

IMPACTS WARRANTING REGIONAL MITIGATION RATIONALE - SUMMARY TABLE FOR ANTONITO SOUTHEAST SOLAR ENERGY ZONE (SEZ)

Resource/ Issue	Residual or Unavoidable Impact? ¹	How certain is it that the residual impacts will occur? ²	How significant are the residual impacts onsite? ³	How significant are the residual impacts of developing the Antonito SEZ in the region (San Luis Valley-Taos Plateau)? ⁴	Role in the ecosystem? ⁵	Other Considerations	Are potential residual impacts likely to warrant regional mitigation? ⁶
Acoustics	Probable Terrestrial wildlife, birds, bats	Probable Noise level depends on technology, construction and operational phase traffic	Moderately Context: Low current ambient noise on site. Intensity & Duration: Construction-phase noise limited, operation-phase traffic noise levels 30+ years or permanent change	Moderately Residual operational-phase noise impacts resulting from 80% build out of 9,700 acre SEZ, represent a large undeveloped geographic area where new noise would occur, would be of long duration: (minimum of 30 years) and cumulative to noise sources from the nearby Imery plant, railroad, Highway 285 and Town of Antonito. <i>See also endnoteⁱ</i>	Noise associated with solar development on the SEZ represents a Human Element that also impacts wildlife.	SEZ noise impacts would be cumulative to vegetation-habitat impacts from 80% build out of the 2,650 acres at Los Mogotes E SEZ and other ongoing activities in the vicinity of the Antonito SE SEZ.	Possibly When considered cumulative to impacts associated with loss of 9,700 acres of vegetation-habitat for terrestrial wildlife, sensitive species, raptors, and migratory birds.

¹ BLM CO-NM Technical-IDT Qualitative Assessment Rating : **Yes , Probable, Possible, Unlikely, No**

² BLM CO-NM Technical-IDT Qualitative Assessment Rating : **Certain, Probable, Possible, Unlikely , No**

³ BLM CO-NM Technical-IDT Qualitative Assessment Rating: **Highly, Potentially Highly, Moderately Highly, Moderately, Low**

⁴ BLM CO-NM Technical-IDT Qualitative Assessment Rating: **Highly, Potentially Highly, Moderately Highly, Moderately, Low**. Status and trend of the resource evaluated on the basis of landscape assessment data (Argonne and BLM 2014) for current distribution and predicted effects of change agents, other baseline data sources (see http://www.blm.gov/co/st/en/fo/slvfo/solar/solar_regional_mitigation.html), and IDT specialist subject matter expertise.

⁵ Walston et al. 2014, Appendix D. Conservation Element-Specific Conceptual Models.

⁶ BLM Technical-IDT Qualitative Assessment Rating: **Yes, Possibly, No**

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Air Quality	<p>Yes</p> <p>Depending on level and timing of SEZ build out, particularly level of native plant cover retention within SEZ</p>	<p>Certain</p> <p>Under Solar PEIS ROD (BLM 2012) grading assumptions and 80% build out scenario for a 9,700 acre SEZ that does not specify native plant cover retention.</p> <p>Level of residual impact on-site depends on extent of site grading, level of new road construction, traffic, degree of retention of native plant cover, and/or use of dust suppressants.</p>	<p>Moderately Highly</p> <p>Considered PM10 avoidance and minimization measures core to residual impact onsite significance.</p> <p>The duration of construction-phase fugitive dust would be limited for any individual SEZ project with trafficked access routes likely mitigated by use of dust suppressants.</p> <p>The extent of 80% build out scenario, (roughly equivalent acreage to 48 fallowed center-pivot irrigation fields) is large.</p> <p>Calcic soil types and silty textured soils at surface and subsurface potentially exposed to wind erosion at Antonito SE SEZ is a driving USDA-NRCS and BLM residual impact concern.</p>	<p>Highly</p> <p>Aggregate residual air quality impacts from dust (PM10 – PM2.5) in a region and air basin (San Luis Valley) that annually experiences seasonal dust storms and measured events exceeding 400 ppm PM10, along with associated public health effects to sensitive populations</p> <p><u>Landscape:</u> Residual impacts could result from 80% build-out of the 9,700 acre SEZ, specifically new fugitive dust, to undeveloped areas in this air basin; specifically communities & households in Conejos County, CO adjacent or downwind to SEZ and residual visibility effects to Rio Grande National Monument in Taos County, NM.</p> <p>See also endnoteⁱⁱ</p>	Air emissions associated with solar development on the SEZ represent a Human Element that also impacts wildlife.	<p>Problematic dust sources adjacent to 9,700 acre SEZ.</p> <p>Possible concurrent 80% build out of 2,650 acres on Los Mogotes SEZ in Conejos County.</p> <p>Potential residual impacts resulting from use of dust suppressant at SEZ-scales on multiple projects over the 20-yr assessment period are unknown, and potentially extensive depending on area of 9,700 acre SEZ where suppressants would be applied.</p>	<p>Possibly</p> <p>Avoidance-minimization measures to reduce potential for fugitive dust generation based on technology (e.g., solar array mounting systems, panel height, etc.) and varied levels of native plant cover retention and/or use of dust suppressants are reasonable alternatives for project-level NEPA analysis.)</p> <p>Dust monitoring or dust studies should be used to identify, validate, or invalidate dust avoidance measures and inform adaptive management in Antonito SE SEZ development</p> <p>Findings to be informed by dust impact modeling (Cheng et al. 2015).</p>

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Climate Change	No						No
Cultural	Yes Cultural Landscape Assessment to inform assessment	Possible	Depends on results of Cultural Landscape Assessment analyses and pre-development cultural inventory and evaluation.		Human Element		Possibly Impacts warranting mitigation to be evaluated based on results of Cultural Landscape Assessment analyses and coordination with stakeholders

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Ecology: Vegetation and Riparian Areas	Yes	Certain Many impacts to riparian areas can be mitigated onsite by avoiding development in riparian areas and by the installation of engineering controls on surface water runoff/erosion.	Highly The extent of an 80% Antonito SE SEZ build out scenario, (roughly equivalent acreage to 48 center-pivot irrigation fields at 160 acres each) includes loss of important winterfat-shortgrass vegetation and represents very significant onsite big-game habitat conversion and fragmentation. Project-level NEPA vegetation avoidance alternatives may result in retaining and/or restoring some vegetation.	Highly Winterfat-short grass basin shrub-grassland loss at Antonito SE scale (9700 acres) and 80% build out scenario represents a regionally extensive acreage and high degree of winter range habitat loss and fragmentation adjacent to the Rio Grande del Norte National Monument. Any soil disturbance also affects ground nesting pollinators and host plant reproduction. Ground nesting pollinators are the most dominate pollinators in these systems. <u>Landscape:</u> Potential residual impacts to vegetation from Antonito SEZ development would occur within a San Luis Valley-Taos Plateau region, where 45% of the basin grassland and shrubland, (~737,854 acres) is projected to be moderately to very highly degraded and be subject to invasive species invasion by 2030, yet further reducing vegetation productivity in a landscape already 20% degraded from that ecological system change agent, (Argonne and BLM 2014). <i>See also endnoteⁱⁱⁱ</i>	Basic Component	Possible concurrent 80% build out of 2600 acres on Los Mogotes SEZ in Conejos County and other ongoing activities in the vicinity of the Antonito SE SEZ. SEZ Vegetation Management Plan needs to include best management practice (BMPs) for pollinators.	Yes As a critical component of a functioning ecosystem. When possible, native soils and vegetation should be left undisturbed and solar arrays should be placed on these undisturbed areas. Avoidance-minimization measures to maintain the highest degree of retention of native plant cover, foster low stature vegetation growth, and to reduce potential for fugitive dust generation based on technology (e.g., solar array mounting systems, panel height, etc.) are reasonable alternatives for project-level NEPA.

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Invasive & Noxious Weeds	Yes	Certain Vegetation management plan requirements, including weed management strategy, will reduce but not eliminate risk of spread of invasive and noxious weeds at 80% SEZ build-out scale.	Highly Design features can greatly reduce, but not eliminate the risk of establishment and spread of invasive species. The extent of an 80% Antonito SE SEZ build out scenario is roughly equivalent acreage to 48 center-pivot irrigation fields at 160 acres and represents a very large change in invasive species spread risk.	Highly Disturbance and/or loss of winterfat-short grass shrub-grassland at Antonito SE scale (9,700 acres) and 80% build out scenarios represent a regionally extensive acreage and high degree of native ground cover loss and increased invasive risk adjacent to the Rio Grande del Norte National Monument. Any soil disturbance also affects ground nesting pollinator and host plant reproduction, impacts those populations and affects plant reproduction. Ground nesting pollinators are the most dominate pollinators in these systems. <u>Landscape:</u> Potential residual impacts to vegetation from Antonito SEZ development would occur within a San Luis Valley-Taos Plateau region, where 45% of the basin grassland and shrubland (~737,854 acres) is projected to be moderately high to very highly degraded and be subject to invasive species invasion by 2030, yet further reducing vegetation productivity in a landscape already 20% degraded from that ecological system change agent (Argonne and BLM 2014). <i>See also endnote^{iv}</i>	Change Agent	Possible concurrent 80% build out of 2,600 acres on Los Mogotes SEZ in Conejos County and other ongoing activities in the vicinity of the Antonito SE SEZ.	Possibly As a critical component of a functioning ecosystem and high-cost land management action. When possible, the native soils and vegetation should be left undisturbed and solar arrays should be placed on these undisturbed areas. Avoidance-minimization measures to maintain the highest degree of retention of native plant cover, foster low stature vegetation growth, and to reduce potential for fugitive dust generation based on technology (e.g., solar array mounting systems, panel height, etc.) are reasonable alternatives for project-level NEPA.

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Ecology: Terrestrial Wildlife	Yes	Certain	Highly Expect the loss of habitat for most general wildlife species over the entire developable area.	Highly High ecological significance from residual impacts due to overall extent of habitat loss (80% of 9700 acres) for grassland fauna and reduction of connectivity to the San Antonio River corridor and to isolated water sources interspersed throughout SEZ. <u>Landscape:</u> High significance likely from residual cumulative impacts from Antonito SEZ development because SEZ is largely undeveloped, whereas 29% of grassland fauna habitat in the surrounding landscape has been either highly or very highly modified by human development; human modification of grassland fauna habitat is expected to increase to 37% by 2030. Likewise, pronghorn, elk/deer habitat, and migration habitat are defined as 3 conservation elements under this analysis and are currently intact in the SEZ but are highly or very highly modified at levels of 30%, 19%, and 8%, respectively, across the larger landscape and are expected to increase to 35%, 26%, and 14%, respectively, by 2030. <i>See also endnote^v</i>	Basic Component	There is movement of animals between this SEZ and the Rio Grande del Norte National Monument and Taos Plateau. Wildlife habitat was identified as one of the objects for which the monument was designated (White House 2013). Consideration of wildlife movements between the SEZ and the Monument are important.	Yes As a critical component of a functioning ecosystem.

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Ecology: Migratory Birds, Raptors, Eagle	Yes	Certain Based on inference to FWS-BLM monitoring (2012-2014) at Palen and Desert Sunlight solar facilities in California. Migratory bird, eagles, raptor monitoring data needed.	Potentially Highly Significance level will be re-evaluated when more monitoring data is available.	Potentially Highly The Rio Grande Gorge and the larger landscape of the Rio Grande del Norte National Monument is a significant part of a migratory bird flyway and partially designated for that object (migratory birds) in Presidential Proclamation (White House 2013). This SEZ is close to the Monument and would be closely tied in habitat use along this flyway. There is potential for impact to golden eagle, ferruginous hawk, sandhill cranes, and other migrating birds due to risk of collisions with the solar arrays in addition to the overall loss from 80% development of 9,700 acres of shrub/grassland habitat along this flyway. Cumulative impacts from the factors listed above in addition to increased noise in the SEZ, increased lighting, and increased insects in the development area attracting birds are additive to human development in the landscape. Projections show an increase in human development from the current level of 29% across the larger landscape to 37%, which could result in a higher significance of residual impacts for migrating birds through development of this SEZ. <i>See also endnote^{vi}</i>	Basic Component	Close proximity to the Rio Grande del Norte National Monument and Taos Plateau. Systematic survey, monitoring, and baseline research under regional ecological conditions required to understand residual or unavoidable impact, deterrence measures and effectiveness for migratory birds, raptors, and eagles	Yes As a key grassland component in the flyway for migrating birds.

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Ecology: Plant Special Status Species (SSS)	Yes	Certain Loss of habitat is certain. Loss of individual SSS plants is likely (e.g., Ripley's milkvetch)	Moderately Onsite survey required. Expect the total loss of SSS habitat or individual plants and/or habitat in the developable area.	Moderately Highly Moderately high significant residual impacts for sensitive plants are expected due to the anticipated 80% development of 9,700 acres as well as cumulative effects from the potential of also developing Los Mogotes SEZ. Minimization measures implemented that reduce soil disturbance and vegetation loss are likely to help, but not eliminate the impacts. Loss of special status species habitat or occurrence of sensitive plants is a regional concern when considered at the San Luis Valley – Taos Plateau ecological scale and relevant to long-term conservation of Ripley's milkvetch.	Basic Component (along with other vegetation)	Mitigation of impacts to SSS is required by BLM policy.	Yes

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Ecology: Avian or Terrestrial Special Status Species (SSS)	Yes	Certain Loss of habitat is certain. Loss of SSS animals is possible.	Highly Very high due to the SEZ size— expect the total loss of habitat for SSS animal species over the entire developable area.	Highly Aggregate habitat loss and fragmentation impacts resulting from 80% build out of 9,700 acres to eight BLM Terrestrial Special Status Species is a regional concern when considered at the San Luis Valley – Taos Plateau ecological scale and relevant to long-term conservation of Gunnison’s prairie dog, burrowing owl, swift fox, ferruginous hawk, Brewer’s sparrow, mountain plover, and Northern leopard frog. <u>Landscape</u> Moderately high significance of residual impacts are still anticipated for Gunnison’s prairie dog, burrowing owl, and swift fox. Avoidance measures protecting occupied habitat will reduce residual impacts; however, impacts would still be present because of overall habitat loss (80% of 9,700 acres), loss of connectivity of habitat, and cumulative effects. <i>See also endnote^{vii}</i>	Basic Component (along with other wildlife)	Mitigation of impacts to SSS is required by BLM policy.	Yes

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Environmental Justice	<p>Possible</p> <p>See also Air Quality.</p>	<p>Possible</p> <p>Depends on the level of fugitive dust generated, and the level of exposure of sensitive populations.</p>	<p>Potentially Highly</p> <p>The duration of construction-phase fugitive dust would be limited for any individual SEZ project with trafficked access routes likely mitigated by use of dust suppressants.</p> <p>The extent of the 80% build out scenario, (roughly equivalent acreage to 48 fallowed center-pivot irrigation fields) is large.</p> <p>Calcic soil texture at surface and subsurface potentially exposed to wind erosion at Antonito SE SEZ is a driving human health concern.</p>	<p>Potentially Highly</p> <p>Residual air quality impacts in a region and air basin that annually experiences seasonal dust storms, measured events exceeding 400 ppm PM10, and associated public health effects to sensitive populations.</p> <p>Conejos County households do not currently experience regional dust events to the extent of households in Alamosa, Costilla, Rio Grande, & Saguache Counties.</p> <p><u>Landscape</u> Residual impacts could result from 80% build-out of the 9,700 acre SEZ, specifically fugitive dust, to new areas in the air basin, specifically communities and households in Conejos County downwind of the SEZ, and residual visibility effects to Rio Grande del Norte National Monument in Taos County, NM.</p> <p>See also endnote^{viii}</p>	Human Element	<p>Problematic dust sources adjacent to 9,700 acre SEZ.</p> <p>Concurrent 80% build out of 2,650 acres on Los Mogotes SEZ in Conejos County.</p> <p>The potential residual impacts resulting from use of dust suppressant at SEZ-scales on multiple projects over the 20-yr assessment period are unknown and assumed to be large for the 9,700-acre SEZ.</p>	<p>Possibly</p> <p>Avoidance-minimization measures to reduce potential for fugitive dust generation based on technology (e.g., solar array mounting systems, panel height, etc.), or based on maintaining the highest degree of retention of native plant cover, are reasonable alternatives for project-level NEPA analysis.</p>

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<p>Hydrology: Surface Water and Water Quality</p>	<p>Yes</p> <p>Development of the SEZ may alter ephemeral stream channels that can impact runoff and groundwater recharge.</p> <p>Reductions to the connectivity of these areas with surface waters and groundwater could limit water availability and thus alter the ability of the area to support vegetation growth and diversity, generating critical habitat areas and connecting wildlife corridors.</p>	<p>Certain</p> <p>Based on SEZ grading assumptions and 80% build out scenario that does not specify native plant cover retention, there would be residual impacts on flow timing and routing, loss of ephemeral stream networks and alterations of natural drainage patterns.</p> <p>See also endnote^{ix}</p>	<p>Highly</p> <p>The SEZ is located within three HUC-12 watersheds. About 4,645 acres of land would be disturbed within one of the watersheds that has an area of 26,011 acres. The disturbance rate will be about 18% of this watershed. The other two watersheds would have 8% and 0.06% disturbance rates. Based on the disturbance rating, onsite residual impacts on these three watersheds would be very high, moderate, and low, respectively.</p>	<p>Moderately</p> <p>Although the total disturbance area of the SEZ with respect to the region is very minimal, currently 26% of the region has experienced high human development, and 19% of the region has been highly impacted by climate change. In addition, the region surface water is scarce, with mostly ephemeral and intermittent streams.</p> <p>Perennial streams originate in adjacent mountainous ecoregions. Very few lakes or reservoirs are present. Some perennial water bodies are changing to ephemeral. In general, all these impacts on an ecoregion with dry and arid climate, added cumulatively to the proposed SEZ development, would have moderate residual impacts in the region.</p>	<p>Basic Component</p>	<p>Some impacts can be mitigated onsite by avoiding development in the ephemeral drainages and by the installation of engineering controls on surface water runoff/erosion.</p> <p>Dependent on the level/type of dust suppressant used during SEZ development, there would be impacts on surface water quality.</p>	<p>Yes</p> <p>Depending on the level of grading and retention of native plant species.</p> <p>Avoidance-minimization measures to maintain the highest degree of retention of native plant cover and to reduce potential for fugitive dust generation based on technology (e.g., solar array mounting systems, panel height, etc.) are reasonable alternatives for project-level NEPA.</p>

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Hydrology: Groundwater Quality & Availability	<p>Yes.</p> <p>The nature of the solar technology deployed will dictate water requirements.</p> <p>Dependent on compensation requirements, on the water demands of the development, and whether the subsurface, hydrology is affected.</p> <p>Onsite mitigation will reduce, but will not eliminate the need for water.</p>	<p>Certain.</p> <p>Assuming 80% SEZ build-out and residual impacts.</p> <p>Depends on the level of water demand of the development and whether the subsurface hydrology is affected.</p>	<p>Potentially Highly</p> <p>Groundwater withdrawals for SEZ development may cause declines in groundwater elevations that can impact water availability for surface water features, vegetation, and ecological habitats.</p>	<p>Potentially Highly</p> <p>The Antonito Southeast SEZ is located in the Rio Grande Basin. The combined groundwater withdrawals for a solar energy facility and other withdrawals and uses in the basin could exceed the sustainable yield and dewater the aquifer to the degree that nearby water wells and other water bodies are adversely affected. Depending on solar technology deployed, groundwater withdrawals exceeding the sustainable yield of the groundwater basin could cause permanent loss of storage capacity in the aquifer. However, the strict management of water resources in the Rio Grande Basin acts to ensure that any impacts from a new water use would be minimal.</p>	<p>Basic Component</p>	<p>Groundwater depletion from the basin continues to increase. The total cumulative depletion of groundwater storage starting from 1900 to 2000 is about 3.3 km³ and from 1900 through 2008 is about 3.6 km³ (Konikow 2013).</p> <p>Dependent on the level/type of dust suppressant used during SEZ development, there would be impacts on groundwater quality.</p>	<p>Yes</p> <p>Depends on technology used and on compensation requirements.</p>
Lands & Realty	<p>No</p> <p>By regulation, any new activity must occur in deference to existing rights. Thus, potential impacts have been avoided.</p>						<p>No</p>

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Livestock Grazing	Yes	Certain Assuming 80% SEZ build-out and residual impacts on 3 grazing allotments.	Potentially Highly Under 80% build out scenario, impacts on 3 grazing allotments to be evaluated based on locations of development within the SEZ and project-level NEPA.	Moderately Winterfat-short grass basin shrub-grassland loss at Antonito SE scale (9,700 acres) and 80% build out scenario represents a regionally extensive acreage of public grazing land conversion.	Land Use	Rio Grande del Norte National Monument Planning. Regional private land solar development sector experience in Alamosa County during 2010-2012 substantiates value of under-panel sheep grazing for vegetation management as an alternative to mechanical and chemical approaches.	Possibly Project design features may address impacts. Livestock grazing alternatives that afford allotment conversion to sheep permits for vegetation management represent a reasonable project-level NEPA alternative.
Military & Civilian Aviation	No						No
Minerals	No					Lands have been withdrawn from location or entry under the mining laws.	No

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Native American Concerns	Yes	Probable Traditionally-important plants will likely be destroyed and habitat for traditionally-important animals will likely be lost.	See vegetation and wildlife sections in this table.	Residual impacts to be evaluated based on results of Cultural Landscape Assessment analyses.	Human element		Unknown at this time. Consultation on project applications will determine whether regional mitigation may be warranted.
Paleontology	No						No
Recreation	Possible	Probable Depends on mitigation measures implemented on the basis of project-level NEPA.	Low Relatively little recreation currently occurs in the SEZ. If new vehicle routes are established, a NEPA analysis would be required for those routes.	Low			No

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Socioeconomics	<p>Possible</p> <p>Over the course of a 30-year BLM right-of-way permit, some private sector employment, potential future but uncertain federal-state revenue sharing; county cost-of-services; grazing & current recreational activity preclusion (e.g., hunting).</p> <p>Indirectly influences wider SLV water markets and private land markets for renewable energy.</p>	Possible	Moderately	Potentially Highly	Human element		Possibly

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Soils/Erosion	<p>Yes</p> <p>Programmatic design features can reduce but not eliminate soil erosion risk assuming disturbance of up to 7,770 acres.</p> <p>Level of site grading would be a primary driver of residual impact for full build-out of SEZ.</p> <p>In addition, avoidance (not developing some areas) will minimize the acreage and soil stabilization measures can reduce post disturbance soil erosion.</p>	<p>Certain</p> <p>Based on SEZ grading assumptions and 80% build-out scenario that does not specify native plant cover retention, there would be residual impacts on soils.</p>	<p>Highly</p> <p>Soil disturbance that occurs as a result of construction activities like grading, excavation and backfilling that displace topsoil and disturb the existing soil profile.</p> <p>Such soil disturbances affect vegetation by disrupting indigenous plant communities and facilitating the growth of invasive species. In addition, soil loss due to erosion and deposition by wind and water and surface runoff would occur, resulting in sedimentation</p>	<p>Highly</p> <p>Although the total disturbance area of SEZ with respect to the region is very minimal, currently 26% of the region has experienced high human development, and 19% of the region has been highly impacted due to climate change, topsoil loss by wind and water erosion would have residual impact in the region. The degree of significance will depend on the level of grading and retention of native plant species</p>	Basic component		<p>Yes</p> <p>Reclaiming equivalent areas with bare and highly erodible soils in the region warranted</p> <p>Avoidance-minimization measures to reduce potential for fugitive dust generation based on technology (e.g., solar array mounting systems, panel height, etc.), and varied levels of native plant cover retention and/or use of dust suppressants are reasonable alternatives for project-level NEPA analyses.</p>

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<p>Specially Designated Areas & Lands with Wilderness Characteristics (LWC)</p>	<p>Yes</p> <p>Specially designated areas (SDAs) within 25 miles (40 km) of the SEZ that could be impacted by solar development.</p>	<p>Possible</p> <p>Visual data needed for key observation points around SEZ.</p> <p>Additional work regarding BLM's LWC inventory may be warranted.</p> <p>Programmatic design features require analysis of lands that have been identified in a citizen's wilderness proposal to determine whether they possess wilderness characteristics. All work must be completed in accordance with current BLM policies and procedures.</p>	<p>Potentially Highly</p> <p>Residual impacts to be evaluated based on locations of development within the SEZ and project-level NEPA.</p> <p>For visual impacts, full development of the SEZ with solar facilities would cause moderate to strong visual contrasts that could not be hidden from view from the specially designated areas.</p>	<p>Moderately Highly</p> <p>SEZ-specific programmatic design features require that early consultation be initiated with the entity responsible for developing the management plan for the Sangre de Cristo NHA, in order to understand how development of the SEZ could be consistent with NHA plans and goals.</p>	<p>Human element</p>	<p>Whether or not LWC are identified through ongoing inventory efforts, BLM can choose whether or not to manage entirely for that aspect of its multiple use mandate or entirely for solar energy development, or for something in between.</p> <p>Residual impacts to be evaluated based on locations of development within the SEZ and project-level NEPA.</p>	<p>Possibly</p> <p>Findings to be confirmed with results of additional ongoing analysis of impacts at key observation points.</p>

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Transportation	No	Probable Vehicle routes currently open within the SEZ could be closed or rerouted.	Low	Low	Human element	Local roads improvements will be made to accommodate additional traffic.	No
Visual	Yes The SEZ will be readily visible to travelers on U.S. 285, those visiting the Rio Grande del Norte National Monument, and on the Los Caminos Antiguos Scenic Byway.	Certain Additional data from key observation points is needed.	Potentially High Depends on locations of development within the SEZ and project-level NEPA.	Highly The Solar PEIS identified strong visual contrasts for some viewpoints in the San Antonio WSA, Los Caminos Antiguos Scenic Byway, the West Fork of the North Branch of the Old Spanish Trail, and for the community of Antonito. There would also be strong visual contrasts for some viewpoints within the newly designated Rio Grande del Norte National Monument.	Human element	For visual impacts, full development of the SEZ with solar facilities would cause moderate to strong visual contrasts that could not be hidden from view from the specially designated areas.	Yes Findings to be informed by results of additional ongoing analysis of impacts at key observation points.
Wild Horses & Burros	No				Land use		No

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ASSESSMENT END NOTES

ⁱ Landscape reasoning: While somewhat distant to people and households, potential future Antonito SE SEZ noise sources would occur in a landscape where wildlife experience large-scale modification of the acoustic environment. As an example 29% of habitat (~1,041,000 acres) for 3 BLM sensitive species (burrowing owl, Gunnison's prairie dog, and mountain plover) in the San Luis Valley-Taos Plateau ecoregion is currently highly or very highly modified by human development, and future human development and associated noise sources, are projected to increase to 37% of the landscape by 2030 (Argonne and BLM 2014).

In a regional geographic context, Antonito SE SEZ changes to the acoustic environment would occur in the portion of the San Luis Valley-Taos Plateau adjacent to the Rio Grande del Norte National Monument where natural state is an object of Presidential Proclamation (White House 2013).

ⁱⁱ Potential residual impacts from Antonito SEZ disturbance and new sources of fugitive dust generation would occur within a San Luis Valley-Taos Plateau region where 22% of the landscape (~1,094,000 acres) of the soil is currently highly to very highly impacted by human development, contributing to spring dust events and where developed landscapes are projected to increase to 29% landscape coverage by 2030 (Argonne and BLM 2014).

Residual air quality impacts from soil disturbance at the scale of Antonito SEZ would occur in a landscape where 34% of land cover is subject to high and very high temperature-precipitation effects of climate change, which influence drought severity and plant cover productivity, and exacerbate soil susceptibility to dust generation (Chang et al. 2015).

ⁱⁱⁱ High to very high degraded acreage from human development and climate change in the basin grassland and shrubland vegetation type characteristic of the Antonito SE SEZ are also expected to double in the SEZ region by 2030, further establishing ecological downward trend in SEZ region (Argonne and BLM 2014).

^{iv} High to very high degraded acreage from human development and climate change in the basin grassland and shrubland vegetation type characteristic of the Antonito SE SEZ, are also expected to double in the SEZ region by 2030 (Argonne and BLM 2014).

^v Moderately high significance is expected from impacting wildlife migration routes and overall habitat acreage for wildlife species ranging between Colorado and New Mexico's Rio Grande del Norte National Monument and the Taos Plateau. Wildlife habitat is an object of Presidential Proclamation (White House 2013). Presuming an 80% development level on 9,700 acres and a configuration that spans 5 miles parallel to the San Antonio River corridor, residual impacts for movement of big game are expected to be moderately high and movement to the north for pronghorn, and possibly other big game, will be greatly reduced or altered.

Moderate ecological significance is expected for residual impacts from SEZ development on groundwater resources depending on the methods used for development due to cumulative effects. Compounding effects include climate change, declining aquifers, and competing demands on the water resource. Currently, habitat in the landscape is already highly to very highly impacted by climate change with large magnitude increases expected by 2030. Two habitats more impacted by climate change are pronghorn habitat showing 11% highly to very highly affected in the landscape with a projection of increasing to 27% by 2030. Likewise, grassland fauna habitat is expected to change from 8% highly or very highly modified by climate change to 22% by 2030 (Argonne and BLM 2014).

^{vi} Migrating waterbirds also have high potential for residual impacts largely due to the significance of the flyway in this area. There is a high potential for collisions with the solar arrays and high expenditure of energy from flying to the site

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due to the appearance of water in that more confined location of the San Luis Valley. These impacts are cumulative with human development and climate change effects for these species.

Over 75 species of waterbirds are known to migrate through the San Luis Valley on their way to and from wintering to breeding grounds. Waterbirds are documented as a group that may be highly impacted by solar panels. Human development (categorized as highly to very highly modified) across the landscape in waterbird habitat is currently 32% and projected to be 38% by 2030. Waterbird habitat is currently 29% highly or very highly affected by climate change and those higher level climate impacts are projected to increase to 34% by 2030 (Argonne and BLM 2014). Because of these cumulative impacts, and the potential to impact water tables in and around the area, which could further effect the species, residual impacts are high for the waterbird migratory group.

vii Cumulative residual impacts include the overall loss of grass and shrubland habitat, increase in roads and disturbance, additive to current and anticipated increases in human development across the landscape (from 29% currently to 37% by 2030 categorized as highly to very highly modified in Gunnison prairie dog habitat). Cumulative effects also include current and projected climate change impacts to these species preferred habitat of shrub and grasslands. Currently, 17% of the landscape is highly or very highly impacted by climate change with a projection of 22% of the shrub/grassland habitat affected by 2030 (Argonne and BLM 2014).

Moderate residual impacts are expected for the Northern leopard frog. Avoidance measures that protect more prominent water bodies will reduce residual impacts to “moderate”, but development on 80% of 9,700 acres will result in loss of availability of ephemeral habitats in the SEZ not showing on the maps but that are important to frogs after rainfall events. Connectivity of these habitats in the SEZ will be greatly reduced and dispersal of species throughout these 9,700 acres will be minimized, especially if grading occurs. Any groundwater changes from operation will also result in residual effects to frogs. Cumulative impacts for the Northern leopard frog would be similar to shorebirds and waterfowl which show 29% of their habitat highly to very highly impacted by climate change currently with an increase to 34% highly to very highly impacted by 2030.

Moderately high residual impacts are expected for the ferruginous hawk and the peregrine falcon because of the loss of 80% of 9,700 acres and increasing risks for collisions with solar arrays while foraging. Minimization measures implemented that reduce perching availability are likely to help, but not eliminate the impacts. Cumulative impacts are expected from SEZ development due to high levels of human development in the landscape for these species, road building, increased traffic, and climate change impacts to the species habitat. Human development categorized as highly to very highly modified currently alters the habitat for ferruginous hawks across the landscape by 49% with a projection of 55% by 2030. Any groundwater changes that affect the vigor or health of the vegetation are likely to affect predator/prey relationships for these species. Any unmitigated water use is likely to create residual impacts by decreasing prey species abundance due to the anticipated 80% development of 9,700 acres as well as cumulative effects from the potential of also developing the Los Mogotes SEZ. Other cumulative effects include human development and invasive species factors that show 15% highly to very highly modified human development in Brewer’s sparrow habitat across the landscape with a projection of 27% high to very high development by 2030. This SEZ development is also likely to contribute to residual cumulative effects from invasive species. The current amount of Brewer’s sparrow habitat affected by invasives in the landscape is 23% whereas projections indicate their habitat may be affected by invasives at a level of 48% by 2030. Any groundwater changes in the area and/or surrounding area from the project are likely to have cumulative impacts additive to climate change affecting vegetative vigor for these species nesting and foraging habitats.

Moderately high residual impacts for the swift fox. Residual impacts to swift fox would occur due to their high degree of habitat specificity and inability to disperse long distances, unlike other canids. The 80% development of the 9,700 acres and the cumulative effects of the potential development of Los Mogotes SEZ would decrease availability and

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abundance of prey for swift fox, a species that may cover 8-10 km² in a single night while foraging. Swift fox overall habitat quality would be affected by human development. Currently 29% of the area has very high or high human development, while in 2030 projections indicate that 37% of the area will have very high or high human development. The anticipated future conditions would further limit foraging, prey abundance, and potential denning sites for swift fox.

Moderately high impacts for the Brewer's sparrow and the mountain plover are expected

Low to moderate residual impacts for the big free-tailed bat are expected due to the anticipated 80% development of 9,700 acres as well as cumulative effects from the potential of also developing Los Mogotes SEZ. The loss of habitat would reduce the amount of vegetation and insects that the Mexican free-tailed depends on for prey and the bat would have limited capacity to forage within any developed SEZ. Invasive species could affect species diversity and richness and overall abundance of prey species. Currently, 47% of the area is at high or very high impacts from invasives, while 2030 projections indicate that 65% of the area will experience high or very high levels of invasives. The Mexican free-tailed bat roosts in large colonies and is susceptible to large population declines when disturbed by human development. In 2030 human development could be at high or very high levels in 31% of the landscape and 23% of the landscape is currently at those levels.

^{viii} Potential residual impacts from Antonito SEZ disturbance and new sources of fugitive dust generation would occur within a San Luis Valley-Taos Plateau region where 23% of the soil landscape (~1,094,000 acres) is currently highly or very highly modified by human development, contributing to spring dust events and where developed landscapes are projected to increase to 29% landscape coverage by 2030 (Argonne and BLM 2014).

Residual air quality impacts from soil disturbance at the scale of Antonito SEZ would occur in a landscape where 34% of land cover is subject to high and very high temperature-precipitation effects of climate change, the latter which influence drought severity, plant cover productivity, & exacerbate soil susceptibility to dust generation

^{ix} All these processes could lead to increased erosion, sediment transport, and sediment deposition impacts. The modification of ephemeral water bodies could also result in some parts of the developed area receiving less water as the result of concentrating drainage patterns. Residual impacts depend on the level of retention of native plant cover and the extent of grading.

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