



United States Department of the Interior



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In Reply Refer To:
AESO/SE
02EAAZOO-2013-F-0035

April 14, 2014

Mr. David Swearingen
Federal Energy Regulatory Commission
Office of Energy Projects
Division of Gas – Environment and Engineering
888 First Street, NE, Room 1A
Washington, D.C. 20426

OEP/DG2E/Gas 4
Sierrita Gas Pipeline LLC
Sierrita Pipeline Project
Docket Nos. CP13-73-000; CP13-74-000

Dear Mr. Swearingen:

Thank you for your request for formal consultation with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (ESA). Your request was received by us on October 31, 2013, as was your additional request related to designated jaguar critical habitat on March 5, 2014. Your requests were supplemented with additional information from Sierrita Gas Pipeline LLC (Sierrita) on December 5, 2013 and December 17, 2013. At issue are possible effects of the proposed construction of the Sierrita Pipeline Project, a proposal by Sierrita to construct approximately 61 miles of new 36-inch-diameter natural gas pipeline in the Altar Valley of Pima County, Arizona.

You (the Federal Energy Regulatory Commission (FERC)) concluded that the proposed project “may affect, and is likely to adversely affect” the endangered Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*), and it is this species that is the subject of this Biological Opinion (BO).

The FERC also concluded that the proposed action “may affect, but is not likely to adversely affect” the masked bobwhite quail (*Colinus virginianus ridgwayi*), jaguar (*Panthera onca*) and its designated critical habitat, lesser long-nosed bat (*Leptonycteris yerbabuena*), and the

threatened Chiricahua leopard frog (*Lithobates chiricahuensis*) and its designated critical habitat. We concur with your determination on these species and provide our rationale in Appendix A. The FERC has determined that there would be no effect to all other listed species and their designated or proposed critical habitats that occur within the action area for the Sierrita Pipeline Project.

We will conference, in response to your October 31, 2013 request, pursuant to section 7(a)(4) of the Act and its implementing regulations at 50 CFR §402.10(d), on the northern Mexican gartersnake (*T. eques megalops*), proposed as a threatened species, and a proposed rule to designate critical habitat for this species (78 FR 41500 and 78 FR 41550, respectively), for which you have concluded there is a “may affect, but is not likely to adversely affect” determination. Our Conference Reports can be found in Appendix B.

This BO is based on information provided in the FERC’s draft and final EISs, Sierrita’s biological survey reports, Sierrita’s Plans and Procedures, supplemental information provided by Sierrita, telephone conversations and meetings between our staffs, and other sources of information found in the administrative record supporting this BO. Literature cited in this BO is not a complete bibliography of all literature available on the types of activities included in the Sierrita Pipeline Project or the species addressed in this consultation. A complete administrative record of this consultation is on file at this office.

Consultation history

- October 5, 2012: Sierrita provides FWS with draft Environmental Resource Reports for review and comment.
- December 7, 2012: The FERC provides FWS with preliminary effects determinations to review for species to potentially be included in section 7 consultation.
- May 8, 2013: Sierrita provides preliminary Draft Biological Assessment (BA) to FWS for review and comment
- July 15, 2013: FWS provides Sierrita and the FERC with comments and recommendations on the draft BA.
- September 11, 2013: The FERC provides FWS with an administrative draft EIS for comment and review.
- October 30, 2013: The FERC requests initiation of consultation with FWS and provides the Draft EIS as the BA for this consultation.
- November 27, 2013: FWS requests additional information from Sierrita needed in order to initiate consultation with the FERC.
- December 5, 2013: FWS receives additional information requested from Sierrita and requests some additional information from the FERC.

- December 10, 2013: FWS receives additional information from the FERC.
- December 18, 2013: FWS receives a copy of the additional information the FERC requested of Sierrita in the Draft EIS.
- January 24, 2014: FWS provides a letter to the FERC indicating that section 7 consultation has been initiated.
- February 7, 2014: The FERC provides FWS with an administrative final EIS for comment and review.
- February 24, 2014: FWS receives information from the FERC related to a change in the proposed action resulting from a minor route variation.
- March 5, 2014: FWS receives a request from the FERC to consult on the newly designated jaguar critical habitat.
- March 20, 2014: FWS provides draft BO to the FERC.
- March 31, 2014: The FERC provides FWS with comments on the draft BO.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action is the implementation of the Sierrita Pipeline Project. The Project would involve the construction and operation of a buried natural gas pipeline and related aboveground facilities. An overview map showing the Project location is provided as Figure 1-1 in the Final EIS. Detailed maps showing the proposed pipeline route and aboveground facility locations are provided in Appendix B of the Final EIS.

Pipeline Facilities

Sierrita proposes to construct and operate approximately 61 miles of new 36-inch-diameter natural gas transmission pipeline in Pima County, Arizona. The Project would extend from near Tucson, Arizona south to the U.S.-Mexico border near the Town of Sasabe, Arizona (see Figure 1-1 in the Final EIS). The pipeline would be designed to provide approximately 200,846 dekatherms per day of natural gas to an interconnect with the proposed Sásabe-Guaymas Pipeline. The maximum allowable operating pressure of the pipeline would be 1,440 pounds per square inch gauge.

Aboveground Facilities

Sierrita proposes to construct and operate a tie-in (interconnection with existing facilities), two meter stations, six mainline valves (MLVs), two pig launchers, and two pig receivers. Aboveground facilities are shown on the maps in Appendix B of the Final EIS. Some of the aboveground facilities are collocated on the same site with one another.

Land Requirements

Construction of the Project would disturb about 995.1 acres of land, including the pipeline construction right-of-way, additional temporary workspaces (ATWS), aboveground facilities, contractor yards, and improved access roads. Operation of the pipeline would require about 380.2 acres, including the pipeline permanent right-of-way and aboveground facility sites. Sierrita's construction and operation work areas are limited to the areas described in the Final EIS and any subsequent Commission authorizations.

Pipeline Right-of-Way

Sierrita will use a 75- to 150-foot-wide construction right-of-way for the proposed pipeline. Right-of-way widths vary based on ephemeral wash and floodplain crossings, and environmental resources. Sierrita consulted with the Pima County Regional Flood Control District (RFCD) to establish the pipeline right-of-way width at ephemeral wash and floodplain crossings. The construction right-of-way width identified is dependent on the required pipeline depth at each ephemeral and floodplain crossing and the amount of construction workspace necessary to accommodate trench spoil.

In coordination with the Pima County RFCD, Sierrita conducted a detailed *Scour and Lateral Bank Migration Analysis* (Analysis) for the Project. The Analysis identified the minimum pipeline burial depth for safe pipeline operation at each ephemeral wash and floodplain crossing assuming 100-year flood conditions based on site-specific scour resistance characteristics, calculated scour depth, and lateral erosion distance. As a result:

- for dry washes requiring a trench depth equal to or less than 9.5 feet, Sierrita would require no more than 100 feet of construction right-of-way and would not require ATWS;
- for dry washes requiring a trench depth greater than 9.5 feet and less than 11.5 feet, Sierrita would require no more than 130 feet of construction right-of-way; and
- for dry washes requiring a trench depth greater than 11.5 feet, Sierrita would require no more than 150 feet of construction right-of-way.

Sierrita has also proposed to use an additional 20 feet of uncleared, extra construction right-of-way adjacent to the construction right-of-way in select, non-wetland, non-sensitive locations to place cleared woody vegetation. In total, the pipeline construction right-of-way would temporarily require about 771.9 acres of land (See Figures 2.2.1-1 through 2.2.1-3 of the Final EIS which illustrates the typical construction rights-of-way).

Sierrita has proposed a pipeline route that is generally parallel to and within about 250 feet of existing rights-of-way associated with roads and utilities for approximately 20.9 miles (35 percent) of the total pipeline length. The remaining approximately 40.0 miles (65 percent) of the pipeline route would deviate from these rights-of-way. On February 24, 2014, the FERC provided FWS with information changing the proposed action that is related to a minor route variation associated with the Santa Margarita Ranch. All of the information related to potential effects to listed species and critical habitat resulting from this variation had previously been provided to the FWS by the FERC and Sierrita. No additional information related to this route variation was needed to complete our analysis in this BO.

Following construction, Sierrita will retain a 50-foot-wide permanent right-of-way to operate the pipeline. The permanent right-of-way would require about 370 acres of land. In addition to the construction right-of-way, ATWS would be required in areas such as the following:

- where the proposed route crosses roadways, waterbodies, fencelines, or other utilities;
- areas of steep or rugged terrain and areas with other construction constraints that require special construction techniques;
- where the horizontal directional drill (HDD) construction method would be used to cross the CAP Canal;
- truck turnarounds; and
- staging and fabrication areas.

Most ATWSs would add 25 feet onto the construction right-of-way. In total, ATWSs would temporarily require about 59.7 acres of land. Following construction, ATWSs will be reseeded and reclaimed to preconstruction conditions in accordance with Sierrita's plans (see section 2.3 of Final EIS). Although Sierrita has identified areas where ATWS would be required, additional or alternative areas could be identified in the future due to changes in site-specific construction requirements. Sierrita would be required to file information on each of those areas for review and approval by the FERC prior to use.

Aboveground Facilities

Aboveground facilities associated with the Project include a tie-in, two meter stations, six MLVs, two pig launchers, and two pig receivers. Land requirements for aboveground facilities would total about 10.2 acres during construction and 10.2 acres during operation. Appendix B of the Final EIS shows the locations of aboveground facilities proposed as part of the Project.

Contractor Yard

Sierrita will use four contractor yards to house contractor management offices and to stage and store vehicles, equipment, pipe, and other materials. The four yards would temporarily occupy 68.9 acres. Appendix B of the Final EIS shows the locations of the contractor yards.

Access Roads

Sierrita will use existing public and private roads to gain access to the Project area. Many of the existing roads are presently in a condition that can accommodate construction traffic without modification or improvement. Some roads, however, are dirt or gravel roads that are not currently suitable for construction traffic. Sierrita is proposing to improve unsuitable dirt and gravel roads through widening and/or grading. Widening would involve increasing the width of the road bed by up to 20 feet. Grading would be confined to the existing road bed or to the footprint of the newly widened road. Sierrita has identified 31 existing roads that would be improved or modified; another 3 roads would not require improvements or modifications but are needed to temporarily access construction. Access road use would temporarily affect about 84.4 acres. In addition to improving existing dirt and gravel roads, Sierrita will create two driveways from existing roads to permanently access the two meter station sites. The road to access the San Joaquin Road Meter Station will consist of an approximately 25-foot-long by 25-foot-wide permanent driveway that extends from an existing road off of San Joaquin Road established by Tucson Water to access its water line. The road to access the Sasabe Delivery Meter Station will consist of a permanent driveway that extends from the existing Border Road along the U.S.-Mexico border and would be an approximately 25-foot-long by 25-foot-wide driveway.

After construction Sierrita is proposing to remove access road improvements and restore improved roads to their preconstruction condition unless the landowner or land-managing agency requests that the improvements be left in place. To restore the roads, Sierrita would recontour the areas outside the original road footprint and seed disturbed areas with an appropriate seed mix. The FERC recognizes that road restoration can be very difficult. The FERC would hold Sierrita to its access road restoration commitment and would require Sierrita to continue its road restoration efforts until restoration is successful in returning the areas to preconstruction conditions.

Construction Procedures

Sierrita will design, construct, operate, and maintain its pipeline in accordance with U.S. Department of Transportation (DOT) regulations under 49 CFR 192 (Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards) and other applicable Federal and State regulations. The DOT regulations specify pipeline material selection; minimum design requirements; protection from internal, external, and atmospheric corrosion; and qualification procedures for welders and operations personnel, in addition to other design standards. Sierrita also would comply with the siting and maintenance requirements in 18 CFR 380.15 (Siting and Maintenance Requirements) and other applicable Federal and State regulations, including the requirements of the U.S. Department of Labor, Occupational Safety and Health Administration.

Sierrita has prepared an *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) for the proposed Project. The intent of Sierrita's Plan is to identify baseline mitigation measures for minimizing erosion and enhancing revegetation in upland areas. Sierrita also developed *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures) for the proposed Project. The intent of the Sierrita's Procedures is to identify baseline mitigation measures for minimizing the extent and duration of construction-related disturbance to waterbodies, which includes

ephemeral washes. Several waterbodies are crossed by the Project, resulting in impacts to approximately 104.1 acres of xeroriparian habitat.

The FERC recommended that Sierrita revise its Plan and Procedures by addressing the FERC staff's comments to minimize impacts on ephemeral washes that may be used by federally-listed or proposed species during construction, to control erosion and sedimentation, and to minimize Project-related impacts on environmental resources. Copies of Sierrita's Plan and Procedures are included in Appendices E and F, respectively, of the Final EIS.

In addition to its Plan and Procedures, Sierrita also prepared the following additional plans, which describe the myriad measures Sierrita would use to avoid or reduce various Project impacts (appendix references are found in the Final EIS):

- *Reclamation Plan* (see Appendix G);
- *Post-Construction Vegetation Monitoring Document* (see Appendix H);
- *Noxious Weed Control Plan* (see Appendix I);
- *Fugitive Dust Control Plan* (see Appendix J);
- *Blast Plan* (see Appendix K);
- *Site-Specific Horizontal Directional Drill Crossing Plan for the CAP Canal* (see Appendix L);
- *HDD Contingency Plan and Feasibility Assessment (HDD Plan)* (see Appendix M);
- *Hydrostatic Testing Best Management Practices Plan* (see Appendix N);
- *Spill Prevention, Control, and Countermeasures Plan (SPCC Plan)* (see Appendix O); and
- *Fire Protection Plan* (see Appendix P).

In addition, Sierrita has also committed to developing a *Right-of-Way, Security, and Access Control Plan (Security Plan)*¹ in coordination with the U.S. Border Patrol and local law enforcement agencies. The intent of the Security Plan is to identify measures that would ensure, to the extent possible, that persons suspected as being associated with illegal cross-border activity do not enter and/or use the right-of-way.

General Pipeline Construction Procedures

Sierrita will construct the pipeline by following several sequential pipeline construction techniques, which include survey and staking; clearing and grading; trenching; pipe stringing, bending, and welding; lowering-in and backfilling; hydrostatic testing; commissioning; and cleanup and restoration. These construction techniques would proceed in an assembly line fashion and construction crews would move down the construction right-of-way as work progresses. Construction at any single point along the pipeline, from surveying and staking to cleanup and restoration, would typically last about 6 to 10 weeks. The construction process

¹ The Security Plan and other measures developed with law enforcement agencies contain sensitive security information that is intended to deter illegal activities. Therefore, this information would be made available only to Project security personnel and law enforcement agencies.

would be coordinated to limit the time the trench is open in any single area. Figure 2.3.1-1 of the Final EIS illustrates the typical pipeline construction sequence. Following construction, Sierrita would monitor areas disturbed by the Project to ensure successful restoration and revegetation.

Post-Construction Monitoring

Sierrita will conduct follow-up inspections and monitor disturbed areas annually for at least 5 years after construction and until revegetation thresholds are met and temporary erosion control devices are removed. Sierrita will submit annual monitoring reports to the FERC and ASLD and other appropriate agencies as requested after the 5-year annual monitoring period is completed. Sierrita would also continue annual monitoring until the FERC and/or Federal land-managing agency determines that the restoration and revegetation goals have been achieved. Restoration is deemed complete by the FERC when the density and cover of non-noxious vegetation are similar in density and cover to adjacent, undisturbed areas. In addition, Sierrita will complete restoration activities and monitoring as specified in its easement agreements with the individual landowner or land-managing agency. The FERC would also monitor for issues such as vegetation cover, invasive species, soil settling, soil compaction, excessively rocky soils, and drainage problems. Sierrita has developed a set of measures it would use to minimize vegetation impacts during and after construction activities. These measures are fully detailed in Sierrita's Plan, Procedures, *Reclamation Plan*, *Post-Construction Vegetation Monitoring Document*, and *Noxious Weed Control Plan* (see appendices E, F, G, H and I, respectively, of the Final EIS).

The FERC will continue its oversight of the Project area after construction by reviewing Sierrita's periodic monitoring reports and conducting its own compliance inspections. The FERC would require Sierrita to continue its revegetation efforts until the FERC determines that restoration is successful.

Special Pipeline Construction Procedures

Special construction techniques are typically required when constructing across waterbodies, riparian areas, roads, foreign utilities, steep slopes, geologic faults, and international borders. ATWSs adjacent to the construction right-of-way would be utilized at most of these areas for staging construction, stockpiling spoil, storing materials, maneuvering equipment, and fabricating pipe.

Construction Schedule and Workforce

Sierrita will seek approval to begin construction as soon as possible after receiving all necessary Federal authorizations and has proposed an in-service date of September 30, 2014. Construction of the Project would involve one construction spread with an estimated peak workforce of 375, although the total construction workforce on any given day would vary depending on the phase of construction. As the pipeline spread moves along, construction at any single point would last approximately 6 to 10 weeks. However, the duration of construction may be longer at aboveground facility sites and at hydrostatic test tie-in locations. Construction crews typically would work 10 hours per day, 6 days per week. Work would be conducted during daylight hours, except where the pipe would be installed using the HDD and bore methods, which require around-the-clock operations and typically last a few days to a few weeks.

Environmental Inspection

The FERC may impose conditions on any Certificate granted for the Project. These conditions could include requirements and mitigation measures identified to minimize environmental impacts associated with the Project. The FERC will recommend to the Commission that these requirements and mitigation measures be included as conditions to any approving Certificate issued for the Project. Further, Sierrita would be required to implement the construction procedures and mitigation measures it has proposed in its filings with the FERC, unless specifically modified by other Certificate conditions.

Other regulatory agencies also may include terms and conditions or stipulations as part of their permits or approvals. While there would be jurisdictional differences between the FERC's and other agencies' conditions, the environmental inspection program for the Project would address all environmental or construction-related conditions or other permit requirements placed on the Project by all regulatory agencies.

Sierrita has proposed to employ two Environmental Inspectors (EI) on this Project to ensure that construction of the Project complies with the construction procedures and mitigation measures identified in Sierrita's application, the FERC Certificate, other environmental permits and approvals, and environmental requirements in landowner easement agreements. EIs would have peer status with all other activity inspectors. EIs would have the authority to stop activities that violate the environmental conditions of the FERC Certificate, other permits, or landowner requirements, and to order the appropriate corrective action. The EIs would also be responsible for maintaining status reports and training records.

Compliance Monitoring

Sierrita will implement a third-party compliance monitoring program on the Project. The overall objective of a third-party compliance monitoring program is threefold: to assess environmental compliance during construction in order to achieve a higher level of environmental compliance throughout the Project; to assist the FERC staff in screening and processing variance requests during construction; and to create and maintain a database of daily reports documenting compliance and instances of noncompliance. In addition to the EIs, third-party monitors from the FERC would conduct periodic field inspections during construction and restoration. The monitors would report on the effectiveness of Sierrita's environmental inspection program and help ensure compliance with the terms and conditions of the FERC Certificate. Third-party compliance monitors would report to the FERC; would have authority to approve simple variance requests; and would have the authority to stop any activity that violates an environmental condition of the FERC Certificate. The FERC environmental staff would also visit the site periodically during construction and restoration. The FERC monitor would be present on the ground throughout construction. Other Federal, state, and local agencies also may monitor the Project to the extent determined necessary by the agency.

Post-Approval Variance Process

The pipeline alignment and work areas identified in this EIS should be sufficient for construction and operation (including maintenance) of the Project and ancillary facilities. However, minor route realignments and other workspace refinements often continue past the Project planning phase and into the construction phase. As a result, the Project location and areas of disturbance described in the proposed action may require refinement after Project approval. These changes frequently involve minor route realignments, shifting or adding new ATWS or staging areas, or adding additional access roads. The FERC has developed a procedure for assessing impacts on those areas that have not been evaluated in the Final EIS and for approving or denying their use. In general, biological and cultural resource surveys were conducted using a survey corridor larger than that necessary to construct the pipeline. For example, Sierrita utilized a 160- to 300-foot-wide survey corridor for wildlife and cultural resource surveys, and identified wells and springs within 150 feet of the proposed pipeline route. If Sierrita shifts any ATWS or requires unanticipated workspace subsequent to any Project approval, these areas would typically be within the previously surveyed area. Such requests would be reviewed using a post-approval variance process.

Sierrita would prepare its request for route realignments or ATWS locations, including a copy of the survey results, and forward it to the FERC (and other Federal land-managing agencies, such as the FWS for access roads on the BANWR, as applicable) in the form of a “variance request.” The FERC and/or the other Federal land-managing agency would take the lead on reviewing the request, depending on the ownership status of the subject land. Typically, no further resource agency consultation would be required if the requested change is within previously surveyed areas as long as no sensitive species or features were present. The procedures used for assessing impacts on work areas outside the survey corridor and for approving their use are similar to those described above, except that additional surveys, analyses, and resource agency consultations would be performed to ensure that impacts on biological, cultural, and other sensitive resources are avoided or minimized to the maximum extent practicable.

At the conclusion of the Project, as-built drawings would be provided to the FERC and other Federal land-managing agencies, as appropriate, to document the final location of the constructed facilities. The other Federal land-managing agencies, as appropriate, would use the information in the as-built survey to determine if an amendment to the temporary use permit for Federal land would be necessary.

Pipeline Surveys and Inspections

As required by 49 CFR 192.615, Sierrita will establish an operation and maintenance plan and an emergency plan that includes procedures to minimize the hazards in a natural gas pipeline emergency. As a part of pipeline operations and maintenance, Sierrita would conduct regular patrols of the pipeline right-of-way. The patrol program would include monthly aerial and periodic ground patrols of the pipeline facilities to survey surface conditions on and adjacent to the pipeline right-of-way for evidence of leaks, unauthorized excavation activities, erosion and wash-out areas, areas of sparse vegetation, damage to permanent erosion control devices, exposed pipe, missing markers and signs, new residential developments, and other conditions

that might affect the safety or operation of the pipeline. The cathodic protection system would also be inspected periodically to ensure that it is functioning properly. In addition, pigs are regularly sent through the pipeline to check for corrosion and irregularities in the pipe in accordance with DOT requirements.

Sierrita will also maintain a liaison with the appropriate fire, law enforcement, and public officials as part of its Emergency Operating Procedures Manual. Communications with these parties would include the potential hazards associated with Sierrita facilities located in their service area and prevention measures undertaken; the types of emergencies that may occur on or near Sierrita facilities; the purpose of pipeline markers and the information contained on them; pipeline location information; recognition of and response to pipeline emergencies; and procedures to contact Sierrita for more information.

In addition, Sierrita will install a supervisory control and data acquisition system, which continuously monitors gas pressure, temperature, and volume at specific locations along the pipeline. This system would be continuously monitored from Sierrita's gas control center in Colorado Springs, Colorado. The system provides continuous information to the control center operators and has threshold and alarm values set such that warnings are provided to the operators if critical parameters are exceeded.

Right-of-Way Maintenance

In addition to the survey, inspection, and repair activities described above, operation of the pipeline will include maintenance of the right-of-way. The right-of-way will be allowed to revegetate after restoration; however, larger shrubs and brush may be periodically removed near the pipeline. The frequency of the vegetation maintenance would depend upon the vegetation growth rate.

In accordance with its Plan, if the 50-foot-wide permanent right-of-way were to become inundated with large trees, cacti, and shrubs, Sierrita will be allowed to conduct vegetation mowing or clearing over the full width of the 50-foot-wide permanent right-of-way. Full permanent right-of-way mowing or clearing would not be allowed more frequently than every 3 years. To facilitate aerial surveillance and inspection of the area immediately over the pipeline centerline for corrosion or leaks, Sierrita will be allowed to annually clear and maintain a 10-foot-wide corridor centered on the pipeline in an herbaceous state should this area become inundated with vegetation that prevents visual inspection of the area. Further, Sierrita will be allowed to mow or clear large trees that are within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline.

These vegetation maintenance allowances of the permanent right-of-way, as listed in Sierrita's Plan, are typically required along pipeline projects in other parts of the United States based on the rate of vegetation re-establishment and the pipeline company's need to visually observe its pipeline for corrosion and/or leaks. However, as acknowledged throughout the EIS, the proposed Project affects vegetation types that may be re-established in 2 years or less; species richness may take longer to recover, however, ranging from an average of 2 to 13 years. Other vegetation types associated with the Project are acknowledged to take an average of 76 years to

obtain full establishment of perennial plant coverage and 215 years to recover species composition typical of undisturbed areas. Regardless of these vegetation maintenance allowances noted in Sierrita's Plan, Sierrita does not anticipate that it would need to conduct vegetation mowing or clearing of the 50-foot-wide permanent right-of-way, including the 10-foot-corridor centered over the pipeline, or areas within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline based on the time required to obtain establishment of vegetation coverage. Therefore, shrubs, cacti, and herbaceous vegetation would be allowed to be maintained within the permanent right-of-way and, as such, would match surrounding vegetation once successfully re-established. In no case would routine vegetation maintenance clearing occur between April 15 and August 1 of any year. Vegetation maintenance would not normally be required in grazing areas.

Future Plans and Abandonment

Sierrita stated in its application that it currently has no foreseeable expansion or abandonment plans for the proposed pipeline system. Market forces (e.g., natural gas supply and demand) are the main factors that would determine the need for expansion or abandonment of the proposed facilities. If future expansion or abandonment were necessary, Sierrita would be required to seek appropriate regulatory approvals at that time, including any authorizations that might be required from the FERC or other agencies. If the pipeline is abandoned, the pipe may be left in place or may be removed and the area reclaimed in accordance with provisions and requirements of the FERC Certificate authorizing abandonment and any other land-management agency requirements.

Best Management Practices and Conservation Measures

In the Final EIS and associated documents from Sierrita, a number of Best Management Practices and Conservation Measures have been proposed to avoid and minimize the potential effects of the proposed action on listed species and their habitats. These Best Management Practices and Conservation Measures are considered part of the proposed action and are summarized below:

General

To minimize the Project-related impacts on dry wash crossings during runoff/flash flooding events, Sierrita committed in its Plan to the following measures:

- upcoming weather forecasts would be monitored by the construction crews and EIs to determine if significant rainfall is anticipated at times when construction across dry washes is planned and, to the extent practicable, Sierrita would avoid installing the pipeline across dry washes during periods of anticipated significant rainfall;
- if rainfall is not expected to be significant (e.g., less than 0.5 inch), Sierrita would proceed with the dry wash crossing; however, environmental crews would be notified of planned crossing location(s) and made available to respond if additional erosion control devices are needed;

- if flow conditions develop during construction of a dry wash crossing, Sierrita's EIs and environmental crews would be notified immediately to determine the extent of the flow and would install additional erosion control devices as necessary; and
- if flows are significant and siltation is likely to occur, Sierrita would stop work until flows have ceased or have decreased to the point where potential erosion can be contained within the construction work area.

Sierrita would further minimize impacts on ephemeral washes during construction by implementing measures contained in its Plan and Procedures, which include:

- implementing the Spill Plan if a spill or leak occurs during construction;
- locating ATWS at least 50 feet from the edge of the CAP Canal;
- locating equipment parking areas, equipment refueling areas, concrete coating activities, and hazardous material storage at least 100 feet from ephemeral washes, unless otherwise approved by the EI, the location is designated for such use by an appropriate governmental authority, or the location is an existing industrial site designated for such use;
- revegetating disturbed riparian habitat with conservation grasses and legumes or native plant species, preferably woody species;
- limiting vegetation maintenance adjacent to ephemeral washes to allow a riparian vegetation strip at least 25 feet wide to permanently revegetate with native plant species across the entire construction right-of-way;
- re-establishing original water flow path in accordance with Sierrita's hydrogeological scour analysis of washes and in consultation with the Pima County RFCO;
- omitting crowning of excess backfill over the pipeline to prevent channeling of water along the pipeline and pipeline disturbance;
- minimizing the alignment width and vegetation clearing, in accordance with Sierrita's hydrogeological survey and scour analysis of ephemeral washes;
- in riparian habitat, placing cut woody vegetation along the top of the ephemeral wash banks above the normal high water line to provide stabilization, obstruct vehicular traffic, and provide cover, and increase wildlife habitat value. The placement of woody vegetation would occur during final cleanup and would be monitored as part of Sierrita's *Post-Construction Vegetation Monitoring Document*;
- placing water bars to divert water off the right-of-way into a vegetated area instead of directly into the ephemeral wash;
- restricting annual maintenance of vegetation to a 10-foot-wide strip centered over the pipeline and to trees within 15 feet of the pipeline centerline that have roots that may compromise the integrity of the pipeline;
- Sierrita will construct fencing across the right-of-way in specific or sensitive locations to minimize unauthorized vehicular access and/or livestock grazing to further promote revegetation and restoration;
- Sierrita will maintain the riparian shrub root crowns during clearing and grading activities to provide resprouting opportunities;
- Sierrita will analyze the feasibility of replacing removed riparian vegetation with nursery stock shrubs pending the results of the hydrogeological survey and scour analysis;

- conducting follow-up inspections annually during the growing season for at least 5 years following construction in accordance with Sierrita's *Post-Construction Vegetation Monitoring Document*; and
- Sierrita will provide protective installation and restoration measures at ephemeral (dry) washes where the dry wash is connected to and upstream of a livestock tank.

In an effort to enhance livestock range conditions and wildlife habitat, Sierrita would discharge hydrostatic test water into livestock tanks if the following conditions are met:

- a hydrostatic test manifold is located near an existing livestock tank (for example, if there is an unnamed tank located approximately 220 feet from MP R35.7, which is close to the proposed discharge location at MP R35.1 (see table 4.3.2-4 of the Final EIS));
- the water quality tests meet applicable water quality standards for the intended use (livestock use); and
- the landowner or land-managing agency approves the use of the water in writing. Sierrita would coordinate with the landowner or land-managing agency for use of the water.

In general, to minimize construction-related effects, Sierrita would implement its Plan (see Appendix E of the Final EIS). The intent of Sierrita's Plan is to identify baseline mitigation measures for minimizing erosion and enhancing revegetation in upland areas. Implementation of Sierrita's Plan would aid in restoration. Some of the restoration and best management practices identified in Sierrita's Plan include the following:

- employment of two EIs who would ensure compliance with the Plan, Procedures, and other Project-specific plans and required conditions;
- segregation of topsoil from subsoil in specific areas from the construction right-of-way from the trench and spoil side or full work area;
- installation of temporary erosion control measures, such as slope breakers, sediment barriers, and mulch;
- installation of permanent erosion control devices, such as trench breakers and slope breakers;
- revegetation in accordance with the local soil conservation authority (e.g., NRCS), landowner, or land-management agency;
- placement of barriers to control off-road vehicle activities;
- post-construction monitoring, maintenance, and reporting results of revegetated areas, including a commitment to monitor riparian habitat for revegetation after construction and a commitment to adopt a stratified random approach for monitoring whereby 10 random plots would be established in riparian habitat in addition to 20 random plots that would be established in non-riparian upland areas;
- Sierrita will salvage saguaro cacti without arms that are less than 9 feet tall, Palmer's agave, and Pima pineapple cacti that cannot be avoided during construction;
- Sierrita will assess approximately 50 percent of *Agave parviflora* found on the right-of-way and transplant the healthy and viable plants (approximately 30 percent) adjacent to the right-of-way.; and

- Sierrita will confirm survivability of transplanted saguaro cactus and Palmer's agave that cannot be avoided or transplanted during construction after the second growing season and would continue to monitor transplanted plants over a 5-year period.

To minimize fragmentation impacts and restore portions of the construction right-of-way, Sierrita would replant the construction right-of-way according to its Plan and *Reclamation Plan*, which includes reseeding disturbed areas using seed mixtures developed by the NRCS and augmented by recommendations from the FWS, land-management agency, and/or landowner to enhance wildlife habitat. Sierrita's *Reclamation Plan* includes a table identifying seed mix, seeding methodology, and timing. Prior to construction, Sierrita would further identify its final seed mixes, rates, and timing based on consultations with the NRCS.

In an effort to minimize impacts on the restoration efforts and to avoid further fragmentation of vegetation in the Project area, Sierrita would adopt measures to discourage vehicle use of the right-of-way following construction such as excavating low areas and creating mounds, spreading hydro-axed vegetation across the right-of-way, and placing whole, cut mesquite along the right-of-way (see section 4.9.2 of the Final EIS). Sierrita would also use rock, where available, as a method for discouraging vehicle use on the right-of-way. Sierrita will implement the following to reduce post-construction use of the pipeline right-of-way:

- salvage and replant desert vegetation, including large cacti, shrubs, and desert wash woodland species at road or trail access;
- redistribute woody material removed during construction across the right-of-way in locations where available to both disguise the right-of-way and serve as "vertical mulch;"
- install deterrents to unauthorized public access such as dirt/rock berms, log barriers, signs, and locked gates where the right-of-way intersects paved and unpaved roads and at off-road vehicle trails and two-track roads;
- imprint the right-of-way by excavating 18-inch to 3-foot low areas followed by 18-inch to 3-foot mounds along the length of the right-of-way;
- restore the right-of-way to minimize the traces of the intersection of the pipeline at existing off-road vehicle trails, two-track, or dirt roads;
- store cut brush and slash from clearing operations and pull it back onto the right-of-way during restoration to visually break up the linear appearance of the right-of-way, provide physical barriers on the right-of-way, and to help discourage unauthorized public access;
- at riparian crossings in riparian habitat, place cut vegetation along the top of the bank;
- place water bars on the right-of-way to serve as both erosion control devices and barriers to discourage vehicle traffic on the right-of-way; and
- install rock barriers and/or fencing across the right-of-way in selected areas (e.g., dry washes) where the barrier would be used in conjunction with the terrain to discourage vehicle access.

As described in Sierrita's updated *Post-Construction Vegetation Monitoring Document*, Sierrita would monitor the right-of-way for at least 5 years. Sierrita would also continue annual monitoring until the FERC and/or Federal land-management agency determines that the restoration and revegetation goals have been achieved (i.e., that plant cover similar to that of the areas adjacent to the Project right-of-way that were not disturbed by Project construction has

been established). The *Post-Construction Vegetation Monitoring Document* describes the performance criteria, which includes percent coverage of native versus noxious weeds, for reclamation of the construction right-of-way (see Appendix H of the Final EIS).

In addition, the *Post-Construction Vegetation Monitoring Document* describes the adaptive management approach Sierrita would use in the event vegetation establishment does not meet the identified criteria. Sierrita would evaluate adopting one or more of the measures listed below to promote successful revegetation:

- reseeding problem areas with the original seed mix or modifying the seed mix based on the success of the original seeding mix;
- removing or limiting disturbing influences on the right-of-way, such as potential unauthorized access to the right-of-way or livestock grazing. Sierrita would work with the grazing leasees to determine if deferment is needed and can be applied to specific locations along the right-of-way;
- installing further noxious and/or invasive weeds control measures;
- discussing methods to better capture surface run-off water from precipitation events; and/or
- determining that no action is appropriate if an area is trending in the appropriate direction.

Some of the minimization and control measures outlined in Sierrita's *Noxious Weed Control Plan* include:

- Sierrita would inform and train construction contractors regarding noxious weed management, weed identification, and the potential impacts of noxious weeds on agriculture, livestock, wildlife, etc.
- Equipment and vehicle cleaning would be carried out prior to arrival at the Project right-of-way for the first time. Cleaning would concentrate on tracks, feet, or tires and on the undercarriage, with special emphasis on axles, frames, cross members, motor mounts, the underside of running boards, and front bumper/brush guard assemblies. If the weather conditions and right-of-way conditions are dry, compressed air would be used to clean vehicles and equipment. If muddy conditions exist, a mat platform with containment would be set up and the vehicles and equipment would be cleaned with high-pressure water. Equipment mat platforms would be disinfected with a hot bleach water solution or other approved cleaning method prior to being transferred off-site when construction in an area was completed. Equipment and vehicles used to move vegetation and topsoil during Project clearing and restoration phases would be cleaned of seeds, roots, and rhizomes prior to being moved off site.
- In areas of the right-of-way where high density (greater than 30 percent and high ground cover) noxious weed populations are identified, Sierrita would stockpile cleared vegetation and salvaged topsoil adjacent to the area from which they were stripped to eliminate the transport of soil-borne noxious and invasive weed seeds, roots, or rhizomes. Weed-infested stockpiles would be marked with clearly visible signage until the restoration phase, when the contractor would return topsoil and vegetation material from infestation sites to the areas from which they were stripped. In addition, the contractor

would not be permitted to move soil and vegetation matter outside of the identified and marked noxious weed infestation areas.

- Sierrita would ensure that straw or hay bales used for sediment barrier installations or mulch distribution, where appropriate, are certified weed-free and obtained from state-cleared sources. If certified weed-free bales are unavailable, alternative weed-free sediment barrier installations would be utilized.
- Restoration of disturbed lands would occur immediately following construction as outlined in Sierrita's *Reclamation Plan* (see Appendix G of the Final EIS). Continuing revegetation efforts would ensure adequate vegetation cover to prevent the invasion of noxious weeds.
- Sierrita would take appropriate action (including the potential use of herbicides) prior to construction on identified weed infestations to reduce the spread or proliferation of weeds. Applications would be controlled to minimize the impacts on the surrounding vegetation. In areas of dense infestation, a broader application would be used and a follow-up seeding program implemented. Treatment methods would be based on species-specific and area-specific conditions (e.g., proximity to water, riparian vegetation, or agricultural land; time of year) and would be coordinated with regulatory offices.
- Sierrita would begin monitoring the Project right-of-way for infestations of noxious and invasive species in the first growing season after construction and would continue to monitor the Project area biannually for 5 years. Sierrita would monitor sites with high-density noxious weeds identified during the construction period, new high-density noxious weed populations identified during post-construction monitoring, and equipment cleaning station locations established for Project construction. Both qualitative and quantitative data would be collected and analyzed and if the data does not meet the criteria for success, the monitoring program would be extended. In this case, Sierrita would consult with the appropriate agencies in analyzing and implementing the appropriate weed management program. In addition, if new or reoccurring infestations are noted during the post-construction monitoring period, treatment would be implemented and the frequency of monitoring may be increased.
- Should infestations be identified during monitoring, Sierrita would assess the potential for the infestation to spread and would develop a treatment plan to control the infestation. The treatment plan would be developed using integrated weed management principles and, if herbicides are used, all applicable approvals would be obtained prior to their use, including landowner approvals. Only herbicides that are approved for use within treated lands (private, State, or Federal) would be used. Sierrita is committed to following herbicide and pesticide label instructions. Treatments would not be conducted during precipitation events or when precipitation is expected within 6 hours following application. Proper buffers would be used if weeds targeted for herbicide treatments are in the vicinity of sensitive sites so as to prevent the spread of herbicides. Sierrita would conduct follow-up inspections of treated areas biannually (once between May and July and once between September and October) to determine the success of weed control and revegetation, and would continue inspections until revegetation is considered successful or the infestation is eradicated. As previously stated, the FERC, in coordination with the land-managing agency or landowner, would ultimately determine if restoration and revegetation is successful and if the Project is in compliance with Executive Order 13112.

- Sierrita will treat weeds when the percent cover reaches 10 percent on the right-of-way where weed cover off-right-of-way does not exist.

To mitigate for potential impacts on wildlife and wildlife habitat, Sierrita will:

- implement its Plan, Procedures, *Reclamation Plan*, *Post-Construction Vegetation Monitoring Document*, and *Noxious Weed Control Plan* (see appendices E, F, G, H, and I, respectively, of the Final EIS) during construction and to restore areas disturbed by construction;
- implement the SPCC Plan (see appendix O of Final EIS) to avoid unintentional contamination of wildlife habitat;
- provide environmental awareness training to all construction personnel working on the Project;
- conduct proper disposal of trash and food debris in secured containers so as not to attract wildlife;
- prohibit firearms or pets on Project work sites;
- comply with posted speed limits;
- minimize vegetation clearing to those areas needed to safely and efficiently construct the pipeline facilities;
- limit the permanent right-of-way width to 50 feet;
- replant the right-of-way with native species as outlined in the *Reclamation Plan* (see appendix G of the Final EIS);
- control noxious weeds on the right-of-way on all lands crossed to help maintain native forage species as outlined in the *Noxious Weed Control Plan* (see appendix I of the Final EIS);
- coordinate the use of pesticides and herbicides with land-managing agencies and landowners to avoid application in sensitive wildlife and riparian habitats;
- avoid removal of cacti and other desert succulent and woody species, where practicable, and coordinate plant salvaging efforts with the Arizona Department of Agriculture, in accordance with the Arizona Native Plant Law;
- leave breaks in stockpiles at least 10 feet wide approximately every 0.5 mile along the entire right-of-way. The location of ramps and breaks may be extended by up to 0.2 mile if it coincides with the location of a natural break in the construction right-of-way, such as a road crossing, ephemeral wash crossing, or highway crossing, where a ramp or break would already occur as part of construction. Sierrita would also install escape ramps adjacent to access roads crossed by the pipeline; each ramp would be sloped on each side (less than 45 degrees) to act as an escape ramp for any livestock/wildlife that happens to become trapped in the trench;
- provide a gap in the welded pipe string to coincide with the hard or soft plug locations and breaks between stockpiles. A gap may include either leaving a joint or section of pipe out or separating the two ends of an overlap to allow livestock/wildlife to pass;
- maintain hard plugs (unexcavated portion of trench) or install soft plugs (backfilled trench materials) in the trench after excavation to coincide with the breaks between stockpiles;
- check for wildlife under vehicles and equipment that have been stationary for more than

- one hour and each morning prior to moving or operation;
- allow wildlife that have entered the work area to leave the area on their own volition;
- install escape ramps and/or covering excavations at night;
- inspect the open ditch line daily to ensure that livestock/wildlife is not trapped in the open trench, and ensure that animals would be removed prior to backfilling by a qualified individual; and
- in the case where an injury to wildlife or livestock has occurred, Sierrita would contact the appropriate wildlife agency or, in the case of livestock, the landowner, and would assist with manpower and/or equipment to remove the animal, as appropriate.

In order to minimize potential noise impacts, Sierrita will:

- restrict construction activities to daylight hours except for periods when water pumping and HDD activities are required;
- comply with Pima County noise ordinances;
- maintain vehicles and equipment in accordance with manufacturer recommendations;
- implement noise control measures (e.g., noise tent, exhaust silencers) to reduce noise associated with HDD activities to 55 dBA or less;
- utilize best management practices during blasting activities, such as the use of blasting mats or soil cover;
- only conduct blasting activities during daylight hours; and
- implement a Project-specific *Blast Plan* in accordance with industry accepted standards, applicable regulations, and permit requirements.

Sierrita is not currently planning to conduct blasting activities within proximity of raptor nests. However, should blasting be required within 0.25 mile of an active raptor nest, Sierrita will contact the FWS prior to the initiation of blasting activities to identify the mitigation measures, such as timing, frequency, and duration of the blasting, as well as monitoring that would be implemented to ensure minimal disturbance of raptors.

During the operation of the pipeline, noise emissions would be limited to monitoring and maintenance activities, such as vegetation clearing on the permanent right-of-way, or on the ground or in the air surveillance of the pipeline, as required by regulations. Sierrita plans to implement monthly overflights of the Project right-of-way at 1,000 feet altitude, which could cause startle effects in some individuals in proximity to the Project area; however, these activities would be infrequent and short-term in duration.

Sierrita will implement the following mitigation measures to protect migratory bird species:

- Conduct pre-construction surveys to document local occurrences of nesting birds, including raptors, unless construction would take place outside of the nesting periods. The objectives of these surveys would be to:
 - anticipate protected resources at Project-critical times and locations;
 - determine sensitive or protected nesting behaviors; and
 - devise deterrence measures or pre-emptive mitigations.

- Perform clearing, grubbing, and other site preparation activities in advance of nest initiation, if feasible, to deter certain species from establishing nests that would then require avoidance (most suitable for ground-nesting birds).
- When migratory bird habitat cannot be avoided during the nesting season (early April through September), a qualified biologist assigned to each survey spread would conduct an active nest survey in the area to be cleared. The biologist would consult with the Tucson FWS-AESO to obtain additional guidance on conducting the necessary surveys; FWS staff at the Regional Migratory Bird Management Office may provide additional input. The qualified biologist would identify active nests and the associated species located within clearing areas using a global positioning system (GPS). The biologist would monitor nests within the clearing area and the associated birds' behavior, and would promptly notify and consult FWS staff in cases where nesting migratory birds are located. The surveys and the FWS consultation would be completed at least 5 days prior to arrival of construction equipment.
- If an active nest is encountered during pre-construction surveys, Sierrita would coordinate with the FWS to determine appropriate spatial buffers based on species ecology and relative sensitivity to disturbance activities (e.g., clearing, grading, ditching).
- Sierrita would coordinate with the FWS to maintain a pass through around the buffer (should the buffer extend only partially across the construction right-of-way) for equipment and vehicles in the immediate area.
- Cases may arise where a decision is made jointly by Sierrita in coordination with the FWS that eggs and/or young birds should be removed from an active nest. Should eggs and/or young birds be removed from an active nest, Sierrita would obtain authorization from the FWS for such an activity. In these cases, Sierrita would coordinate with local licensed bird rehabilitation facilities, if necessary, to facilitate such a removal. If such a decision is made, Sierrita would only use bird rehabilitation facilities that have all appropriate state and FWS required permits.
- The EI would defer work activities within a buffer zone of an active nest until the young have fledged. Exceptions to this restriction would be to allow for motor vehicle traffic, etc. on previously existing public or private roads where this activity does not generate noise levels or disturbance such that it could result in a take.
- In addition to these measures, as suggested by the FWS, Sierrita would implement best management practices to reduce the impacts of lighting and noise on raptors and listed species, including the use of appropriate mufflers or baffles on generators to attenuate noise from construction equipment, and limiting nighttime construction activities that would require lighting, with the exception of the 24-hour continuous HDD of the CAP Canal.
- In accordance with FWS Region 2 policy, prior to construction, Sierrita would remove inactive raptor nests that are within the construction right-of-way to prevent nesting of species. Sierrita would place cones at inactive nests within 0.5 mile of the Project area as a nesting deterrent, as approved by the landowner or land-managing agency. The deterrent cones would be removed from the inactive nests after construction activities are complete to allow use of the nest the following year.

ESA-Listed and Proposed Species-Specific Measures

Sierrita will implement appropriate measures to avoid or minimize impacts on ESA-listed, proposed, candidate, and species of concern. Such measures may include:

- flagging sensitive areas to be avoided that are within the Project construction areas; and prior to and during construction and restoration activities, if a federally-listed, proposed, and/or candidate species is observed on the right-of-way, or an individual species falls into an open trench:
 - Sierrita would immediately stop construction in that area;
 - Sierrita's on-site qualified biological monitor would contact the FWS, the FERC compliance monitor, and the Project environmental manager to determine what protection measure(s) would be required;
 - Sierrita's biological monitor would evaluate immediate rescue, depending upon conditions; and
 - Sierrita would not resume work in the area until it has been notified by the Director of OEP in writing and the FWS that construction activity may continue.
- Sierrita's Reclamation Plan and Post-Construction Vegetation Monitoring Document (see Appendices G and H, respectively, of the Final EIS) identifies the procedures that would be used to restore the right-of-way to pre-construction conditions, including the salvaging and transplanting of Pima pineapple cacti, saguaro cacti and Palmer's agave species, and other revegetation techniques to reduce the timeframe for revegetation. Sierrita will implement recontouring and seeding proposed jaguar critical habitat areas affected by the Project with an appropriate seed mix developed in consultation with the NRCS and FWS to restore native habitat. Further, Sierrita will restore cover densities to pre-construction levels, or to at least greater than 1 percent, but less than 50 percent canopy cover, and would adopt restoration measures to deter unauthorized use of the permanent right-of-way by foot and vehicle users. Sierrita will also discharge hydrostatic test water into wildlife/livestock tanks meeting certain criteria in an effort to enhance livestock range conditions and wildlife habitat. Sierrita will also implement its Noxious Weed Control Plan and coordinate with land-managing agencies and landowners to control the spread of noxious weeds on the right-of-way. Also, fire management (e.g., prescribed burns) across the right-of-way would be allowed to continue to further enhance wildlife habitat.

Jaguar and Jaguar Critical Habitat

To minimize impacts on riparian vegetation that is within jaguar critical habitat and also serves as important wildlife habitat for a number of wildlife species at Brown Wash, Sierrita will install the Brown Wash crossing as a drag section to reduce the workspace required for installation to a 75-foot-wide corridor.

Additionally, Sierrita will avoid placing stable nighttime lighting over any 0.4-square-mile area located within or potentially impacting proposed jaguar critical habitat to further reduce potential impacts on the jaguar through impacts on the primary constituent elements as identified by the FWS.

Lesser Long-Nosed Bat

To minimize Project-related impacts on the lesser long-nosed bat, Sierrita will implement the following to obtain the objective of no-net-loss of lesser long-nosed bat forage plants:

- avoid, to the extent practicable, removal of Palmer's agave and saguaro cacti;
- transplant, if feasible (based on size, health, etc.), Palmer's agave and saguaro cacti (less than 9 feet tall and without arms) that cannot be avoided;
- replace Palmer's agave and saguaro cacti that cannot be avoided and that are not transplantable with nursery stock (if available) at a 3:1 ratio to obtain a 1:1 survivability ratio after the second growing season, and monitor over a 5-year period;
- assess approximately 50 percent of *Agave parviflora* found on the right-of-way and transplant the healthy and viable plants (approximately 30 percent) adjacent to the right-of-way; and
- avoid nighttime construction activities and associated lighting in lesser long-nosed bat habitat, with the exception of HDD activities, refueling, and water pumping.

Chiricahua Leopard Frog and Critical Habitat

To minimize Project-related impacts on the Chiricahua leopard frog and its designated Critical Habitat, Sierrita will:

- avoid impacting wildlife/livestock tanks;
- prevent downstream erosion into wildlife/livestock tanks or waters by implementing its Project-specific Plan and Procedures (see Appendices E and F, respectively, of the Final EIS);
- have a biological monitor that is qualified to identify Chiricahua leopard frogs present during construction of the Project to assist the EI. If Chiricahua leopard frogs are observed during construction, the qualified biologist and EI would ensure that Project activities do not directly affect any individuals;
- discharge hydrostatic test water that meets water quality standards in wildlife/livestock tanks to enhance wildlife habitat;
- return the site and ephemeral washes to pre-construction contours, as near as practicable, upon completion of construction;
- stabilize and revegetate all disturbed soils, as appropriate;
- cover open trenches at the end of each work day or provide escape ramps for wildlife that may fall into the trenches;
- inspect trenches at the beginning of each work day to determine if any wildlife has become trapped in the trenches;
- create breaks in spoils piles to reduce impediments or barriers; and
- limit vehicle use to existing or designated routes.

Masked Bobwhite Quail

To minimize potential Project-related impacts on the masked bobwhite quail, and in addition to implementing its Reclamation Plan, Post-Construction Vegetation Monitoring Document, and Noxious Weed Control Plan (see Appendices G, H, and I, respectively, of the Final EIS), and allowing prescribed burns to continue across the right-of-way, Sierrita will:

- conduct pre-construction surveys to document local occurrences of nesting birds, unless construction would occur outside of the nesting periods. The biological monitor would contact the BANWR for positive identification of any potential masked bobwhite quail that are observed between MPs 35 and 59 or use of access roads in masked bobwhite quail suitable habitat;
- if possible, perform clearing, grubbing, and other site preparation activities in advance of masked bobwhite nest initiation to deter certain species from establishing nests that would then require avoidance;
- have a biological monitor that is qualified to identify masked bobwhite quail present during construction to assist with the EI. If masked bobwhites are observed during construction, the qualified biological monitor would contact the BANWR to ensure positive identification. The BANWR staff, biological monitor, and EI would ensure that Project activities do not directly affect individuals and would report all observations to the BANWR; and
- use a post-construction seed mix south of MP 38 that includes important masked bobwhite quail leguminous shrub forage species developed in consultation with the FWS, depending on availability and landowner approval, such as white ball acacia (*Acacia angustissima*) and bundleflower (*Desmanthus cooleyi*), both of which are important winter forage species.

Pima Pineapple Cactus

Sierrita will avoid as many Pima pineapple cactus as possible during construction activities. Transplantation of Pima pineapple cactus has had limited success, with low levels of survival (FWS, 2004) and, therefore, for unavoidable direct and permanent impacts on Pima pineapple cactus habitat, the Project's impacts would be offset by acquiring credits in an approved mitigation bank. In order to minimize fugitive dust generation, Sierrita will monitor dust during construction and conduct abatement of fugitive dust when there is a visible plume of dust with an estimated opacity exceeding 20 percent extending more than 300 feet from the dust source. Abatement would include reducing travel speeds or applying dust suppressants, such as water, as outlined in Sierrita's Fugitive Dust Control Plan (see Appendix J of the Final EIS). With the implementation of the measures outlined in the Fugitive Dust Control Plan, impacts on cacti as a result of dust deposition would be minimized. Sierrita would control the spread of invasive plant species in the Project area in accordance with the procedures outlined in its Noxious Weed Control Plan, in order to further promote restoration of native species.

We and the FERC acknowledge that there are limited data available on the successful transplantation of Pima pineapple cacti; however, we and the FERC believe that even if Sierrita could accomplish a 30 to 40 percent transplant survival rate, this would be beneficial to the

species. Sierrita has agreed to implement a program for transplanting Pima pineapple cacti in order to increase the general knowledge and understanding of this tool as a potential conservation measure. Sierrita coordinated with the FWS to develop an approach for transplanting and monitoring Pima pineapple cacti. Sierrita and the FWS determined that Pima pineapple cacti that cannot be avoided will be transplanted in compliance with Sierrita's Reclamation Plan and Post Construction Vegetation Monitoring Document (see Appendices G and H of the final EIS).

Northern Mexican Gartersnake and Proposed Critical Habitat

To minimize potential Project-related impacts on the northern Mexican gartersnake and its proposed Critical Habitat, Sierrita will adopt the same conservation measures outlined for the Chiricahua leopard frog and described above, and the following:

- have a biological monitor that is qualified to identify northern Mexican gartersnakes present during construction to assist the EI. If northern Mexican gartersnakes are observed, the biologist and EI would ensure that Project activities do not directly affect any individuals;
- maintain the riparian shrub root crowns during clearing and grading;
- revegetate disturbed riparian habitat with native plant species, preferably woody species; and place cut woody vegetation along the top of the ephemeral wash banks above the normal high water line to provide stabilization.
- Sierrita will implement actions within its Plan and Procedures as listed in the appendices in E and F of the Final EIS to further minimize potential impacts on ephemeral washes that could be used by this species as movement corridors during the summer monsoon period.

Riparian Wildlife Movement Areas 6 and 7 are north-south connections where the northern Mexican gartersnake critical habitat is proposed (see section 4.5.3 of the Final EIS). It is possible that northern Mexican gartersnakes utilize the riparian vegetation within these riparian movement corridors for thermoregulation, gestation, shelter, protection from predators, immigration, emigration, brumation and foraging.

A complete description of the proposed action, best management practices, and conservation measures are found the FERC's October 2013 draft EIS and the FERC's March 2014 Final EIS, including Sierrita's Upland Erosion Control, Revegetation, and Maintenance Plan; Wetland and Waterbody Construction and Mitigation Procedures; Reclamation Plan; Post-Construction Vegetation Monitoring Document; Noxious Weed Control Plan; Fugitive Dust Control Plan; Spill Prevention, Control, and Countermeasure Plan; and Fire Protection Plan. These documents are incorporated herein by reference.

STATUS OF THE SPECIES

Pima Pineapple Cactus

The Pima pineapple cactus was listed as an endangered species without critical habitat on September 23, 1993 (58 FR 49875), and critical habitat was not designated at that time. Factors that contributed to the listing include habitat loss and degradation, habitat modification and fragmentation, limited geographical distribution and species rareness, illegal collection, and difficulties in protecting areas large enough to maintain functioning populations. In 2005, a 5-year review was initiated for the Pima pineapple cactus (70 FR 5460). This review was completed in 2007 and recommended no change to the cactus's classification as an endangered species (FWS 2007a).

Recent investigations of taxonomy and geographical distribution focused in part on assessing the validity of the taxon (see Baker 2004, Baker 2005, Schmalzel *et al.* 2004, and Baker and Butterworth 2013). Although there is evidence for a general pattern of clinal variation across the range of the species (Schmalzel *et al.* 2004), this does not preclude the recognition of taxonomic varieties within *C. sheeri* (= *C. robustispina*). Baker and Butterworth (2013) found that there are distinct geographical gaps between the distribution of this subspecies and the other subspecies, which occur in eastern Arizona, New Mexico, and Texas, and that the subspecies are morphologically coherent within their respective taxa. Their geographical, morphological, and genetics work supports the idea that the sub-specific groups within *C. robustispina* are indeed discrete, and merit separate taxonomic status as subspecies (FWS 2007a; Baker and Butterworth 2013).

We have determined that Pima pineapple cacti that are too isolated from each other may not be effectively pollinated. For example, the major pollinator of Pima pineapple cactus is thought to be *Diadasia rinconis*, a ground-nesting, solitary, native bee. McDonald (2005) found that Pima pineapple cactus plants need to be within approximately 600 m (1,969 ft) of each other in order to facilitate effective pollination. Based on this information and other information related to similar cacti and pollinators, we have determined that Pima pineapple cactus plants that are located at distances greater than 900 meters from one another become isolated with regard to meeting their life history requirements. The species is an obligate outcrosser (not self-pollinating), so it is important for plants to be within a certain distance to exchange pollen with each other. Also, the study found that pollination was more effective when other species of native cacti are near areas that support Pima pineapple cactus. The native bees pollinate a variety of cacti species and the sole presence of Pima pineapple cactus may not be enough to attract pollinators.

The Pima pineapple cactus occurs south of Tucson, in Pima and Santa Cruz counties, Arizona, as well as in adjacent northern Sonora, Mexico. In Arizona, it is distributed at very low densities throughout both the Altar and Santa Cruz valleys, and in low-lying areas connecting the two valleys. This cactus generally grows on slopes of less than 10 percent and along the tops (upland areas) of alluvial bajadas. The plant is found at elevations between 2,360 feet (ft.) and 4,700 ft. (Phillips *et al.* 1981, Benson 1982, Ecosphere Environmental Services Inc. 1992), in vegetation characterized as either or a combination of Arizona upland of the Sonoran desertscrub

community and semi-desert grasslands (Brown 1982, Johnson 2004). Paredes-Aguilar *et al.* (2000) reports the subspecies from oak woodlands in Sonora, while Baker's (2005) surveys in Sonora found Pima pineapple cactus at low densities (approximately 1 plant per hectare), mostly in mesquite scrub. Several attempts have been made to delineate habitat within the range of Pima pineapple cactus (McPherson 2002, RECON Environmental Inc. 2006, FWS unpublished analysis) with limited success. As such, we are still unable to determine exact ecological characters to help us predict locations of Pima pineapple cactus or precisely delineate Pima pineapple cactus habitat (FWS 2007a), except perhaps in localized areas (FWS 2005).

As a consequence of its general habitat requirements, considerable habitat for this species appears to exist in Pima and Santa Cruz counties, much of which is not known to be occupied. Pima pineapple cactus occurs at low densities, widely scattered, sometimes in clumps, across the valley bottoms and bajadas. The species can be difficult to detect, especially in dense grass cover. For this reason, systematic surveys are expensive and have not been conducted extensively throughout the range of the Pima pineapple cactus. As a result, location information has been gathered opportunistically, either through small systematic surveys, usually associated with specific development projects, or larger surveys that are typically only conducted in areas that seem highly suited for the species. Furthermore, our knowledge of the distribution and status of this species is gathered primarily through the section 7 process; and we only see projects that require a Federal permit or have Federal funding. There are many projects that occur within the range of Pima pineapple cactus that do not undergo section 7 consultation, and we have no information regarding the status or loss of plants or habitat associated with those projects. For these reasons, it is difficult to address abundance and population trends for this species.

The AGFD maintains the Heritage Data Management System (HDMS), a database identifying elements of concern in Arizona and consolidating information about their distribution and status throughout the state. This database has 5,553 Pima pineapple cactus records, 5,449 Pima pineapple cactus of which have coordinates. Some of the records are quite old, and we have not confirmed whether the plants are still alive. We also cannot determine which plants may be the result of multiple surveys in a given area. Of the known individuals (5,553), approximately 1,340 Pima pineapple cactus plants are documented in the database as extirpated as of 2003. There have been additional losses since 2003, but that information is still being compiled in the database. The database is dynamic, based on periodic entry of new information, as time and staffing allows. As such, the numbers used from one biological opinion to the next may vary and should be viewed as a snapshot in time at any given moment. We have not tracked loss of habitat because a limited number of biological assessments actually quantify habitat for Pima pineapple cactus.

We do know the number and fate of Pima pineapple cactus that have been detected during surveys for projects that have undergone section 7 consultation. Through 2010, section 7 consultations on development projects (e.g., residential and commercial development, mining, infrastructure improvement) considered 2,680 Pima pineapple cactus plants found on approximately 15,192 acres within the range of the Pima pineapple cactus. Of the total number of plants, 1,985 Pima pineapple cactus (74 percent) were destroyed, removed, or transplanted as a result of development, mining, and infrastructure projects. In terms of Pima pineapple cactus

habitat, some of the 15,192 acres likely did not provide Pima pineapple cactus habitat, but that amount is difficult to quantify because Pima pineapple cactus habitat was not consistently delineated in every consultation. Of the 15,192 acres, however, we are aware that 14,545 acres (96 percent) have been either permanently or temporarily impacted. Some of these acres may still provide natural open space, but we have not been informed of any measures (e.g., conservation easements) that have been completed to ensure these areas will remain open. Through section 7 consultation on non-development-related projects (e.g., fire management plans, grazing, buffelgrass control), we are aware of an additional 781 plants within an unknown number of acres; we do not know the number of acres because these types of projects are often surveyed for Pima pineapple cactus inconsistently, if at all. Across the entire Pima pineapple cactus range, it is difficult to quantify the total number of Pima pineapple cactus lost and the rate and amount of habitat loss for three reasons: 1) we review only a small portion of projects within the range of Pima pineapple cactus (only those that have Federal involvement and are subject to section 7 consultation), 2) development that takes place without any jurisdictional oversight is not tracked within Pima and Santa Cruz counties, and 3) many areas within the range of the Pima pineapple cactus have not been surveyed; therefore, we do not know how many plants exist or how much habitat is presently available.

Some additional information related to the survival of Pima pineapple cactus comes from six demographic plots that were established in 2002 in the Altar Valley. The results from the first year (2002-2003) indicate that the populations were stable; out of a total of over 300 Pima pineapple cactus measured, only 10 died, and two Pima pineapple cactus seedlings were found (Routson *et al.* 2004). The plots were not monitored in 2004, but were visited again starting in May 2005. In the two years between September 2003 and September 2005, 35 individuals, or 13.4 percent, of the original population had died and no new seedlings were found (Baker 2006). Baker (2006) suggests that recruitment likely occurs in punctuated events in response to quality and timing of precipitation, and possibly temperature, but there is little evidence until such events occur. He goes on to say that further observations need to be made to determine the rate at which the population is declining, because, based on an overall rate of die-off of 13.4 percent every two years, few individuals will be alive at this site after 15 years. As this monitoring program continues, critical questions regarding the life cycle of this species will be answered.

Threats to Pima pineapple cactus continue to include habitat loss and fragmentation, competition with non-native species, and inadequate regulatory mechanisms to protect this species. We believe residential and commercial development, and its infrastructure, is by far the greatest threat to Pima pineapple cactus and its habitat. However, we have only a limited ability to track the cumulative amount of development within the range of Pima pineapple cactus. What is known with certainty is that development pressure continues in Pima and Santa Cruz counties.

Invasive grass species may be a threat to the habitat of Pima pineapple cactus. Habitat in the southern portion of the Altar Valley is now dominated by Lehmann lovegrass (*Eragrostis lehmanniana*). According to Gori and Enquist (2003), Boer lovegrass (*Eragrostis chloromelas*) and Lehmann lovegrass are now common and dominant on 1,470,000 acres in southeastern Arizona. They believe that these two grass species will continue to invade native grasslands to the north and east, as well as south into Mexico. These grasses have a completely different fire regime than the native grasses, tending to form dense stands that promote higher intensity fires

more frequently. Disturbance (like fire) tends to promote the spread of these non-natives (Ruyle *et al.* 1988, Anable *et al.* 1992). Roller and Halvorson (1997) hypothesized that fire-induced mortality of Pima pineapple cactus increases with Lehmann lovegrass density. Buffelgrass (*Pennisetum ciliare*) has become locally dominant in vacant areas in the City of Tucson and along roadsides, notably in the rights-of-way along Interstate 10 and State Route 86. Some portions of Pima pineapple cactus habitat along these major roadways are already being converted to dense stands of buffelgrass, which can lead to recurring grassland fires and the destruction of native desert vegetation (Buffelgrass Working Group 2007).

The effects of climate change (e.g., decreased precipitation and water resources) are a threat to the long-term survival and distribution of native plant species, including the Pima pineapple cactus. For example, temperatures rose in the twentieth century and warming is predicted to continue over the twenty-first century. Although climate models are less certain about predicted trends in precipitation, the southwestern United States is expected to become warmer and drier. In addition, precipitation is expected to decrease in the southwestern United States, and many semi-arid regions will suffer a decrease in water resources from climate change as a result of less annual mean precipitation and reduced length of snow season and snow depth. Approximately half of the precipitation within the range of the Pima pineapple cactus typically falls in the summer months; however, the impacts of climate change on summer precipitation are not well understood. Drought conditions in the southwestern United States have increased over time and may have contributed to loss of Pima pineapple cactus populations through heat stress, drought stress, and related insect attack and rodent predation, as well as a reduction in germination and seedling success since the species was originally listed in 1993, and possibly historically. The full impact of drought and climate change on Pima pineapple cactus has yet to be studied, but it is likely that, if recruitment occurs in punctuated events based on precipitation and temperature (Baker 2006), Pima pineapple cactus will be negatively affected by these forces. Already we have seen a nearly 25% loss of individuals across six study sites in the Altar Valley between 2010 and 2011; these deaths were attributed largely to drought and associated predation by native insects and rodents (Baker 2011). Climate change trends are likely to continue, and the impacts on species will likely be complicated by interactions with other factors (e.g., interactions with non-native species and other habitat-disturbing activities).

The Arizona Native Plant Law can delay vegetation clearing on private property for the salvage of specific plant species within a 30-day period. Although the Arizona Native Plant Law prohibits the taking of this species on State and private lands without a permit for educational or research purposes, it does not provide for protection of plants *in situ* through restrictions on development activities. Even if Pima pineapple cactus are salvaged from a site, transplanted individuals only contribute to a population if they survive and are close enough (within 900 m [(2,970 ft.)] to other Pima pineapple cactus to be part of a breeding population from the perspective of pollinator travel distances and the likelihood of effective pollination. Transplanted Pima pineapple cacti have variable survival rates, with moderate to low levels of survival documented. Past efforts to transplant individual Pima pineapple cactus to other locations have had limited success. For example, on two separate projects in Green Valley, the mortality rate for transplanted Pima pineapple cactus after two years was 24 percent and 66 percent, respectively (SWCA, Inc. 2001, WestLand 2004). One project southwest of Corona de Tucson involved transplanting Pima pineapple cactus into areas containing *in situ* plants. Over

the course of three years, 48 percent of the transplanted individuals and 24 percent of the *in situ* individuals died (WestLand 2008). There is also the unquantifiable loss of the existing Pima pineapple cactus seed bank associated with the loss of suitable habitat. Furthermore, once individuals are transplanted from a site, Pima pineapple cactus is considered to be extirpated from that site, as those individuals functioning in that habitat are moved elsewhere.

Pima County regulates the loss of native plant material associated with ground-disturbing activities through their Native Plant Protection Ordinance (NPPO) (Pima County 1998). The NPPO requires inventory of the site and protection and mitigation of certain plant species slated for destruction by the following method: the designation of a minimum of 30 percent of on-site, permanently protected open space with preservation in place or transplanting of certain native plant species from the site. There are various tables that determine the mitigation ratio for different native plant species (e.g. saguaros, ironwood trees, Pima pineapple cactus) with the result that mitigation may occur at a 1:1 or 2:1 replacement ratio. Mitigation requirements are met through the development of preservation plans. The inadvertent consequence of this ordinance is that it has created a “market” for Pima pineapple cactus. Any developer who cannot avoid this species or move it to another protected area must replace it. Most local nurseries do not grow Pima pineapple cactus (and cannot grow them legally unless seed was collected before the listing). As a result, environmental consultants are collecting Pima pineapple cactus seed from existing sites (which can be done with a permit from the Arizona Department of Agriculture and the permission of the private landowner), germinating seed, and placing Pima pineapple cactus plants grown from seed back on these sites. There have been no long-term studies of transplant projects, thus the conservation benefit of these actions is unknown. Moreover, growing and planting Pima pineapple cactus does not address the loss of Pima pineapple cactus habitat that necessitated the action of transplanting cacti in the first place.

Other specific threats that have been previously documented (U.S. Fish and Wildlife Service 1993), such as overgrazing, illegal collection, prescribed fire, and mining, have not yet been analyzed to determine the extent of effects to this species. However, limited, anecdotal information exists. Overgrazing by livestock, illegal collection, and fire-related interactions involving exotic Lehmann lovegrass and buffelgrass may negatively affect Pima pineapple cactus populations. Mining has resulted in the loss of hundreds, if not thousands, of acres of potential habitat throughout the range of the plant. Much of the mining activity has been occurring in the Green Valley area, which is the center of the plant’s distribution and the area known to support the highest densities of pineapple cactus.

The protection of Pima pineapple cactus habitat and individuals is complicated by the varying land ownership within the range of this species in Arizona. An estimated 10 percent of the potential habitat for Pima pineapple cactus is held in Federal ownership. The remaining 90 percent is on Tribal, State, and private lands. Most of the federally-owned land is either at the edge of the plant’s range or in scattered parcels. The largest contiguous parcel of federally-owned habitat is the Buenos Aires National Wildlife Refuge, located at the southwestern edge of the plant’s range at higher elevations and with lower plant densities. No significant populations of Pima pineapple cactus are known from Sonora or elsewhere in Mexico (Baker 2005).

There have been some notable conservation developments for this species. Currently, there are two conservation banks for Pima pineapple cactus, one on a private ranch in the Altar Valley (Palo Alto Ranch Conservation Bank) and another owned by Pima County that includes areas in both the Altar Valley and south of Green Valley. In the Palo Alto Ranch Conservation Bank, 193.6 acres have been conserved to date. In Pima County's Bank, a total of 530 acres are under a conservation easement at this time (the County offsets its own projects within this bank). Additionally, three large blocks of land totaling another 1,078 acres have been set aside or are under conservation easements through previous section 7 consultations (see consultations 02-21-99-F-273, 02-21-01-F-101, and 02-21-03-F-0406). While not formal conservation banks, these areas, currently totaling 1,739.6 acres, are set aside and managed specifically for Pima pineapple cactus as large blocks of land, and likely contribute to recovery of the taxon for this reason; therefore, we consider these acres conserved. Another 647 acres of land have been set aside as natural open space within the developments reviewed through section 7 consultation between 1995 and 2010. However, these are often small areas within residential backyards (not in a common area) that are difficult to manage and usually isolated within the larger development, and often include areas that do not provide Pima pineapple cactus habitat (e.g., washes). Some conservation may occur onsite because of these open space designations, but long-term data on conservation within developed areas are lacking; the value of these areas to Pima pineapple cactus recovery over the long-term is likely not great.

Even with complete data on historical change related to Pima pineapple cactus distribution and abundance, we cannot reliably predict population status due to compounding factors such as climate change, urbanization, and legal and political complexities (McPherson 1995). We do not know if the majority of populations of Pima pineapple cacti can be sustainable under current reduced and fragmented conditions. Thus, there is a need to gather information on limits to the plant's distribution under current habitat conditions.

In summary, Pima pineapple cactus conservation efforts are currently hampered by a lack of information on the species. Specifically, we have not been able to determine exact ecological characters to help us predict locations of Pima pineapple cactus or precisely delineate its habitat, and considerable area within the Pima pineapple cactus range has not been surveyed. Further, there are still significant gaps in our knowledge of the life history of Pima pineapple cactus; for instance, we have yet to observe a good year for seed germination. From researcher observations and motion sensing cameras, we have learned that ants, Harris' antelope squirrels, and jackrabbits act as seed dispersal agents. Demographic plots were established in 2003, and information is just now beginning to be reported with regard to describing population dynamics for Pima pineapple cactus in the Altar Valley, although reading these plots has only been done opportunistically. Monitoring has shown that the range-wide status of the Pima pineapple cactus appears to have been recently affected by threats that have completely altered or considerably modified more than a third of the species' surveyed habitat, and have caused the elimination of nearly 60 percent of documented locations. Dispersed, patchy clusters of individuals are becoming increasingly isolated as urban development, mining, and other commercial activities continue to detrimentally impact the habitat. The remaining habitat also is subject to degradation or modification from current land-management practices, increased recreational use on lands when adjacent to urban expansion (i.e., off-road vehicle use and illegal collection), and the continuing aggressive spread of nonnative grasses into Pima pineapple cactus habitat. Although

there has been a recent slowdown in the development of residential and commercial properties, habitat fragmentation and degradation will likely continue into the foreseeable future based on historical data and growth projections produced by the Pima County Association of Governments (1996). There is very little Federal oversight on conservation measures that would protect or recover the majority of the potential habitat. Even some areas where section 7 consultations have been completed have been modified and may not be able to support viable populations of the Pima pineapple cactus over the long-term.

Our information indicates that, rangewide, more than 65 consultations have been completed or are underway for actions affecting the Pima pineapple cactus. These BOs concerned the effects of development (approximately 28 percent), livestock grazing (approximately 22 percent), fire (approximately 18 percent), agency planning (approximately 9 percent), utility infrastructure (approximately 7 percent), roads and bridges (approximately 7 percent), U.S./Mexico border issues (approximately 4 percent), and mining (approximately 4 percent).

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all Federal actions in the action area that have undergone formal or early section 7 consultation, and impact of State and private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

Description of the Action Area

For the Sierrita Pipeline Project, we define the action area for Pima pineapple cactus as the project footprint (area that will be affected by the proposed pipeline construction and operation right-of-way, ATWS, above-ground facilities, access roads, contractor yards, and utility corridors (powerlines to meter stations, MLV, and contractor yards)) and areas outside the proposed Project footprint that may be affected by noise and dust during construction. To analyze the potential off-site impacts from noise and dust during construction activities, we consider the action area to include an area 0.25 mile from the outside edge of the proposed project footprint described above. Pima pineapple cactus are known or expected to occur within the footprint of the Sierrita Pipeline Project and associated structures and facilities, as well as within the 0.25 mile buffer around the project footprint. However, Pima pineapple cacti were not found and are not expected to occur in the higher elevation areas of the action area with more topography. These areas are typically found at the southern end of the proposed pipeline route. Therefore, the action area for Pima pineapple cactus includes only the lower elevation portions of the proposed utility corridor north of pipeline MP 49. Sierrita estimates that approximately 487 acres of the approximately 832 acres within the construction corridor are considered suitable for Pima pineapple cactus. These estimates of Pima pineapple cactus habitat within the construction area also account for drainage areas (such as Brown Canyon Wash) that support relatively dense xeroriparian vegetation associations that are not suitable to support Pima pineapple cactus (i.e., Pima County Regulated Riparian Habitat) and slopes that are greater than 15%.

The project area is located in the Avra and Altar Valleys southwest of the Tucson metropolitan area. The northernmost 13 miles of the project area, from its point of origin to the community of Three Points, lies within the southern part of Avra Valley. From Three Points south to the international border, the project area traverses the entire length of the Altar Valley.

Avra Valley is a broad, north-draining alluvial basin that is bounded on the east by the Tucson Mountains, on the west by the Roskrige, Waterman, and Silver Bell Mountains, and on the south by the Sierrita Mountains. Brawley Wash, an ephemeral watercourse, is the axial drainage of Avra Valley, ultimately sending stormwater flows into and forming Los Robles Wash, a tributary of the Santa Cruz River. The project area occupies the south end of Avra Valley and is crossed from about MP 2 to MP 3 by Black Wash, which is a large, braided tributary of Brawley Wash that drains the southern Tucson Mountains and the northeastern part of the Sierrita Mountains.

Altar Valley is a broad, north-south-trending alluvial basin that drains northward into Avra Valley. It is bounded on the east by the San Luis, Las Guijas, Cerro Colorado, and Sierrita Mountains and on the west by the Pozo Verde, Baboquivari, Quinlan, and Coyote Mountains. Altar Wash, also ephemeral and flowing only in response to precipitation events, is the axial drainage of Altar Valley, flowing into and becoming Brawley Wash at the north end of the Valley. In the Altar Valley, the project area runs just above the eastern margin of the Altar Wash floodplain to about MP 31.5, where it crosses west of Altar Wash and continues south along the eastern bajada of the Baboquivari and Pozo Verde Mountains to the international border. This stretch of the project area crosses more than a dozen named ephemeral washes; some of the larger ones are Sabino Wash, Brown Wash, Thomas Canyon, and Las Moras Wash.

The action area is entirely within Pima County, Arizona, extending from the southwestern portion of Tucson, north of Highway 86, southward to the U.S. Mexico International Border near the town of Sasabe, generally following the Highway 286 alignment. Topography consists of sloping terrain bisected by washes, with an estimated elevation range from approximately 2,750 to 4,000 feet. The biotic communities present are the Arizona Upland Subdivision of the Sonoran Desert and Semi-desert Grassland (Brown 1994). Typical vegetation within the Project area includes creosote bush (*Larrea tridentata*), velvet mesquite (*Prosopis velutina*), palo verde (*Parkinsonia microphylla*), catclaw acacia (*Acacia greggii*), Lehmann's lovegrass (*Eragrostis lehmaniana*), desert broom (*Baccharis sarathroides*), barrel cactus (*Ferocactus wislizenii*), cholla and prickly pear cactus (*Opuntia* spp.), and saguaro (*Carnegiea gigantea*), as well as a number of native grass and forb species. These vegetation types are found in the valley floor (Altar Valley) and surrounding hills.

Land uses in proximity to the action area include the residential and commercial areas of the southwest part of Tucson, Three Points, Sasabe, and Diamond Bell Ranch, livestock grazing lands, and the Buenos Aires National Wildlife Refuge. In response to the an increase in illegal immigration and smuggling across the Refuge and in the Altar Valley at large, Border Patrol infrastructure (fences, barriers, towers, etc.) has increased. A general trend towards a decrease in illegal activity has been observed, but Border Patrol maintains a presence in the action area with the ongoing presence of agents, continued patrols, surveillance activity, and interdictions.

Status of the Species within the Action Area

Sierrita conducted field surveys within the action area for the Pima pineapple cactus between March and May 2012 and July and November 2012 using FWS-recommended protocols with the objective to identify Pima pineapple cactus and potentially suitable habitat based on soil and landscape features. These surveys covered:

- a 160-foot-wide corridor along the proposed pipeline route;
- a 20-foot-wide corridor on either side of existing roads proposed for use;
- staging yard locations; and
- ATWS that extend beyond the 160-foot-wide survey corridor.

Sierrita's field survey identified 142 Pima pineapple cactus within the above-listed survey areas. Of the 142 individuals identified, 97 are within the construction workspace and 2 are within 25 feet of access roads that need to be improved for construction. The northernmost cactus was observed at MP 6.5 and the southernmost near MP 49.0. Sierrita estimates that approximately 487 acres of the approximately 832 acres within the construction corridor are considered suitable for Pima pineapple cactus (see Figure 4.7.1-6 of the Final EIS). These estimates of Pima pineapple cactus habitat within the construction area also account for drainage areas (such as Brown Canyon Wash) that support relatively dense xeroriparian vegetation associations that are not suitable to support Pima pineapple cactus (i.e., Pima County Regulated Riparian Habitat) and slopes that are greater than 15%. Ongoing surveys for Pima pineapple cacti are conducted adjacent to the action area by ranchers associated with the Altar Valley Conservation Alliance (Alliance), the Buenos Aires National Wildlife Refuge, the Arizona Department of Transportation, and through municipal requirements for commercial and residential developments. These ongoing surveys confirm the presence of Pima pineapple cacti in areas of the southern Avra Valley and much of the area of Altar Valley in proximity to the action area for this Project.

Factors Affecting Species Environment within the Action Area

Residential and commercial developments are the greatest threats to Pima pineapple cactus and its habitat; other threats include habitat loss and fragmentation, competition with nonnative species, loss of the existing seed bank, grazing, illegal plant collection, prescribed fire, mining, border activities, and inadequate regulatory mechanisms (FWS 1993, 2007a, 2008a, b).

Habitat in much of the Altar Valley is now dominated by Lehmann lovegrass, and it is hypothesized that fire-induced mortality of Pima pineapple cactus increases with Lehmann lovegrass density (FWS 2007a). Buffelgrass (*Pennisetum ciliare*), a nonnative grass, is now common in vacant areas in the city of Tucson and along roadsides, notably in the rights-of-way along Interstate 10 and SR 86, and may also pose a threat to Pima pineapple cactus.

Transplanting Pima pineapple cactus is not likely to contribute significantly to the overall population, as recent studies have demonstrated that transplanted individuals have low levels of survival, and past efforts have had only limited success. However, as we gain more information and understanding of relocation and transplanting techniques and protocols, relocating and

transplanting individuals that may be affected by land-use activities may provide an additional tool for the conservation of this species.

Landownership patterns within the range of this species in Arizona complicate the protection of habitat for and individuals of this species: approximately 10% of suitable habitat is on Federal land (most of which is either at the edge of the plant's range or in scattered parcels), and the remaining 90% is on tribal, state, and private lands (FWS 2004).

As discussed above, the effects of climate change (i.e., decreased precipitation and water resources) are a threat to many species (Lenart 2007), including the Pima pineapple cactus. For example, temperatures rose in the twentieth century, and warming is predicted to continue over the twenty-first century. Although climate models are less certain about predicted trends in precipitation, the southwestern United States is expected to become warmer and drier. In addition, precipitation is expected to decrease in the southwestern United States, and many semi-arid regions will suffer a decrease in water resources from climate change as a result of less annual mean precipitation and reduced length of snow season and snow depth. Approximately half of the precipitation within the range of the Pima pineapple cactus typically falls in the summer months; however, the impacts of climate change on summer precipitation are not well understood. Drought conditions in the southwestern United States have increased over time and may have contributed to loss of Pima pineapple cactus populations since the species was originally listed in 1993, and possibly historically. Climate change trends are likely to continue, and the impacts on species will likely be complicated by interactions with other factors (e.g., interactions with nonnative species and other habitat-disturbing activities). Extreme temperatures can negatively impact seedling survival in many Sonoran desert plants, and drought coupled with high temperatures reduces temperature tolerance in seedlings (Nobel 1984).

Additional activities, such as ground disturbances from Arizona Department of Transportation maintenance activities, specifically the clearing of a 30-foot vehicle recovery zone in some areas along the sides of SR 86 and 286, may disturb individuals that may be growing near the road side, as well as Pima pineapple cactus pollinators, primarily ground-nesting bees. Past road improvement projects, such as a bridge replacement, road realignment, or road widening, may have resulted in the loss of individuals. Several acres of habitat were converted to highway roadway. In addition, several roadside fires have impacted the habitat along the road side.

Human disturbance in the action area, while localized, could have a substantial effect on Pima pineapple cactus. The least impacting of these human activities is individuals exploring wildlife-related recreational opportunities. A more serious human disturbance is the large number of undocumented immigrants and drug traffickers moving through the action area. New trails are created regularly and campfires left unattended pose a serious fire risk. In addition, the use of off-highway vehicles by Border Patrol while monitoring and apprehending these individuals could present a significant impact on this species. Recent construction and operation of the international border protection infrastructure has occurred along the international border. This includes vehicle and pedestrian barriers along the south end of the Altar Valley and the installation and operation of electronic observation towers. These barriers have resulted in a relatively recent decrease in illegal immigration and drug smuggling activities moving north from the border through the BANWR. The actions of the U.S. Border Patrol have also decreased

on the BANWR in response. However, all of these actions are still ongoing.

Prescribed fire has been used as a habitat management tool in the Altar Valley for decades. However, based on ongoing monitoring by various entities as described above, preliminary indications are that impacts from prescribed fire on Pima pineapple cacti can be managed and reduced. Ongoing surveys, monitoring, and research will continue to improve fire management related to this species. However, wildfires also occur in Altar Valley which do not necessarily allow management that would reduce effects to Pima pineapple cacti.

EFFECTS OF THE ACTION

Potential Project-related direct impacts on Pima pineapple cactus include removal of individuals during construction activities, which may result in an adverse impact on the Pima pineapple cactus at the population level. Direct effects are caused by the action and occur at the same time and place as the action. The construction of the Project will result in direct impacts to 99 Pima pineapple cactus and approximately 487 acres of Pima pineapple cactus habitat. Areas of permanent disturbance would remove portions of the seed bank, and areas of temporary disturbance could alter the seed bank. Disturbance of soils would change water infiltration, compact soil, and change local site conditions. Because of this, some additional Pima pineapple cacti that are adjacent to the construction workspace and the two are within 25 feet of access roads that need to be improved for construction will be impacted even though they do not fall within the construction footprint and will be mitigated using the measures described above.

Any individuals growing in the action area outside the Project area may also experience effects, such as fugitive dust. Dust can have both physical and chemical impacts (see Farmer 1993; Havaux 1992; Sharifi *et al.* 1997; Thompson *et al.* 1984; Walker and Everett 1987). Physical impacts of windborne fugitive dust on plants could include blockage and damage to stomata, shading, and abrasion of leaf surface or cuticle. Chemical impacts of dust, either directly on the plant surface or on the soil, may be more important than any physical impacts because dust deposited on the ground could produce changes in soil chemistry (including pH), which may result in the long-term changes in plant chemistry, species competition, and community structure. Dust can increase leaf temperature; inhibit pollen germination; reduce photosynthetic activity, respiration, transpiration and fruit set; decrease productivity; and alter community structure.

Indirect effects are caused by the action and are later in time, but are reasonably certain to occur. Recently disturbed areas have an increased potential to be invaded by noxious weeds (e.g., Lehmann lovegrass, buffelgrass), which can negatively affect Pima pineapple cactus. Although some areas of temporary disturbance may recover, it may take many years before full recovery is achieved. The amount of time it takes to restore the pipeline right-of-way to natural conditions will be affected by post-construction use of the right-of-way by vehicular and foot traffic. Repeated use of the pipeline right-of-way as a road or trail will inhibit or eliminate the ability of those areas to revegetate with native vegetation. Research indicates that the Pima pineapple cactus is an obligate out-crosser, requiring that cacti must be within 600 meters of each other in order to effectively pollinate. Pollination also appears to be more effective when other species of native cacti are growing near Pima pineapple cactus, as pollinator attractors (McDonald 2005).

In addition, the post-construction use of the pipeline right-of-way will result in the ongoing potential for Pima pineapple cacti to be trampled or run over, affecting the viability of individual cacti within the right-of-way.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

There are no Federal lands within the Sierrita Project footprint, but FWS and BLM manage and administer projects and permits on adjacent lands within the action area; therefore, some activities that could potentially affect Pima pineapple cactus are likely Federal activities subject to additional Section 7 consultation under the ESA.

Non-Federal actions include continued road maintenance, grazing activities, and recreation in the action area, current and future development, other nearby utility projects, and unregulated activities on non-Federal lands, such as trespass livestock and inappropriate use of OHVs, which can cumulatively adversely affect the Pima pineapple cactus. Additional cumulative effects on Pima pineapple cactus include recreation without a Federal nexus and cross-border activities that include the following: human traffic; deposition of trash; new trails from human traffic; increased fire risk from human traffic; and water depletion and contamination.

The Alliance, whose members include the majority of the land owners and state lease holders in the Altar Valley, are currently working to implement a prescribed fire plan. The Alliance's burn plan generally covers the remaining portions of the Altar Valley Drainage outside of the Refuge. This would include the only portion of Pima pineapple cactus' known distribution that is not currently impacted by development. If adequate conservation measures are not put into place and implemented, and associated monitoring completed, Pima pineapple cactus populations in the northern portion of the Altar Valley could be impacted.

In addition, the corridor along SR 86 from Tucson, AZ to Three-points, AZ is being developed at an increased rate, in particular the north end of the Altar Valley. We are currently aware of development plans for approximately 640 acres, south of Three-points. This area is likely to be under increased pressure for urban developments in the near future. Developments in this area could effectively isolate the southern portion of the Altar Valley from the rest of the range of Pima pineapple cactus. It is likely that some ADOT highway maintenance and improvements along Highways 86 and 286 are implemented without a Federal nexus. The introduction of infrastructure associated with livestock grazing, agricultural activities, and residential and urban development, such as highways and roads, has also impacted surface waters by disrupting lateral flow, disrupting or redirecting the natural drainage, and/or increasing flow velocity and erosion (Pima County 2000).

The Altar Valley is used by undocumented immigrants and drug and human traffickers, the U.S. Border Patrol, hunters, and recreationalists. When users cross through ephemeral wash features and the Altar Valley, their activities result in further deterioration through the formation of roads and/or trails. Road and trail formation disturbs and compacts soils resulting in increased wind and water erosion, tramples and removes vegetation, and may introduce and/or spread noxious and/or invasive species (Jordan 2000; BLM 2008). Vehicular traffic in dry washes disrupts soil conditions, contributing to soil instability and accelerating erosion of stream banks during flash flood events (NPS 2003). The foot and vehicle traffic associated with these users, along with prolonged drought conditions, have made it difficult to re-establish native vegetation and have in several locations established trails that are easily susceptible to erosion and the formation of additional dry washes and gullies.

CONCLUSION

After reviewing the current status of the Pima pineapple cactus, the environmental baseline for the action area, the effects of the proposed Sierrita Pipeline Project, and the cumulative effects, it is our biological opinion that the proposed Sierrita Pipeline Project, as proposed, is not likely to jeopardize the continued existence of the Pima pineapple cactus. No critical habitat has been designated for this species; therefore, none will be affected. We present this conclusion for the following reasons:

- The action area for the proposed action has been surveyed for the presence of Pima pineapple cacti and suitable habitat. Pima pineapple cacti will be avoided whenever possible.
- When individual Pima pineapple cacti cannot be avoided, and for impacts to suitable Pima pineapple cactus habitat, Sierrita will purchase credits at a 1:1 ratio from an approved Pima pineapple cactus mitigation bank to compensate for the approximately 487 acres of Pima pineapple cactus habitat that will be affected by the proposed action.
- Sierrita has agreed to implement a program for transplanting Pima pineapple cacti in order to increase the general knowledge and understanding of this tool as a potential conservation measure. Sierrita coordinated with the FWS to develop an approach for transplanting and monitoring Pima pineapple cacti. Sierrita and the FWS determined that information regarding the Pima pineapple cacti transplanting protocols will further conservation of this species, and Pima pineapple cacti that cannot be avoided will be transplanted in compliance with Sierrita's Reclamation Plan and Post Construction Vegetation Monitoring Document (see Appendices G and H of the Final EIS).
- Other Best Management Practices and Conservation Measures that will minimize effects to and contribute to the conservation of the Pima pineapple cactus will be implemented as outlined in the proposed action.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined (50 CFR 17.3) to include significant habitat

modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined (50 CFR 17.3) as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. “Incidental take” is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species, therefore, no discussion of incidental take of the Pima pineapple cactus will occur in this Incidental Take Statement. However, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of federally listed endangered plants from areas under Federal jurisdiction, or for any act that would remove, cut, dig up, or damage or destroy any such species on any other area in knowing violation of any regulation of any State or in the course of any violation of a State criminal trespass law.

Disposition of Dead or Injured Listed Species

Upon locating a dead, injured, or sick listed species, initial notification must be made to the FWS's Law Enforcement Office, 2450 W. Broadway Rd, Suite 113, Mesa, Arizona, 85202, telephone: 480/967-7900) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve the biological material in the best possible state.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. We recommend that the FERC participate in efforts to identify and conserve Pima pineapple cactus throughout its range.
2. We recommend that the FERC support research and monitoring proposals that will contribute to an increased understanding of important conservation efforts related to Pima pineapple cactus such as the effectiveness of translocating Pima pineapple cactus, appropriate management of conservation lands and conservation banks to promote recovery of Pima pineapple cactus, and effects of climate change and fire on Pima pineapple cactus.

REINITIATION NOTICE

This concludes formal consultation on the proposed Sierrita Pipeline Project as outlined in this BO. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Our office appreciates the FERC's efforts to identify and minimize effects to listed species from this Project. For further information please contact Scott Richardson (520) 670-6150 (x 242) or Jean Calhoun (520) 670-6150 (x 223). Please refer to the consultation number 02EAAZOO-2013-F-0035 in future correspondence concerning this Project.

Sincerely,

/ s / Jean Calhoun for
Steven L. Spangle
Field Supervisor

cc (hard copy):

Field Supervisor, Fish and Wildlife Service, Phoenix, AZ (2 copies)
Jean Calhoun, Assistant Field Supervisor, Fish and Wildlife Service, Tucson, AZ
Sally Flatland, Refuge Manager, Buenos Aires National Wildlife Refuge, Sasabe, AZ
U.S. Army Corps of Engineers, Phoenix, Arizona (Attn: Sallie Diebolt)

cc (electronic copy):

Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ (pep@azgfd.gov)
Regional Supervisor, Arizona Game and Fish Department, Tucson, AZ
(Attn: Kristin Terpening)

APPENDIX A.

Lesser Long-nosed Bat (*Leptonycteris yerbabuenae*)Environmental Baseline

This species is known from grasslands, arid scrublands, and oak woodlands below 5500 ft. in elevation. In Arizona, these bats arrive in mid- April, roosting in caves, abandoned mine shafts and tunnels. Young are typically born in maternity colonies in mid-May. Females and young remain in maternity roosts and forage on primarily saguaros below about 3500 ft. until approximately mid-July. At this time the range expands and bats are found up to about 5500 ft. in areas of semi-desert grassland and lower oak woodland, foraging primarily on agaves. These bats typically leave southern Arizona by late September to early October. While there are small caves and some mine shafts on or near the proposed pipeline route, no roost sites or maternity colonies are known to be within the action area for the proposed pipeline.

The primary threats to the lesser long-nosed bat are roost site loss or disturbance and impacts to forage availability (FWS 2007b). Other threats that have contributed to the current endangered status of the species include roost disturbance and deterioration, border activities, recreation, vandalism, fire, vampire bat control, mine closures, and forage availability. The effects of climate change (i.e., decreased precipitation and water resources) are a threat to many species, including the lesser long-nosed bat (Lenart 2007). For example, temperatures rose in the twentieth century and warming is predicted to continue over the twenty-first century. Although climate models are less certain about predicted trends in precipitation, the southwestern United States is expected to become warmer and drier. In addition, precipitation is expected to decrease in the southwestern United States, and many semi-arid regions will suffer a decrease in water resources from climate change as a result of less annual mean precipitation and reduced length of snow season and snow depth. Approximately half of the precipitation within the range of the lesser long-nosed bat typically falls in the summer months; however, the impacts of climate change on summer precipitation are not well understood. Drought conditions in the southwestern United States have increased over time and may have contributed to loss of lesser long-nosed bat populations since the species was originally listed in 1988, and possibly historically. Climate change trends are likely to continue, and the impacts on species will likely be complicated by interactions with other factors (e.g., interactions with habitat-disturbing activities and impacts to forage resources).

Lesser long-nosed bats are known to forage within the action area for the proposed Sierrita pipeline, using species of agave and columnar cacti, as well as hummingbird feeders. *Agave palmeri* in the action area typically occurs in relatively small numbers in the foothills portion of the proposed pipeline right-of-way. Saguaro cacti, which are not numerous within the action area, will be avoided, relocated, or replaced as part of the proposed action.

Conclusion

The Service concurs with the FERC determination that the action may affect, but is not likely to adversely affect lesser long-nosed bat, based upon the following:

- There are no known roost sites within the action area; therefore the effects to roosts will be discountable.
- Work will occur during daylight hours; therefore effects to foraging behavior will be minimized.
- Saguaro cacti and agaves within the Project footprint will be avoided, relocated, or replaced to result in no net loss of forage resources, therefore the effects to lesser long-nosed bat forage resources will be insignificant.

Chiricahua Leopard Frog (*Lithobates chiricahuensis*)

Environmental Baseline

The Chiricahua leopard frog was listed as a threatened species on June 13, 2002 (FWS 2002), without critical habitat. Included in the listing was a special rule to exempt operation and maintenance of livestock tanks on non-Federal lands from the Section 9 take prohibitions of the ESA. Subsequently, the Ramsey Canyon leopard frog (*Lithobates "subaquavocalis"*) was subsumed into *Lithobates chiricahuensis* (Crother 2008) and recognized by the USFWS as part of the listed entity (USFWS 2009). As a result, reevaluation of the species listing status was needed. A revised final rule was published on March 20, 2012 (77 FR 16324) that listed the species as threatened with critical habitat and maintained the special rule included in the original listing.

A recovery plan for Chiricahua leopard frog was completed in 2007 (FWS 2007c), and a 5-year review was completed in 2011 (FWS 2011c). The action area overlaps a portion of Recovery Unit 1 (Tumacacori-Atascosa-Pajarita) as designated by the Chiricahua Leopard Frog Recovery Plan, and also overlaps the Buenos Aires Central Tanks management area (MA) located on BANWR in the Altar Valley. Chiricahua leopard frogs are present in 4 functioning metapopulations within this recovery unit, including a metapopulation within the Buenos Aires Central Tanks MA. This metapopulation is currently considered to be the most stable metapopulation known within the range of the species (USFWS 2011c, 2012). The three other metapopulations in this recovery unit are within the Pajarita Wilderness MA on adjacent portions of the Coronado National Forest. The primary land use within this recovery unit and management area in the action area is ranching; one private rancher in the Altar Valley participates in the statewide Safe Harbor Agreement for the Chiricahua Leopard Frog in Arizona administered by the Arizona Game and Fish Department (Arizona Game and Fish Department and USFWS 2006). American bullfrogs (*Rana catesbeiana*), crayfish (*Orconectes virilis* and possibly others), non-native fishes, illegal border activity and law enforcement response, and drought continue to threaten frogs in recovery unit 1 (FWS 2011c). Chytridiomycosis, a fungal skin disease caused by the pathogen *Batrachochytrium dendrobatidis* (*Bd*), is present, but the frog is persisting with the disease, which appears to have little effect on population viability in recovery unit 1 (FWS 2011c). A tremendous effort has been made to eliminate nonnative

American bullfrogs throughout recovery unit 1 (USFWS 2011c). Efforts are underway to eliminate one of the last known populations of bullfrogs in the Altar Valley on the Santa Margarita Ranch to the south of BANWR and in the vicinity of Arivaca Lake east of BANWR (USFWS 2012, USFWS files). However, bullfrogs remain a threat to the Chiricahua leopard frog in the Altar Valley, and bullfrog control continues in the area to maintain the integrity of the Buenos Aires Central Tanks metapopulation.

The Chiricahua leopard frog was historically an inhabitant of a variety of aquatic habitats, including cienegas, pools, livestock tanks, lakes, reservoirs, streams, and rivers at elevations of 3,281 to 8,890 feet (FWS 2007c). Of those sites occupied by Chiricahua leopard frogs in New Mexico from 1994 to 1999, 67% were creeks or rivers, 17% were springs or spring runs, and 12% were stock tanks (see FWS 2007c). In Arizona, slightly more than half of all known historical localities are natural free flowing aquatic systems, a little less than half are stock tanks, and the remaining locations are lakes and reservoirs. Sixty-three percent of populations extant in Arizona from 1993 to 1996 were found in stock tanks (FWS 2007c). The Chiricahua leopard frog is now restricted to springs, livestock tanks, ponds, and streams in the upper portions of watersheds where nonnative predators (e.g., sportfishes, bullfrogs, crayfish, or barred tiger salamanders [*Ambystoma mavortium mavortium*]) either have not yet invaded or been introduced, or where the numbers of nonnative predators are few and habitats are complex, which allow Chiricahua leopard frogs to coexist with these species. Adult frogs eat arthropods and other invertebrates (AGFD 2006; FWS 2007c). Larvae are herbivorous and eat algae, organic debris, plant tissue, and minute organisms in the water. Stomach analyses of other members of the leopard frog complex from the western United States show a wide variety of prey items, including many types of aquatic and terrestrial invertebrates and small vertebrates. There are 16 stock tanks at which Chiricahua leopard frogs have occurred on the BANWR in recent years, and 5 of these stock tanks are known breeding sites (FWS files). No species-specific surveys have been conducted for Chiricahua leopard frogs for the purposes of this Project; however, the action area is located within the elevational range of the species, and Chiricahua leopard frogs are known to occur in the Altar Valley within 3 miles of the Project area (AGFD 2012). There are no perennial lotic aquatic habitats known to support the Chiricahua leopard frog in the action area; however, there are miles of ephemeral washes that could provide movement corridors and approximately 43 stock tanks (most are likely ephemeral but some could be perennial) within 1 mile of that Project area that could potentially support this species (FWS 2013). Appendix S of the Final EIS lists the washes in the Project area that are connected to and upstream of livestock tanks that could support this species during the summer monsoon period. The action area of this project for the Chiricahua Leopard frog includes these areas of ephemeral washes connected to stock tanks.

Conclusion

We concur with your determination that the proposed action is not likely to adversely affect the Chiricahua leopard frog for the following reasons:

- Only dispersal habitat for Chiricahua leopard frogs is identified within the Project footprint. Therefore, direct effects to Chiricahua leopard frogs occupying breeding habitat are discountable. However, because some stock tanks downstream of the project

footprint may be perennial, it is possible Chiricahua leopard frogs occupy such stock tanks. If breeding Chiricahua leopard frogs are found within the action area, Sierrita will consult with the FWS regarding how to avoid impacts to breeding frogs.

- A biological monitor that is qualified to identify Chiricahua leopard frogs will be present during construction of the proposed Project to assist the Environmental Inspector (EI). If Chiricahua leopard frogs are observed during construction, the qualified biological monitor and EI will ensure that project activities will not directly affect any Chiricahua leopard frogs through coordination with the FWS.
- The effects of the proposed action are thus insignificant and discountable in terms of individual Chiricahua leopard frogs and the species' population as a whole.

Chiricahua Leopard Frog Critical Habitat

Environmental Baseline

On March 15, 2011, the FWS proposed to designate critical habitat for the Chiricahua leopard frog (FWS 2011a). On September 21, 2011, the FWS notified the public of changes to the March 15 proposed critical habitat rule, proposing to add three additional units in New Mexico and to amend the PCEs (FWS 2011b). On March 20, 2012, the FWS designated critical habitat for the Chiricahua leopard frog (FWS 2012). Critical habitat for the Chiricahua leopard frog includes 39 areas in Arizona and New Mexico (FWS 2012). The designated critical habitat totals approximately 11,467 acres in Apache, Cochise, Gila, Graham, Greenlee, Pima, Santa Cruz, and Yavapai Counties, Arizona; and Catron, Hidalgo, Grant, Sierra, and Socorro Counties, New Mexico. No critical habitat units occur within the action area (FWS 2012). Los Moras Wash and Chongo Tank in Unit 8, the BANWR Central Tanks Unit (the closest designated critical habitat) is located approximately 2.5 miles east of the Project area (see Figure 2.10 of the Final EIS). Because some potential effects from the proposed action (sedimentation) could extend some distance from the project footprint, possible effects to Chiricahua leopard frog critical habitat are considered here.

The Primary Constituent Elements (PCEs) of leopard frog critical habitat are 1) presence of suitable aquatic breeding habitats and 2) dispersal and non-breeding habitat, including permanent and ephemeral water sources not suitable for breeding but which provide barrier-free dispersal corridors of appropriate length. These sites provide essential PCEs including breeding habitat in tanks which typically hold water over extended periods of time as well as dispersal and non-breeding habitats within and adjacent to drainages which are intermittently flooded and hold water over short periods of time. Leopard frogs can occur within any of these habitat areas, but have been documented in only a few of the tanks in recent years.

While no designated critical habitat occurs within the action area, several tanks and dispersal corridors suitable for Chiricahua leopard frogs are found in proximity to the proposed Sierrita Pipeline Project footprint. Appendix S of the Final EIS lists the washes in the Project area that are connected to and upstream of livestock tanks that could support this species during the summer monsoon period. Given the ability of Chiricahua leopard frogs to move across the landscape, potential effects of the proposed project may reach sites in proximity to the action area that are designated as critical habitat. Effects to flows within xeroriparian systems and

associated stock tanks may affect habitat factors for the Chiricahua leopard frog as described in PCE 2. Such impacts to PCE 2 from the proposed action will be minimized in these areas. Best management practices and conservation measures designed to protect leopard frogs would also protect critical habitat, including actions to reduce or stop sediment flows into tanks which could provide critical habitat for the Chiricahua leopard frog.

Threats to Chiricahua leopard frog critical habitat in proximity to the action area include a lack of permanent water sources in breeding habitats, chytridiomycosis (a fungal disease), and predation by non-native bull frogs (*Rana catesbeiana*) and crayfish (unknown species).

Conclusion

The Service concurs with the FERC determination that the proposed action may affect, but is not likely to adversely affect, destroy, or adversely modify Chiricahua leopard frog critical habitat, based upon the following:

- No critical habitat for the Chiricahua leopard frog occurs within the Project footprint, however, areas of riparian habitat and stock tanks are found in the action area that are in proximity to designated critical habitat. We expect the effects of the project to these areas of adjacent critical habitat to be discountable.
- PCE 1, the presence of suitable breeding habitat, will not be affected by the proposed action because adjacent areas of suitable critical habitat will be avoided through various conservation measures. Additionally, the proposed action will not increase the occurrence of non-native predators or competitors or chytrid fungus.
- As a result of the conservation measures and guidelines that will be implemented during the proposed action, riparian areas and drainages connected to critical habitat will be protected and buffered such that effects to PCEs 1 and 2 of Chiricahua leopard frog critical habitat will be insignificant.

Jaguar

Environmental Baseline

The jaguar was listed as an endangered species in the U.S. portion of the species' range on July 22, 1997 (FWS 1997), without critical habitat, and the non-U.S. population was listed as endangered in 1972 (FWS 2000). In 2010, the FWS, based on a court order, announced that designation of critical habitat for the jaguar was prudent (FWS 2010); therefore, the FWS, together with the Jaguar Recovery Team, developed a recovery outline, with scientific population and habitat analyses for jaguars that were considered in the preparation of a critical habitat proposal for the species in the northern portion of their range (Jaguar Recovery Team and FWS 2012).

Jaguars are known from a variety of vegetation communities in North and South America. Range-wide, jaguars are mostly found in tropical and subtropical zones (FWS 2008b). In the southwestern United States, the more open, dry habitat has been suggested as being marginal in terms of water, cover, and prey densities, although historically there was a presumably larger and

naturally breeding population (Brown and López González 2001). Jaguar populations in northwestern Mexico and the southwestern United States occur in arid areas, especially thornscrub, mesquite grassland, Madrean oak woodland, and pine oak woodland communities (Boydston and López-González 2005; McCain and Childs 2008). Based on 25 historical (from 1902 to 2001) reliable and spatially accurate jaguar sighting records in Arizona, the majority of jaguars were observed in scrub grasslands (56%) and Madrean evergreen forests (20%), all were within 6.2 miles of a water source, and most occurred in moderately rugged to extremely rugged terrain (Hatten et al. 2005). Additionally, river valleys and other drainage features likely “provide travel corridors for jaguars, along with higher prey densities, cooler air, and denser vegetation than surrounding habitats” (Jaguar Recovery Team and FWS 2012).

In the U.S.–Mexico borderlands, peccaries (javelina) and deer (white-tailed [*Odocoileus virginianus*] and mule [*O. hemionus*]) are presumably dietary mainstays; other potential prey species in the southwestern United States include white-nosed coatis (*Nasua nasua*), skunk (*Mephitis* spp., *Spilogale gracilis*), raccoon (*Procyon lotor*), and jackrabbit (*Lepus* spp.) (Hatten et al. 2005).

Jaguars have relatively large home ranges and appear to select relatively intact habitats away from human settlements (FWS 2008b). Jaguar home ranges are highly variable and depend on topography, available prey, and population dynamics; sizes range from 11 to 15 square miles in Belize; from 10 to 25 square miles for females in the dry and wet seasons, respectively, in Jalisco, Mexico (Brown and López González 2001; FWS 2008b); from 5 to 52 square miles during the wet season and 11 to 64 square miles during the dry season for males in Brazil, Venezuela, and Belize; and 38 square miles for two males and 16 square miles for four females in the tropical deciduous forest of Jalisco, Mexico (Jaguar Recovery Team and FWS 2012). Limited home range studies have been conducted for jaguars in northwestern Mexico, but telemetry data from an adult female in Sonora, Mexico, during the dry season was 39 square miles, and camera trap data indicated that the average male home range in Sonora is 32 to 77 square miles. No home range studies using standard radio-telemetry techniques have been conducted for jaguars in the southwestern United States.

The southwestern United States lies at the extreme northern limit of the jaguar’s range. It has been suggested that Arizona may support only marginal habitat for the species because of recent altered habitat from drought and associated large-scale catastrophic wildfires in recent years and that it therefore does not support a significant jaguar population. Hatten et al. (2003) estimated that 21% to 30% of Arizona (23,940–34,200 square miles) is potentially suitable jaguar habitat; however, the species currently occurs on an occasional basis in only a small portion of this area.

Habitat destruction and modification and the illegal killing of jaguars are the two most significant threats to the jaguar (Jaguar Recovery Team and FWS 2012). The legal (and illegal) killing of jaguars and their potential prey species have also contributed to the historical decline of the species in the United States (FWS 2008b). However, there have been no reports of jaguars having been killed by humans in the United States since the 1980s, and all recent records are from ranchers, mountain lion hunters, and others who have seen or photographed the animals without killing them. Human population growth and development have both direct and indirect impacts on jaguar populations because they fragment habitat and isolate populations of

jaguars and other wildlife. Further, roads may directly impact jaguars and their habitat, resulting in mortality caused by vehicles, disturbance, habitat fragmentation, changes in prey numbers or distribution, and provision of increased access for legal or illegal harvest. There are no known diseases or predators that threaten the jaguar (FWS 1997); however, the potential role of disease is poorly understood for the jaguar, and wild felid diseases are an increasing threat to wild cats due to habitat restriction and fragmentation and encroachment from domestic animals (Jaguar Recovery Team and FWS 2012).

Other current threats identified include the development of infrastructure projects (e.g., pedestrian fences, etc.) along the U.S.–Mexico border, which could impede the movements of jaguars (FWS 2008b). The international border is semi-permeable, however, with some areas (particularly in the mountains) that allow large-bodied animals to cross. Recent droughts have resulted in habitat loss, fragmentation, and degradation. Additionally, large-scale, open-pit mines have been identified as having the potential to threaten known core habitat of jaguars in southeastern Arizona (McCain and Childs 2008).

Similar to the previously discussed species, the effects of climate change (i.e., decreased precipitation and water resources) are a threat to many species, including the jaguar (Lenart 2007). For example, temperatures rose in the twentieth century, and warming is predicted to continue over the twenty-first century. Although climate models are less certain about predicted trends in precipitation, the southwestern United States is expected to become warmer and drier. In addition, precipitation is expected to decrease in the southwestern United States, and many semi-arid regions will suffer a decrease in water resources from climate change as a result of less annual mean precipitation and reduced length of snow season and snow depth. Approximately half of the precipitation within the range of the jaguar typically falls in the summer months; however, the impacts of climate change on summer precipitation are not well understood. Drought conditions in the southwestern United States have increased over time and may have contributed to loss of jaguar populations since the species was originally listed in 1997, and possibly historically. Climate change trends are likely to continue, and the impacts on species will likely be complicated by interactions with other factors (e.g., stochastic events driven by climate, such as drought and wildfires in jaguar habitat, and other habitat destruction and fragmentation) (Jaguar Recovery Team and FWS 2012).

No species-specific surveys have been conducted for jaguars for the purposes of this Project; however, the action area is located within the elevational range of the species and contains this species' habitat, and at least one individual jaguar has been documented using the Project area (FWS 2013). Additionally, a jaguar was recently sighted near the action area in the Baboquivari Mountains in 2009: the easternmost portion of the range of this individual was located approximately 20 miles southwest of the action area (McCain and Childs 2008). Since June 2011, a single male jaguar has been documented several times in the Santa Rita Mountains in Pima and Santa Cruz Counties and once in the Whetstone Mountains in Cochise County, approximately 40 miles and 60 miles east of the proposed Project area, respectively (AGFD 2011; Jaguar Recovery Team and FWS 2012). These locations are close enough to the action area that it is possible that this jaguar (or jaguars) could use the action area as part of its home range, or as a foray area (i.e., foraging, scouting, mate-seeking) (AGFD 2009; McCain and Childs 2008; FWS 2008b). Further, habitat conditions are such (e.g., action area contains open

spaces with minimal to no human population density and no stable nighttime lighting, provides connectivity to Mexico, contains adequate levels of native prey species, includes surface water sources in semidesert grassland vegetation, and contains some areas of rugged terrain) that the potential for jaguar occurrence remains reasonably likely (FWS 2013).

The action area is located within diffuse movement area D14 (Baboquivari/Coyote/Quinlan Mountains Wildland Block) and landscape movement area L19 (Poza Verde Mountains to Mexico) as identified during the development of the 2012 *Pima County Wildlife Connectivity Assessment: Report on Stakeholder Input* (AGFD 2012b). A landscape movement area is a type of wildlife linkage in which animals move between distinct habitat blocks, and the Poza Verde Mountains to Mexico landscape movement area (L19) connects the Baboquivari/Coyote/Quinlan Mountains Wildland Block (D14) and the BANWR Wildland Block (D17) to Mexico. Jaguar is a species that is known for both the Poza Verde Mountains to Mexico landscape movement area (L19) and the Baboquivari/Coyote/Quinlan Mountains Wildland Block (D14).

Conclusion

We concur with your determination that the proposed action is not likely to adversely affect the jaguar for the following reasons:

- The action area is within the range of the jaguar and contains habitat, as well as designated critical habitat for the jaguar. Jaguars are rare in Arizona, but have been detected in the past in proximity to this Project's action area. Human presence may temporarily disturb these cats. Because of the extremely rare nature of the jaguar in the action area, these effects would be considered rare occurrences and would typically be relatively short in duration during the time of construction. Thus, human disturbance and noise are expected to only have insignificant short- or long-term effects to the jaguar.
- Best management practices that limit habitat disturbance (i.e., reducing project footprint to a 75-foot-wide corridor in jaguar designated critical habitat in Brown Canyon) will be implemented during construction.
- The project area will be recontoured and seeded with an appropriate seed mix to restore native habitat. Monitoring and adaptive management will occur until restoration within the pipeline right-of-way is successful.
- Nighttime construction activities and associated lighting will be avoided, with the exception of drilling and refueling.
- The effects of the proposed action are thus insignificant and discountable in terms of individual jaguars and this species' population as a whole.

Jaguar Critical Habitat

Your October 30, 2013 correspondence concluded that the proposed action may affect, but is not likely to adversely affect, proposed jaguar (*Panthera onca*) critical habitat. Subsequently, we finalized the designation of jaguar critical habitat, effective April 4, 2014 (79 FR 12571).

Following this final rule designating critical habitat, you requested that we include the designated critical habitat in this consultation on the proposed action. We concur with your determination and provide our rationale below.

Description of the Proposed Action

The proposed action is the construction of approximately 60.9 miles of new 36-inch-diameter natural gas pipeline and associated facilities in the Altar Valley, Pima County, Arizona. A complete description of the proposed action is found in the attached BO.

The FWS published a proposal to designate critical habitat for the jaguar in Pima, Santa Cruz, and Cochise Counties of southeast Arizona, and in southwest New Mexico (77 FR 50214, 78 FR 39237, 78 FR 53390). A Final Rule designating critical habitat was published March 5, 2014 (79 FR 12571) and becomes effective April 4, 2014.

In the United States, jaguars have been found in a variety of habitats, ranging from low-elevation thornscrub and desertscrub to high-elevation coniferous forests. In Arizona, most encounters have occurred in Madrean evergreen-woodland, mixed scrub-grassland, and in riparian habitats. Regardless of habitat type, jaguars are generally found in well-vegetated areas. Jaguar habitat requires abundant prey sources, unfragmented movement corridors between the United States and Mexico and other habitat types, adequate cover and shelter for resting, access to water, and minimal human contact (Johnson et al., 2009).

The FWS has identified the following primary constituent elements as habitat features necessary to support jaguar:

- include expansive open spaces of at least 36.8 square miles that provide connectivity to Mexico;
- contain adequate levels of native prey species;
- include surface water sources available within 12.4 miles of each other;
- contain 1 to 50 percent canopy cover with Madrean evergreen woodland or semidesert grassland vegetation communities;
- are characterized by rugged terrain;
- have minimal to no human population density;
- have no major roads;
- have no stable nighttime lighting over any 0.4-square-mile area; and
- are below 6,562 feet elevation.

The critical habitat designated by the FWS contains primary constituent elements that are considered to satisfy these requirements. The Project area would cross critical habitat between MPs 38.0 and 39.2 and MPs 53.5 and 58.8 (see figure 4.7.1-2 of the Final EIS).

Between MPs 38.0 and 39.2, the Project would cross Brown Wash and impact approximately 24 acres of jaguar critical habitat, which is located west and parallel to the boundary of the Sonoran Semidesert Grasslands Management Unit of the BANWR and east of and parallel to the BANWR Brown Canyon Unit. The BANWR Brown Canyon Unit is currently restricted to the public and open only for guided tours in an effort to preserve the ecological integrity of the area. Brown Canyon is in the foothills of the Baboquivari Mountains and contains Madrean habitat in

its upper reaches (FWS 2003). The proposed right-of-way crosses Brown Wash in an area of dense hydriparian/mesoriarian vegetation, which may be used as shelter or travel corridors by jaguars. To minimize impacts on this riparian habitat, critical jaguar habitat, and potential wildlife movements, Sierrita would install the Brown Wash crossing section of the pipeline using the drag section method and within a reduced 75-foot-wide construction right-of-way (see section 2.3.2.8 of the Final EIS for a discussion of the drag section construction method).

The project area would also overlap 99 acres of jaguar critical habitat (Unit 1 – Baboquivari) in two areas: approximately 5 miles (75 acres) would overlap with Subunit 1b – Southern Baboquivari, and approximately 1 mile (24 acres) would overlap with Subunit 1a – Baboquivari-Coyote. Sierrita would impact approximately 75 acres of jaguar critical habitat between MPs 53.5 and 58.8, which consists of more rugged terrain associated with the foothills of the Pozo Verde Mountains. The Arizona Wildlife Linkages Workgroup (2006) and AGFD (2012b) postulate that jaguars may use the Pozo Verde Mountains as a north-south corridor between southeastern Arizona and Mexico (see section 4.5.3 of the Final BO). The Project would cross approximately 20 minor washes and La Osa Wash within the foothills of the Pozo Verde Mountains, which contain some xeroriarian habitat, although relatively less dense than in Brown Wash. Several livestock tanks are located east of the foothills of the Pozo Verde Mountains within this critical habitat area. The Project is west of the majority of these livestock tanks and east of the Pozo Verde Mountains, introducing a potential barrier to wildlife movements between habitat in the Pozo Verde Mountains and water sources. This barrier would result both from temporary disturbance caused during construction (jaguars would likely avoid the area) and habitat fragmentation. Trails and roads, livestock management, and minor residential development currently existing in this area also contribute to habitat fragmentation, in addition to ongoing illegal immigration, drug and human trafficking, and U.S. Border Patrol activities. In addition, the Project would result in the removal of vegetation, particularly riparian vegetation, which would reduce canopy cover required by jaguars to move between habitats and to hunt. The Project would also reduce habitat used by prey species, thereby reducing prey availability and hunting success.

Conclusion

We have analyzed the effects of the actions as presented in the BO, and the FERC's draft and final EISs, and determined that the proposed action may affect, but is not likely to adversely affect, jaguar critical habitat for the following reasons:

- Sierrita committed to recontouring and seeding jaguar critical habitat areas affected by the Project with an appropriate seed mix developed in consultation with the NRCS and FWS to restore native habitat. Further, Sierrita would restore cover densities to pre-construction levels, or to at least greater than 1 percent, but less than 50 percent canopy cover. Thus, effects to jaguar critical habitat PCEs related to unfragmented open space and adequate cover would be temporary and limited in scope.
- Sierrita will adopt restoration measures to deter unauthorized use of the permanent right-of-way by foot and vehicle users, reducing the potential for increased levels of human activity.

- Sierrita will also discharge hydrostatic test water meeting certain criteria into livestock tanks, to enhance livestock range conditions and wildlife habitat. This action would also maintain the jaguar critical habitat PCE related to water availability.
- Sierrita will implement its *Noxious Weed Control Plan* (see Appendix I of the Final EIS) and coordinate with land-managing agencies and landowners to control the spread of noxious weeds on the right-of-way. Also, fire management (e.g., prescribed burns) across the right-of-way would be allowed to continue to further enhance wildlife habitat. These activities would help maintain and/or improve wildlife habitat for jaguar prey species in the area.
- Additionally, Sierrita will avoid placing stable nighttime lighting over any 0.4-square-mile area located within or potentially impacting jaguar critical habitat to further reduce potential impacts on the jaguar through impacts on the primary constituent elements as identified by the FWS.

Therefore, we conclude that the proposed action may affect, but will not adversely affect or adversely modify jaguar critical habitat. We recommend that monitoring and adaptive management continue for the life of pipeline operations within areas designated as jaguar critical habitat so that these areas will maintain the necessary PCEs for jaguar critical habitat.

Masked Bobwhite Quail

Environmental Baseline

The masked bobwhite quail was listed as endangered in 1967 (FWS 1967) without critical habitat. A Recovery Plan for masked bobwhite was completed in February 1978 and revised in 1984 and again in 1995 (FWS 1995). The plan states that the masked bobwhite will be considered for downlisting to threatened once two viable populations are established in the United States, and cooperation with the Mexican government results in the reintroduction of two or more populations in Mexico and the existing populations in Mexico are maintained and increased. One management area, the BANWR, was established in 1985; it is located within the historical range of the bird and is managed to provide habitat recovery for this species. The proposed Sierrita Pipeline Project will occur adjacent to the BANWR.

The masked bobwhite is found in desert grasslands at elevations ranging from 1,000 to 4,000 feet where vegetation is highly diverse and moderately dense and consists of a variety of native grasses, forbs and shrubs, as well as some trees (AGFD 2001; FWS 2002). The masked bobwhite is closely associated with unarmed acacia (*Acacia angustissima*) and uses the seeds as a major food source in winter, fall, and early spring (FWS 2002). On BANWR, habitat within known home ranges had more aerial grass cover (e.g., *Bouteloua* spp., *Eragrostis* spp., *Aristida* spp., and *Sporobolus* spp.), less halfshrub cover and density, and less cactus density than areas outside the home ranges (AGFD 2001).

The most important threats to the masked bobwhite are grazing and drought (FWS 1995). Similar to the previously discussed species, the effects of climate change (i.e., decreased precipitation and water resources and increased evapotranspiration) are a threat to many species (Lenart 2007), including the masked bobwhite. For example, temperatures rose in the twentieth

century, and warming is predicted to continue over the twenty-first century. Although climate models are less certain about predicted trends in precipitation, the southwestern United States is expected to become warmer and drier. In addition, precipitation is expected to decrease in the southwestern United States, and many semi-arid regions will suffer a decrease in water resources from climate change as a result of less annual mean precipitation and reduced length of snow season and snow depth. Approximately half of the precipitation within the range of the masked bobwhite typically falls in the summer months; however, the impacts of climate change on summer precipitation are not well understood. Drought conditions in the southwestern United States have increased over time and have likely contributed to loss of masked bobwhite populations since the species was originally listed, and likely historically. Climate change trends are likely to continue, and the impacts on species will likely be complicated by interactions with other factors (e.g., interactions with nonnative species and disease).

No species-specific surveys have been conducted for masked bobwhite for the purposes of this Project; however, the action area is located within the elevational range of the species and the majority of the action area is considered masked bobwhite habitat. Masked bobwhites are known to occur in the Altar Valley within 3 miles of the Project area (AGFD 2012a).

Conclusion

We concur with your determination that the proposed action is not likely to adversely affect the masked bobwhite quail for the following reasons:

- The only known masked bobwhite individuals in the action area are the result of a refuge population of masked bobwhite quail resulting from the captive rearing of this species initiated in 1985 at Buenos Aires National Wildlife Refuge (BANWR) in the southern Altar Valley in Pima County, Arizona. In 1996, Buenos Aires' masked bobwhite quail population was estimated at 300-500. However, due to drought and declining habitat conditions, masked bobwhite quail have not been detected consistently in the Altar Valley for several years; thus, potential effects from the proposed action are discountable.
- A biological monitor who is qualified to identify masked bobwhite will be present during construction of the proposed project to assist the EI. If masked bobwhites are observed during construction, the qualified biological monitor will contact the BANWR to ensure positive identification. The BANWR staff, biological monitor, and EI will ensure that project activities will not directly affect any masked bobwhite and will report all such observations to the BANWR.
- South of MP 38, the seed mix used for post-construction restoration will include important masked bobwhite leguminous shrub forage species, depending on availability, such as white ball acacia (*Acacia angustissima*) and bundleflower (*Desmanthus cooleyi*), both of which are important winter masked bobwhite forage species, and will offset masked bobwhite forage loss.
- Invasive species control (see Appendices H and I of the Final EIS) will be implemented, which should reduce the effects of invasive species on the masked bobwhite to insignificant levels.
- The effects of the proposed action are thus insignificant and discountable in terms of individual masked bobwhite quail and the species' population as a whole.

APPENDIX B

Conference Reports**Northern Mexican Gartersnake**

Your October 30, 2013 correspondence concluded that the proposed action may affect, but is not likely to adversely affect, the northern Mexican gartersnake (*Thamnophis eques megalops*), a species proposed as threatened under the ESA (78 FR 41500). We concur with your determination and provide our rationale below. This response constitutes our Conference Report related to informal conference for the proposed listing of the northern Mexican gartersnake as threatened under the ESA.

Description of the Proposed Action

The proposed action is the construction of approximately 61 miles of new 36-inch-diameter natural gas pipeline and associated facilities in the Altar Valley, Pima County, Arizona. A complete description of the proposed action is found in the attached BO.

The northern Mexican gartersnake is restricted to riparian areas, except when dispersing, and occurs at elevations usually ranging from 3,000 to 5,000 feet, but may occur at elevations ranging from 130 to 8,497 feet (AGFD 2012a; FWS 2008a). An important component of northern Mexican gartersnake habitat is a stable supply of native prey, and general habitat types, including 1) source-area wetlands (ponds and cienegas); 2) large, lowland river riparian woodlands and forests; and 3) upland streamside gallery forests. The northern Mexican gartersnake historically occurred in Mexico, in New Mexico, and in every county in Arizona, and now occurs in only eight perennial or intermittent stream reaches and wetlands in Arizona. The species' most viable populations occur in fragmented areas within the middle and upper Verde River drainage (including Oak Creek and the Verde River), middle and lower Tonto Creek, the Cienega Creek drainage, and in a small number of isolated wetland habitats associated with the upper Santa Cruz basin within the San Rafael Valley in southeastern Arizona (AGFD 2012a; FWS 2006). The species is considered extant as a low-density population with the area of the BANWR, including, potentially, the action area for the proposed Sierrita Pipeline Project.

The most significant threats affecting the status of the northern Mexican gartersnake rangewide include negative ecological interactions with harmful nonnative species (crayfish, American bullfrogs, spiny-rayed warm water sportfish) and dewatering of suitable habitat (FWS 2013b). These factors, in combination with other threats that act on the species in a synergistic fashion contribute to fragmentation of populations and threaten genetic connectivity among populations.

Similar to the previously discussed species, the effects of climate change (i.e., decreased precipitation and water resources and increased evapotranspiration) are a threat to many species (Lenart 2007), including the northern Mexican gartersnake. For example, temperatures rose in the twentieth century, and warming is predicted to continue over the twenty-first century. Although climate models are less certain about predicted trends in precipitation, the southwestern United States is expected to become warmer and drier. In addition, precipitation is

expected to decrease in the southwestern United States, and many semi-arid regions will suffer a decrease in water resources from climate change as a result of less annual mean precipitation and reduced length of snow season and snow depth. Approximately half of the precipitation within the range of the northern Mexican gartersnake typically falls in the summer months; however, the impacts of climate change on summer precipitation are not well understood. Drought conditions in the southwestern United States have increased over time and have likely contributed to loss of northern Mexican gartersnake populations. Climate change trends are likely to continue, and the impacts on species will likely be complicated by interactions with other factors (e.g., interactions with nonnative species and disease).

Suitable habitat for this species exists within the general Project area in the form of livestock tanks, which may also support preferred prey species (see figure 4.7.1-7 of the Final EIS). The terrestrial spaces between aquatic habitats also support this species by allowing for thermoregulation, gestation, shelter, protection from predators, immigration, emigration, brumation, and foraging. Radio telemetry studies have observed northern Mexican gartersnakes moving several hundreds of meters away from water sources (Emmons 2014). In addition, during the summer monsoon period, there is the potential that northern Mexican gartersnakes could disperse through the Project area. Appendix S of the Final EIS lists the washes in the Project area that are connected to and upstream of livestock tanks that could support this species during the summer monsoon period.

The FWS has also identified riparian habitat adjacent to aquatic habitat as an important habitat element supporting this species by maintaining the integrity of the adjacent riparian area (e.g., maintain channel morphology, flood control, nutrient recharge) (FWS 2013c). Appendix U of the Final EIS identifies riparian habitats affected by the Project.

Potential Project-related direct and indirect impacts on northern Mexican gartersnakes include degradation and modification of suitable aquatic habitat (i.e., livestock tanks) through increased sedimentation or erosion caused by Project activities, including the removal of adjacent riparian vegetation; introduction of barriers to wildlife movement (e.g., within ephemeral washes); noise that could alter behavior and spatial and temporal distribution; and possibly injury/mortality by vehicles and heavy equipment and/or snakes falling into open trenches. The generation of noise emissions and degradation of aquatic habitat could also reduce prey availability, and thus reduce hunting success.

Conclusion

We have analyzed the effects of the actions as presented in the BO, and the FERC's draft and final EISs, and determined that the proposed action may affect, but is not likely to adversely affect, the proposed threatened northern Mexican gartersnake for the following reasons:

- Sierrita would adopt the same conservation measures outlined for the Chiricahua leopard frog in section 4.7.1.3 of the Final EIS;

- Sierrita will have a biological monitor who is qualified to identify northern Mexican gartersnakes present during construction to assist the EI. If northern Mexican gartersnakes are observed, the biologist and EI would ensure that Project activities do not directly affect any individuals;
- Sierrita will maintain the riparian shrub root crowns during clearing and grading;
- Sierrita will revegetate significant areas of disturbed riparian habitat (as defined by Pima County's Riparian Habitat Classification process) with native plant species, preferably woody species;
- Sierrita will place cut woody vegetation along the top of the ephemeral wash banks above the normal high water line to provide stabilization;
- Sierrita will implement its Plan and Procedures to further minimize potential impacts on ephemeral washes that could be used by this species as movement corridors during the summer monsoon period and eliminate or reduce sedimentation in downstream stock tanks; and
- The action area occurs outside but adjacent to an area considered occupied by the species as represented by a low-density population, reducing the likelihood that the species will be present during the construction phase of the project.

Therefore, we conclude that the proposed action will not jeopardize the northern Mexican gartersnake, proposed for listing as threatened under the ESA. We recommend that monitoring and adaptive management continue for the life of pipeline operations within areas that may support the northern Mexican gartersnake so that actions that may affect the northern Mexican gartersnake will be avoided or remain insignificant.

In the future, you may request, in writing, that we confirm this conference report as a concurrence under section 7 of the ESA if the listing of the northern Mexican gartersnake is finalized. If we find there have been no significant changes between the proposed and final listing rules, and the proposed action has not changed, we will confirm this conference report as a concurrence required under section 7 of the ESA for the Project.

Northern Mexican Gartersnake Proposed Critical Habitat

Your October 30, 2013 correspondence concluded that the proposed action may affect, but is not likely to adversely affect, proposed critical habitat for the northern Mexican gartersnake (*Thamnophis eques megalops*) (FWS 2013c). We concur with your determination and provide our rationale below. This response constitutes our Conference Report related to informal conference for the proposed designation of northern Mexican gartersnake critical habitat under the ESA.

Description of the Proposed Action

The proposed action is the construction of approximately 61 miles of new 36-inch-diameter natural gas pipeline and associated facilities in the Altar Valley, Pima County, Arizona. A complete description of the proposed action is found in the attached BO.

Based on our current knowledge of the physical and biological features and habitat characteristics required to sustain the northern Mexican gartersnake's life history processes, we determined that the primary constituent elements for northern Mexican gartersnake critical habitat are:

- Aquatic or riparian habitat that includes:
 - perennial or spatially intermittent streams of low to moderate gradient with pools or backwater habitat, and with a unregulated or modified/regulated flow regime that allows for periodic flooding and adequate river functions, such as flows capable of processing sediment loads; or
 - lentic wetlands, such as livestock tanks, springs, and cienegas;
 - shoreline habitat with adequate organic and inorganic structure complexity to support life-history functions; and
 - aquatic habitat with characteristics that support a native amphibian prey base.
- Adequate terrestrial space (600 feet lateral extent to either side of bankfull stage) adjacent to designated stream systems with sufficient structure characteristics to support life-history functions.
- A prey base consisting of viable populations of native amphibian and native fish species.
- An absence of nonnative fish species, bullfrogs (*Lithobates catesbeianus*), and/or crayfish (*Orconectes virilis*, *Procambarus clarki*, etc.), or occurrences of these nonnative species at low enough levels such that recruitment of northern Mexican gartersnakes and maintenance of viable native or nonnative prey species is still occurring.

Critical habitat has been proposed in 14 different units in central to southern Arizona for this species, of which the BANWR unit is the closest to the Project area. The BANWR critical habitat unit consists of 117,335 acres and includes the springs, seeps, streams, livestock tanks, and terrestrial space in between these features. The proposed Sierrita Pipeline Project does not cross the proposed critical habitat, but comes within 70 feet of critical habitat at MP 51.3 (see figure 4.7.1-7 of Final EIS).

Although the Project would not directly impact proposed northern Mexican gartersnake critical habitat, the Project-related indirect impacts include potential degradation and modification of aquatic habitat (i.e., livestock tanks) through increased sedimentation or erosion caused by Project activities, including the removal of adjacent riparian vegetation and introduction of barriers to wildlife movement (e.g., within ephemeral washes and riparian corridors).

During the summer monsoon period, there is the potential that northern Mexican gartersnakes could disperse through the Project area. Riparian Wildlife Movement Areas 6 and 7 are north-south connections where the northern Mexican gartersnake critical habitat is proposed (see section 4.5.3 of the Final EIS). It is possible that northern Mexican gartersnakes utilize the riparian communities within these riparian movement corridors for thermoregulation, gestation, shelter, protection from predators, immigration, emigration, brumation and foraging.

Conclusion

We have analyzed the effects of the actions as presented in the BO, and the FERC's draft and final EISs, and determined that the proposed action may affect, but is not likely to adversely affect, proposed northern Mexican gartersnake critical habitat for the following reasons:

- The proposed action will not affect PCEs 3 or 4;
- Effects to PCE's 1 and 2 will be avoided or minimized through best management practices and conservation measures including 1) to the extent possible, the avoidance and minimization of impacts to riparian habitat in Riparian Wildlife Movement Areas 6 and 7 that are north-south connections where the northern Mexican gartersnake critical habitat is proposed (see section 4.5.3 of the final EIS) and that may provide habitat for thermoregulation, gestation, shelter, protection from predators, immigration, emigration, brumation and foraging; and 2) implementing their Plan and Procedures to eliminate or reduce sedimentation in downstream stock tanks.

Therefore, we conclude that the proposed action will not destroy or adversely modify proposed northern Mexican gartersnake critical habitat. We recommend that monitoring and adaptive management continue for the life of pipeline operations within areas that may affect proposed or designated northern Mexican gartersnake critical habitat so that these areas will maintain the necessary PCEs for northern Mexican gartersnake critical habitat.

In the future, you may request, in writing, that we confirm this conference report as a concurrence under section 7 of the ESA if the proposed northern Mexican gartersnake critical habitat is designated. If we find there have been no significant changes between the proposed and final critical habitat determinations, and the proposed action has not changed, we will confirm this conference report as a concurrence required under section 7 of the ESA for the Project.

References

- Anable, M.E., M. P. McClaran, and G.B. Ruyle. 1992. Spread of introduced Lehmann lovegrass (*Eragrostis lehmanniana* Nee.) in southern Arizona, USA. *Biological Conservation* 61:181-188.
- Arizona Game and Fish Department (AGFD). 2006. *Rana chiricahuensis*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix.
- . 2009. Macho B jaguar information. Available http://www.azgfd.gov/w_c/jaguar/machob.shtml. Accessed July 26, 2011.
- . 2011. Game and Fish confirms report of jaguar in southern Arizona. Available at: <http://azgfd.net/artman/publish/NewsMedia/Game-and-Fish-confirms-report-of-jaguar-insouthern-Arizona.shtml>. Accessed December 19, 2011.
- . 2012a. *Special Status Species for the Sasabe Lateral Project*. Heritage Data Management System, Project Evaluation Program. September 10.
- . 2012b. *The Pima County Wildlife Connectivity Assessment: Report on Stakeholder Input*. Tucson: Arizona Game and Fish Department.
- Baker, M. 2004. Phenetic analysis of *Coryphantha*, section *Robustispina* (Cactaceae), part 1: stem characters. Final report submitted to U.S. Fish and Wildlife Service under contract with the Arizona Board of Regents, University of Arizona, Tucson. 21 pp.
- Baker, M. 2005. Geographic distribution and DNA analysis of *Coryphantha robustispina* ssp. *robustispina*, part 1: geographic distribution. Final report submitted to the Department of Agriculture on 7 July 2005. 7 pp. + appendices.
- Baker, M. 2006. 2005 demographic study of *Coryphantha robustispina* ssp. *robustispina*. Status report prepared for Bureau of Reclamation. 17 pp.
- Baker, M. 2011. A demographic study of *Coryphantha robustispina* ssp. *robustispina* – report to BOR. Phoenix Area Office. 51 pp.
- Baker, M. and C.A. Butterworth. 2013. Geographic distribution and taxonomic circumscription of populations within *Coryphantha* section *robustispina* (Cactaceae). *American Journal of Botany* 100(5): 984-997.
- Benson, L. 1982. *The Cacti of the United States and Canada*. Stanford University Press, Stanford, CA. Page 820.

- Boydston, E.E., and C.A. López-González. 2005. Sexual differentiation in the distribution potential of northern jaguars (*Panthera onca*). In *Connecting Mountain Islands and Desert Seas: Biodiversity and Management of the Madrean Archipelago II*, edited by G.J. Gottfried, B.S. Gebow, L.G. Eskew, and C.B. Edminster, pp. 51–56. RMRS-P-36. Fort Collins, Colorado: Rocky Mountain Research Station, Forest Service.
- Brown, D.E. (ed.). 1994. *Biotic Communities: Southwestern United States and Northwestern Mexico*. Salt Lake City: University of Utah Press.
- Brown, D.E., ed. 1982. Biotic Communities of the American Southwest---United States and Mexico. *Desert Plants* 4:1-342.
- Brown, D.E., and C. López González. 2001. *Borderland Jaguars; Tigres de la Frontera*. Logan, Utah: University of Utah Press.
- Buffelgrass Working Group. 2007. Buffelgrass invasion in the Sonoran Desert: Imminent risks and unavoidable mitigation. 4 pp. <http://www.buffelgrass.org/pdf/invasion.pdf>, accessed May 19, 2009.
- Bureau of Land Management (BLM). 2008. Yuma Field Office Proposed Resource Management Plan and Final Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Colorado River District, Yuma Field Office, Arizona. April 2008.
- Crother, B.I. (ed.). 2008. Scientific and Common Names for Amphibians and Reptiles of North America North of México. Society for the Study of Amphibians and Reptiles, Herpetological Circular No. 37:1-84
- Ecosphere Environmental Services Inc. 1992. Final Report: A survey for threatened and endangered plant species at three proposed reservoir sites and associated pipelines. Bureau of Reclamation contract 0-CS-32-1950. Farmington, NM. 69 pp.
- Emmons, I.D. 2014. E-mail correspondence from Iain Emmons (Northern Arizona University) (January 15, 2014; 0819 hrs).
- Farmer, A.M. 1993. The effects of dust on vegetation – a review. *Environmental Pollution* 79(1993):63–75.
- Gori, D. F. and C. A. F. Enquist. 2003. An assessment of the spatial extent and condition of grasslands in Central and Southern Arizona, Southwestern New Mexico and Northern Mexico. Prepared by the Nature Conservancy, Arizona Chapter. 28 pp.
- Hatten, J.R., A. Averill-Murray, and W.E. Van Pelt. 2005. A spatial model of potential jaguar habitat in Arizona. *Journal of Wildlife Management* 69(3):1024–1033.
- Havaux, M. 1992. Stress tolerance of photosystem II in vivo – antagonistic effects of water, heat, and photoinhibition stresses. *Plant Physiology* 100:424–432.

- Jaguar Recovery Team, and U.S. Fish and Wildlife Service. 2012. *Recovery Outline for the Jaguar (Panthera onca)*. Available at: <http://www.fws.gov/southwest/es/arizona/Documents/SpeciesDocs/Jaguar/049777%20-%20Jaguar%20Recovery%20Outline.pdf>. Accessed February 27, 2013.
- Johnson, M. B. 2004. Cacti, other succulents, and unusual xerophytes of southern Arizona. Boyce Thompson Southwestern Arboretum, Superior, AZ. 96 pp.
- Jordan, M. 2000. Ecological Impacts of Recreational Use of Trails: A Literature Review. The Nature Conservancy, 250 Lawrence Hill Road, Cold Spring Harbor, New York.
- Lenart, M. 2007. *Global Warming in the Southwest: Projections, Observations and Impacts*. Tucson: The Climate Assessment Project for the Southwest (CLIMAS) Institute for the Study of Planet Earth, the University of Arizona.
- McCain, E.B., and J.L. Childs. 2008. Evidence of resident jaguars (*Panthera onca*) in the southwestern United States and the implications for conservation. *Journal of Mammalogy* 89(1):1–10
- McDonald, C. J. 2005. Conservation of the rare Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*): recruitment after fires and pollination in the Altar Valley of southern Arizona. Master of Science Thesis, School of Natural Resource, The University of Arizona. 82 pp.
- McPherson, G. R. 2002. Relationship of ecological variables in the field with the presence of Pima pineapple cactus. Report to USFWS under agreement 1448-20181-01-J818. 4 pp.
- McPherson, G.R. 1995. The role of fire in desert grasslands. Pages 130-151 in M.P. McClaran and T.R. Van Devender (editors), *The Desert Grassland*. University of Arizona Press, Tucson, Arizona.
- National Park Service. 2003. Proposed Vehicle Barrier Environmental Assessment. Organ Pipe Cactus National Monument/Coronado National Memorial, Arizona. U.S. Department of the Interior, National Park Service. April 2003.
- Nobel, P.S. 1984. Extreme temperatures and thermal tolerances for seedlings of desert succulents. *Oecologia* 62:310-317.
- Paredes-Aguilar, R., T. R. Van Devender, and R. S. Felger. 2000. *Cactáceas de Sonora, México: Su diversidad, uso, y conservación*. Instituto del Medio Ambiente y el Desarrollo Sustentable del Estado de Sonora (IMADES), Hermosillo, Sonora y Arizona-Sonora Desert Museum, Tucson, AZ. 143 pp.

- Phillips, A. M. III, B. G. Phillips, and N. Brian. 1981. Status report for *Coryphantha scheeri* var. *robustispina*. Unpublished Report. U.S. Fish and Wildlife Service, Office of Endangered Species, Albuquerque, NM.
- Pima County Association Of Governments, 1996. Population handbook 1995.
- Pima County. 2000. Resources of the Altar Valley Subarea, Sonoran Desert Conservation Plan. Chapter 9 – Subarea 6a – Altar Valley: Watershed/Watercourse Characteristics. Draft 1.
- Pima County. 1998. Native Plant Preservation. Chapter 18.72.
- RECON Environmental, Inc. 2006. Draft Pima County Multi-Species Conservation Plan, Pima County, Arizona and Attachments.
- Roller, P. S. and W. L. Halvorson. 1997. Fire and Pima pineapple cactus (*Coryphantha scheeri* Kuntze var. *robustispina* Schott) in southern Arizona. In Proceedings of Fire Effects on Rare and Endangered Species and Habitats Conference, Coeur d’Alene, Idaho. Pp. 267-274.
- Routson, R., M. Dimmitt, and R. C. Brusca. 2004. A demographic study of *Coryphantha scheeri* var. *robustispina*. Final report to USFWS. NFWF contract # 2000-0015. 18 pp.
- Ruyle, G. B., B. A. Roundy, and J. R. Cox. 1988. Effects of burning on germinability of Lehmanns lovegrass. *Journal of Range Management* 41:404-406.
- Schmalzel, R. J., R. T. Nixon, A. L. Best, and J. A. Tress. 2004. Morphometric variation in *Coryphantha robustispina* (Cactaceae). *Systematic Botany* 29:553-568.
- Sharifi, M.R., A.C. Gibson, and P.W. Rundel. 1997. Surface dust impacts on gas exchange in Mojave Desert shrubs. *Journal of Applied Ecology* 34(4):827–846.
- SWCA, Inc. 2001. September 12, 2001 Technical Memorandum regarding the PPC mitigation program at Las Campanas.
- Thompson, J.R., P.W. Mueller, W. Flückiger, and A.J. Rutter. 1984. The effect of dust on photosynthesis and its significance for roadside plants. *Environmental Pollution* 34:171–190.
- U.S. Fish and Wildlife Service. 1993. Determination of endangered status for the plant PPC (*Coryphantha scheeri* var. *robustispina*). *Federal Register* 58(158):49875-49880.
- . 1997. Endangered and threatened wildlife and plants; final rule to extend endangered status for the jaguar in the United States. *Federal Register* 62(140):39147–39157.
- . 2000. Jaguar: General species information. Available at: <http://www.fws.gov/southwest/es/arizona/Jaguar.htm>. Accessed June 29, 2011.

- . 2002. Endangered and threatened wildlife and plants; listing of the Chiricahua Leopard Frog (*Rana chiricahuensis*); final rule. *Federal Register* 67(114):40790–40811.
- . 2004. Biological Opinion on the Amended 2003 BANWR Fire Management Plan. AESO 2-21-02-F-068 R1. Arizona Ecological Services Office, Phoenix, Arizona. May 18, 2004. 20pp.
- . 2005. Biological Opinion on the Buenos Aires National Wildlife Refuge Fire Management Plan for the 2005-2008 Burn Seasons. AESO 02-21-05-F-0243. Arizona Ecological Services Office, Phoenix, Arizona. May 20, 2005. 56pp.
- . 2006. Mexican gartersnake (*Thamnophis eques*): General species information. Available at:<http://www.fws.gov/southwest/es/arizona/Documents/Redbook/Mexican%20Gartersnake%20RB.pdf>. Accessed February 26, 2013.
- . 2007a. 5-year review for Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*). Arizona Ecological Services Office, Phoenix, Arizona. 17 pp. Available at: http://www.fws.gov/southwest/es/arizona/Documents/SpeciesDocs/PimaPineappleCactus/PPC_5yrReview.pdf
- . 2007b. Lesser long-nosed bat 5-year review: summary and evaluation. Available at: <http://www.fws.gov/southwest/es/arizona/Lesser.htm>. Accessed June 30, 2011.
- . 2007c. *Chiricahua Leopard Frog* (*Rana chiricahuensis*) *Final Recovery Plan*. Albuquerque, New Mexico: U.S. Fish and Wildlife Service, Southwest Region.
- . 2008a. Biological Opinion for the Altar Valley Fire Management Plan. AESO 22410-2005-F-0002. Arizona Ecological Services Office, Tucson, Arizona. December 15, 2008. 40pp.
- . 2008b. Biological opinion on Secure Border Initiative (SBInet) Tucson West Tower Project, Ajo, Tucson, Casa Grande, Nogales, and Sonoita Stations Area of Operation, U.S. Border Patrol, Tucson Sector, Arizona (AESO/SE 22410-2008-F-0373). Available at:<http://www.fws.gov/southwest/es/arizona/Biological.htm>. Accessed June 30, 2011.
- . 2010. Endangered and threatened wildlife and plants; determination that designation of critical habitat is prudent for the jaguar. *Federal Register* 75(8):1741–1744.
- . 2011a. Endangered and threatened wildlife and plants; Listing and designation of critical habitat for the Chiricahua leopard frog; Proposed rule. *Federal Register* 76(50):14126–14207.
- . 2011b. Endangered and threatened wildlife and plants; Listing and designation of critical habitat for the Chiricahua leopard frog; Proposed rule; Reopening of comment period. *Federal Register* 76(183):58441–58455.

- _____. 2011c. Chiricahua leopard frog (*Lithobates [=Rana] chiricahuensis*) 5-Year Review: Summary and Evaluation. Arizona Ecological Services Office, Phoenix, Arizona.
- _____. 2012. Endangered and threatened wildlife and plants; Listing and designation of critical habitat for the Chiricahua Leopard Frog. *Federal Register* 77(54):16324–16424.
- _____. 2013a. Preliminary discussion of ESA, MBTA, and BGEPA with respect to Sasabe Lateral Project. Reference No. AESO/SE 02EAAZ00-2013-R-0035. Letter on file, Federal Energy Regulatory Commission, from Jean Calhoun, Assistant Field Supervisor, U.S. Fish and Wildlife Service, to Nichole M. Seidell, CH2M Hill Engineers, Inc. January 22.
- _____. 2013b. Endangered and threatened wildlife and plants; threatened status for the northern Mexican gartersnake and narrow-headed gartersnake; proposed rule. *Federal Register* 78:41500-41547.
- _____. 2013c. Endangered and threatened wildlife and plants; designation of critical habitat for the northern Mexican gartersnake and narrow-headed gartersnake; proposed rule. *Federal Register* 78:41550-41608.
- Walker, D.A., and K.R. Everett. 1987. Road dust and its environmental impact on Alaskan taiga and tundra. *Arctic and Alpine Research* 19(4):479–489.
- WestLand Resources, Inc. 2004. January 26, 2004, Technical Memorandum regarding the transplanted PPC at the Madera Highland Reserve.
- WestLand Resources, Inc. 2008. May 22, 2008, Technical Memorandum regarding the survival of transplanted Pima pineapple cactus on the Sycamore Highland Property.