatively similar conditions.

Conductor: Transmission line wire strung between transmission line structures to transmit electricity from one location to another.

Corona effect: Electrical breakdown of air into charged particles. It is caused by the electric field at the surface of conductors.

Council on Environmental Quality (CEQ): Established by NEPA. CEQ regulations (40 CFR Parts 1500-1508) describe the process for implementing NEPA, including preparation of environmental assessments and environmental impact statements, and the timing and extent of public participation.

Criteria pollutant: An air pollutant that is regulated by the NAAQS. The EPA must describe the characteristics and potential health and welfare effects that form the basis for setting or revising the standard for each regulated pollutant. Criteria pollutants are sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter.

Critical habitat: Habitat essential to the conservation of an endangered or threatened species that has been designated as critical by the U.S. Fish and Wildlife Service following the procedures outlined in the *Endangered Species Act* and its implementing regulations (50 CFR 424). See endangered species and threatened species.

Cultural resources: Districts, sites, structures, and objects and evidence of some importance to a culture, a subculture, or a community for scientific, traditional, religious, and other reasons. These resources and relevant environmental data are important for describing and reconstructing past lifeways, for interpreting human behavior, and for predicting future courses of cultural development.

Cumulative impact: The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.17).

Current: Flow of electrical charge.

Decibel (dB): A unit for expressing the relative intensity of sounds on a logarithmic scale from zero for the average least perceptible sound to about 130 for the average level at which sound causes pain to humans. For traffic and industrial noise measurements, the A-weighted decibel (dBA), a frequency-weighted noise unit, is widely used. The A-weighted decibel scale corresponds approximately to the frequency response of the human ear and thus correlates well with loudness.

Deposition: In geology, the laying down of potential rock-forming materials; sedimentation. In atmospheric transport, the settling out on ground and building surfaces of atmospheric aerosols and particles ("dry deposition") or their removal from the air to the ground by precipitation ("wet deposition" or "rainout").

Direct embedment: Type of pole installation that requires excavation of a shaft wider than the pole using a caisson-drilling rig and then subsequent backfilling around the pole.

Distance zones: The relative visibility from travel routes or observation points.

Double-circuit: Two sets of lines (circuits) on a single tower (a single circuit consists of three conductors).

Drinking water standards: The prescribed level of constituents or characteristics in a drinking water supply that cannot be legally exceeded.

Ecology: A branch of science dealing with the interrelationships of living organisms with one another and with their nonliving environment.

Ecosystem: A community of organisms and their physical environment interacting as an ecological unit.

Effects: As used in NEPA documentation, the terms effects and impacts are synonymous. Effects can be ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health; effects can be direct, indirect, or cumulative. Effects include both beneficial and detrimental impacts.

Effluent: A waste stream flowing into the atmosphere, surface water, groundwater, or soil. Most frequently the term applies to wastes discharged to surface waters.

Elevation: Height above sea level.

Eligible cultural resource: A cultural resource that has been evaluated and reviewed by an agency and the SHPO and recommended as eligible for inclusion in the National Register of Historic Places, based on the criteria of significance. The criteria of significance consider American history, architecture, archaeology, engineering, and culture. The criteria require integrity and association with lives or events, distinctiveness for any of a variety of reasons, or importance because of information the property does or could hold.

Embedment: See direct embedment.

Emissions: Pollution discharged into the atmosphere from smoke stacks, other vents, and surface areas of commercial or industrial facilities, residential chimneys, and vehicle exhausts.

Emission Standards: Requirements established by a state, local government, or the EPA Administrator that limit the quantity, rate, or concentration of emissions of air pollutants on a continuous basis.

Endangered Species: Plants or animals that are in danger of extinction throughout all or a significant portion of their ranges and that have been listed as endangered by the USFWS or the National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR Part 424). Some states also list species as endangered.

Endangered Species Act* (ESA)*: (16 U.S. Code 1531 et seq.) Provides for listing and protection of animal and plant species identified as in danger, or likely to be in danger, of extinction throughout all or a significant portion of their range. Section 7 places strict requirements on Federal agencies to protect listed species.

Environmental Impact Statement (EIS): The detailed written statement that is required by section 102(2)(C) of NEPA for a proposed major Federal action that may significantly affect the quality of the human environment. A DOE EIS is prepared in accordance with applicable requirements of the CEQ NEPA regulations in 40 CFR Parts 1500-1508 and DOE NEPA regulations in 10 CFR Part 1021. The statement includes, among other information, discussions of the environmental impacts of the proposed action and all reasonable alternatives, adverse environmental effects that cannot be avoided should the proposal be implemented, the relationship between short-term uses of the human environment and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources.

Environmental Justice: An identification of potential disproportionately high and adverse impacts on low-income and/or minority populations that may result from proposed Federal actions (required by Executive Order 12898).

Environmental Protection Agency (EPA): The independent Federal Agency, established in 1970, that regulates Federal environmental matters and oversees the implementation of Federal environmental laws.

Energy: That which does or is capable of doing work. It is measured in terms of the work it is capable of doing; electric energy is usually measured in kilowatt-hours.

Ephemeral stream: A stream that flows only after a period of heavy precipitation.

Erosion: Wearing away of soil and rock by weathering and the actions of surface water, wind, and underground water.

Ethnographic: Information about cultural beliefs and practices.

Fault: A fracture or a zone of fractures within a rock formation along which vertical, horizontal, or transverse slippage has occurred.

Field effect: Induced currents and voltages as well as related effects that might occur as a result of electric and magnetic fields at ground level.

Floodplain: The lowlands adjoining inland and coastal waters and relatively flat areas, including at a minimum that area inundated by a 1 percent or greater chance flood in any given year. The base floodplain is defined as the 100-year (1 percent) floodplain. The critical action floodplain is defined as the 500-year (0.2 percent) floodplain.

Flow: The volume of water passing a given point per unit of time. Same as streamflow.

Formation: In geology, the primary unit of formal stratigraphic mapping or description. Most formations possess certain distinctive features.

Generation: The act or process of producing electricity from other forms of energy.

Generator: A machine that converts mechanical energy into electrical energy.

Groundwater: Water within the earth that supplies wells and springs.

Groundwater basin: Subsurface structure having the character of a basin with respect to collection, retention, and outflow of water.

Hazardous Air Pollutants (HAP): Air pollutants that are not covered by ambient air quality standards, but that may present a threat of adverse human health effects or adverse environmental effects. They are regulated under Section 112 of the *Clean Air Act*. See also National Emissions Standards for Hazardous Air Pollutants.

Hazardous waste: A category of waste regulated under RCRA. To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in 40 CFR 261.20 through 40 CFR 261.24 (i.e., ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by EPA in 40 CFR 261.31 through 40 CFR 261.33.

Historic properties: Under the NHPA these are properties of national, state, or local significance in American history, architecture, archaeology, engineering, or culture that are worthy of preservation.

Impacts (effects): In this EIS, as well as in the CEQ regulations, the word impact is used synonymously with the word effect. See effects.

Indirect impacts: Effects that are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Infrastructure: The basic installations and facilities on which the continuance and growth of a community or state (e.g., roads, schools, power plants, transportation, communication systems) are based.

Intensity (of an earthquake): A measure of the effects (due to ground shaking) of an earthquake at a particular location, based on observed damage to structures built by humans, changes in the earth's surface, and reports of how people felt the earthquake. Earthquake intensity is measured in numerical units on the Modified Mercalli scale. See Modified Mercalli Intensity scale and magnitude of an earthquake.

Intertie: A transmission line that links two or more regional electric power systems.

Interested parties: Those groups or individuals that are interested, for whatever reason, in the project and its progress. Interested parties include, but are not limited to, private individuals, public agencies, organizations, customers, and potential customers.

Invasive species: An alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health. "Alien species" means, with respect to a particular ecosystem, any species, including its seed, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem.

Invertebrate: Animals characterized by not having a backbone or spinal column, including a wide variety of organisms such as insects, spiders, worms, clams, and crayfish.

Isolated occurrence: A grouping of less than ten archaeological artifacts or a single undatable feature. These often consist of redeposited material of questionable locational context that are not related to nearby archaeological sites.

Kilovolt (kV): The electrical unit of power that equals 1,000 volts.

Lacustrine deposits: Deposits found or formed in lakes.

Landscape: An area composed of interacting ecosystems that are repeated because of geology, land, soils, climate, biota, and human influences throughout the area. Landscapes are generally of a size, shape, and pattern which is determined by interacting ecosystems.

Lithic: A stone artifact that has been modified or altered by human hands.

Load: The amount of electric power required at a given point on a system.

Loam: A rich, permeable soil composed of a mixture of clay, silt, sand, and organic matter.

Low-income population: A population that is classified by the U.S. Bureau of the Census 2000 as having an aggregated mean 1999 income level for a family less than $17,463. This level is adjusted through the poverty index using a standard of living percentage change where applicable.

Magnitude (of an earthquake): A quantity characteristic of the total energy released by an earthquake, as contrasted to "intensity," which describes its effects at a particular place. Magnitude is calculated using common logarithms (base 10) of the largest ground motion. A one-unit increase in magnitude (for example, from magnitude 6 to magnitude 7) represents a 30-fold increase in the amount of energy released. Three common types of magnitude are Richter (or local) (ML), P body wave (mb), and surface wave (Ms).

Maintenance area: Area redesignated as attainment within the last 10 years under the CAA. See attainment area.

Major source: Any stationary source or group of stationary sources in which all of the pollutant- emitting activities emit, or have the potential to emit, 100 or more tons per year of any regulated air pollutant, 10 tons per year of a single HAP, or combined HAP emissions exceeding 25 tons per year.

Mammal: Animals in the class *Mammalia* that are distinguished by having self-regulating body temperature, hair, and in females, milk-producing mammary glands to feed their young.

Management Indicator Species (MIS): Species selected by the USFS for monitoring and analysis because their population changes are believed to indicate the effects of management activities

Megawatt (MW): The electrical unit of power that equals 1 million watts or 1 thousand kilowatts.

Mesa: An isolated relatively flat-topped natural elevation.

Meteorology: The science dealing with the dynamics of the atmosphere and its phenomena, especially relating to weather.

Mineral: Naturally occurring inorganic element or compound.

Minority Population: Individual(s) who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic are minorities (CEQ 1997). CEQ identifies these groups as minority populations when either (1) the minority population of the affected area exceeds 50 percent or (2) the minority population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or appropriate unit of geographical analysis.

Mitigation: The alleviation of adverse impacts on environmental resources by avoidance through project redesign or project relocation, by protection, or by adequate scientific study. Mitigation includes: (1) avoiding an impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; or (5) compensating for an impact by replacing or providing substitute resources or environments.

Modified Mercalli Intensity Scale: The Modified Mercalli Intensity Scale is a standard of relative measurement of earthquake intensity, developed to fit construction conditions in most of the United States. It is a 12-step scale, with values from I (not felt except by a very few people) to XII (damage total).

National Ambient Air Quality Standards (NAAQS): Standards defining the highest allowable levels of certain pollutants in the ambient air. Because EPA must establish the criteria for setting these standards, the regulated pollutants are called criteria pollutants. The criteria pollutants are sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. See *Clean Air Act.*

***National Environmental Policy Act* (NEPA):** (42 USC 4341, passed by Congress in 1969) NEPA established a national policy designed to encourage consideration of the influences of human activities (e.g., population growth, high-density urbanization, industrial development) on the natural environment. NEPA also established the CEQ. NEPA procedures require that environmental information be made available to the public before decisions are made. Information contained in NEPA documents must focus on the relevant issues in order to facilitate the decision-making process.

***National Historic Preservation Act* (NHPA):** (16 USC 470) Provides for an expanded National Register of Historic Places (NRHP) to register districts, sites, buildings, structures, and objects significant to American history, architecture, archaeology, and culture. Section 106 requires that the President's Advisory Council on Historic Preservation be afforded an opportunity to comment on any undertaking that adversely affects properties listed in the NRHP.

National Pollutant Discharge Elimination System (NPDES) Permit: Federal regulation (40 CFR Parts 122 and 125) that requires permits for the discharge of pollutants from any point source into the waters of the United States regulated through the *Clean Water Act*.

National Register of Historic Places (NRHP): A list maintained by the Secretary of the Interior of districts, sites, buildings, structures, and objects of prehistoric or historic local, state, or national significance. The list is expanded as authorized by Section 2(b) of the *Historic Sites Act* of 1935 (16 U.S.C. 462) and Section 101(a)(1)(A) of the *National Historic Preservation Act.*

Native American: Person culturally identified with a tribe that is indigenous to the United States and who belongs to a federally recognized tribe consulted on TEP's proposed project.

Native vegetation: Plant life that occurs naturally in an area without agricultural or cultivation efforts. It does not include species that have been introduced from other geographical areas and have become naturalized.

Noise: Unwanted or undesirable sound, usually characterized as being so loud as to interfere with, or be inappropriate to, normal activities such as communication, sleep, or study. (See background noise.)

Non-attainment area: An area that EPA has designated as not meeting one or more of the NAAQS for criteria pollutants. An area may be in attainment for some pollutants, but not others.

Noxious weed: Invasive plant species regulated under Federal or state law. See invasive species.

Obligate species: Plant species that almost always occur in wetlands (i.e., greater than 99 percent of the time).

Ozone (O_3): The triatomic form of oxygen. In the upper atmosphere, ozone protects the earth from the sun's ultraviolet rays, but in the lower levels of the atmosphere, ozone is considered an air pollutant. In the lower atmosphere, ozone is formed primarily from a photochemical reaction between nitrogen oxides and volatile organic compounds. Small amounts of ozone can be formed from corona effects on transmission lines.

Particulate Matter: Any finely divided solid or liquid material, other than uncombined pure water.

Peak capacity: The maximum capacity of a system to meet loads.

Peak demand: The highest demand for power during a stated period of time.

Permeability: The ability of rock or soil to transmit a fluid.

pH: A measure of the relative acidity or alkalinity of a solution, expressed on a scale from 0 to 14, with the neutral point at 7.0. Acid solutions have pH values lower than 7.0, and basic (i.e., alkaline) solutions have pH values higher than 7.0. Because pH is the negative logarithm of the hydrogen ion (H+) concentration, each unit increase in pH value expresses a change of state of 10 times the preceding state. Thus, pH 5 is 10 times more acidic than pH 6, and pH 9 is 10 times more alkaline than pH 8.

$PM_{2.5}$: Airborne particulate matter with an aerodynamic diameter less than or equal to 2.5 microns; regulated under the NAAQS.

PM_{10}: Airborne particulate matter with an aerodynamic diameter less than or equal to 10 microns; regulated under the NAAQS.

Prehistoric: Of, relating to, or existing in times antedating written history. Prehistoric cultural resources are those that antedate written records of the human cultures that produced them.

Present value: The worth of future returns or costs in terms of their current value. To obtain a present value, an interest rate is used to discount these future returns and costs.

Prevention of Significant Deterioration (of air quality) (PSD): Regulations established to prevent significant deterioration of air quality in areas that already meet NAAQS. Among other provisions, cumulative increases in sulfur dioxide, nitrogen dioxide, and PM_{10} levels after specified baseline dates must not exceed specified maximum allowable amounts.

Prime farmland: Soil types with a combination of characteristics that make them particularly productive for agriculture.

Public Involvement Plan: Methodology used by the agency to encourage public participation.

Quaternary: A subdivision of geological time (the Quaternary period) including roughly the last two million years up to the present.

Raptor: Birds of prey including various types of hawks, falcons, eagles, vultures, and owls.

Record of Decision (ROD): A concise public document that records a Federal agency's decision concerning a proposed action for which the agency has prepared an EIS. The ROD is prepared in accordance with the requirements of the CEQ NEPA regulations (40 CFR 1505.2). A ROD identifies the alternatives considered in reaching the decision, the environmentally preferable alternatives, factors balanced by the agency in making the decision, whether all practicable means to avoid or minimize environmental harm have been adopted, and if not, why they were not.

Reliability: The ability of the power system to provide customers uninterrupted electric service. Includes generation, transmission, and distribution reliability.

Region of Influence (ROI): The geographical region that would be expected to affect a specific resource in some way by the proposed action and/or alternative(s).

Right-of-way (ROW): An easement for a certain purpose over the land of another, such as a strip of land used for a transmission line, roadway or pipeline.

Riparian: Of or pertaining to the bank of a river, stream, lake, or other water bodies.

Runoff: The portion of rainfall, melted snow, or irrigation water that flows across the ground surface and may eventually enter streams.

Saturated zone: The zone in which the voids in the rock or soil are filled with water at a pressure greater than atmospheric pressure. The water table is the top of the saturated zone in an unconfined aquifer.

Scenery Management System (SMS): Visual resource tool used by USFS for the inventory and analysis of aesthetic values of national forest lands as outlined in *Landscape Aesthetics: A Handbook for Scenery Management*.

Scoping: An early, open part of the NEPA process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action.

Section 106 process: A NHPA (16 U.S.C. §470 et seq.) review process used to identify, evaluate, and protect cultural resources eligible for nomination to the NRHP that may be affected by Federal actions or undertakings.

Sediment: Material deposited by wind or water.

Sedimentation: The process of deposition of sediment, especially by mechanical means from a state of suspension in water.

Seismic: Pertaining to any earth vibration, especially an earthquake.

Sensitive species: Those plants and animals identified by the USFS Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trend in populations or density and significant or predicted downward trend in habitat capability.

Socioeconomics: The social and economic condition in the study area.

Solid waste: In general, solid wastes are non-liquid, non-soluble discarded materials ranging from municipal garbage to industrial wastes that contain complex and sometimes hazardous substances. Solid wastes include sewage sludge, agricultural refuse, demolition wastes, and mining residues.

State Historic Preservation Officer (SHPO): The official within each state, authorized by the state at the request of the Secretary of the Interior, to act as liaison for purposes of implementing the NHPA.

Step-up transformer: Transformer in which the energy transfer is from a low- to a high-voltage winding or windings. (Winding means one or more turns of wire forming a continuous coil for a transformer, relay, rotating machine, or other electric device.)

Stratigraphic: Of, relating to, or determined by stratigraphy; the superposition of layers (soil, rock, and other materials) often observed at archaeological sites.

Substation: Facility with transformers where voltage on transmission lines changes from one level to another.

Surface water: All bodies of water on the surface of the earth that are open to the atmosphere, such as rivers, lakes, reservoirs, ponds, seas, and estuaries.

Switchyard: Facility with circuit breakers and automatic switches to turn power on and off on different transmission lines.

Tap: To tie a substation into an existing transmission line through a connection.

Tap Point: The point where two transmission lines interconnect.

Tesla: Unit of measurement of magnetic field.

Threatened species: Any plants or animals that are likely to become endangered species within the foreseeable future throughout all or a significant portion of their ranges and which have been listed as threatened by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures set out in the *Endangered Species Act* and its implementing regulations (50 CFR Part 424).

Traditional Cultural Property/Use Area: Areas of significance to the beliefs, customs, and practices of a community of people that have been passed down through generations.

Transformer: A device for transferring energy from one circuit to another in an alternating-current system. Its most frequent use in power systems is for changing voltage levels.

Transmission line: The structures, insulators, conductors, and other equipment used to transfer electrical power from one point to another.

Tribe: A federally recognized American Indian political entity. All those consulted in TEP’s proposed project are collectively termed the “tribes,” even though many are Nations or Communities. DOE and cooperating agencies recognize that each tribe is an individual, sovereign nation with a unique trust relationship to the U.S. government.

Vertebrate: Animals that are members of the subphylum Vertebrata, including the fishes, amphibians, reptiles, birds, and mammals, all of which are characterized by having a segmented bony or cartilaginous spinal column.

Volatile Organic Compounds (VOCs): A broad range of organic compounds that produce vapors at relatively low temperatures, such as gasoline and solvents.

Volt: The unit of voltage or potential difference. It is the electromotive force which, if steadily applied to a circuit having a resistance of one ohm, will produce a current of one ampere.

Voltage: Potential for an electric charge to do work; source of an electric field.

Water rights: Permits or licenses issued by the State Water Resources Control Board.

Watt: The absolute meter-kilogram-second unit of power equal to the work done at the rate of one joule per second or to the power produced by a current of one ampere across a potential difference of one volt.

Wetland: An area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas.

Yield: A measure of the availability of water to meet authorized purposes, sometimes defined in terms of the ability to meet project needs within specific time periods.

CHAPTER 13
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