FES 12-24 • DOE/EIS-0403

Final Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States

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Final Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States (FES 12-24; DOE/EIS-0403)

Responsible Agencies: The U.S. Department of the Interior (DOI) Bureau of Land Management (BLM) and the U.S. Department of Energy (DOE) are co-lead agencies. Nineteen cooperating agencies participated in the preparation of this PEIS: U.S. Department of Defense; U.S. Bureau of Reclamation; U.S. Fish and Wildlife Service; U.S. National Park Service; U.S. Environmental Protection Agency, Region 9; U.S. Army Corps of Engineers, South Pacific Division; Arizona Game and Fish Department; California Energy Commission; California Public Utilities Commission; Nevada Department of Wildlife; N-4 Grazing Board, Nevada; Utah Public Lands Policy Coordination Office; Clark County, Nevada, including Clark County Department of Aviation; Doña Ana County, New Mexico; Esmeralda County, Nevada; Eureka County, Nevada; Lincoln County, Nevada; Nye County, Nevada; and Saguache County, Colorado.

Locations: Arizona, California, Colorado, Nevada, New Mexico, and Utah.

Contacts: *For further information about this PEIS, contact:* Shannon Stewart, BLM Washington Office, e-mail: shannon_stewart@blm.gov, phone: (202) 912-7219; or Jane Summerson, DOE Solar PEIS Document Manager, e-mail: jane.summerson@ee.doe.gov, phone: (202) 287-6188; or visit the PEIS Web site at http://solareis.anl.gov.

Abstract: The BLM and DOE have jointly prepared this PEIS to evaluate actions that the agencies are considering taking to further facilitate utility-scale solar energy development in six southwestern states.[1] For the BLM, this includes the evaluation of a new Solar Energy Program applicable to solar development on BLM-administered lands. For DOE, it includes the evaluation of developing new guidance to further facilitate utility-scale solar energy development and maximize the mitigation of associated environmental impacts. This Solar PEIS evaluates the potential environmental, social, and economic effects of the agencies' proposed actions and alternatives in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality's regulations for implementing NEPA (Title 40, Parts 1500–1508 of the *Code of Federal Regulations* [40 CFR Parts 1500–1508]), and applicable BLM and DOE authorities.

For the BLM, the Final Solar PEIS analyzes a no action alternative, under which solar energy development would continue on BLM-administered lands in accordance with the terms and conditions of the BLM's existing solar energy policies, and two action alternatives that involve implementing a new BLM Solar Energy Program that would allow the permitting of future solar energy development projects on public lands to proceed in a more efficient, standardized, and environmentally responsible manner. The proposed program would establish right-of-way authorization policies and design features applicable to all utility-scale solar energy development. It would identify categories of lands to be excluded from utility-scale solar energy development and specific locations well suited for utility-scale production of solar energy where the BLM would prioritize development (i.e., solar energy zones or SEZs). The proposed action would also allow for responsible utility-scale solar development on lands outside of priority areas.

1 Utility-scale facilities are defined as projects that generate electricity that is delivered into the electricity transmission grid, generally with capacities greater than 20 megawatts (MW).

For DOE, the Final PEIS analyzes a no action alternative, under which DOE would continue to address environmental concerns for DOE-supported solar projects on a case-by-case basis, and an action alternative, under which DOE would adopt programmatic environmental guidance for use in DOE-supported solar projects.

The BLM and DOE initiated the Solar PEIS process in May 2008. On December 17, 2010, the BLM and DOE published the Draft Solar PEIS. Subsequently, on October 28, 2011, the lead agencies published the Supplement to the Draft Solar PEIS, in which adjustments were made to elements of BLM's proposed Solar Energy Program to better meet BLM's solar energy objectives, and in which DOE's proposed programmatic environmental guidance was presented.

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NOTATION

The following is a list of acronyms and abbreviations, chemical names, and units of measure used in this document. Some acronyms used only in tables may be defined only in those tables.

GENERAL ACRONYMS AND ABBREVIATIONS

AADT	annual average daily traffic
AASHTO	American Association of State Highway and Transportation Officials
AC	alternating current
ACC	air-cooled condenser
ACEC	Area of Critical Environmental Concern
ADEQ	Arizona Department of Environmental Quality
ACHP	Advisory Council on Historic Preservation
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AERMOD	AMS/EPA Regulatory Model
AFC	Application for Certification
AGL	above ground level
AIM	Assessment, Inventory and Monitoring
AIRFA	American Indian Religious Freedom Act
AMA	active management area
AML	animal management level
ANHP	Arizona National Heritage Program
APE	area of potential effect
APLIC	Avian Power Line Interaction Committee
APP	Avian Protection Plan
APS	Arizona Public Service
AQCR	Air Quality Control Region
AQRV	air quality–related value
ARB	Air Resources Board
ARRA	American Recovery and Reinvestment Act of 2009
ARRTIS	Arizona Renewable Resource and Transmission Identification Subcommittee
ARS	Agricultural Research Service
ARZC	Arizona and California
ATSDR	Agency for Toxic Substances and Disease Registry
AUM	animal unit month
AVSE	Arlington Valley Solar Energy
AVWS	Audio Visual Warning System
AWBA	Arizona Water Banking Authority
AWEA	American Wind Energy Association
AWRM	Active Water Resource Management
AZDA	Arizona Department of Agriculture
AZGFD	Arizona Game and Fish Department

AZGS	Arizona Geological Survey
BA	biological assessment
BAP	base annual production
BEA	Bureau of Economic Analysis
BISON-M	Biota Information System of New Mexico
BLM	Bureau of Land Management
BLM-CA	Bureau of Land Management, California
BMP	best management practice
BNSF	Burlington Northern Santa Fe
BO	biological opinion
BOR	U.S. Bureau of Reclamation
BPA	Bonneville Power Administration
BRAC	Blue Ribbon Advisory Council on Climate Change
BSE	Beacon Solar Energy
BSEP	Beacon Solar Energy Project
BTS	Bureau of Transportation Statistics
CAA	Clean Air Act
CAAQS	California Air Quality Standards
CAISO	California Independent System Operator
Caltrans	California Department of Transportation
C-AMA	California-Arizona Maneuver Area
CAP	Central Arizona Project
CARB	California Air Resources Board
CAReGAP	California Regional Gap Analysis Project
CASQA	California Stormwater Quality Association
CASTNET	Clean Air Status and Trends NETwork
CAWA	Colorado Agricultural Water Alliance
CCC	Civilian Conservation Corps
CDC	Centers for Disease Control and Prevention
CDCA	California Desert Conservation Area
CDFG	California Department of Fish and Game
CDNCA	California Desert National Conservation Area
CDOT	Colorado Department of Transportation
CDOW	Colorado Division of Wildlife (now Colorado Parks and Wildlife)
CDPHE	Colorado Department of Public Health and Environment
CDWR	California Department of Water Resources
CEC	California Energy Commission
CEQ	Council on Environmental Quality
CES	constant elasticity of substitution
CESA	California Endangered Species Act
CESF	Carrizo Energy Solar Farm
CFR	*Code of Federal Regulations*
CGE	computable general equilibrium
CHAT	crucial habitat assessment tool

CIRA	Cooperative Institute for Research in the Atmosphere
CLFR	compact linear Fresnel reflector
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNHP	Colorado National Heritage Program
Colorado DWR	Colorado Division of Water Resources
CO_2e	carbon dioxide equivalent
CPC	Center for Plant Conservation
CPUC	California Public Utilities Commission
CPV	concentrating photovoltaic
CRBSCF	Colorado River Basin Salinity Control Forum
CREZ	competitive renewable energy zone
CRPC	Cultural Resources Preservation Council
CRSCP	Colorado River Salinity Control Program
CSA	Candidate Study Area
CSC	Coastal Services Center
CSFG	carbon-sequestration fossil generation
CSP	concentrating solar power
CSQA	California Stormwater Quality Association
CSRI	Cultural Systems Research, Incorporated
CTG	combustion turbine generator
CTPG	California Transmission Planning Group
CTSR	Cumbres & Toltec Scenic Railroad
CUP	Conditional Use Permit
CVP	Central Valley Project
CWA	Clean Water Act
CWCB	Colorado Water Conservation Board
CWHRS	California Wildlife Habitat Relationship System
DC	direct current
DEM	digital elevation model
DHS	U.S. Department of Homeland Security
DIMA	Database for Inventory, Monitoring and Assessment
DLT	dedicated-line transmission
DNA	Determination of NEPA Adequacy
DNI	direct normal insulation
DNL	day-night average sound level
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DOL	U.S. Department of Labor
DOT	U.S. Department of Transportation
DRECP	California Desert Renewable Energy Conservation Plan
DSM	demand-side management
DSRP	Decommissioning and Site Reclamation Plan
DTC/C-AMA	Desert Training Center/California–Arizona Maneuver Area

DWMA	Desert Wildlife Management Area
DWR	Division of Water Resources
EA	environmental assessment
EBID	Elephant Butte Irrigation District
ECAR	East Central Area Reliability Coordination Agreement
ECOS	Environmental Conservation Online System (USFWS)
EERE	Energy Efficiency and Renewable Energy (DOE)
Eg	band gap energy
EIA	Energy Information Administration (DOE)
EIS	environmental impact statement
EISA	Energy Independence and Security Act of 2007
EMF	electromagnetic field
E.O.	Executive Order
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EQIP	Environmental Quality Incentives Program
ERCOT	Electric Reliability Council of Texas
ERO	Electric Reliability Organization
ERS	Economic Research Service
ESA	Endangered Species Act of 1973
ESRI	Environmental Systems Research Institute
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FLPMA	Federal Land Policy and Management Act of 1976
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FRCC	Florida Reliability Coordinating Council
FSA	Final Staff Assessment
FTE	full-time equivalent
FY	fiscal year
G&TM	generation and transmission modeling
GCRP	U.S. Global Climate Research Program
GDA	generation development area
GHG	greenhouse gas
GIS	geographic information system
GMU	game management unit
GPS	global positioning system
GTM	Generation and Transmission Model

GUAC	Groundwater Users Advisory Council
GWP	global warming potential
HA	herd area
HAP	hazardous air pollutant
HAZCOM	hazard communication
HCE	heat collection element
HCP	Habitat Conservation Plan
HMA	herd management area
HMMH	Harris Miller Miller & Hanson, Inc.
HRSG	heat recovery steam generator
HSPD	Homeland Security Presidential Directive
HTF	heat transfer fluid
HUC	hydrologic unit code
HVAC	heating, ventilation, and air-conditioning
I	Interstate
IARC	International Agency for Research on Cancer
IBA	important bird area
ICE	internal combustion engine
ICPDS	Imperial County Planning & Development Services
ICWMA	Imperial County Weed Management Area
IDT	interdisplinary team
IEC	International Electrochemical Commission
IFR	instrument flight rule
IID	Imperial Irrigation District
IM	Instruction Memorandum
IMPS	Iron Mountain Pumping Station
IMS	interim mitigation strategy
INA	Irrigation Non-Expansion Area
IOP	Interagency Operating Procedure
IOU	investor-owned utility
IPCC	Intergovernmental Panel on Climate Change
ISA	Independent Science Advisor; Instant Study Area
ISB	Intermontane Seismic Belt
ISCC	integrated solar combined cycle
ISDRA	Imperial Sand Dunes Recreation Area
ISEGS	Ivanpah Solar Energy Generating System
ISO	independent system operator; iterative self-organizing
ITFR	Interim Temporary Final Rulemaking
ITP	incidental take permit
IUCNNR	International Union for Conservation of Nature and Natural Resources
IUCNP	International Union for Conservation of Nature Pakistan
KGA	known geothermal resources area
KML	keyhole markup language

KOP	key observation point
KSLA	known sodium leasing area
LCC	Landscape Conservation Cooperative
LCCRDA	Lincoln County Conservation, Recreation, and Development Act of 2004
LCOE	levelized cost of energy
L_{dn}	day-night average sound level
LDWMA	Low Desert Weed Management Area
L_{eq}	equivalent sound pressure level
LiDAR	light detection and ranging
LLA	limited land available
LLRW	low-level radioactive waste (waste classification)
LPN	listing priority number
LRG	Lower Rio Grande
LSA	lake and streambed alteration
LSE	load-serving entity
LTMP	long-term monitoring and adaptive management plan
LTVA	long-term visitor area
MAAC	Mid-Atlantic Area Council
MAIN	Mid-Atlantic Interconnected Network
MAPP	methyl acetylene propadiene stabilizer; Mid-Continent Area Power Pool
MCAS	Marine Corps Air Station
MCL	maximum contaminant level
MEB	Marine Expeditionary Brigade
MFP	Management Framework Plan
MIG	Minnesota IMPLAN Group
MLA	maximum land available
MOA	military operating area
MOU	Memorandum of Understanding
MPDS	maximum potential development scenario
MRA	Multiple Resource Area
MRI	Midwest Research Institute
MRO	Midwest Reliability Organization
MSDS	Material Safety Data Sheet
MSL	mean sea level
MTR	military training route
MVEDA	Mesilla Valley Economic Development Alliance
MWA	Mojave Water Agency
MWD	Metropolitan Water District
MWMA	Mojave Weed Management Area
NAAQS	National Ambient Air Quality Standard(s)
NADP	National Atmospheric Deposition Program
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission (California)
NAIC	North American Industrial Classification System

NASA	National Aeronautics and Space Administration
NCA	National Conservation Area
NCCAC	Nevada Climate Change Advisory Committee
NCDC	National Climatic Data Center
NCES	National Center for Education Statistics
NDAA	National Defense Authorization Act
NDCNR	Nevada Department of Conservation and Natural Resources
NDEP	Nevada Division of Environmental Protection
NDOT	Nevada Department of Transportation
NDOW	Nevada Department of Wildlife
NDWP	Nevada Division of Water Planning
NDWR	Nevada Division of Water Resources
NEAP	Natural Events Action Plan
NEC	National Electric Code
NED	National Elevation Database
NEP	Natural Events Policy
NEPA	National Environmental Policy Act of 1969
NERC	North American Electricity Reliability Corporation
NGO	non-governmental organization
NHA	National Heritage Area
NHD	National Hydrography Dataset
NHNM	National Heritage New Mexico
NHPA	National Historic Preservation Act of 1966
NID	National Inventory of Dams
NLCS	National Landscape Conservation System
NMAC	*New Mexico Administrative Code*
NMBGMR	New Mexico Bureau of Geology and Mineral Resources
NMDGF	New Mexico Department of Game and Fish
NM DOT	New Mexico Department of Transportation
NMED	New Mexico Environment Department
NMED-AQB	New Mexico Environment Department-Air Quality Board
NMFS	National Marine Fisheries Service
NMOSE	New Mexico Office of the State Engineer
NMSU	New Mexico State University
NNHP	Nevada Natural Heritage Program
NNL	National Natural Landmark
NNSA	National Nuclear Security Administration
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NP	National Park
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	National Park Service
NPV	net present value
NRA	National Recreation Area

NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
NRHP	*National Register of Historic Places*
NRS	*Nevada Revised Statutes*
NSC	National Safety Council
NSO	no surface occupancy
NSTC	National Science and Technology Council
NTHP	National Trust for Historic Preservation
NTS	Nevada Test Site
NTTR	Nevada Test and Training Range
NVCRS	Nevada Cultural Resources Inventory System
NV DOT	Nevada Department of Transportation
NWCC	National Wind Coordinating Committee
NWI	National Wetlands Inventory
NWIS	National Water Information System (USGS)
NWPP	Northwest Power Pool
NWR	National Wildlife Refuge
NWSRS	National Wild and Scenic River System
O&M	operation and maintenance
ODFW	Oregon Department of Fish and Wildlife
OHV	off-highway vehicle
ONA	Outstanding Natural Area
ORC	organic Rankine cycle
OSE/ISC	Office of the State Engineer/Interstate Stream Commission
OSHA	Occupational Safety and Health Administration
OTA	Office of Technology Assessment
PA	Programmatic Agreement
PAD	Preliminary Application Document
PAH	polycyclic aromatic hydrocarbon
PAT	peer analysis tool
PCB	polychlorinated biphenyl
PCM	purchase change material
PCS	power conditioning system
PCU	power converting unit
PEIS	programmatic environmental impact statement
PFYC	potential fossil yield classification
PGH	Preliminary General Habitat
PIER	Public Interest Energy Research
P.L.	Public Law
PLSS	Public Land Survey System
PM	particulate matter
$PM_{2.5}$	particulate matter with a diameter of 2.5 μm or less
PM_{10}	particulate matter with a diameter of 10 μm or less
PPA	Power Purchase Agreement

P-P-D	population-to-power density
PPH	Preliminary Priority Habitat
POD	plan of development
POU	publicly owned utility
PPA	Power Purchase Agreement
PPE	personal protective equipment
PSD	Prevention of Significant Deterioration
PURPA	Public Utility Regulatory Policy Act
PV	photovoltaic
PVID	Palo Verde Irrigation District
PWR	public water reserve
QRA	qualified resource area
R&I	relevance and importance
RAC	Resource Advisory Council
RCE	Reclamation Cost Estimate
RCI	residential, commercial, and industrial (sector)
RCRA	Resource Conservation and Recovery Act of 1976
RD&D	research, development, and demonstration; research, development, and deployment
RDBMS	Relational Database Management System
RDEP	Restoration Design Energy Project
REA	Rapid Ecoregional Assessment
REAT	Renewable Energy Action Team
REDA	Renewable Energy Development Area
REDI	Renewable Energy Development Infrastructure
REEA	Renewable Energy Evaluation Area
ReEDS	Regional Energy Deployment System
REPG	Renewable Energy Policy Group
RETA	Renewable Energy Transmission Authority
RETAAC	Renewable Energy Transmission Access Advisory Committee
RETI	Renewable Energy Transmission Initiative
REZ	renewable energy zone
RF	radio frequency
RFC	Reliability First Corporation
RFDS	reasonably foreseeable development scenario
RGP	Rio Grande Project
RGWCD	Rio Grande Water Conservation District
RMP	Resource Management Plan
RMPA	Rocky Mountain Power Area
RMZ	Resource Management Zone
ROD	Record of Decision
ROI	region of influence
ROS	recreation opportunity spectrum
ROW	right-of-way

RPG	renewable portfolio goal
RPS	Renewable Portfolio Standard
RRC	Regional Reliability Council
RSEP	Rice Solar Energy Project
RSI	Renewable Systems Interconnection
RTO	regional transmission organization
RTTF	Renewable Transmission Task Force
RV	recreational vehicle
SAAQS	State Ambient Air Quality Standard(s)
SAMHSA	Substance Abuse and Mental Health Services Administration
SCADA	supervisory control and data acquisition
SCE	Southern California Edison
SCRMA	Special Cultural Resource Management Area
SDRREG	San Diego Regional Renewable Energy Group
SDWA	Safe Drinking Water Act of 1974
SEGIS	Solar Energy Grid Integration System
SEGS	Solar Energy Generating System
SEI	Sustainable Energy Ireland
SEIA	Solar Energy Industrial Association
SES	Stirling Energy Systems
SETP	Solar Energy Technologies Program (DOE)
SEZ	solar energy zone
SHPO	State Historic Preservation Office(r)
SIP	State Implementation Plan
SLRG	San Luis & Rio Grande
SMA	Special Management Area
SMART	specific, measurable, achievable, relevant, and time sensitive
SMP	suggested management practice
SNWA	Southern Nevada Water Authority
SPP	Southwest Power Pool
SRMA	Special Recreation Management Area
SSA	Socorro Seismic Anomaly
SSI	self-supplied industry
ST	solar thermal
STG	steam turbine generator
SUA	special use airspace
SWAT	Southwest Area Transmission
SWIP	Southwest Intertie Project
SWPPP	Stormwater Pollution Prevention Plan
SWReGAP	Southwest Regional Gap Analysis Project
TAP	toxic air pollutant
TCC	Transmission Corridor Committee
TDS	total dissolved solids
TEPPC	Transmission Expansion Planning Policy Committee

TES	thermal energy storage
TRACE	Transmission Routing and Configuration Estimator
TSA	Transportation Security Administration
TSCA	Toxic Substances Control Act of 1976
TSDF	treatment, storage, and disposal facility
TSP	total suspended particulates
UACD	Utah Association of Conservation Districts
UBWR	Utah Board of Water Resources
UDA	Utah Department of Agriculture
UDEQ	Utah Department of Environmental Quality
UDNR	Utah Department of Natural Resources
UDOT	Utah Department of Transportation
UDWQ	Utah Division of Water Quality
UDWR	Utah Division of Wildlife Resources
UGS	Utah Geological Survey
UNEP	United Nations Environmental Programme
UNPS	Utah Native Plant Society
UP	Union Pacific
UREZ	Utah Renewable Energy Zone
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USC	*United States Code*
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
Utah DWR	Utah Division of Water Rights
UTTR	Utah Test and Training Range
UWS	Underground Water Storage, Savings and Replenishment Act
VACAR	Virginia–Carolinas Subregion
VCRS	Visual Contrast Rating System
VFR	visual flight rule
VOC	volatile organic compound
VRHCRP	Virgin River Habitat Conservation & Recovery Program
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WA	Wilderness Area
WECC	Western Electricity Coordinating Council
WECC CAN	Western Electricity Coordinating Council–Canada
WEG	wind erodibility group
Western	Western Area Power Administration
WGA	Western Governors' Association
WGFD	Wyoming Game and Fish Department

WHA	wildlife habitat area
WHO	World Health Organization
WIA	Wyoming Infrastructure Authority
WRAP	Water Resources Allocation Program; Western Regional Air Partnership
WRCC	Western Regional Climate Center
WREZ	Western Renewable Energy Zones
WRRI	Water Resources Research Institute
WSA	Wilderness Study Area
WSC	wildlife species of special concern
WSMR	White Sands Missile Range
WSR	Wild and Scenic River
WSRA	Wild and Scenic Rivers Act of 1968
WWII	World War II
WWP	Western Watersheds Project
YPG	Yuma Proving Ground
ZITA	zone identification and technical analysis
ZLD	zero liquid discharge

CHEMICALS

CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
H_2S	hydrogen sulfide
Hg	mercury
N_2O	nitrous oxide
NH_3	ammonia
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
O_3	ozone
Pb	lead
SF_6	sulfur hexafluoride
SO_2	sulfur dioxide
SO_x	sulfur oxides

UNITS OF MEASURE

ac-ft	acre-foot (feet)
bhp	brake horsepower
°C	degree(s) Celsius
cf	cubic foot (feet)
cfs	cubic foot (feet) per second
cm	centimeter(s)
dB	decibel(s)
dBA	A-weighted decibel(s)
°F	degree(s) Fahrenheit
ft	foot (feet)
ft^2	square foot (feet)
ft^3	cubic foot (feet)
g	gram(s)
gal	gallon(s)

GJ	gigajoule(s)
gpcd	gallon per capita per day
gpd	gallon(s) per day
gpm	gallon(s) per minute
GW	gigawatt(s)
GWh	gigawatt hour(s)
GWh/yr	gigawatt hour(s) per year
h	hour(s)
ha	hectare(s)
Hz	hertz
in.	inch(es)
J	joule(s)
K	degree(s) Kelvin
kcal	kilocalorie(s)
kg	kilogram(s)
kHz	kilohertz
km	kilometer(s)
km^2	square kilometer(s)
kPa	kilopascal(s)
kV	kilovolt(s)
kVA	kilovolt-ampere(s)
kW	kilowatt(s)
kWh	kilowatt-hour(s)
kWp	kilowatt peak
L	liter(s)
lb	pound(s)
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
mg	milligram(s)
Mgal	million gallons
mi	mile(s)
mi^2	square mile(s)
min	minute(s)
mm	millimeter(s)
MMt	million metric ton(s)
MPa	megapascal(s)
mph	mile(s) per hour
MVA	megavolt-ampere(s)
MW	megawatt(s)
MWe	megawatt(s) electric
MWh	megawatt-hour(s)
ppm	part(s) per million
psi	pound(s) per square inch
psia	pound(s) per square inch absolute
rpm	rotation(s) per minute
s	second(s)
scf	standard cubic foot (feet)
TWh	terawatt hour(s)
VdB	vibration velocity decibel(s)
W	watt(s)
yd^2	square yard(s)
yd^3	cubic yard(s)
yr	year(s)
μg	microgram(s)
μm	micrometer(s)

ENGLISH/METRIC AND METRIC/ENGLISH EQUIVALENTS

The following table lists the appropriate equivalents for English and metric units.

Multiply	By	To Obtain
English/Metric Equivalents		
acres	0.004047	square kilometers (km^2)
acre-feet (ac-ft)	1,234	cubic meters (m^3)
cubic feet (ft^3)	0.02832	cubic meters (m^3)
cubic yards (yd^3)	0.7646	cubic meters (m^3)
degrees Fahrenheit (ºF) –32	0.5555	degrees Celsius (ºC)
feet (ft)	0.3048	meters (m)
gallons (gal)	3.785	liters (L)
gallons (gal)	0.003785	cubic meters (m^3)
inches (in.)	2.540	centimeters (cm)
miles (mi)	1.609	kilometers (km)
miles per hour (mph)	1.609	kilometers per hour (kph)
pounds (lb)	0.4536	kilograms (kg)
short tons (tons)	907.2	kilograms (kg)
short tons (tons)	0.9072	metric tons (t)
square feet (ft^2)	0.09290	square meters (m^2)
square yards (yd^2)	0.8361	square meters (m^2)
square miles (mi^2)	2.590	square kilometers (km^2)
yards (yd)	0.9144	meters (m)
Metric/English Equivalents		
centimeters (cm)	0.3937	inches (in.)
cubic meters (m^3)	0.00081	acre-feet (ac-ft)
cubic meters (m^3)	35.31	cubic feet (ft^3)
cubic meters (m^3)	1.308	cubic yards (yd^3)
cubic meters (m^3)	264.2	gallons (gal)
degrees Celsius (ºC) +17.78	1.8	degrees Fahrenheit (ºF)
hectares (ha)	2.471	acres
kilograms (kg)	2.205	pounds (lb)
kilograms (kg)	0.001102	short tons (tons)
kilometers (km)	0.6214	miles (mi)
kilometers per hour (kph)	0.6214	miles per hour (mph)
liters (L)	0.2642	gallons (gal)
meters (m)	3.281	feet (ft)
meters (m)	1.094	yards (yd)
metric tons (t)	1.102	short tons (tons)
square kilometers (km^2)	247.1	acres
square kilometers (km^2)	0.3861	square miles (mi^2)
square meters (m^2)	10.76	square feet (ft^2)
square meters (m^2)	1.196	square yards (yd^2)

10 UPDATE TO AFFECTED ENVIRONMENT AND IMPACT ASSESSMENT FOR PROPOSED SOLAR ENERGY ZONES IN COLORADO

The U.S. Department of the Interior Bureau of Land Management (BLM) has carried 17 solar energy zones (SEZs) forward for analysis in this Final Solar Programmatic Environmental Impact Statement (PEIS). These SEZs total approximately 285,000 acres (1,153 km^2) of land potentially available for development. This chapter includes analyses of potential environmental impacts for the proposed SEZs in Colorado—Antonito Southeast, De Tilla Gulch, Fourmile East, and Los Mogotes East. The SEZ-specific analyses provide documentation from which the BLM will tier future project authorizations, thereby limiting the required scope and effort of project-specific National Environmental Policy Act of 1969 (NEPA) analyses.

The BLM is committed to collecting additional SEZ-specific resource data and conducting additional analysis in order to more efficiently facilitate future development in SEZs. The BLM developed action plans for each of the 17 SEZs carried forward as part of the Supplement to the Draft Solar PEIS (BLM and DOE 2011). These action plans described additional data that could be collected for individual SEZs and proposed data sources and methods for the collection of those data. Work is under way to collect additional data as specified under these action plans (e.g., additional data collection to support evaluation of cultural, visual, and water resources has begun). As the data become available, they will be posted on the project Web site (http://solareis.anl.gov) for use by applicants and the BLM and other agency staff.

To accommodate the flexibility described in the BLM's program objectives and in light of anticipated changes in technologies and environmental conditions over time, the BLM has removed some of the prescriptive SEZ-specific design features presented in the Draft Solar PEIS (BLM and DOE 2010) and the Supplement to the Draft (e.g., height restrictions on technologies used to address visual resource impacts). Alternatively, the BLM will give full consideration to any outstanding conflicts in SEZs as part of the competitive process being developed through rulemaking (see Section 2.2.2.2.1).

In preparing selected parcels for competitive offer, the BLM will review all existing analysis for an SEZ and consider any new or changed circumstances that may affect the development of the SEZ. The BLM will also work with appropriate federal, state, and local agencies, and affected tribes, as necessary, to discuss SEZ-related issues. This work would ultimately inform how a parcel would be offered competitively (e.g., parcel size and configuration, technology limitations, mitigation requirements, and parcel-specific competitive process). Prior to issuing a notice of competitive offer, the BLM would complete appropriate NEPA analysis to support the offer. This analysis would tier to the analysis for SEZs in the Solar PEIS to the extent practicable.

It is the BLM's goal to compile all data, information, and analyses for SEZs from the Draft Solar PEIS, the Supplement to the Draft, and this Final PEIS into a single location accessible via the project Web site (http://solareis.anl.gov) for ease of use by applicants and the BLM and other agency staff.

This chapter is an update to the information on Colorado SEZs presented in the Draft Solar PEIS. The information presented in this chapter supplements and updates, but does not replace, the information provided in the corresponding Chapter 10 on proposed SEZs in Colorado in the Draft Solar PEIS. Corrections to incorrect information in Sections 10.1, 10.2, 10.3, and 10.4 of the Draft Solar PEIS and in Sections C.3.1, C.3.2, C.3.3, and C.3.4 of the Supplement to the Draft are provided in Sections 10.1.26, 10.2.26, 10.3.26, and 10.4.26 of this Final Solar PEIS.

10.1 ANTONITO SOUTHEAST

10.1.1 Background and Summary of Impacts

10.1.1.1 General Information

The proposed Antonito Southeast SEZ is located in southeastern Conejos County, on the southern Colorado state boundary with New Mexico. In 2008, the county population was 8,232, while the surrounding six-county region in Colorado and New Mexico had a population of 116,511. The largest nearby town of Alamosa, which had a 2008 population of 8,745, is about 34 mi (55 km) to the north. Several small towns lie closer to the SEZ, with Antonito, Colorado, about 2 mi (3 km) to the northwest. The area is served by the San Luis & Rio Grande (SLRG) Railroad. As of October 28, 2011, there were no pending solar project applications within the SEZ.

As published in the Draft Solar PEIS, the proposed Antonito Southeast SEZ had a total area of 9,729 acres (39.4 km^2) (see Figure 10.1.1.1-1). In the Supplement to the Draft Solar PEIS (BLM and DOE 2011), no boundary revisions were identified for the proposed SEZ. However, areas specified for non-development were mapped, where data were available. For the proposed Antonito Southeast SEZ, 17 acres (0.07 km^2) of wetland and lake areas were identified as non-development areas (see Figure 10.1.1.1-2). The remaining developable area within the SEZ is 9,712 acres (39.3 km^2).

The analyses in the following sections update the affected environment and potential environmental, cultural, and socioeconomic impacts associated with utility-scale solar energy development in the proposed Antonito Southeast SEZ as described in the Draft Solar PEIS.

10.1.1.2 Development Assumptions for the Impact Analysis

Maximum development of the proposed Antonito Southeast SEZ was assumed to be 80% of the developable SEZ area over a period of 20 years, a maximum of 7,770 acres

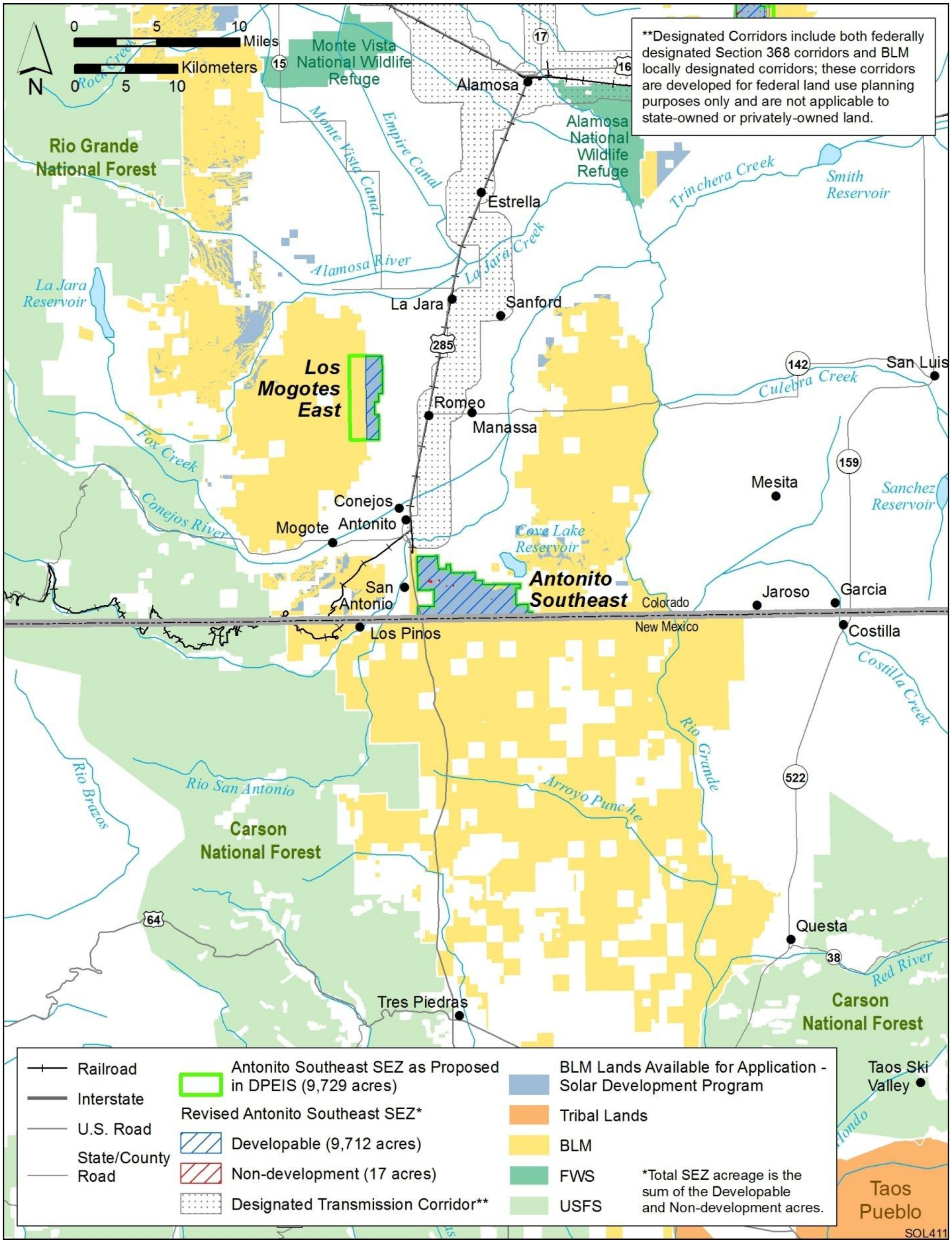

FIGURE 10.1.1.1-1 Proposed Antonito Southeast SEZ as Revised

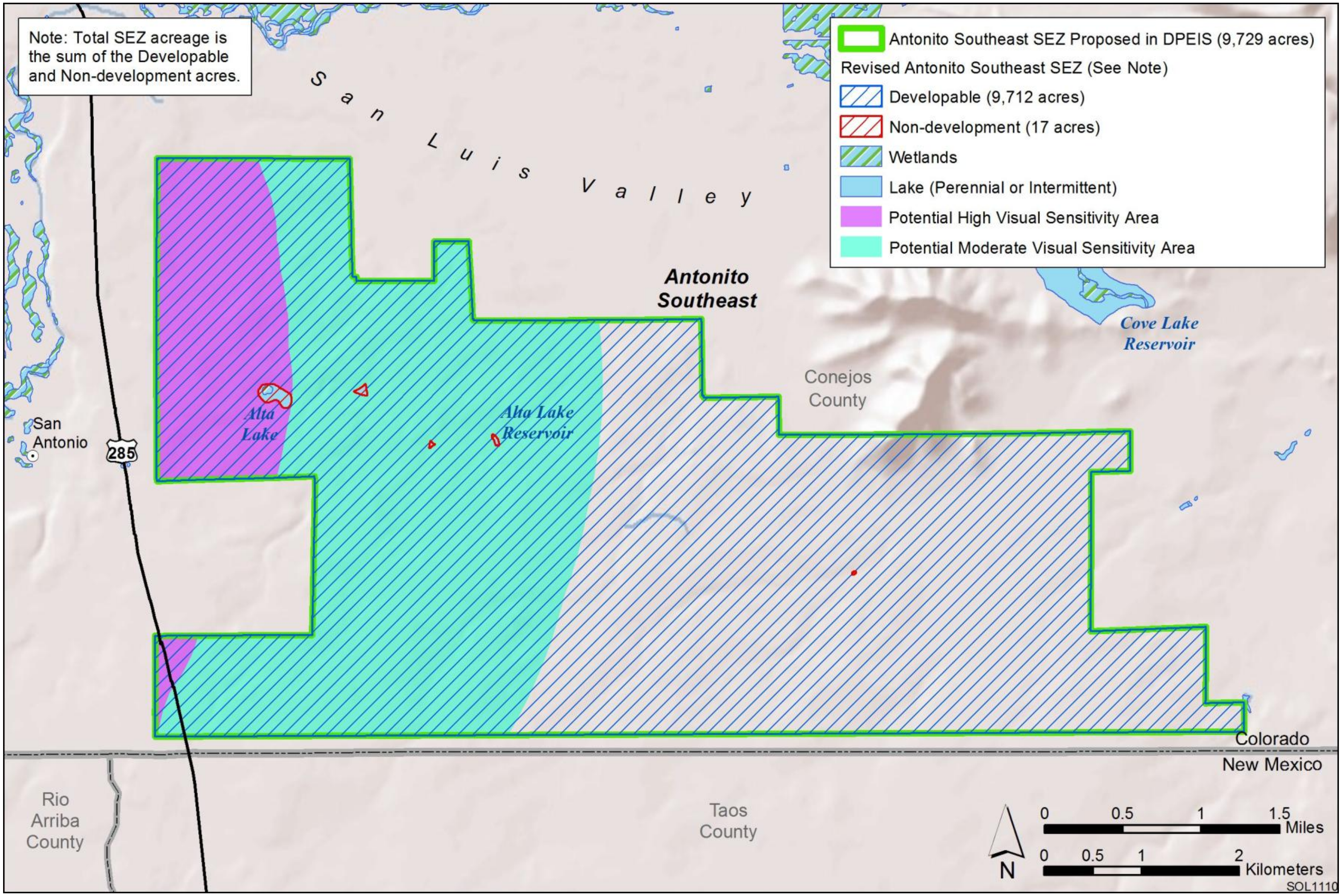

FIGURE 10.1.1.1-2 Developable and Non-development Areas for the Proposed Antonito Southeast SEZ as Revised

(31.4 km^2) (Table 10.1.1.2-1). Full development of the Antonito Southeast SEZ would allow development of facilities with an estimated total of between 863 MW (dish engine or photovoltaic [PV] technologies, 9 acres/MW [0.04 km^2/MW]) and 1,554 MW (solar trough technologies, 5 acres/MW [0.02 km^2/MW]) of electrical power capacity.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. For the proposed Antonito Southeast SEZ, updated data indicate that the nearest existing transmission line is a 69-kV line located about 10 mi (16 km) west of the SEZ (the Draft Solar PEIS had indicated that the closest existing line was a 69-kV line 4 mi north of the SEZ). It is possible that a new transmission line could be constructed from the SEZ to the nearest existing line, but the 69-kV capacity of the line would be inadequate for the possible 1,554 MW of new capacity. Therefore, at full build-out capacity, new transmission lines and/or upgrades of existing transmission lines would be required to bring electricity from the proposed Antonito Southeast SEZ to load centers. An assessment of the most likely load center destinations for power generated at the Antonito Southeast SEZ and a general assessment of the impacts of constructing and operating new transmission facilities to those load centers is provided in Section 10.1.23. In addition, the generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5 of this Final Solar PEIS. Project-specific analyses would also be required to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

TABLE 10.1.1.2-1 Assumed Development Acreages, Solar MW Output, and Nearest Major Access Road and Transmission Line for the Proposed Antonito Southeast SEZ as Revised

Total Developable Acreage and Assumed Developed Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S., or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Assumed Area of Road ROW	Distance to Nearest BLM-Designated Transmission Corridor[e]
9,712 acres[a] and 7,770 acres	863 MW[b] 1,554 MW	Adjacent (U.S. 285)	10 mi[c,d] and 69 kV	0 acres	NA[f]

a To convert acres to km^2, multiply by 0.004047.

b Maximum power output if the SEZ were fully developed using power tower, dish engine, or PV technologies, assuming 9 acres/MW (0.04 km^2/MW) of land required.

c To convert mi to km, multiply by 1.609.

d In the Draft Solar PEIS, the nearest transmission line identified was a 69-kV line 4 mi from the SEZ; this information has been updated.

e BLM-designated corridors are developed for federal land use planning purposes only and are not applicable to state-owned or privately owned land.

f NA = no BLM-designated corridor is near the proposed Antonito Southeast SEZ.

The transmission assessment for the Antonito Southwest SEZ has been updated, and the hypothetical transmission corridor assessed in the Draft Solar PEIS is no longer applicable. For this updated assessment, the 121 acres (0.5 km^2) of land disturbance for a hypothetical transmission corridor to the existing transmission line is no longer assumed (although the impacts of required new transmission overall are addressed in Section 10.1.23).

For the proposed Antonito Southeast SEZ, existing road access should be adequate to support construction and operation of solar facilities, because U.S. 285 runs along the western boundary of the SEZ. Thus, no additional road construction outside of the SEZ was assumed to be required to support solar development of the SEZ, as summarized in Table 10.1.1.2-1.

10.1.1.3 Programmatic and SEZ-Specific Design Features

The proposed programmatic design features for each resource area to be required under the BLM Solar Energy Program are presented in Section A.2.2 of Appendix A of this Final Solar PEIS. These programmatic design features are intended to avoid, minimize, and/or mitigate adverse impacts from solar energy development and will be required for development on all BLM-administered lands including SEZ and non-SEZ lands..

The discussions below addressing potential impacts from solar energy development on specific resource areas (Sections 10.1.2 through 10.1.22) also provide an assessment of the effectiveness of the programmatic design features in mitigating adverse impacts from solar development within the SEZ. SEZ-specific design features to address impacts specific to the proposed Antonito Southeast SEZ may be required in addition to the programmatic design features. The proposed SEZ-specific design features for the Antonito Southeast SEZ have been updated on the basis of revisions to the SEZ since the Draft Solar PEIS (such as boundary changes and the identification of non-development areas), and on the basis of comments received on the Draft and Supplement to the Draft Solar PEIS. All applicable SEZ-specific design features identified to date (including those from the Draft Solar PEIS that are still applicable) are presented in Sections 10.1.2 through 10.1.22.

10.1.2 Lands and Realty

10.1.2.1 Affected Environment

The proposed Antonito Southeast SEZ is a well blocked area of BLM-administered public lands that is rural and largely undeveloped. The SEZ is bordered to the north by private lands, and there are 1,280 acres (5.2 km^2) of state lands located to the east and west of the area. Land to the south of the SEZ in New Mexico is also public land. Section 10.1.2.1 of the Draft Solar PEIS contained a statement that there was one solar facility operating in the San Luis Valley near Mosca. There actually are several operating facilities in that area. The description in the Draft Solar PEIS of the condition of the SEZ and surrounding area in regard to lands and realty issues remains valid.

10.1.2.2 Impacts

Solar development in the proposed SEZ would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Because the SEZ is undeveloped and rural, utility-scale solar development would introduce a new and discordant land use in the area.

The description of impacts in the Draft Solar PEIS identified a strip of public lands of about 1,240 acres (5.0 km^2) abutting the west end of the proposed SEZ that would be isolated by solar development from the rest of the public lands in the SEZ, and indicated that it would be difficult to manage. While the area may be managed differently from the lands in the SEZ, the presence of the highway and cultural resource values in the area make this unavoidable.

Access to public lands south and east of the proposed SEZ could be affected by development of solar facilities that could sever existing roads and trails.

10.1.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on lands and realty are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide some mitigation for the identified impacts but will not completely mitigate adverse impacts. For example, impacts related to the exclusion of many existing and potential uses of the public land, the visual impact of an industrial-type solar facility within an otherwise rural area, and induced land use changes, if any, on nearby or adjacent state and private lands may not be fully mitigated.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, the following proposed SEZ-specific design feature for the revised Antonito Southeast SEZ has been identified:

- Management of the 1,240-acre (5.0-km^2) area of public land west of the proposed SEZ boundary should be addressed as part of the site-specific analysis of any future development within the SEZ.

The need for additional SEZ-specific design features will be established for parcels within the proposed Antonito Southeast SEZ through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.3 Specially Designated Areas and Lands with Wilderness Characteristics

10.1.3.1 Affected Environment

There are nine specially designated areas within 25 mi (40 km) of the proposed Antonito Southeast SEZ. The Draft Solar PEIS accurately describes these areas with one addition. A recently maintained inventory of wilderness characteristics determined that public lands within the proposed SEZ do not contain wilderness characteristics.

10.1.3.2 Impacts

As stated in the Draft Solar PEIS, solar energy development within the SEZ will result in the development of a very large industrial site in an area that otherwise is currently rural. Visual impacts on specially designated areas would be affected by the types of solar technologies deployed within the SEZ. Lower height facilities, facilities with less reflectivity, and facilities that do not use wet cooling would be expected to have less potential for adverse visual impact on surrounding areas (see Section 10.1.14 for a more detailed discussion). Elevated viewpoints, such as the slightly elevated portions of the Cumbres & Toltec Scenic Railroad (CTSR) or nearby viewpoints, such as the San Antonio WSA, the West Fork of the North Branch of the Old Spanish Trail, or the Los Caminos Antiguos Scenic Byway, would have significant views of development within the SEZ and would likely be adversely affected. Site-specific analysis, including consideration of the potential for visible glint and glare from solar panels and the visibility of structures, will need to be completed before impacts can be fully assessed and potential mitigation measures considered. Travelers coming south or east on the Los Antiguos Scenic Byway would be looking directly into the SEZ, and development within the SEZ would be very visible, having the potential to detract from the visitor experience. The route of a portion of the West Branch of the North Fork of the Old Spanish Trail passes within 0.25 mi (0.4 km) of the SEZ; thus solar development in the SEZ may have a major impact on the historic and visual integrity of the Trail, depending on the determination of the integrity and historical significance of the portion of the Trail from which solar development could be seen. Finally, development within the SEZ may be inconsistent with the purposes for which the Sangre de Cristo National Heritage Area (NHA) was designated.

10.1.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on specially designated areas are described in Section A.2.2 of Appendix A of this Final Solar PEIS (design features for specially designated areas, cultural resources, and visual resources would address impacts). Implementing the programmatic design features will provide some mitigation for the identified impacts but may not mitigate impacts on the CTSR and the San Antonio WSA. Programmatic design features will be applied to address SEZ-specific resources and conditions, for example:

- For projects in the Antonito Southeast SEZ that are located within the viewshed of the West Fork of the North Branch of the Old Spanish Trail, a National Trail inventory will be required to determine the area of possible adverse impact on resources, qualities, values, and associated settings of the Trail; to prevent substantial interference; and to determine any areas unsuitable for development. Residual impacts will be avoided, minimized, and/or mitigated to the extent practicable according to program policy standards. Programmatic design features have been included in BLM's Solar Energy Program to address impacts on National Historic Trails (see Section A.2.2.23 of Appendix A).

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, the following proposed SEZ-specific design features have been identified:

- The SEZ-specific design features for visual resources specified in Section 10.1.14.3 should be adopted, as they would provide some protection for visual related impacts on the CTSR and the San Antonio WSA.

- Early consultation should be initiated with the entity responsible for developing the management plan for the Sangre de Cristo NHA to understand how development of the SEZ could be consistent with NHA plans/goals.

The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.4 Rangeland Resources

10.1.4.1 Livestock Grazing

10.1.4.1.1 Affected Environment

The proposed Antonito Southeast SEZ overlaps large portions of three seasonal grazing allotments. These allotments are used by five grazing permittees and provide 669 animal unit months (AUMs) of forage per year

10.1.4.1.2 Impacts

The general discussion in the Draft Solar PEIS regarding determining the impact on grazing operations remains valid. Should the proposed SEZ be fully developed for solar energy production, it is likely that the BLM grazing permits for all three allotments would be cancelled and the permittees would be displaced. While the specific situation of each of the grazing permittees is not known, it is clear that loss of all or part of their grazing permits would be a significant adverse impact on them. Economic losses would not be limited to the value of the lost grazing opportunity but would extend also to the value of the overall ranch operation including any private lands tied to the grazing operation. While permittees would be reimbursed for their portion of the value of range improvements on their permits, this reimbursement would not cover their economic loss.

10.1.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on livestock grazing are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide some mitigation for identified impacts should only portions of grazing permits be affected, but they will not mitigate a complete loss of grazing permits, the loss of livestock AUMs, or the loss of value in ranching operations including private land values.

No SEZ-specific design features to protect livestock grazing have been identified in this Final Solar PEIS. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.4.2 Wild Horses and Burros

10.1.4.2.1 Affected Environment

The information presented in the Draft Solar PEIS remains valid. There are no wild horse or burro herd management areas (HMAs) within the proposed Antonito Southeast SEZ or in proximity to it; however, there have been occasional reports of feral horses seen in the SEZ.

10.1.4.2.2 Impacts

As presented in the Draft Solar PEIS, solar energy development within the proposed Antonito Southeast SEZ would not affect wild horses and burros.

10.1.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, no SEZ-specific design features to address wild horses and burros are required for the proposed Antonito Southeast SEZ.

10.1.5 Recreation

10.1.5.1 Affected Environment

The area of the proposed Antonito Southeast SEZ has not changed from that presented in the Draft Solar PEIS.

Comments have pointed out that most of the recreational discussion in the Draft Solar PEIS was focused internally within the SEZ and did not address the larger part that public and other federal lands play in the landscape and tourism economy of the San Luis Valley. A summary of the better known attractions within the valley includes Great Sand Dunes National Park and Preserve, the Old Spanish Trail, two scenic railroads, the Los Caminos Antiguos Scenic Byway, the Sangre de Cristo Mountains, three national wildlife refuges, and numerous designated wilderness areas. These areas are among the highlights of the recreational and tourism opportunities in the area. The Antonito Southeast SEZ is adjacent to U.S. 285, which is the major access route into the valley from the south, and also is very visible from CO 17, which accesses the valley from the west and is a part of the Los Caminos Antiguos Scenic Byway, which accesses the valley from the west. Tourism is an important part of the valley economy and an important focus for future economic growth.

While the public land within the proposed SEZ is flat and generally unremarkable, it is also large and conspicuous because it is undeveloped and is readily accessible to recreational users. It also adjoins a large block of public lands to the south in New Mexico. As described in the Draft Solar PEIS, the area supports a range of dispersed recreational activities, although it is believed that levels of recreational use are low. The Colorado Division of Wildlife (CDOW)[1] has commented the area is habitat for pronghorn antelope, an important species for hunting in the area. More detailed information on impacts on these species can be found in Section 10.1.11.3.2 of the Draft Solar PEIS.

10.1.5.2 Impacts

As stated in the Draft Solar PEIS, solar development of the SEZ will be readily visible to travelers on U.S. 285 and on the Los Caminos Antiguos Scenic Byway. Since the proposed SEZ is large, solar development of the area has the potential to influence the impressions of recreational and tourism visitors entering the San Luis Valley via routes near the SEZ. Whether there would be a potential impact on recreation and tourism in the valley because of the solar development along these access routes is unknown. There may be potential to provide interpretive activities focused on solar energy and development that would be of interest to travelers.

Because the route of the West Fork of the North Branch of the Old Spanish Trail is so near the SEZ, it is anticipated that the viewshed of the Trail would be adversely affected by solar development within the SEZ and might reduce the potential future recreational attraction of the Trail. However, the integrity and historical significance of the portion of the Trail near to the proposed SEZ remain undetermined.

Visual impacts on surrounding recreational use areas would be greater with taller solar facilities such as power towers and facilities with wet cooling. Visitors to areas located at higher elevations than the SEZ (e.g., San Luis Hills ACEC and WSA, and the CTSR) will see the solar

[1] Note that on July 1, 2011, Colorado State Parks and the Colorado Division of wildlife were merged to form Colorado State Parks and Wildlife.

development within the SEZ, but the impact on recreational use of these areas is unknown at this time. The types of solar technologies employed and whether there is significant glint or glare from reflective surfaces of solar facilities would play a large role in the extent of visibility of solar development. The focus and intent of the relatively new Sangre de Cristo NHA is not yet well defined, so it has not been possible to assess how solar development may interact with the objectives of the NHA.

The CDOW has commented there is a specific concern with the loss of pronghorn antelope habitat in Game Management Unit (GMU) 81, where the SEZ is located. There are limited antelope hunting permits issued in the GMU, and the reduction in habitat that would occur due to solar development within the SEZ could result in a reduction in antelope hunting opportunities. However, the overall impact on pronghorn was estimated to be small in this assessment (see Section 10.1.11.4.2 of the Draft Solar PEIS), because only a small portion of the available habitat in the valley occurs within the proposed SEZ.

In addition, lands that are outside of the proposed SEZ may be acquired or managed for mitigation of impacts on other resources (e.g., sensitive species). Managing these lands for mitigation could further exclude or restrict recreational use, potentially leading to additional losses in recreational opportunities in the region. The impact of acquisition and management of mitigation lands would be considered as a part of the environmental analysis of specific solar energy projects.

10.1.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on recreational resources are described in Section A.2.2 of Appendix A of this Final Solar PEIS (design features for both specially designated areas and visual resources also would address some impacts). Implementing the programmatic design features will provide some mitigation for the identified impacts but will not mitigate the loss of recreational access to public lands developed for solar energy production. Likewise, a loss of wildlife-related hunting recreation will not be mitigated.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, the following proposed SEZ-specific design feature for the proposed Antonito Southeast SEZ has been identified:

- Tourism is an important economic growth area for the San Luis Valley, and the Antonito Southeast SEZ is located in a visible location adjacent to principal highway routes into the valley. Because of its location, there is potential to influence visitors’ perception of the tourism climate in the valley. As projects are proposed for the SEZ, the potential impacts on tourism should be considered and reviewed with local community leaders.

The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.6 Military and Civilian Aviation

10.1.6.1 Affected Environment

As stated in the Draft Solar PEIS, the proposed Antonito Southeast SEZ is located under two military training routes (MTRs) and is identified by the BLM as an area of required consultation with the U.S. Department of Defense (DoD).

10.1.6.2 Impacts

Through comments on the Draft Solar PEIS, the military has indicated that it has no concerns about potential impacts on its activities associated with solar development. There also are no anticipated impacts on civilian aviation.

10.1.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on military and civilian aviation are described in Section A.2.2 of Appendix A of this Final Solar PEIS. The programmatic design features require early coordination with the DoD to identify and avoid, minimize, and/or mitigate, if possible, any potential impacts on the use of military airspace.

No SEZ-specific design features for military and civilian aviation have been identified in this Final Solar PEIS. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.7 Geologic Setting and Soil Resources

10.1.7.1 Affected Environment

10.1.7.1.1 Geologic Setting

Data provided in the Draft Solar PEIS remain valid. The boundaries of the proposed Antonito Southeast SEZ remain the same, but about 17 acres (0.069 km^2) of wetland and lake areas are now designated as non-development areas.

10.1.7.1.2 Soil Resources

Data provided in the Draft Solar PEIS remain valid, with the following update:

- Table 10.1.7.1-1 provides revised areas for soil map units taking into account the non-development area within the Antonito Southeast SEZ.

10.1.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar project. Because the developable area of the SEZ has changed by less than 1%, the assessment of impacts provided in the Draft Solar PEIS remains valid, with the following update:

- Impacts related to wind erodibility are somewhat reduced because the identification of non-development areas eliminates about 5 acres (0.020 km^2) of moderately erodible soils from development (the playa areas are not rated for wind erodibility).

10.1.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on soils are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will reduce the potential for soil impacts during all project phases.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, no SEZ-specific design features for soil resources were identified at the proposed Antonito Southeast SEZ. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.8 Minerals (Fluids, Solids, and Geothermal Resources)

A mineral potential assessment for the proposed Antonito Southeast SEZ has been prepared and reviewed by BLM mineral specialists knowledgeable about the region where the SEZ is located (BLM 2012). The BLM is proposing to withdraw the SEZ from settlement, sale, location, or entry under the general land laws, including the mining laws, for a period of 20 years (see Section 2.2.2.2.4 of the Final Solar PEIS). The potential impacts of this withdrawal are discussed in Section 10.1.24.

10.1.8.1 Affected Environment

There are no oil and gas leases, mining claims, or geothermal leases located in the proposed SEZ. The description of the mineral resources in the Draft Solar PEIS remains valid.

TABLE 10.1.7.1-1 Summary of Soil Map Units within the Proposed Antonito Southeast SEZ as Revised

Map Unit Symbol[a]	Map Unit Name	Erosion Potential: Water[b]	Erosion Potential: Wind[c]	Description	Area in Acres[d] (Percentage of SEZ)
53	Travelers very stony loam (1 to 3% slope)	Slight	Low (WEG 8)[e]	Nearly level soils on mesas and hillslopes capped by basalts, andesite, and/or rhyolite. Parent material consists of thin calcareous sediments weathered from basalt. Shallow and well to somewhat excessively drained, with medium surface-runoff potential and moderate to moderately rapid permeability. Available water capacity is very low. Used mainly as rangeland. Susceptible to compaction.	5,445 (56.0)[f]
17	Garita cobbly loam (0 to 3% slope)	Slight	Moderate (WEG 4)	Nearly level soils on alluvial fans and fan terraces. Parent material consists of thick calcareous sediments from basalt. Deep and well drained, with very low surface-runoff potential and moderate permeability. Available water capacity is low. Used mainly as native pastureland. Susceptible to compaction.	2,707 (27.8)[g]
18	Garita cobbly loam (3 to 25% slope)	Slight	Moderate (WEG 4)	Nearly level to gently sloping soils on alluvial fans and fan terraces. Parent material consists of thick calcareous and gravelly alluvium from basalt. Deep and well drained, with low surface-runoff potential and moderate permeability. Available water capacity is low. Used mainly as native pastureland. Susceptible to compaction.	1,060 (10.9)[h]
38	Monte loam (1 to 3% slope)	Slight	Moderate (WEG 4)	Nearly level soils on alluvial fans and floodplains. Parent material consists of alluvium from rhyolite and latite. Deep and well drained, with low surface-runoff potential and moderate permeability. Available water capacity is high. Used mainly for native rangeland and irrigated cropland; prime farmland if irrigated.[i] Susceptible to compaction; severe rutting hazard.	209 (2.2)

TABLE 10.1.7.1-1 (Cont.)

Map Unit Symbol[a]	Map Unit Name	Erosion Potential: Water[b]	Erosion Potential: Wind[c]	Description	Area in Acres[d] (Percentage of SEZ)
54	Travelers very stony loam (3 to 25% slope)	Slight	Low (WEG 8)	Nearly level to gently sloping soils on mesas and hillslopes capped by basalts, andesite, and/or rhyolite. Parent material consists of thin calcareous material weathered from basalt. Shallow and well to somewhat excessively drained, with high surface-runoff potential (very low infiltration) and moderate to moderately rapid permeability. Available water capacity is very low. Used mainly as rangeland. Susceptible to compaction.	209 (2.1)[j]
28	Luhon loam (1 to 3% slope)	Slight	Moderate (WEG 4)	Nearly level soils on alluvial fans and valley side slopes. Parent material consists of mixed calcareous alluvium. Deep and well drained, with low surface-runoff potential and moderate permeability. Available water capacity is high. Used mainly as native pastureland; prime farmland if irrigated. Susceptible to compaction; severe rutting hazard.	79 (<1)
60	Playas	Not rated	Not rated	Very poorly drained soils formed in playas; moderately to strongly saline. Compaction resistance not rated; severe rutting hazard.	20 (<1)[k]

[a] Map unit symbols are shown in Figure 10.1.7.1-7 of the Draft Solar PEIS.

[b] Water erosion potential rates the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. The ratings are based on slope and soil erosion factor K and represent soil loss caused by sheet or rill erosion where 50 to 75% of the surface has been exposed by ground disturbance. A rating of “slight” indicates that erosion is unlikely under ordinary climatic conditions.

[c] Wind erosion potential here is based on the wind erodibility group (WEG) designation: groups 1 and 2, high; groups 3 through 6, moderate; and groups 7 and 8, low (see footnote d for further explanation).

[d] To convert acres to km^2, multiply by 0.004047.

Footnotes continued on next page.

TABLE 10.1.7.1-1 (Cont.)

[e] WEGs are based on soil texture, content of organic matter, effervescence of carbonates, content of rock fragments, and mineralogy, and also take into account soil moisture, surface cover, soil surface roughness, wind velocity and direction, and the length of unsheltered distance (USDA 2004). Groups range in value from 1 (most susceptible to wind erosion) to 8 (least susceptible to wind erosion). The NRCS provides a wind erodibility index, expressed as an erosion rate in tons per acre (4,000 m^2) per year, for each of the wind erodibility groups: WEG 1, 220 tons (200 metric tons) per acre (4,000 m^2) per year (average); WEG 2, 134 tons (122 metric tons) per acre (4,000 m^2) per year; WEGs 3 and 4 (and 4L), 86 tons (78 metric tons) per acre (4,000 m^2) per year; WEG 5, 56 tons (51 metric tons) per acre (4,000 m^2) per year; WEG 6, 48 tons (44 metric tons) per acre (4,000 m^2) per year; WEG 7, 38 tons (34 metric tons) per acre (4,000 m^2) per year; and WEG 8, 0 tons per acre per year.

[f] A total of 5 acres (0.020 km^2) of the Travelers very stony loam (1 to 3% slopes) is currently categorized as a non-development area.

[g] Less than 1 acre (0.0040 km^2) of the Garita cobbly loam (0 to 3% slopes) is currently categorized as a non-development area.

[h] Less than 1 acre (0.0040 km^2) of the Garita cobbly loam (3 to 25% slopes) is currently categorized as a non-development area.

[i] Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses.

[j] A total of 5 acres (0.020 km^2) of the Travelers very stony loam (3 to 35% slopes) is currently categorized as a non-development area.

[k] A total of 6 acres (0.024 km^2) of the playa areas is currently categorized as a non-development area.

Source: NRCS (2009).

10.1.8.2 Impacts

There are no anticipated impacts on mineral resources from the development of solar energy facilities in the proposed SEZ. The analysis of impacts on mineral resources in the Draft Solar PEIS remains valid.

10.1.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that will reduce impacts on mineral resources are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide adequate protection of mineral resources.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, no SEZ-specific design features for minerals have been identified in this Final Solar PEIS. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.9 Water Resources

10.1.9.1 Affected Environment

The description of the affected environment given in the Draft Solar PEIS relevant to water resources at the proposed Antonito Southeast SEZ remains valid and is summarized in the following paragraphs.

The Antonito Southeast SEZ is within the Rio Grande Headwaters subbasin of the Rio Grande hydrologic region. The SEZ is located in the San Luis Valley bounded by the San Juan Mountains to the west and the Sangre de Cristo Mountains to the east. Precipitation and snowfall in the valley is around 7 in./yr (18 cm/yr) and 25 in./yr (64 cm), respectively, with much greater amounts in the surrounding mountains. Pan evaporation rates are estimated to be on the order of 54 in./yr (137 cm/yr). Surface water features within the SEZ include Alta Lake and several intermittent/ephemeral washes. Alta Lake covers an area of approximately 2 acres (0.0040 km^2), and the existing intermittent/ephemeral washes are generally shallow and flow from southwest to northeast. Three palustrine wetlands have been identified within the SEZ, which are temporally flooded throughout the year. Alta Lake and these wetland areas have been identified as non-development areas covering 17 acres (0.07 km^2) in total. Flood hazards have not been identified, but intermittent flooding may occur along the intermittent/ephemeral washes and Alta Lake. Groundwater in the San Luis Valley is primarily in basin-fill deposits with an upper unconfined aquifer and a lower confined aquifer, which are separated by a series of confining clay layers and unfractured volcanic rocks. There are no confining clay layers in the vicinity of the Antonito Southeast SEZ; however, a basalt layer that is near the surface acts as a confining unit over the basin-fill aquifer. Groundwater monitoring wells within the SEZ have reported depths to groundwater ranging from 200 to 300 ft (61 to 91 m) below the surface that indicate a groundwater flow from west to east toward the Rio Grande. Water quality in the aquifers of the San Luis Valley varies, with good water quality along the edges of the valley and poor water quality in the vicinity of the depression around San Luis Lake.

The Antonito Southeast SEZ is located in the Colorado Division 3 management zone (Rio Grande Basin) of the Colorado Division of Water Resources (Colorado DWR), where both surface water and groundwater rights are overappropriated. The Rio Grande Compact of 1938 obligates Colorado to meet water delivery schedules to New Mexico and governs much of the water management decision making in the San Luis Valley. In order to balance water uses within the San Luis Valley and to meet treaty obligations, several water management mechanisms have been developed that affect existing water rights and water right transfers. The two primary water management considerations affecting solar energy development are the need for an augmentation water plan, and the rules set by the recently formed Special Improvement District Number 1 (Subdistrict #1). Augmentation water plans were described in the Draft Solar PEIS (Section 10.1.9.1.3) and essentially require junior water right holders to have additional water reserves to ensure that more senior water rights are not hindered. The water management plan for Subdistrict #1 was ruled on in June 2010, putting restrictions on groundwater withdrawals in an effort to restore groundwater levels in the unconfined aquifer. None of the Colorado SEZs are located within the boundaries of Subdistrict #1, which primarily includes central portions of the San Luis Valley that are currently used for agriculture. However, given that water rights are overappropriated in the San Luis Valley and largely clustered within Subdistrict #1, it is likely that any new water diversions and water right transfers would involve these new groundwater management considerations.

In addition to the water resources information provided in the Draft Solar PEIS, this section provides a planning-level inventory of available climate, surface water, and groundwater monitoring stations within the immediate vicinity of the proposed Antonito Southeast SEZ and surrounding basin. Additional data regarding climate, surface water, and groundwater conditions are presented in Tables 10.1.9.1-1 through 10.1.9.1-7 and in Figures 10.1.9.1-1 and 10.1.9.1-2. Fieldwork and hydrologic analyses needed to determine 100-year floodplains and jurisdictional water bodies would need to be coordinated with appropriate federal, state, and local agencies. Areas within the Antonito Southeast SEZ that are found to be within a 100-year floodplain will be identified as non-development areas. Any water features within the Antonito Southeast SEZ determined to be jurisdictional will be subject to the permitting process described in the Clean Water Act (CWA).

10.1.9.2 Impacts

10.1.9.2.1 Land Disturbance Impacts on Water Resources

The discussion of land disturbance effects on water resources in the Draft Solar PEIS remains valid. As stated in the Draft Solar PEIS, land disturbance impacts in the vicinity of the proposed Antonito Southeast SEZ could potentially affect drainage patterns, Alta Lake, several small wetlands, and groundwater recharge. The alteration of natural drainage pathways during

TABLE 10.1.9.1-1 Watershed and Water Management Basin Information Relevant to the Proposed Antonito Southeast SEZ as Revised

Basin	Name	Area (acres)[b]
Subregion (HUC4)[a]	Rio Grande Headwaters (1301)	4,871,782
Cataloging unit (HUC8)	Alamosa–Trinchera (13010002)	1,625,212
Cataloging unit (HUC8)	Conejos (13010005)	490,998
Groundwater basin	San Luis Valley	2,000,000
SEZ	Antonito Southeast	9,729

a HUC = Hydrologic Unit Code; a USGS system for characterizing nested watersheds that includes large-scale subregions (HUC4) and small-scale cataloging units (HUC8).

b To convert acres to km^2, multiply by 0.004047.

TABLE 10.1.9.1-2 Climate Station Information Relevant to the Proposed Antonito Southeast SEZ as Revised

Climate Station (COOP ID[a])	Elevation[b] (ft)[c]	Distance to SEZ (mi)[d]	Period of Record	Mean Annual Precipitation (in.)[e]	Mean Annual Snowfall (in.)
Chama, New Mexico (291664)	7,850	36	1893–2011	21.33	107.00
Conejos 3 NNW, Colorado (051816)	7,907	9	1904–1960	7.93	21.40
Manassa, Colorado (055322)	7,690	11	1893–2011	7.27	24.80
Skarda, New Mexico (298352)	8,507	15	1942–1983	13.21	58.40

a National Weather Service's Cooperative Station Network station identification code.

b Surface elevations for the proposed Antonito Southeast SEZ range from 7,715 to 8,035 ft.

c To convert ft to m, multiply by 0.3048.

d To convert mi to km, multiply by 1.6093.

e To convert in. to cm, multiply by 2.540.

Source: NOAA (2012).

construction can lead to impacts related to flooding, loss of water delivery to downstream regions, and sedimentation in Alta Lake and wetland areas, along with alterations to riparian vegetation and habitats. Within the SEZ, 17 acres (0.069 km^2) have been identified as non-development areas, including Alta Lake and several small wetlands.

Land clearing, land leveling, and vegetation removal during the development of the SEZ have the potential to disrupt intermittent/ephemeral stream channels. Several programmatic

TABLE 10.1.9.1-3 Total Lengths of Selected Streams at the Subregion, Cataloging Unit, and SEZ Scale Relevant to the Proposed Antonito Southeast SEZ as Revised

Water Feature	Subregion, HUC4 (ft)[a]	Cataloging Unit, HUC8 Alamosa–Trinchera (ft)	Cataloging Unit, HUC8 Conejos (ft)	SEZ (ft)
Unclassified streams	19,502	6,556	858	0
Perennial streams	14,694,407	3,488,426	1,740,886	0
Intermittent/ephemeral streams	94,288,163	30,056,019	9,101,096	102,884
Canals	12,151,458	5,521,867	963,558	26,940

[a] To convert ft to m, multiply by 0.3048.

Source: USGS (2012a).

TABLE 10.1.9.1-4 Stream Discharge Information Relevant to the Proposed Antonito Southeast SEZ as Revised

Parameter	Station (USGS ID): Conejos River near Mogote, Colorado (08246500)	San Antonio River at Ortiz, Colorado (08247500)	Rio Grande near Lobatos, Colorado (08251500)	Rio Grande at Colorado–New Mexico State Line (08252000)
Period of record	1903–2010	1920–2010	1900–2010	1954–1982
No. of observations	102	87	111	29
Discharge, median (ft^3/s)[a]	2,260	469	2,500	1,440
Discharge, range (ft^3/s)	441–9,000	40–1,750	280–13,200	357–5,000
Discharge, most recent observation (ft^3/s)	2,330	964	1,640	1,920
Distance to SEZ (mi)[b]	13	5	11	12

[a] To convert ft^3 to m^3, multiply by 0.0283.

[b] To convert mi to km, multiply by 1.6093.

Source: USGS (2012b).

design features described in Section A.2.2 of Appendix A of this Final Solar PEIS would avoid, minimize, and/or mitigate impacts associated with the disruption of intermittent/ephemeral water features. Additional analyses of intermittent/ephemeral streams are presented in this update, including an evaluation of functional aspects of stream channels with respect to groundwater recharge, flood conveyance, sediment transport, geomorphology, and ecological habitats. Only a summary of the results from these surface water analyses is presented in this section; more information on methods and results is presented in Appendix O.

TABLE 10.1.9.1-5 Surface Water Quality Data Relevant to the Proposed Antonito Southeast SEZ as Revised

Parameter	Station (USGS ID)[a] 08246500	08247500	08251500	08252000	08249200
Period of record	1967–1987	1978–1986	1919–2011	1978–1982	1957–1969
No. of records	208	158	742	86	537
Temperature (°C)[b]	6 (0–19.5)	3 (0–25)	12 (0–210)	10.25 (0–23)	10 (0–25)
Total dissolved solids (mg/L)	70 (37–77)	NA[c]	177.5 (73–690)	NA	229 (94)
Dissolved oxygen (mg/L)	8.4	NA	8.9 (4.7–87)	NA	661
pH	7.1 (6.8–8.3)	NA	8.2 (6.4–9)	NA	7.6 (6.6–8.9)
Total nitrogen (mg/L)	<0.14	NA	0.37 (0.11–1.2)	NA	NA
Phosphorus (mg/L as P)	0.015	NA	0.37 (0.11–1.2)	NA	NA
Organic carbon (mg/L)	1.8	NA	0.06 (0.006–0.41)	NA	NA
Calcium (mg/L)	13 (6–16)	NA	26 (10–98)	NA	38 (13–88)
Magnesium (mg/L)	1.7 (1–2.7)	NA	5.1 (1.3–24)	NA	7.3 (1–20)
Sodium (mg/L)	2.7 (1–3.2)	NA	19 (6.2–100)	NA	32 (8.2–183)
Chloride (mg/L)	1.1 (0.5–2.5)	NA	5.95 (1.2–33)	NA	7.6 (1.5–33)
Sulfate (mg/L)	4.2 (2.41–5)	NA	39.5 (7.92–320)	NA	53 (15–296)
Arsenic (µg/L)	1	NA	2.95 (1–6)	NA	NA

[a] Median values are listed; the range in values is shown in parentheses.

[b] To convert °C to °F, multiply by 1.8, then add 32.

[c] NA = no data collected for this parameter.

Source: USGS (2012b).

TABLE 10.1.9.1-6 Water Quality Data from Groundwater Samples Relevant to the Proposed Antonito Southeast SEZ as Revised

Parameter	Station (USGS ID)[a]	
	370140105593701	370142105561101
Period of record	2011	1982
No. of records	1	1
Temperature (°C)[b]	1	14.5
Total dissolved solids (mg/L)	NA[c]	136
Dissolved oxygen (mg/L)	1	NA
pH	1	7.9
Nitrate + nitrite (mg/L as N)	NA	0.62
Phosphate (mg/L)	NA	NA
Organic carbon (mg/L)	NA	NA
Calcium (mg/L)	NA	22
Magnesium (mg/L)	NA	3.8
Sodium (mg/L)	NA	7.1
Chloride (mg/L)	NA	2
Sulfate (mg/L)	NA	6
Arsenic (µg/L)	NA	NA

[a] Median values are listed.

[b] To convert °C to °F, multiply by 1.8, then add 32.

[c] NA = no data collected for this parameter.

Source: USGS (2012b).

TABLE 10.1.9.1-7 Groundwater Surface Elevations Relevant to the Proposed Antonito Southeast SEZ as Revised

Parameter	Station (USGS ID)			
	370140105593701	370056105564301	370142105561101	370326105575501
Period of record	1982	1982	1981–1982	2001–2011
No. of observations	1	1	2	120
Surface elevation (ft)[a]	7,928	7,865	7,782	7,815
Well depth (ft)	333	337	230	65
Depth to water, median (ft)	262.08	293.74	216.18	56.61
Depth to water, range (ft)	–[b]	–	216.06–216.3	47.21–61.93
Depth to water, most recent observation (ft)	262.08	293.74	216.3	55.84
Distance to SEZ (mi)[c]	3	0	1	3

[a] To convert ft to m, multiply by 0.3048.

[b] A dash indicates only one data point at this site.

[c] To convert mi to km, multiply by 1.6093.

Source: USGS (2012b).

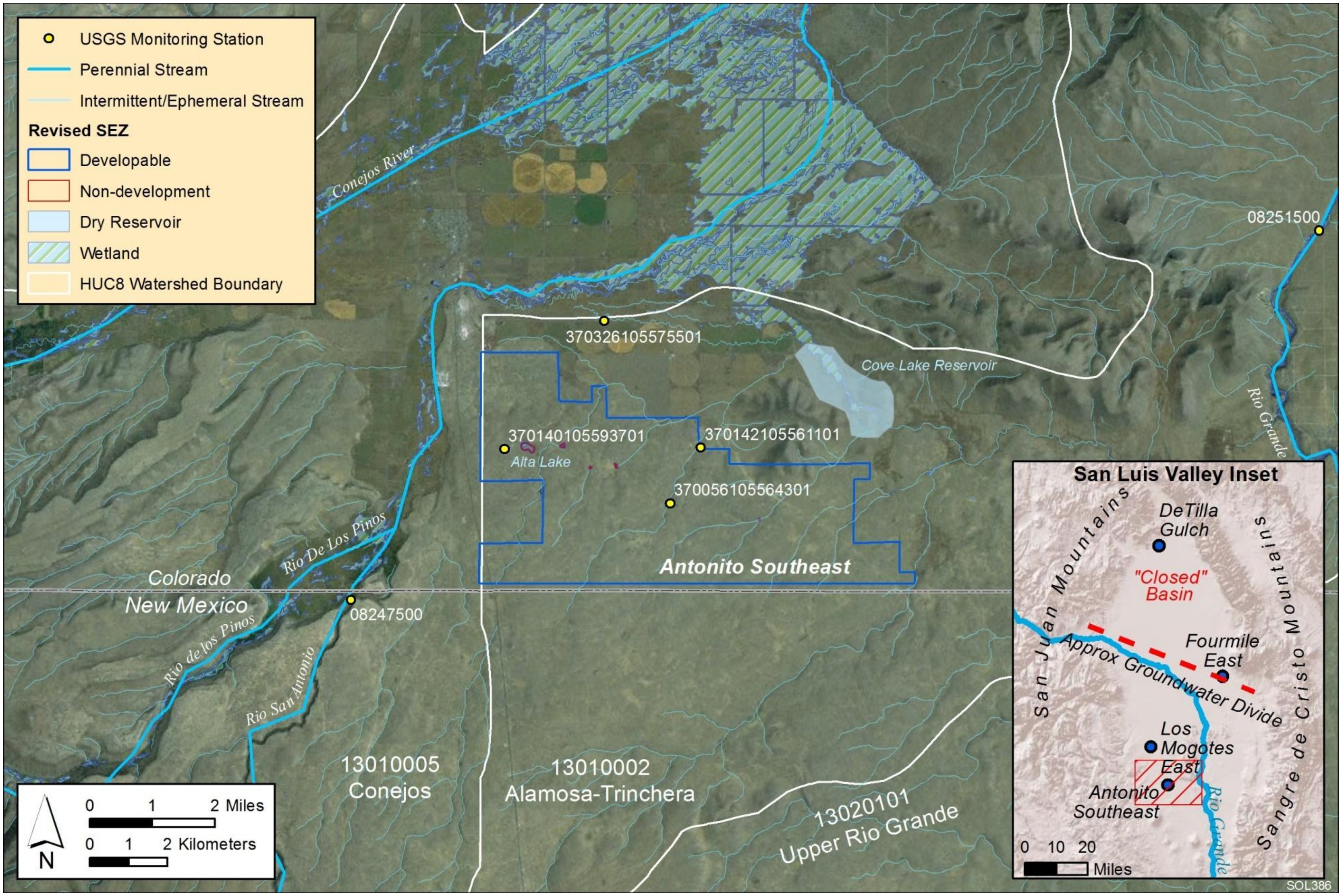

FIGURE 10.1.9.1-1 Water Features near the Proposed Antonito Southeast SEZ as Revised

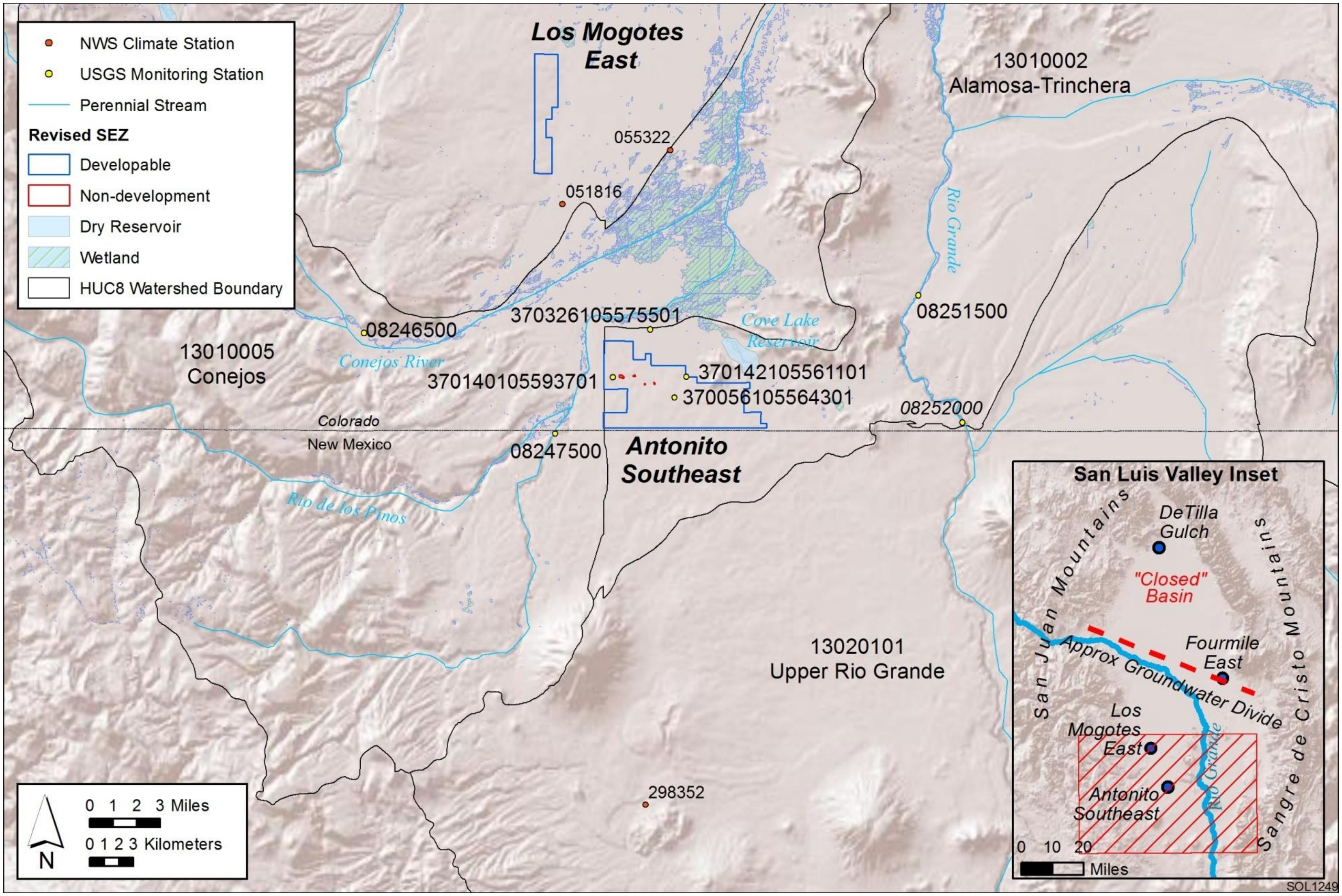

FIGURE 10.1.9.1-2 Water Features within the Alamosa–Trinchera and Conejos Watersheds, Which Include the Proposed Antonito Southeast SEZ as Revised

The study region considered for the intermittent/ephemeral stream evaluation relevant to the Antonito Southeast SEZ is a subset of the Alamosa–Trinchera and Conejos watersheds (HUC8), for which information regarding stream channels is presented in Tables 10.1.9.1-3 and 10.1.9.1-4 of this Final Solar PEIS. The results of the intermittent/ephemeral stream evaluation are shown in Figure 10.1.9.2-1, which depicts flow lines from the National Hydrography Dataset (USGS 2012a) labeled as low, moderate, and high sensitivity to land disturbance. Within the study area, 63% of the intermittent/ephemeral stream channels had low sensitivity and 37% had moderate sensitivity to land disturbance. All the intermittent/ephemeral channel reaches within the Antonito SEZ were classified as having low sensitivity to land disturbance.

10.1.9.2.2 Water Use Requirements for Solar Energy Technologies

The water use requirements for full build-out scenarios of the Antonito Southeast SEZ have not changed from the values presented in the Draft Solar PEIS (see Tables 10.1.9.2-1 and 10.1.9.2-2 in the Draft Solar PEIS). This section presents additional analyses of groundwater, which includes a basin-scale water budget and a simplified, one-dimensional groundwater model to assess groundwater drawdown for various development scenarios. Only a summary of the results from these groundwater analyses is presented in this section; more information on methods and results is presented in Appendix O.

The Antonito Southeast SEZ is located in the San Luis Valley, where both surface waters and groundwater are managed conjunctively. Previous studies on water resources in the San Luis Valley typically present a basin-scale water balance, which considers inputs and outputs of water via precipitation, surface water flows, and groundwater (e.g., Mayo et al. 2007). Table 10.1.9.2-1 presents an example water balance for the San Luis Valley that considers all water inputs and outputs from the valley. As noted by Mayo et al. (2007), it is difficult to reconcile some of the historical water budget presented for the San Luis Valley; however, it can be generally stated that the water budget is predominately a balance of precipitation and stream flow inputs with output dominated by evapotranspiration by agricultural lands, riparian areas, and meadows.

The estimated total water use requirements during the peak construction year are as high as 964 ac-ft/yr (1.2 million m^3/yr), which does not constitute a significant amount given the short duration of this water demand relative to water resources within the region. The long duration of groundwater pumping during operations (20 years) poses a greater threat to groundwater resources. This analysis considered low, medium, and high groundwater pumping scenarios that represent full build-out of the SEZ assuming PV, dry-cooled parabolic trough, and wet-cooled parabolic trough, respectively (a 30% operational time was considered for all solar facility types on the basis of operations estimates for proposed utility-scale solar energy facilities). The low, medium, and high pumping scenarios result in groundwater withdrawals that range from 44 to 7,805 ac-ft/yr (54,300 to 9.6 million m^3/yr), or 880 to 155,820 ac-ft (1.1 million to 192 million m^3) over the 20-year operational period. From a groundwater budgeting perspective,

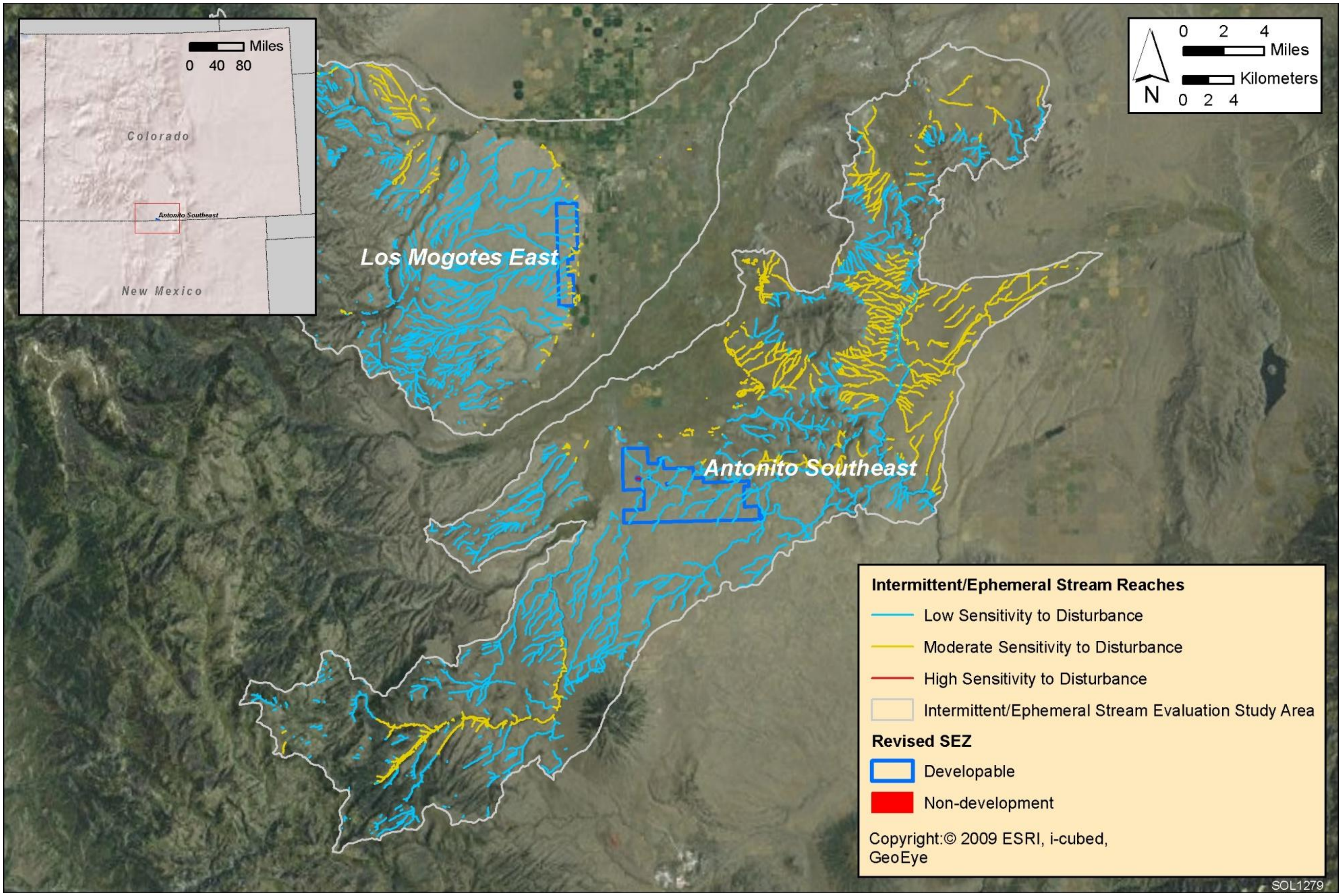

FIGURE 10.1.9.2-1 Intermittent/Ephemeral Stream Channel Sensitivity to Surface Disturbances in the Vicinity of the Proposed Antonito Southeast SEZ as Revised

TABLE 10.1.9.2-1 Water Budget for the San Luis Valley, Which Includes the Proposed Antonito Southeast SEZ as Revised

Process	Amount
Inputs	
Precipitation (ac-ft/yr)[a]	1,086,356
Streams draining Sangre de Cristo Mts. (ac-ft/yr)	214,839
Streams draining San Juan Mts. (ac-ft/yr)	1,321,463
Groundwater underflow (ac-ft/yr)	721,535
Outputs	
Evapotranspiration (ac-ft/yr)	2,245,676
Rio Grande discharge (ac-ft/yr)	332,392
Groundwater underflow (ac-ft/yr)	72,964
Groundwater pumping (ac-ft/yr)[b]	641,214
Groundwater storage	
Storage (ac-ft)	2,026,783

[a] To convert ac-ft to m^3, multiply by 1,234.

[b] Colorado DWR (2004).

Source: Mayo et al. (2007).

the high pumping scenario over the 20-year analysis period represents 8% of the groundwater storage, and its annual pumping rate is on the order of 1.2% of the current annual groundwater withdrawals in the basin. The amounts of estimated groundwater withdrawals for the low and medium pumping scenarios do not represent significant quantities in comparison to the water budget of the San Luis Valley.

Examining groundwater withdrawals with respect to a basin-scale water budget allows for an assessment of potential impacts only to an order of magnitude approximation of basin-scale estimates of complex groundwater processes. In addition, a water budget approach ignores the temporal and spatial components of how groundwater withdrawals affect groundwater surface elevations, groundwater flow rates, and connectivity to surface water features such as streams, wetlands, playas, and riparian vegetation. A one-dimensional groundwater modeling analysis was performed to present a simplified depiction of the spatial and temporal effects of groundwater withdrawals by examining groundwater drawdown in a radial direction around the center of the SEZ for the low, medium, and high pumping scenarios considering pumping from the upper unconfined aquifer and lower confined aquifer separately. A detailed discussion of the groundwater modeling analysis is presented in Appendix O. It should be noted, however, that the aquifer parameters used for the one-dimensional groundwater model (Table 10.1.9.2-2) represent available literature data, and that the model aggregates these value ranges into a simplistic representation of the aquifers.

TABLE 10.1.9.2-2 Aquifer Characteristics and Assumptions Used in the One-Dimensional Groundwater Model for the Proposed Antonito Southeast SEZ as Revised

Parameter	Value[a]
Upper, unconfined aquifer	
Aquifer type/conditions	Unconfined/basin fill
Aquifer thickness (ft)[b,c]	100
Hydraulic conductivity (ft/day)	200
Transmissivity (ft^2/day)	20,000
Specific yield	0.24
Lower, confined aquifer	
Aquifer type/conditions	Confined/basin fill
Aquifer thickness (ft)	500
Hydraulic conductivity (ft/day)	50
Transmissivity (ft^2/day)	25,000
Storage coefficient	0.0000025
Upper and lower aquifers	
Analysis period (yr)	20
High pumping scenario (ac-ft/yr)[d]	7,791
Medium pumping scenario (ac-ft/yr)	1,111
Low pumping scenario (ac-ft/yr)	44

a Values used for model in parentheses.

b Mayo et al. (2007).

c To convert ft to m, multiply by 0.3048.

d To convert ac-ft to m^3, multiply by 1,234.

Source: Colorado DWR (2004).

Depth to groundwater in the unconfined aquifer is typically on the order of 50 ft (15 m) in the vicinity of the Antonito Southeast SEZ, and the confined aquifer is on the order of 200 to 300 ft (61 to 91 m) below the surface. The one-dimensional groundwater modeling results for the upper unconfined aquifer suggest that groundwater drawdown in the vicinity of the SEZ (approximately a 2-mi [3.2-km] radius) ranges up to 60 ft (18 m) for the high pumping scenario, up to 10 ft (3 m) for the medium pumping scenario, and less than 1 ft (0.3 m) for the low pumping scenario (Figure 10.1.9.2-2). The extent of groundwater drawdown is primarily restricted to the vicinity of the SEZ for all pumping scenarios, except the high pumping scenario, which has 5 ft (1.5 m) of drawdown occurring 5 mi (8 km) away from the SEZ. The modeling results for the lower confined aquifer suggest significant groundwater drawdown occurs for the high pumping scenario, ranging from 30 to 80 ft (9 to 24 m) and extending more than 50 mi (80 km) from the SEZ (Figure 10.1.9.2-2). The low and medium pumping scenarios have a much lower impact on groundwater drawdown, from 0 to 10 ft (0 to 3 m).

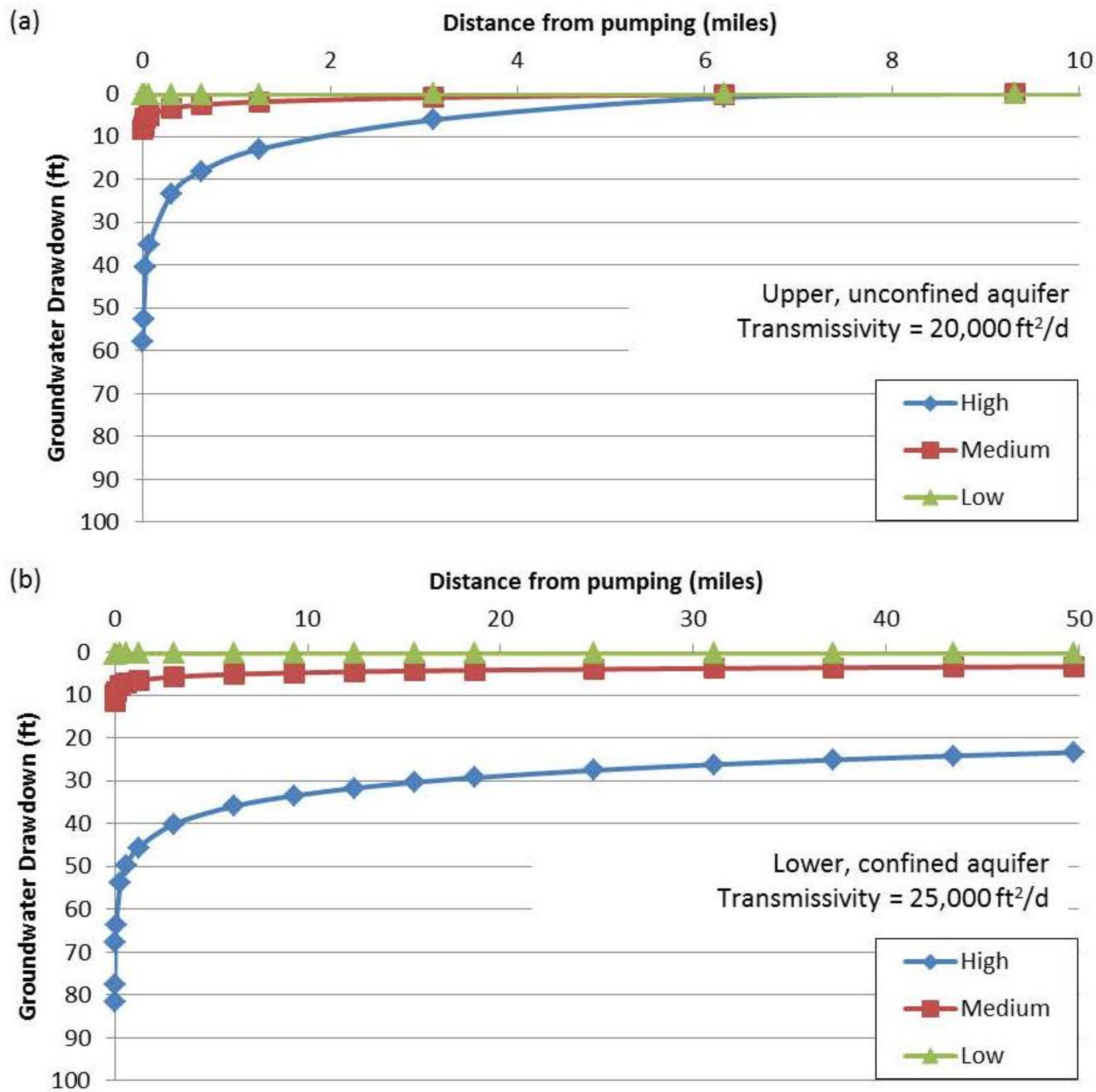

FIGURE 10.1.9.2-2 Estimated One-Dimensional Groundwater Drawdown in (a) Upper Unconfined Aquifer and (b) Lower Confined Aquifer Resulting from High, Medium, and Low Groundwater Pumping Scenarios over the 20-Year Operational Period at the Proposed Antonito Southeast SEZ as Revised

The comparison of water use requirements to the basin-scale water budget and the one dimensional groundwater modeling gives mixed results. From a groundwater budgeting perspective, the three pumping scenarios considered are not significant relative to the amounts of water moved through the San Luis Valley. Groundwater modeling results suggest that the high pumping scenario would have a localized groundwater drawdown effect if groundwater were extracted from the unconfined aquifer, but a more significant impact extending more than 50 mi (80 km) away from the SEZ if withdrawn from the confined aquifer. As stated in Section 10.1.9.1, water management of the San Luis Valley is restrictive given its overappropriated water rights and its obligations to maintain flows in the Rio Grande. Ultimately, any proposed groundwater withdrawals for solar energy facilities would be reviewed for impacts by the Colorado DWR and would be subject to the rules and court decisions outlined in Case Numbers 06CV64 and 07CW52 (Colorado District Court 2010).

10.1.9.2.3 Off-Site Impacts: Roads and Transmission Lines

As stated in the Draft Solar PEIS, impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns related to potential chemical spills, and land disturbance effects on the natural hydrology. Water needed for transmission line construction activities (e.g., for soil compaction, dust suppression, and potable supply for workers) could be trucked to the construction area from an off-site source. If this occurred, water use impacts at the SEZ would be negligible. The Draft Solar PEIS assessment of impacts on water resources from road and transmission line construction remains valid.

10.1.9.2.4 Summary of Impacts on Water Resources

The additional information and analyses of water resources presented in this update agree with the information provided in the Draft Solar PEIS, which indicates that the San Luis Valley is a high-elevation basin, with predominately agricultural land use, and is the headwaters of the Rio Grande, where surface water and groundwater processes are coupled and managed jointly. Groundwater in the San Luis Valley is found both in the upper unconfined aquifer and lower confined aquifer, and historical diversions of both surface water and groundwater for irrigation have affected streamflows and groundwater levels. Water management plays a significant role in the San Luis Valley as it pertains to ensuring river flows in the Rio Grande according to the Rio Grande Compact, which is the primary responsibility of the Colorado DWR.

Disturbance to intermittent/ephemeral stream channels within the Antonito Southeast SEZ should not have a significant impact on the critical functions of groundwater recharge, sediment transport, flood conveyance, and ecological habitat, given the relatively small footprint of the SEZ with respect to the study area, and the low sensitivity to land disturbances of identified intermittent/ephemeral streams. Groundwater withdrawals pose the greatest threat to water resources in the San Luis Valley. The water budgeting and groundwater modeling analyses suggest that significant groundwater drawdown could occur both locally and off-site under the high pumping scenario if groundwater were extracted from either the unconfined or confined aquifer. The low and medium pumping scenarios are preferable, because estimated groundwater drawdown is much less. Ultimately, the process of transferring water rights established by the Colorado DWR will determine how much water can be used by proposed solar facilities. As stated in the Draft Solar PEIS, given the restrictive nature of water rights and the need for augmentation water reserves, it would be difficult for any projects seeking an amount of water more than 1,000 ac-ft/yr (1.2 million m^3/yr) to be successful in obtaining the needed water rights (McDermott 2010).

Predicting impacts associated with groundwater withdrawal is often difficult given the heterogeneity of aquifer characteristics, the long time period between the onset of pumping and its effects, and limited data. Another consideration relevant to the San Luis Valley is that the transfer of water rights will likely come from the purchase of existing irrigation water rights, which will result in a change in the location of the point of diversion and change land use patterns in the basin, both of which can affect groundwater processes. One of the primary mitigation measures to protect water resources is the implementation of long-term monitoring and adaptive management (see Section A.2.4 of Appendix A). For groundwater, this requires a combination of monitoring and modeling to fully identify the temporal and spatial extent of potential impacts. Water management in the San Luis Valley relies on several water monitoring and modeling tools developed by the Colorado DWR and the Colorado Water Conservation Board (CWCB) that are a part of the Colorado's Decision Support Systems (available at http://cdss.state.co.us/Pages/CDSSHome.aspx), and these tools should be implemented with respect to long-term monitoring and adaptive management strategies for solar energy development occurring within the San Luis Valley.

10.1.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on surface water and groundwater are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide some protection of and reduce impacts on water resources.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses, and consideration of comments received as applicable, the following SEZ-specific design feature has been identified:

- Groundwater analyses suggest full build-out of wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed wet-cooled projects would have to reduce water requirements to less than approximately 1,000 ac-ft/yr (1.2 million m^3/yr) in order to secure water rights and comply with water management in the San Luis Valley.

The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.10 Vegetation

10.1.10.1 Affected Environment

Several wetlands mapped by the National Wetlands Inventory (NWI) within the proposed Antonito Southeast SEZ, with a total of about 17 acres (0.07 km^2), were identified as non-development areas in the Supplement to the Draft Solar PEIS.

As presented in Section 10.1.10.1 of the Draft Solar PEIS, 7 cover types were identified within the area of the proposed SEZ, while 26 cover types were identified within the area of indirect effects, including the previously assumed transmission line corridor, and within 5 mi (8 km) of the SEZ boundary. For this updated assessment, a specifically located hypothetical transmission line is no longer being assumed (see Section 10.1.23 for an updated transmission assessment for this SEZ). Sensitive habitats on the SEZ include wetlands and ephemeral washes. Figure 10.1.10.1-1 shows the cover types within the affected area of the Antonito Southeast SEZ as revised.

10.1.10.2 Impacts

As presented the Draft Solar PEIS, the construction of solar energy facilities within the proposed Antonito Southeast SEZ would result in direct impacts on plant communities because of the removal of vegetation within the facility footprint during land-clearing and land-grading operations. With full development of the SEZ, approximately 80% of the SEZ would be expected to be cleared. Taking the newly identified non-development area into account, approximately 7,770 acres (31.4 km^2) would be cleared.

Overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of a cover type would be lost; and (3) *large*: >10% of a cover type would be lost.

10.1.10.2.1 Impacts on Native Species

The analysis presented in the Draft Solar PEIS for the original Antonito Southeast SEZ developable area indicated that development would result in a moderate impact on three land cover types and a small impact on all other land cover types occurring within the SEZ (Table 10.1.10.1-1 in the Draft Solar PEIS). Development within the revised Antonito Southeast SEZ could still directly affect all the cover types evaluated in the Draft Solar PEIS; the reduction in the developable area would result in slightly reduced impact levels on some cover types in the affected area, but the impact magnitudes on all land cover types would remain unchanged compared to original estimates in the Draft Solar PEIS.

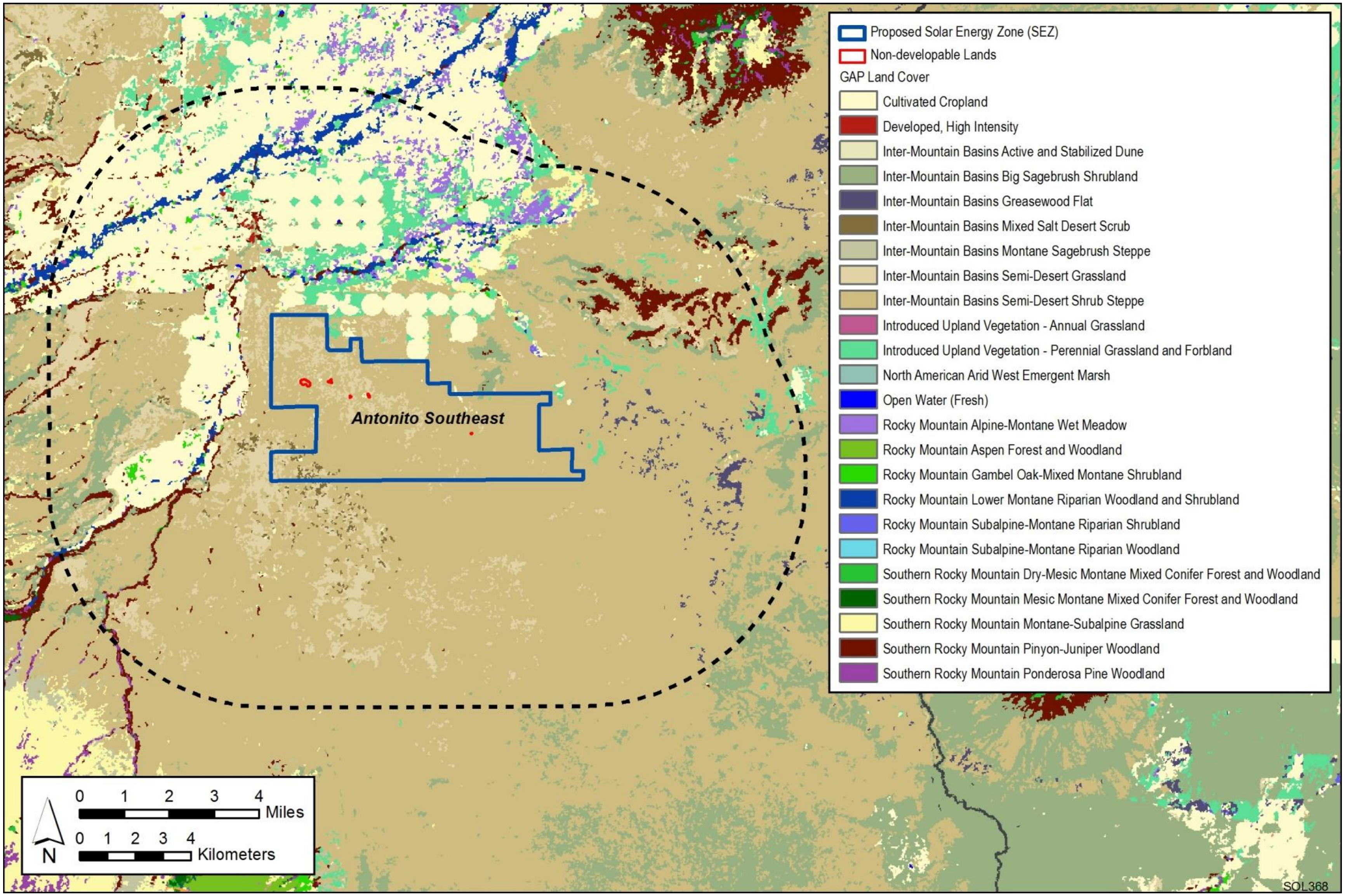

FIGURE 10.1.10.1-1 Land Cover Types within the Proposed Antonito Southeast SEZ as Revised

Direct impacts on the NWI-mapped wetlands, such as Alta Lake, that occur within the non-developable portions of the SEZ, or the previously identified transmission corridor, would not occur. However, direct impacts on unmapped wetlands within the remaining developable areas of the SEZ could still occur. In addition, indirect impacts on wetlands within or near the SEZ, as described in the Draft Solar PEIS, could occur.

10.1.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

As presented the Draft Solar PEIS, land disturbance from project activities and indirect effects of construction and operation within the Antonito Southeast SEZ could potentially result in the establishment or expansion of noxious weeds and invasive species populations, potentially including those species listed in Section 10.1.10.1 in the Draft Solar PEIS. Impacts such as reduced restoration success and possible widespread habitat degradation could still occur.

10.1.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific species and habitats will determine how programmatic design features are applied, for example:

- All wetland and dry wash habitats within the SEZ shall be avoided to the extent practicable, and any impacts minimized and/or mitigated in consultation with appropriate agencies. A buffer area shall be maintained around wetlands, dry washes, and riparian areas to reduce the potential for impacts on wetlands on or near the SEZ and on riparian habitats associated with the Rio San Antonio, Rio de los Pinos, Conejos River, and Cove Lake Reservoir.

- Appropriate engineering controls shall be used to minimize impacts on wetland, dry wash, and riparian habitats, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls will be determined through agency consultation.

- Groundwater withdrawals shall be limited to reduce the potential for indirect impacts on wetland habitats along the Rio San Antonio or the Conejos River, or on springs associated with groundwater discharge.

It is anticipated that implementation of these programmatic design features will reduce a high potential for impacts from invasive species and impacts on wetlands, springs, dry washes, and riparian habitats to a minimal potential for impact. Residual impacts on wetlands could result from remaining groundwater withdrawal and so forth; however, it is anticipated that these impacts would be avoided in the majority of instances.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, no SEZ-specific design features for vegetation have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.11 Wildlife and Aquatic Biota

For the assessment of potential impacts on wildlife and aquatic biota, overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the species' habitat within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of the species' habitat would be lost; and (3) *large*: >10% of the species' habitat would be lost.

10.1.11.1 Amphibians and Reptiles

10.1.11.1.1 Affected Environment

As presented in the Draft Solar PEIS, amphibian and reptile species expected to occur within the Antonito Southeast SEZ include the Woodhouse's toad (*Bufo woodhousii*), fence lizard (*Sceloporus undulatus*), gopher snake (*Pituophis catenifer*), western rattlesnake (*Crotalus viridis*), and western terrestrial garter snake (*Thamnophis elegans*). The potential for these species to occur in the SEZ has not changed, because the boundaries of the Antonito Southeast SEZ have not changed.

10.1.11.1.2 Impacts

As presented in the Draft Solar PEIS, solar energy development within the Antonito Southeast SEZ could affect potentially suitable habitats for several amphibian and reptile species. The analysis presented in the Draft Solar PEIS indicated that development would result in a small overall impact on representative amphibian and reptile species (Table 10.1.11.1-1 in the Draft Solar PEIS). Development within the Antonito Southeast SEZ could still affect the same species evaluated in the Draft Solar PEIS; however, the reduction in the developable wetland and lake areas would, in particular, minimize potential impacts on amphibians. Non-development in the wetland and lake areas would result in reduced (and still small) impact levels on amphibians and reptiles in the Antonito Southeast SEZ compared to original estimates in the Draft Solar PEIS.

10.1.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that will reduce impacts on amphibian and reptile species are described in Section A.2.2 of Appendix A of this Final Solar PEIS. With implementation of required programmatic design features, impacts on amphibian and reptile species would be small.

Because of the change in the developable area within the SEZ and the elimination of consideration of a specific route for a new transmission line, the SEZ-specific design features identified in Section 10.1.11.1.3 of the Draft Solar PEIS (i.e., Alta Lake and surrounding wetlands should be avoided; engineering controls should be used to minimize impacts on aquatic habitats) are no longer applicable. On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, no SEZ-specific design features for reptiles and amphibians have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.11.2 Birds

10.1.11.2.1 Affected Environment

As presented in the Draft Solar PEIS, a large number of bird species could occur or have potentially suitable habitat within the affected area of the proposed Antonito Southeast SEZ. Representative bird species identified in the Draft Solar PEIS included the killdeer (*Charadrius vociferus*), Brewer's blackbird (*Euphagus cyanocephalus*), Brewer's sparrow (*Spizella breweri*), common nighthawk (*Chordeiles minor*), horned lark (*Eremophila alpestris*), vesper sparrow (*Pooecetes gramineus*), western meadowlark (*Sturnella neglecta*), the American kestrel (*Falco sparverius*), ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis*), short-eared owl (*Asio flammeus*), Swainson's hawk (*Buteo swainsoni*), turkey vulture (*Cathartes aura*), and the mourning dove (*Zenaida macroura*). The potential for these species to occur in the SEZ has not changed because the boundaries of the Antonito Southeast SEZ have not changed.

10.1.11.2.2 Impacts

As presented in the Draft Solar PEIS, solar energy development within the Antonito Southeast SEZ could affect potentially suitable habitats of bird species. The analysis presented in the Draft Solar PES for the original Antonito Southeast SEZ indicated that development would result in a small overall impact on the representative bird species. Non-development in the wetland and lake areas would result in reduced (and still small) impact levels on birds in the Antonito Southeast SEZ compared to original estimates in the Draft Solar PEIS. The reduction in the developable wetland and lake areas would, in particular, minimize potential impacts on the killdeer.

10.1.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on bird species are described in Section A.2.2 of Appendix A of this Final Solar PEIS. With the implementation of required programmatic design features, impacts on bird species would be reduced.

On the basis of impact analyses conducted for the Draft Solar PEIS, and consideration of comments received as applicable, the following SEZ-specific design feature for birds has been identified:

- If present, prairie dog colonies (which could provide habitat or a food source for some raptor species) should be avoided to the extent practicable.

If SEZ-specific design features are implemented in addition to required programmatic design features, it is anticipated that impacts on bird species would be small. The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.11.3 Mammals

10.1.11.3.1 Affected Environment

As presented in the Draft Solar PEIS, a large number of mammal species were identified that could occur or have potentially suitable habitat within the affected area of the proposed Antonito Southeast SEZ. Representative mammal species identified in the Draft Solar PEIS included (1) big game species: the American black bear (*Ursus americanus*), bighorn sheep (*Ovis canadensis*), cougar (*Puma concolor*), elk (*Cervis canadensis*), mule deer (*Odocoileus hemionus*), and pronghorn (*Antilocapra americana*); (2) furbearers and small game species: the American badger (*Taxidea taxus*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), and white-tailed jackrabbit (*Lepus townsendii*); and (3) small nongame species: the big brown bat (*Eptesicus fuscus*), deer mouse (*Peromyscus maniculatus*), least chipmunk (*Tamias minimus*), little brown myotis (*Myotis lucifugus*), northern pocket gopher (*Thomomys talpoides*), Ord's kangaroo rat (*Dipodomys ordii*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), and western small-footed myotis (*Myotis ciliolabrum*). The potential for these species to occur in the SEZ has not changed because the boundaries of the Antonito Southeast SEZ have not changed.

10.1.11.3.2 Impacts

As presented in the Draft Solar PEIS, solar energy development within the Antonito Southeast SEZ could affect potentially suitable habitats of mammal species. The analysis presented in the Draft Solar PEIS for the original Antonito Southeast SEZ indicated that development would result in a small overall impact on all representative mammal species analyzed (Table 10.1.11.3-1 in the Draft Solar PEIS). Development within the Antonito Southeast SEZ could still affect the same representative mammal species evaluated in the Draft Solar PEIS; however, the reduction in the developable wetland and lake areas would result in slightly reduced (and still small) impact levels compared to original estimates in the Draft Solar PEIS. Based on mapped activity areas, no notable changes in the magnitude of impacts on elk or mule deer activity areas result from reconfigured solar energy development within the Antonito Southeast SEZ. This includes a moderate impact on elk severe winter range and pronghorn summer concentration area (Tables 10.1.11.3-3 and 10.1.11.3-5 in the Draft Solar PEIS, respectively). Impacts on all other elk, mule deer, and pronghorn activity areas would remain as small to none (see Tables 10.1.11.3-3 through 10.1.11.3-5 in the Draft Solar PEIS).

10.1.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on mammal species are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific resources and conditions will determine how programmatic design features are applied, for example:

- Prairie dog colonies shall be avoided to the extent practicable to reduce impacts on species such as desert cottontail and thirteen-lined ground squirrel.

If the programmatic design features are implemented, impacts on mammal species will be reduced. On the basis of impact analyses conducted for the Draft Solar PEIS, updates to the analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design features for mammals have been identified:

- Construction should be curtailed during winter when big game species are present, particularly within elk severe winter range.

- Disturbance near the elk and mule deer resident population areas should be avoided.

- Where big game winter ranges intersect or are within close proximity to the SEZ, use of motorized vehicles and other human disturbances should be controlled (e.g., through road closures).

- Development in the 253-acre (1-km^2) portion of the SEZ that overlaps the pronghorn summer concentration area should be avoided.

If these SEZ-specific design features are implemented in addition to required programmatic design features, impacts on mammal species would be small. The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.11.4 Aquatic Biota

10.1.11.4.1 Affected Environment

Ephemeral washes and Alta Lake and its associated wetlands are the primary surface water features on the Antonito Southeast SEZ. Because the boundaries of the Antonito Southeast SEZ given in the Draft Solar PEIS have not changed, the amount of surface water features within the area of direct and indirect effects is still valid. The following updates to the Draft Solar PEIS have been identified:

- The wetlands in the SEZ (including Alta Lake) have now been identified as non-development areas.

- A specific route for a new transmission line corridor is no longer assumed.

Aquatic biota present in the surface water features of the Antonito Southeast SEZ have not been characterized. As stated in Appendix C of the Supplement to the Draft Solar PEIS, site surveys can be conducted at the project-specific level to characterize aquatic biota, if present.

10.1.11.4.2 Impacts

The types of impacts from the development of utility-scale solar energy facilities that could affect aquatic habitats and biota are identified in Section 5.10.3 of the Draft Solar PEIS and this Final Solar PEIS. Aquatic habitats present on or near the Antonito Southeast SEZ could be affected by solar energy development in a number of ways, including (1) direct disturbance, (2) deposition of sediments, (3) changes in water quantity, and (4) degradation of water quality. The impact assessment provided in the Draft Solar PEIS remains valid, with the following update:

- Because Alta Lake and other wetlands in the SEZ have been identified as non-development areas, direct impacts on them would not occur. However, as described in the Draft Solar PEIS, the wetlands could be affected indirectly by solar development activities within the SEZ.

10.1.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features applicable to aquatic biota are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific resources and conditions will guide how programmatic design features are applied, for example:

- Undisturbed buffer areas and sediment and erosion controls shall be maintained around Alta Lake and associated wetlands in the western portion of the SEZ.

- The use of heavy machinery and pesticides shall be avoided within the immediate catchment basins for Alta Lake and its associated wetlands.

- Development shall avoid any additional wetlands identified during future site-specific fieldwork.

It is anticipated that implementation of the programmatic design features will reduce impacts on aquatic biota, and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in nearby aquatic habitats, the potential impacts on aquatic biota from solar energy development at the Antonito Southeast SEZ would be small.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, no SEZ-specific design features for aquatic biota have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.12 Special Status Species

10.1.12.1 Affected Environment

Thirty-eight special status species that could occur or have potentially suitable habitat within the affected area of the proposed Antonito Southeast SEZ were identified in the Draft Solar PEIS. Since publication of the Draft Solar PEIS, there have been no revisions to the boundaries of the proposed SEZ; however, approximately 17 acres (0.07 km^2) of wetland and playa habitat within the SEZ have been identified as non-development areas. Exclusion of these wetland areas from development does not reduce the number of species that could be affected by development on the Antonito Southeast SEZ.

Since publication of the Draft Solar PEIS, three additional special status species (Mexican spotted owl [*Strix occidentalis lucida*], western yellow-billed cuckoo [*Coccyzus americanus occidentalis*], and fringed myotis [*Myotis thysanodes*]) have been identified that could occur in the affected area based on known occurrences and the presence of potentially suitable habitat. These three additional species are discussed in the remainder of this section.

Following the publication of the Draft Solar PEIS, the BLM conducted field surveys for special status bat species, as well as for Gunnison prairie dog (*Cynomys gunnisoni*) and western burrowing owl (*Athene cunicularia*), in the Antonito Southeast SEZ. Surveys for bat species were conducted in the SEZ by using passive and active acoustic monitoring techniques at various times between June 16, 2011, and October 15, 2011 (Rodriguez 2011). The big free-tailed bat (*Nyctinomops macrotis*) was the only special status bat species recorded on the SEZ. However, the documented presence of the fringed myotis (*Myotis thysanodes*) in the DeTilla Gulch SEZ suggests that the fringed myotis could occur throughout the San Luis Valley and potentially within the Antonito Southeast SEZ. No roosting habitat for this species was observed on the SEZ (Rodriguez 2011).

Field surveys for Gunnison prairie dog and western burrowing owl were conducted between June 6, 2011, and September 9, 2011 (Garcia and Harvey 2011). Gunnison prairie dog activity was noted in five distinct areas in the western and northern portions of the SEZ within a total approximate area of 592.4 acres (2.4 km^2). Burrowing owls were not recorded on the SEZ during the field survey. However, burrowing owls may be associated with prairie dog colonies on private land west of the SEZ and may utilize the SEZ (particularly the western portion of the SEZ) for nesting and/or foraging. A single burrowing owl was seen on the ground approximately 5 mi (8 km) east of the SEZ on June 21, 2011 (Garcia and Harvey 2011).

Mexican Spotted Owl. The Mexican spotted owl was listed as a threatened species under the ESA on March 16, 1993 (USFWS 1993). Critical habitat for this species was designated on June 6, 1995 (USFWS 1995), but several court rulings resulted in the U.S. Fish and Wildlife Service (USFWS) removing the critical habitat designation on March 25, 1998 (USFWS 1998). In March 2000, the USFWS was ordered by the courts to propose critical habitat; this resulted in the current designation that includes 4.6 million acres (0.02 km^2) in Arizona, Colorado, New Mexico, and Utah on federal lands (USFWS 2004). A recovery plan for the Mexican spotted owl was published in December 1995 and later revised in June 2011 (USFWS 2011). At the time of federal listing in 1993, the total population of Mexican spotted owls was estimated at 2,100.

The Mexican spotted owl occurs from southern British Columbia, Canada, to central Mexico. The primary habitat of the spotted owl is steep rocky canyons, although mature coniferous forests are also important habitat. The spotted owl occupies closed canopy forests in steep canyons with uneven-aged tree stands with a high basal area, and an abundance of snags and downed logs (NatureServe 2010; USFWS 2011).

The Mexican spotted owl feeds mainly on rodents but also consumes rabbits, birds, reptiles, and insects. Nest sites are in trees (typically those with broken tops), tree trunk cavities, and cliffs along canyon walls. Breeding takes place in the spring (March) with egg-laying in late March or early April. After a 30-day incubation period, hatching occurs and fledging takes place in 4 to 5 weeks. The young depend on the adults for food in the summer and eventually disperse from the nesting area in the fall (NatureServe 2010; USFWS 2011).

The Mexican spotted owl is known to occur in Conejos County, Colorado, and potentially suitable habitat for this species may occur in the affected area of the Antonito Southeast SEZ. Potentially suitable habitat for this species does not occur on the SEZ. However, the SWReGAP habitat suitability model for the spotted owl identified approximately 4,900 acres (20 km^2) of potentially suitable habitat within the area of indirect effects (Figure 10.1.12.1-1; Table 10.1.12.1-1). Designated critical habitat for the Mexican spotted owl does not occur in the affected area.

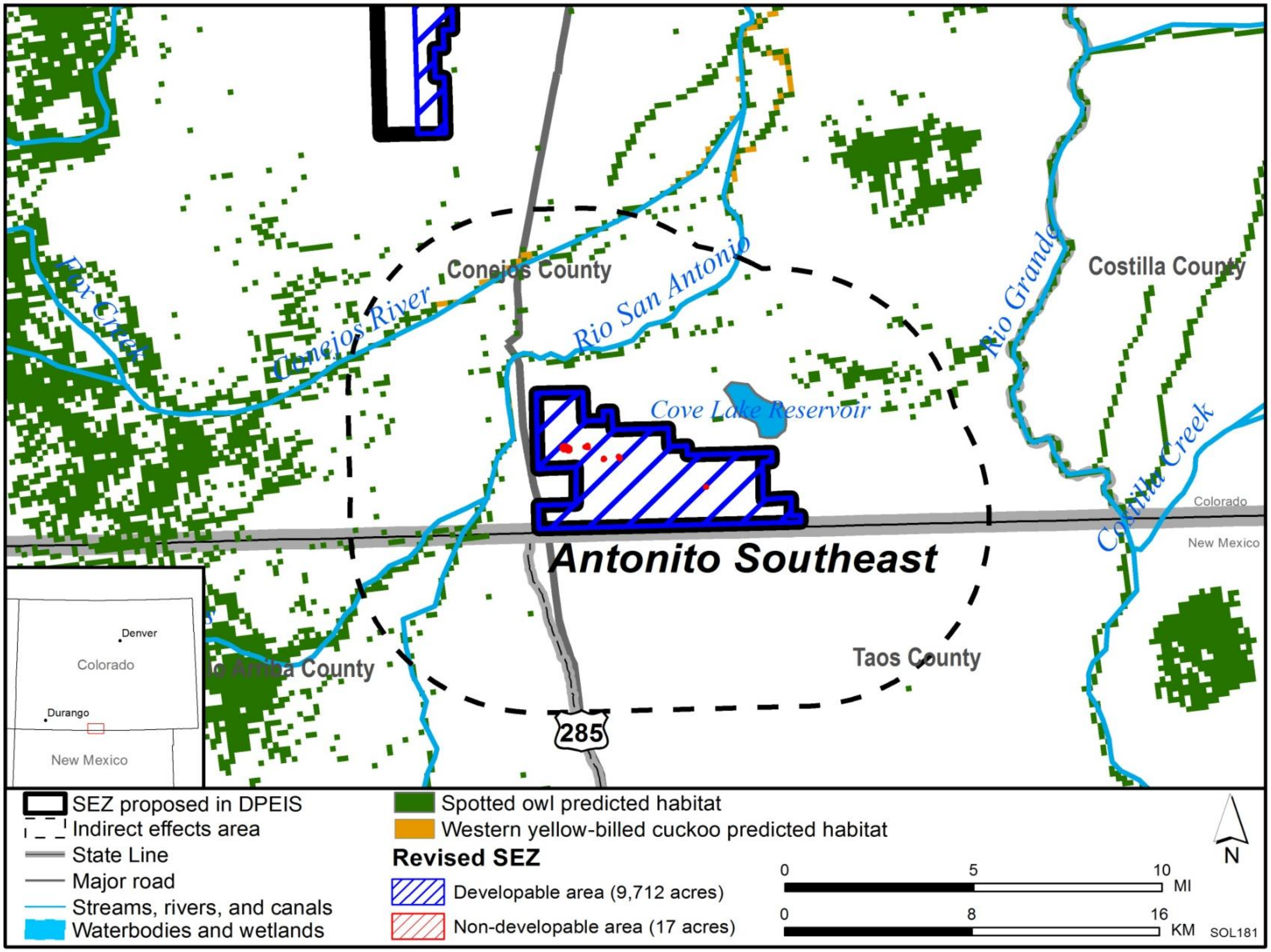

FIGURE 10.1.12.1-1 Developable Area for the Proposed Antonito Southeast SEZ as Revised and Distribution of Potentially Suitable Habitat for the Mexican Spotted Owl and Western Yellow-Billed Cuckoo

TABLE 10.1.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Additional Special Status Species That Could Be Affected by Solar Energy Development on the Proposed Antonito Southeast SEZ as Revised[a]

Common Name	Scientific Name	Listing Status[b]	Habitat[c]	Maximum Area of Potential Habitat Affected[d]: Within SEZ (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[d]: Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds						
Mexican spotted owl	*Strix occidentalis lucida*	ESA-T; CO-T; CO-S1	Inhabits deep, sheer-walled canyons in old-age, mixed coniferous forests. Known to occur in Conejos County, Colorado. About 698,700 acres[i] of potentially suitable habitat occurs in the SEZ region.	0 acres	4,900 acres of potentially suitable habitat (0.7% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	ESA-C	Breeds in scattered areas along the lower Colorado River and larger bodies of water in the southwestern United States. Primarily associated with riparian cottonwood and willow forests with dense understory foliage. Known to occur in Conejos County, Colorado. About 2,800 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	250 acres of potentially suitable habitat (9% of available potentially suitable habitat)	Small overall impact; no direct impact. Avoiding or limiting groundwater withdrawals for solar energy development on the SEZ could reduce impacts on this species.
Mammal						
Fringed myotis	*Myotis thysanodes*	BLM-S; FWS-SC	Summer or year-round resident in wide range of habitats, including woodland, riparian, and shrubland habitats. Roosts in caves, crevices, and buildings. About 3,500,000 acres of potentially suitable habitat occurs within the SEZ region.	9,700 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	122,500 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible, because suitable foraging habitat is widespread in the area of direct effects.

Footnotes on next page.

TABLE 10.1.12.1-1 (Cont.)

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[a] The species presented in this table represent new species identified following publication of the Draft Solar PEIS or a re-evaluation of those species that were determined to have moderate or large impacts in the Draft Solar PEIS. The other special status species for this SEZ are identified in Table 10.1.12.1-1 of the Draft Solar PEIS.

[b] BLM-S = listed as a sensitive species by the BLM; CO-S1 = ranked as S1 in the state of Colorado; CO-T = listed as threatened in the state of Colorado; ESA-C = candidate for listing under the ESA; ESA-T = listed as threatened under the ESA; FWS-SC = USFWS species of concern.

[c] Potentially suitable habitat was determined using SWReGAP habitat suitability models (USGS 2004, 2007). Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[d] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability models (USGS 2004, 2007). This approach probably overestimates the amount of suitable habitat in the project area.

[e] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[f] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from project developments. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[g] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; and (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Design features would reduce most indirect effects to negligible levels.

[h] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[i] To convert acres to km^2, multiply by 0.004047.

Western Yellow-Billed Cuckoo. The western yellow-billed cuckoo is a candidate for listing under the ESA and has the potential to occur in the affected area. The western yellow-billed cuckoo is a neotropical migrant bird that inhabits large riparian woodlands in the western United States. This species is not known to occur in Conejos County, Colorado, but it has been documented in nearby counties, such as La Plata and Rio Grande Counties, Colorado. Although the SWReGAP habitat suitability model for the western yellow-billed cuckoo does not identify any suitable habitat for this species within the SEZ, approximately 250 acres (1 km^2) of potentially suitable riparian habitat occurs within the area of indirect effects along the Conejos River (Figure 10.1.12.1-1; Table 10.1.12.1-1). Potentially suitable habitat may also occur in the area of indirect effects along the Rio San Antonio and Cove Lake Reservoir. Additional basic information on life history, habitat needs, and threats to populations of this species is provided in Appendix J.

Fringed Myotis. The fringed myotis is a year-round resident in western Colorado, where it forages in a variety of habitats including ponderosa pine woodlands, greasewood flats, oakbrush, and shrublands. This species was not evaluated for the Antonito Southeast SEZ in the Draft Solar PEIS. The species roosts in caves, rock crevices, or buildings. The fringed myotis was not recorded on the Antonito Southeast SEZ during field surveys conducted in 2011 (Rodriguez 2011). However, fringed myotis was recorded on the DeTilla Gulch SEZ, suggesting that the species could occur elsewhere in the San Luis Valley and potentially within the Antonito Southeast SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat for the fringed myotis could occur on the SEZ and throughout portions of the area of indirect effects (Table 10.1.12.1-1). There is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the area of direct effects.

10.1.12.2 Impacts

Overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the special status species' habitat within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of the special status species' habitat would be lost; and (3) *large*: >10% of the special status species' habitat would be lost.

As presented in the Draft Solar PEIS, solar energy development within the Antonito Southeast SEZ could affect potentially suitable habitats of special status species. The analysis presented in the Draft Solar PEIS for the original Antonito Southeast SEZ developable area indicated that development would result in no impact or a small overall impact on all special status species (Table 10.1.12.1-1 in the Draft Solar PEIS). Because the boundaries of the Antonito Southeast SEZ have not changed, development within the SEZ could still affect the same 38 species evaluated in the Draft Solar PEIS; however, the reduction in the developable area would result in reduced (but still small) impact levels compared to original estimates in the Draft Solar PEIS.

Field surveys were conducted for the BLM following the publication of the Draft Solar PEIS to determine the potential occurrence of Gunnison prairie dog, western burrowing owl, and special status bat species in the Colorado SEZs (Garcia and Harvey 2011; Rodriguez 2011). Results of these surveys have documented the presence of the Gunnison prairie dog in the western and northern portions of the Antonito Southeast SEZ within an area of approximately 592.4 acres (2.4 km^2) (Garcia and Harvey 2011). In the Draft Solar PEIS, it was determined that as much as 8,293 acres (34 km^2) of potentially suitable habitat for the Gunnison prairie dog could be directly affected by solar energy development within the Antonito Southeast SEZ, resulting in a small overall impact magnitude compared to available habitat in the SEZ region. Development within the revised developable area of the Antonito Southeast SEZ will not affect any more potentially suitable habitat than what was presented in the Draft Solar PEIS; therefore, the overall impact magnitude for the Gunnison prairie dog remains small.

The western burrowing owl was not observed on the Antonito Southeast SEZ during field surveys in 2011 (Garcia and Harvey 2011). However, this species may be associated with prairie dog colonies in close proximity to the SEZ and may utilize the SEZ for nesting and/or foraging. In the Draft Solar PEIS, it was determined that as much as 9,700 acres (39 km^2) of potentially suitable habitat for the western burrowing owl could be directly affected by solar energy development within the Antonito Southeast SEZ, resulting in a small overall impact magnitude compared to available habitat in the SEZ region. Development within the revised developable area of the Antonito Southeast SEZ will not affect any more potentially suitable habitat than what was presented in the Draft Solar PEIS; therefore, the overall impact magnitude for the western burrowing owl remains small.

On the basis of field surveys for special status bat species and comments received on the Draft Solar PEIS, there are three additional special status species that may occur in the affected area of the Antonito Southeast SEZ—Mexican spotted owl, western yellow-billed cuckoo, and fringed myotis. Impacts on these species are discussed below and in Table 10.1.12.1-1. The impact assessment for these additional species was carried out in the same way as for those species analyzed in the Draft Solar PEIS (Section 10.1.12.2 of the Draft Solar PEIS).

Mexican Spotted Owl. The Mexican spotted owl is known to occur in Conejos County, Colorado, and, according to the SWReGAP habitat suitability model for the spotted owl, suitable habitat for the species does not occur anywhere within the Antonito Southeast SEZ. However, approximately 4,900 acres (20 km^2) of potentially suitable year-round habitat occurs within the area of indirect effects (Figure 10.1.12.1-1). The amount of potentially suitable habitat within the indirect effects area represents about 0.7% of the available suitable habitat in the region (Table 10.1.12.1-1).

The overall impact on the Mexican spotted owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the Antonito Southeast SEZ is considered small, because suitable habitat for this species does not occur in the SEZ and only indirect effects are possible. The implementation of design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Western Yellow-Billed Cuckoo. The western yellow-billed cuckoo is known to occur in Conejos County, Colorado, and potentially suitable habitat occurs in the affected area of the Antonito Southeast SEZ. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ. However, the SWReGAP habitat suitability model indicates approximately 250 acres (1 km^2) of potentially suitable habitat occurs in the area of indirect effects, primarily along the Conejos River (Figure 10.1.12.1-1). This indirect effects area represents about 9% of the available suitable habitat in the region (Table 10.1.12.1-1).

The overall impact on the western yellow-billed cuckoo from construction, operation, and decommissioning of utility-scale solar energy facilities within the Antonito Southeast SEZ is considered small, because no potentially suitable habitat for this species occurs in the area of direct effects and only indirect effects are possible. The implementation of design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Fringed Myotis. The fringed myotis is a year-round resident in southwestern Colorado and is known to occur within the San Luis Valley. Although this species is not known to occur in the Antonito Southeast SEZ, field surveys conducted in 2011 documented the presence of this species in the DeTilla Gulch SEZ (Rodriguez 2011). According to the SWReGAP habitat suitability model, approximately 9,700 acres (39 km^2) of suitable foraging habitat on the Antonito Southeast SEZ may be directly affected by construction and operations (Table 10.1.12.1-1). This direct effects area represents 0.3% of potentially suitable habitat in the SEZ region. About 122,500 acres (496 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.5% of the available suitable habitat in the region (Table 10.1.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. There is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the area of direct effects; however, it is possible for individuals to roost in nearby habitats within the area of indirect effects (Rodriguez 2011).

The overall impact on the fringed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the Antonito Southeast SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

10.1.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific resources conditions will guide how programmatic design features are applied, for example:

- Pre-disturbance surveys shall be conducted within the SEZ (i.e., area of direct effects) to determine the presence and abundance of special status species including those identified in Table 10.1.12.1-1 of the Draft Solar PEIS as well as those identified in Table 10.1.12.1-1 in this Final Solar PEIS. Disturbance to occupied habitats for these species shall be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible, translocation of individuals from areas of direct effects or compensatory mitigation of direct effects on occupied habitats may be used to reduce impacts. A comprehensive mitigation strategy for special status species that uses one or more of these options to offset the impacts of projects shall be developed in coordination with the appropriate federal and state agencies.

- Disturbance of wetland and riparian habitat within the SEZ shall be avoided or minimized to the extent practicable. Alta Lake and other identified wetlands have been identified as non-developable areas. Pre-disturbance surveys shall be conducted to determine the presence of additional wetland and riparian habitat in the developable area; development of these habitats shall be avoided or minimized. Adverse impacts on the following special status species could be reduced with the avoidance of wetland and riparian habitats: halfmoon milkvetch (*Astragalus allochrous* var. *playanus*), least moonwort (*Botrychium simplex)*, Rocky Mountain blazing-star (*Liatris ligulistylis)*, Rio Grande chub (*Gila Pandora*), Rio Grande sucker (*Catostomus plebeius)*, milk snake *(Lampropeltis triangulum)*, bald eagle (*Haliaeetus leucocephalu)*, Barrow's goldeneye (*Bucephala islandica)*, ferruginous hawk (*Buteo regalis)*, and southwestern willow flycatcher (*Empidonax traillii extimus)*.

- Avoiding or limiting groundwater withdrawals for solar energy development on the SEZ shall be employed to reduce impacts on groundwater-dependent special status species, including those species that may occur in riparian or aquatic habitats supported by groundwater. These species include the southwestern willow flycatcher and the western yellow-billed cuckoo.

- Consultations with the USFWS and CDOW shall be conducted to address the potential for impacts on the southwestern willow flycatcher, a species listed as endangered under the Endangered Species Act (ESA). Consultation would identify an appropriate survey protocol, avoidance measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.

- Coordination with the USFWS and CDOW shall be conducted to address the potential for impacts on the Gunnison's prairie dog and northern leopard frog (*Rana pipiens)*—species that are either candidates or under review for listing under the ESA. Coordination would identify an appropriate survey protocol, avoidance measures, and, potentially, translocation or compensatory mitigation.

If the programmatic design features are implemented, it is anticipated that the majority of impacts on the special status species from habitat disturbance and groundwater use will be reduced.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, no SEZ-specific design features for special status species have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis. Projects will comply with terms and conditions set forth by the USFWS Biological Opinion resulting from the programmatic consultation and any necessary project-specific ESA Section 7 consultations.

10.1.13 Air Quality and Climate

10.1.13.1 Affected Environment

Except as noted below, the information for air quality and climate presented for the affected environment of the Draft Solar PEIS remains essentially unchanged.

10.1.13.1.1 Existing Air Emissions

The Draft Solar PEIS presented Conejos County emissions data for 2002. More recent data for 2008 (CDPHE 2011) were reviewed for this Final Solar PEIS. The two emissions inventories used different sources and assumptions. All emissions in the 2008 data were lower than those in the 2002 data, and all criteria air pollutants were much lower, but volatile organic compounds (VOCs) were about half of those in the 2002 data. These changes would not affect the modeled air quality impacts presented in this update.

10.1.13.1.2 Air Quality

The calendar quarterly average National Ambient Air Quality Standard (NAAQS) of 1.5 $\mu g/m^3$ for lead (Pb) presented in Table 10.1.13.1-2 of the Draft Solar PEIS has been replaced by the rolling 3-month standard (0.15 $\mu g/m^3$). The federal 24-hour and annual sulfur dioxide (SO_2), 1-hour ozone (O_3), and annual PM_{10} (particulate matter with a diameter of 10 µm or less) standards have been revoked as well (EPA 2011). All Colorado State Ambient Air Quality Standards (SAAQS), except the 3-hour SO_2 standard of 700 $\mu g/m^3$, have been revoked since the publication of the Draft Solar PEIS. These changes would not affect the modeled air quality impacts presented in this update.

The developable area of the proposed Antonito Southeast SEZ was reduced by about 0.2%, from 9,729 acres (39.4 km^2) to 9,712 acres (39.3 km^2). This reduction was effected by removing interior portions of the proposed SEZ from potentially developable areas. The boundaries of the SEZ were not changed, and distances to all receptors of interest remain the same as in the Draft Solar PEIS.

10.1.13.2 Impacts

10.1.13.2.1 Construction

Methods and Assumptions

The methods and modeling assumptions have not changed from those presented in the Draft Solar PEIS. The reduction in the developable area of the proposed Antonito Southeast SEZ by less than 1% would cause only a negligible impact on modeled air quality impacts; thus air quality impacts were not remodeled.

Results

Since the annual PM_{10} standard has been rescinded, the discussion of annual PM_{10} impacts in the Draft Solar PEIS is no longer applicable, and Table 10.1.13.2-1 has been updated for this Final Solar PEIS.

Since the air quality impacts remain the same as those presented in the Draft Solar PEIS, the discussion and conclusions in the Draft Solar PEIS remain valid.[2] Predicted 24-hour PM_{10} and 24-hour $PM_{2.5}$ (particulate matter with a diameter of 2.5 μm or less) concentration levels could exceed the standard level used for comparison at the SEZ boundaries and in the immediate surrounding areas during the construction of a solar facility. However, these high particulate concentrations would be limited to the immediate vicinity of the proposed SEZ boundary and would decrease quickly with distance. At the nearest residence located about 0.5 mi (0.8 km) north of the SEZ, the 24-hour PM_{10} standard level used for comparison would be exceeded, but the 24-hour and annual $PM_{2.5}$ standard levels would not be exceeded at any nearby residences or communities.

The conclusions in the Draft Solar PEIS concerning impacts in nearby Prevention of Significant Deterioration (PSD) Class I areas remain valid. Predicted 24-hour PM_{10} concentration increments at the nearest Class I Area—Wheeler Peak WA, New Mexico—

[2] At this programmatic level, detailed information on construction activities, such as facility size, type of solar technology, heavy equipment fleet, activity level, work schedule, and the like, is not known; thus air quality modeling cannot be conducted. It has been assumed that an area of 3,000 acres (12.1 km^2) in total would be disturbed continuously; thus the modeling results and discussion here should be interpreted in that context. During the site-specific project phase, more detailed information would be available and more realistic air quality modeling analysis could be conducted. It is likely that impacts on ambient air quality predicted for specific projects would be much lower than those in this Final Solar PEIS.

TABLE 10.1.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Antonito Southeast SEZ as Revised

			Concentration ($\mu g/m^3$)				Percentage of NAAQS	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background	Total	NAAQS	Increment	Total
PM_{10}	24 hours	H6H	569	27	596	150	380	398
$PM_{2.5}$	24 hours	H8H	40.0	16	56.0	35	114	160
	Annual	–[c]	10.6	4	14.6	15	70	97

[a] $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm.

[b] Concentrations for attainment demonstration are presented. H6H = highest of the sixth-highest concentrations at each receptor over the 5-year period. H8H = highest of the multiyear average of the eighth-highest concentrations at each receptor over the 5-year period. For the annual average, multiyear averages of annual means over the 5-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

[c] A dash indicates not applicable.

Source: Chick (2009) for background concentration data.

would exceed the PSD increment for Class I Areas. When distances, prevailing winds, and topography are considered, concentration increments at the Great Sand Dunes Wilderness Area (WA) would be similar to those at Wheeler Peak WA but would be much lower than those at the Weminuche WA.

Overall, the conclusions of the Draft Solar PEIS remain valid. Predicted 24-hour PM_{10} and 24-hour $PM_{2.5}$ concentration levels could exceed the standard level used for comparison at the SEZ boundaries and in immediate surrounding areas during the construction of a solar facility. To reduce potential impacts on ambient air quality and in compliance with required programmatic design features, aggressive dust control measures would be used. Predicted total concentrations for annual $PM_{2.5}$ would be below the standard level used for comparison at the site boundary. Potential air quality impacts on neighboring communities would be much lower. Modeling indicates that construction activities are anticipated to exceed Class I PSD PM_{10} increments at the nearest federal Class I areas (Wheeler Peak WA, New Mexico, and Great Sand Dunes WA). Construction activities are not subject to the PSD program, and the comparison provides only a screen to gauge the size of the impact. Accordingly, it is anticipated that impacts of construction activities on ambient air quality would be moderate and temporary.

Since there were no boundary changes to the proposed Antonito Southeast SEZ, any potential impacts on air quality-related values (AQRVs) at nearby federal Class I areas would be the same as in the Draft Solar PEIS and the conclusions in the Draft remain valid. Emissions from construction-related equipment and vehicles are temporary and would cause some unavoidable but short-term impacts.

10.1.13.2.2 Operations

The reduction in developable area of the proposed Antonito Southeast SEZ by less than 1% reduces the generating capacity and annual power generation by a similar percentage and thus reduces the potentially avoided emissions presented in the Draft Solar PEIS. Updated estimates for emissions potentially avoided by a solar facility can be obtained from Table 10.1.13.2-2 in the Draft Solar PEIS by reducing the tabulated emissions by about 0.18%. Maximum emissions avoided would be up to 3,600 tons/yr for SO_2, 4,151 tons/yr for NO_x, and 2,690,000 tons/yr for carbon dioxide (CO_2); other reductions are too small to show. These small reductions would not affect the analysis presented in the Draft Solar PEIS, and the conclusion presented therein that solar facilities built in the proposed Antonito Southeast SEZ could avoid relatively more fuel emissions in Colorado than those built in other states with less reliance on fossil fuel–generated power remains valid.

10.1.13.2.3 Decommissioning and Reclamation

The discussion in the Draft Solar PEIS remains valid. Decommission and reclamation activities would be of short duration, and their potential impacts would be moderate and temporary.

10.1.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce air quality impacts are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Limiting dust generation during construction and operations is a required programmatic design feature under the BLM Solar Energy Program. These extensive fugitive dust control measures would keep off-site particulate matter (PM) levels as low as possible during construction.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, no SEZ-specific design features for air quality have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.14 Visual Resources

10.1.14.1 Affected Environment

No boundary revisions were identified for the proposed Antonito Southeast SEZ; however, 17 acres (0.07 km^2) of non-development wetland and lake areas were identified. The remaining developable area within the SEZ is 9,712 acres (39.3 km^2).

An updated Visual Resources Inventory (VRI) map for the SEZ and surrounding lands is shown in Figure 10.1.14.1-1; it provides information from the BLM's September 2010 VRI, which was finalized in October 2011 (BLM 2011a). As shown, the VRI values for the SEZ now are VRI Class II, III, and IV. The western portion of the SEZ still is VRI Class III, indicating moderate relative visual values, while much of the eastern portion now is VRI Class IV, indicating low relative visual values. These portions of the SEZ are located within the Antonito Southeast scenic quality rating unit. This unit is identified as having low scenic quality and moderate levels of sensitivity. A small portion of the SEZ remains as VRI Class II, indicating high relative visual values; this part of the SEZ is located within the San Luis Hills scenic quality rating unit. This unit is characterized as having high scenic quality and high sensitivity.

Within the La Jara Field Office, lands within the 25-mi (40-km), 650-ft (198-m) viewshed of the SEZ contain 31,253 acres (126.5 km^2) of VRI Class II lands, 36,225 acres (146.6 km^2) of VRI Class III lands, and 25,345 acres (102.6 km^2) of VRI Class IV lands.

10.1.14.2 Impacts

The summary of impacts provided in the Draft Solar PEIS remains valid. In general, the Antonito Southeast SEZ is located in an area of low scenic quality. Visitors to the area, workers, and residents of nearby areas may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads.

Utility-scale solar energy development within the proposed Antonito Southeast SEZ is likely to result in strong visual contrasts for some viewpoints in the San Antonio WSA, along some portions of the Los Caminos Antiguos Scenic Byway, along portions of the West Fork of the North Branch of the Old Spanish Trail, and where there are clear views to the SEZ for residents of and visitors to the community of Antonito. Moderate visual contrast levels would be expected for high-elevation viewpoints in the San Luis Hills WSA and ACEC and for portions of the CTSR Corridor and CTSR Corridor ACEC. Residents and visitors to Conejos likely would observe lower levels of contrasts; minimal to weak visual contrasts would be expected for some viewpoints within other sensitive visual resource areas within the 25-mi (40-km) viewshed of the SEZ.

Solar development on lands in the SEZ visible from and in close proximity to the West Fork of the North Branch of the Old Spanish Trail has a higher potential to have visual impacts on the Trail. The BLM has identified areas in the SEZ visible from and within 1 mi (1.6 km) of the West Fork as potential high visual sensitivity areas, where solar development would be subject to specific, additional design features that would be identified when project-specific environmental analyses are conducted. In addition, the BLM has identified areas in the SEZ visible from 1 to 3 mi (1.6 to 4.8 km) from the Trail as potential moderate visual sensitivity areas. Solar development within these areas also would be subject to specific, additional design features identified as part of a project specific analysis.

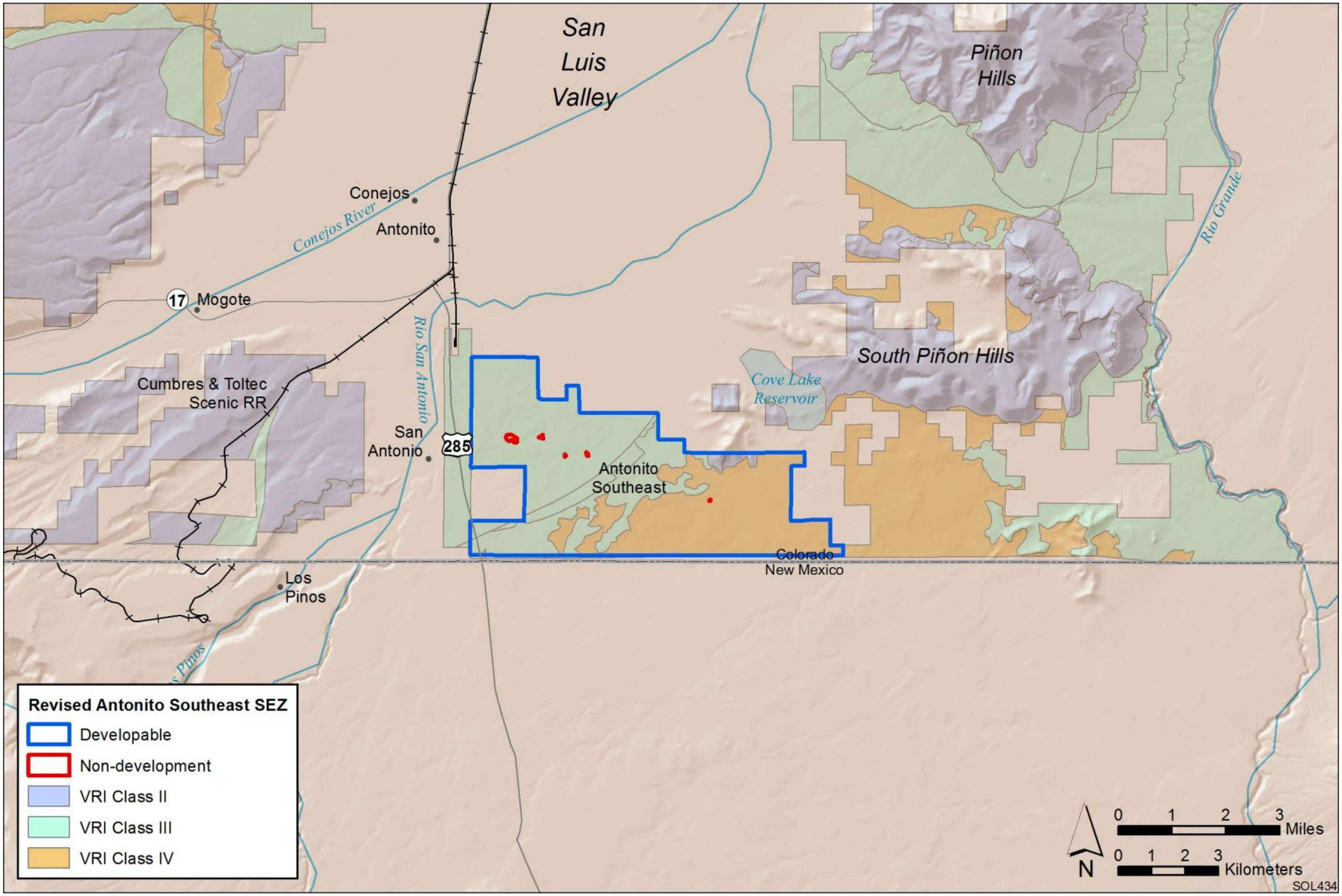

FIGURE 10.1.14.1-1 Visual Resource Inventory Values for the Proposed Antonito Southeast SEZ as Revised

In addition, the BLM has identified areas in the SEZ visible from and within 3 mi (4.8 km) of the CTSR ACEC and San Antonio WSA as potential moderate visual sensitivity areas. In these areas, solar development also would be subject to specific, additional design features to be identified in conjunction with project-specific analyses.

10.1.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on visual resources are described in Section A.2.2 of Appendix A of this Final Solar PEIS. While application of the programmatic design features would reduce potential visual impacts somewhat, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas would be the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures generally would be limited. Utility-scale solar energy development using any of the solar technologies analyzed in this Solar PEIS and at the scale analyzed would be expected to result in large adverse visual impacts that could not be mitigated.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, the following proposed SEZ-specific design features for visual resources have been identified:

- The development of power tower facilities should be prohibited within the SEZ. The San Luis Valley is a regionally important tourist destination and is an area with many small communities and numerous important historic, cultural, and recreational resources. The valley contains numerous historic sites, two scenic railways, two scenic highways, several wildlife refuges, Great Sand Dunes NP and Preserve, the Rio Grande WSR, congressionally designated WAs, the Sangre de Cristo NHA, and various other attractions that draw tourists to the region. A number of these areas overlook the San Luis Valley from the surrounding mountains and include elevated viewpoints that would have clear views of power tower facilities in the Valley. The height of solar power tower receiver structures, combined with the intense light generated by the receiver atop the tower, would be expected to create strong visual contrasts that could not be effectively screened from view for most areas surrounding the SEZ. The effective area of impact from power tower structures is much larger than that for comparably rated lower height facilities, which makes it more likely that they would conflict with the growing tourism focus of the Valley. In addition, for power towers exceeding 200 ft (61 m) in height, hazard navigation lighting that could be visible for very long distances would likely be required. Prohibiting the development of power tower facilities would remove these sources of impacts, thus substantially reducing potential visual impacts on the CTSR, its depot, and the associated ACEC; the West Fork of the North Branch of the Old Spanish Trail; other sensitive visual resource areas as identified in the Draft Solar PEIS; the community of Antonito; travelers on U.S. 285; and other residents and visitors to the San Luis Valley.

- Special visual impact mitigation shall be considered for solar development on lands in the SEZ visible from and within 3 mi (5 km) of the centerline of the West Fork of the North Branch of the Old Spanish Trail. Solar development on lands in the SEZ visible from and in close proximity to the West Fork of the North Branch of the Old Spanish Trail has a higher potential to cause visual impacts on the Trail. Therefore, the BLM has identified areas in the SEZ visible from and within 1 mi (1.6 km) of the West Fork of the North Branch of the Old Spanish Trail as potential high visual sensitivity areas, where solar development would be subject to specific additional design features that will be identified when project-specific environmental analyses are conducted. In addition, the BLM has identified areas in the SEZ visible from and within 3 mi (5 km) of the West Fork of the North Branch of the Old Spanish Trail as potential moderate visual sensitivity areas, where solar development would also be subject to specific additional design features that will be identified when project-specific environmental analyses are conducted.

- Special visual impact mitigation shall be considered for solar development on lands in the SEZ visible from and within 3 mi (5 km) of the CTSR ACEC and San Antonio WSA. Solar development on lands in the SEZ visible from and in close proximity to the CTSR ACEC and San Antonio WSA has a higher potential to cause visual impacts on the ACEC and the WSA. Therefore, the BLM has identified areas in the SEZ visible from and within 3 mi (5 km) of the CTSR ACEC and San Antonio WSA as potential moderate visual sensitivity areas, where solar development would be subject to specific additional design features that will be identified when project-specific environmental analyses are conducted.

The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.15 Acoustic Environment

10.1.15.1 Affected Environment

The developable area of the proposed Antonito Southeast SEZ was reduced by less than 1%, from 9,729 acres (39.4 km^2) to 9,712 acres (39.3 km^2). The boundaries of the SEZ were not changed, and thus the information for acoustic environment remains the same as presented in the Draft Solar PEIS.

10.1.15.2 Impacts

Given the small reduction in the developable area of the Antonito Southeast SEZ and the lack of change in the boundaries, the conclusions presented in the Draft Solar PEIS remain valid except for construction and operations impacts on specially designated areas and impacts from operating dish engine facilities.

10.1.15.2.1 Construction

Except as noted below, for impacts in specially designated areas, the assessment in the Draft Solar PEIS remains valid.

On the basis of comments received and recent references as applicable, this Final Solar PEIS used an updated approximate significance threshold of 55 dBA corresponding to the onset of adverse physiological impacts (Barber et al. 2010) to update the analysis of potential noise impacts on terrestrial wildlife in areas of special concern. As a result of this updated analysis, the conclusion in the Draft Solar PEIS that wildlife would not be adversely affected has been updated for this Final Solar PEIS as follows. For construction activities occurring near the southwestern SEZ boundary, the estimated noise level at the boundary of the San Antonio WSA in New Mexico (about 1.6 mi [2.6 km] to the southwest) would be about 37 dBA. This estimated level is below the significance threshold; thus noise from construction in the proposed Antonito Southeast SEZ is not anticipated to adversely affect wildlife in the nearby specially designated areas. However, as discussed in Section 5.10.2 of this Final Solar PEIS, there is the potential for other effects to occur at lower noise levels (Barber et al. 2011). Because of the potential for impacts at lower noise levels, impacts on terrestrial wildlife from construction noise would have to be considered on a project-specific basis, including site-specific background levels and hearing sensitivity for site-specific terrestrial wildlife of concern. However, even with potential impacts at these lower noise levels, construction noise at the SEZ would not be anticipated to affect wildlife in nearby specially designated areas.

For construction activities occurring near the western SEZ boundary, the estimated noise level at the West Fork of the North Branch of the Old Spanish Trail (as close as 660 ft [200 m] to the west) would be about 66 dBA, which is well above the typical daytime mean rural background level of 40 dBA. Accordingly, construction occurring near the western SEZ boundary could result in adverse noise impacts on the Old Spanish Trail, but these impacts would be temporary.

Construction within the proposed Antonito Southeast SEZ would cause some unavoidable but localized short-term noise impacts on neighboring communities, particularly activities occurring near the northern or western proposed SEZ boundaries, close to the nearby residences. No adverse vibration impacts are anticipated from construction activities, including pile driving for dish engines.

10.1.15.2.2 Operations

Given the small reduction in the developable area of the proposed Antonito Southeast SEZ, the assessment presented in the Draft Solar PEIS remains valid, except as noted below for impacts from thermal energy storage (TES) and dish engine facilities near residence or in specially designated areas.

Parabolic Trough and Power Tower

As stated above under construction impacts, for this Final Solar PEIS an updated approximate significance threshold of 55 dBA was used to evaluate potential noise impacts on terrestrial wildlife in areas of special concern. With TES operating near the southwestern SEZ boundary, estimated daytime and nighttime noise levels at the boundary of the San Antonio WSA in New Mexico would be about 37 and 47 dBA, respectively. These estimated levels are below the significance threshold; thus noise from operations in the proposed Antonito Southeast SEZ is not anticipated to considerably affect wildlife in the nearby specially designated areas. However, as discussed in Section 5.10.2 of this Final Solar PEIS, there is the potential for other effects to occur at lower noise levels (Barber et al. 2011). Because of these impacts and the potential for impacts at lower noise levels, noise impacts on terrestrial wildlife from a parabolic trough or power tower facility equipped with TES would have to be considered on a project-specific basis, including site-specific background levels and hearing sensitivity for site-specific terrestrial wildlife of concern.

For operations of a parabolic trough or power tower facility equipped with TES near the western SEZ boundary, the estimated daytime and nighttime noise levels at the West Fork of the North Branch of the Old Spanish Trail (as close as 660 ft [200 m] to the west) would be about 49 and 59 dBA, respectively, which are significantly above the typical daytime and nighttime mean rural background levels of 40 and 30 dBA. Accordingly, a solar facility with TES located near the western SEZ boundary could result in adverse noise impacts on the North Branch of the Old Spanish Trail.

Dish Engines

As stated above under construction impacts, for this Final Solar PEIS an updated approximate significance threshold of 55 dBA was used to evaluate potential noise impacts on terrestrial wildlife in areas of special concern. Estimated noise level from operation of a dish engine solar facility at the boundary of the San Antonio WSA in New Mexico would be about 43 dBA. This estimated level is below the significance threshold; thus noise from operations in the proposed Antonito Southeast SEZ is not anticipated to adversely affect wildlife in the nearby specially designated area. However, as discussed in Section 5.10.2 of this Final Solar PEIS, there is the potential for other effects to occur at lower noise levels (Barber et al. 2011). With these impacts and the potential for impacts at lower noise levels, noise impacts on terrestrial wildlife from a dish engine facility would have to be considered on a project-specific basis, including site-specific background levels and hearing sensitivity for site-specific terrestrial wildlife of concern.

On the basis of a full build-out of the SEZ with dish engine facilities, the estimated noise level at the West Fork of the North Branch of the Old Spanish Trail (as close as 660 ft [200 m] to the west) would be about 55 dBA, which is well above the typical daytime mean rural background level of 40 dBA. Therefore, dish engine noise from the SEZ could result in adverse noise impacts on the West Fork of the North Branch of the Old Spanish Trail.

With no changes in the boundaries of the proposed Antonito Southeast SEZ, the discussions of vibration, transformer and switchyard noise, and transmission line corona discharge presented in the Draft Solar PEIS remain valid. Noise impacts from these sources would be minimal to negligible.

10.1.15.2.3 Decommissioning and Reclamation

The conclusions on decommissioning and reclamation in the proposed Antonito Southeast SEZ as presented in the Draft Solar PEIS remain valid. Decommissioning and reclamation activities would be of short duration, and their potential noise impacts would be minor and temporary. Potential noise and vibration impacts on surrounding communities would be minimal.

10.1.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce noise impacts are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide some protection from noise impacts.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, no SEZ-specific design features for noise were identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.16 Paleontological Resources

10.1.16.1 Affected Environment

Data provided in the Draft Solar PEIS remain valid, with the following update:

- The BLM Regional Paleontologist may have additional information regarding the paleontological potential of the SEZ and be able to verify the potential fossil yield classification (PFYC) of the SEZ as Class 1 and 4/5 as used in the Draft Solar PEIS.

10.1.16.2 Impacts

The assessment provided in the Draft Solar PEIS remains valid. Impacts on significant paleontological resources are possible in those areas where the Alamosa Formation is determined to be at a depth that could be affected by solar energy development. However, a more detailed look at the geological deposits is necessary to determine whether a paleontological survey is warranted.

10.1.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features are described in Appendix A of this Final Solar PEIS. Impacts would be minimized through the implementation of required programmatic design features, including a stop-work stipulation in the event that paleontological resources are encountered during construction, as described in Section A.2.2 of Appendix A.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, the following SEZ-specific design feature has been identified:

- Avoidance of PFYC Class 4 or 5 areas is recommended for development within the proposed Antonito Southeast SEZ (i.e., the 4-acre [0.016-km^2] parcel in the north part of the SEZ). Where avoidance of Class 4 or 5 deposits is not possible, a paleontological survey or monitoring would be required by the BLM.

The need for and nature of additional SEZ-specific design features will depend on the findings of future paleontological investigations and may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

As additional information on paleontological resources (e.g., from regional paleontologists or from new surveys) becomes available, the BLM will post the data to the project Web site (http://solareis.anl.gov) for use by applicants, the BLM, and other stakeholders.

10.1.17 Cultural Resources

10.1.17.1 Affected Environment

Data provided in the Draft Solar PEIS remain valid, with the following updates:

- A study by the National Park Service (NPS) was recently conducted to identify “opportunities to preserve and interpret nationally significant American Latino heritage sites within the San Luis Valley and central Sangre de Cristo Mountains, as well as opportunities for conservation of the area’s landscape, environment, and natural resources” (NPS 2011). This area, including the Sangre de Cristo National Heritage Area, has been recognized and celebrated for its rich natural and cultural resources, much of it associated with America’s Latino heritage. The findings of the reconnaissance survey indicated that the “resources and traditions existing within the survey area meet National Park Service criteria for national significance and possess exceptional value in illustrating and interpreting the theme of American Latino heritage” (NPS 2011).

- The San Luis Valley and central Sangre de Cristo Mountains were initially part of Mexico’s northern frontier, and settlement of the area was facilitated by the approval of land grants from the Mexican government. The three land grants from the Mexican government in the San Luis Valley were the Conejos Grant, the Luis Maria Baca No. 4 Land Grant, and the Sangre de Cristo Grant. The Conejos Grant (2.5 million acres [10,117 km^2]) was one of the oldest in Colorado, having been established in 1833. The portion of the grant near the Colorado–New Mexico border, in the western part of the San Luis Valley, was initially settled by Hispanic immigrants from the lower Chama Valley in New Mexico, and their settlements included Conejos, Mogote, Las Mesitas, and Rincones. The U.S. government decided not to honor the land grant and dissolved it, settling the northern portion under U.S. laws. The Luis Maria Baca Land Grant (100,000 acres[405 km^2]) was originally granted in 1821, but because of conflicting claims in the early 1860s, the Baca heirs agreed to accept five parcels in three different states, one of which is this land grant (No. 4). This land grant is notable for having been owned by two different Colorado governors and then by mining investors who extracted more than $50 million in gold. The Sangre de Cristo Grant (1 million acres [4,047 km^2]) was established in 1843 and was settled in the eastern San Luis Valley in Costilla County by Hispanic settlers from Taos after the Mexican–American War. This land grant is notable for being the focus of an 1876 Supreme Court decision, *Tameling v. United States Freehold & Emigration Co.*, in which its large acreage was upheld, changing the way that Mexican land grant claims were processed (NPS 2011).

- An ethnographic study of Hispanic heritage in association with the Old Spanish Trail was published in 2008 (Stoffle et al. [2008]). The North Branch of the Old Spanish Trail running through the San Luis Valley (including both East and West Forks) was one of five segments of the Old Spanish Trail that were investigated; others included segments of the Old Spanish Trail in New Mexico and California. The study identified important heritage sites and resources in the San Luis Valley associated with the northern Old Spanish Trail route from Taos to California on the basis of interviews conducted in the community of San Luis. Several land grants were issued (as discussed above) between 1821 and 1863 encouraging settlement in the area. San Luis, the oldest surviving town in Colorado, was founded in 1851 in what was then part of New Mexico. Although this is after the period of significance of the Old Spanish Trail (1829–1849), permanent settlement of the area in the 1840s was evident prior to the official founding of this town. Acequias (irrigation canals) were established in the permanent settlements in the valley to create common watershed areas and represent the oldest water rights in Colorado. When asked why the valley was selected for Hispanic settlement, it was stated that the valley was attractive for grazing and agriculture; a number of plants and animals were identified in the study as traditionally harvested or hunted. Interviews identified key locations of significance within the San Luis Valley, such as Mt. Blanca (Blanca Peak), Culebra Mountains, La Vega, Fort Massachusetts, Taylor Ranch, the San Luis estate, several hot springs (Ojo Caliente, Mineral Hot Springs, Indian Springs), and trails, such as the California Trail and Jacale Road (where the jacales, or earliest adobe homes in the area, were built). Concerns about the Old Spanish Trail included a fear of damage from visitors, especially from vehicles, and a desire to keep portions of the Trail a secret from outsiders to protect it (Stoffle et al. 2008).

- Trujillo Homestead was designated a National Historic Landmark in January 2012. It encompasses approximately 35 acres (0.14 km^2) of land about 15 mi (24 km) north of the Fourmile East SEZ and consists of two nineteenth-century Hispanic ranch properties: the Teofilo and Adrellita Homestead dating to 1865 and the Pedro and Sofia Trujillo Homestead dating to 1879. The homesteads consist of two discontiguous pieces of land with two standing buildings, one structure, and concentrations of historic debris associated with the homesteads. The sites were designated a landmark because they are representative of the movement of Hispanic Americans into the northern frontier and offer important information on early livestock economy, ethnic and racial conflicts, and settlement and subsistence patterns, as well as assimilation efforts of early Hispanic Americans (DOI 2012; Simmons and Simmons 2003).

- Additional information may be available to characterize the SEZ and its surrounding area in the future (after the Final Solar PEIS is completed), as follows:
  - Results of an ethnographic study currently being conducted by TRC Solutions, which focuses on Native American use of lands being analyzed for solar development within the San Luis Valley. The study will discuss sensitive and traditional use areas. Interviews with tribal members and field visits will facilitate the identification of resources and sites of traditional and religious importance to tribes.
  - Results of a Class II sample survey of the SEZ designed to obtain a statistically valid sample of archeological properties and their distribution within the SEZ. Results from the ethnographic study and the sample

inventory can be combined to project cultural sensitivity zones as an aid in planning future solar developments. Identification of the integrity and historical significance of the portion of the West Fork of the North Branch of the Old Spanish Trail in the vicinity of the SEZ, and viewshed analyses from key observation points along the Trail. If this portion of the Trail is determined significant, a mitigation strategy would need to be developed to address unavoidable impacts on the Trail.

– Continuation of government-to-government consultation as described in Section 2.4.3 of the Supplement to the Draft Solar PEIS and IM 2012-032 (BLM 2011b), including follow-up to recent ethnographic studies covering some SEZs in Nevada and Utah with tribes not included in the original studies to determine whether those tribes have similar concerns.

10.1.17.2 Impacts

Impacts on significant cultural resources are possible in the proposed Antonito Southeast SEZ. The potential significance of the Taos Valley Canal, the stagecoach route, and other possible historic or indigenous trail segments should be investigated further to determine whether solar energy development would adversely affect these resources. Impacts on the West Fork of the North Branch of the Old Spanish Trail are possible; however, further investigation is needed to determine the location and integrity of portions of the Trail from which future potential development in the SEZ could be viewed. Visual impacts are likely on the CTSR ACEC; however, the general area is not pristine and significant development is already present in the area. The assessment provided in the Draft Solar PEIS remains valid with the following update:

- Impacts on significant cultural resources and cultural landscapes associated with American Latino heritage are possible throughout the San Luis Valley.

10.1.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on cultural resources are described in Section A.2.2. of Appendix A of this Final Solar PEIS. Programmatic design features will be applied to address SEZ-specific resources and conditions, for example:

- For projects in the Antonito Southeast SEZ that are located within the viewshed of the West Fork of the North Branch of the Old Spanish Trail, a National Trail inventory will be required to determine the area of possible adverse impact on resources, qualities, values, and associated settings of the Trail; to prevent substantial interference; and to determine any areas unsuitable for development. Residual impacts will be avoided, minimized, and/or mitigated to the extent practicable according to program policy standards. Programmatic design features have been included in BLM's Solar Energy Program to address impacts in National Historic Trails (see Section A.2.2.23 of Appendix A).

Programmatic design features also assume that the necessary surveys, evaluations, and consultations will occur. Ongoing consultation with the Colorado State Historic Preservation Office (SHPO) and the appropriate Native American governments would be conducted during the development of the proposed Antonito Southeast SEZ. It is likely that adverse effects on significant resources in the valley could be mitigated to some degree through such efforts, although not enough to eliminate the adverse effects unless a significant resource is avoided entirely.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, the following SEZ-specific design features have been identified:

- Development of a Memorandum of Agreement (MOA) may be needed among the BLM, Colorado SHPO, and other parties, such as the Advisory Council on Historic Preservation (ACHP) to address the adverse effects of solar energy development on historic properties. The agreement may specify avoidance, minimization, and/or mitigation measures. Should an MOA be developed to resolve adverse effects on the Old Spanish National Historic Trail or the West Fork of the North Branch of the Old Spanish Trail, the Trail Administration for the Old Spanish Trail (BLM-NMSO and NPS Intermountain Trails Office, Santa Fe) should be included in the development of that MOA.

- Additional coordination with the CTSR Commission is recommended to address possible mitigation measures for reducing visual impacts on the railroad.

The need for and nature of additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.18 Native American Concerns

10.1.18.1 Affected Environment

Data provided in the Draft Solar PEIS remain valid but will be supplemented in the future by the results of the ethnographic study being completed in the San Luis Valley (see Section 10.1.17.1).

10.1.18.2 Impacts

The description of potential concerns provided in the Draft Solar PEIS remains valid. No direct impacts from solar energy development are likely to occur to known culturally significant areas (i.e., San Luis Lakes, the Great Sand Dunes, and Blanca Peak); however, indirect visual and auditory impacts are possible. It is likely that traditional plant resources and animal habitats would be directly affected with solar energy development in the proposed Antonito Southeast SEZ.

10.1.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on Native American concerns are described in Section A.2.2. of Appendix A of this Final Solar PEIS. For example, impacts would be minimized through the avoidance of sacred sites, water sources, and tribally important plant and animal species. Programmatic design features require that the necessary surveys, evaluations, and consultations would occur. The tribes would be notified regarding the results of archaeological surveys, and they would be contacted immediately upon any discovery of Native American human remains and associated cultural items.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, no SEZ-specific design features to address Native American concerns have been identified. The need for and nature of SEZ-specific design features would be determined during government-to-government consultation with affected tribes, as part of the process of preparing parcels for competitive offer and subsequent project-specific analysis. Potentially significant sites and landscapes in the vicinity of the SEZ associated with Blanca Peak, Great Sand Dunes, and San Luis Lakes, as well as trail systems, mountain springs, mineral resources, burial sites, ceremonial areas, water resources, and plant and animal resources, should be considered and discussed during consultation.

10.1.19 Socioeconomics

10.1.19.1 Affected Environment

The developable area of the proposed Antonito Southeast SEZ has changed by less than 1%. The socioeconomic region of influence (ROI), the area in which site employees would live and spend their wages and salaries, and into which any in-migration would occur, includes the same counties and communities as described in the Draft Solar PEIS, meaning that no updates to the affected environment information given in the Draft Solar PEIS are required.

10.1.19.2 Impacts

Socioeconomic resources in the ROI around the SEZ could be affected by solar energy development through the creation of direct and indirect employment and income, the generation of direct sales and income taxes, SEZ acreage rental and capacity payments to BLM, the in-migration of solar facility workers and their families, and impacts on local housing markets and on local community service employment. Since the boundaries of the proposed Antonito Southeast SEZ remain unchanged and the reduction of the developable area was small (less than 1%), the impacts for full build-out of the SEZ estimated in the Draft Solar PEIS remain essentially unchanged. During construction, between 218 and 2,885 jobs and between $11.6 million and $154 million in income could be associated with solar development in the SEZ. During operations at full build-out, between 24 and 529 jobs and between $0.7 million and $16.6 million in income could be produced. In-migration of workers and their families would mean between 48 and 631 rental housing units would be needed during construction, and between 7 and 134 owner-occupied units during operations.

10.1.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce socioeconomic impacts are described in Section A.2.2. of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will reduce the potential for socioeconomic impacts during all project phases.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, no SEZ-specific design features to address socioeconomic impacts have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.20 Environmental Justice

10.1.20.1 Affected Environment

The data presented in the Draft Solar PEIS for the proposed Antonito Southeast SEZ have not changed substantially. While there are minority populations in the Colorado or New Mexico portions of the 50-mi (80-km) radius of the SEZ taken as a whole, there are no low-income populations in this area (as a whole).

In the Colorado portion of the 50-mi (80-km) radius, more than 50% of the population in all but one of the block groups in Conejos County consists of minority population groups, together with all the block groups in adjacent Costilla County. Block groups in the cities of Alamosa (Alamosa County), Monte Vista, and Del Norte (both in Rio Grande County) are also more than 50% minority. In the New Mexico portion of the radius, Rio Arriba County has three block groups in which the minority population is more than 20 percentage points higher than the state average and one block group that is more than 50% minority. Taos County has six block groups with more than 50% minority, and five block groups in the vicinity of the City of Taos (Taos County) have minority populations that are 20 percentage points higher than the state average.

Low-income populations in the 50-mi (80-km) radius are limited to two block groups in the Colorado portion in the cities of San Luis (Costilla County) and Alamosa, both of which have low-income population shares that are more than 20 percentage points higher than the state average. Figure 10.1.20.1-1 shows the locations of the low-income population groups within the 50-mi (80-km) radius of the SEZ.

10.1.20.2 Impacts

Potential impacts (e.g., from noise and dust during construction and operations, visual impacts, cultural impacts, and effects on property values) on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Although impacts are likely to be small, there are minority populations defined by Council on Environmental Quality (CEQ) guidelines (CEQ 1997) (see Section 10.1.20.1 of the Draft Solar PEIS) within the 50-mi (80-km) radius around the boundary of the SEZ. This means that any adverse impacts of solar projects could disproportionately affect minority populations. Further analysis of these impacts would be included in subsequent National Environmental Policy Act of 1969 (NEPA) reviews of individual solar projects. Because there are no low-income populations within the 50-mi (80-km) radius as a whole, there would not be impacts on low-income populations.

10.1.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce potential environmental justice impacts are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will reduce the potential for environmental justice impacts.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, no SEZ-specific design features for environmental justice have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.21 Transportation

10.1.21.1 Affected Environment

The reduction in developable area of the proposed Antonito Southeast SEZ of less than 1% does not change the information on affected environment for transportation provided in the Draft Solar PEIS.

10.1.21.2 Impacts

As stated in the Draft Solar PEIS, the primary transportation impacts are anticipated to be from commuting worker traffic. U.S. 285 provides a regional traffic corridor that could

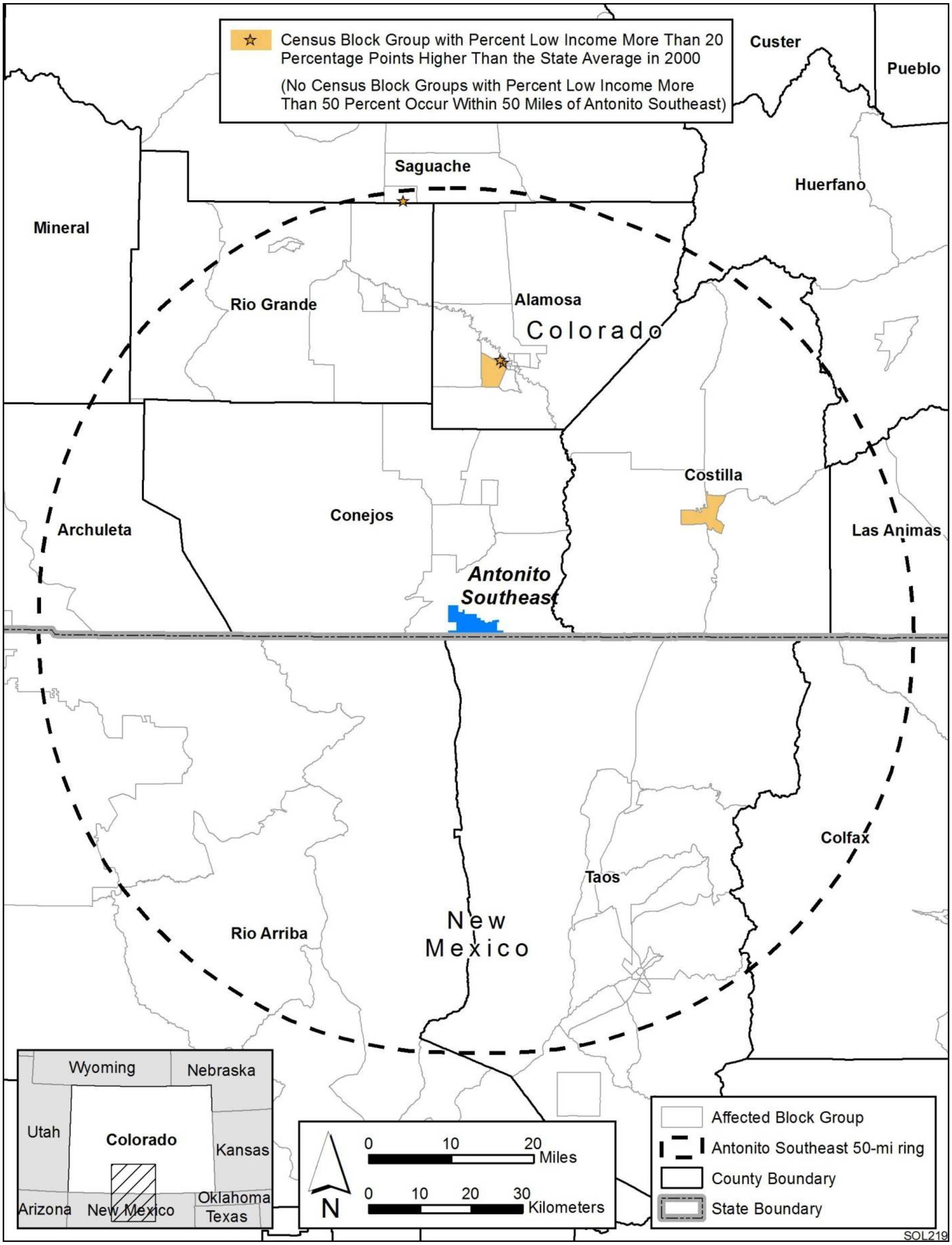

FIGURE 10.1.20.1-1 Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Antonito Southwest SEZ as Revised

experience moderate impacts for single projects that may have up to 1,000 daily workers with an additional 2,000 vehicle trips per day (maximum), an increase nearly twice the current annual average daily traffic (AADT) value for this route. In addition, local road improvements would be necessary in any portion of the SEZ that might be developed so as not to overwhelm the local roads near any site access point(s).

Solar development within the SEZ would affect public access along off-highway vehicle (OHV) routes that are designated open and available for public use. Although open routes crossing areas granted rights-of-way (ROWs) for solar facilities could be redesignated as closed (see Section 5.5.1 of the Draft Solar PEIS), a programmatic design feature has been included under Recreation (Section A.2.2.6.1 of Appendix A) that requires consideration of replacement of lost OHV route acreage and of access across and to public lands.

10.1.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce transportation impacts are described in Section A.2.2. of Appendix A of this Final Solar PEIS. The programmatic design features, including local road improvements, multiple site access locations, staggered work schedules, and ride-sharing, will all provide some relief to traffic congestion on local roads leading to the SEZ. Depending on the location of solar facilities within the SEZ, more specific access locations and local road improvements could be implemented.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, no SEZ-specific design features to address transportation have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.1.22 Cumulative Impacts

The analysis of potential impacts in the vicinity of the proposed Antonito Southeast SEZ presented in the Draft Solar PEIS is still generally applicable for this Final Solar PEIS. The following sections include an update to the information presented in the Draft Solar PEIS regarding cumulative effects for the proposed Antonito Southeast SEZ.

10.1.22.1 Geographic Extent of the Cumulative Impact Analysis

The geographic extent of the cumulative impact analysis has not changed. The extent varies on the basis of the nature of the resource being evaluated and the distance at which an impact may occur (thus, e.g., air quality impacts may have a greater regional extent than visual resource impacts). Lands around the SEZ are privately owned, administered by the U.S. Forest Service (USFS), or administered by the BLM. The BLM administers approximately 11% of the lands within a 50-mi (80-km) radius of the SEZ.

10.1.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The Draft Solar PEIS included three other proposed SEZs in Colorado: Fourmile East, DeTilla Gulch, and Los Mogotes East. All of these proposed SEZs are being carried forward to the Final Solar PEIS; the areas of the De Tilla Gulch, Fourmile East, and Los Mogotes East SEZs have been decreased.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to energy production and distribution and (2) other ongoing and reasonably foreseeable actions, including those related to mining and mineral processing, grazing management, transportation, recreation, water management, and conservation (Section 10.1.22.2.2). Together, these actions and trends have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

10.1.22.2.1 Energy Production and Distribution

The list of reasonably foreseeable future actions near the proposed Antonito Southeast SEZ has been updated and is presented in Table 10.1.22.2-1. Projects listed in the table are shown in Figure 10.1.22.2-1.

Xcel Energy (Public Service Company of Colorado) has submitted a transmission planning report to the Colorado Public Utility Commission stating that it intends to end its involvement in the proposed San Luis Valley–Calumet-Comanche Transmission Project (Heide 2011). The project itself has not been cancelled.

10.1.22.2.2 Other Actions

None of the major ongoing and foreseeable actions within 50 mi (80 km) of the proposed Antonito Southeast SEZ that were listed in Table 10.1.22.2-3 of the Draft Solar PEIS have had a change in their status. An additional mining and mineral processing activity is the Taos Gravel Products Torres Pit, a subsurface sand and gravel products mining activity in Taos County, New Mexico, approximately 35 mi (56 km) south of the SEZ. The existing Torres Pit occupies 51 acres (0.21 km^2), and it is proposed to extend the mining operation on 84 acres (0.34 km^2), all privately owned land. Water is used only for fugitive dust control and is provided by an on-site well (BLM 2011c).

10.1.22.3 General Trends

The information on general trends presented in the Draft Solar PEIS remains valid.

TABLE 10.1.22.2-1 Ongoing and Reasonably Foreseeable Future Actions Related to Energy Development and Distribution near the Proposed Antonito Southeast SEZ and in the San Luis Valley[a]

Description	Status	Resources Affected	Primary Impact Location
Renewable Energy Development			
San Luis Valley Generation Development Area (GDA) (Solar) Designation	Ongoing	Land use	San Luis Valley
Xcel Energy/SunEdison Project, 8.2-MW PV	**Operating**	Land use, ecological resources, visual	San Luis Valley GDA
San Luis Valley Solar Ranch (formerly Alamosa Solar Generating Project), 30-MW PV	**Operating**[b]	Land use, ecological resources, visual	San Luis Valley GDA
Greater Sandhill Solar Project, 9-MW PV	**Operating**[b]	Land use, ecological resources, visual	San Luis Valley GDA
San Luis Valley Solar Project, Tessera Solar, 200-MW dish engine, **changed to 145 MW, 1,500 acres**[c,d]	**New proposal**[d]	Land use, ecological resources, visual, cultural	San Luis Valley GDA
Solar Reserve, 200-MW solar tower	**Application submitted for land use permit**[e]	Land use, ecological resources, visual	San Luis Valley GDA (Saguache)
Alamosa Solar Generating Project (formerly Cogentrix Solar Services), 30-MW high-concentration PV	**Under construction**	Land use, ecological resources, visual	San Luis Valley GDA
Lincoln Renewables, 37-MW PV	County permit approved	Land use, ecological resources, visual	San Luis Valley GDA
NextEra, 30-MW PV	County permit approved	Land use, ecological resources, visual	San Luis Valley GDA
Transmission and Distribution Systems			
San Luis Valley–Calumet-Comanche Transmission Project	**Proposed**[f]	Land use, ecological resources, visual, cultural	San Luis Valley (select counties)

[a] Projects with status changed from that given in the Draft Solar PEIS are shown in bold text.

[b] See SEIA (2012) for details.

[c] To convert acres to km^2, multiply by 0.004047.

[d] See Solar Feeds (2012) for details.

[e] See Tetra Tech EC, Inc. (2011), for details.

[f] See Heide (2011) for details.

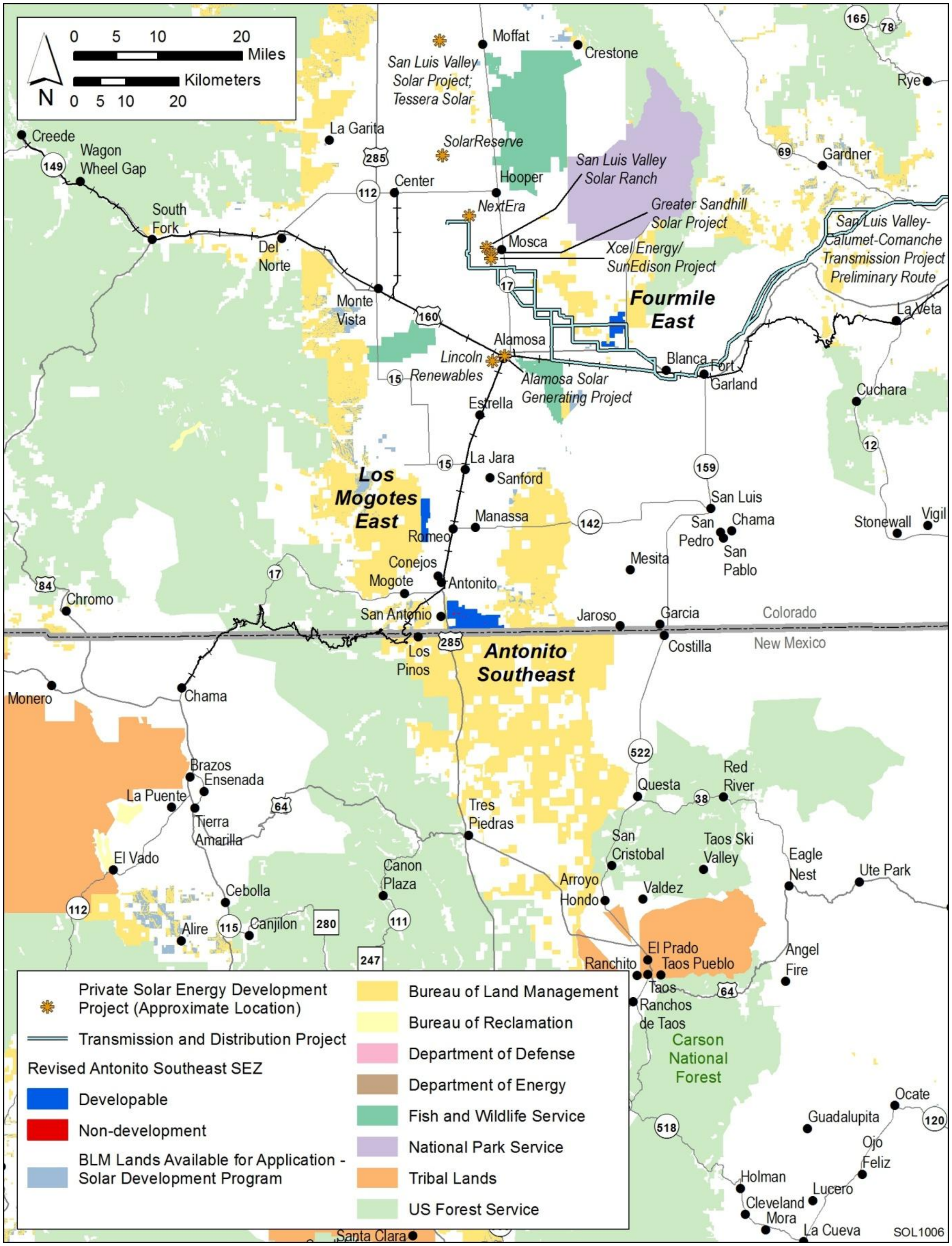

FIGURE 10.1.22.2-1 Locations of Existing and Reasonably Foreseeable Renewable Energy Projects on Public Land within a 50-mi (80-km) Radius of the Proposed Antonito Southeast SEZ as Revised

10.1.22.4 Cumulative Impacts on Resources

Total disturbance over 20 years in the proposed Antonito Southeast SEZ is assumed to be about 7,700 acres (31.2 km^2), or 80% of the entire proposed SEZ. This development would contribute incrementally to the impacts from other past, present, and reasonably foreseeable future actions in the region as described in the Draft Solar PEIS. Primary impacts from development in the Antonito Southeast SEZ may include impacts on water quantity and quality, air quality, ecological resources such as habitat and species, cultural and visual resources, and specially designated lands.

One additional project, the expansion of the Torres Gravel Pit, has been identified within 50 mi (80 km) of the SEZ. As a result of the reduction in the developable areas of the nearby Los Mogotes East and Fourmile East SEZs, the incremental cumulative impacts associated with development in the proposed Antonito Southeast SEZ during construction, operation, and decommissioning are expected to be the same or less than those projected in the Draft Solar PEIS.

On the basis of comments received on the Draft Solar PEIS, cumulative impacts on recreation in the San Luis Valley have been reconsidered. While it is unlikely that the Antonito Southeast SEZ individually would have a large impact on recreation and tourism throughout the valley, cumulative impacts on the overall tourism and recreation environment of the area could be significant, because it is one of four proposed SEZs totaling about 16,300 acres (66 km^2) on public lands and there is additional solar energy development on private lands. Because most of the land on the valley floor of the San Luis Valley is private and heavily developed for agricultural use, undeveloped public lands around the valley provide accessible areas for public recreation. Although it is believed the recreational use of the proposed SEZ is low, the loss of public access to such areas cumulatively leads to an overall reduction in the availability of recreation that can become significant.

10.1.23 Transmission Analysis

The methodology for this transmission analysis is described in Appendix G of this Final Solar PEIS. This section presents the results of the transmission analysis for the Antonito Southeast SEZ, including the identification of potential load areas to be served by power generated at the SEZ and the results of the dedicated-line-transmission (DLT) analysis. Unlike Sections 10.1.2 through 10.1.22, this section is not an update of previous analysis for the Antonito Southeast SEZ; this analysis was not presented in the Draft Solar PEIS. However, the methodology and a test case analysis were presented in the Supplement to the Draft Solar PEIS. Comments received on the material presented in the Supplement were used to improve the methodology for the assessment presented in this Final Solar PEIS.

On the basis of its size, the assumption of a minimum of 5 acres (0.02 km^2) of land required per MW, and the assumption of a maximum of 80% of the land area developed, the Antonito Southeast SEZ is estimated to have the potential to generate 1,554 MW of marketable solar power at full build-out.

10.1.23.1 Identification and Characterization of Load Areas

The primary candidates for Antonito Southeast SEZ load areas are the major surrounding cities. Figure 10.1.23.1-1 shows the possible load areas for the Antonito Southeast SEZ and the estimated portion of their market that could be served by solar generation. Possible load areas for the Antonito Southeast SEZ include Pueblo, Colorado Springs, and Denver, Colorado; Farmington, Albuquerque, and Santa Fe, New Mexico; Salt Lake City, Utah; Phoenix, Arizona; and Las Vegas, Nevada.

The two load area groups examined for the Antonito Southeast SEZ are as follows:

1. Pueblo, Colorado Springs, and Denver, Colorado; and

2. Farmington and Albuquerque, New Mexico; Salt Lake City, Utah; and Phoenix, Arizona.

Figure 10.1.23.1-2 shows the most economically viable transmission scheme for the Antonito Southeast SEZ (transmission scheme 1), and Figure 10.1.23.1-3 shows an alternative transmission scheme (transmission scheme 2) that represents a logical choice should transmission scheme 1 be infeasible. As described in Appendix G, the alternative shown in

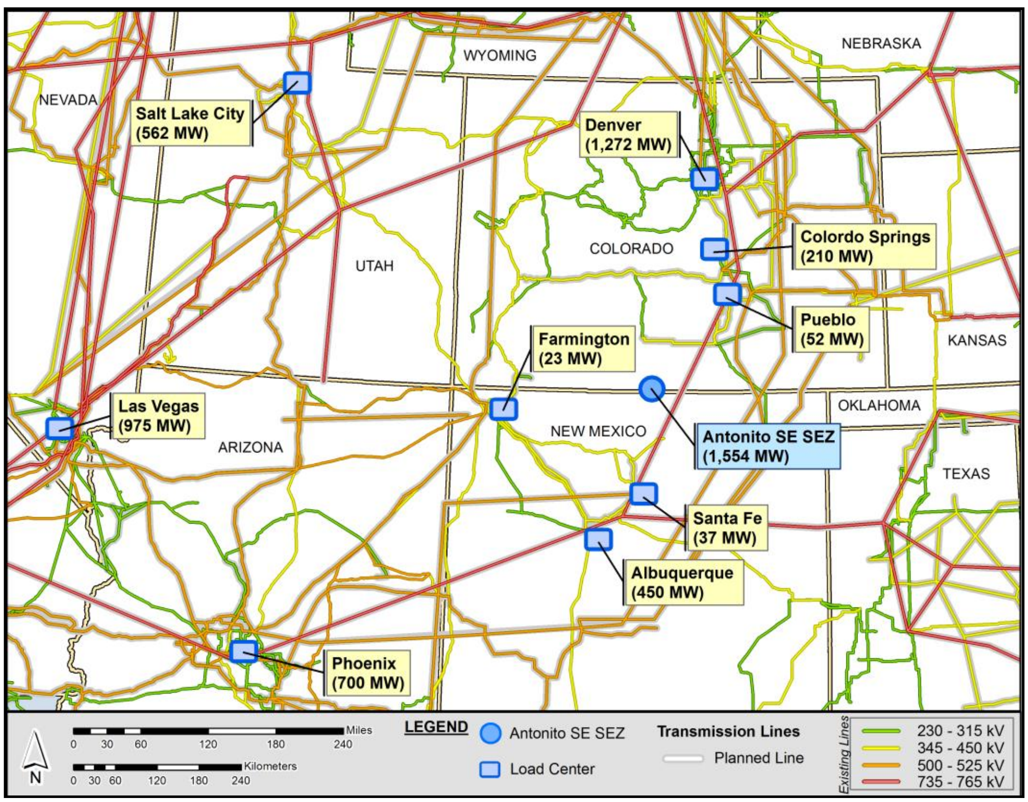

FIGURE 10.1.23.1-1 Location of the Proposed Antonito Southeast SEZ and Possible Load Areas (Source for background map: Platts 2011)

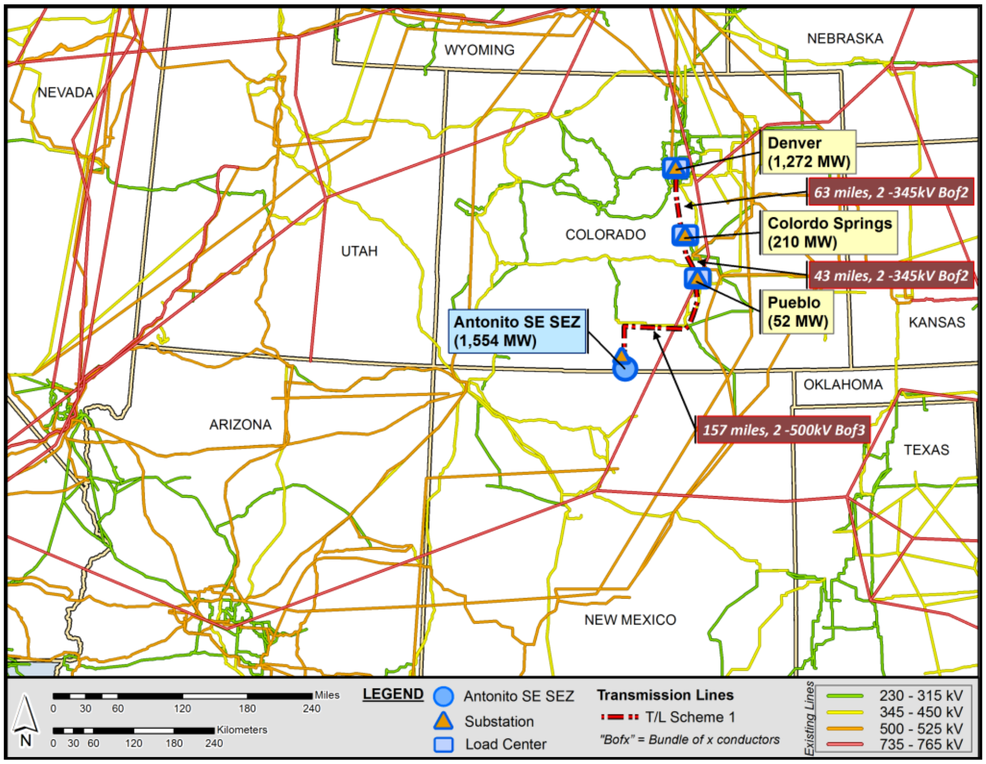

FIGURE 10.1.23.1-2 Transmission Scheme 1 for the Proposed Antonito Southeast SEZ (Source for background map: Platts 2011)

transmission scheme 2 represents the optimum choice if one or more of the primary linkages in transmission scheme 1 are excluded from consideration. The groups provide for linking loads along alternative routes so that the SEZ's output of 1,554 MW could be fully allocated.

Table 10.1.23.1-1 summarizes and groups the load areas according to their associated transmission scheme and provides details on how the megawatt load for each area was estimated.

10.1.23.2 Findings for the DLT Analysis

The DLT analysis approach assumes that the Antonito Southeast SEZ will require all new construction for transmission lines (i.e., dedicated lines) and substations. The new transmission lines(s) would be designed to be able to directly convey the 1,554-MW output of the Antonito Southeast SEZ to the prospective load areas for each possible transmission scheme. Note that the combined solar market for the Pueblo, Colorado Springs, and Denver region during the initial year is only about 1,534 MW (or about 20 MW short of the SEZ's maximum output). However, the total load of the region is projected to grow to 1,559 MW by the second year of the study period, assuming a population load growth of 2% a year. Thus by the second year, the Denver region should be able to absorb all of the SEZ's maximum power output. The approach also assumes that all existing transmission lines in the Western Electricity Coordinating Council

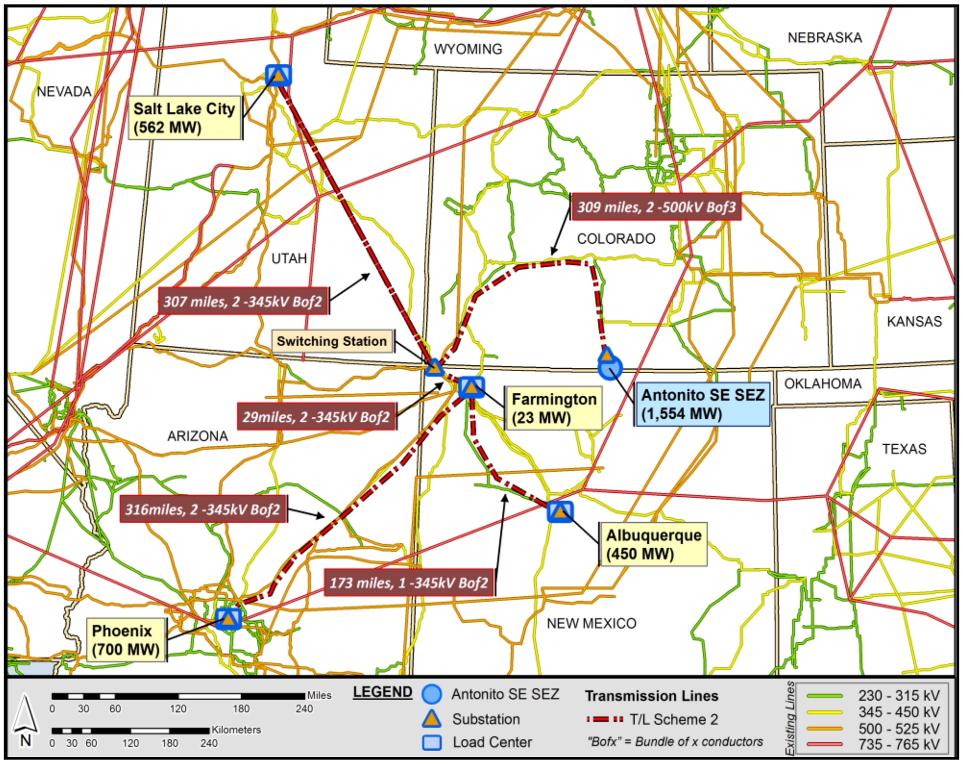

FIGURE 10.1.23.1-3 Transmission Scheme 2 for the Proposed Antonito Southeast SEZ (Source for background map: Platts 2011)

TABLE 10.1.23.1-1 Candidate Load Area Characteristics for the Proposed Antonito Southeast SEZ

Transmission Scheme	City/Load Area Name	Position Relative to SEZ	2010 Population[c]	Estimated Total Peak Load (MW)	Estimated Peak Solar Market (MW)
1	Pueblo, Colorado[a]	North	105,000	262	52
	Colorado Springs, Colorado[a]	North	420,000	1,050	210
	Denver, Colorado[b]	North	2,543,000	6,358	1,272
2	Farmington, New Mexico[a]	Southwest	46,000	115	23
	Albuquerque, New Mexico[b]	South	908,000	2,269	450
	Salt Lake City, Utah[b]	Northwest	1,124,000	2,810	562
	Phoenix, Arizona[a]	Southwest	1,400,000	3,616	700

[a] The load area represents the city named.

[b] The load area represents the metropolitan area (i.e., the identified city plus adjacent communities).

[c] City and metropolitan area population data are from 2010 Census data (U.S. Bureau of the Census 2010).

(WECC) region are saturated and have little or no available capacity to accommodate the SEZ's output throughout the entire 10-year study horizon.

Figures 10.1.23.1-2 and 10.1.23.1-3 display the pathways that new dedicated lines might follow to distribute solar power generated at the Antonio Southeast SEZ via the two identified transmission schemes described in Table 10.1.23.1-1. These pathways parallel existing 500-, 345-, 230-kV, and/or lower voltage lines. The intent of following existing lines is to avoid pathways that may be infeasible due to topographical limitations or other concerns.

For transmission scheme 1, serving load centers to the north, a new line would be constructed to connect with Pueblo (52 MW), Colorado Springs (210 MW), and Denver (1,272 MW), so that the 1,554-MW output of the Antonio Southeast SEZ could be fully utilized by the second year of the study based on nominal anticipated load growth as noted above. This particular scheme has three segments. The first segment extends about 157 mi (253 km) northeast to Pueblo. To efficiently convey the full SEZ output of 1,554 MW over this segment, a double-circuit 500-kV line (2–500 kV) bundle of three conductors (Bof3) would be required. The second segment, from Pueblo to Colorado Springs, is about 43 mi (69 km) long. The third and last segment, from Colorado Springs to Denver, is about 63 mi (101 km) long. In general, the transmission configuration options for each leg, or segment, may vary and were determined by using the line "loadability" curve provided in American Electric Power's *Transmission Facts* (AEP 2010). Appendix G documents the line options used for this analysis and describes how the load area groupings were determined.

For transmission scheme 2, primarily serving load centers to the southwest and northwest, new lines would be constructed to connect with Farmington (23 MW), Albuquerque (450 MW), Phoenix (700 MW), and Salt Lake City (562 MW). The scheme assumes that marketing power to nearby Denver, Pueblo, and Colorado Springs is no longer feasible. The alternate scheme has five segments. The length and transmission line configurations associated with each segment are shown in Figure 10.1.23.1-3.

Table 10.1.23.2-1 summarizes the distances to the various load areas over which new transmission lines would need to be constructed, as well as the assumed number of substations that would be required. One substation is assumed to be installed at each load area and an additional one at the SEZ. Thus, in general, the total number of substations per scheme is simply equal to the number of load areas associated with the scheme plus one. Substations at the load areas would consist of one or more step-down transformers, while the originating substation at the SEZ would consist of several step-up transformers. For schemes that require the branching of the lines, a switching substation is assumed to be constructed at the appropriate junction. In general, switching stations carry no local load but are assumed to be equipped with switching gears (e.g., circuit breakers and connecting switches) to reroute power as well as, in some cases, with additional equipment to regulate voltage. The originating substation would have a combined substation rating of at least 1,554 MW (to match the plant's output), while the combined load substations would have a similar total rating of 1,554 MW.

Table 10.1.23.2-2 provides an estimate of the total land area disturbed for construction of new transmission facilities under each of the schemes evaluated. The most favorable

TABLE 10.1.23.2-1 Potential Transmission Schemes, Estimated Solar Markets, and Distances to Load Areas for the Proposed Antonito Southeast SEZ

Transmission Scheme	City/Load Area Name	Estimated Peak Solar Market (MW)[c]	Total Solar Market (MW)	Sequential Distance (mi)[d]	Total Distance (mi)[d]	Line Voltage (kV)	No. of Substations
1	Pueblo, Colorado[a]	52	1,534	157	263	500,	4
	Colorado Springs, Colorado[a]	210		43		345	
	Denver, Colorado[b]	1,272		63			
2	Switching Station	0	1,735	309	1,134	500,	6
	Farmington, New Mexico[a]	23		29		345	
	Albuquerque, New Mexico[b]	450		173			
	Salt Lake City, Utah[b]	562		307			
	Phoenix, Arizona[a]	700		316			

[a] The load area represents the city named.

[b] The load area represents the metropolitan area (i.e., the identified city plus adjacent communities).

[c] From Table 10.1.23.1-1.

[d] To convert mi to km, multiply by 1.6093.

TABLE 10.1.23.2-2 Comparison of the Various Transmission Line Configurations with Respect to Land Use Requirements for the Proposed Antonito Southeast SEZ

				Land Use (acres)[d]		
Transmission Scheme	City/Load Area Name	Total Distance (mi)[c]	No. of Substations	Transmission Line	Substation	Total
1	Pueblo, Colorado[a]	263	4	6,054.5	37.3	6,091.8
	Colorado Springs, Colorado[a]					
	Denver, Colorado[b]					
2	Switching Station	1,134	6	24,990.9	74.6	25,065.5
	Farmington, New Mexico[a]					
	Albuquerque, New Mexico[b]					
	Salt Lake City, Utah[b]					
	Phoenix, Arizona[a]					

[a] The load area represents the city named.

[b] The load area represents the metropolitan area (i.e., the identified city plus adjacent communities).

[c] To convert mi to km, multiply by 1.6093.

[d] To convert acres to km^2, multiply by 0.004047.

transmission scheme with respect to minimizing the costs and area disturbed would be scheme 1, which would serve the Pueblo, Colorado Springs, and Denver markets and for which the construction of new transmission lines and substations is estimated to disturb about 6,092 acres (24.7 km^2) of land. The less favorable transmission scheme with respect to minimizing the costs and area disturbed would be scheme 2. For scheme 2, the construction of new transmission lines and substations is estimated to disturb a land area on the order of 25,066 acres (101.4 km^2).

Table 10.1.23.2-3 shows the estimated net present value (NPV) of both transmission schemes and takes into account the cost of constructing the lines, the substations, and the projected revenue stream over the 10-year horizon. A positive NPV indicates that revenues more than offset investments. This calculation does not include the cost of producing electricity.

The most economically attractive configuration (transmission scheme 1) has the highest positive NPV and serves the Colorado cities of Pueblo, Colorado Springs, and Denver. The secondary case (transmission scheme 2), which excludes one or more of the primary pathways used in scheme 1, is less economically attractive and focuses on delivering power to the cities of Farmington, Albuquerque, Phoenix, and Salt Lake City.

Table 10.1.23.2-4 shows the effect of varying the value of the utilization factor on the NPV of the transmission schemes. The table shows that at about 40% utilization, the NPVs for both schemes are positive. It also shows that as the utilization factor is increased, the economic viability of the lines also increases. Utilization factors can be raised by allowing the new dedicated lines to market other power generation outputs in the region in addition to that of its associated SEZ.

TABLE 10.1.23.2-3 Comparison of Potential Transmission Lines with Respect to NPV (Base Case) for the Proposed Antonito Southeast SEZ

Transmission Scheme	City/Load Area Name	Present Value Transmission Line Cost ($ million)	Present Value Substation Cost ($ million)	Annual Sales Revenue ($ million)	Present Worth of Revenue Stream ($ million)	NPV ($ million)
1	Pueblo, Colorado[a] Colorado Springs, Colorado[a] Denver, Colorado[b]	951.9	102.6	272.3	2,102.3	1,047.9
2	Switching Station Farmington, New Mexico[a] Albuquerque, New Mexico[b] Salt Lake City, Utah[b]	3,362.5	205.1	272.3	2,102.3	–1,465.3

[a] The load area represents the city named.

[b] The load area represents the metropolitan area (i.e., the identified city plus adjacent communities).

TABLE 10.1.23.2-4 Effect of Varying the Utilization Factor on the NPV of the Transmission Schemes for the Proposed Antonito Southeast SEZ

Transmission Scheme	City/Load Area Name	NPV ($ million) at Different Utilization Factors					
		20%	30%	40%	50%	60%	70%
1	Pueblo, Colorado[a] Colorado Springs, Colorado[a] Denver, Colorado[b]	1,047.9	2,099.0	3,150.2	4,201.4	5,252.5	6,303.7
2	Switching Station Farmington, New Mexico[a] Albuquerque, New Mexico[b] Salt Lake City, Utah[b] Phoenix, Arizona[a]	–1,465.3	–414.1	637.0	1,688.2	2.739.4	3,790.5

[a] The load area represents the city named.

[b] The load area represents the metropolitan area (i.e., the identified city plus adjacent communities).

The findings of the DLT analysis for the proposed Antonito Southeast SEZ are as follows:

- Transmission scheme 1, which identifies the cities of Pueblo, Colorado Springs, and Denver (in that specific sequence) as the primary markets, represents the most favorable option based on NPV and land use requirements. This scheme would result in new land disturbance of about 6,092 acres (24.7 km^2).

- Transmission scheme 2 represents an alternative configuration in which electricity would be marketed to the geographically dispersed load areas of Farmington, Albuquerque, Salt Lake City, and Phoenix, but would result in a considerably lower NPV and greater amounts of new land disturbance, on the order of 25,066 acres (101.4 km^2).

- Other load area configurations are possible but would be less favorable than scheme 1 in terms of NPV and, in most cases, also in terms of land use requirements. If new electricity generation at the proposed Antonito Southeast SEZ is not sent to either of the two markets identified above, the potential upper-bound impacts in terms of cost would be greater.

- The analysis of transmission requirements for the proposed Antonito Southeast SEZ would be expected to show lower costs and less land disturbance if solar-eligible load assumptions were increased, although the magnitude of those changes would vary due to a number of factors. In general, for cases such as the Antonito Southeast SEZ that show multiple load areas being served to accommodate the specified capacity, the estimated costs and land disturbance would be affected by increasing the solar-eligible load assumption. By increasing the eligible loads at all load areas, the transmission routing and configuration solutions can take advantage of shorter line distances and deliveries to fewer load areas, thus reducing costs and land disturbed. In general, SEZs that show the greatest number of load areas served and greatest distances required for new transmission lines (e.g., Riverside East) would show the greatest decrease in impacts as a result of increasing the solar-eligible load assumption from 20% to a higher percentage.

10.1.24 Impacts of the Withdrawal

The BLM is proposing to withdraw 9,729 acres (39 km^2) of public land comprising the proposed Antonito Southeast SEZ from settlement, sale, location, or entry under the general land laws, including the mining laws, for a period of 20 years (see Section 2.2.2.2.4 of the Final Solar PEIS). The public lands would be withdrawn, subject to valid existing rights, from settlement, sale, location, or entry under the general land laws, including the mining laws. This means that the lands could not be appropriated, sold, or exchanged during the term of the withdrawal, and new mining claims could not be filed on the withdrawn lands. Mining claims filed prior to the segregation or withdrawal of the identified lands would take precedence over future solar energy development. The withdrawn lands would remain open to the mineral leasing, geothermal leasing, and mineral material laws, and the BLM could elect to lease the oil, gas, coal, or geothermal steam resources, or to sell common-variety mineral materials, such as sand and gravel, contained in the withdrawn lands. In addition, the BLM would retain the discretion to authorize linear and renewable energy ROWs on the withdrawn lands.

The purpose of the proposed land withdrawal is to minimize the potential for conflicts between mineral development and solar energy development for the proposed 20-year withdrawal period. Under the land withdrawal, there would be no mining-related surface development, such as the establishment of open pit mining, construction of roads for hauling materials, extraction of ores from tunnels or adits, or construction of facilities to process the material mined, that could preclude use of the SEZ for solar energy development. For the Antonito Southeast SEZ, the impacts of the proposed withdrawal on mineral resources and related economic activity and employment are expected to be negligible because the mineral potential of the lands within the SEZ is low (BLM 2012). There has been no documented mining within the SEZ, and there are no known locatable mineral deposits within the land withdrawal area. According to the Legacy Rehost 2000 System (LR2000) (accessed in January 2012), there are no recorded mining claims within the land withdrawal area.

Although the mineral potential of the lands within the Antonito Southeast SEZ is low, the proposed withdrawal of lands within the SEZ would preclude many types of mining activity over a 20-year period, resulting in the avoidance of potential mining-related adverse impacts. Impacts commonly related to mining development include increased soil erosion and sedimentation, water use, generation of contaminated water in need of treatment, creation of lagoons and ponds (hazardous to wildlife), toxic runoff, air pollution, establishment of noxious weeds and invasive species, habitat destruction or fragmentation, disturbance of wildlife, blockage of migration corridors, increased visual contrast, noise, destruction of cultural artifacts and fossils and/or their context, disruption of landscapes and sacred places of interest to tribes, increased traffic and related emissions, and conflicts with other land uses (e.g., recreational).

10.1.25 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this Final Solar PEIS. It is likely that at the time of publication of this Final Solar PEIS, some of these Web pages may no longer be available or the URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this Final Solar PEIS.

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10.1.26 Errata for the Proposed Antonito Southeast SEZ

This section presents corrections to material presented in the Draft Solar PEIS and the Supplement to the Draft. The need for these corrections was identified in several ways: through comments received on the Draft Solar PEIS and the Supplement to the Draft (and verified by the authors), through new information obtained by the authors subsequent to publication of the Draft Solar EIS and the Supplement to the Draft, or through additional review of the original material by the authors. Table 10.1.26-1 provides corrections to information presented in the Draft Solar PEIS and the Supplement to the Draft.

TABLE 10.1.26-1 Errata for the Proposed Antonito Southeast SEZ (Section 10.1 of the Draft Solar PEIS and Section C.3.1 of the Supplement to the Draft Solar PEIS)

Section No.	Page No.	Line No.	Figure No.	Table No.	Correction
10.1.11.2					All uses of the term “neotropical migrants” in the text and tables of this section should be replaced with the term “passerines.”

10.2 DE TILLA GULCH

10.2.1 Background and Summary of Impacts

10.2.1.1 General Information

The proposed De Tilla Gulch SEZ is located in Saguache County in south–central Colorado. In 2008, the county population was 6,903, while the four-county region surrounding the SEZ—Alamosa, Chafee, Saguache, and Rio Grande Counties—had a total population of 51,974. The largest nearby town, which is located about 50 mi (80 km) to the south, is Alamosa, with a 2008 population of 8,745.

U.S. 285, a two-lane highway, passes along the northwestern border of the proposed De Tilla Gulch SEZ. The SLRG Railroad also serves the area. As of October 28, 2011, there were no pending solar project applications within the SEZ.

As published in the Draft Solar PEIS (BLM and DOE 2010), the proposed De Tilla Gulch SEZ had a total area of 1,522 acres (6.2 km^2) (see Figure 10.2.1.1-1). In the Supplement to the Draft Solar PEIS (BLM and DOE 2011), the size of the SEZ was reduced, eliminating 458 acres (1.9 km^2) along the northwest edge of the SEZ (i.e., the area that had bordered U.S. 285) (see Figure 10.2.1.1-2). Eliminating this area is primarily intended to avoid impacts on an active Gunnison prairie dog colony, on pronghorn winter range and winter concentration area, and on the proposed Cochetopa Scenic Byway. No additional areas for non-development were identified within the SEZ. The remaining developable area within the SEZ is 1,064 acres (4.3 km^2).

Because of the extensive potential impacts from solar development in the portion of the De Tilla Gulch SEZ that has been eliminated, those lands are proposed as solar ROW exclusion areas; that is, applications for solar development on those lands will not be accepted by the BLM.

The analyses in the following sections update the affected environment and potential environmental, cultural, and socioeconomic impacts associated with utility-scale solar energy development in the De Tilla Gulch SEZ as described in the Draft Solar PEIS.

10.2.1.2 Development Assumptions for the Impact Analysis

Maximum development of the proposed De Tilla Gulch SEZ was assumed to be 80% of the developable SEZ area over a period of 20 years, a maximum of 851 acres (3.4 km^2) (Table 10.2.1.2-1). Full development of the De Tilla Gulch SEZ would allow development of facilities with an estimated total of between 95 MW (dish engine or PV technologies, 9 acres/MW [0.04 km^2/MW]) and 170 MW (solar trough technologies, 5 acres/MW [0.09 km^2/MW]) of electrical power capacity.

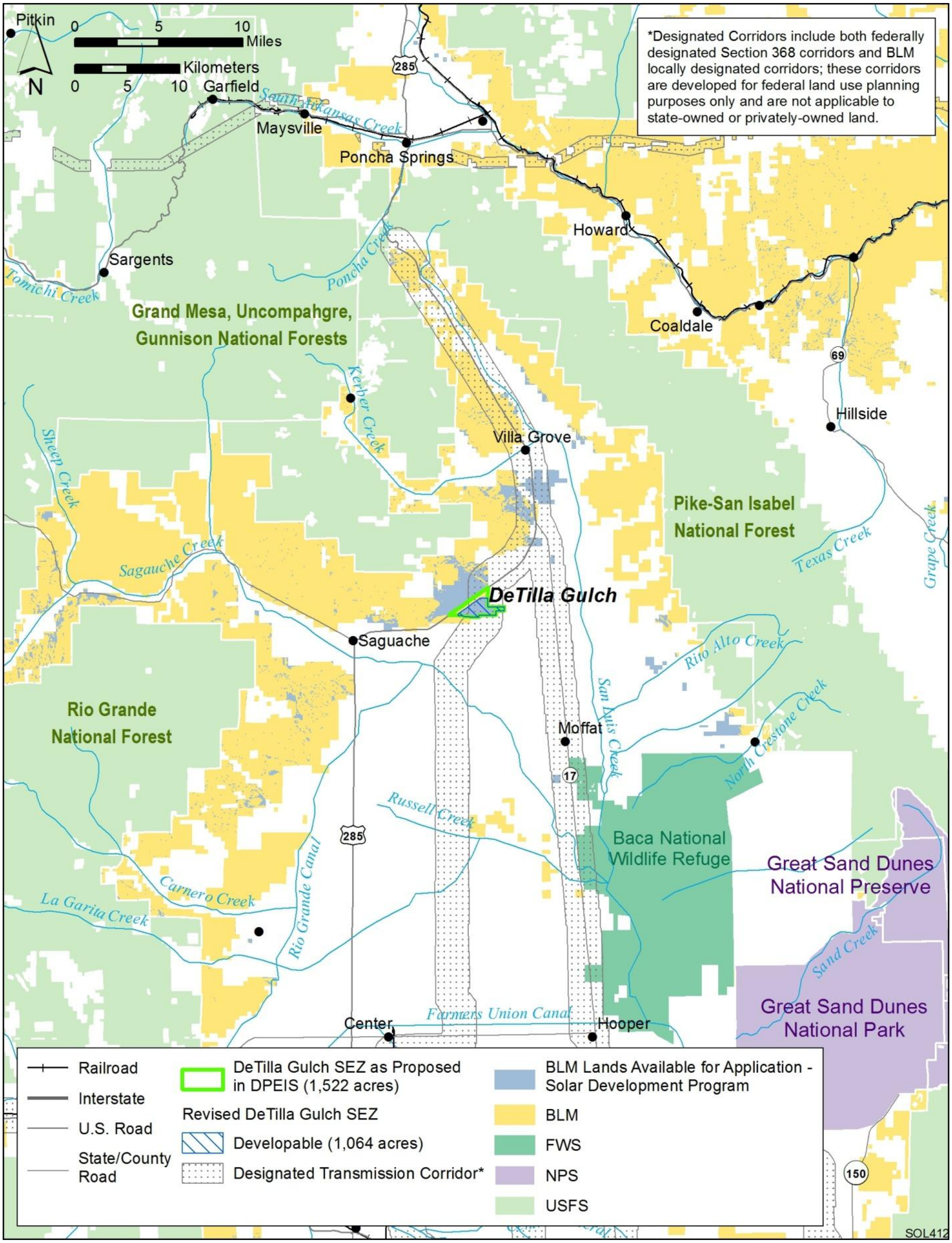

FIGURE 10.2.1.1-1 Proposed De Tilla Gulch SEZ as Revised

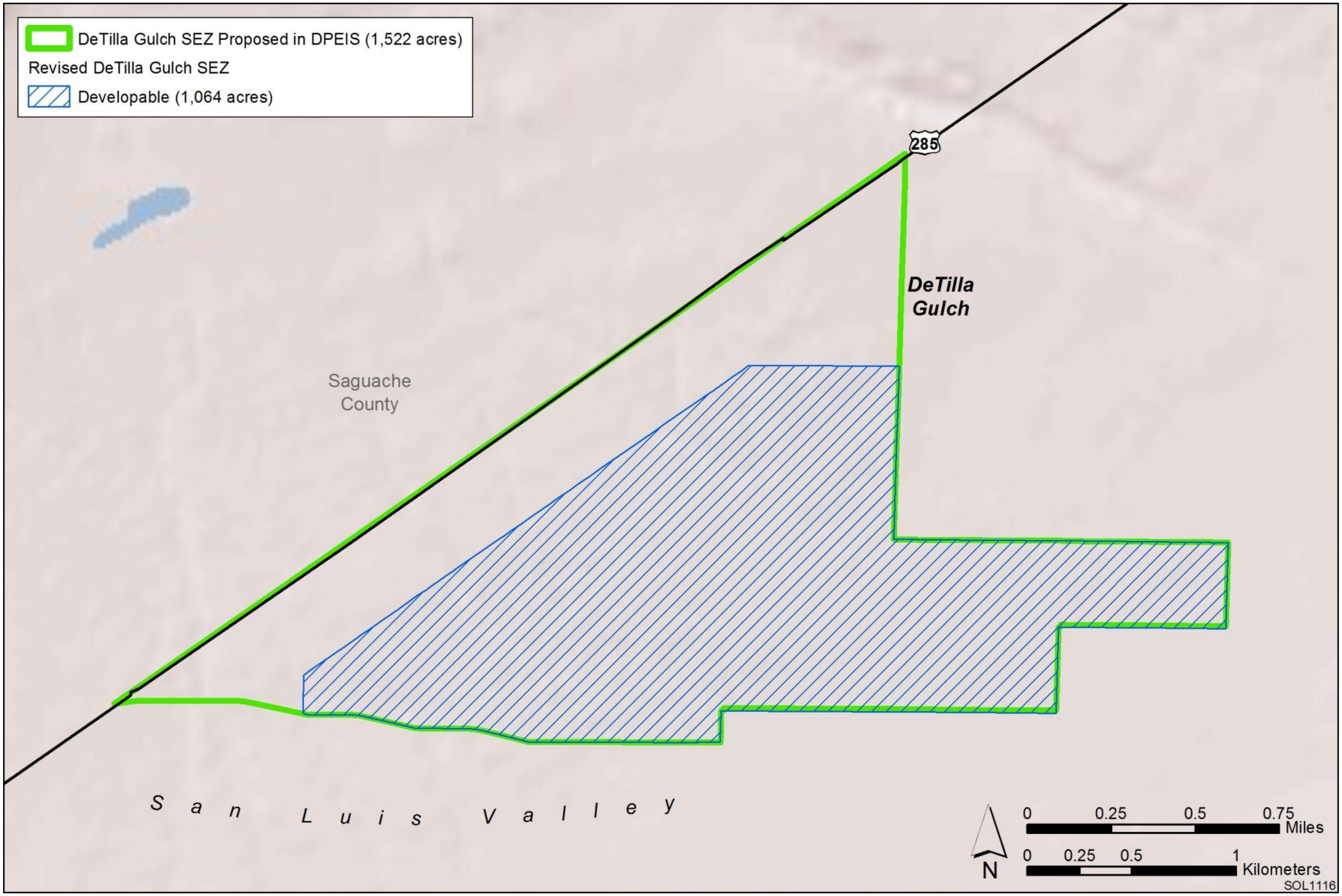

FIGURE 10.2.1.1-2 Developable Area for the Proposed De Tilla Gulch SEZ as Revised

TABLE 10.2.1.2-1 Assumed Development Acreages, Solar MW Output, and Nearest Access Road and Transmission Line for the Proposed De Tilla Gulch SEZ as Revised

Total Developable Acreage and Assumed Development Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S., or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Assumed Area of Road ROW	Distance to Nearest BLM-Designated Corridor[d]
1,064 acres[a] and 851 acres	95 MW[b] 170 MW[c]	Adjacent (U.S. 285)	Adjacent and 115-kV	0 acres	Adjacent/through[e]

[a] To convert acres to km^2, multiply by 0.004047.

[b] Maximum power output if the SEZ were fully developed using power tower, dish engine, or PV technologies, assuming 9 acres/MW (0.04 km^2/MW) of land required.

[c] Maximum power output if the SEZ were fully developed using solar trough technologies, assuming 5 acres/MW (0.02 km^2/MW) of land required.

[d] BLM-designated corridors are developed for federal land use planning purposes only and are not applicable to state-owned or privately owned land.

[e] A BLM locally designated corridor covers about two-thirds of the proposed De Tilla Gulch SEZ.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. For the proposed De Tilla Gulch SEZ, the nearest existing transmission line as identified in the Draft Solar PEIS is a 115-kV transmission line that crosses the SEZ. It is possible that this existing line could be used to provide access from the SEZ to the transmission grid, but the 115-kV capacity of the existing line may not be adequate for 95 to 170 MW of new capacity. Therefore, at full build-out capacity, new transmission lines and upgrades of existing transmission lines may be required to bring electricity from the proposed De Tilla Gulch SEZ to load centers. An assessment of the most likely load center destinations for power generated at the De Tilla Gulch SEZ and a general assessment of the impacts of constructing and operating new transmission facilities to those load centers is provided in Section 10.2.23. In addition, the generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5 of this Final Solar PEIS. Project-specific analyses would also be required to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

Most of the De Tilla Gulch SEZ overlaps a locally designated transmission corridor. For this impact assessment, it is assumed that up to 80% of the proposed SEZ could be developed. This does not take into account the potential limitations to solar development that may result from siting constraints associated with this corridor. The development of solar facilities and the existing corridor will be dealt with by the BLM on a case-by-case basis; see Section 10.2.2.2 on impacts on lands and realty for further discussion.

For the proposed De Tilla Gulch SEZ, U.S. 285 runs along the northwestern boundary of the SEZ. Thus existing road access to the proposed De Tilla Gulch SEZ should be adequate to support construction and operation of solar facilities, and no additional road construction outside the SEZ is assumed to be required to support solar development of the SEZ, as summarized in Table 10.2.1.2-1.

10.2.1.3 Programmatic and SEZ-Specific Design Features

The proposed programmatic design features for each resource area to be required under the BLM Solar Energy Program are presented in Section A.2.2 of Appendix A of this Final Solar PEIS. These programmatic design features are intended to avoid, minimize, and/or mitigate adverse impacts from solar energy development and will be required for development on all BLM-administered lands, including SEZ and non-SEZ lands.

The discussions below addressing potential impacts from solar energy development on specific resource areas (Sections 10.2.2 through 10.2.22) also provide an assessment of the effectiveness of the programmatic design features in mitigating adverse impacts from solar development within the SEZ. SEZ-specific design features to address impacts specific to the proposed De Tilla Gulch SEZ may be required in addition to the programmatic design features. The proposed SEZ-specific design features for the De Tilla Gulch SEZ have been updated on the basis of revisions to the SEZ since the Draft Solar PEIS (such as boundary changes and the identification of non-development areas) and on the basis of comments received on the Draft and Supplement to the Draft Solar PEIS. All applicable SEZ-specific design features identified to date (including those from the Draft Solar PEIS that are still applicable) are presented in Sections 10.2.2 through 10.2.22.

10.2.2 Lands and Realty

10.2.2.1 Affected Environment

The size of the proposed De Tilla Gulch SEZ has been reduced to 1,064 acres (4.3 km^2) with an assumed developable area (80%) of 851 acres (3.4 km^2). The description of the condition of the SEZ in the Draft Solar PEIS remains accurate, except that because of the boundary change U.S. 285 no longer is immediately adjacent to the area. A BLM-designated transmission corridor covers almost all the SEZ. The lands south and east of the SEZ are private or state-owned.

10.2.2.2 Impacts

Although the proposed SEZ has been reduced in size, solar development on the proposed SEZ would still introduce a new and discordant land use into an otherwise rural area and would exclude many current and future uses of the land. Because of the SEZ's location close to U.S. 285, solar development within the SEZ will be highly visible to visitors as they enter the northern end of the San Luis Valley. The boundary changes will isolate an area of about 458 acres (1.9 km^2) between the proposed SEZ and the highway, fragmenting the public land in the area and making the isolated public land parcel more difficult to manage.

Most of the proposed De Tilla Gulch SEZ overlaps a locally-designated transmission corridor. This existing corridor will be used primarily for the siting of transmission lines and other infrastructure such as pipelines. The existing corridor will be the preferred location for any transmission development that is required to support solar development and future transmission grid improvements related to the build-out of the De Tilla Gulch SEZ. Any use of the corridor lands within the De Tilla Gulch SEZ for solar energy facilities, such as solar panels or heliostats, must be compatible with the future use of the existing corridor. The BLM will assess solar projects in the vicinity of existing corridor on a case-by-case basis. The BLM will review and approve individual project plans of development to ensure compatible development that maintains the use of the corridor.

The remaining analysis in the Draft Solar PEIS is still valid.

10.2.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on lands and realty are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide some mitigation for the identified impacts but will not mitigate all adverse impacts. For example, impacts related to the exclusion of many existing and potential uses of the public land, the visual impact of an industrial-type solar facility within an otherwise rural area, and induced land use changes on state and private lands may not be fully mitigated.

No SEZ-specific design features for lands and realty have been identified through this Final Solar PEIS. Some SEZ-specific design features may be established for parcels within the De Tilla Gulch SEZ through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.3 Specially Designated Areas and Lands with Wilderness Characteristics

10.2.3.1 Affected Environment

The route of the Old Spanish National Historic Trail parallels the southern border of the SEZ about 0.25 mi (0.4 km) south of the proposed SEZ, and there is one USFS roadless area located within 5 mi (8 km) of the SEZ. Several additional specially designated areas are within the viewshed of the SEZ. A recently maintained inventory of wilderness characteristics of public lands within the SEZ found that these lands do not contain wilderness characteristics. The description of specially designated lands in the Draft Solar PEIS remains accurate.

10.2.3.2 Impacts

Because the Old Spanish National Historic Trail is within 0.25 mi (0.4 km) of the SEZ, it is anticipated that solar development on the SEZ would have a major impact on the historic and visual integrity of the Trail and on future management of the Trail. The magnitude of these impacts would depend on the integrity and historical significance of the segment of the Trail from which solar development could be seen.

There are no additional significant impacts on specially designated areas anticipated from solar energy development of the SEZ. The description of impacts in the Draft Solar PEIS remains valid.

10.2.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on specially designated areas are described in Section A.2.2 of Appendix A of this Final Solar PEIS (design features for specially designated areas, cultural resources, and visual resources would address impacts).

Programmatic design features will be applied to address SEZ-specific resources and conditions, for example:

- For projects in the De Tilla Gulch SEZ that are located within the viewshed of the Old Spanish National Historic Trail, a National Trail inventory will be required to determine the area of possible adverse impact to resources, qualities, values, and associated settings of the Trail; to prevent substantial interference; and to determine any areas unsuitable for development. Residual impacts will be avoided, minimized, and/or mitigated to the extent practicable according to program policy standards. Programmatic design features have been included in BLM's Solar Energy Program to address impacts on National Historic Trails (see Section A.2.2.23 of Appendix A).

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the no SEZ-specific design features have been identified. The need for SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.4 Rangeland Resources

10.2.4.1 Livestock Grazing

10.2.4.1.1 Affected Environment

One BLM grazing allotment overlaps the proposed De Tilla Gulch SEZ. The reduction in the size of the proposed SEZ results in a change in the percentage of the Crow grazing allotment that is within the SEZ from 55% to 38%. The allotment has not been grazed for many years.

10.2.4.1.2 Impacts

Although there has been a reduction in the size of the SEZ, it is still anticipated that, should solar development occur in the SEZ, the Crow Allotment grazing permit would be cancelled. Even though there is a reduction in the percentage of the allotment that is physically in the SEZ, the lands that are no longer in the SEZ are located in the strip between the SEZ and the highway and would not be easily accessible to livestock. The current water source for the allotment remains within the revised SEZ boundary and would become unavailable. However, the fact that the allotment has not been grazed for many years because of the lack of adequate fencing is still relevant, and it is not likely that the allotment would be used again even without solar development in the proposed SEZ.

10.2.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on livestock grazing are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide some mitigation for identified impacts should only a portion of the grazing permit be affected, but they would not mitigate a complete loss of the grazing permit, the loss of livestock AUMs, or the loss of value in ranching operations including private land values.

No SEZ-specific design features to protect livestock grazing have been identified in this Final Solar PEIS. Some SEZ-specific design features may be established when specific projects within the SEZ are being considered.

10.2.4.2 Wild Horses and Burros

10.2.4.2.1 Affected Environment

As presented in the Draft Solar PEIS, no wild horse or burro HMAs occur within the proposed De Tilla Gulch SEZ or in proximity to it. The reduction in size of the SEZ does not alter these data.

10.2.4.2.2 Impacts

As presented in the Draft Solar PEIS, solar energy development within the proposed De Tilla Gulch SEZ would not affect wild horses and burros. The reduction in size of the SEZ does not affect this conclusion.

10.2.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features to address wild horses and burros are required for the proposed De Tilla Gulch SEZ.

10.2.5 Recreation

10.2.5.1 Affected Environment

The area of the proposed De Tilla Gulch SEZ has been reduced by about 30%, to 1,064 acres (4.3 km^2), by removing the area along the northwest edge of the SEZ.

Comments pointed out that most of the recreation discussion in the Draft Solar PEIS focused internally within the SEZ and did not address the larger part that public and other federal lands play in the landscape and tourism economy of the San Luis Valley. The better-known attractions within the valley include Great Sand Dunes National Park and Preserve, the Old Spanish National Historic Trail, two scenic railroads, the Los Caminos Antiguos Scenic Byway, the Sangre de Cristo Mountains, three national wildlife refuges, and numerous designated wilderness areas, and these are among the highlights of the recreational and tourism opportunities of the area. While the land within the De Tilla Gulch SEZ is flat, plain, and not an important recreational use area, it is adjacent to U.S. 285 and is highly visible to travelers entering the San Luis Valley from the north. Tourism is an important part of the valley economy and an important focus for future economic growth.

The public lands within the proposed SEZ are identified by the CDOW as habitat for both deer and pronghorn antelope, and animals that use these lands likely support hunting recreational opportunities in other areas of the valley. More detailed information on impacts on these species can be found in Section 10.2.11.3.2 of the Draft Solar PEIS.

10.2.5.2 Impacts

Solar development of the SEZ would exclude recreational users from the public lands within the SEZ, but the anticipated level of this impact is small. Visual impacts on surrounding recreational areas potentially would be greater with taller solar facilities, such as power towers and facilities that utilize wet-cooling technology, but the overall impacts of solar development of this site are anticipated to be low. The only exception would likely be recreational visitors interested in the Old Spanish National Historic Trail (described in Section 10.2.3.2 above), for whom impacts might be higher.

Solar development in the SEZ will be readily visible to travelers on U.S. 285 and to travelers headed to tourist attractions elsewhere in the San Luis Valley, and solar development at the northern entrance to the valley may affect the overall impression of recreational visitors to the area. Recreational visitors to areas at elevations higher than that of the SEZ (e.g., Sangre de Cristo wilderness areas and USFS roadless areas) will see the solar development within the SEZ, but the impact on these areas is anticipated to be minimal. The types of solar technologies employed and the possibility of significant glint or glare from reflective surfaces of solar facilities would play a large role in the extent of visibility of solar development. Because of the location of the SEZ along a main highway, there may be some potential to provide interpretive activities focused on solar energy and development that would be of interest to travelers.

The CDOW has identified the potential for an impact on the availability of hunting opportunities for pronghorn antelope associated with development of the De Tilla Gulch SEZ. While it is unlikely that hunting occurs directly within the proposed SEZ, animals that use the land likely support hunting recreation elsewhere. However, the overall impact on pronghorn was estimated to be small in this assessment (see Section 10.2.11.4.2 of the Draft Solar PEIS), because only a small portion of the available habitat in the valley occurs within the proposed SEZ.

In addition, lands that are outside of the proposed SEZ may be acquired or managed for mitigation of impacts on other resources (e.g., sensitive species). Managing these lands for mitigation could further exclude or restrict recreational use, potentially leading to additional losses in recreational opportunities in the region. The impact of acquisition and management of mitigation lands would be considered as a part of the environmental analysis of specific solar energy projects.

10.2.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on recreational resources are described in Section A.2.2 of Appendix A of this Final Solar PEIS (design features for both specially designated areas and visual resources also would address some impacts). Implementing the programmatic design features for visual impacts would help minimize impacts of individual solar projects, but would not address the larger question of what level of solar energy development might cause adverse impacts on tourism and recreational segments of the local economy. In addition, implementing the programmatic design features for recreation would not mitigate the loss of recreational access to public lands developed for solar energy production or the loss of wildlife-related hunting recreation.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design feature has been identified:

- Tourism is an important economic growth area for the San Luis Valley, and the De Tilla Gulch SEZ is located in a visible location adjacent to a principal highway route into the valley. Because of its location, there is potential to influence visitors' perception of the tourism climate in the valley. As projects are proposed for the SEZ, the potential impacts on tourism should be considered and reviewed with local community leaders.

The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.6 Military and Civilian Aviation

10.2.6.1 Affected Environment

Although the size of the SEZ has been reduced, the remaining proposed SEZ is still located under special use airspace (SUA) and is identified by the BLM as an area of required consultation with DoD.

10.2.6.2 Impacts

Through comments on the Draft Solar PEIS, the military has indicated that it has no concerns about potential impacts on its activities associated with solar development. There are no anticipated impacts on civilian aviation.

10.2.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on military and civilian aviation are described in Section A.2.2 of Appendix A of this Final Solar PEIS. The programmatic design features require early coordination with the DoD to identify and avoid, minimize, and/or mitigate, if possible, any potential impacts on the use of military airspace.

No SEZ-specific design features for military and civilian aviation have been identified in this Final Solar PEIS. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.7 Geologic Setting and Soil Resources

10.2.7.1 Affected Environment

10.2.7.1.1 Geologic Setting

Data provided in the Draft Solar PEIS remain valid, with the following update:

- The terrain of the proposed De Tilla Gulch SEZ is relatively flat with a very gentle dip to the southeast (Figure 10.2.7.1-1). The boundaries of the De Tilla Gulch SEZ have been changed to eliminate 458 acres (1.9 km^2) along the northwest edge of the site. Based on these changes, the elevations range from 7,790 ft (2,374 m) along the northwest corner of the SEZ to about 7,660 ft (2,335 m) at the southeastern-most corner.

10.2.7.1.2 Soil Resources

Data provided in the Draft Solar PEIS remain valid, with the following updates:

- Soils within the proposed De Tilla Gulch SEZ as revised are predominantly the gravelly to gravelly sandy loams of the Rock River and Graypoint Series, which now make up about 73% of the soil coverage at the site.

- Soil unit coverage at the proposed De Tilla Gulch SEZ as revised is shown in Figure 10.2.7.1-2. The new SEZ boundaries eliminate 254 acres (1.03 km^2) of the Rock River gravelly loam (3 to 15% slopes), 107 acres (0.43 km^2) of the Graypoint gravelly sandy loam (0 to 3% slopes), 25 acres (0.10 km^2) of the Shawa loam (0 to 4% slopes), 70 acres (0.28 km^2) of the Platoro loam (0 to 3% slopes), and eight acres (0.032 km^2; all) of the Jodero-Lolo complex (0 to 6% slopes) (Table 10.2.7.1-1).

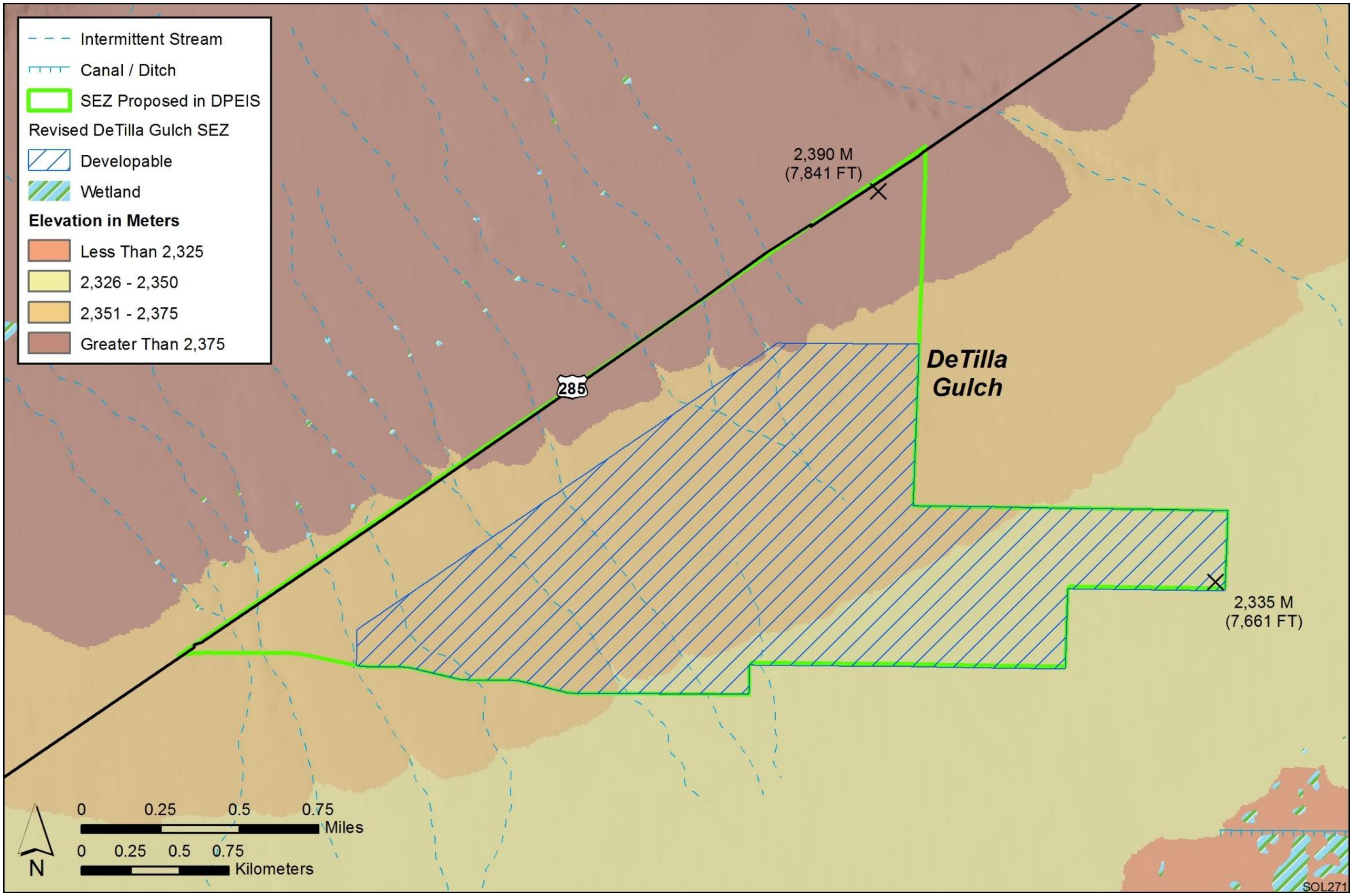

FIGURE 10.2.7.1-1 General Terrain of the Proposed De Tilla Gulch SEZ as Revised

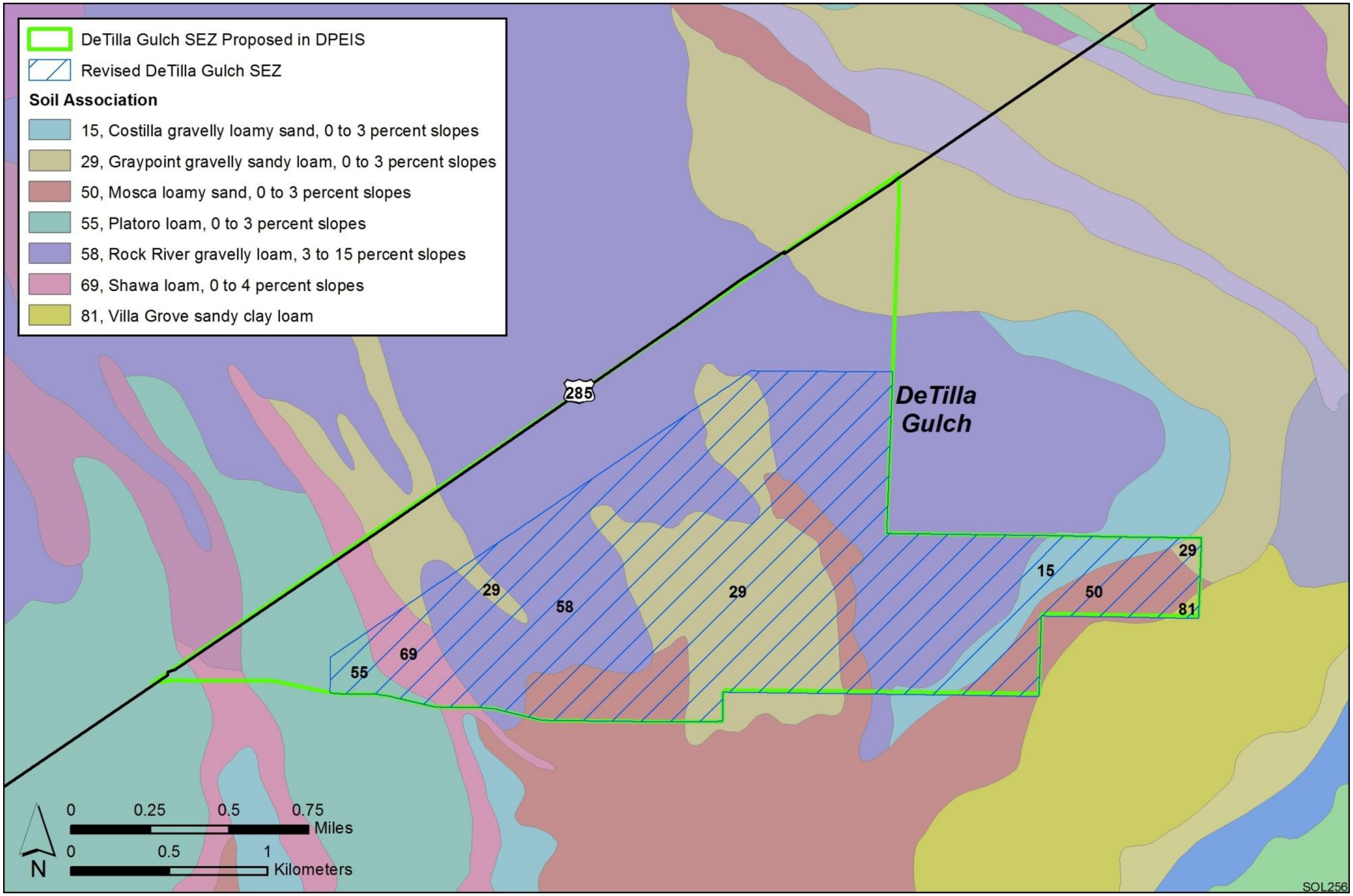

FIGURE 10.2.7.1-2 Soil Map for the Proposed De Tilla Gulch SEZ as Revised (NRCS 2008)

TABLE 10.2.7.1-1 Summary of Soil Map Units within the Proposed De Tilla Gulch SEZ as Revised

Map Unit Symbol	Map Unit Name	Erosion Potential Water[a]	Erosion Potential Wind[b]	Description	Area in Acres[c] (Percentage of SEZ)
58	Rock River gravelly loam (3 to 15% slope)	Slight	Moderate (WEG 4)[d]	Nearly level to gently sloping soils on valley side slopes and fans. Parent material consists of calcareous alluvium. Deep and well drained, with moderate surface-runoff potential and moderate permeability. Shrink-swell potential is low. Available water capacity is moderate. Used mainly as rangeland. Moderate rutting hazard.	506 (47.5)
29	Graypoint gravelly sandy loam (0 to 3% slope)	Slight	Moderate (WEG 3)	Level to nearly level soils on broad fans and terraces. Parent material consists of alluvium derived from basalt. Deep and well drained, with moderate surface-runoff potential and moderate permeability. Shrink-swell potential is low to moderate. Available water capacity is low. Caving hazard exists. Used mainly as rangeland and irrigated cropland, pasture, and hayland. Farmland of unique importance.[e] Moderate rutting hazard.	274 (25.8)
50	Mosca loamy sand (0 to 3% slope)	Slight	High (WEG 2)	Level to nearly level soils on fans and floodplains. Parent material consists of alluvium derived from basalt. Soils are deep and well drained, with moderate surface-runoff potential and moderate permeability. Shrink-swell potential is low. Available water capacity is low. Used mainly as rangeland and irrigated cropland. Farmland of unique importance. Moderate rutting hazard.	169 (15.9)
15	Costilla gravelly loamy sand (0 to 3% slope)	Slight	High (WEG 2)	Level to nearly level soils on fans and terraces. Parent material consists of sandy alluvium. Deep and somewhat excessively drained, with a low surface-runoff potential (high infiltration rate) and moderately rapid permeability. Shrink-swell potential is low. Available water capacity is low. Caving hazard exists. Used mainly as rangeland and wildlife habitat, and locally for irrigated crops. Moderate rutting hazard.	56 (5.2)

TABLE 10.2.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Erosion Potential: Water[a]	Erosion Potential: Wind[b]	Description	Area in Acres[c] (Percentage of SEZ)
69	Shawa loam (0 to 4% slope)	Slight	Moderate (WEG 6)	Level to nearly level soils on fans and low terraces adjacent to streams. Parent material consists of alluvium. Deep and moderately well drained, with moderate surface-runoff potential and moderate permeability. Shrink-swell potential is low to moderate. Available water capacity is high. Used mainly as irrigated pastureland, irrigated cropland, and rangeland. Prime farmland, if irrigated. Severe rutting hazard.	37 (3.5)
55	Platoro loam (0 to 3% slope)	Slight	Moderate (WEG 6)	Level to nearly level soils on fans and terraces. Parent material consists of alluvium derived mainly from basalt. Deep and well drained, with moderate surface-runoff potential and moderately slow permeability. Shrink-swell potential is low to moderate. Available water capacity is moderate. Used mainly as irrigated cropland, irrigated pastureland, and rangeland. Prime farmland, if irrigated. Severe rutting hazard.	19 (1.8)
81	Villa Grove sandy clay loam	Slight	Moderate (WEG 5)	Level soils on floodplains. Parent material consists of alluvium. Deep and poorly drained, with moderate surface-runoff potential and moderate permeability. Shrink-swell potential is low to moderate. Available water capacity is low. Flooding hazard during snowmelt season. Used mainly as rangeland and locally as irrigated pastureland. Prime farmland, if irrigated. Severe rutting hazard.	3 (<1)

[a] Water erosion potential rates the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. The ratings are based on slope and soil erosion factor K and represent soil loss caused by sheet or rill erosion where 50 to 75% of the surface has been exposed by ground disturbance. A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions.

[b] Wind erosion potential here is based on the wind erodibility group (WEG) designation: groups 1 and 2, high; groups 3 through 6, moderate; and groups 7 and 8, low (see footnote d for further explanation).

[c] To convert acres to km^2, multiply by 0.004047.

Footnotes continued on next page.

TABLE 10.2.7.1-1 (Cont.)

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[d] WEGs are based on soil texture, content of organic matter, effervescence of carbonates, content of rock fragments, and mineralogy, and also take into account soil moisture, surface cover, soil surface roughness, wind velocity and direction, and the length of unsheltered distance (USDA 2004). Groups range in value from 1 (most susceptible to wind erosion) to 8 (least susceptible to wind erosion). The NRCS provides a wind erodibility index, expressed as an erosion rate in tons per acre (4,000 m^2) per year, for each of the wind erodibility groups: WEG 1, 220 tons (200 metric tons) per acre (4,000 m^2) per year (average); WEG 2, 134 tons (122 metric tons) per acre per year; WEGs 3 and 4 (and 4L), 86 tons (78 metric tons) per acre (4,000 m^2) per year; WEG 5, 56 tons (51 metric tons) per acre (4,000 m^2) per year; WEG 6, 48 tons (44 metric tons) per acre (4,000 m^2) per year; WEG 7, 38 tons (34 metric tons) per acre (4,000 m^2) per year; and WEG 8, 0 tons (0 metric tons) per acre (4,000 m^2) per year.

[e] Farmland is of unique importance for the production of food, feed, fiber, forage, or oilseed crops. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses.

Sources: NRCS (2009); USDA (1984).

- Re-evaluation of the soil coverage indicates an increase of 4 acres (0.016 km^2) for the Mosca loamy sand, and a 1-acre (0.0040-km^2) increase for both the Costilla gravelly loamy sand and the Villa Grove sandy clay loam relative to what was reported in the Draft Solar PEIS (Table 10.2.7.1-1).

10.2.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar project. The assessment provided in the Draft Solar PEIS remains valid, with the following update:

- Impacts related to wind erodibility are reduced because the new SEZ boundaries eliminate 464 acres (1.9 km^2) of moderately erodible soils from development.

10.2.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on soils are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will reduce the potential for soil impacts during all project phases.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features were identified for soil resources at the proposed De Tilla Gulch SEZ. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.8 Minerals (Fluids, Solids, and Geothermal Resources)

A mineral potential assessment for the proposed De Tilla Gulch SEZ has been prepared and reviewed by BLM mineral specialists knowledgeable about the region where the SEZ is located (BLM 2012). The BLM is proposing to withdraw the SEZ from settlement, sale, location, or entry under the general land laws, including the mining laws, for a period of 20 years (see Section 2.2.2.2.4 of the Final Solar PEIS). The potential impacts of this withdrawal are discussed in Section 10.2.24.

10.2.8.1 Affected Environment

There are no oil and gas leases, mining claims, or geothermal leases located in the proposed SEZ. The description in the Draft Solar PEIS remains valid.

10.2.8.2 Impacts

There are no anticipated impacts on mineral resources from the development of solar energy facilities in the proposed SEZ. The analysis of impacts on mineral resources in the Draft Solar PEIS remains valid.

10.2.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on mineral resources are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide adequate protection of mineral resources.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for mineral resources have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.9 Water Resources

10.2.9.1 Affected Environment

The overall size of the De Tilla Gulch SEZ has been reduced by 31% from the area described in the Draft Solar PEIS, resulting in a total area of 1,064 acres (4.3 km^2). The description of the affected environment given in the Draft Solar PEIS relevant to water resources at the De Tilla Gulch SEZ remains valid and is summarized in the following paragraphs.

The De Tilla Gulch SEZ is within the Rio Grande Headwaters subbasin of the Rio Grande hydrologic region. The SEZ is located in the northern part of the San Luis Valley bounded by the San Juan Mountains to the west and the Sangre de Cristo Mountains to the east. Precipitation and snowfall in the valley is around 8 in./yr (20 cm/yr) and 24 in./yr (61 cm), respectively, with much greater amounts in the surrounding mountains. Pan evaporation rates are estimated to be on the order of 54 in./yr (137 cm/yr). No permanent surface water bodies, flood hazards, or wetlands have been identified within the SEZ. Several intermittent/ephemeral drainages cross the area from the northwest to the southeast and may be subject to intermittent flooding. Groundwater in the San Luis Valley is primarily in basin-fill deposits with an upper unconfined aquifer and a lower confined aquifer, which are separated by a series of confining clay layers and unfractured volcanic rocks. The SEZ sits on an alluvial fan deposit at the base of the San Juan Mountains over unconfined groundwater. A groundwater monitoring well within the site has reported a depth to groundwater of 136 ft (41 m) and indicates a groundwater flow from north to south. Water quality in the northern San Luis Valley varies, with small areas of TDS values of up to 1,000 mg/L near the SEZ; much smaller concentrations (250 to 500 mg/L) generally surround the area.

The De Tilla Gulch SEZ is located in the Colorado Division 3 management zone (Rio Grande Basin) of the Colorado DWR, where both surface water and groundwater rights are overappropriated. The Rio Grande Compact of 1938 obligates Colorado to meet water delivery schedules to New Mexico and governs much of the water management decision making in the San Luis Valley. In order to balance water uses within the San Luis Valley and to meet treaty obligations, several water management mechanisms have been developed that affect existing water rights and water right transfers. The two primary water management considerations affecting solar energy development are the need for an augmentation water plan, and the rules set by the recently formed Special Improvement District Number 1 (Subdistrict #1). Augmentation water plans were described in the Draft Solar PEIS (Section 10.2.9.1.3) and essentially require junior water right holders to have additional water reserves to ensure that more senior water rights are not hindered. The water management plan for Subdistrict #1 was ruled on in June of 2010, putting restrictions on groundwater withdrawals in an effort to restore groundwater levels in the unconfined aquifer. None of the Colorado SEZs are located within the boundaries of Subdistrict #1, which primarily includes central portions of the San Luis Valley that are currently used for agriculture. However, given that water rights are overappropriated in the San Luis Valley and largely clustered within Subdistrict #1, it is likely that any new water diversions and water right transfers would involve these new groundwater management considerations.

In addition to the water resources information provided in the Draft Solar PEIS, this section provides a planning-level inventory of available climate, surface water, and groundwater monitoring stations within the immediate vicinity of the De Tilla Gulch SEZ and surrounding basin. Additional data regarding climate, surface water, and groundwater conditions are presented in Tables 10.2.9.1-1 through 10.2.9.1-7 and in Figures 10.2.9.1-1 and 10.2.9.1-2. Fieldwork and hydrologic analyses needed to determine 100-year floodplains and jurisdictional water bodies would need to be coordinated with appropriate federal, state, and local agencies. Areas within the De Tilla Gulch SEZ that are found to be within a 100-year floodplain will be identified as non-development areas. Any water features within the De Tilla Gulch SEZ determined to be jurisdictional will be subject to the permitting process described in the CWA.

10.2.9.2 Impacts

10.2.9.2.1 Land Disturbance Impacts on Water Resources

The discussion of land disturbance effects on water resources in the Draft Solar PEIS remains valid. As stated in the Draft Solar PEIS, land disturbance impacts in the vicinity of the proposed De Tilla Gulch SEZ could potentially affect drainage patterns and groundwater recharge. The alteration of natural drainage pathways during construction can lead to impacts related to flooding, loss of water delivery to downstream regions, and alterations to riparian vegetation and habitats. The alteration of the SEZ boundaries removes several intermittent/ephemeral stream reaches, which reduces the potential for adverse impacts associated with land disturbance activities.

TABLE 10.2.9.1-1 Watershed and Water Management Basin Information Relevant to the Proposed De Tilla Gulch SEZ as Revised

Basin	Name	Area (acres)[b]
Subregion (HUC4)[a]	Rio Grande Headwaters (1301)	4,871,764
Cataloging unit (HUC8)	Sagauche (13010004)	864,210
Groundwater basin	San Luis Valley	2,000,000
SEZ	De Tilla Gulch	1,064

[a] HUC = Hydrologic Unit Code; a USGS system for characterizing nested watersheds that includes large-scale subregions (HUC4) and small-scale cataloging units (HUC8).

[b] To convert acres to km^2, multiply by 0.004047.

TABLE 10.2.9.1-2 Climate Station Information Relevant to the Proposed De Tilla Gulch SEZ as Revised

Climate Station (COOP ID[a])	Elevation[b] (ft)[c]	Distance to SEZ (mi)[d]	Period of Record	Mean Annual Precipitation (in.)[e]	Mean Annual Snowfall (in.)
Center 4 SSW, Colorado (051458)	7,673	30	1941–2011	7.00	25.00
Crestone 1 SE, Colorado (051964)	8,004	19	1982–2011	13.00	62.40
Sagauche, Colorado (057337)	7,701	8	1894–2009	8.27	23.50
Sargents, Colorado (057460)	8,470	30	1899–2011	14.17	105.60

[a] National Weather Service's Cooperative Station Network station identification code.

[b] Surface elevations for the proposed De Tilla Gulch SEZ range from 7,670 to 7,835 ft.

[c] To convert ft to m, multiply by 0.3048.

[d] To convert mi to km, multiply by 1.6093.

[e] To convert in. to cm, multiply by 2.540.

Source: NOAA (2012).

TABLE 10.2.9.1-3 Total Lengths of Selected Streams at the Subregion, Cataloging Unit, and SEZ Scale Relevant to the Proposed De Tilla Gulch SEZ as Revised

Water Feature	Subregion, HUC4 (ft)[a]	Cataloging Unit, HUC8 (ft)	SEZ (ft)
Unclassified streams	19,502	0	0
Perennial streams	14,694,407	2,430,527	0
Intermittent/ephemeral streams	94,288,163	18,660,065	17,354
Canals	12,151,458	1,770,862	0

[a] To convert ft to m, multiply by 0.3048.

Source: USGS (2012a).

TABLE 10.2.9.1-4 Stream Discharge Information Relevant to the Proposed De Tilla Gulch SEZ as Revised

	Station (USGS ID)
Parameter	Saguache Creek near Saguache, Colorado (08227000)
Period of record	1911–2007
No. of observations	88
Discharge, median (ft^3/s)[a]	293
Discharge, range (ft^3/s)	67–1220
Discharge, most recent observation (ft^3/s)	250
Distance to SEZ (mi)[b]	16

[a] To convert ft^3 to m^3, multiply by 0.0283.

[b] To convert mi to km, multiply by 1.6093.

Source: USGS (2012b).

TABLE 10.2.9.1-5 Surface Water Quality Data Relevant to the Proposed De Tilla Gulch SEZ as Revised

	Station (USGS ID)[a]	
Parameter	08227000	381004105552000
Period of record	1967–2004	1975–1976
No. of records	126	4
Temperature (°C)[b]	8.4 (0–22.5)	60 (59–60)
Total dissolved solids (mg/L)	107.5 (82–124)	661 (648–690)
Dissolved oxygen (mg/L)	9.1 (7.1–11.3)	NA[c]
pH	7.5 (7.1–8.9)	6.5 (6.5–7.3)
Total nitrogen (mg/L)	NA	NA
Phosphorus (mg/L as P)	0.0815 (0.061–0.088)	NA
Organic carbon (mg/L)	NA	NA
Calcium (mg/L)	17 (12.1–21)	57 (55–59)
Magnesium (mg/L)	2.7 (1.84–5.1)	13
Sodium (mg/L)	5.9 (4.04–9.5)	140 (140–150)
Chloride (mg/L)	1.505 (0.64–3.6)	39.5 (38–40)
Sulfate (mg/L)	5.17 (2.68–12)	170 (160–190)
Arsenic (µg/L)	NA	31 (26–36)
Cadmium (µg/L)	NA	<2 (–)
Copper (µg/L)	NA	<2 (–)

[a] Median values are listed; the range in values is shown in parentheses.

[b] To convert °C to °F, multiply by 1.8, then add 32.

[c] NA = no data collected for this parameter

Source: USGS (2012b).

Land clearing, land leveling, and vegetation removal during the development of the SEZ have the potential to disrupt intermittent/ephemeral stream channels. Several programmatic design features described in Section A.2.2 of Appendix A of this Final Solar PEIS would avoid, minimize, and/or mitigate impacts associated with the disruption of intermittent/ephemeral water features. Additional analyses of intermittent/ephemeral streams are presented in this update, including an evaluation of functional aspects of stream channels with respect to groundwater recharge, flood conveyance, sediment transport, geomorphology, and ecological habitats. Only a summary of the results from these surface water analyses is presented in this section; more information on methods and results is presented in Appendix O.

The study region considered for the intermittent/ephemeral stream evaluation relevant to the De Tilla Gulch SEZ is a subset of the Sagauche watershed (HUC8), for which information regarding stream channels is presented in Tables 10.2.9.1-3 and 10.2.9.1-4 of this Final Solar PEIS. The results of the intermittent/ephemeral stream evaluation are shown in Figure 10.2.9.2-1, which depicts flow lines from the National Hydrography Dataset (USGS 2012a) labeled as low, moderate, and high sensitivity to land disturbance. Within the study area, 28% of the intermittent/ephemeral stream channels had low sensitivity and 72% had

TABLE 10.2.9.1-6 Water Quality Data from Groundwater Samples Relevant to the Proposed De Tilla Gulch SEZ as Revised

Parameter	Station (USGS ID)[a]		
	380515106080501	380605106002501	380955105550301
Period of record	1968	1968	1968
No. of records	1	1	1
Temperature (°C)[b]	11.7	14	12
Total dissolved solids (mg/L)	NA[c]	172	NA
Dissolved oxygen (mg/L)	NA	NA	NA
pH	NA	7.2	NA
Nitrate + nitrite (mg/L as N)	NA	NA	NA
Phosphate (mg/L)	NA	0.01	NA
Organic carbon (mg/L)	NA	NA	NA
Calcium (mg/L)	NA	29	NA
Magnesium (mg/L)	NA	3.9	NA
Sodium (mg/L)	NA	20	NA
Chloride (mg/L)	NA	5.1	NA
Sulfate (mg/L)	NA	26	NA
Arsenic (μg/L)	NA	NA	NA

[a] Median values are listed.

[b] To convert °C to °F, multiply by 1.8, then add 32.

[c] NA = no data collected for this parameter.

Source: USGS (2012b).

TABLE 10.2.9.1-7 Groundwater Surface Elevations Relevant to the Proposed De Tilla Gulch SEZ as Revised

Parameter	Station (USGS ID)		
	380651106004501	380421106033001	380512106004901
Period of record	1989–2011	1979–2011	1979–2011
No. of observations	18	384	375
Surface elevation (ft)[a]	7,748	7,625	7,628
Well depth (ft)	194	63.3	86
Depth to water, median (ft)	130.16	6.2	23.38
Depth to water, range (ft)	127.35–144.83	2.02–11.95	21.41–27.96
Depth to water, most recent observation (ft)	144.83	9.48	27.75
Distance to SEZ (mi)[b]	1	4	2

[a] To convert ft to m, multiply by 0.3048.

[b] To convert mi to km, multiply by 1.6093.

Source: USGS (2012b).

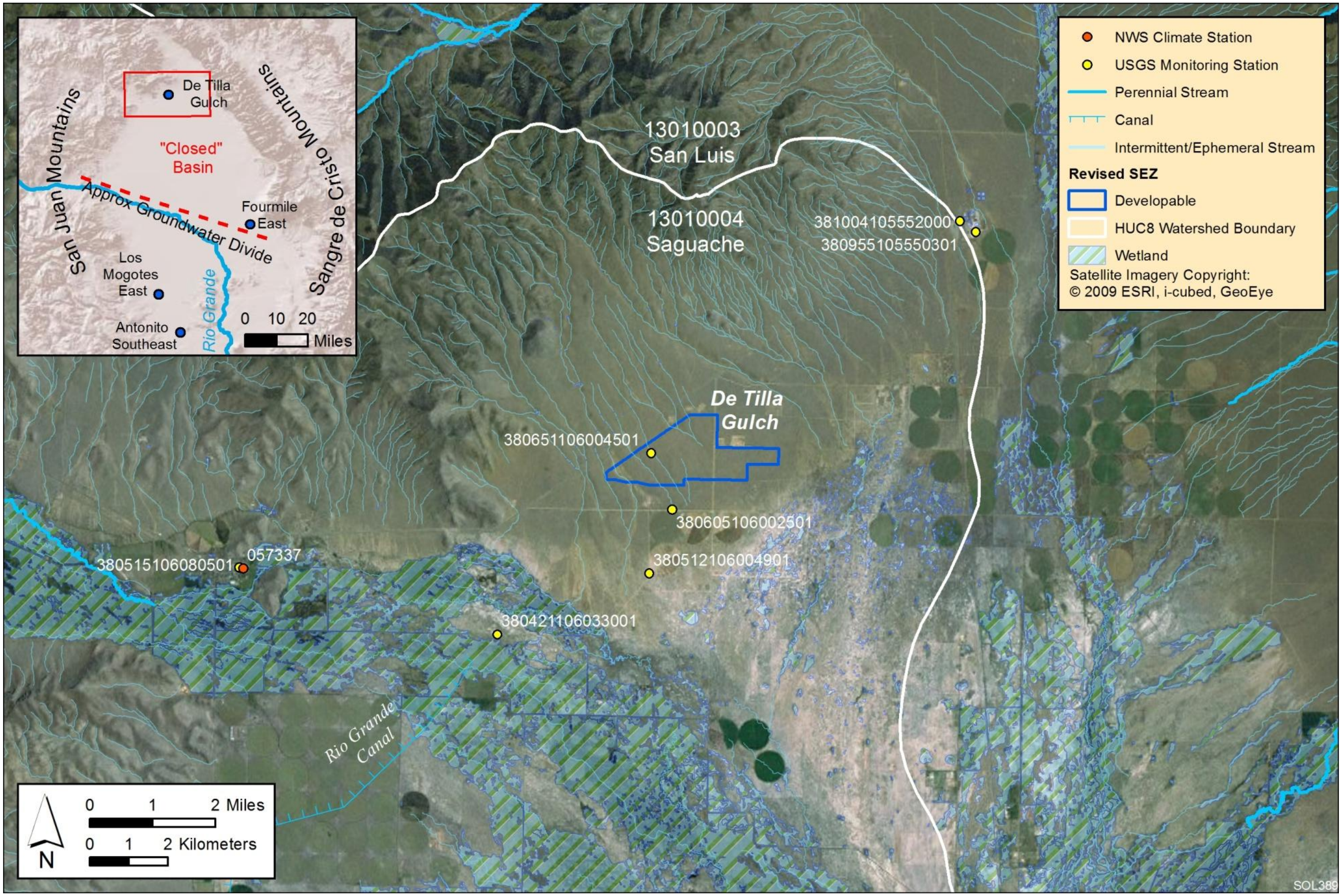

FIGURE 10.2.9.1-1 Water Features near the Proposed De Tilla Gulch SEZ as Revised

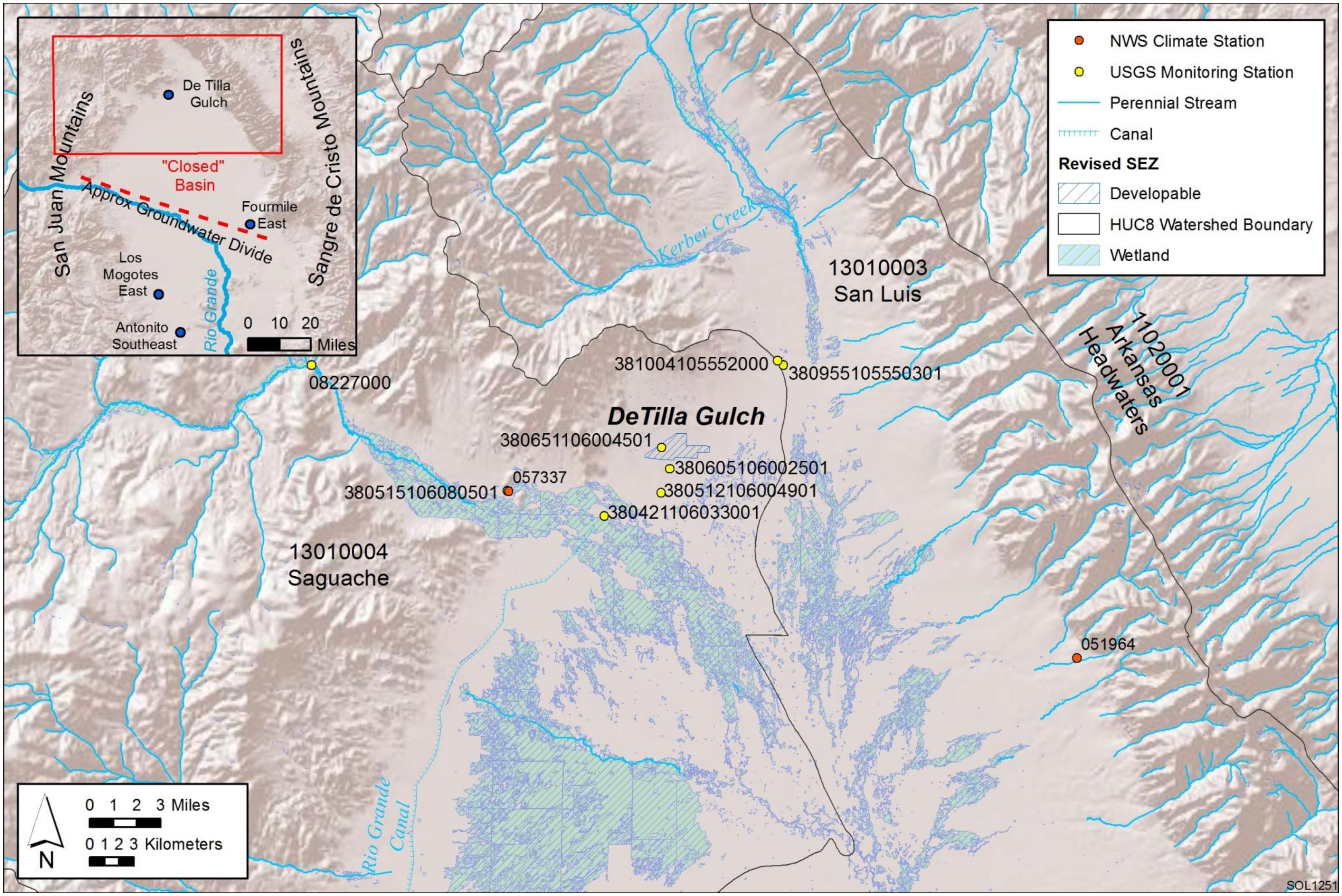

FIGURE 10.2.9.1-2 Water Features within the Sagauche Watershed, Which Includes the Proposed De Tilla Gulch SEZ as Revised

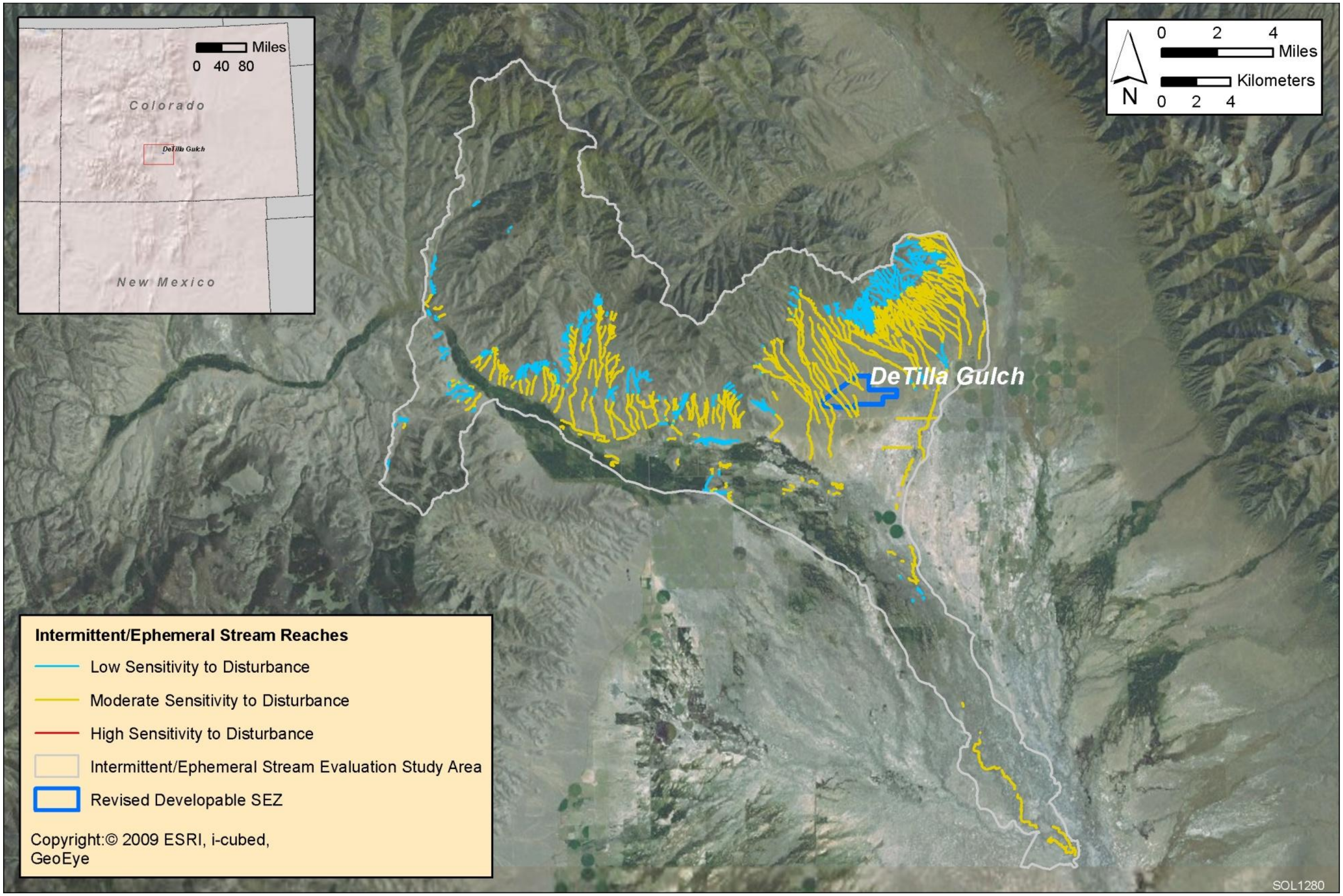

FIGURE 10.2.9.2-1 Intermittent/Ephemeral Stream Channel Sensitivity to Surface Disturbances in the Vicinity of the Proposed De Tilla Gulch SEZ as Revised

TABLE 10.2.9.2-1 Estimated Water Requirements for the Proposed De Tilla Gulch SEZ as Revised[a]

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Construction—Peak Year				
Water use requirements				
Fugitive dust control (ac-ft)[b]	261	261	261	261
Potable supply for workforce (ac-ft)	31	13	5	3
Total water use requirements (ac-ft)	292	274	266	264
Wastewater generated				
Sanitary wastewater (ac-ft)	31	13	5	3
Operations				
Water use requirements				
Mirror/panel washing (ac-ft/yr)	85	47	47	5
Potable supply for workforce (ac-ft/yr)	2	1	1	<1
Dry cooling (ac-ft/yr)	34–170	19–95	NA[c]	NA
Wet cooling (ac-ft/yr)	766–2,468	426–1,371	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	48	5
Dry-cooled technologies (ac-ft/yr)	121–257	67–143	NA	NA
Wet-cooled technologies (ac-ft/yr)	853–2,555	474–1,419	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)	48	27	NA	NA
Sanitary wastewater (ac-ft/yr)	2	1	1	<1

[a] See Section M.9.2 of Appendix M of the Draft Solar PEIS for methods used in estimating water use requirements.

[b] To convert ac-ft to m^3, multiply by 1,234.

[c] NA = not applicable.

moderate sensitivity to land disturbance. All the intermittent/ephemeral channel reaches within the De Tilla Gulch SEZ were classified as having moderate sensitivity to land disturbance.

10.2.9.2.2 Water Use Requirements for Solar Energy Technologies

Changes in the De Tilla Gulch SEZ boundaries resulted in changes to the estimated water use requirements and a reduction in the land affected by surface disturbances. This section presents changes in water use estimates for the reduced SEZ area and additional analyses pertaining to groundwater. The additional analyses of groundwater include a basin-scale water budget and a simplified, one-dimensional groundwater model of potential groundwater drawdown. Only a summary of the results from these groundwater analyses is presented in this section; more information on methods and results is presented in Appendix O. Table 10.2.9.2-1 presents the revised estimates of water requirements for both construction and operation of solar facilities at the De Tilla Gulch SEZ assuming full build-out of the SEZ and accounting for its decreased size.

The De Tilla Gulch SEZ is located in the San Luis Valley, where both surface waters and groundwater are managed conjunctively. Previous studies on water resources in the San Luis Valley typically present a basin-scale water balance, which considers inputs and outputs of water via precipitation, surface water flows, and groundwater (e.g., Mayo et al. 2007). Table 10.1.9.2-2 presents an example water balance for the San Luis Valley that considers all water inputs and outputs from the valley. As noted by Mayo et al. (2007), it is difficult to reconcile some of the historical water budget presented for the San Luis Valley; however, it can be generally stated that the water budget is predominately a balance of precipitation and streamflow inputs, with output dominated by evapotranspiration by agricultural lands, riparian areas, and meadows.

The estimated total water use requirements during the peak construction year are as high as 292 ac-ft/yr (360,200 m^3/yr), which does not constitute a significant amount given the short duration of this water demand relative to water resources within the region. The long duration of groundwater pumping during operations (20 years) poses a greater threat to groundwater resources. This analysis considered low, medium, and high groundwater pumping scenarios that represent full build-out of the SEZ, assuming PV, dry-cooled parabolic trough, and wet-cooled parabolic trough, respectively (a 30% operational time was considered for all solar facility types on the basis of operations estimates for proposed utility-scale solar energy facilities). The low, medium, and high pumping scenarios result in groundwater withdrawals that range from 5 to 854 ac-ft/yr (6,200 to 1.1 million m^3/yr) or 100 to 17,080 ac-ft (123,400 to 21.1 million m^3) over the 20-year operational period. From a groundwater budgeting perspective, all pumping scenarios over the 20-year operational period represent less than 1% of the groundwater storage.

Examining groundwater withdrawals with respect to a basin-scale water budget allows for an assessment of potential impacts only to an order of magnitude approximation of basin-scale estimates of complex groundwater processes. In addition, a water budget approach ignores the temporal and spatial components of how groundwater withdrawals affect groundwater surface elevations, groundwater flow rates, and connectivity to surface water features such as streams, wetlands, playas, and riparian vegetation. A one-dimensional groundwater modeling analysis was performed to present a simplified depiction of the spatial and temporal effects of groundwater withdrawals by examining groundwater drawdown in a radial direction around the center of the SEZ for the low, medium, and high pumping scenarios considering pumping from the upper unconfined aquifer only. As stated in the Draft Solar PEIS, the De Tilla Gulch SEZ is located in a region of the San Luis Valley where confining clay and volcanic rock layers are absent. A detailed discussion of the groundwater modeling analysis is presented in Appendix O. It should be noted, however, that the aquifer parameters used for the one-dimensional groundwater model (Table 10.2.9.2-3) represent available literature data, and that the model aggregates these value ranges into a simplistic representation of the aquifers.

TABLE 10.2.9.2-2 Water Budget for the San Luis Valley, Which Includes the Proposed De Tilla Gulch SEZ as Revised

Process	Amount
Inputs	
Precipitation (ac-ft/yr)[a]	1,086,356
Streams draining Sangre de Cristo Mts. (ac-ft/yr)	214,839
Streams draining San Juan Mts. (ac-ft/yr)	1,321,463
Groundwater underflow (ac-ft/yr)	721,535
Outputs	
Evapotranspiration (ac-ft/yr)	2,245,676
Rio Grande discharge (ac-ft/yr)	332,392
Groundwater underflow (ac-ft/yr)	72,964
Groundwater pumping (ac-ft/yr)[b]	641,214
Groundwater storage	
Storage (ac-ft)	2,026,783

[a] To convert ac-ft to m^3, multiply by 1,234.

[b] Colorado DWR (2004).

Source: Mayo et al. (2007).

TABLE 10.2.9.2-3 Aquifer Characteristics and Assumptions Used in the One-Dimensional Groundwater Model for the Proposed De Tilla Gulch SEZ as Revised

Parameter	Value
Aquifer type/conditions	Unconfined/basin fill
Aquifer thickness (ft)[a,b]	100
Hydraulic conductivity (ft/day)	10
Transmissivity (ft^2/day)	1,000
Specific yield	0.24
Analysis period (yr)	20
High pumping scenario (ac-ft/yr)[c]	854
Medium pumping scenario (ac-ft/yr)	122
Low pumping scenario (ac-ft/yr)	5

[a] Mayo et al. (2007).

[b] To convert ft to m, multiply by 0.3048.

[c] To convert ac-ft to m^3, multiply by 1,234.

Source: Colorado DWR (2004).

Depth to groundwater is typically 100 to 200 ft (30 to 61 m) below the surface in the vicinity of the De Tilla Gulch SEZ. The one-dimensional groundwater modeling results for the unconfined aquifer suggest that groundwater drawdown in the vicinity of the SEZ (approximately a 1-mi [1.6-km] radius) ranges from up to 110 ft (34 m) for the high pumping scenario, up to 15 ft (5 m) for the medium pumping scenario, and less than 1 ft (0.3 m) for the low pumping scenario (Figure 10.2.9.2-2). The groundwater drawdown associated with the high pumping scenario is on the order of the saturated thickness of the aquifer assumed for the model (Table 10.2.9.2-3) at the center of pumping, which represents a significant, but localized, groundwater impact. The extent of groundwater drawdown is primarily restricted to the vicinity of the SEZ for all pumping scenarios.

The comparison of water use requirements to the basin-scale water budget and the one dimensional groundwater modeling suggests that groundwater withdrawal would only have a local impact on groundwater resources. From a groundwater budgeting perspective, the three pumping scenarios considered are not significant relative to the amounts of water moved through the San Luis Valley. Groundwater modeling results suggest that the high pumping scenario would have a localized groundwater drawdown effect in the unconfined aquifer. As stated in Section 10.2.9.1, water management of the San Luis Valley is restrictive given its overappropriated water rights and its obligations to maintain flows in the Rio Grande. Ultimately, any proposed groundwater withdrawals for solar energy facilities would be reviewed for impacts by the Colorado DWR and would be subject to the rules and court decisions outlined in Case Numbers 06CV64 and 07CW52 (Colorado District Court 2010).

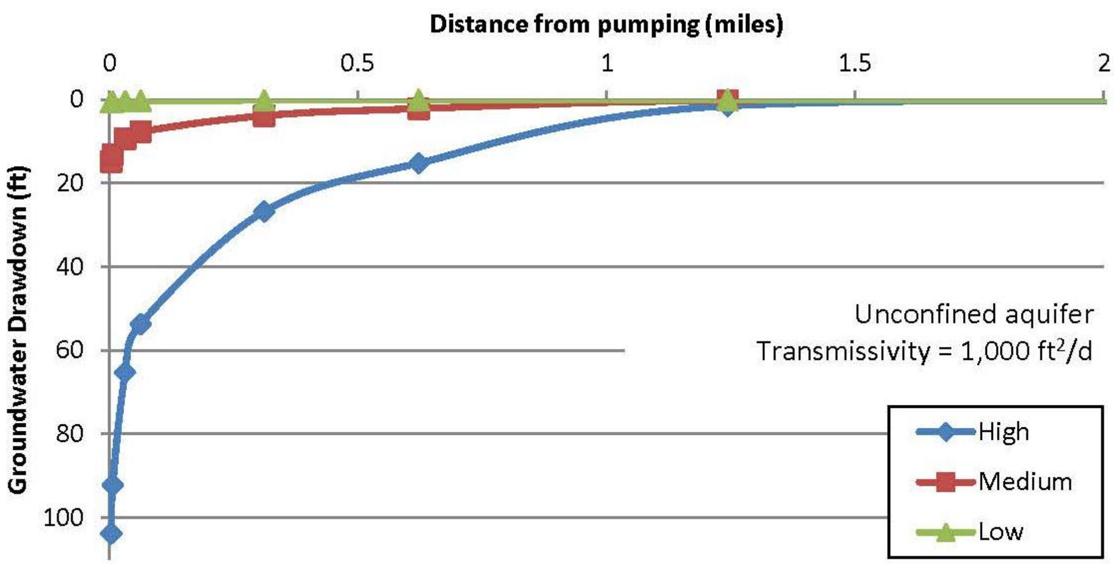

FIGURE 10.2.9.2-2 Estimated One-Dimensional Groundwater Drawdown Resulting from High, Medium, and Low Groundwater Pumping Scenarios over the 20-Year Operational Period at the Proposed De Tilla Gulch SEZ as Revised

10.2.9.2.3 Off- Site Impacts: Roads and Transmission Lines

As stated in the Draft Solar PEIS, impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. Water needed for transmission line construction activities (e.g., for soil compaction, dust suppression, and potable supply for workers) could be trucked to the construction area from an off-site source. If this occurred, water use impacts at the SEZ would be negligible. The Draft Solar PEIS assessment of impacts on water resources from road and transmission line construction remains valid.

10.2.9.2.4 Summary of Impacts on Water Resources

The additional information and analyses of water resources presented in this update agree with the information provided in the Draft Solar PEIS, which indicates that the San Luis Valley is a high-elevation basin, with predominately agricultural land use, and is the headwaters of the Rio Grande, where surface water and groundwater processes are coupled and managed jointly. Groundwater in the San Luis Valley is found both in the upper unconfined aquifer and lower confined aquifer, and historical diversions of both surface water and groundwater for irrigation have affected streamflows and groundwater levels. Water management plays a significant role in the San Luis Valley because it pertains to ensuring river flows in the Rio Grande according to the Rio Grande Compact, which is the primary responsibility of the Colorado DWR.

Disturbance to intermittent/ephemeral stream channels within the De Tilla Gulch SEZ could potentially affect groundwater recharge, as this portion of the San Luis Valley is an important recharge area (see Figure O.1-3 in Appendix O). The intermittent/ephemeral stream evaluation suggests that all the intermittent/ephemeral streams crossing the SEZ have a moderate sensitivity to land disturbances. Several design features described in Section A.2.2 of Appendix A of this Final Solar PEIS specify measures to reduce impacts regarding intermittent/ephemeral water features, and drainage alterations associated with stormwater management should focus on maintaining groundwater recharge functionality.

Groundwater withdrawals associated with solar energy facilities typically pose the greatest threat to water resources in arid and semiarid regions; however, water budgeting and groundwater modeling analyses suggest that only localized groundwater drawdown occurs in the unconfined aquifer for all pumping scenarios at the De Tilla Gulch SEZ. The high pumping scenario has the potential for a significant groundwater drawdown within the SEZ, but not the surrounding area. Ultimately, the process of transferring water rights established by the Colorado DWR will determine how much water can be used by proposed solar facilities. As stated in the Draft Solar PEIS, given the restrictive nature of water rights and the need for augmentation water reserves, it would be difficult for any projects seeking an amount of water more than 1,000 ac-ft/yr (1.2 million m^3/yr) to be successful in obtaining the needed water rights (McDermott 2010). The only scenario where this level of groundwater withdrawals is exceeded is for a full build-out scenario of wet-cooled facilities that have an operating period of greater than 30%, which is highly unlikely.

Predicting impacts associated with groundwater withdrawals is often difficult, given the heterogeneity of aquifer characteristics, the long time period between the onset of pumping and its effects, and limited data. Another consideration relevant to the San Luis Valley is that the transfer of water rights will likely come from the purchase of existing irrigation water rights, which will result in a change in the location of the point of diversion and a change in land use patterns in the basin, both of which can affect groundwater processes. One of the primary mitigation measures to protect water resources is the implementation of long-term monitoring and adaptive management (see Section A.2.4 of Appendix A). For groundwater, this requires a combination of monitoring and modeling to fully identify the temporal and spatial extent of potential impacts. Water management in the San Luis Valley relies on several water monitoring and modeling tools developed by the Colorado DWR and the CWCB that are a part of the Colorado's Decision Support Systems (available at http://cdss.state.co.us/Pages/CDSSHome.aspx), and these tools should be implemented with respect to long-term monitoring and adaptive management strategies for solar energy development occurring within the San Luis Valley.

10.2.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on surface water and groundwater are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features would provide some protection of and reduce impacts on water resources.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design feature has been identified:

- Application of the design features regarding intermittent/ephemeral water bodies and storm water management should emphasize the need to maintain groundwater recharge for disturbed surface water features within the De Tilla Gulch SEZ.

The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project specific analysis.

10.2.10 Vegetation

10.2.10.1 Affected Environment

As presented in the Draft Solar PEIS, 4 cover types were identified within the area of the proposed De Tilla Gulch SEZ, while 34 cover types were identified within 5 mi (8 km) of the SEZ boundary (the indirect effects area). Sensitive habitats on the SEZ include ephemeral dry washes. Because of the changes to the SEZ boundaries that exclude lands along the northwest margin, Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland Complex and Recently Logged Areas cover types no longer occur within 5 mi (8 km) of the SEZ boundary. Figure 10.2.10-1 shows the cover types within the affected area of the De Tilla Gulch SEZ as revised.

10.2.10.2 Impacts

As presented the Draft Solar PEIS, the construction of solar energy facilities within the proposed De Tilla Gulch SEZ would result in direct impacts on plant communities because of the removal of vegetation within the facility footprint during land-clearing and land-grading operations. Approximately 80% of the SEZ would be expected to be cleared with full development of the SEZ. Considering the reduced size of the SEZ, approximately 851 acres (3.4 km^2) would be cleared.

Overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of a cover type would be lost; and (3) *large*: >10% of a cover type would be lost.

10.2.10.2.1 Impacts on Native Species

The analysis presented in the Draft Solar PEIS for the original De Tilla Gulch SEZ developable area indicated that development would result in a small impact on all land cover types occurring within the SEZ (Table 10.2.11.1-1 in the Draft Solar PEIS). Development within the De Tilla Gulch SEZ could still directly affect all the cover types evaluated in the Draft Solar PEIS; indirect impacts on the Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland Complex and Recently Logged Areas cover types would not occur. The reduction in the developable area would result in reduced (and still small) impact levels on all cover types in the affected area, compared to original estimates in the Draft Solar PEIS.

Direct impacts could still occur on unmapped wetlands within the remaining areas of the SEZ. In addition, indirect impacts on wetlands within or near the SEZ, as described in the Draft Solar PEIS, could occur.

10.2.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

As presented the Draft Solar PEIS, land disturbance from project activities and indirect effects of construction and operation within the De Tilla Gulch SEZ could potentially result in the establishment or expansion of noxious weeds and invasive species populations, potentially including those species listed in Section 10.2.10.1 of the Draft Solar PEIS. Impacts such as reduced restoration success and possible widespread habitat degradation could still occur; however, a small reduction in the potential for such impacts would result from the reduced developable area of the SEZ.

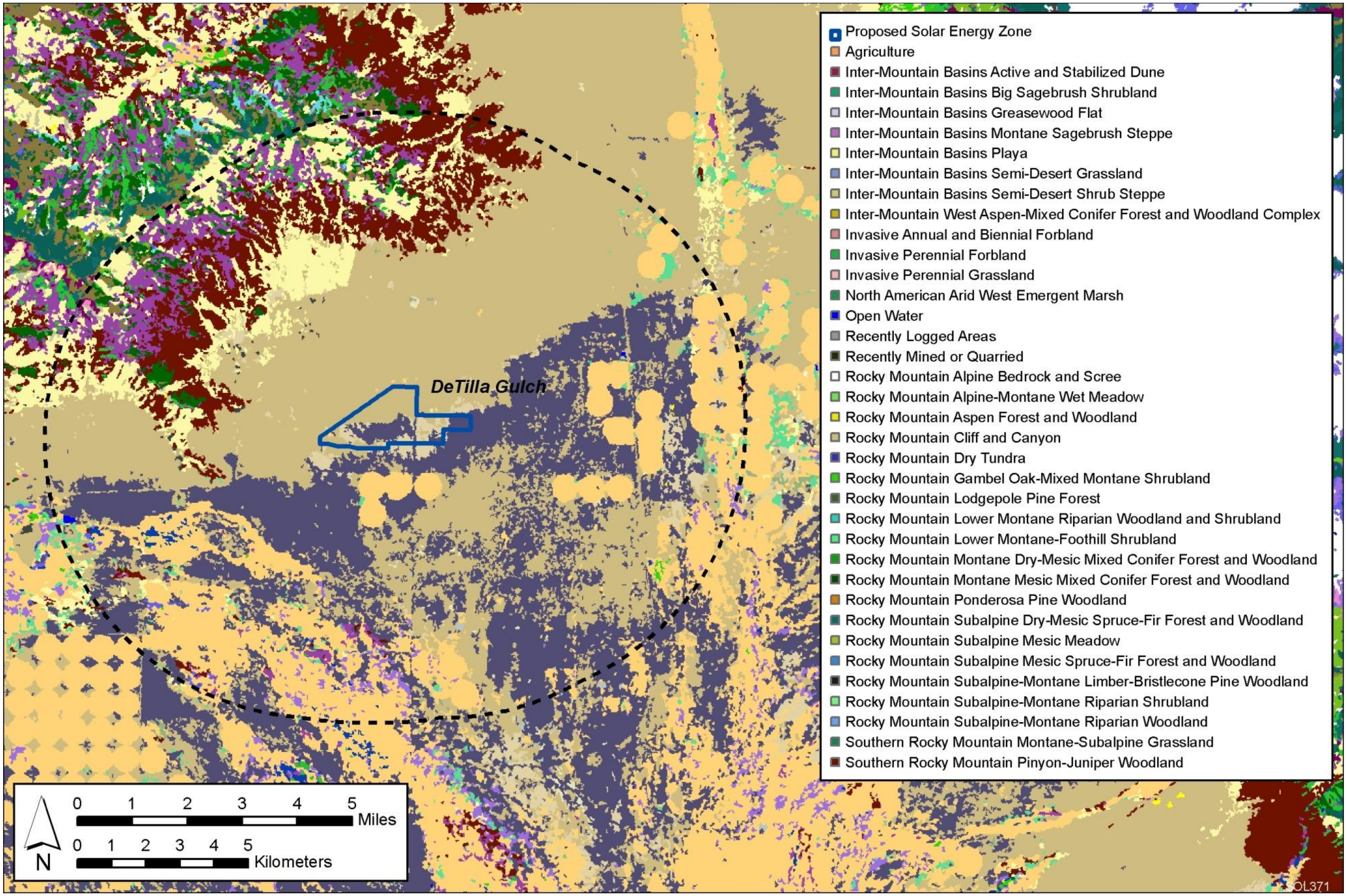

FIGURE 10.2.10.1-1 Land Cover Types within the Proposed De Tilla Gulch SEZ as Revised

10.2.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on vegetation are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific species and habitats will determine how programmatic design features are applied, for example:

- All ephemeral dry wash habitats within the SEZ shall be avoided to the extent practicable, and any impacts minimized and mitigated in consultation with appropriate agencies. A buffer area shall be maintained around dry washes to reduce the potential for impacts on these habitats on or near the SEZ.

- Appropriate engineering controls shall be used to minimize impacts on wetland, dry wash, and riparian habitats, including downstream occurrences, such as those associated with Saguache Creek or San Luis Creek, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls will be determined through agency consultation.

- Groundwater withdrawals shall be limited to reduce the potential for indirect impacts on wetland habitats, such as many of those south, southwest, or southeast of the De Tilla Gulch SEZ, including the wetland complexes associated with Saguache and San Luis Creeks, which are associated with groundwater discharge.

It is anticipated that implementation of the programmatic design features will reduce a high potential for impacts from invasive species and impacts on wetlands, dry washes, and riparian habitats to a minimal potential for impact. Residual impacts on wetlands could result from remaining groundwater withdrawal and so forth; however, it is anticipated that these impacts would be avoided in the majority of instances.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.11 Wildlife and Aquatic Biota

For the assessment of potential impacts on wildlife and aquatic biota, overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the species' habitat within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of the species' habitat would be lost; and (3) *large*: >10% of the species' habitat would be lost.

10.2.11.1 Amphibians and Reptiles

10.2.11.1.1 Affected Environment

As presented in the Draft Solar PEIS, representative amphibian and reptile species expected to occur within the SEZ include the Great Plains toad (*Bufo cognatus*), Woodhouse's toad (*Bufo woodhousii*), fence lizard (*Sceloporus undulatus*), gopher snake (*Pituophis catenifer*), many-lined skink (*Eumeces multivirgatus*),western rattlesnake (*Crotalus viridis*), short-horned lizard (*Phrynosoma hernandesi*), and western terrestrial garter snake (*Thamnophis elegans*). The reduction in the size of the De Tilla Gulch SEZ does not alter the potential for these species to occur in the affected area.

10.2.11.1.2 Impacts

As presented the Draft Solar PEIS, solar energy development within the proposed De Tilla Gulch SEZ could affect potentially suitable habitats for amphibian and reptile species. The analysis presented in the Draft Solar PEIS for the original De Tilla Gulch SEZ indicated that development would result in a small overall impact on representative amphibian and reptile species (Table 10.2.11.1-1 in the Draft Solar PEIS). Development within the revised De Tilla Gulch SEZ could still affect the same species evaluated in the Draft Solar PEIS; however, the changes to the SEZ boundaries would result in reduced (and still small) impact levels compared to original estimates in the Draft Solar PEIS.

10.2.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that will reduce impacts on amphibian and reptile species are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific conditions will be considered when programmatic design features are applied, for example:

- Ephemeral drainages within the SEZ shall be avoided to the extent practicable.

- Appropriate engineering controls shall be used to minimize impacts resulting from surface water runoff, erosion, sedimentation, accidental spills, or fugitive dust deposition on aquatic, riparian, and wetland habitats associated with Saguache Creek, San Luis Creek, Rio Grande Canal, and wetland areas located within the area of indirect effects.

With the implementation of required programmatic design features, impacts on amphibian and reptile species would be small.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for amphibian and reptile species have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.11.2 Birds

10.2.11.2.1 Affected Environment

As presented in the Draft Solar PEIS, a large number of bird species could occur or have potentially suitable habitat within the affected area of the proposed De Tilla Gulch SEZ. Representative bird species identified in the Draft Solar PEIS included Brewer's blackbird (*Euphagus cyanocephalus*), Brewer's sparrow (*Spizella breweri*), common nighthawk (*Chordeiles minor*), horned lark (*Eremophila alpestris*), northern rough-winged swallow (*Stelgidopteryx serripennis*), vesper sparrow (*Pooecetes gramineus*), western meadowlark (*Sturnella neglecta*), American kestrel (*Falco sparverius*), ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis*), short-eared owl (*Asio flammeus*), Swainson's hawk (*Buteo swainsoni*), turkey vulture (*Cathartes aura*), and the mourning dove (*Zenaida macroura*). The reduction in the size of the De Tilla Gulch SEZ does not alter the potential for these species or other bird species to occur in the affected area.

10.2.11.2.2 Impacts

As presented in the Draft Solar PEIS, solar energy development within the De Tilla Gulch SEZ could affect potentially suitable habitats of bird species. The analysis presented in the Draft Solar PEIS for the original De Tilla Gulch SEZ indicated that development would result in a small overall impact on the representative bird species (Table 10.2.11.2-1 in the Draft Solar PEIS). Development within the revised De Tilla Gulch SEZ could still affect the same species evaluated in the Draft Solar PEIS; however, the reduction in the size of the SEZ would result in reduced (and still small) impact levels compared to original estimates in the Draft Solar PEIS.

10.2.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that will reduce impacts on bird species are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific species and habitats will determine how programmatic design features are applied, for example:

- Appropriate engineering controls shall be used to minimize impacts resulting from surface water runoff, erosion, sedimentation, accidental spills, or fugitive dust deposition on aquatic, riparian, and wetland habitats associated with Saguache Creek, San Luis Creek, Rio Grande Canal, and wetland areas.

With the implementation of required programmatic design features, impacts on bird species will be reduced.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design feature has been identified:

- Prairie dog colonies (which could provide habitat or food resources for some bird species) should be avoided to the extent practicable. An active Gunnison's prairie dog colony has been eliminated from potential development because of the reduction in size of the SEZ (see Section 10.2.12 for more discussion of the prairie dog).

If SEZ-specific design features are implemented in addition to required programmatic design features, it is anticipated that impacts on bird species would be small. The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.11.3 Mammals

10.2.11.3.1 Affected Environment

As presented in the Draft Solar PEIS, a large number of mammal species were identified that could occur or have potentially suitable habitat within the affected area of the proposed De Tilla Gulch SEZ. Representative mammal species identified in the Draft Solar PEIS included (1) big game species: the American black bear (*Ursus americanus*), bighorn sheep (*Ovis canadensis*), cougar (*Puma concolor*), elk (*Cervis canadensis*), mule deer (*Odocoileus hemionus*), and pronghorn (*Antilocapra americana*); (2) furbearers and small game species: the American badger (*Taxidea taxus*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), and white-tailed jackrabbit (*Lepus townsendii*); and (3) small nongame species: the big brown bat (*Eptesicus fuscus*), deer mouse (*Peromyscus maniculatus*), least chipmunk (*Tamias minimus*), little brown myotis (*Myotis lucifugus*), northern pocket gopher (*Thomomys talpoides*), Ord's kangaroo rat (*Dipodomys ordii*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), and western small-footed myotis (*Myotis ciliolabrum*). The reduction in the size of the De Tilla Gulch SEZ does not alter the potential for these species or any additional mammal species to occur in the affected area.

10.2.11.3.2 Impacts

As presented in the Draft Solar PEIS, solar energy development within the De Tilla Gulch SEZ could affect potentially suitable habitats of mammal species. The analysis presented in the Draft Solar PEIS for the original De Tilla Gulch SEZ indicated that development would result in no impacts on elk and a small overall impact on all other representative mammal species analyzed (Table 10.2.11.3-1 in the Draft Solar PEIS). Development within the revised De Tilla Gulch SEZ could still affect the same representative mammal species evaluated in the Draft Solar PEIS; however, the reduction in the size of the SEZ would result in reduced (and still small) impact levels compared to original estimates in the Draft Solar PEIS. The 213-acre (0.9-km^2) portion of the SEZ that overlapped elk summer range for the original De Tilla Gulch SEZ is largely excluded from the revised SEZ.

Overall range for elk, overall range and winter range for mule deer, and overall range and winter range for pronghorn would be reduced from 1,217 acres (4.9 km^2) to 851 acres (3.4 km^2) or less for the De Tilla Gulch SEZ as revised. Impact levels for these activity areas would still be small. The 497 acres (2.0 km^2) of elk winter range and severe winter range would be largely excluded from direct impacts because these ranges fall within the 458 acres (1.9 km^2) excluded from the revised SEZ. Most of the 609 acres (2.5 km^2) of pronghorn winter concentration area could still be directly affected by solar energy development within the revised De Tilla Gulch SEZ. The overall impact level would still be small.

10.2.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific conditions will be considered when programmatic design features are applied, for example:

- Prairie dog colonies shall be avoided to the extent practicable to reduce impacts on species such as desert cottontail and thirteen-lined ground squirrel. An active Gunnison's prairie dog colony has been eliminated from potential development because of the changed in the boundaries of the SEZ (see Section 10.2.12 for more discussion of the prairie dog).

If the programmatic design features are implemented, impacts on mammal species will be reduced. On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design features have been identified:

- The extent of habitat disturbance should be minimized within the elk severe winter range and pronghorn winter concentration area. Most of the elk severe winter range occurs within the area removed from the SEZ.

- Construction should be curtailed during winter when big game species are present.

- Where big game winter ranges intersect or are within close proximity to the SEZ, motorized vehicles and other human disturbances should be controlled (e.g., through road closures).

If these SEZ-specific design features are implemented in addition to the required programmatic design features, it is anticipated that impacts on mammal species would be small. The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.11.4 Aquatic Biota

10.2.11.4.1 Affected Environment

No perennial surface water bodies, seeps, or springs are present on the proposed De Tilla Gulch SEZ. Several intermittent drainages do cross the site, but they are not known to support aquatic communities. The boundaries of the De Tilla Gulch SEZ have been reduced compared to the boundaries given in the Draft Solar PEIS. Based on these changes, an update to the Draft Solar PEIS is as follows:

- Approximately 5 mi (8 km) of the perennial Saguache Creek and 4 mi (6 km) of the San Luis Creek are located within the area of indirect effects within 5 mi (8 km) of the SEZ. In addition, 1 mi (2 km) of the Rio Grande canal is located within the area of potential indirect effects.

Aquatic biota present in the surface water features in the De Tilla Gulch SEZ have not been characterized. As stated in Appendix C of the Supplement to the Draft Solar PEIS, site surveys can be conducted at the project-specific level to characterize the aquatic biota, if present, within the De Tilla Gulch SEZ.

10.2.11.4.2 Impacts

The types of impacts on aquatic habitats and biota that could occur from development of utility-scale solar energy facilities are identified in Section 5.10.3 of the Draft Final PEIS and this Final Solar PEIS. Aquatic habitats present on or near the De Tilla Gulch SEZ could be affected by solar energy development in a number of ways, including (1) direct disturbance, (2) deposition of sediments, (3) changes in water quantity, and (4) degradation of water quality. The impact assessment provided in the Draft Solar PEIS remains valid, with the following update:

- The amount of surface water features within the SEZ and in the area of indirect effects that could potentially be affected by solar energy development is less because the size of the SEZ has been reduced.

10.2.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features applicable to aquatic biota are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific resources and conditions will determine how programmatic design features are applied, for example:

- Sediment and erosion controls shall be implemented along intermittent drainages that drain toward Saguache or San Luis Creeks and the wetlands in the vicinity of the SEZ.

It is anticipated that implementation of the programmatic design features will reduce impacts on aquatic biota, and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in nearby aquatic habitats, the potential impacts on aquatic biota from solar energy development at the De Tilla Gulch SEZ would be small.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for aquatic biota have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.12 Special Status Species

10.2.12.1 Affected Environment

Thirty-three special status species that could occur or have potentially suitable habitat within the affected area of the proposed De Tilla Gulch SEZ were identified in the Draft Solar PEIS. The reduction in the size of the De Tilla Gulch SEZ does not alter the potential for these special status species to occur in the affected area. However, field surveys conducted for the BLM following the publication of the Draft Solar PEIS have indicated that two additional special status bat species are known to occur in the SEZ affected area—the big free-tailed bat (*Nyctinomops macrotis*) and the fringed myotis (*Myotis thysanodes*). Figure 10.2.12.1-1 shows the known or potential occurrences of species in the affected area of the revised De Tilla Gulch SEZ that are listed, proposed, or candidates for listing under the ESA.

Following the publication of the Draft Solar PEIS, the BLM conducted field surveys for special status bat species, as well as Gunnison prairie dog (*Cynomys gunnisoni*) and western burrowing owl (*Athene cunicularia*), in the De Tilla Gulch SEZ. Surveys for bat species were conducted in the SEZ using passive and active acoustic monitoring techniques at various times between June 16, 2011, and October 15, 2011 (Rodriguez 2011). Survey results indicated high bat activity during night hours within the SEZ. The big free-tailed bat and the fringed myotis were the only special status bat species recorded on the SEZ. No roosting habitat for these

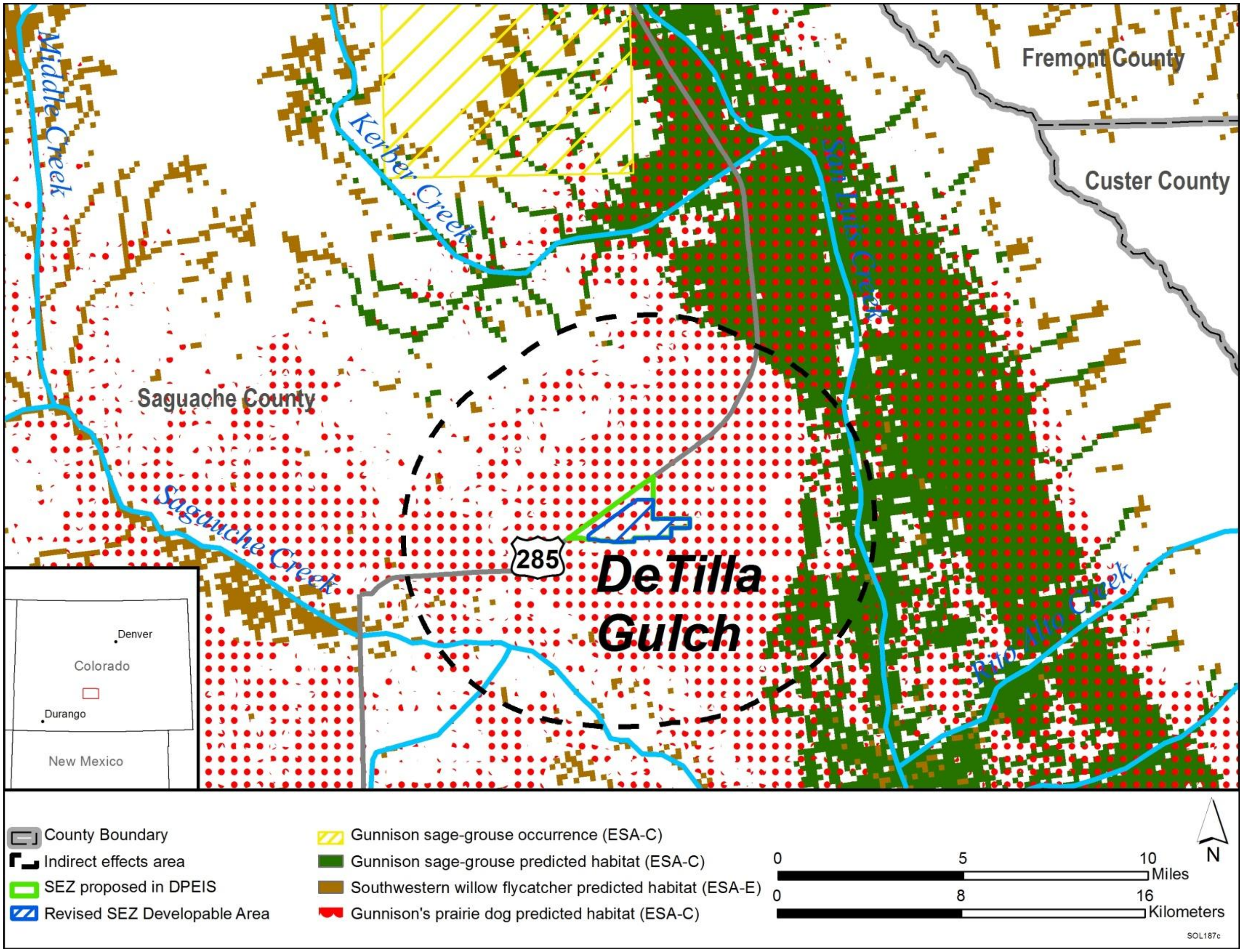

FIGURE 10.2.12.1-1 Developable Area for the Proposed De Tilla Gulch SEZ as Revised and Known or Potential Occurrences of Species Listed as Threatened or Endangered, Proposed, or Candidates for Listing under the ESA

species was observed on the SEZ (Rodriguez 2011). Additional life ecological and natural history information for these two species is provided below.

Field surveys for Gunnison prairie dog and western burrowing owl were conducted June 6, July 18, and September 22, 2011 (Garcia and Harvey 2011). Gunnison prairie dog activity was noted in five distinct areas in the western portion of the De Tilla Gulch SEZ within a total approximate area of 104.3 acres (0.4 km^2). Although the size of the De Tilla Gulch SEZ has been reduced since the field surveys were conducted, some Gunnison prairie dog colonies are likely to occur in the revised area of the De Tilla Gulch SEZ. Burrowing owls were not recorded on the SEZ during the field surveys. However, burrowing owls may be associated with prairie dog colonies west and north of the SEZ and may utilize the SEZ for nesting and/or foraging (Garcia and Harvey 2011).

Big Free-Tailed Bat. The big free-tailed bat is a year-round resident in western Colorado where it forages in a variety of habitats including coniferous forests and desert shrublands. This species was not evaluated for the De Tilla Gulch SEZ in the Draft Solar PEIS. The species roosts in rock crevices or in buildings. The species is known to occur in the San Luis Valley of southern Colorado, and field surveys conducted in 2011 documented the presence of this species on the De Tilla Gulch SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat for the big free-tailed bat occurs on the SEZ and in portions of the area of indirect effects (Table 10.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the area of direct effects. Results of the field survey conducted in 2011 concluded that although roost habitat does not occur on the SEZ, individual big free-tailed bats may roost in nearby habitats within the area of indirect effects (Rodriguez 2011).

Fringed Myotis. The fringed myotis is a year-round resident in western Colorado where it forages in a variety of habitats including ponderosa pine woodlands, greasewood flats, oakbrush, and shrublands. This species was not evaluated for the De Tilla Gulch SEZ in the Draft Solar PEIS. The species roosts in caves, rock crevices, or in buildings. Field surveys conducted in 2011 documented the presence of this species on the De Tilla Gulch SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat for the fringed myotis does not occur on the SEZ. However, the species may use portions of the SEZ as foraging habitat. Foraging and roosting may also occur outside the SEZ in the area of indirect effects (Table 10.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the area of direct effects. Results of the field survey conducted in 2011 concluded that although roost habitat does not occur on the SEZ, individuals may roost in nearby habitats within the area of indirect effects (Rodriguez 2011).

TABLE 10.2.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Be Affected by Solar Energy Development on the Proposed De Tilla Gulch SEZ as Revised[a]

Common Name	Scientific Name	Listing Status[b]	Habitat[c]	Maximum Area of Potential Habitat Affected[d]: Within SEZ (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[d]: Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals						
Big free-tailed bat	*Nyctinomops macrotis*	BLM-S; CO-S1; FWS-SC	Roosts in rock crevices on cliff faces or in buildings. Forages primarily in coniferous forests and arid shrublands. Known to occur in within the SEZ. About 1,258,000 acres[i] of potentially suitable habitat occurs in the affected area.	0 acres; however, potentially suitable foraging habitat may occur throughout the SEZ.	9,700 acres of potentially suitable habitat (0.7% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.
Fringed myotis	*Myotis thysanodes*	BLM-S; FWS-SC	Summer or year-round resident in wide range of habitats, including woodland, riparian, and shrubland habitats. Roosts in caves, crevices, and buildings. Known to occur in within the SEZ. About 3,166,000 acres of potentially suitable habitat occurs within the SEZ region.	1,000 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	68,600 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

[a] The species presented in this table represent new species identified following publication of the Draft Solar PEIS or a re-evaluation of those species that were determined to have moderate or large impacts in the Draft Solar PEIS. The other special status species for this SEZ are identified in Table 10.2.12.1-1 of the Draft Solar PEIS.

[b] BLM-S = listed as a sensitive species by the BLM; CO-S1 = ranked as S1 in the state of Colorado; FWS-SC = USFWS species of concern.

[c] Potentially suitable habitat was determined by using SWReGAP habitat suitability models (USGS 2007). Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

Footnotes continued on next page.

TABLE 10.2.12.1-1 (Cont.)

[d] Maximum area of potential habitat that could be affected relative to availability within the analysis area. Habitat availability for each species within the analysis area was determined by using SWReGAP habitat suitability models (USGS 2007). This approach probably overestimates the amount of suitable habitat in the project area.

[e] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[f] Area of indirect effects was assumed to be the area adjacent to the SEZ and within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff or dust from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[g] Overall impact magnitude categories were based on professional judgment and include (1) *small*: ≤1% of the population or its habitat would be lost, and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat, would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; and (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Design features would reduce most indirect effects to negligible levels.

[h] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[i] To convert acres to km^2, multiply by 0.004047.

10.2.12.2 Impacts

Overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the special status species' habitat within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of the special status species' habitat would be lost; and (3) *large*: >10% of the special status species' habitat would be lost.

As presented in the Draft Solar PEIS, solar energy development within the De Tilla Gulch SEZ could affect potentially suitable habitats of special status species. The analysis presented in the Draft Solar PEIS for the original area of the De Tilla Gulch SEZ indicated that development would result in no impact or a small overall impact on all special status species (Table 10.2.12.1-1 in the Draft Solar PEIS). Development within the revised De Tilla Gulch SEZ could still affect the same 33 species evaluated in the Draft Solar PEIS; however, the reduction in the developable area would result in reduced (and still small) impact levels compared to original estimates in the Draft Solar PEIS.

Field surveys were conducted for the BLM following the publication of the Draft Solar PEIS to determine the potential occurrence of Gunnison prairie dog, western burrowing owl, and special status bat species in the Colorado SEZs (Garcia and Harvey 2011; Rodriguez 2011). Results of these surveys have documented the presence of the Gunnison prairie dog in the western portion of the De Tilla Gulch SEZ within an area of approximately 104.3 acres (0.4 km^2) (Garcia and Harvey 2011). It is likely that some of these prairie dog colonies occur in the revised area of the De Tilla Gulch SEZ. In the Draft Solar PEIS, it was determined that as much as 1,289 acres (5 km^2) of potentially suitable habitat for the Gunnison prairie dog could be directly affected by solar energy development within the original De Tilla Gulch SEZ, resulting in a small overall impact magnitude compared to available habitat in the SEZ region. Development within the revised area of the De Tilla Gulch SEZ will affect less potentially suitable habitat than that presented in the Draft Solar PEIS; therefore, the overall impact magnitude for the Gunnison prairie dog remains small.

The western burrowing owl was not observed on the De Tilla Gulch SEZ during field surveys in 2011 (Garcia and Harvey 2011). However, this species may be associated with prairie dog colonies in close proximity to the SEZ and may utilize the SEZ for nesting and/or foraging. In the Draft Solar PEIS, it was determined that as much as 1,200 acres (5 km^2) of potentially suitable habitat for the western burrowing owl could be directly affected by solar energy development within the original De Tilla Gulch SEZ, resulting in a small overall impact magnitude compared to available habitat in the SEZ region. Development within the revised area of the De Tilla Gulch SEZ will not affect any more potentially suitable habitat than that presented in the Draft Solar PEIS; therefore, the overall impact magnitude for the western burrowing owl remains small.

Field surveys for special status bat species indicated that two additional special status bat species are known to occur in the SEZ affected area—the big free-tailed bat and the fringed myotis (Rodriguez 2011). Impacts on these two species are provided below.

Big Free-Tailed Bat. The big free-tailed bat is a year-round resident in southwestern Colorado and is known to occur within the De Tilla Gulch SEZ. According to the SWReGAP habitat suitability model, suitable foraging habitat for this species does not occur on the SEZ. However, it is possible for this species to forage throughout the entire revised area of the De Tilla Gulch SEZ (1,064 acres [4.3 km^2]) (Table 10.2.12.1-1). This direct effects area represents less than 0.1% of potentially suitable habitat in the SEZ region. About 9,700 acres (39 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 0.7% of the available suitable habitat in the region (Table 10.2.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the area of direct effects. Results of the field survey conducted in 2011 concluded that although roost habitat does not occur on the SEZ, individual big free-tailed bats may roost in nearby habitats within the area of indirect effects (Rodriguez 2011).

The overall impact on the big free-tailed bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the revised area of the De Tilla Gulch SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effect and readily available in other portions of the SEZ region.

Fringed Myotis. The fringed myotis is a year-round resident in southwestern Colorado and is known to occur within the De Tilla Gulch SEZ. According to the SWReGAP habitat suitability model, approximately 1,000 acres (4 km^2) of suitable foraging habitat on the revised area of the De Tilla Gulch SEZ may be directly affected by construction and operations (Table 10.2.12.1-1). This direct effects area represents less than 0.1% of potentially suitable habitat in the SEZ region. About 68,600 acres (278 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.2% of the available suitable habitat in the region (Table 10.2.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the area of direct effects. Results of the field survey conducted in 2011 concluded that although roost habitat does not occur on the SEZ, individuals may roost in nearby habitats within the area of indirect effects (Rodriguez 2011).

The overall impact on the fringed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the revised area of the De Tilla Gulch SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

10.2.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific resources and conditions will determine how programmatic design features are applied, for example:

- Pre-disturbance surveys shall be conducted within the SEZ to determine the presence and abundance of special status species, including those identified in Table 10.2.12.1-1 of the Draft Solar PEIS, as well as those mentioned in Table 10.2.12.1-1 of this Final Solar PEIS. Disturbance to occupied habitats for these species shall be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible, translocation of individuals from areas of direct effects or compensatory mitigation of direct effects on occupied habitats may be used to reduce impacts. A comprehensive mitigation strategy for special status species that uses one or more of these options to offset the impacts of development shall be developed in coordination with the appropriate federal and state agencies.

- Avoiding or limiting groundwater withdrawals for solar energy development on the SEZ shall be employed to reduce impacts on groundwater-dependent special status species, including those species that may occur in riparian or aquatic habitats supported by groundwater. These species include the southwestern willow flycatcher.

- Coordination with the USFWS and CDOW shall be conducted to address the potential for impacts on the Gunnison's prairie dog, a candidate for listing under the ESA. Coordination would identify an appropriate survey protocol, avoidance measures, and, potentially, translocation or compensatory mitigation.

If the programmatic design features are implemented, it is anticipated that the majority of impacts on the special status species from habitat disturbance and groundwater use will be reduced.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for special status species have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis. Projects will comply with terms and conditions set forth by the USFWS Biological Opinion resulting from the programmatic consultation and any necessary project-specific ESA Section 7 consultations.

10.2.13 Air Quality and Climate

10.2.13.1 Affected Environment

Except as noted below, the information for air quality and climate presented in the affected environment section of the Draft Solar PEIS remains essentially unchanged.

10.2.13.1.1 Existing Air Emissions

The Draft Solar PEIS presented Saguache County emissions data for 2002. More recent data for 2008 (CDPHE 2011) were reviewed. The two emissions inventories are from different sources and make different assumptions. Emissions of SO_2 were the same in both inventories. Emissions of NO_x, CO, and VOCs were lower in the more recent data, while PM_{10} and $PM_{2.5}$ emissions were lower in the 2002 data. These changes would not affect modeled air quality impacts presented in this Final Solar PEIS.

10.2.13.1.2 Air Quality

The calendar quarterly average NAAQS of 1.5 $\mu g/m^3$ for lead (Pb) presented in Table 10.2.13.1-2 of the Draft Solar PEIS has been replaced by the rolling 3-month standard (0.15 $\mu g/m^3$). The federal 24-hour and annual SO_2, 1-hour O_3, and annual PM_{10} standards have been revoked as well (EPA 2011). All Colorado SAAQS, except the 3-hour SO_2 standard of 700 $\mu g/m^3$, have been revoked since the Draft Solar PEIS. These changes will not affect the modeled air quality impacts presented in this Final Solar PEIS.

The size of the proposed De Tilla Gulch SEZ was reduced by about 30% from 1,522 acres (6.2 km^2) to 1,064 acres (4.3 km^2) by removing a strip along U.S. 285. With this change in boundaries, the distance to Great Sand Dunes WA remains the same as in the Draft Solar PEIS, the distance to Weminuche WA increases by about 0.5 mi (0.8 km), and the distance to La Garita WA increases by about 1 mi (1.6 km).

10.2.13.2 Impacts

10.2.13.2.1 Construction

Methods and Assumptions

Except for the area disturbed at any one time during construction, the methods and modeling assumptions have not changed from those presented in the Draft Solar PEIS. Based on the reduction in the area of the proposed De Tilla Gulch SEZ, air quality for this Final Solar

PEIS was remodeled assuming that 851 acres (3.4 km^2), 80% of the updated developable area, would be disturbed at any one time. The Draft Solar PEIS assumed disturbance of an area of 1,218 acres (4.9 km^2).

Results

Since the annual PM_{10} standard has been rescinded, the discussion of annual PM_{10} impacts in the Draft Solar PEIS is no longer applicable, and Table 10.2.13.2-1 has been updated for this Final Solar PEIS. The concentration values in the table are based on updated air quality modeling reflecting the revised boundaries of the proposed SEZ.

Given the reduced area of the proposed SEZ, the concentrations predicted for this Final Solar PEIS are less than or equal to those predicted in the Draft Solar PEIS, but the conclusions presented in the Draft remain valid.[1] Predicted 24-hour PM_{10} and 24-hour $PM_{2.5}$ concentration levels could exceed NAAQS levels used for comparison at the SEZ boundaries and in the immediately surrounding area during the construction phase of a solar development. These high particulate levels would be limited to the immediate area surrounding the SEZ boundary and would decrease quickly with distance. Predicted total concentrations for annual $PM_{2.5}$ would be below the standard level used for comparison.

At the two nearest residences about 0.3 mi (0.5 km) east of the proposed SEZ and 0.45 mi (0.7 km) to the south and at the nearby communities of Saguache, Moffat, and Crestone, the conclusion of the Draft Solar PEIS that total particulate levels (background plus the increment due to construction activities) would not exceed standard levels remains valid.

Consistent with the conclusions in the Draft Solar PEIS, the updated 24-hour and annual PM_{10} concentration increments at the nearest Class I area—the Great Sand Dunes WA—would be about 112% and 6%, respectively, of the PSD increment levels for Class I areas. Given the distances and prevailing winds, concentration increments at the other two Class I areas (La Garita WA and Weminuche WA) would be much lower than those at the Great Sand Dunes WA.

The conclusion of the Draft Solar PEIS that construction emissions from the proposed De Tilla Gulch SEZ would contribute minimally to PM_{10} concentrations in the Canon City PM_{10} maintenance area about 45 mi (72 km) east-northeast of the proposed SEZ and thus would not affect its attainment status remains valid.

[1] At this programmatic level, detailed information on construction activities, such as facility size, type of solar technology, heavy equipment fleet, activity level, work schedule, and so on, is not known; thus air quality modeling cannot be conducted. It has been assumed that 80% of the developable area of 1,064 acres (3.4 km^2) would be disturbed continuously; thus the modeling results and discussion here should be interpreted in that context. During the site-specific project phase, more detailed information would be available and more realistic air quality modeling analysis could be conducted. It is likely that impacts on ambient air quality predicted for specific projects would be much lower than those in this Final Solar PEIS.

TABLE 10.2.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed De Tilla Gulch SEZ as Revised

			Concentration ($\mu g/m^3$)				Percentage of NAAQS	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background	Total	NAAQS	Increment	Total
PM_{10}	24 hours	H3H	430	27.0	457	150	287	305
$PM_{2.5}$	24 hours	H8H	26.3	16.0	42.3	35	75	121
	Annual	–[c]	6.5	4.0	10.5	15	43	70

[a] $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm.

[b] Concentrations for attainment demonstration are presented. H3H = highest of the third-highest concentrations at each receptor over the 2-year period. H8H = highest of the multiyear average of the eighth-highest concentrations at each receptor over the 2-year period. For the annual average, multiyear averages of annual means over the 2-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

[c] A dash indicates not applicable.

Source: Chick (2009) for background concentration data.

Overall, predicted 24-hour PM_{10} and 24-hour $PM_{2.5}$ concentration levels could exceed standard levels used for comparison at the SEZ boundaries and in the immediately surrounding areas during the construction phase of a solar development project. To reduce potential impacts on ambient air quality and in compliance with required programmatic design features, aggressive dust control measures would be used. Potential impacts on the air quality of neighboring communities would be much lower. Predicted total concentrations for annual $PM_{2.5}$ would be below the standard level. Construction activities could result in concentrations above Class I PSD PM_{10} increment levels at the nearest federal Class I area, the Great Sand Dunes WA. However, construction activities are not subject to the PSD program; the comparison is made as an indicator of possible dust levels in the WA during the limited construction period and as a screen to gauge the size of the potential impact. Therefore, it is anticipated that the potential impacts of construction activities on ambient air quality would be moderate and temporary.

With the reduced size of the SEZ, emissions from construction equipment and vehicles would be less than those discussed in the Draft Solar PEIS. Any potential impacts on AQRVs at nearby federal Class I areas would be less. The conclusions in the Draft Solar PEIS remain valid. Emissions from construction-related equipment and vehicles are temporary and could cause some unavoidable but short-term impacts.

10.2.13.2.2 Operations

The reduction in the size of the proposed De Tilla Gulch SEZ by about 30%, from 1,522 acres (6.2 km^2) to 1,064 acres (4.3 km^2), reduces the generating capacity and annual power generation and thus reduces the potentially avoided emissions presented in the Draft Solar PEIS. Total revised power generation capacity ranging from 95 to 170 MW is estimated for the De Tilla Gulch SEZ for various solar technologies. Updated estimates for emissions potentially avoided by a solar facility can be obtained from the table in the Draft Solar PEIS by reducing the tabulated estimates by about 30%, as shown in the revised Table 10.2.13.2-2. For example, for power tower, dish engine, and PV technologies, up to 253 tons per year (= 69.92% × [the low-end value of 361 tons per year tabulated in the Draft Solar PEIS]) of NO_X could be avoided by full solar development of the proposed De Tilla Gulch SEZ as revised for this Final Solar PEIS. Although the total emissions avoided by full solar development of the proposed SEZ are considerably reduced from those presented in the Draft Solar PEIS, the conclusions of the Draft remain valid. Solar facilities built in the De Tilla Gulch SEZ could avoid relatively more fossil fuel emissions than those built in other states that rely less on fossil fuel–generated power.

10.2.13.2.3 Decommissioning and Reclamation

The discussion in the Draft Solar PEIS remains valid. Decommissioning and reclamation activities would be of short duration, and their potential air impacts would be moderate and temporary.

10.2.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce air quality impacts are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Limiting dust generation during construction and operations is a required programmatic design feature under the BLM Solar Energy Program. These extensive fugitive dust control measures will keep off-site PM levels as low as possible during construction.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for air quality have been identified for the proposed De Tilla Gulch SEZ. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

TABLE 10.2.13.2-2 Annual Emissions from Combustion-Related Power Generation Avoided by Full Solar Development of the Proposed De Tilla Gulch SEZ as Revised

Area Size (acres)[a]	Capacity (MW)[b]	Power Generation (GWh/yr)[c]	Emissions Avoided (tons/yr; 10^3 tons/yr for CO_2)[d]			
			SO_2	NO_x	Hg	CO_2
1,064	95–170	166–298	219–394	253–455	0.001–0.003	164–295
Percentage of total emissions from electric power systems in the state of Colorado[e]			0.35–0.63%	0.35–0.63%	0.35–0.63%	0.35–0.63%
Percentage of total emissions from all source categories in the state of Colorado[f]			0.19–0.33%	0.06–0.11%	–[g]	0.16–0.28%
Percentage of total emissions from electric power systems in the six-state study area[e]			0.09–0.16%	0.07–0.12%	0.05–0.09%	0.06–0.11%
Percentage of total emissions from all source categories in the six-state study area[f]			0.05–0.08%	0.01–0.02%	–	0.02–0.04%

[a] To convert acres to km^2, multiply by 0.004047.

[b] It is assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.020 km^2) per MW (for parabolic trough technology) to 9 acres (0.036 km^2) per MW (power tower, dish engine, and PV technologies) would be required.

[c] Assumed a capacity factor of 20%.

[d] Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 2.64, 3.05, 1.7×10^{-5}, and 1,976 lb/MWh, respectively, were used for the state of Colorado.

[e] Emission data for all air pollutants are for 2005.

[f] Emission data for SO_2 and NO_x are for 2002, while those for CO_2 are for 2005.

[g] A dash indicates not estimated.

Sources: EPA (2009a,b); WRAP (2009).

10.2.14 Visual Resources

10.2.14.1 Affected Environment

The proposed De Tilla Gulch SEZ, as revised, extends approximately 1.0 mi (1.6 km) north to south (at its greatest extent) and 2.2 mi (3.5 km) east to west (at its greatest extent). The SEZ has been revised to eliminate 458 acres (1.9 km^2) along the northwest edge of the SEZ. The proposed SEZ now occupies an area of 1,064 acres (4.3 km^2). Because of the reduction in size of the De Tilla Gulch SEZ, the total acreage of the lands visible within the 25-mi (40-km) viewshed of the SEZ also has decreased.

U.S. 285 no longer is the northwestern boundary of the SEZ. A portion of this highway is locally referred to as the Cochetopa Scenic Byway, which runs south from Poncha Pass on U.S. 285 to Saguache, along Highway 114 to Highway 50, and back east to Poncha Springs. The road has been nominated for an official scenic byway designation by a citizen proposal (BLM 2011a; Gunnison County Board of Commissioners 2011).

An updated VRI map for the SEZ and surrounding lands is shown in Figure 10.2.14.1-1; it provides information from the BLM's 2009 VRI, which was finalized in October 2011 (BLM 2011b). As shown, the VRI value for the SEZ still is VRI Class III, indicating moderate relative visual values.

Lands in the Saguache Field Office within the 25-mi (40-km), 650-ft (198-m) viewshed of the revised SEZ include 22,633 acres (91.6 km^2) of VRI Class II areas; 22,996 acres (93.1 km^2) of VRI Class III areas; and 12,757 acres (51.6 km^2) of VRI Class IV areas.

10.2.14.2 Impacts

The reduction in size of the SEZ would reduce the total visual impacts associated with solar energy development in the SEZ. It would limit the total amount of solar facility infrastructure that would be visible and reduce the geographic extent of the visible infrastructure.

The reduction in size of the SEZ proposed in the Supplement to the Draft Solar PEIS eliminated approximately 30% of the original SEZ. The resulting visual contrast reduction for any given point within view of the SEZ would vary greatly depending on the viewpoint's distance and direction from the SEZ. In general, contrast reduction would be greatest for viewpoints closest to the portions of the SEZ that were eliminated and especially for those that had broad wide-angle views of these areas. Contrast reductions also would be larger for elevated viewpoints relative to non-elevated viewpoints, because the reduction in area of the solar facilities would be more apparent when looking down at the SEZ than when looking across it.

10.2.14.2.1 Impacts on the Proposed De Tilla Gulch SEZ

Although the reduction in size of the SEZ would reduce visual contrasts associated with solar development, solar development within the SEZ still would involve major modification of the existing character of the landscape and would likely dominate the views from most locations within the SEZ. Additional impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines. In general, strong visual contrasts from solar development still would be expected for viewing locations within the SEZ.

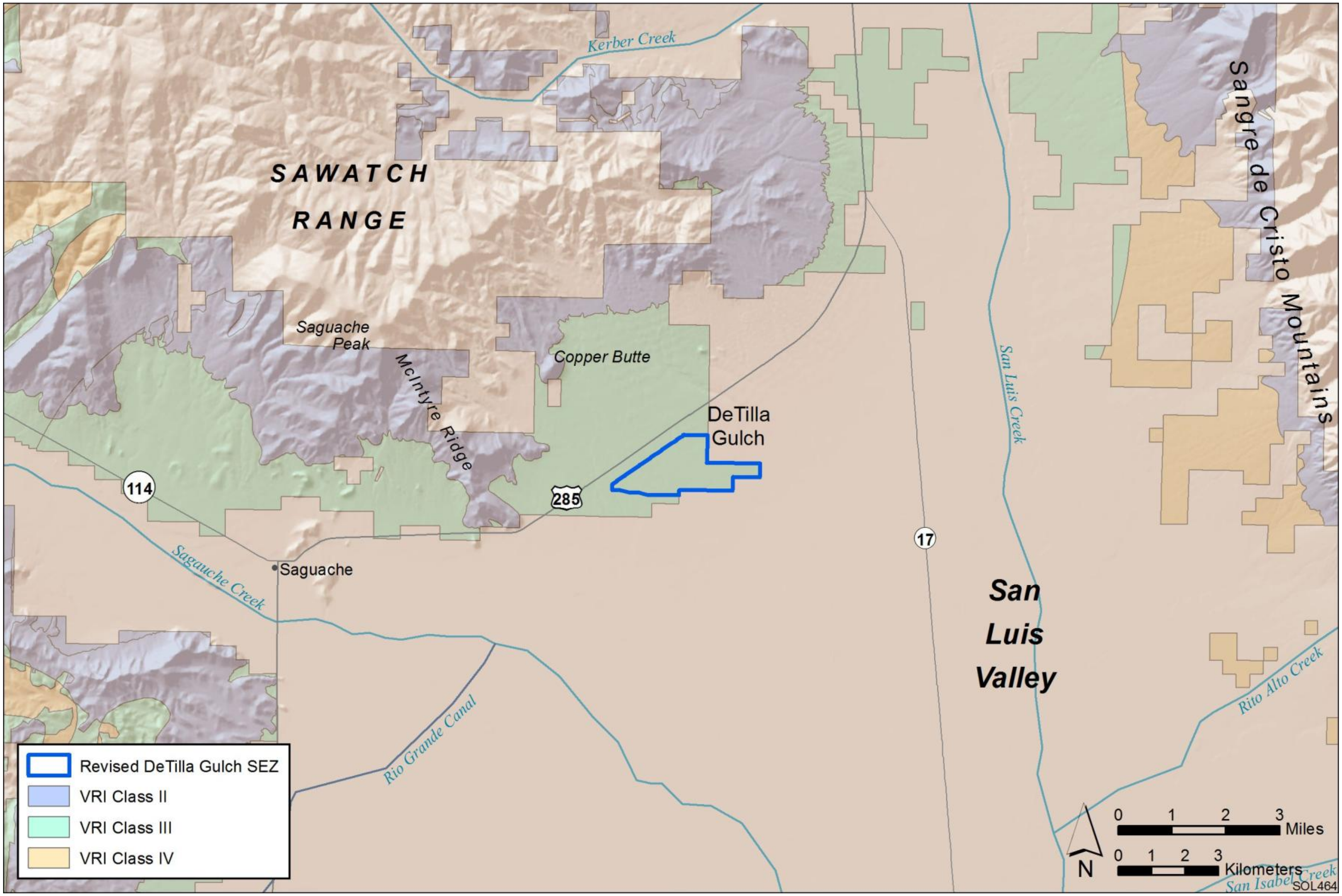

FIGURE 10.2.14.1-1 Visual Resource Inventory Values for the Proposed De Tilla Gulch SEZ as Revised

10.2.14.2.2 Impacts on Lands Surrounding the Proposed De Tilla Gulch SEZ

For the Draft Solar PEIS, preliminary viewshed analyses were conducted to identify which lands surrounding the proposed SEZ could have views of solar facilities in at least some portion of the SEZ (see Appendixes M and N of the Draft Solar PEIS for important information on assumptions and limitations of the methods used). Four viewshed analyses were conducted, assuming four different heights representative of project elements associated with potential solar energy technologies: PV and parabolic trough arrays, 24.6 ft (7.5 m); solar dishes and power blocks for CSP technologies, 38 ft (11.6 m); transmission towers and short solar power towers, 150 ft (45.7 m); and tall solar power towers, 650 ft (198.1 m).

These same viewsheds were recalculated in order to account for the boundary changes described in the Supplement to the Draft Solar PEIS. Figure 10.2.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored segments indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown, light purple, and the additional areas shaded in dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, and dark purple, and at least the upper portions of power tower receivers could be visible from the additional areas shaded in medium brown.

10.2.14.2.3 Impacts on Selected Federal-, State-, and BLM-Designated Sensitive Visual Resource Areas and Other Lands and Resources

Figure 10.2.14.2-2 shows the results of a geographic information system (GIS) analysis that overlays selected federal-, state-, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds, in order to illustrate which of these sensitive visual resource areas would have views of solar facilities within the SEZ and therefore potentially would be subject to visual impacts from those facilities. Distance zones that correspond with BLM's VRM system-specified foreground-middleground distance (5 mi [8 km]), background distance (15 mi [24.1 km]), and a 25-mi (40.2-km) distance zone are shown as well, in order to indicate the effect of distance from the SEZ on impact levels, which are highly dependent on distance. A similar analysis was conducted for the Draft Solar PEIS.

The scenic resources included in the analysis were as follows:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;

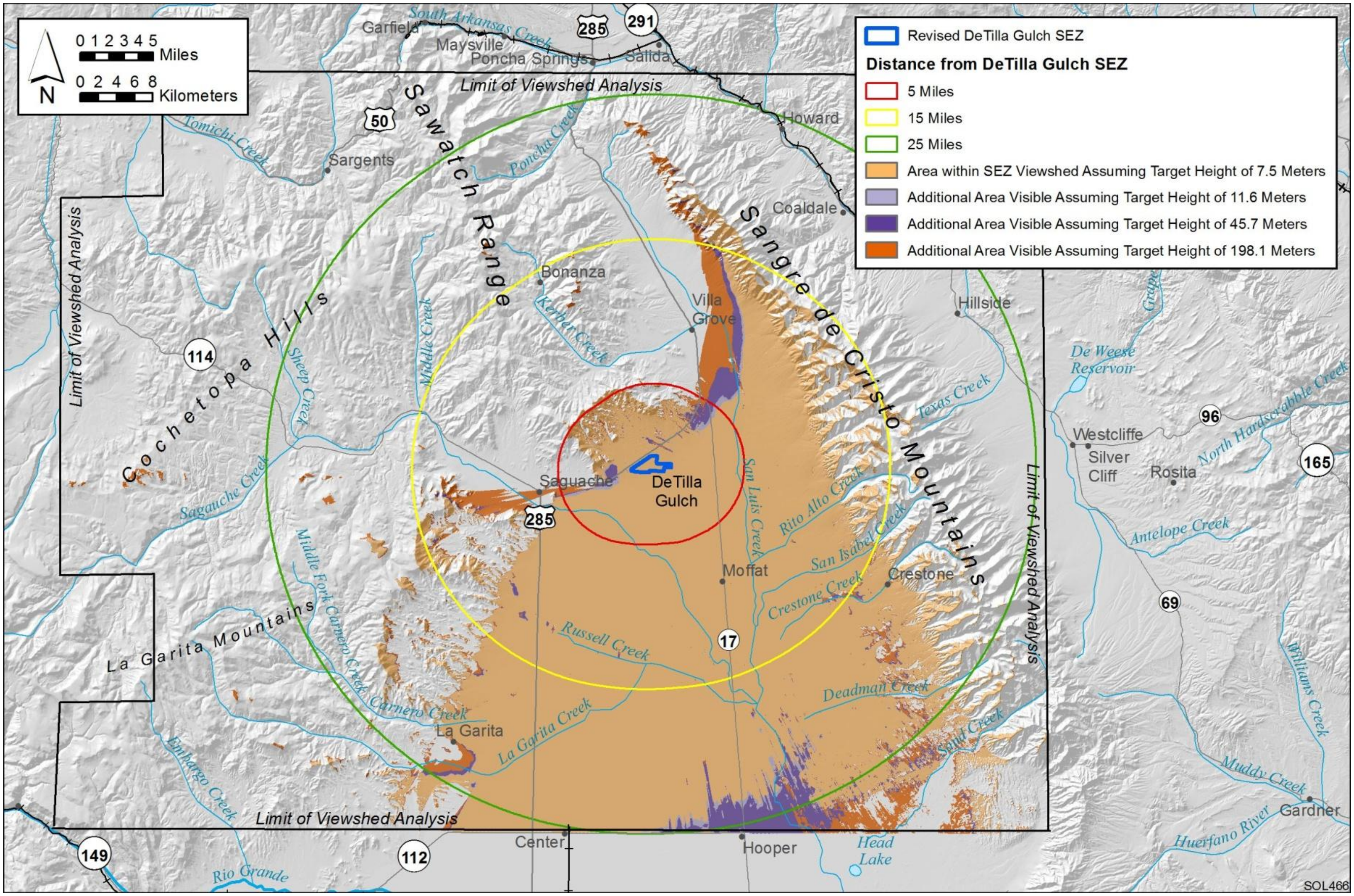

FIGURE 10.2.14.2-1 Viewshed Analyses for the Proposed De Tilla Gulch SEZ as Revised and Surrounding Lands, Assuming Viewshed Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development and/or associated structures within the SEZ could be visible)

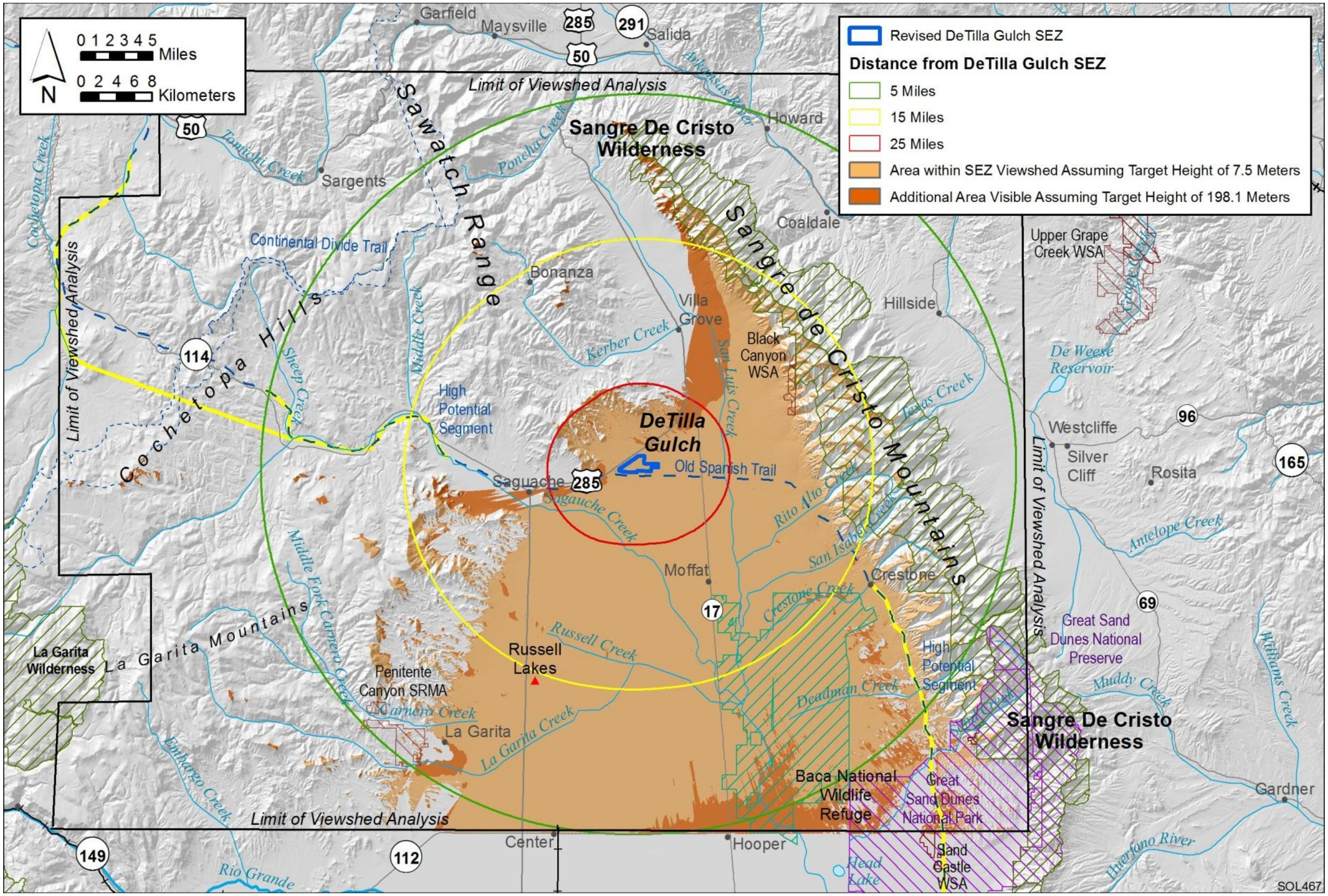

FIGURE 10.2.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed De Tilla Gulch SEZ as Revised

- Congressionally authorized Wilderness Areas;
- Wilderness Study Areas;
- National Wild and Scenic Rivers;
- Congressionally authorized Wild and Scenic Study Rivers;
- National Scenic Trails and National Historic Trails;
- National Historic Landmarks and National Natural Landmarks;
- All-American Roads, National Scenic Byways, State Scenic Highways, and BLM- and USFS-designated scenic highways/byways;
- BLM-designated Special Recreation Management Areas; and
- ACECs designated because of outstanding scenic qualities.

The results of the GIS analyses are summarized in Table 10.2.14.2-1. The change in size of the SEZ alters the viewshed of the SEZ, such that the visibility of the SEZ and solar facilities within the SEZ from the surrounding lands would be reduced. With the reduction in size of the SEZ, solar energy development within the SEZ would be expected to create minimal or weak visual contrasts for viewers within most of the surrounding scenic resource areas listed in Table 10.2.14.2-1. An exception is the Old Spanish National Historic Trail; in this resource area, strong visual contrasts still would be expected.

In addition to these areas, impacts on other lands and resource areas also were evaluated. These areas include the surrounding communities of Saguache and Moffat and U.S. 285, a portion of which coincides with the proposed Cochetopa Scenic Byway, as described in Section 10.2.14.1.

10.2.14.2.4 Summary of Visual Resource Impacts for the Proposed De Tilla Gulch SEZ

The visual contrast analysis in the Draft Solar PEIS determined that because there could be multiple solar facilities within the De Tilla Gulch SEZ, a variety of technologies employed, and a range of supporting facilities required, solar development would make the SEZ essentially industrial in appearance and would contrast strongly with the surrounding mostly natural-appearing landscape.

The elimination of acreage within the SEZ would reduce the visual contrast associated with solar facilities as seen both within the SEZ and from surrounding lands in both daytime and nighttime views. The reductions in visual contrast can be summarized as follows:

TABLE 10.2.14.2-1 Selected Potentially Affected Sensitive Visual Resources within a 25-mi (40-km) Viewshed of the Proposed De Tilla Gulch SEZ as Revised, Assuming a Target Height of 650 ft (198.1 m)

		Feature Area or Linear Distance[b,c]		
			Visible Between	
Feature Type	Feature Name (Total Acreage)[a]	Visible within 5 mi	5 and 15 mi	15 and 25 mi
National Historic Trail	Old Spanish (2,700 mi)[d]	12.6 mi (0%)	10.7 mi (0%)	10.7 mi (0%)
WA	Sangre de Cristo (217,695 acres)	0 acres	10,607 acres (5%)	7,459 acres (3%)
WSA	Black Canyon (16,699 acres)	0 acres	1,032 acres (6%)	0 acres
NNL	Russell Lakes (3,860 acres)	0 acres	0 acres	3,860 acres (100%)
NWR	Baca (92,596 acres)	0 acres	13,755 acres (15%)	61,964 acres (67%)
SRMA	Penitente Canyon (4,173 acres)	0 acres	0 acres	297 acres (7%)

[a] To convert acres to km^2, multiply by 0.004047.

[b] To convert mi to km, multiply by 1.609.

[c] Percentage of total feature acreage or road length viewable.

[d] Source: BLM (2011c).

- Within the De Tilla Gulch SEZ: Contrasts experienced by viewers along the northwest edge of the SEZ would be reduced due to the elimination of 458 acres (1.9 km^2) along U.S. 285. However, strong contrasts still would be expected in the remaining developable area.

- Old Spanish National Historic Trail: A very slight reduction in contrasts would be anticipated due to the elimination of acreage within the western portion of the SEZ; however, with the proximity of the Trail to the southern boundary of the SEZ, solar development within the SEZ still would cause strong contrasts for those portions of the Trail in close proximity to the SEZ, with lower contrasts for more distant portions of the Trail.

- Sangre De Cristo WA: A very slight reduction in contrasts would be anticipated; however, solar development within the SEZ still would cause weak visual contrasts.

- Black Canyon WSA: A very slight reduction in contrasts would be anticipated; however, solar development within the SEZ still would cause weak visual contrasts.

- Russell Lakes NNL: No reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak visual contrasts.

- Baca NWR: A reduction in contrasts would be anticipated; however, solar development within the SEZ still would cause minimal to weak visual contrasts.

- Penitente Canyon SRMA: A very slight reduction in contrasts would be anticipated; solar development within the SEZ would cause minimal visual contrasts.

- Saguache: A very slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause minimal contrasts.

- Moffat: No reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak visual contrasts.

- U.S. 285: U.S. 285 was the border of the SEZ as it was originally proposed in the Draft Solar PEIS. Approximately 458 acres (1.9 km^2) of the SEZ were eliminated along this roadway. A substantial reduction in contrasts would be anticipated, since solar development would no longer be adjacent to U.S. 285. However, solar development still would cause strong contrasts, especially for viewers travelling along portions of the roadway located within 0.25 mi (0.40 km) of the boundary of the SEZ and immediately to the east of the SEZ. Contrasts would be lower for viewpoints on U.S. 285 farther from the SEZ.

- Cochetopa Scenic Byway (proposed): Portions of this roadway that are located within the 650-ft (198.1-m), 25-mi (40-km) viewshed coincide with U.S. 285 between Saguache and just north of the intersection of U.S. 285 and State Route 17. Contrasts resulting from solar development within the SEZ would be similar to that described for U.S. 285.

10.2.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on visual resources are described in Section A.2.2 of Appendix A of this Final Solar PEIS. While application of the programmatic design features will reduce potential visual impacts somewhat, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas would be the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures generally would be limited. Utility-scale solar energy development using any of the solar technologies analyzed in this Final Solar PEIS and at the scale analyzed would be expected to result in large adverse visual impacts that could not be mitigated.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, a proposed SEZ-specific design feature for the SEZ is as follows:

- The development of power tower facilities should be prohibited within the SEZ. The San Luis Valley is a regionally important tourist destination and is an area with many small communities and numerous important historic, cultural, and recreational resources. The valley contains numerous historic sites, two scenic railways, two scenic highways, several wildlife refuges, Great Sand Dunes NP and Preserve, the Rio Grande WSR, congressionally designated WAs, the Sangre de Cristo NHA, and various other attractions that draw tourists to the region. A number of these areas overlook the San Luis Valley from the surrounding mountains and include elevated viewpoints that would have clear views of power tower facilities in the Valley. The height of solar power tower receiver structures, combined with the intense light generated by the receivers atop the towers, would be expected to create strong visual contrasts that could not be effectively screened from view for most areas surrounding the SEZ. The effective area of impact from power tower structures is much larger than that for comparably rated lower height facilities, which makes it more likely that they would conflict with the growing tourism focus of the Valley. In addition, for power towers exceeding 200 ft (61 m) in height, hazard navigation lighting that could be visible for very long distances would likely be required. Prohibiting the development of power tower facilities would remove this source of impacts, thus substantially reducing potential visual impacts on the Old Spanish National Historic Trail, the community of Saguache, and other residents of and visitors to the San Luis Valley, a regionally important tourist destination.

The need for additional SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.15 Acoustic Environment

10.2.15.1 Affected Environment

The size of the proposed De Tilla Gulch SEZ was reduced by about 30%, from 1,522 acres (6.2 km^2) to 1,064 acres (4.3 km^2) by removing a strip along U.S. 285. However, this reduction in the size of the SEZ did not substantially change the distances to some of the sensitive receptors at which noise was modeled for the Draft Solar PEIS. The affected environment presented in the Draft Solar PEIS remains valid.

10.2.15.2 Impacts

On the basis of the boundary changes and reduced size of the proposed De Tilla Gulch SEZ, noise impacts were remodeled for this Final Solar PEIS. The distance to the nearest residence remained the same as in the Draft Solar PEIS.

10.2.15.2.1 Construction

Estimated noise levels from construction activities in the proposed SEZ at the nearest residence about 0.3 mi (0.5 km) away would be about 56 dBA, which is higher than a typical daytime mean rural background level of 40 dBA. Estimated day-night average noise levels at this residence would be 52 dBA L_{dn}, which is below the EPA guideline of 55 dBA L_{dn} for residential areas.

Noise levels from construction activities occurring near the southern SEZ boundary, at the Old Spanish National Historic Trail (as close as 0.25 mi [0.4 km] to the south), would be about 58 dBA, which is well above the typical daytime mean rural background level of 40 dBA. The conclusion in the Draft Solar PEIS that construction occurring near the southern SEZ boundary could result in noise impacts on the Old Spanish Historic Trail remains valid, but these impacts would be temporary.

Overall, construction would cause some unavoidable but localized short-term impacts on neighboring communities, particularly for activities occurring near the eastern proposed SEZ boundary, close to nearby residences.

No adverse vibration impacts are anticipated from construction activities, including pile driving for dish engines.

10.2.15.2.2 Operations

The conclusions presented in the Draft Solar PEIS remain valid, except as noted below for impacts from TES and dish engine facilities near residences or in specially designated areas.

Parabolic Trough and Power Tower

If TES were not used for parabolic trough and power tower technologies (12 hours of daytime operations only), estimated noise levels at the nearest residence about 0.3 mi (0.5 km) away from the SEZ boundary would be about 47 dBA, which exceeds the typical daytime mean rural background of 40 dBA. The day-night average noise level of 45 dBA L_{dn} would be below the EPA guideline of 55 dBA L_{dn} for residential areas. If TES were used, the estimated nighttime noise level at the nearest residence would be about 57 dBA, which is higher than the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 58 dBA L_{dn}, which is a little higher than the EPA guideline of 55 dBA L_{dn} for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms. Thus it is likely that noise levels would be lower than 58 dBA L_{dn} at the nearest residence, even if TES were used at a solar facility. Nonetheless, operating parabolic trough or power tower facilities using TES and located near the eastern SEZ boundary could result in potential noise impacts on the nearest residence, depending on background noise levels and meteorological conditions.

For operations of a parabolic trough or power tower facility equipped with TES occurring near the southern SEZ boundary, the estimated daytime and nighttime noise levels at the Old Spanish National Historic Trail would be about 48 and 58 dBA, respectively, which are higher than the typical daytime and nighttime mean rural background levels of 40 and 30 dBA. The conclusion in the Draft Solar PEIS that operation of a solar facility near the southern SEZ boundary could result in noise impacts on the Old Spanish National Historic Trail remains valid.

Dish Engines

The reduced size of the proposed SEZ would reduce the maximum potential number of 25-kW dish engines to 3,800 covering 851 acres (3.4 km^2); the Draft Solar PEIS modeled 5,400 dish engines covering 1,217 acres (4.9 km^2). The estimated noise level at the nearest residence about 0.3 mi (0.5 km) from the SEZ boundary would be about 50 dBA, which is higher than the typical daytime mean rural background level of 40 dBA. The estimated day-night average noise level of 48 dBA L_{dn} at this residence is below the EPA guideline of 55 dBA L_{dn} for residential areas. The conclusion of the Draft Solar PEIS that noise from dish engines could cause adverse noise impacts on the nearest residences, depending on background noise levels and meteorological conditions, remains valid.

The estimated noise level from an operating dish engine facility would be about 51 dBA at the Old Spanish National Historic Trail (about 0.25 mi [0.4 km] to the south), which is higher than the typical daytime mean rural background level of 40 dBA. Thus, the conclusion in the Draft Solar PEIS that noise from an operating dish engine facility in the De Tilla Gulch SEZ could result in adverse impacts on the Old Spanish National Historic Trail remains valid.

The discussions of vibration, transformer and switchyard noise, and transmission line corona discharge presented in the Draft Solar PEIS remain valid. Noise impacts from vibration and transformer and switchyard noise would be minimal. Noise impacts from transmission line corona discharge would be negligible.

10.2.15.2.3 Decommissioning and Reclamation

The conclusions on decommissioning and reclamation in the proposed De Tilla Gulch SEZ as presented in the Draft Solar PEIS remain valid. Decommissioning and reclamation activities would be of short duration, and their potential noise impacts would be minor and temporary. Potential noise and vibration impacts on surrounding communities would be minimal.

10.2.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce noise impacts are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide some protection from noise impacts.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for the proposed De Tilla Gulch SEZ have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.16 Paleontological Resources

10.2.16.1 Affected Environment

Data provided in the Draft Solar PEIS remain valid, with the following update:

- The BLM Regional Paleontologist may have additional information regarding the paleontological potential of the SEZ and be able to verify the PFYC of the SEZ as Class 3b as used in the Draft Solar PEIS.

10.2.16.2 Impacts

The assessment provided in the Draft Solar PEIS remains valid. Impacts on significant paleontological resources are unknown, and a more detailed look at the geological deposits and their depth is needed to determine whether a paleontological survey is warranted.

10.2.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Impacts would be minimized through the implementation of the required programmatic design features, including a stop-work stipulation in the event that paleontological resources are encountered during construction, as described in Section A.2.2 of Appendix A.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes in the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for paleontological resources have been identified for the proposed De Tilla Gulch SEZ. Because the PFYC of the proposed SEZ is Class 3b (unknown potential), paleontological surveys would be needed to identify those areas that may have significant paleontological resources; therefore, the need for and nature of any SEZ-specific design features would depend on the findings of future paleontological investigations. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

As additional information on paleontological resources (e.g., from regional paleontologists or from new surveys) becomes available, the BLM will post the data to a public Web site for use by applicants, the BLM, and other stakeholders.

10.2.17 Cultural Resources

10.2.17.1 Affected Environment

Data provided in the Draft Solar PEIS remain valid, with the following updates:

- Because the footprint of the proposed De Tilla Gulch SEZ has changed, the amount of the SEZ that has been surveyed has been reduced from two surveys of 51 acres (0.2 km^2) covering 3.8% of the SEZ, to one survey of about 17 acres (0.06 km^2), covering approximately 1.6% of the proposed De Tilla Gulch SEZ.

- Additional information may be available to characterize the SEZ and its surrounding area in the future (after the Final Solar PEIS has been completed), as follows:
  - A Class III inventory of linear features in close proximity to the SEZ that were previously identified using light detection and ranging (LiDAR);
  - Results of an ethnographic study currently being conducted by TRC Solutions, which focuses on Native American use of lands being analyzed for solar development within the San Luis Valley. The study will discuss sensitive and traditional use areas. Interviews with tribal members and field visits will facilitate the identification of resources and sites of traditional and religious importance to tribes. Results of a Class II sample

survey of the SEZ designed to obtain a statistically valid sample of archeological properties and their distribution within the SEZ. Results from the ethnographic study and the sample inventory can be combined to project cultural sensitivity zones as an aid in planning future solar developments.

  – Identification of the location of the Old Spanish National Historic Trail in the vicinity of the SEZ and viewshed analyses from key points along the Trail. High-potential segments of the Trail have been identified to the east between Crestone, Colorado, and the Fourmile East SEZ and to the west of Saguache, Colorado. The Trail segment to the east would be within the viewshed at about 16 mi (26 km) regardless of solar technology type. Also within the viewshed at about 6 mi (10 km) would be the West Fork of the North Branch of the Old Spanish Trail, not currently part of the National Historic Trail system, but still an important trail and significant cultural resource that would be visually affected along an approximately 20-mi (32-km) stretch of the Trail.
  – Continuation of government-to-government consultation as described in Section 2.4.3 of the Supplement to the Draft Solar PEIS and IM 2012-032 (BLM 2011d), including follow-up to recent ethnographic studies covering some SEZs in Nevada and Utah with tribes not included in the original studies to determine whether those tribes have similar concerns.

10.2.17.2 Impacts

The assessment provided in the Draft Solar PEIS remains valid. Impacts on significant cultural resources are possible; however, a cultural resource survey of the area of potential affect would be needed to determine whether any resources are present. An inventory of the location, integrity, and significance of portions of the Old Spanish Trail from which future development in the SEZ could be viewed would need to occur to determine whether adverse impacts on the Trail would occur with solar energy development. The assessment provided in the Draft Solar PEIS remains valid with the following update:

- Impacts on significant cultural resources and cultural landscapes associated with American Latino heritage are possible throughout the San Luis Valley.

10.2.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on cultural resources are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Programmatic design features will be applied to address SEZ-specific resources and conditions, for example:

- For projects in the De Tilla Gulch SEZ that are located within the viewshed of the Old Spanish National Historic Trail and/or the West Fork of the North Branch of the Old Spanish Trail, a National Trail inventory will be required to determine the area of possible adverse effect on resources, qualities, values, and associated settings of the trail; to prevent substantial interference; and to determine any areas unsuitable for development. Residual impacts will be avoided, minimized, and/or mitigated to the extent practicable according to program policy standards. Programmatic design features have been included in BLM's Solar Energy Program to address impacts on National Historic Trails (see Section A.2.2.23 of Appendix A).

Programmatic design features also assume that the necessary surveys, evaluations, and consultations will occur. Ongoing consultations with the Colorado SHPO and the appropriate Native American governments would be conducted during the development of the De Tilla Gulch SEZ. It is likely that most adverse effects on significant resources in the valley could be mitigated to some degree through such efforts, although not enough to eliminate the adverse effects unless a significant resource is avoided entirely.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design feature has been identified:

- Development of an MOA may be needed among the BLM, Colorado SHPO, and other parties, such as the ACHP, to address the adverse effects of solar energy development on historic properties. The agreement may specify avoidance, minimization, or mitigation measures. Should an MOA be developed to resolve adverse effects on the Old Spanish National Historic Trail and/or the West Fork of the North Branch of the Old Spanish Trail, the Trail Administration for the Old Spanish Trail (BLM-NMSO and NPS Intermountain Trails Office, Santa Fe) should be included in the development of that MOA.

The need for and nature of additional SEZ-specific design features will depend on the results of future investigations. Some additional SEZ-specific design features may be established through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.18 Native American Concerns

10.2.18.1 Affected Environment

Data provided in the Draft Solar PEIS remain valid but will be supplemented in the future by the results of the ethnographic study being completed in the San Luis Valley (see Section 10.1.17.1).

10.2.18.2 Impacts

The description of potential concerns provided in the Draft Solar PEIS remains valid. No direct impacts from solar energy development are likely to occur on culturally significant areas (i.e., San Luis Lakes, the Great Sand Dunes, and Blanca Peak); however, indirect visual and auditory impacts are possible. It is likely that traditional plant resources and animal habitats would be directly affected by solar energy development in the proposed De Tilla Gulch SEZ.

10.2.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on Native American concerns are described in Section A.2.2 of Appendix A of this Final Solar PEIS. For example, impacts would be minimized through the avoidance of sacred sites, water sources, and tribally important plant and animal species. Programmatic design features require that the necessary surveys, evaluations, and consultations would occur. The tribes would be notified regarding the results of archaeological surveys, and they would be contacted immediately upon any discovery of Native American human remains and associated cultural items.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes in the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features to address Native American concerns have been identified for the proposed De Tilla Gulch SEZ. The need for and nature of SEZ-specific design features would be determined during government-to-government consultation with affected tribes as part of the process of preparing parcels for competitive offer and subsequent project-specific analysis. Potentially significant sites and landscapes in the vicinity of the SEZ associated with Blanca Peak, Great Sand Dunes, and San Luis Lakes, as well as trail systems, mountain springs, mineral resources, burial sites, ceremonial areas, water resources, and plant and animal resources, should be considered and discussed during consultation.

10.2.19 Socioeconomics

10.2.19.1 Affected Environment

Although the boundaries of the De Tilla Gulch SEZ have been reduced compared to the boundaries given in the Draft Solar PEIS, the socioeconomic ROI, the area in which site employees would live and spend their wages and salaries, and into which any in-migration would occur, includes the same counties and communities as described in the Draft Solar PEIS; that is, no updates to the affected environment information given in the Draft Solar PEIS are required.

10.2.19.2 Impacts

Socioeconomic resources in the ROI around the SEZ could be affected by solar energy development through the creation of direct and indirect employment and income, the generation of direct sales and income taxes, SEZ acreage rental and capacity payments to BLM, the in-migration of solar facility workers and their families, impacts on local housing markets, and on local community service employment. The impact assessment provided in the Draft Solar PEIS remains valid, with the following updates:

10.2.19.2.1 Solar Trough

Construction

Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technologies would be 789 jobs (Table 10.2.19.2-1). Construction activities would constitute 2.4% of total ROI employment. A solar development would also produce $43.2 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $1.7 million.

Given the scale of construction activities and the low likelihood that the entire construction workforce in the required occupational categories would be available within the ROI, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with up to 518 persons in-migrating to the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with up to 179 rental units expected to be occupied in the ROI. This occupancy rate would represent 8.5% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, up to six new teachers, one physician, and one public safety employee (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 0.8% of total ROI employment expected in these occupations.

Operations

Total operations employment impacts in the ROI (including direct and indirect impacts) of a full build-out of the SEZ using solar trough technologies would be 55 jobs (Table 10.2.19.2-1). Such a solar development would also produce $1.8 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.1 million. On the basis

TABLE 10.2.19.2-1 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed De Tilla Gulch SEZ as Revised with Trough Facilities

Parameter	Maximum Annual Construction Impacts[a]	Annual Operations Impacts[b]
Employment (no.)		
Direct	466	37
Total	789	55
Income[c]		
Total	43.2	1.8
Direct state taxes[c]		
Sales	<0.1	<0.1
Income	1.7	0.1
BLM payments[c]		
Rental	NA[d]	0.1
Capacity[e]	NA	1.1
In-migrants (no.)	518	24
Vacant housing[f] (no.)	179	15
Local community service employment		
Teachers (no.)	6	0
Physicians (no.)	1	0
Public safety (no.)	1	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 170 MW (corresponding to 851 acres [3 km^2] of land disturbance) could be built.

[b] Operations impacts were based on full build-out of the site, producing a total output of 170 MW.

[c] Values are reported in $ million 2008.

[d] NA = not applicable.

[e] The BLM annual capacity payment was based on a fee of $6,570/MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884/MW.

[f] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

of fees established by the BLM (BLM 2010), acreage rental payments would be $0.1 million, and solar generating capacity payments, at least $1.1 million.

As for the construction workforce, operation of a solar facility likely would require some in-migration of workers and their families from outside the ROI, with up to 24 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with up to 15 owner-occupied units expected to be occupied in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

10.2.19.2.2 Power Tower

Construction

Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be 314 jobs (Table 10.2.19.2-2). Construction activities would constitute 1.0 % of total ROI employment. Such a solar development would also produce $17.2 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes of $0.7 million.

Given the scale of construction activities and the low likelihood that the entire construction workforce in the required occupational categories would be available within the ROI, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with up to 206 persons in-migrating to the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with up to 71 rental units expected to be occupied in the ROI. This occupancy rate would represent 3.4% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, up to two new teachers and one physician would be required in the ROI. These increases would represent 0.3% of total ROI employment expected in these occupations.

TABLE 10.2.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed De Tilla Gulch SEZ as Revised with Power Tower Facilities

Parameter	Maximum Annual Construction Impacts[a]	Annual Operations Impacts[b]
Employment (no.)		
Direct	185	19
Total	314	26
Income[c]		
Total	17.2	0.8
Direct state taxes[c]		
Sales	<0.1	<0.1
Income	0.7	<0.1
BLM payments[c]		
Rental	NA[d]	0.1
Capacity[e]	NA	0.6
In-migrants (no.)	206	12
Vacant housing[f] (no.)	71	8
Local community service employment		
Teachers (no.)	2	0
Physicians (no.)	1	0
Public safety (no.)	0	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 95 MW (corresponding to 851 acres [3 km^2] of land disturbance) could be built.

[b] Operations impacts were based on full build-out of the site, producing a total output of 95 MW.

[c] Values are reported in $ million 2008.

[d] NA = not applicable.

[e] The BLM annual capacity payment was based on a fee of $6,570/MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884/MW.

[f] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

Operation

Total operations employment impacts in the ROI (including direct and indirect impacts) of a full build-out of the SEZ using power tower technologies would be 26 jobs (Table 10.2.19.2-2). Such a solar development would also produce $0.8 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, less than $0.1 million. On the basis of fees established by the BLM (BLM 2010), acreage rental payments would be $0.1 million, and solar generating capacity payments, at least $0.6 million.

As for the construction workforce, operation of a solar facility likely would require some in-migration of workers and their families from outside the ROI, with up to 12 persons in-migrating to the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with up to 8 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

10.2.19.2.3 Dish Engine

Construction

Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technologies would be 128 jobs (Table 10.2.19.2-3). Construction activities would constitute 0.4% of total ROI employment. Such a solar development would also produce $7.0 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.3 million.

Given the scale of construction activities and the low likelihood that the entire construction workforce in the required occupational categories would be available within the ROI, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with up to 84 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with up to 29 rental units expected to be occupied in the ROI. This occupancy rate would represent 1.4% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly,

TABLE 10.2.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed De Tilla Gulch SEZ as Revised with Dish Engine Facilities

Parameter	Maximum Annual Construction Impacts[a]	Annual Operations Impacts[b]
Employment (no.)		
Direct	75	19
Total	128	26
Income[c]		
Total	7.0	0.8
Direct state taxes[c]		
Sales	<0.1	<0.1
Income	0.3	<0.1
BLM payments[c]		
Rental	NA[d]	0.1
Capacity[e]	NA	0.6
In-migrants (no.)	84	12
Vacant housing[f] (no.)	29	7
Local community service employment		
Teachers (no.)	1	0
Physicians (no.)	0	0
Public safety (no.)	0	0

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 95 MW (corresponding to 851 acres [3 km^2] of land disturbance) could be built.

a Operations impacts were based on full build-out of the site, producing a total output of 1,557 MW.

c Values are reported in $ million 2008.

d NA = not applicable.

e The BLM annual capacity payment was based on a fee of $6,570/MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884/MW.

f Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

one new teacher would be required in the ROI. This increase would represent 0.1% of total ROI employment expected in this occupation.

Operations

Total operations employment impacts in the ROI (including direct and indirect impacts) of a full build-out of the SEZ using dish engine technologies would be 26 jobs (Table 10.2.19.2-3). Such a solar development would also produce $0.8 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, less than $0.1 million. On the basis of fees established by the BLM (BLM 2010), acreage rental payments would be $0.1 million, and solar generating capacity payments, at least $0.6 million.

As for the construction workforce, operation of a solar facility likely would require some in-migration of workers and their families from outside the ROI, with up to 12 persons in-migrating to the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with up to seven owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

10.2.19.2.4 Photovoltaic

Construction

Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be 60 jobs (Table 10.2.19.2-4). Construction activities would constitute 0.2% of total ROI employment. Such a solar development would also produce $3.3 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.1 million.

Given the scale of construction activities and the low likelihood that the entire construction workforce in the required occupational categories would be available within the ROI, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with up to 39 persons in-migrating to the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with up to 14 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.6% of the vacant rental units expected to be available in the ROI.

TABLE 10.2.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed De Tilla Gulch SEZ as Revised with PV Facilities[a]

Parameter	Maximum Annual Construction Impacts[a]	Annual Operations Impacts[b]
Employment (no.)		
Direct	35	2
Total	60	3
Income[c]		
Total	3.3	0.1
Direct state taxes[c]		
Sales	<0.1	<0.1
Income	0.1	<0.1
BLM payments[c]		
Rental	NA[d]	0.1
Capacity[e]	NA	0.5
In-migrants (no.)	39	1
Vacant housing[f] (no.)	14	1
Local community service employment		
Teachers (no.)	0	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 95 MW (corresponding to 851 acres [12 km^2] of land disturbance) could be built.

[b] Operations impacts were based on full build-out of the site, producing a total output of 95 MW.

[c] Values are reported in $ million 2008.

[d] NA = not applicable.

[e] The BLM annual capacity payment was based on a fee of $5,256/MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010), assuming full build-out of the site.

[f] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

No new community service employment would be required to meet existing levels of service in the ROI.

Operations

Total operations employment impacts in the ROI (including direct and indirect impacts) of a full build-out of the SEZ using PV technologies would be three jobs (Table 10.2.19.2-4). Such a solar development would also produce $0.1 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, less than $0.1 million. Based on fees established by the BLM (BLM 2010), acreage rental payments would be $0.1 million, and solar generating capacity payments, at least $0.5 million.

As for the construction workforce, operation of a solar facility likely would require some in-migration of workers and their families from outside the ROI, with one person in-migrating to the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with one owner-occupied unit expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

10.2.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce socioeconomic impacts are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will reduce the potential for socioeconomic impacts during all project phases.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features to address socioeconomic impacts have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.20 Environmental Justice

10.2.20.1 Affected Environment

The data presented in the Draft Solar PEIS have changed due to the change in boundaries of the proposed De Tilla Gulch SEZ. The affected environment information for environmental justice presented in the Draft Solar PEIS has also changed, as reflected in the following discussion.

The data in Table 10.2.20.1-1 show the minority and low-income composition of the total population located within a 50-mi (80-km) radius of the proposed SEZ based on 2000 Census data and CEQ guidelines (CEQ 1997) (see Section 10.2.20.1 of the Draft Solar PEIS). Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals also identifying themselves as being part of one or more of the population groups listed in the table.

A large number of minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius, 27.9% of the population is classified as minority, while 14.6% is classified as low-income. However, the number of minority or low-income individuals does not exceed the state average by 20 percentage points or more, and does not exceed 50% of the total population in the area; that is, there are no minority or low-income populations in the 50-mi (80-km) radius of the SEZ based on 2000 Census data and CEQ guidelines.

A small number of block groups in the 50-mi (80-km) radius have minority populations that make up more than 50% of the total population. These are located in Conejos and Costilla Counties and in the cities of Alamosa (Alamosa County), Monte Vista and Del Norte (both in Rio Grande County), and Center (Saguache County) and in the vicinity of Canon City (Freemont County).

Low-income populations in the 50-mi (80-km) radius are limited to one block group, in the City of Alamosa, which has a low-income population share that is more than 20 percentage points higher than the state average.

Figures 10.2.20.1-1 and 10.2.20.1-2 show the locations of the minority and low-income population groups in the 50-mi (80-km) radius around the boundary of the SEZ.

10.2.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy development are described in detail in Section 5.18 of the Draft Solar PEIS. The potentially relevant environmental impacts associated with solar development within the proposed SEZ include noise and dust generation during the construction of solar facilities; noise and EMF effects associated with solar project operations; the visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values as areas of concern that might potentially affect minority and low-income populations.

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Although impacts are likely to be small, there are no minority populations, as defined by CEQ

TABLE 10.2.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed De Tilla Gulch SEZ as Revised

Parameter	Colorado
Total population	100,258
White, non-Hispanic	72,336
Hispanic or Latino	22,009
Non-Hispanic or Latino minorities	5,913
One race	4,630
Black or African American	2,838
American Indian or Alaskan Native	1,147
Asian	493
Native Hawaiian or other Pacific Islander	35
Some other race	117
Two or more races	1,283
Total minority	27,922
Low-income	12,905
Percentage minority	27.9
State percent minority	25.5
Percentage low-income	14.6
State percent low-income	9.3

Sources: U.S. Bureau of the Census (2009a,b).

guidelines (CEQ 1997) (see Section 10.2.20.1 of the Draft Solar PEIS), within the 50-mi (80-km) radius around the boundary of the SEZ; that is, any adverse impacts of solar projects would not disproportionately affect minority populations. Because there are no low-income populations within the 50-mi (80-km) radius, there would be no impacts on low-income populations. Further analysis of any impacts that could occur would be included in subsequent NEPA reviews of individual solar projects.

10.2.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce potential environmental justice impacts are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will reduce the potential for environmental justice impacts.

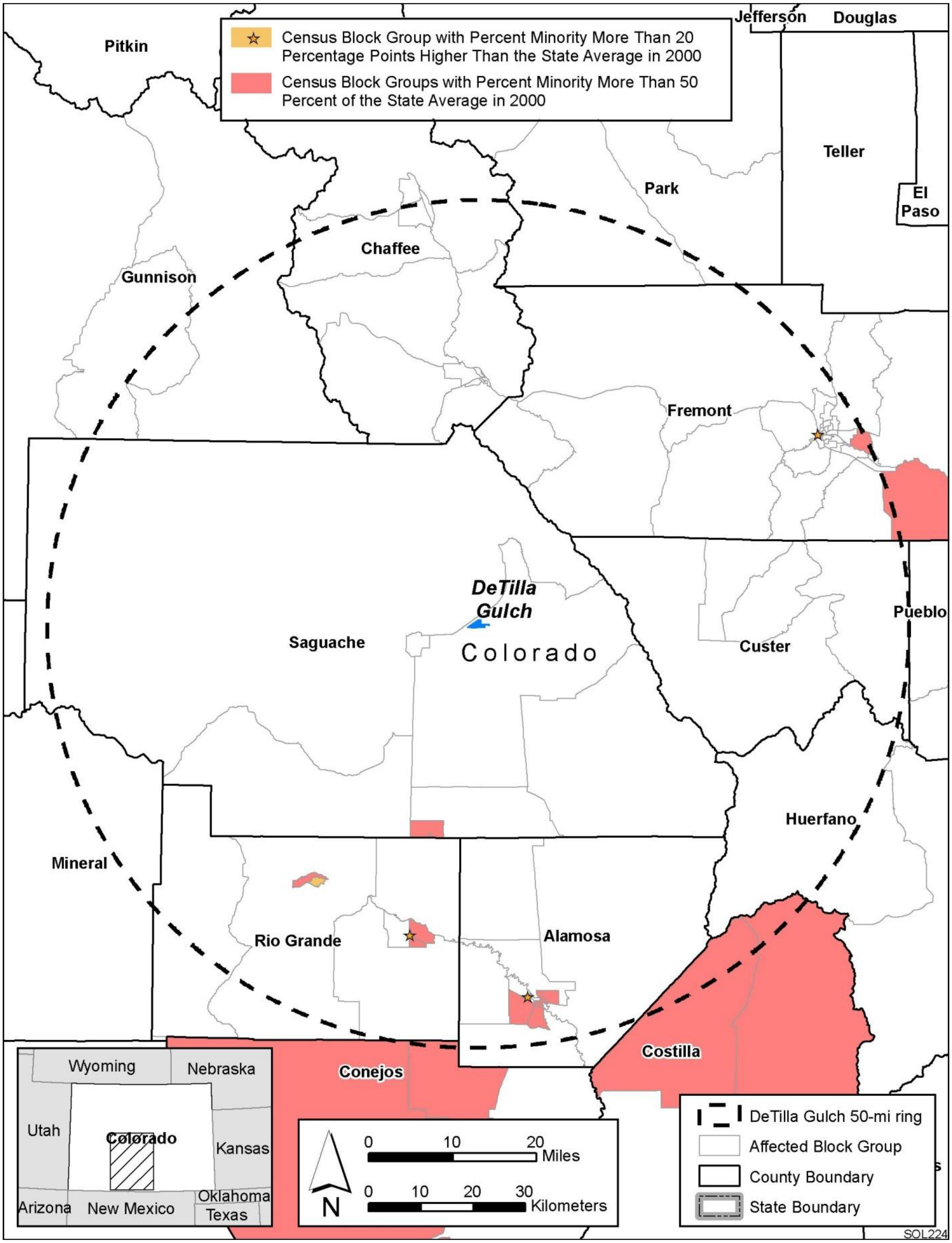

FIGURE 10.2.20.1-1 Minority Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed De Tilla Gulch SEZ as Revised

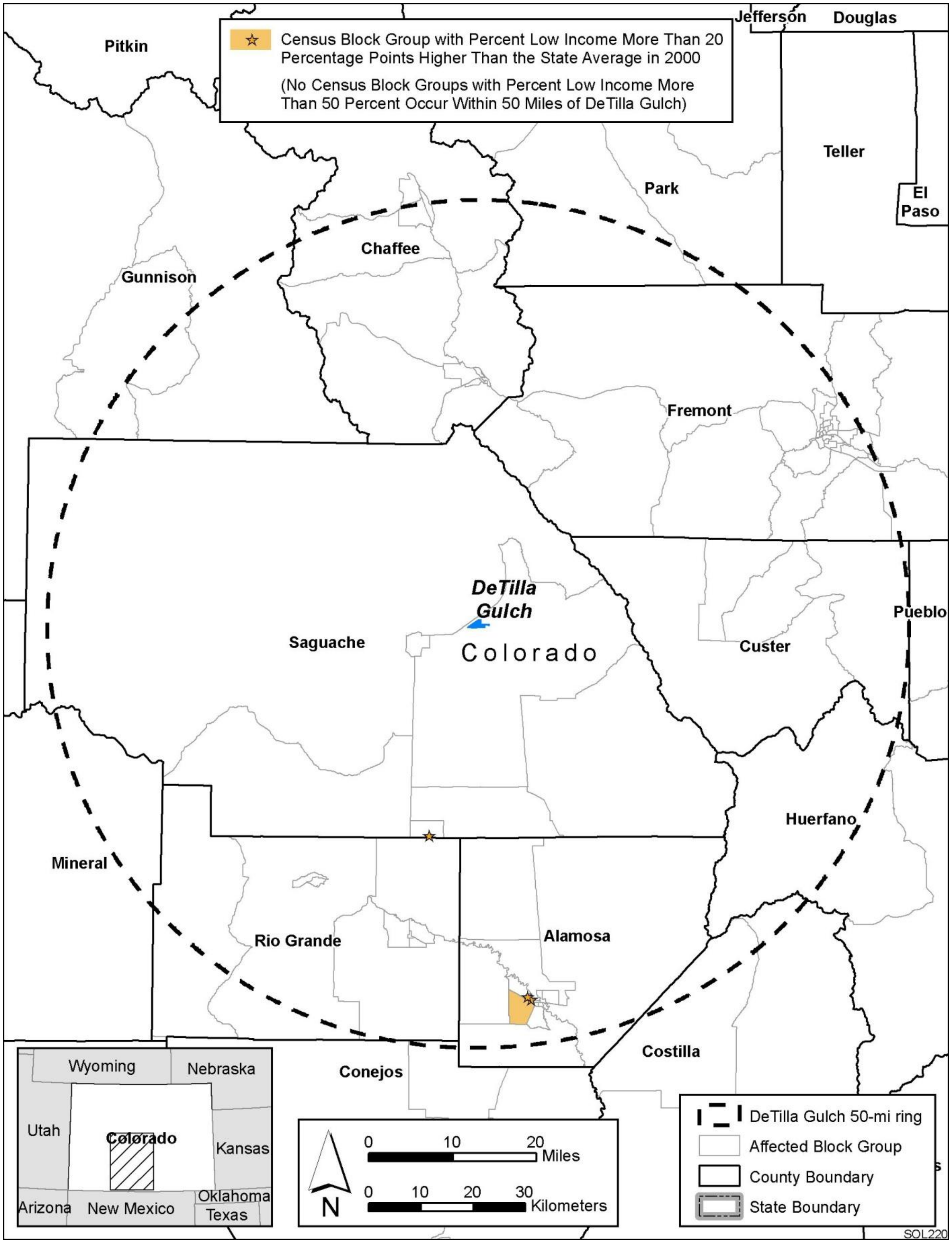

FIGURE 10.2.20.1-2 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed De Tilla Gulch SEZ as Revised

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for environmental justice have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.21 Transportation

10.2.21.1 Affected Environment

The reduction in size of the SEZ does not change the information on affected environment for transportation presented in the Draft Solar PEIS.

10.2.21.2 Impacts

As stated in the Draft Solar PEIS, the primary transportation impacts are anticipated to be from commuting worker traffic. U.S. 285 provides a regional traffic corridor that could experience moderate impacts for single projects that may have up to 1,000 daily workers, with an additional 2,000 vehicle trips per day (maximum). This would represent up to approximately two times the current AADT values for U.S. 285, or up to approximately three times the amount of traffic currently using State Highway 17, depending on the distribution of new worker traffic between these two routes. Local road improvements would be necessary in any portion of the SEZ along U.S. 285 that might be developed so as not to overwhelm the local roads near any site access point(s). CR 55 and any other access roads connected to it would require road improvements to handle the additional traffic.

Solar development within the SEZ would affect public access along OHV routes that are designated open and available for public use. Although open routes crossing areas granted ROWs for solar facilities could be redesignated as closed (see Section 5.5.1 of the Draft Solar PEIS), a programmatic design feature has been included under Recreation (Section A.2.2.6.1 of Appendix A) that requires consideration of replacement of lost OHV route acreage and of access across and to public lands.

10.2.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce transportation impacts are described in Section A.2.2 of Appendix A of this Final Solar PEIS. The programmatic design features, including local road improvements, multiple site access locations, staggered work schedules, and ride-sharing, will all provide some relief to traffic congestion on local roads leading to the SEZ. Depending on the location of solar facilities within the SEZ, more specific access locations and local road improvements could be implemented.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to these analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features to address transportation impacts in the proposed De Tilla Gulch SEZ have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.2.22 Cumulative Impacts

The analysis of potential impacts in the vicinity of the proposed De Tilla Gulch SEZ presented in the Draft Solar PEIS is still generally applicable for this Final Solar PEIS, although the impacts would be decreased because the size of the proposed SEZ has been reduced to 1,064 acres (4.3 km^2). The following sections include an update to the information presented in the Draft Solar PEIS regarding cumulative effects for the proposed De Tilla Gulch SEZ.

10.2.22.1 Geographic Extent of the Cumulative Impact Analysis

The geographic extent of the cumulative impact analysis has not changed. The extent varies on the basis of the nature of the resource being evaluated and the distance at which an impact may occur (thus, e.g., air quality impacts may have a greater regional extent than cultural resources impacts). Lands around the SEZ are privately owned or administered by the USFS, NPS, or the BLM. The BLM administers approximately 16% of the lands within a 50-mi (80-km) radius of the De Tilla Gulch SEZ.

10.2.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The proposed De Tilla Gulch SEZ decreased from 1,522 acres (6.2 km^2) to 1,064 acres (4.3 km^2). The Draft Solar PEIS included three other proposed SEZs in Colorado: Antonito Southeast, Fourmile East, and Los Mogotes East. All of these SEZs are being carried forward to the Final Solar PEIS; the areas of the Fourmile East and Los Mogotes East SEZs have been decreased.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to energy production and distribution and (2) other ongoing and reasonably foreseeable actions, including those related to electric power generation and distribution, wildlife management, and military facility improvement (Section 10.2.22.2.2). Together, these actions and trends have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

10.2.22.2.1 Energy Production and Distribution

The list of reasonably foreseeable future actions near the proposed De Tilla Gulch SEZ has been updated and is presented in Table 10.2.22.2-1. Projects listed in the table are shown in Figure 10.2.22.2-1.

Xcel Energy (Public Service Company of Colorado) has submitted a transmission planning report to the Colorado Public Utility Commission stating that it intends to end its involvement in the proposed San Luis Valley–Calumet-Comanche Transmission project (Heide 2011). The project itself has not been cancelled.

10.2.22.2.2 Other Actions

None of the major ongoing and foreseeable actions within 50 mi (80 km) of the proposed De Tilla Gulch SEZ listed in Table 10.2.22.2-3 of the Draft Solar PEIS have had a change in their status.

10.2.22.3 General Trends

The information on general trends presented in the Draft Solar PEIS remains valid.

10.2.22.4 Cumulative Impacts on Resources

Total disturbance over 20 years in the proposed De Tilla Gulch SEZ is assumed to be about 851 acres (3.4 km^2) (80% of the entire proposed SEZ). This development would contribute incrementally to the impacts from other past, present, and reasonably foreseeable future actions in the region as described in the Draft Solar PEIS. Primary impacts from development in the De Tilla Gulch SEZ may include impacts on water quantity and quality, air quality, ecological resources such as habitat and species, cultural and visual resources, and specially designated lands.

No additional major actions have been identified within 50 mi (80 km) of the SEZ. As a result of the reduction in the developable area of the SEZ, the incremental cumulative impacts associated with development in the proposed De Tilla Gulch SEZ during construction, operation, and decommissioning are expected to be the same or less than those discussed in the Draft Solar PEIS.

On the basis of comments received on the Draft Solar PEIS, cumulative impacts on recreation in the San Luis Valley have been reconsidered. While it is unlikely that the proposed De Tilla Gulch SEZ would have a large impact on recreational use or tourism throughout the valley, cumulative impacts could occur because it is one of four proposed SEZs totaling about 16,300 acres (66 km^2) on public lands, and there are additional solar energy developments on private lands. Because most of the land on the valley floor of the San Luis Valley is private and

TABLE 10.2.22.2-1 Ongoing and Reasonably Foreseeable Future Actions Related to Energy Development and Distribution near the Proposed De Tilla Gulch SEZ as Revised and in the San Luis Valley[a]

Description	Status	Resources Affected	Primary Impact Location
Renewable Energy Development			
San Luis Valley Generation Development Area (GDA) (Solar) Designation	Ongoing	Land use	San Luis Valley
Xcel Energy/SunEdison Project, 8.2-MW PV	**Operating**	Land use, ecological resources, visual	San Luis Valley GDA
San Luis Valley Solar Ranch (formerly Alamosa Solar Generating Project), 30-MW PV	**Operating[b]**	Land use, ecological resources, visual	San Luis Valley GDA
Greater Sandhill Solar Project, 19-MW PV	**Operating[b]**	Land use, ecological resources, visual	San Luis Valley GDA
San Luis Valley Solar Project, Tessera Solar, 200-MW dish engine **changed to 145 MW, 1,500 acres[c]**	**New proposal[d]**	Land use, ecological resources, visual, cultural	San Luis Valley GDA
Solar Reserve, 200-MW solar tower	**Application submitted for land use permit[e]**	Land use, ecological resources, visual	San Luis Valley GDA (Saguache)
Alamosa Solar Generating Project (formerly Cogentrix Solar Services), 30-MW high concentration PV	**Under construction**	Land use, ecological resources, visual	San Luis Valley GDA
Lincoln Renewables, 37-MW PV	County permit approved	Land use, ecological resources, visual	San Luis Valley GDA
NextEra, 30-MW PV	County permit approved	Land use, ecological resources, visual	San Luis Valley GDA
Transmission and Distribution Systems			
San Luis Valley–Calumet-Comanche Transmission Project	**Proposed[f]**	Land use, ecological resources, visual, cultural	San Luis Valley (select counties)

[a] Projects with status changed from that given in the Draft Solar PEIS are shown in bold text.

[b] See SEIA (2012) for details.

[c] To convert acres to km^2, multiply by 0.004047.

[d] See Solar Feeds (2012) for details.

[e] See Tetra Tech EC, Inc. (2011), for details.

[f] See Heide (2011) for details.

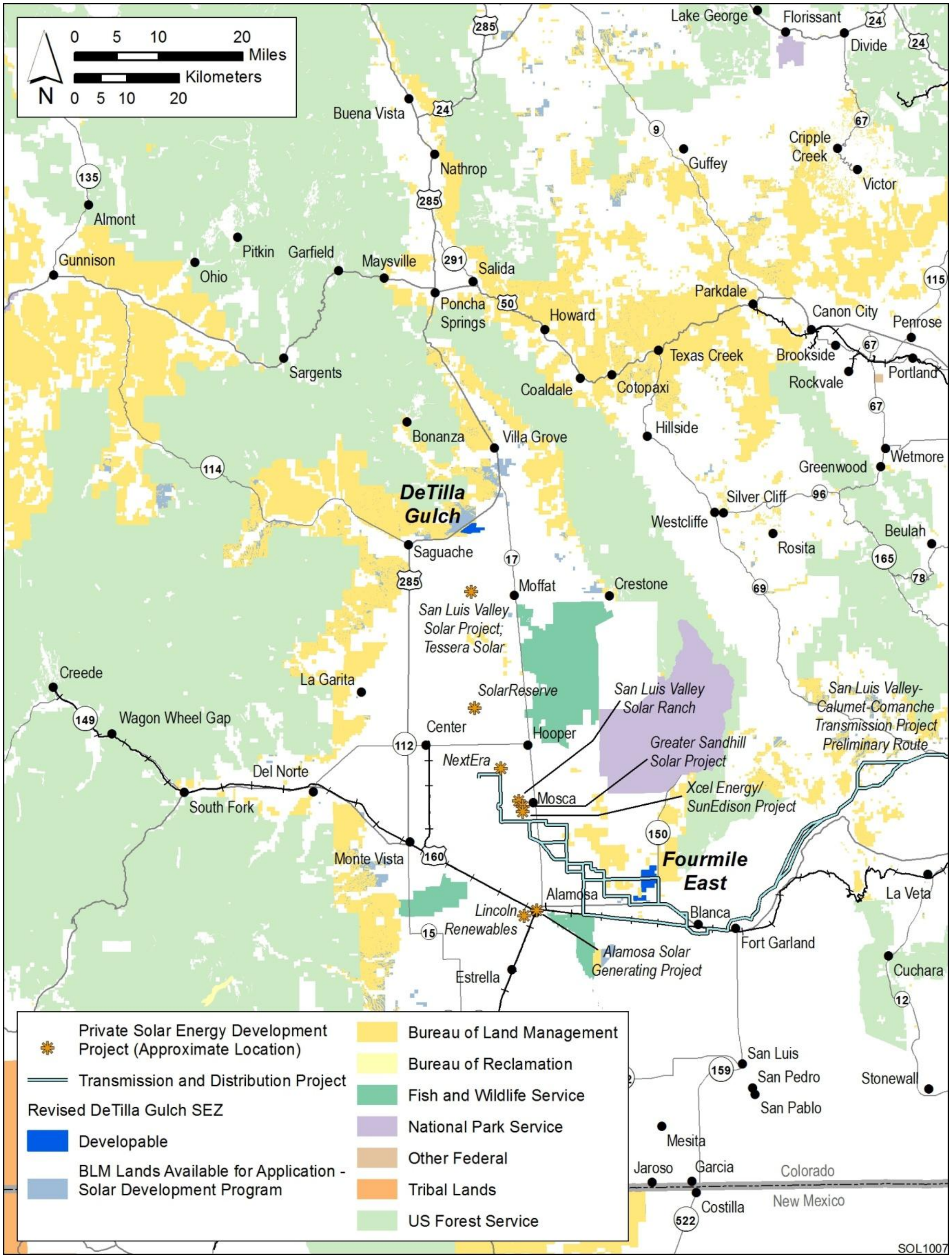

FIGURE 10.2.22.2-1 Locations of Existing and Reasonably Foreseeable Renewable Energy Projects on Public Land within a 50-mi (80-km) Radius of the Proposed De Tilla Gulch SEZ as Revised

is heavily developed for agricultural use, undeveloped public lands around the valley provide accessible areas for public recreation. Although it is believed the recreational use of the proposed SEZ is low, the loss of public access to such areas cumulatively leads to an overall reduction in the availability of recreation that can become significant.

The CDOW has identified the potential for an impact on the availability of hunting opportunities for pronghorn antelope associated with development of the De Tilla Gulch SEZ. While it is unlikely that hunting occurs directly within the proposed SEZ, animals that use the land likely support hunting recreation elsewhere. The relatively small potential impact on the De Tilla Gulch SEZ is probably better considered in the context of the potential cumulative loss of about 16,000 acres to solar development on public lands from potential development of all four SEZs. Permits to hunt pronghorn in the San Luis Valley are very scarce, and impacts associated with incremental habitat loss on public lands that are open to hunting may be reflected in a further reduction of available hunting permits.

10.2.23 Transmission Analysis

The methodology for this transmission analysis is described in Appendix G of this Final Solar PEIS. This section presents the results of the transmission analysis for the De Tilla Gulch SEZ, including the identification of potential load areas to be served by power generated at the SEZ and the results of the DLT analysis. Unlike Sections 10.2.2 through 10.2.22, this section is not an update of previous analysis for the De Tilla Gulch SEZ; this analysis was not presented in the Draft Solar PEIS. However, the methodology and a test case analysis were presented in the Supplement to the Draft Solar PEIS. Comments received on the material presented in the Supplement were used to improve the methodology for the assessment presented in this Final Solar PEIS.

On the basis of its size, the assumption of a minimum of 5 acres (0.02 km^2) of land required per MW, and the assumption of a maximum of 80% of the land area developed, the De Tilla Gulch SEZ is estimated to have the potential to generate 170 MW of marketable solar power at full build-out.

10.2.23.1 Identification and Characterization of Load Areas

The primary candidates for De Tilla Gulch SEZ load areas are the major surrounding cities. Figure 10.2.23.1-1 shows the possible load areas for the De Tilla Gulch SEZ and the estimated portion of their market that could be served by solar generation. Possible load areas for the De Tilla Gulch SEZ include Pueblo, Colorado Springs, and Denver, Colorado; Farmington, Albuquerque, and Santa Fe, New Mexico; Salt Lake City, Utah; Phoenix, Arizona; and Las Vegas, Nevada.

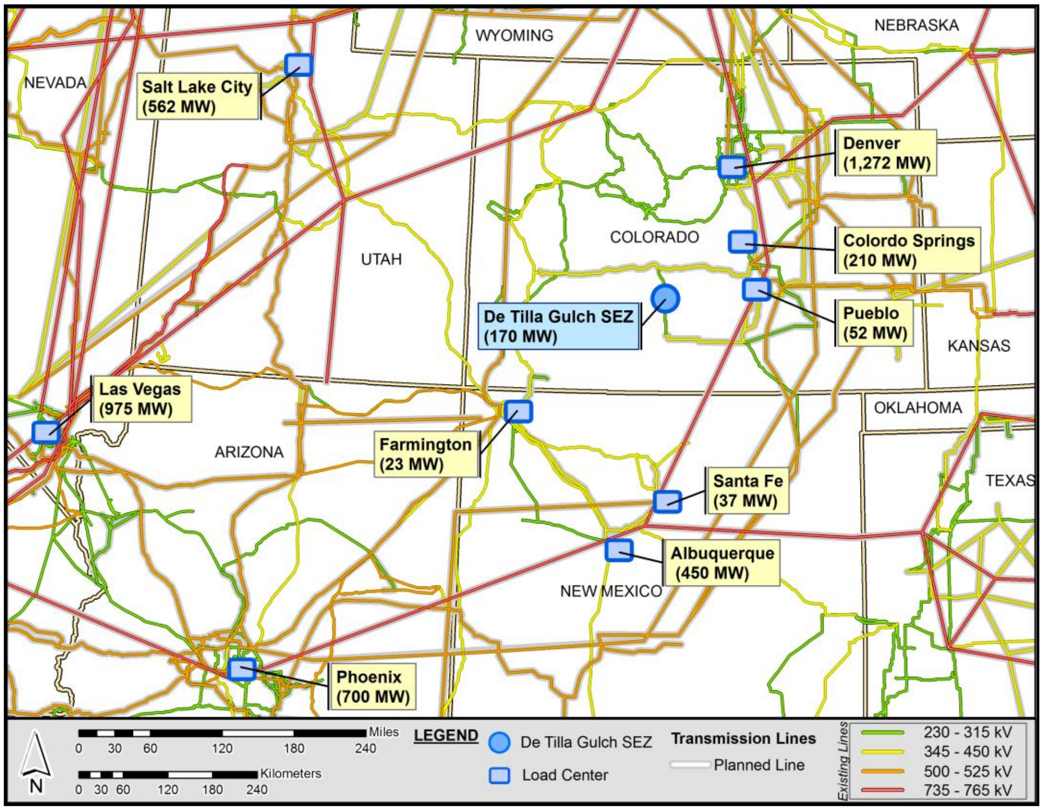

FIGURE 10.2.23.1-1 Location of the Proposed De Tilla Gulch SEZ and Possible Load Areas (Source for background map: Platts 2011)

The two load area groups examined for the De Tilla Gulch SEZ are as follows:

1. Colorado Springs, Colorado, and

2. Denver, Colorado.

Figure 10.2.23.1-2 shows the most economically viable transmission scheme for the De Tilla Gulch SEZ (transmission scheme 1) and Figure 10.2.23.1-3 shows an alternative transmission scheme (transmission scheme 2) that represents a logical choice should transmission scheme 1 be infeasible. As described in Appendix G, the alternative shown in transmission scheme 2 represents the optimum choice if one or more of the primary linkages in transmission scheme 1 are excluded from consideration. The groups provide for linking loads along alternative routes so that the SEZ's output of 170 MW could be fully allocated.

Table 10.2.23.1-1 summarizes and groups the load areas according to their associated transmission scheme and provides details on how the megawatt load for each area was estimated.

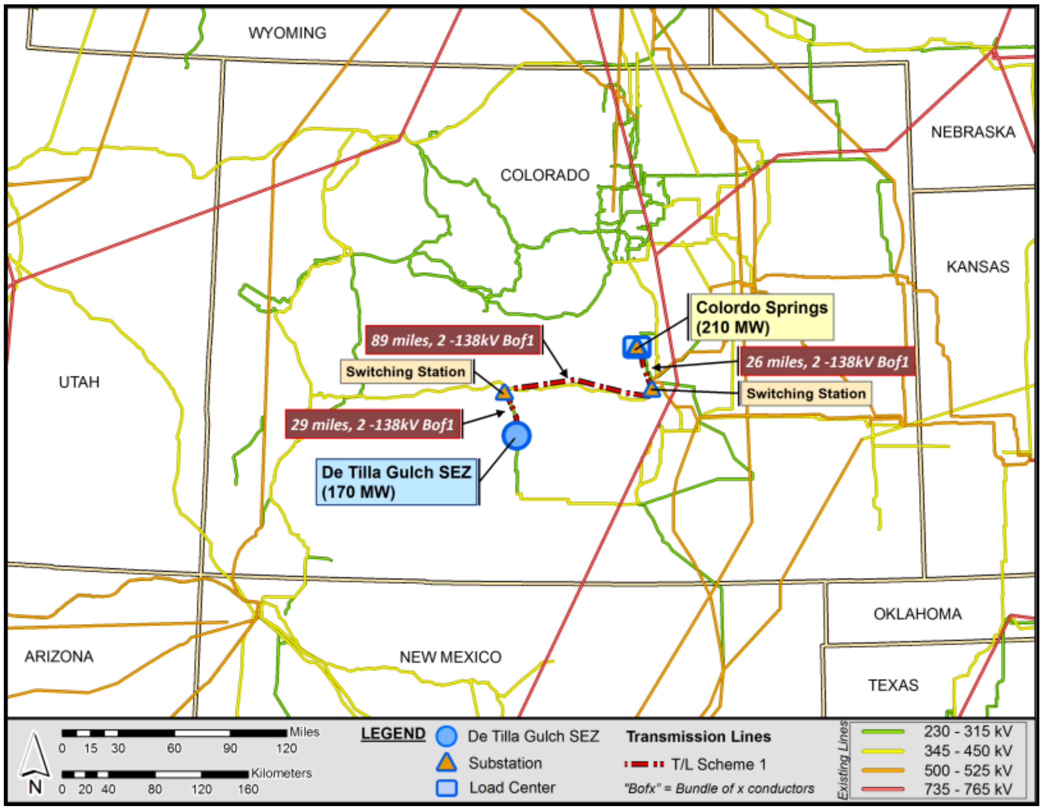

FIGURE 10.2.23.1-2 Transmission Scheme 1 for the Proposed De Tilla Gulch SEZ (Source for background map: Platts 2011)

10.2.23.2 Findings for the DLT Analysis

The DLT analysis approach assumes that the De Tilla Gulch SEZ will require all new construction for transmission lines (i.e., dedicated lines) and substations. The new transmission lines(s) would directly convey the 170-MW output of the De Tilla Gulch SEZ to the prospective load areas for each possible transmission scheme. The approach also assumes that all existing transmission lines in the WECC region are saturated and have little or no available capacity to accommodate the SEZ's output throughout the entire 10-year study horizon.

Figures 10.2.23.1-2 and 10.2.23.1-3 display the pathways that new dedicated lines might follow to distribute solar power generated at the De Tilla Gulch SEZ via the two identified transmission schemes described in Table 10.2.23.1-1. These pathways parallel existing 500-, 345-, 230-kV, and/or lower voltage lines. The intent of following existing lines is to avoid pathways that may be infeasible due to topographical limitations or other concerns.

For transmission scheme 1, serving a load center to the north, a new line would be constructed to connect with Colorado Springs (210 MW), so that the 170-MW output of the De Tilla Gulch SEZ could be fully utilized (Figure 10.2.23.1-2). This particular scheme has three segments. The first segment stretches from the SEZ, running about 29 mi (47 km) north, to the

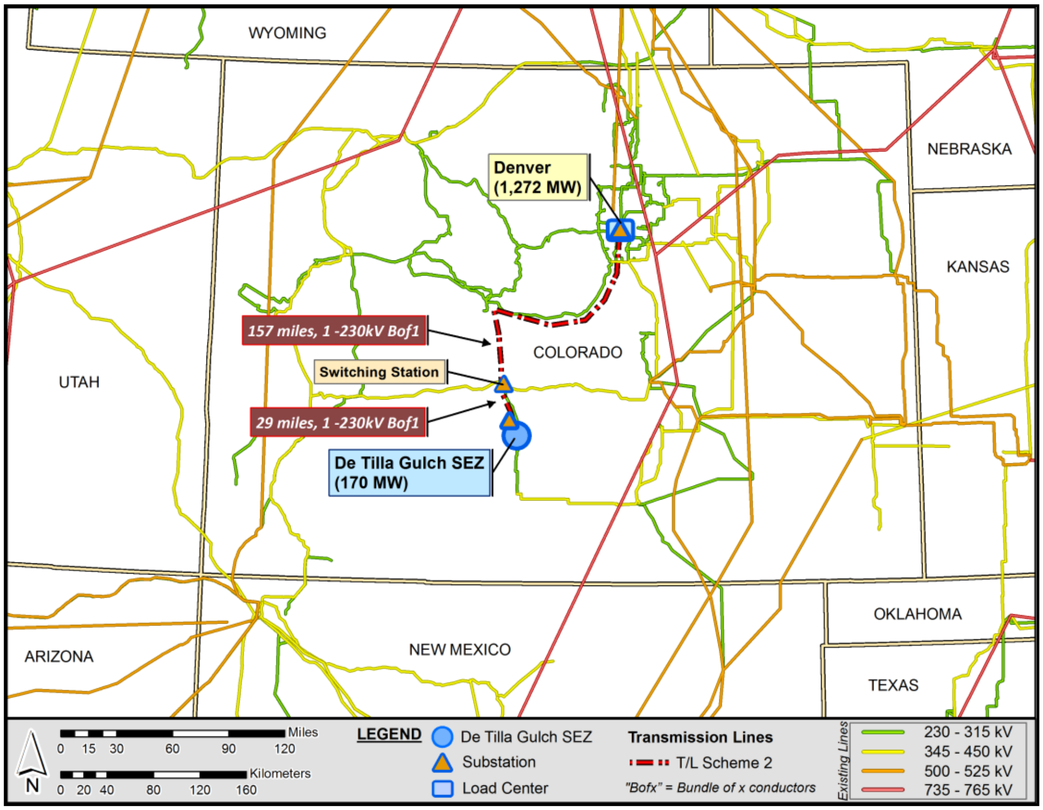

FIGURE 10.2.23.1-3 Transmission Scheme 2 for the Proposed De Tilla Gulch SEZ (Source for background map: Platts 2011)

TABLE 10.2.23.1-1 Candidate Load Area Characteristics for the Proposed De Tilla Gulch SEZ

Transmission Scheme	City/Load Area Name	Position Relative to SEZ	2010 Population[c]	Estimated Total Peak Load (MW)	Estimated Peak Solar Market (MW)
1	Colorado Springs, Colorado[a]	North	420,000	1,050	210
2	Denver, Colorado[b]	North	2,543,000	6,358	1,272

[a] The load area represents the city named.

[b] The load area represents the metropolitan area of Denver (i.e., the identified city plus adjacent communities).

[c] City and metropolitan area population data are from 2010 Census data (U.S. Bureau of the Census 2010).

first switching or junction substation. The second segment extends about 89 mi (143 km) from the first switching station to a second switching substation. The third leg extends 26 mi (42 km) north to Colorado Springs. The transmission configuration options were determined by using the line "loadability" curve provided in American Electric Power's *Transmission Facts* (AEP 2010). Appendix G documents the line options used for this analysis and describes how the load area groupings were determined.

For transmission scheme 2 serving Denver to the northeast, Figure 10.2.23.1-3 shows that a new line would need to be constructed to connect from the SEZ directly to Denver (1,272 MW). The line comprises two segments and has a total length of about 186 mi (301 km). On the basis of engineering and operational considerations, this line would require a single-circuit 230-kV bundle of one conductor (Bof1) design. The design of the transmission lines takes into account the thermal, voltage drop, and steady-state stability limits associated with the operation of the lines.

Table 10.2.23.2-1 summarizes the distances to the various load areas over which new transmission lines would need to be constructed, as well as the assumed number of substations that would be required. One substation is assumed to be installed at each load area and an additional one at the SEZ. Thus, in general, the total number of substations per scheme is simply equal to the number of load areas associated with the scheme plus one. Substations at the load areas would consist of one or more step-down transformers, while the originating substation at the SEZ would consist of several step-up transformers. The originating substation would have a combined substation rating of at least 170 MW (to match the plant's output), while the combined load substations would have a similar total rating of 170 MW. For both schemes 1 and 2, note that several intervening substations or booster stations (also called switching stations) are installed. These substations are installed at junction points where future possible branching could be made. The primary purposes for this specific design are to strengthen the line segments and to provide a voltage-boosting mechanism so that a lower transmission voltage can be utilized to drive the cost down. In general, switching stations carry no local load but are assumed to be equipped with switching gears (e.g., circuit breakers and connecting switches) to reroute power as well as, in some cases, with additional equipment to regulate voltage.

Table 10.2.23.2-2 provides an estimate of the total land area disturbed for construction of new transmission facilities under each of the schemes evaluated. The most favorable transmission scheme with respect to minimizing the costs and area disturbed would be scheme 1, which would serve Colorado Springs and for which the construction of new transmission lines and substations is estimated to disturb about 1,409 acres (5.7 km^2) of land. The second most favorable transmission scheme with respect to minimizing the costs and area disturbed would be scheme 2 (serving Denver). For this scheme, the construction of new transmission lines and substations is estimated to disturb a land area on the order of 3,390 acres (13.7 km^2).

Table 10.2.23.2-3 shows the estimated NPV of both transmission schemes and takes into account the cost of constructing the lines and the substations and the projected revenue stream over the 10-year horizon. A positive NPV indicates that revenues more than offset investments. This calculation does not include the cost of producing electricity.

TABLE 10.2.23.2-1 Potential Transmission Schemes, Estimated Solar Markets, and Distances to Load Areas for the Proposed De Tilla Gulch SEZ

Transmission Scheme	City/Load Area Name	Estimated Peak Solar Market (MW)[c]	Total Solar Market (MW)	Sequential Distance (mi)[d]	Total Distance (mi)[d]	Line Voltage (kV)	No. of Substations
1	Colorado Springs, Colorado[a]	210	210	144	144	138	4
2	Denver, Colorado[b]	1,272	1,272	186	186	230	3

[a] The load area represents the city named.

[b] The load area represents the metropolitan area of Denver (i.e., the identified city plus adjacent communities).

[c] From Table 10.2.23.1-1.

[d] To convert mi to km, multiply by 1.6093.

TABLE 10.2.23.2-2 Comparison of the Various Transmission Line Configurations with Respect to Land Use Requirements for the Proposed De Tilla Gulch SEZ

				Land Use (acres)[d]		
Transmission Scheme	City/Load Area Name	Total Distance (mi)[c]	No. of Substations	Transmission Line	Substation	Total
1	Colorado Springs, Colorado[a]	144	4	1,396.4	12.2	1,408.6
2	Denver, Colorado[b]	186	2	3,381.8	8.1	3,389.9

[a] The load area represents the city named.

[b] The load area represents the metropolitan area of Denver (i.e., the identified city plus adjacent communities).

[c] To convert mi to km, multiply by 1.6093.

[d] To convert acres to km^2, multiply by 0.004047.

TABLE 10.2.23.2-3 Comparison of Potential Transmission Lines with Respect to NPV (Base Case) for the Proposed De Tilla Gulch SEZ

Transmission Scheme	City/Load Area Name	Present Value Transmission Line Cost ($ million)	Present Value Substation Cost ($ million)	Annual Sales Revenue ($ million)	Present Worth of Revenue Stream ($ million)	NPV ($ million)
1	Colorado Springs, Colorado[a]	110.0	11.2	29.8	230.0	108.8
2	Denver, Colorado[b]	204.6	11.2	29.8	230.0	14.2

[a] The load area represents the city named.

[b] The load area represents the metropolitan area of Denver (i.e., the identified city plus adjacent communities).

The most economically attractive configuration (transmission scheme 1) has the highest positive NPV and serves Colorado Springs. The secondary case (transmission scheme 2), which excludes one or more of the primary pathways used in scheme 1, is less economically attractive and focuses on delivering power to Denver. Scheme 2 exhibits a positive but substantially lower NPV than scheme 1 for the assumed utilization factor of 20%.

Table 10.2.23.2-4 shows the effect of varying the value of the utilization factor on the NPV of the transmission schemes. It also shows that as the utilization factor is increased, the economic viability of the lines also increases. Utilization factors can be raised by allowing the new dedicated lines to market other power generation outputs in the region in addition to that of its associated SEZ.

The findings of the DLT analysis for the proposed De Tilla Gulch SEZ are as follows:

- Transmission scheme 1, which identifies Colorado Springs as the primary market, represents the most favorable option based on NPV and land use requirements. This scheme would result in new land disturbance of about 1,409 acres (5.7 km^2).

- Transmission scheme 2, which represents an alternative configuration, serves Denver. In terms of defining potential upper-bound impacts of new transmission infrastructure development, this configuration would result in new land disturbance of about 3,390 acres (13.7 km^2).

- Other load area configurations are possible but would be less favorable than scheme 1 in terms of NPV and, in most cases, also in terms of land use requirements. If new electricity generation at the proposed De Tilla Gulch SEZ is not sent to either of the two markets identified above, the potential upper-bound impacts in terms of cost would be greater.

TABLE 10.2.23.2-4 Effect of Varying the Utilization Factor on the NPV of the Transmission Schemes for the Proposed De Tilla Gulch SEZ

Transmission Scheme	City/Load Area Name	NPV ($ million) at Different Utilization Factors 20%	30%	40%	50%	60%	70%
1	Colorado Springs, Colorado[a]	108.8	223.8	338.8	453.8	568.8	683.7
2	Denver, Colorado[b]	14.2	129.2	244.2	359.2	474.2	589.1

[a] The load area represents the city named.

[b] The load area represents the metropolitan area of Denver (i.e., the identified city plus adjacent communities).

- The analysis of transmission requirements for the proposed De Tilla Gulch SEZ indicates no reduction of impacts from increasing the solar-eligible load assumption for either transmission scheme 1, which brings power to Colorado Springs, or transmission scheme 2, which brings power to Denver. Increasing the solar-eligible percentage would have no effect, because an adequate load area was identified under the 20% assumption that would accommodate all of the SEZ's capacity. Thus, line distances and voltages would not be affected by increasing the solar-eligible load assumption, and, similarly, the associated costs and land disturbance would not be affected.

10.2.24 Impacts of the Withdrawal

The BLM is proposing to withdraw 1,064 acres (4.3 km^2) of public land comprising the proposed De Tilla Gulch SEZ from settlement, sale, location, or entry under the general land laws, including the mining laws, for a period of 20 years (see Section 2.2.2.2.4 of the Final Solar PEIS. The public lands would be withdrawn, subject to valid existing rights, from settlement, sale, location, or entry under the general land laws, including the mining laws. This means that the lands could not be appropriated, sold, or exchanged during the term of the withdrawal, and new mining claims could not be filed on the withdrawn lands. Mining claims filed prior to the segregation or withdrawal of the identified lands would take precedence over future solar energy development. The withdrawn lands would remain open to the mineral leasing, geothermal leasing, and mineral material laws, and the BLM could elect to lease the oil, gas, coal, or geothermal steam resources, or to sell common variety-mineral materials, such as sand and gravel, contained in the withdrawn lands. In addition, the BLM would retain the discretion to authorize linear and renewable energy ROWs on the withdrawn lands.

The purpose of the proposed land withdrawal is to minimize the potential for conflicts between mineral development and solar energy development for the proposed 20-year withdrawal period. Under the land withdrawal, there would be no mining-related surface development, such as the establishment of open pit mining, construction of roads for hauling materials, extraction of ores from tunnels or adits, or construction of facilities to process the material mined, that could preclude use of the SEZ for solar energy development. For the De Tilla Gulch SEZ, the impacts of the proposed withdrawal on mineral resources and related economic activity and employment are expected to be negligible because the mineral potential of the lands within the SEZ is low (BLM 2012). There has been no documented mining within the SEZ, and there are no known locatable mineral deposits within the land withdrawal area. According to the LR2000 (accessed in May 2012), there are no recorded mining claims within the land withdrawal area.

Although the mineral potential of the lands within the De Tilla Gulch SEZ is low, the proposed withdrawal of lands within the SEZ could preclude many types of mining activity over a 20-year period, resulting in the avoidance of potential mining-related adverse impacts. Impacts commonly related to mining development include increased soil erosion and sedimentation, water use, generation of contaminated water in need of treatment, creation of lagoons and ponds (hazardous to wildlife), toxic runoff, air pollution, establishment of noxious weeds and invasive species, habitat destruction or fragmentation, disturbance of wildlife, blockage of migration corridors, increased visual contrast, noise, destruction of cultural artifacts and fossils and/or their context, disruption of landscapes and sacred places of interest to tribes, increased traffic and related emissions, and conflicts with other land uses (e.g., recreational).

10.2.25 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this Final Solar PEIS. It is likely that at the time of publication of this Final Solar PEIS, some of these Web pages may no longer be available or the URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this Final Solar PEIS.

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10.2.26 Errata for the Proposed De Tilla Gulch SEZ

This section presents corrections to material presented in the Draft Solar PEIS and the Supplement to the Draft. The need for these corrections was identified in several ways: through comments received on the Draft Solar PEIS and the Supplement to the Draft (and verified by the authors), through new information obtained by the authors subsequent to publication of the Draft and Supplement, or through additional review of the original material by the authors. Table 10.2.26-1 provides corrections to information presented in the Draft Solar PEIS and the Supplement to the Draft Solar PEIS.

TABLE 10.2.26-1 Errata for the Proposed De Tilla Gulch SEZ (Section 10.2 of the Draft Solar PEIS and Section C.3.2 of the Supplement to the Draft Solar PEIS)

Section No.	Page No.	Line No.	Figure No.	Table No.	Correction
10.2.1.3	10.2-13			10.2.1.3-1	“Weak to moderate contrasts could be observed from the northern portions of the [Baca] NWR,” should read “Weak contrasts could be observed from the northern portions of the NWR.”
10.2.11.2	10.2-202				All uses of the term “neotropical migrants” in the text and tables of this section should be replaced with the term “passerines.”
10.2.15.2.1	10.2-202	31			“If a 10.2-hour daytime...” should read “If a 10-hour daytime...”

10.3 FOURMILE EAST

10.3.1 Background and Summary of Impacts

10.3.1.1 General Information

The proposed Fourmile East SEZ is located in Alamosa County in south-central Colorado. The town of Alamosa is located about 13 mi (21 km) west of the SEZ and had an estimated 2008 population of 8,745. In 2008, the county population was 15,783. U.S. 160 runs from west to east about 0.6 mi (1 km) south of the SEZ, while CO 150 runs north–south near the eastern border of the SEZ; Great Sands Dunes National Park is located about 9 mi (14 km) north of the SEZ on CO 150. The SLRG Railroad serves the area. As of October 28, 2011, there were no pending solar project applications within or adjacent to the SEZ.

As published in the Draft Solar PEIS (BLM and DOE 2010), the proposed Fourmile East SEZ had a total area of 3,882 acres (15.7 km^2) (see Figure 10.3.1.1-1). In the Supplement to the Draft Solar PEIS (BLM and DOE 2011), the size of the SEZ was reduced, eliminating 999 acres (4 km^2) and identifying a total of about 1 acre (0.004 km^2) of dispersed wetlands as a non-development area. The eliminated areas are mainly along the eastern boundary of the SEZ and include a small area on the west side of the proposed SEZ (see Figure 10.3.1.1-2). Eliminating these areas is primarily intended to avoid or minimize impacts on known cultural resources, a historic playa basin, Caminos Antiguos Scenic Byway, the Old Spanish National Historic Trail, the Pike National Historic Trail, big game winter range, and important riparian habitat. The remaining developable area within the SEZ area is 2,882 acres (11.7 km^2).

Because of the extensive potential impacts from solar development in the portion of the Fourmile East SEZ that has been eliminated, those lands are proposed as solar ROW exclusion areas; that is, applications for solar development on those lands will not be accepted by the BLM.

The analyses in the following sections update the affected environment and potential environmental, cultural, and socioeconomic impacts associated with utility-scale solar energy development in the Fourmile East SEZ as described in the Draft Solar PEIS.

10.3.1.2 Development Assumptions for the Impact Analysis

Maximum development of the proposed Fourmile East SEZ was assumed to be 80% of the total SEZ area over a period of 20 years, a maximum of 2,306 acres (9.3 km^2) (Table 10.3.1.2-1). Full development of the Fourmile East SEZ would allow development of facilities with an estimated total of between 256 MW (power tower, dish engine, or PV technologies, 9 acres/MW [0.04 km^2/MW]) and 461 MW (solar trough technologies, 5 acres/MW [0.02 km^2/MW]) of electrical power capacity.

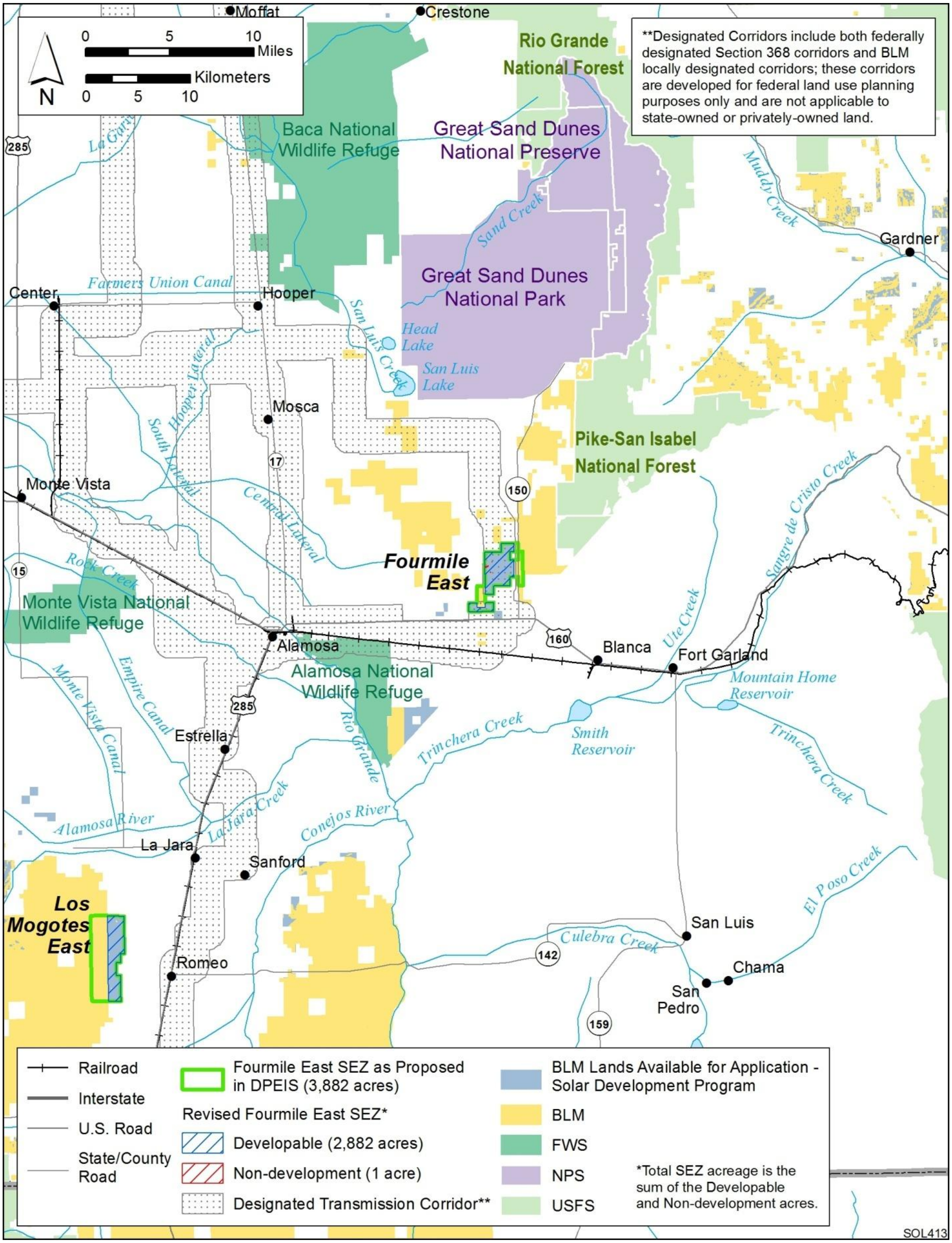

FIGURE 10.3.1.1-1 Proposed Fourmile East SEZ as Revised

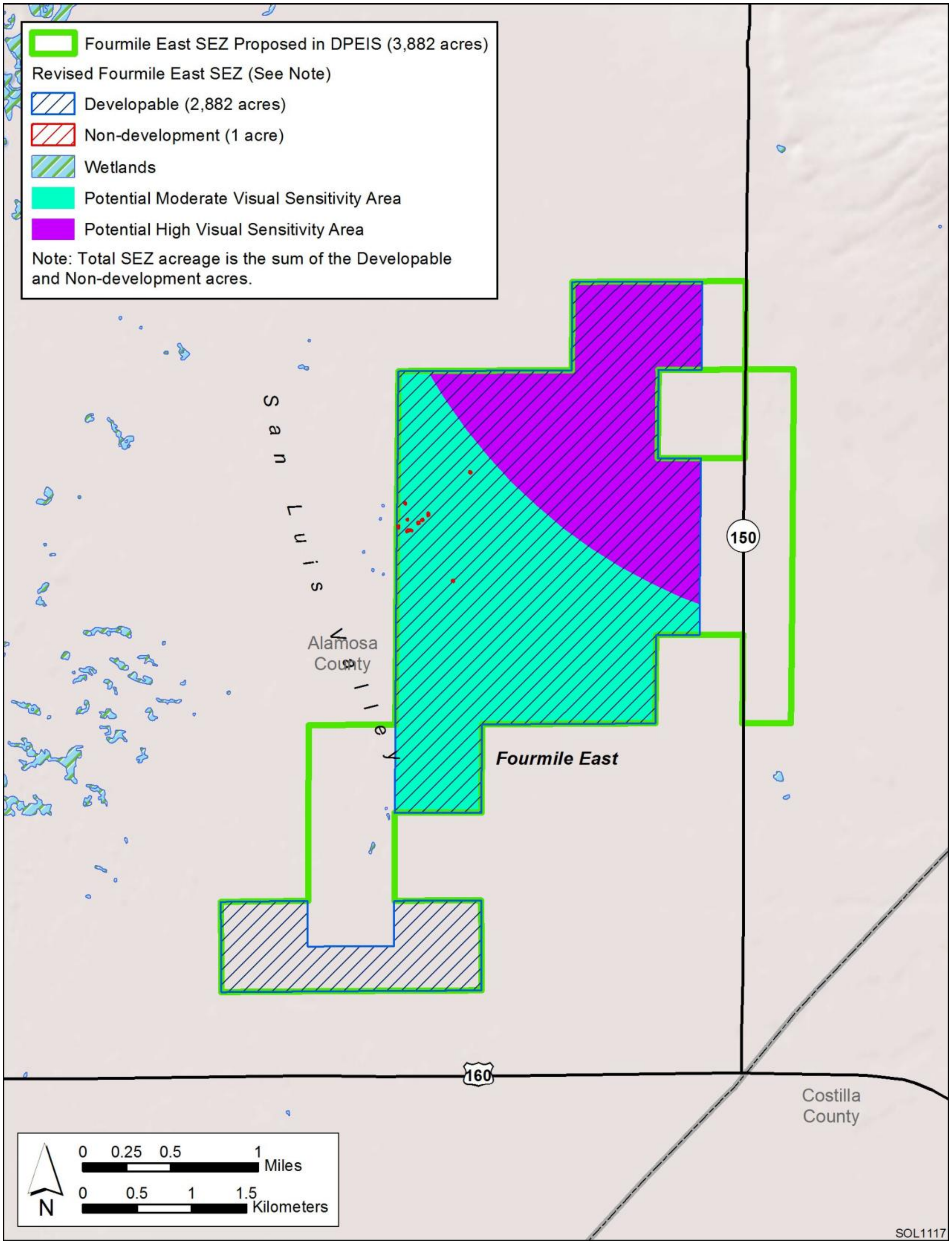

FIGURE 10.3.1.1-2 Developable and Non-development Areas for the Proposed Fourmile East SEZ as Revised

TABLE 10.3.1.2-1 Assumed Development Acreages, Solar MW Output, and Nearest Major Access Road and Transmission Line for the Proposed Fourmile East SEZ as Revised

Total Developable Acreage and Assumed Developed Acreage (80% of Total)	Assumed Maximum SEZ Output for PV Technologies	Distance to Nearest State, U.S., or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Assumed Area of Road ROW	Distance to Nearest BLM-Designated Transmission Corridor[e]
2,882 acres[a] and 2,306 acres	256 MW[b] 461 MW[c]	Adjacent (CO 150)	2 mi[d] and 69 kV	0 acres	Adjacent/ through[f]

[a] To convert acres to km^2, multiply by 0.004047.

[b] Maximum power output if the SEZ were fully developed using PV technologies, assuming 9 acres/MW (0.04 km^2/MW) of land required.

[c] Maximum power output if the SEZ were fully developed using solar trough technologies, assuming 5 acres/MW (0.02 km^2/MW) of land required.

[d] To convert mi to km, multiply by 1.609.

[e] BLM-designated corridors are developed for federal land use planning purposes only and are not applicable to state-owned or privately owned land.

[f] A BLM locally designated corridor covers the entire proposed Fourmile East SEZ.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. For the proposed Fourmile East SEZ, the nearest existing transmission line as identified in the Draft Solar PEIS is a 69-kV line 2 mi (3.2 km) south of the SEZ. It is possible that a new transmission line could be constructed from the SEZ to the nearest existing line, but the 69-kV capacity of that line would be inadequate for 256 to 461 MW of new capacity. Therefore, at full build-out capacity, new transmission lines and possibly upgrades of existing transmission lines would be required to bring electricity from the proposed Fourmile East SEZ to load centers. An assessment of the most likely load center destinations for power generated at the Fourmile East SEZ and a general assessment of the impacts of constructing and operating new transmission facilities to those load centers are provided in Section 10.3.23. In addition, the generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5 of this Final Solar PEIS. Project-specific analyses would also be required to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

The transmission assessment for the Fourmile East SEZ has been updated, and the hypothetical transmission corridor assessed in the Draft Solar PEIS is no longer applicable. For this updated assessment, the 61 acres (0.25 km^2) of land disturbance for a hypothetical transmission corridor to the existing transmission line is no longer assumed (although the impacts of required new transmission overall are addressed in Section 10.3.23).

Most of the Fourmile East SEZ overlaps a locally designated transmission corridor that does not currently contain any transmission facilities. For this impact assessment, it is assumed that up to 80% of the proposed SEZ could be developed. This does not take into account the potential limitations to solar development that may result from siting constraints associated with the corridor. The development of solar facilities and the existing corridor will be dealt with by the BLM on a case-by-case basis. See Section 10.3.2.2 on impacts on lands and realty for further discussion.

For the proposed Fourmile East SEZ, both CO 150 and U.S. 160 run within 1 mi (2 km) of the SEZ. Existing road access to the proposed Fourmile East SEZ should be adequate to support construction and operation of solar facilities. No additional road construction outside of the SEZ is assumed to be required to support solar development, as summarized in Table 10.3.1.2-1.

10.3.1.3 Programmatic and SEZ-Specific Design Features

The proposed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Section A.2.2 of Appendix A of this Final Solar PEIS. These programmatic design features are intended to avoid, minimize, and/or mitigate adverse impacts from solar energy development and will be required for development on all BLM-administered lands, including SEZ and non-SEZ lands.

The discussions below addressing potential impacts from solar energy development on specific resource areas (Sections 10.3.2 through 10.3.22) also provide an assessment of the effectiveness of the programmatic design features in mitigating adverse impacts from solar development within the SEZ. SEZ-specific design features to address impacts specific to the proposed Fourmile East SEZ may be required in addition to the programmatic design features. The proposed SEZ-specific design features for the Fourmile East SEZ have been updated on the basis of revisions to the SEZ since the Draft Solar PEIS (such as boundary changes and the identification of non-development areas), and on the basis of comments received on the Draft and Supplement to the Draft Solar PEIS. All applicable SEZ-specific design features identified to date (including those from the Draft Solar PEIS that are still applicable) are presented in Sections 10.3.2 through 10.3.22.

10.3.2 Lands and Realty

10.3.2.1 Affected Environment

The total developable acreage of the proposed Fourmile East SEZ has been reduced to 2,882 acres (11.7 km^2), with an assumed developable area (80%) of 2,306 acres (9.3 km^2). The description of the condition of the SEZ contained in the Draft Solar PEIS remains accurate, with the exception that because of the boundary change, CO 50 no longer passes through the SEZ. It now is located 0.25 mi (0.4 km) east of the eastern border of the SEZ, and a short road ROW would be required to access the SEZ from the highway. The boundary adjustment of the SEZ has also resulted in a 400-acre (1.6-km^2) portion of the southwestern corner of the proposed SEZ not being contiguous with the rest of the SEZ (Figure 10.3.1.1-1). Access to this detached parcel of the SEZ would require a separate ROW of about 0.5 mi (0.8 km). A BLM-designated transmission corridor covers all of the proposed SEZ.

10.3.2.2 Impacts

Full development of the SEZ would disturb up to 2,306 acres (9.3 km^2) and would exclude many existing and potential uses of the public land. Because the SEZ is undeveloped and rural, utility-scale solar energy development would introduce a new and discordant land use into the area. The boundary adjustment of the SEZ has further fragmented the public land ownership in the area and may make the isolated public lands more difficult to manage. If the public lands are developed for solar energy production, similar development could be induced on neighboring state and private lands with landowner agreement.

Most of the proposed Fourmile East SEZ overlaps a locally designated transmission corridor. This existing corridor will be used primarily for the siting of transmission lines and other infrastructure such as pipelines. The existing corridor will be the preferred location for any transmission development that is required to support solar development and future transmission grid improvements related to the build-out of the Fourmile East SEZ. Any use of the corridor lands within the Fourmile East SEZ for solar energy facilities, such as solar panels or heliostats, must be compatible with the future use of the existing corridor. The BLM will assess solar projects in the vicinity of the existing corridor on a case-by-case basis. The BLM will review and approve individual project plans of development to ensure compatible development that maintains the use of the corridor.

The additional description of impacts in the Draft Solar PEIS remains valid.

10.3.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on lands and realty activities are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide some mitigation for identified impacts but will not mitigate all adverse impacts. For example, impacts related to the exclusion of many existing and potential uses of the public land, the visual impact of an industrial-type solar facility within an otherwise rural area, and induced land use changes on state and private lands, if any, may not be fully mitigated.

No SEZ-specific design features for lands and realty have been identified through this Final Solar PEIS, Some SEZ-specific design features may be established for parcels within the Fourmile East SEZ through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.3 Specially Designated Areas and Lands with Wilderness Characteristics

10.3.3.1 Affected Environment

The affected environment section in the Draft Solar PEIS is generally accurate, with some corrections and modifications. A recently maintained inventory of wilderness characteristics was used to determine whether public lands within the SEZ have wilderness characteristics. The finding of this inventory was that these lands do not contain wilderness characteristics.

Because the eastern boundary of the proposed SEZ has been shifted to the west, the route of the Old Spanish Trail is now about 1.25 mi (2 km) from the SEZ at the nearest point.

10.3.3.2 Impacts

The description of impacts presented in the Draft Solar PEIS remains valid, with the following updates. While the size of the proposed SEZ has been reduced by 999 acres (4 km^2), solar energy development of the remaining portion of the SEZ will still result in the development of a very large industrial site in an area that otherwise is currently rural. Elevated and relatively nearby viewpoints such as Blanca Peak and the slightly elevated portions of the Old Spanish National Historic Trail will still have significant views of development within the SEZ. A high-potential segment of the Trail has been identified directly to the northeast of the SEZ. Solar development in the SEZ may have a major impact on the historic and visual integrity of the Blanca Peak and the Trail.

Tall facilities such as power towers would have a larger visual impact than shorter facilities. Site-specific analysis, including consideration of the potential for visible glint and glare from solar facility mirrors and panels, will need to be completed before impacts can be fully assessed. Because of the proximity of the SEZ to the Blanca Wetlands ACEC/SRMA, it is likely there will be an adverse impact on visitor use of the portion of the ACEC/SRMA nearest to the SEZ. Where the scenic highway passes within 0.25 mi (0.4 km) to 0.50 mi (0.8 km) from the boundary of the SEZ, development within the SEZ still would be very visible and has the potential to detract from the visitor experience on the highway. The westward relocation of the eastern boundary of the SEZ will remove the “tunnel effect” that would have been created by development on both sides of the highway and will reduce the impact on highway users. There also is potential for adverse impact on the Sangre de Cristo NHA.

10.3.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on specially designated areas are described in Section A.2.2 of Appendix A of this Final Solar PEIS (design features for specially designated areas, cultural resources, and visual resources would address impacts). Implementing the programmatic design features will provide some mitigation for the identified impacts. Exceptions to this may include impacts on recreational users of the Blanca Wetlands ACEC, impacts on wilderness characteristics in the Sangre de Cristo WA, and, impacts on users of the Los Antiguos Scenic Byway. Programmatic design features will be applied to address SEZ-specific resources and conditions, for example:

- For projects in the Fourmile East SEZ that are located within the viewshed of the Old Spanish National Historic Trail, a National Trail inventory will be required to determine the area of possible adverse impact on resources, qualities, values, and associated settings of the Trail; to prevent substantial interference; and to determine any areas unsuitable for development. Residual impacts will be avoided, minimized, and/or mitigated to the extent practicable according to program policy standards. Programmatic design features have been included in BLM's Solar Energy Program to address impacts on National Historic Trails (see Section A.2.2.23 of Appendix A).

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design feature has been identified:

- As part of project-specific analysis, early consultation should be initiated with the entity responsible for developing the management plan for the Sangre de Cristo NHA to understand how development could be consistent with the goals of the NHA.

The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.4 Rangeland Resources

10.3.4.1 Livestock Grazing

10.3.4.1.1 Affected Environment

The analysis in the Draft Solar PEIS indicated that there are two BLM seasonal grazing allotments that would be affected by the proposed SEZ. Since the eastern boundary of the SEZ has been moved about 0.25 mi (0.4 km) west of CO 150, only the Tobin Allotment now would be affected by the SEZ. About 44% of the Tobin Allotment is now located within the SEZ, and the allotment permittee is authorized to graze 139 AUMs.

10.3.4.1.2 Impacts

For the SEZ as presented in the Draft Solar PEIS, about 60% of the Tobin allotment was within the SEZ, and it was assumed to be likely that the grazing permit on the public lands would be cancelled and that all 139 AUMs would be lost. This is still a likely outcome, although a smaller percentage (44%) of the allotment is within the proposed SEZ. For the purposes of this Final Solar PEIS, it is assumed that the allotment would be cancelled and the permittee would be displaced. In this scenario, all 139 AUMs would be lost. While the specific situation of the grazing permittee is not known, it is clear that loss of all or part of the grazing permit would be a significant adverse impact. Economic losses would not be limited to the value of the lost grazing opportunity but would extend to the value of the overall ranch operation, including any private lands tied to the grazing operation. While the permittee would be reimbursed for the portion of the value of range improvements on the permits, this would cover their economic loss.

10.3.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on livestock grazing are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide some mitigation for identified impacts should only portions of the grazing permit be affected, but they would not mitigate a complete loss of the grazing permit, any loss of livestock AUMs, or the loss of value in the ranching operations including private land values.

No SEZ-specific design features to protect livestock grazing have been identified in this Final Solar PEIS. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.4.2 Wild Horses and Burros

10.3.4.2.1 Affected Environment

As presented in the Draft Solar PEIS, no wild horse or burro HMAs occur within the proposed Fourmile East SEZ or in proximity to it. The reduced size of the SEZ does not alter these data.

10.3.4.2.2 Impacts

As presented in the Draft Solar PEIS, solar energy development within the proposed Fourmile East SEZ would not affect wild horses and burros. The reduction in size of the SEZ does not affect this conclusion.

10.3.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

Because solar energy development within the proposed Fourmile East SEZ would not affect wild horses and burros, no SEZ-specific design features to address wild horses and burros have been identified in this Final Solar PEIS.

10.3.5 Recreation

10.3.5.1 Affected Environment

The area of the proposed Fourmile East SEZ has been reduced by about 26%, to 2,882 acres (11.7 km^2), by removing areas mainly along the eastern boundary of the SEZ.

Commenters have pointed out that most of the recreational discussion in the Draft Solar PEIS was focused internally within the SEZ and did not address the larger part that public and other federal lands play in the landscape and tourism economy of the San Luis Valley. A summary of the better-known attractions within the valley includes Great Sand Dunes National Park and Preserve, the Old Spanish National Historic Trail, two scenic railroads, the Los Caminos Antiguos Scenic Byway, the Sangre de Cristo Mountains, three national wildlife refuges, and numerous designated wilderness areas; these are among the highlights of the recreational and tourism opportunities on federal lands in the area. Tourism is an important part of the valley economy and an important focus for future economic growth.

The land within the Fourmile East SEZ is flat, plain, and not an important recreational use area, but it is adjacent to both U.S. 160 and CO 150, which make up part of the heavily traveled and important visitor route, the Los Caminos Antiguos Scenic Byway, also the main access route into Great Sand Dunes National Park. In addition, the SEZ sits near the base of the magnificent Sangre de Cristo Mountains and 14,345-ft (4,372-m) Blanca Peak, which is the fourth-highest mountain in Colorado. The Rio Grande Scenic Railroad runs east–west about 2.5 mi (4 km) south of the SEZ.

10.3.5.2 Impacts

Solar development of the SEZ still will be readily visible to travelers on the Los Caminos Antiguos Scenic Byway and to travelers headed to the national park and preserve, but the modification to the SEZ that removes the potential development on the east side of CO 150 will reduce the level of impact on travelers and on the view of the Sangre de Cristos and Blanca Peak. The boundary change will also provide additional distance between the SEZ and the Old Spanish National Historic Trail, but it is anticipated that the viewshed of the Trail would still be adversely affected. Whether there will be any adverse impacts on recreational visitors traveling to the national park or visiting the Trail is not known. Visual impacts on surrounding recreational areas would be greater with taller solar facilities such as power towers and facilities with wet cooling. Visitors to areas located at elevations higher than that of the SEZ (e.g., Great Sand Dunes National Park, Zapata Falls recreation area, Sangre de Cristo wilderness areas) will see the solar development within the SEZ, but the impact on recreational use of these areas is unknown at this time. Whether there is significant glint or glare from reflective surfaces of solar facilities and what types of technologies might be employed will have a big impact on visibility. The focus and intent of the relatively new Sangre de Cristo NHA is not yet well defined, so it has not been possible to assess how solar development may interact with the objectives of the NHA.

There may be some potential to provide interpretive activities focused on solar energy and development that would be of interest to travelers.

In addition, lands that are outside of the proposed SEZ may be acquired or managed for mitigation of impacts on other resources (e.g., sensitive species). Managing these lands for mitigation could further exclude or restrict recreational use, potentially leading to additional losses in recreational opportunities in the region. The impact of acquisition and management of mitigation lands would be considered as a part of the environmental analysis of specific solar energy projects.

10.3.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on resources are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will help reduce impacts of individual solar projects but will not address the larger question of what level of solar energy development would cause adverse impacts on tourism and recreational segments of the local economy. In addition, implementing the programmatic design features for recreation will not mitigate the loss of recreation access to public lands developed for solar energy production.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes in the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design feature has been identified:

- Tourism is an important economic growth area for the San Luis Valley, and the four proposed SEZs are located in visible locations adjacent to the principal highway routes into the valley. Because of the location of the SEZs, there is potential to influence visitors’ perception of the tourism climate in the valley. As projects are proposed for the SEZs, the potential impacts on tourism should be considered and reviewed with local community leaders.

The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.6 Military and Civilian Aviation

10.3.6.1 Affected Environment

Although the size of the SEZ has been reduced, the remaining proposed SEZ is still located under an MTR and is identified by the BLM as an area of required consultation with the DoD.

10.3.6.2 Impacts

Through comments on the Draft Solar PEIS, the military has indicated that it has no concerns about potential impacts on its activities associated with solar development. There also are no anticipated impacts on civilian aviation.

10.3.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on military and civilian aviation are described in Section A.2.2 of Appendix A of this Final Solar PEIS. The programmatic design features require early coordination with the DoD to identify and avoid, minimize, and/or mitigate, if possible, any potential impacts on the use of military airspace.

No SEZ-specific design features for military and civilian aviation have been identified in this Final Solar PEIS. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.7 Geologic Setting and Soil Resources

10.3.7.1 Affected Environment

10.3.7.1.1 Geologic Setting

Data provided in the Draft Solar PEIS remain valid, with the following update:

- The terrain of the proposed Fourmile East SEZ is relatively flat with a very gentle dip to the west and northwest (Figure 10.3.7.1-1). The boundaries of the Fourmile East SEZ have been changed to eliminate 999 acres (4.0 km^2), mainly along the eastern boundary of the SEZ, as well as a small area on the west side. Within this area, additional small wetland areas with a total area of about 1 acre (0.0040 km^2) have been identified as a non-development area. Based on these changes, the elevations range from about 7,660 ft (2,335 m) near the new northeastern corner of the site to less than 7,600 ft (2,316 m) along its western boundary.

10.3.7.1.2 Soil Resources

Data provided in the Draft Solar PEIS remain valid, with the following updates:

- Soils within the proposed Fourmile East SEZ as revised are predominantly the loamy fine sands and loamy sands of the Space City, Hooper, and Mosca

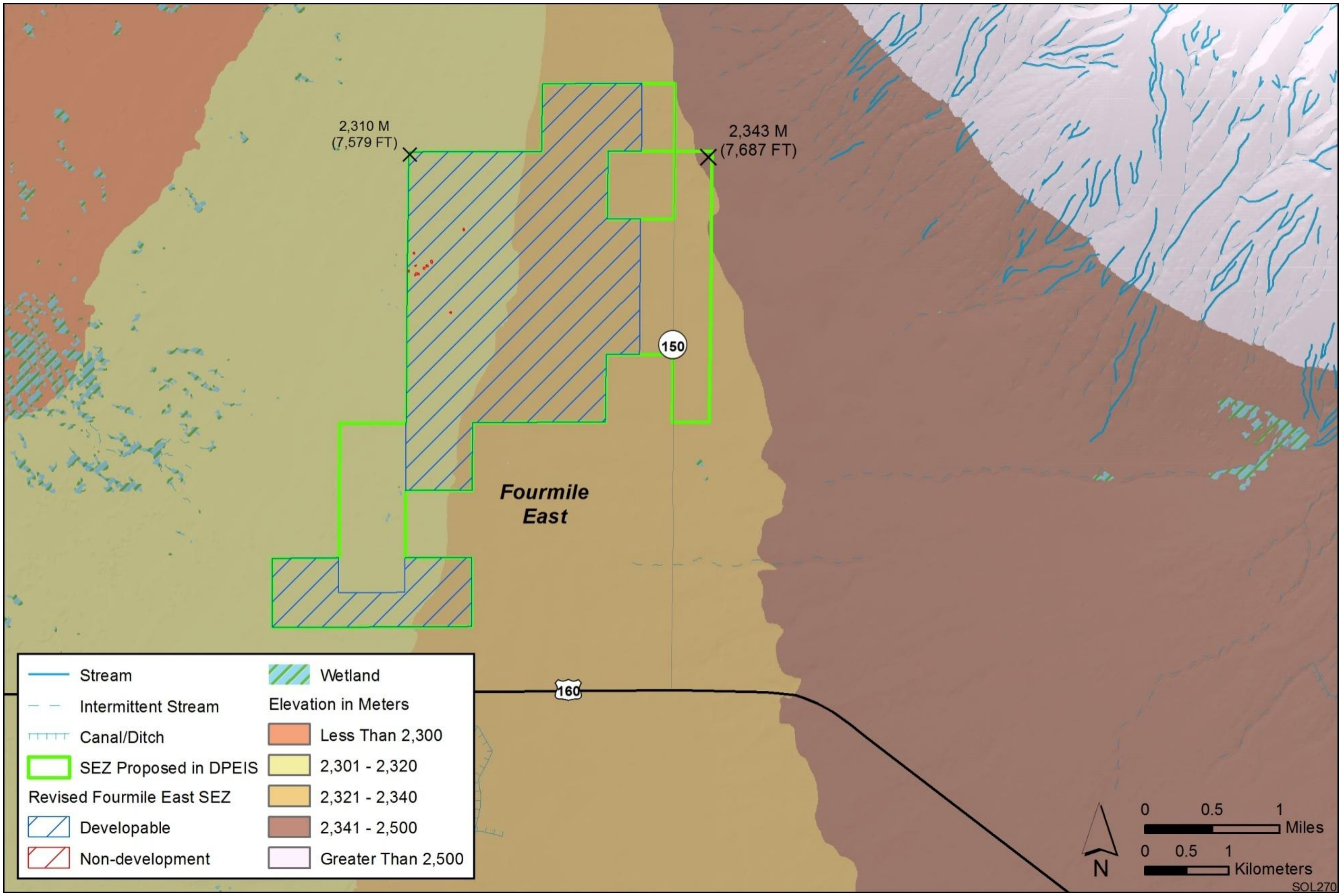

FIGURE 10.3.7.1-1 General Terrain of the Proposed Fourmile East SEZ as Revised

Series, which now make up about 86% of the soil coverage at the site. Dune land soils still cover less than 1% of the SEZ.

- Soil unit coverage at the proposed Fourmile East SEZ as revised is shown in Figure 10.3.7.1-2. The new SEZ boundaries eliminate 622 acres (2.5 km^2) of the Space City loamy fine sand (0 to 3% slopes), 167 acres (0.66 km^2) of the Laney loam, 151 acres (0.61 km^2) of the Hooper clay loam, 59 acres (0.24 km^2) of the Corlett–Hooper complex, and 1 acre (0.0040 km^2) of the Hooper loamy sand (non-development wetland areas) (Table 10.3.7.1-1).

10.3.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar project. The assessment provided in the Draft Solar PEIS remains valid, with the following update:

- Impacts related to wind erodibility are reduced because the new SEZ boundaries eliminate 833 acres (3.4 km^2) of highly erodible soils and 167 acres (0.66 km^2) of moderately erodible soils from development. The coverage by dune land sands (13 acres, or 0.053 km^2), which have a high wind erosion potential, remains the same.

10.3.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on soils are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will reduce the potential for soil impacts during all project phases.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design feature for soil resources has been identified:

- The need for a study of the eolian processes that maintain the sand dune fields in Great Sand Dunes National Park should be determined. The study would support the assessment of whether building a solar facility close to the park could have impacts on the sand dunes there (by disrupting these processes).

The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

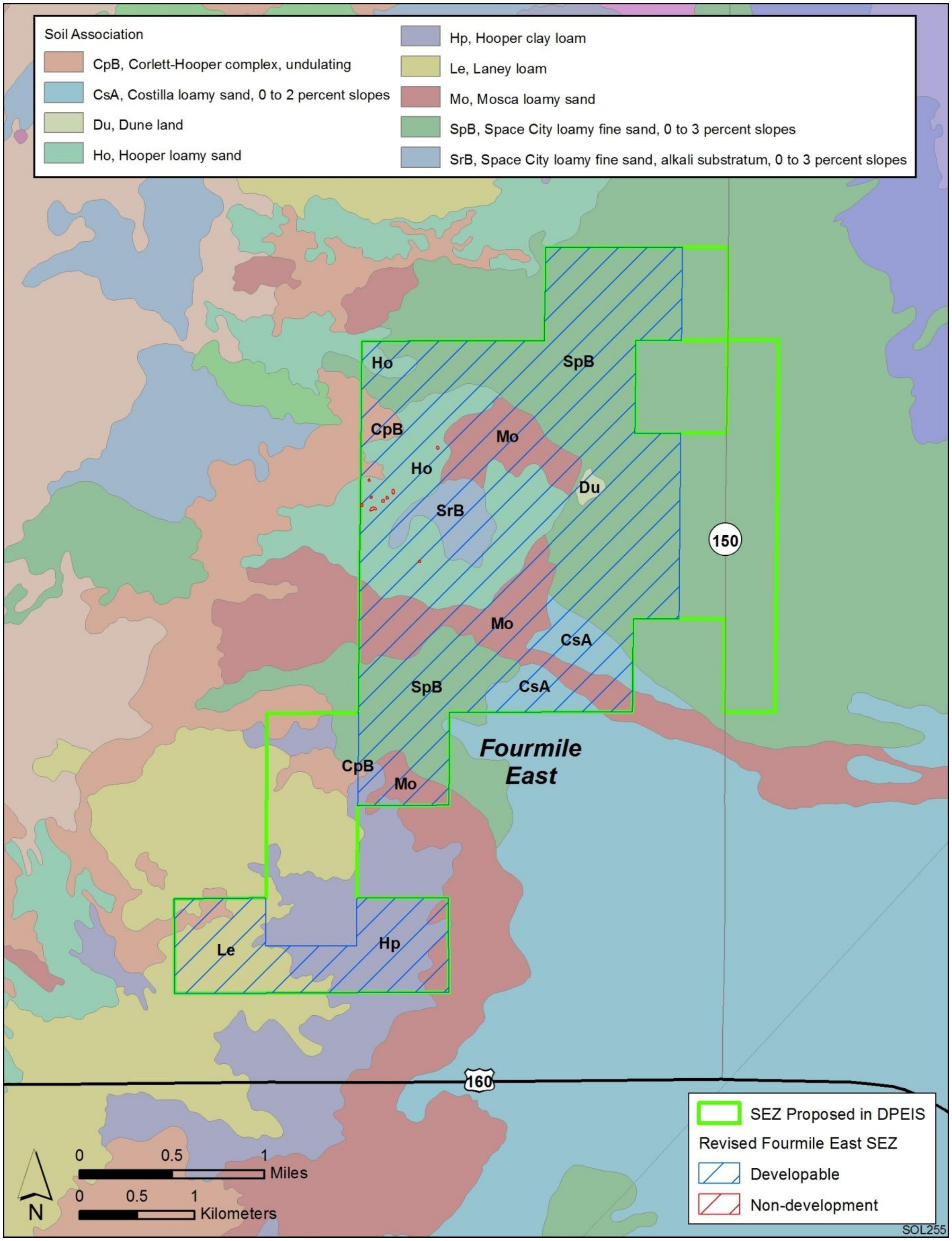

FIGURE 10.3.7.1-2 Soil Map for the Proposed Fourmile East SEZ as Revised (Source: NRCS 2008)

TABLE 10.3.7.1-1 Summary of Soil Map Units within the Proposed Fourmile East SEZ as Revised

Map Unit Symbol	Map Unit Name	Erosion Potential		Description	Area, in Acres[c] (Percentage of SEZ)
		Water[a]	Wind[b]		
SpB	Space City loamy fine sand (0 to 3% slope)	Slight	High (WEG 2)[d]	Level to nearly level soils along isolated low ridges on the valley floor. Parent material consists of eolian sands derived from igneous rock. Somewhat excessively drained with high surface-runoff potential (low infiltration rate) and rapid permeability. Shrink-swell potential is low. Available water capacity is low. Moderate rutting hazard. Used mainly as rangeland.	1,264 (44.9)
Mo	Mosca loamy sand	Slight	High (WEG 2)	Nearly level soils on floodplains. Parent material consists of alluvium derived from igneous rock. Deep and well drained with moderate surface-runoff potential and moderate permeability; moderately to strongly alkaline. Shrink-swell potential is low. Available water capacity is low. Moderate rutting hazard. Used locally for irrigated crops and pastureland. Farmland of unique importance.[e]	466 (16.2)
Ho	Hooper loamy sand	Slight	High (WEG 2)	Level to nearly level soils on floodplains. Parent material consists of alluvium derived from igneous rock. Deep and well drained with high surface-runoff potential (low infiltration rate) and slow permeability; strongly alkaline. Shrink-swell potential is low to moderate. Available water capacity is low. Moderate rutting hazard. Used mainly as rangeland.	463 (16.1)[f]
Hp	Hooper clay loam	Slight	High (WEG 1)	Level to nearly level soils on floodplains. Parent material consists of alluvium derived from igneous rock. Deep and well drained with high surface runoff potential (low infiltration rate) and slow permeability; strongly alkaline. Most areas are without vegetation; provides some cover for wildlife. Shrink-swell potential is moderate to high. Available water capacity is very low. Severe rutting hazard. Used mainly as rangeland.	203 (7.1)

TABLE 10.3.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Erosion Potential: Water[a]	Erosion Potential: Wind[b]	Description	Area, in Acres[c] (Percentage of SEZ)
Le	Laney loam	Slight	Moderate (WEG 4)	Nearly level soils on floodplains. Parent material consists of alluvium derived from igneous rock. Deep and well drained, with moderate surface-runoff potential and moderate permeability. Shrink-swell potential is low to moderate. Available water capacity is moderate. Severe rutting hazard. Used mainly as rangeland.	174 (6.1)
CsA	Costilla loamy sand (0 to 2%)	Slight	High (WEG 1)	Level to nearly level soils on floodplains. Parent material consists of wind-worked alluvium. Deep and somewhat excessively drained with low runoff potential (high infiltration rate) and rapid permeability. Shrink-swell potential is low. Available water capacity is low. Moderate rutting hazard. Used locally for irrigated cropland.	150 (5.2)
SrB	Space City loamy fine sand, alkali substratum (0 to 3% slope)	Slight	High (WEG 2)	Level to nearly level soils along isolated low ridges on the valley floor. Parent material consists of eolian sands derived from igneous rock. Somewhat excessively drained, with low surface runoff potential (high infiltration rate) and rapid permeability. Strongly alkaline below 24 in.[g] Shrink-swell potential is low. Available water capacity is low. Moderate rutting hazard. Used mainly as rangeland.	94 (3.3)
CpB	Corlett–Hooper complex, undulating	Slight	High (WEG 1)	Composed of 45% Corlett sand and loamy sand, 40% Hooper loamy sand and sandy loam, and 15% minor components. Parent material consists of eolian deposits; soils occur on and between sand dunes. Undulating, deep and moderately well drained with low surface runoff potential (high infiltration rate) and rapid permeability. Shrink-swell potential is low. Available water capacity is very low. Severe rutting hazard.	56 (1.9)

TABLE 10.3.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Erosion Potential: Water[a]	Erosion Potential: Wind[b]	Description	Area, in Acres[c] (Percentage of SEZ)
u	Dune land	Very severe	High (WEG 1)	Constantly shifting medium-grained sand deposited by wind blowing across the valley. Parent material consists of eolian sands. Little or no vegetation; low surface runoff potential (high infiltration rate) and very rapid permeability. Shrink-swell potential is low. Available water capacity is very low. Severe rutting hazard.	13 (<1)

a Water erosion potential rates the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. The ratings are based on slope and soil erosion factor K and represent soil loss caused by sheet or rill erosion where 50 to 75% of the surface has been exposed by ground disturbance. A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions. A rating of "very severe" indicates that significant erosion is expected; loss of soil productivity and damage are likely and erosion control measures are costly and generally impractical.

b Wind erosion potential here is based on the wind erodibility group (WEG) designation: groups 1 and 2, high; groups 3 through 6, moderate; and groups 7 and 8, low (see footnote d for further explanation).

c To convert acres to km^2, multiply by 0.004047.

d WEGs are based on soil texture, content of organic matter, effervescence of carbonates, content of rock fragments, and mineralogy, and also take into account soil moisture, surface cover, soil surface roughness, wind velocity and direction, and the length of unsheltered distance (USDA 2004). Groups range in value from 1 (most susceptible to wind erosion) to 8 (least susceptible to wind erosion). The NRCS provides a wind erodibility index, expressed as an erosion rate in tons per acre (4,000 m^2) per year, for each of the wind erodibility groups: WEG 1, 220 tons (200 metric tons) per acre (4,000 m^2) per year (average); WEG 2, 134 tons (122 metric tons) per acre (4,000 m^2) per year; WEGs 3 and 4 (and 4L), 86 tons (78 metric tons) per acre (4,000 m^2) per year; WEG 5, 56 tons (51 metric tons) per acre (4,000 m^2) per year; WEG 6, 48 tons (44 metric tons) per acre (4,000 m^2) per year; WEG 7, 38 tons (34 metric tons) per acre (4,000 m^2) per year; and WEG 8, 0 tons (0 metric tons) per acre (4,000 m^2) per year.

e Farmland is of unique importance for the production of food, feed, fiber, forage, or oilseed crops.

f One acre (0.0040 km^2) within the Hooper loamy sand is currently categorized as a non-development area (denoted by red areas in Figure 10.3.7.1-2).

g To convert in. to cm, multiply by 2.54.

Sources: NRCS (2009); USDA (1968).

10.3.8 Minerals (Fluids, Solids, and Geothermal Resources)

A mineral potential assessment for the proposed Fourmile East SEZ has been prepared and reviewed by BLM mineral specialists knowledgeable about the region where the SEZ is located (BLM 2012). The BLM is proposing to withdraw the SEZ from settlement, sale, location, or entry under the general land laws, including the mining laws, for a period of 20 years (see Section 2.2.2.2.4 of the Final Solar PEIS). The potential impacts of this withdrawal are discussed in Section 10.3.24.

10.3.8.1 Affected Environment

There are no oil and gas leases, mining claims, or geothermal leases located in the proposed SEZ. The description in the Draft Solar PEIS remains valid.

10.3.8.2 Impacts

There are no anticipated impacts on mineral resources from the development of solar energy facilities in the proposed SEZ. The analysis of impacts on mineral resources in the Draft Solar PEIS remains valid.

10.3.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that will reduce impacts on mineral resources are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide adequate protection of mineral resources.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for minerals have been identified in this Final Solar PEIS. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.9 Water Resources

10.3.9.1 Affected Environment

The overall size of the Fourmile East SEZ has been reduced by 26% from the area described in the Draft Solar PEIS, resulting in a total area of 2,883 acres (11.7 km^2). The description of the affected environment given in the Draft Solar PEIS relevant to water resources at the Fourmile East SEZ remains valid and is summarized in the following paragraphs.

The Fourmile East SEZ is within the Rio Grande Headwaters subbasin of the Rio Grande hydrologic region. The SEZ is located in the eastern part of the San Luis Valley bounded by the San Juan Mountains to the west and the Sangre de Cristo Mountains to the east. Precipitation and snowfall in the eastern part of the valley are about 8.5 in./yr (22 cm/yr) and 24 in./yr (61 cm/yr), respectively, with much greater amounts in the surrounding mountains. Annual pan evaporation rates are estimated to be on the order of 54 in./yr (137 cm/yr). No permanent surface water features, intermittent/ephemeral washes, or flood hazards have been identified within the SEZ. Several small palustrine wetlands have been identified along the western boundary of the SEZ, which are temporally flooded throughout the year and have been identified as non-development areas (total area of 1 acre [0.004 km^2]). Groundwater in the San Luis Valley is primarily in basin-fill deposits with an upper unconfined aquifer and a lower confined aquifer, which are separated by a series of confining clay layers and unfractured volcanic rocks. The Fourmile East SEZ sits atop the distal area of an alluvial fan, above an unconfined aquifer about 125 ft (38 m) thick. Groundwater monitoring wells within the SEZ have reported depths to groundwater ranging from 32 to 52 ft (10 to 16 m) below the surface and indicate a groundwater flow from east to west. Water quality in the aquifers of the San Luis Valley varies, and in 2007, the level of TDS in the groundwater surrounding the SEZ was well below the maximum contaminant level.

The Fourmile East SEZ is located in the Colorado Division 3 management zone (Rio Grande Basin) of the CDWR, where both surface water and groundwater rights are over-appropriated. The Rio Grande Compact of 1938 obligates Colorado to meet water delivery schedules to New Mexico, and governs much of the water management decision making in the San Luis Valley. In order to balance water uses within the San Luis Valley and to meet treaty obligations, several water management mechanisms have been developed that affect existing water rights and water rights transfers. The two primary water management considerations affecting solar energy development are the need for an augmentation water plan, and the rules set by the recently formed Special Improvement District Number 1 (Subdistrict #1). Augmentation water plans were described in the Draft Solar PEIS (Section 10.3.9.1.3), but essentially require junior water rights holders to have additional water reserves to ensure that more senior water rights are not hindered. The water management plan for Subdistrict #1 was ruled on in June 2010 and places restrictions on groundwater withdrawals in an effort to restore groundwater levels in the unconfined aquifer. None of the Colorado SEZs are located within the boundaries of Subdistrict #1, which primarily includes central portions of the San Luis Valley currently used for agriculture. However, given that water rights are overappropriated in the San Luis Valley and largely clustered within Subdistrict #1, it is likely that any new water diversions and water right transfers would involve these new groundwater management considerations.

In addition to the water resources information provided in the Draft Solar PEIS, this section provides a planning-level inventory of available climate, surface water, and groundwater monitoring stations within the immediate vicinity of the Fourmile East SEZ and surrounding basin. Additional data regarding climate, surface water, and groundwater conditions are presented in Tables 10.3.9.1-1 through 10.3.9.1-7 and in Figures 10.3.9.1-1 and 10.3.9.1-2. Fieldwork and hydrologic analyses needed to determine 100-year floodplains and jurisdictional water bodies would need to be coordinated with appropriate federal, state, and local agencies. Areas within the Fourmile East SEZ that are found to be within a 100-year floodplain will be

TABLE 10.3.9.1-1 Watershed and Water Management Basin Information Relevant to the Proposed Fourmile East SEZ as Revised

Basin	Name	Area (acres)[a]
Subregion (HUC4)[b]	Rio Grande Headwaters (1301)	4,871,764
Cataloging unit (HUC8)	San Luis (13010003)	1,021,562
Groundwater basin	San Luis Valley	2,000,000
SEZ	Fourmile East	2,883

[a] To convert acres to km^2, multiply by 0.004047.

[b] HUC = Hydrologic Unit Code; a USGS system for characterizing nested watersheds that includes large-scale subregions (HUC4) and small-scale cataloging units (HUC8).

TABLE 10.3.9.1-2 Climate Station Information Relevant to the Proposed Fourmile East SEZ as Revised

Climate Station (COOP ID[a])	Elevation[b] (ft)[c]	Distance to SEZ (mi)[d]	Period of Record	Mean Annual Precipitation (in./yr)[e]	Mean Annual Snowfall (in./yr)
Alamosa 2S, Colorado (050128)	7,533	14	2005–2011	7.07	28.80
Blanca, Colorado (050776)	7,750	8	1909–2010	8.56	24.30
Great Sand Dunes NM, Colorado (053541)	8,120	15	1950–2011	11.16	41.00
La Veta Pass, Colorado (054870)	9,245	25	1909–1954	21.60	150.10

[a] National Weather Service's Cooperative Station Network station identification code.

[b] Surface elevations for the proposed Fourmile East SEZ range from 7,585 to 7,675 ft.

[c] To convert ft to m, multiply by 0.3048.

[d] To convert mi to km, multiply by 1.6093.

[e] To convert in. to cm, multiply by 2.54.

Source: NOAA (2012).

TABLE 10.3.9.1-3 Total Lengths of Selected Streams at the Subregion, Cataloging Unit, and SEZ Scale Relevant to the Proposed Fourmile East SEZ as Revised

Water Feature	Subregion, HUC4 (ft)[a]	Cataloging Unit, HUC8 (ft)	SEZ (ft)
Unclassified streams	19,502	12,089	0
Perennial streams	14,694,407	2,241,783	0
Intermittent/ephemeral streams	94,288,163	14,696,358	0
Canals	12,151,458	3,537,124	0

[a] To convert ft to m, multiply by 0.3048.

Source: USGS (2012a).

TABLE 10.3.9.1-4 Stream Discharge Information Relevant to the Proposed Fourmile East SEZ as Revised

	Station (USGS ID)		
Parameter	San Luis Creek near Poncha Pass, Colorado (08224110)	San Luis Creek above Villa Grove, Colorado (08224113)	Closed Basin Project Canal above Hwy 150 near Mosca, Colorado (373947105421101)
Period of record	1984–1986	1984–1986	2004–2011
No. of observations	16	17	73
Discharge, median (ft^3/s)[a]	1.22	1.32	16.8
Discharge, range (ft^3/s)	0.74–3.48	0.72–3.57	0.37–23.3
Discharge, most recent observation (ft^3/s)	1.25	0.96	15
Distance to SEZ (mi)[b]	55	66	11

[a] To convert ft^3 to m^3, multiply by 0.0283.

[b] To convert mi to km, multiply by 1.6093.

Source: USGS (2012b).

TABLE 10.3.9.1-5 Surface Water Quality Data Relevant to the Proposed Fourmile East SEZ as Revised

	Station (USGS ID)[a]					
Parameter	08224110	08224200	08224500	08226700	08227500	08234200
Period of record	1979–1984	1967–1970	1967–1981	1967–1970	1967–1981	1966–2000
No. of records	60	56	86	66	73	93
Temperature (°C)[b]	9.75 (0–28)	4.75 (0–10)	5.5 (0–21)	5.25 (0–12)	2 (0–13.5)	6.95 (0–15.3)
Total dissolved solids (mg/L)	NA[c]	38.5 (37–40)	202 (70–436)	175.5 (128–191)	59 (39–68)	122 (101–150)
Dissolved oxygen (mg/L)	NA	NA	6.6	NA	NA	8.25 (7.2–11.1)
pH	NA	7.2 (6.9–7.4)	6.7 (3.6–7.6)	7.65 (7.5–7.8)	7.15 (7.1–7.4)	8 (7.3–8.2)
Total nitrogen (mg/L)	NA	NA	NA	NA	NA	NA
Phosphorus (mg/L as P)	NA	NA	NA	NA	NA	NA
Organic carbon (mg/L)	NA	NA	NA	NA	NA	NA
Calcium (mg/L)	NA	8.2 (8–9.2)	39 (10–49)	39.5 (29–44)	17 (10–20)	24 (16.9–33)
Magnesium (mg/L)	NA	1.2 (1–2.2)	7.1 (2.7–15)	11.5 (9.2–13)	1.5 (1–2.4)	5.815 (4.41–7.3)
Sodium (mg/L)	NA	1.45 (1.4–1.7)	4.9 (2.4–7.2)	2.15 (1.2–2.8)	1.4 (0.7–1.9)	7.2 (5.8–9.6)
Chloride (mg/L)	NA	1.45 (0.8–1.8)	1.6 (0.9–2.6)	1.1 (0.9–2.3)	0.9 (0.8–1.1)	2.95 (1.5–3.7)
Sulfate (mg/L)	NA	5.5 (4.5–5.8)	125.5 (28–311)	56 (38–67)	4.6 (3.8–5.5)	10.85 (7.18–14)
Arsenic (mg/L)	NA	NA	NA	NA	NA	NA

[a] Median values are listed; the range in values is shown in parentheses.

[b] To convert °C to °F, multiply by 1.8, then add 32.

[c] NA = no data collected for this parameter.

Source: USGS (2012b).

TABLE 10.3.9.1-6 Water Quality Data from Groundwater Samples Relevant to the Proposed Fourmile East SEZ as Revised

Parameter	Station (USGS ID)[a]		
	372920105405601	373104105403801	373247105382301
Period of record	1979	1978	1979
No. of records	2	1	2
Temperature (°C)[b]	13.75 (11.5–16)	20.5	13.5
Total dissolved solids (mg/L)	44 (42–46)	94	74
Dissolved oxygen (mg/L)	NA[c]	NA	NA
pH	8.4 (8.3–8.5)	8.5	8.6
Nitrate + nitrite (mg/L as N)	0.23 (0.22–0.24)	0.02	0.13
Phosphate (mg/L)	NA	0.03	NA
Organic carbon (mg/L)	NA	2.8	NA
Calcium (mg/L)	16 (15–17)	18	14
Magnesium (mg/L)	1.35 (1.1–1.6)	1	0.5
Sodium (mg/L)	15.5 (15–16)	7.4	6.1
Chloride (mg/L)	2.2 (2.1–2.3)	1.3	2.2
Sulfate (mg/L)	12 (10–14)	7.3	1.1
Arsenic (mg/L)	3	2	NA

[a] Median values listed.

[b] To convert °C to °F, multiply by 1.8, then add 32.

[c] NA = no data collected for this parameter.

Source: USGS (2012b).

TABLE 10.3.9.1-7 Groundwater Surface Elevations Relevant to the Proposed Fourmile East SEZ as Revised

Parameter	Station (USGS ID)		
	372923105383501	372948105385202	373106105363401
Period of record	1976–2011	1982–2005	1980–2005
No. of observations	378	25	60
Surface elevation (ft)[a]	7,598	7,587	7,529
Well depth (ft)	50	113	80
Depth to water, median (ft)	28.03	22.68	47.8
Depth to water, range (ft)	20.5–32.6	14.36–25	41.64–50.75
Depth to water, most recent observation (ft)	32.57	25	50.75
Distance to SEZ (mi)[b]	2	2	1

[a] To convert ft to m, multiply by 0.3048.

[b] To convert mi to km, multiply by 1.6093.

Source: USGS (2012b).

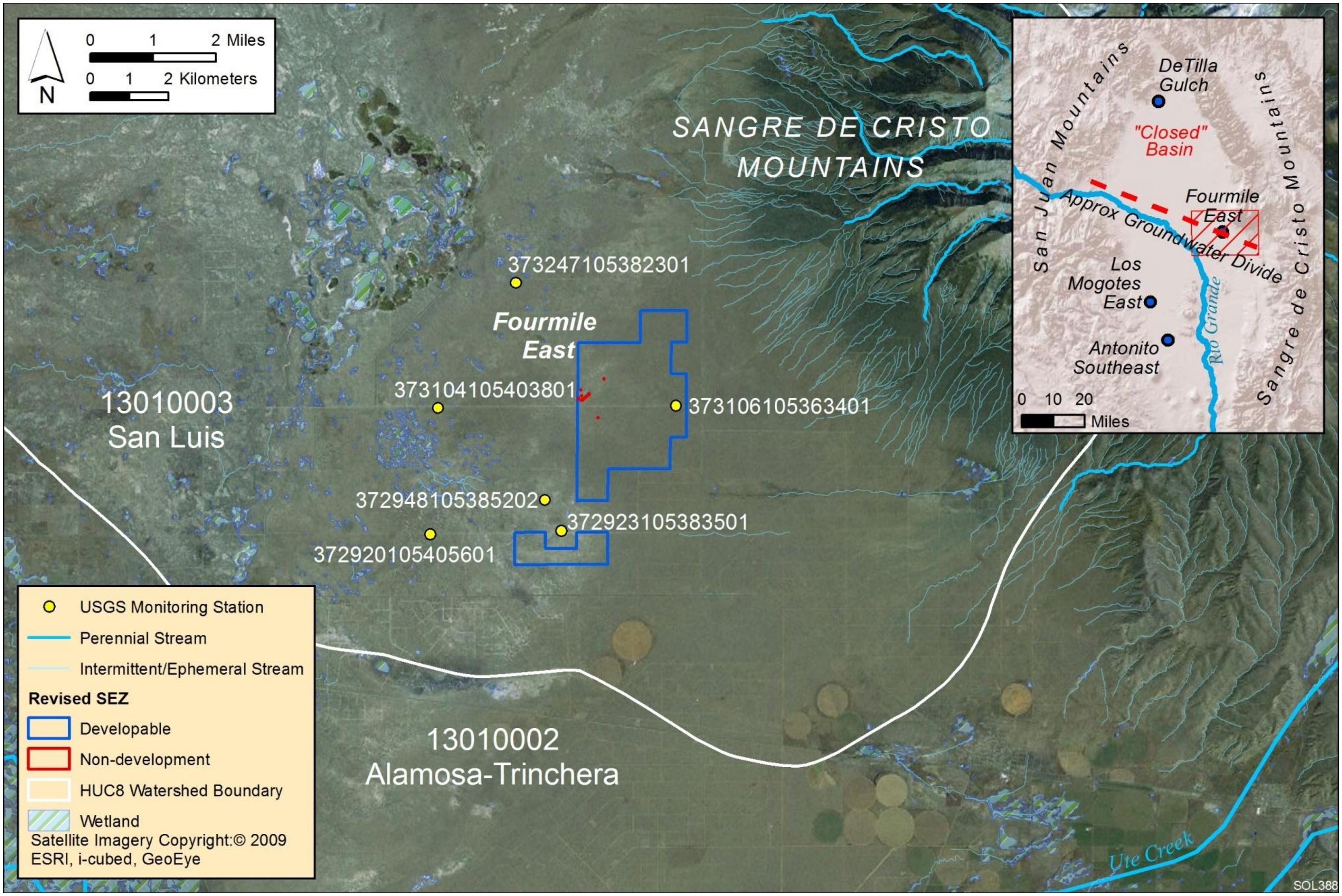

FIGURE 10.3.9.1-1 Water Features near the Proposed Fourmile East SEZ as Revised

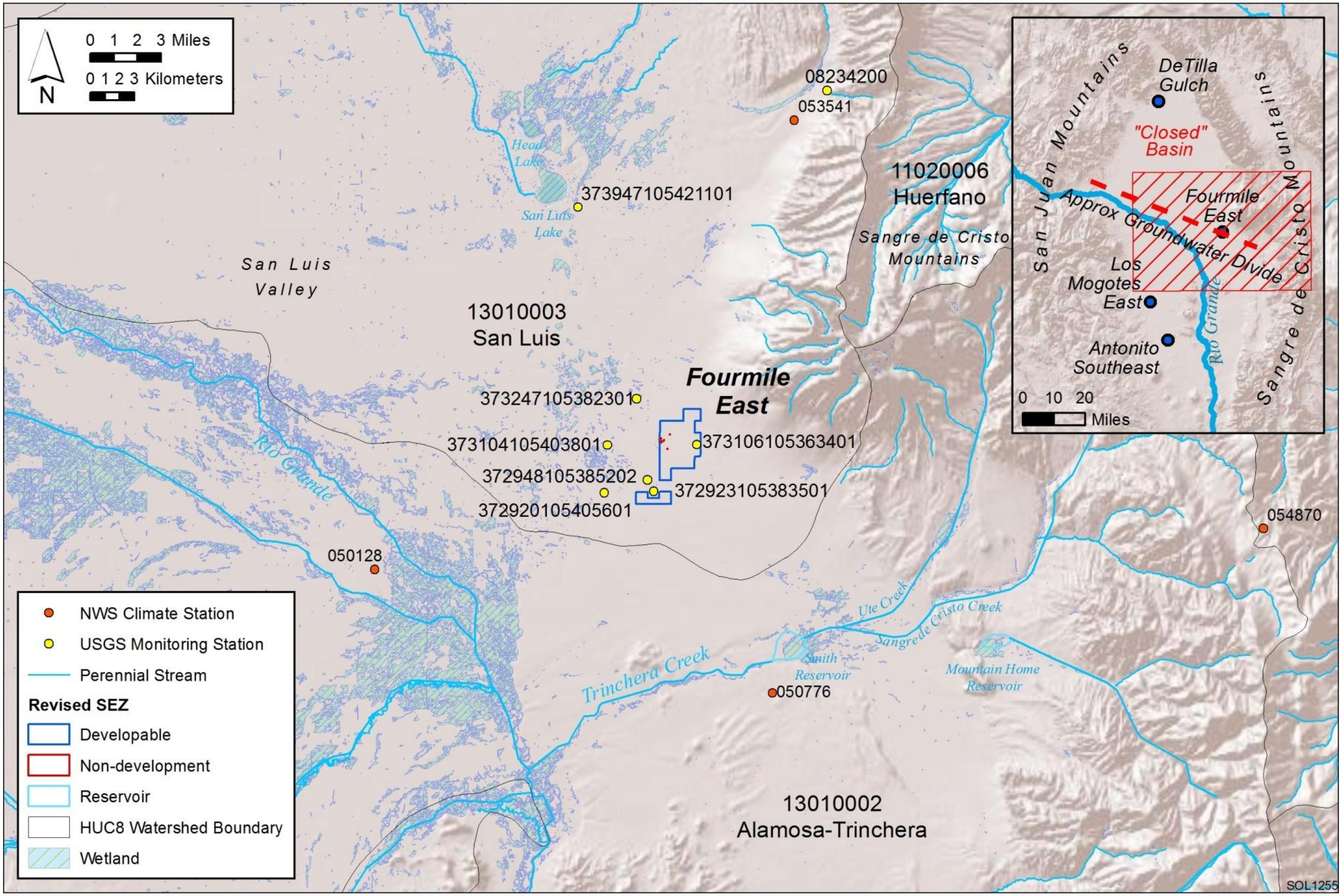

FIGURE 10.3.9.1-2 Water Features within the San Luis Watershed, Which Includes the Proposed Fourmile East SEZ as Revised

identified as non-development areas. Any water features within the Fourmile East SEZ determined to be jurisdictional will be subject to the permitting process described in the CWA.

10.3.9.2 Impacts

10.3.9.2.1 Land Disturbance Impacts on Water Resources

The discussion of land disturbance effects on water resources in the Draft Solar PEIS remains valid. As stated in the Draft Solar PEIS, land disturbance impacts in the vicinity of the proposed Fourmile East SEZ could potentially affect drainage patterns and groundwater recharge. The alteration of natural drainage pathways during construction can lead to impacts related to flooding, loss of water delivery to downstream regions, and alterations to riparian vegetation and habitats.

Land clearing, land leveling, and vegetation removal during the development of the SEZ have the potential to disrupt intermittent/ephemeral stream channels. Several programmatic design features described in Section A.2.2 of Appendix A of this Final Solar PEIS would avoid, minimize, and/or mitigate impacts associated with the disruption of intermittent/ephemeral water features. Additional analyses of intermittent/ephemeral streams are presented in this update, including an evaluation of functional aspects of stream channels with respect to groundwater recharge, flood conveyance, sediment transport, geomorphology, and ecological habitats. Only a summary of the results from these surface water analyses is presented in this section; more information on methods and results is presented in Appendix O.

The study region considered for the intermittent/ephemeral stream evaluation relevant to the Fourmile East SEZ is a subset of the San Luis watershed (HUC8), for which information regarding stream channels is presented in Tables 10.3.9.1-3 and 10.3.9.1-4 of this Final Solar PEIS. The results of the intermittent/ephemeral stream evaluation are shown in Figure 10.3.9.2-1, which depicts flow lines from the National Hydrography Dataset (USGS 2012a) labeled as low, moderate, and high sensitivity to land disturbance. Within the study area, 12% of the intermittent/ephemeral stream channels had low sensitivity and 88% had moderate sensitivity to land disturbance. No intermittent/ephemeral stream channels were identified in the Fourmile East SEZ, but several stream reaches with moderate sensitivity to land disturbance are located more than 1 mi (1.6 km) east of the SEZ, all of which drain the Sangre de Cristo Mountains.

10.3.9.2.2 Water Use Requirements for Solar Energy Technologies

Changes in the Fourmile East SEZ boundaries resulted in changes to the estimated water use requirements and a reduction in the land affected by surface disturbances. This section presents changes in water use estimates for the reduced SEZ area and additional analyses pertaining to groundwater. The additional analyses of groundwater include a basin-scale water budget and a simplified, one-dimensional groundwater model of potential groundwater

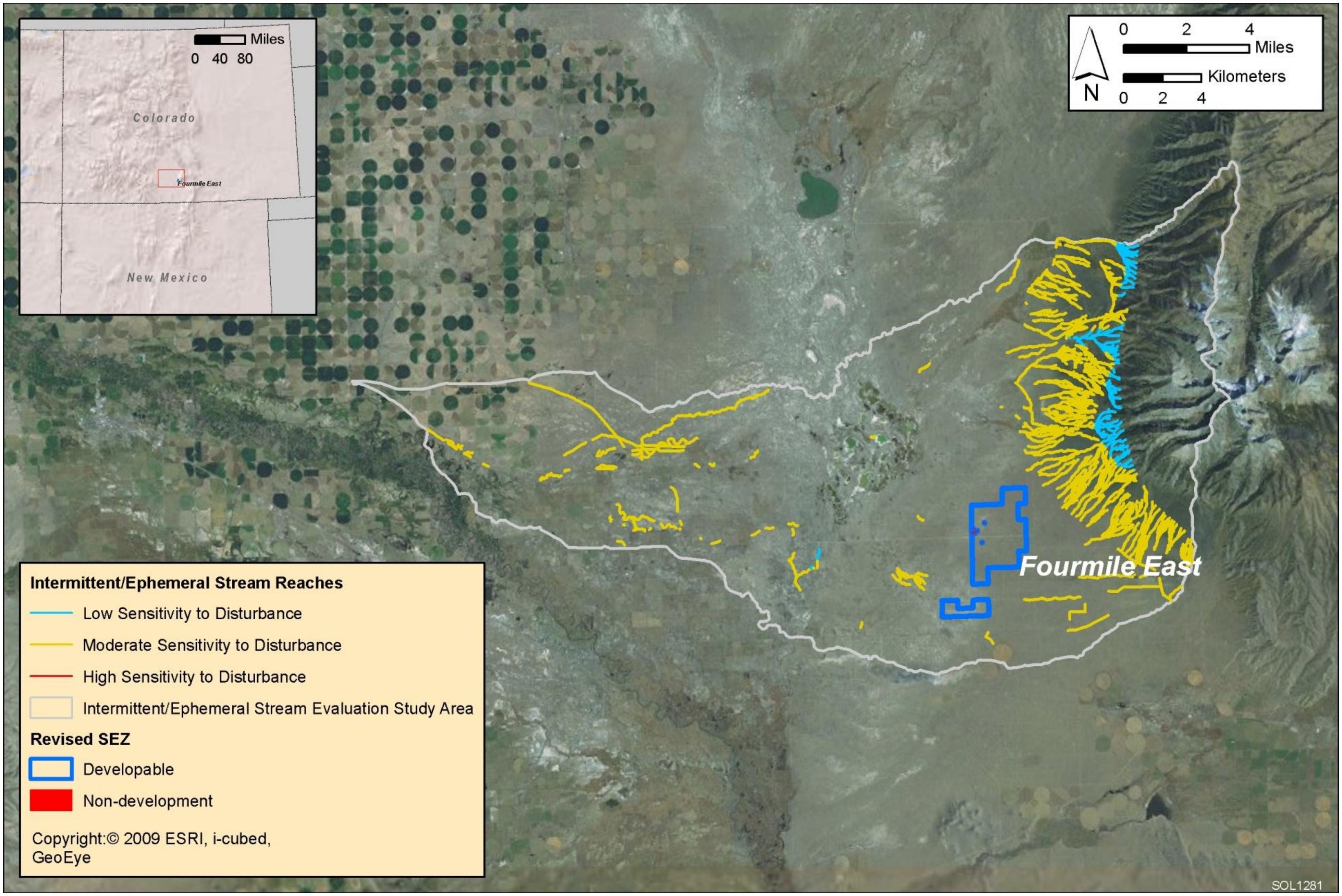

FIGURE 10.3.9.2-1 Intermittent/Ephemeral Stream Channel Sensitivity to Surface Disturbances in the Vicinity of the Proposed Fourmile East SEZ as Revised

drawdown. Only a summary of the results from these groundwater analyses is presented in this section; more information on methods and results is presented in Appendix O. Table 10.3.9.2-1 presents the revised estimates of water requirements for both construction and operation of solar facilities at the Fourmile East SEZ assuming full build-out of the SEZ and accounting for its decreased size.

The Fourmile East SEZ is located in the San Luis Valley, where both surface waters and groundwater are managed conjunctively. Previous studies on water resources in the San Luis Valley typically present a basin-scale water balance, which considers inputs and outputs of water via precipitation, surface water flows, and groundwater (e.g., Mayo et al. 2007). Table 10.3.9.2-2 presents an example water balance for the San Luis Valley that considers all water inputs and outputs from the valley. As noted by Mayo et al. (2007), it is difficult to

TABLE 10.3.9.2-1 Estimated Water Requirements for the Proposed Fourmile East SEZ as Revised[a]

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Construction—Peak Year				
Water use requirements				
Fugitive dust control (ac-ft)[b]	612	706	706	706
Potable supply for workforce (ac-ft)	74	34	14	7
Total water use requirements (ac-ft)	686	740	720	713
Wastewater generated				
Sanitary wastewater (ac-ft)	74	34	14	7
Operations				
Water use requirements				
Mirror/panel washing (ac-ft/yr)	231	128	128	13
Potable supply for workforce (ac-ft/yr)	6	3	3	<1
Dry cooling (ac-ft/yr)	92–461	51–256	NA	NA
Wet cooling (ac-ft/yr)	2,075–6,686	1,153–3,715	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA[c]	NA	131	13
Dry-cooled technologies (ac-ft/yr)	329–698	182–387	NA	NA
Wet-cooled technologies (ac-ft/yr)	2,312–6,923	1,284–3,846	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)	131	73	NA	NA
Sanitary wastewater (ac-ft/yr)	6	3	3	<1

a See Section M.9.2 of Appendix M of the Draft Solar PEIS for methods used in estimating water use requirements.

b To convert ac-ft to m^3, multiply by 1,234.

c NA = not applicable.

TABLE 10.3.9.2-2 Water Budget for the San Luis Valley, Which Includes the Proposed Fourmile East SEZ as Revised

Process	Amount
Inputs	
Precipitation (ac-ft/yr)[a]	1,086,356
Streams draining Sangre de Cristo Mts. (ac-ft/yr)	214,839
Streams draining San Juan Mts. (ac-ft/yr)	1,321,463
Groundwater underflow (ac-ft/yr)	721,535
Outputs	
Evapotranspiration (ac-ft/yr)	2,245,676
Rio Grande discharge (ac-ft/yr)	332,392
Groundwater underflow (ac-ft/yr)	72,964
Groundwater pumping (ac-ft/yr)[b]	641,214
Groundwater storage	
Storage (ac-ft)	2,026,783

[a] To convert ac-ft to m^3, multiply by 1,234.

[b] Colorado DWR (2004).

Source: Mayo et al. (2007).

reconcile some of the historical water budget presented for the San Luis Valley; however, it can be generally stated that the water budget is predominately a balance of precipitation and streamflow inputs with output dominated by evapotranspiration by agricultural lands, riparian areas, and meadows.

The estimated total water use requirements during the peak construction year are as high as 740 ac-ft/yr (912,800 m^3/yr), which does not constitute a significant amount given the short duration of this water demand relative to water resources within the region. The long duration of groundwater pumping during operations (20 years) poses a greater threat to groundwater resources. This analysis considered low, medium, and high groundwater pumping scenarios that represent full build-out of the SEZ, assuming PV, dry-cooled parabolic trough, and wet-cooled parabolic trough, respectively (a 30% operational time was considered for all solar facility types on the basis of operations estimates for proposed utility-scale solar energy facilities). The low, medium, and high pumping scenarios result in groundwater withdrawals that range from 13 to 2,312 ac-ft/yr (16,000 to 2.8 million m^3/yr) or 260 to 46,240 ac-ft (320,700 to 57 million m^3) over the 20-year operational period. From a groundwater budgeting perspective, all pumping scenarios over the 20-year operational period represent less than 2% of the groundwater storage, and all annual pumping scenarios are less than 1% of the current withdrawals in the basin.

Examining groundwater withdrawals with respect to a basin-scale water budget allows for an assessment of potential impacts only to an order of magnitude approximation of basin-scale estimates of complex groundwater processes. In addition, a water budget approach ignores the temporal and spatial components of how groundwater withdrawals affect groundwater surface elevations, groundwater flow rates, and connectivity to surface water features such as streams, wetlands, playas, and riparian vegetation. A one-dimensional groundwater modeling analysis was performed to present a simplified depiction of the spatial and temporal effects of groundwater withdrawals by examining groundwater drawdown in a radial direction around the center of the SEZ for the low, medium, and high pumping scenarios, considering pumping from the upper unconfined aquifer only. A detailed discussion of the groundwater modeling analysis is presented in Appendix O. It should be noted, however, that the aquifer parameters used for the one-dimensional groundwater model (Table 10.3.9.2-3) represent available literature data and that the model aggregates these value ranges into a simplistic representation of the aquifers.

Depth to groundwater is typically on the order of 50 ft (15 m) below the surface in the vicinity of the Fourmile East SEZ. The one-dimensional groundwater modeling results for the upper unconfined aquifer suggest that groundwater drawdown in the vicinity of the SEZ (approximately a 2-mi [3.2-km] radius) ranges from up to 55 ft (17 m) for the high pumping scenario, up to 8 ft (2 m) for the medium pumping scenario, and less than 1 ft (0.3 m) for the low pumping scenario (Figure 10.3.9.2-2). The extent of groundwater drawdown is primarily

TABLE 10.3.9.2-3 Aquifer Characteristics and Assumptions Used in the One-Dimensional Groundwater Model for the Proposed Fourmile East SEZ as Revised

Parameter	Value
Upper, unconfined aquifer	
Aquifer type/conditions	Unconfined/basin fill
Aquifer thickness (ft)[a]	125
Hydraulic conductivity (ft/day)	50
Transmissivity (ft^2/day)	6,250
Specific yield	0.15
Lower, confined aquifer	
Aquifer type/conditions	Confined/basin fill
Aquifer thickness (ft)	500
Hydraulic conductivity (ft/day)	15
Transmissivity (ft^2/day)	7,500
Upper and lower aquifers	
Storage coefficient	0.0000025
Analysis period (yr)	20
High pumping scenario (ac-ft/yr)[b]	2,312
Medium pumping scenario (ac-ft/yr)	329
Low pumping scenario (ac-ft/yr)	13

[a] To convert ft to m, multiply by 0.3048.

[b] To convert ac-ft to m^3, multiply by 1,234.

Source: Colorado DWR (2004).

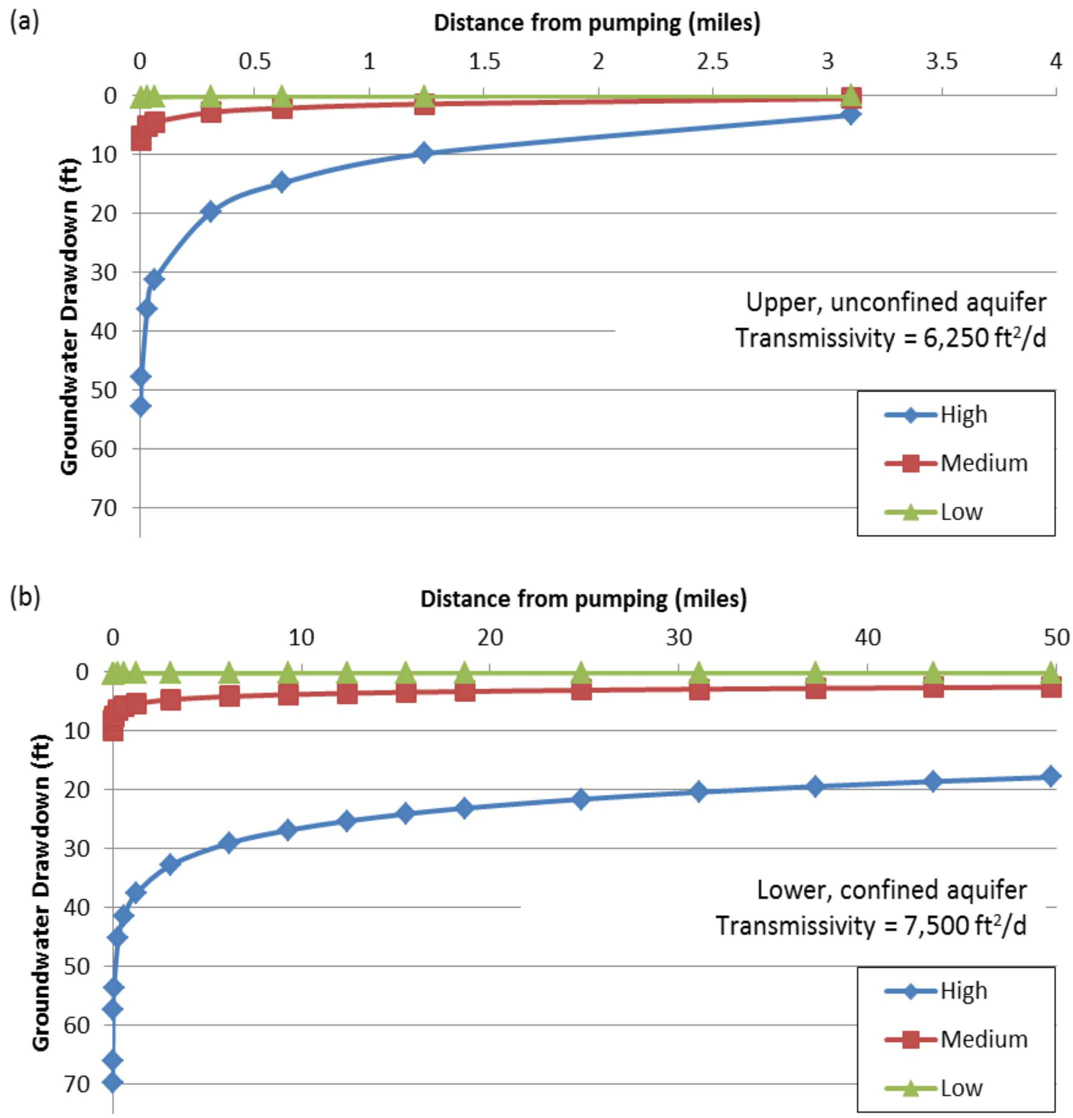

FIGURE 10.3.9.2-2 Estimated One-Dimensional Groundwater Drawdown in (a) Upper Unconfined Aquifer and (b) Lower Confined Aquifer Resulting from High, Medium, and Low Groundwater Pumping Scenarios over the 20-Year Operational Period at the Proposed Fourmile East SEZ as Revised

restricted to the vicinity of the SEZ for all pumping scenarios. The modeling results for the lower confined aquifer suggest significant groundwater drawdown for the high pumping scenario, ranging from 20 to 70 ft (6 to 21 m) and extending more than 50 mi (80 km) from the SEZ (Figure 10.3.9.2-2). The low and medium pumping scenarios have a much lower impact on groundwater drawdown, from 0 to 10 ft (0 to 3 m).

The comparison of water use requirements to the basin-scale water budget and the one-dimensional groundwater modeling gives mixed results. From a groundwater budgeting perspective, the three pumping scenarios considered are not significant relative to the amounts of water moved through the San Luis Valley. Groundwater modeling results suggest that the high pumping scenario would have a localized groundwater drawdown effect if groundwater were extracted from the unconfined aquifer, but a more significant impact extending more than 50 mi (80 km) away from the SEZ if withdrawn from the confined aquifer. As stated in Section 10.3.9.1, water management of the San Luis Valley is restrictive given its overappropriated water rights and its obligations to maintain flows in the Rio Grande. Ultimately, any proposed groundwater withdrawals for solar energy facilities would be reviewed for impacts by the Colorado DWR and would be subject to the rules and court decisions outlined in Case Numbers 06CV64 and 07CW52 (Colorado District Court 2010).

10.3.9.2.3 Off-Site Impacts: Roads and Transmission Lines

As stated in the Draft Solar PEIS, impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. Water needed for transmission line construction activities (e.g., for soil compaction, dust suppression, and potable supply for workers) could be trucked to the construction area from an off-site source. If this occurred, water use impacts at the SEZ would be negligible. The Draft Solar PEIS assessment of impacts on water resources from road and transmission line construction remains valid.

10.3.9.2.4 Summary of Impacts on Water Resources

The additional information and analyses of water resources presented in this update agree with the information provided in the Draft Solar PEIS, which indicates that the San Luis Valley is a high-elevation basin, with predominantly agricultural land use, and is the headwaters of the Rio Grande, where surface water and groundwater processes are coupled and managed jointly. Groundwater in the San Luis Valley is found in both the upper unconfined aquifer and the lower confined aquifer, and historical diversions of both surface water and groundwater for irrigation have affected streamflows and groundwater levels. Water management plays a significant role in the San Luis Valley, because it pertains to ensuring river flows in the Rio Grande according to the Rio Grande Compact, which is the primary responsibility of the Colorado DWR.

Disturbance to intermittent/ephemeral stream channels within the Fourmile East SEZ should not have a significant impact on the critical functions of groundwater recharge, sediment transport, flood conveyance, and ecological habitat, given the relatively small footprint of the SEZ with respect to the study area and the absence of stream channels within the SEZ. Groundwater withdrawals pose the greatest threat to water resources in the San Luis Valley. The water budgeting and groundwater modeling analyses suggest that significant groundwater drawdown could occur both locally and off-site under the high pumping scenario if groundwater were extracted from either the unconfined or confined aquifer. The low and medium pumping scenarios are preferable because their estimated groundwater drawdown is much less. Ultimately, the process of transferring water rights established by the Colorado DWR will determine how much water can be used by proposed solar facilities. As stated in the Draft Solar

PEIS, given the restrictive nature of water rights and the need for augmentation water reserves, it would be difficult for any projects seeking more than 1,000 ac-ft/yr (1.2 million m^3/yr) of water to be successful in obtaining the needed water rights (McDermott 2010).

Predicting impacts associated with groundwater withdrawal is often difficult, given the heterogeneity of aquifer characteristics, the long time period between the onset of pumping and its effects, and limited data. Another consideration relevant to the San Luis Valley is that the transfer of water rights will likely come from the purchase of existing irrigation water rights, which will result in a change in the location of the point of diversion and a change in land use patterns in the basin, both of which can affect groundwater processes. One of the primary mitigation measures to protect water resources is the implementation of long-term monitoring and adaptive management (see Section A.2.4 of Appendix A). For groundwater, this requires a combination of monitoring and modeling to fully identify the temporal and spatial extent of potential impacts. Water management in the San Luis Valley relies on several water monitoring and modeling tools developed by the Colorado DWR and the CWCB that are a part of the Colorado's Decision Support Systems (available at http://cdss.state.co.us/Pages/CDSSHome.aspx), and these tools should be implemented with respect to long-term monitoring and adaptive management strategies for solar energy development occurring within the San Luis Valley.

10.3.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on surface water and groundwater are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide some protection of and reduce impacts on water resources.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses, and consideration of comments received as applicable, the following SEZ-specific design feature for water resources has been identified:

- Groundwater analyses suggest full build-out of wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed wet-cooled projects would have to reduce water requirements to less than approximately 1,000 ac-ft/yr (1.2 million m^3/yr) in order to secure water rights and comply with water management in the San Luis Valley.

The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.10 Vegetation

10.3.10.1 Affected Environment

Revisions to the boundaries of the proposed Fourmile East SEZ have eliminated several wetlands mapped by the NWI and a playa in the southwestern portion of the SEZ. In addition, several NWI-mapped wetland areas within the west-central portion of the SEZ, with a total of about 1 acre (0.004 km^2), were identified as non-development areas in the Supplement to the Draft Solar PEIS.

As presented in Section 10.3.10.1 of the Draft Solar PEIS, 5 cover types were identified within the area of the proposed Fourmile East SEZ, while 35 cover types were identified in the area of indirect effects, including the previously assumed transmission line corridor and within 5 mi (8 km) of the SEZ boundary. For this updated assessment, a specifically located hypothetical transmission line is no longer being assumed (see Section 10.3.23 for an updated transmission assessment for this SEZ). Sensitive habitats on the SEZ include wetlands, sand dunes, ephemeral washes, and playas. Because of the SEZ boundary changes, the Inter-Mountain Basins Playa cover type no longer occurs within the SEZ. Figure 10.3.10.1-1 shows the cover types within the affected area of the Fourmile East SEZ as revised.

10.3.10.2 Impacts

As presented the Draft Solar PEIS, the construction of solar energy facilities within the proposed Fourmile East SEZ would result in direct impacts on plant communities because of the removal of vegetation within the facility footprint during land-clearing and land-grading operations. Approximately 80% of the SEZ would be expected to be cleared with full development of the SEZ. As a result of the new configuration of the SEZ boundary, approximately 2,306 acres (9.3 km^2) would be cleared.

Overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of a cover type would be lost; and (3) *large*: >10% of a cover type would be lost.

10.3.10.2.1 Impacts on Native Species

The analysis presented in the Draft Solar PEIS for the original Fourmile East SEZ developable area indicated that development would result in a small impact on all land cover types occurring within the SEZ (Table 10.3.10.1-1 in the Draft Solar PEIS). Development within the Fourmile East SEZ could still directly affect most of the cover types evaluated in the Draft Solar PEIS, with the exception of Inter-Mountain Basins Playa; the reduction in the developable area would result in reduced (and still small) impact levels on all cover types in the affected area, compared to original estimates in the Draft Solar PEIS.

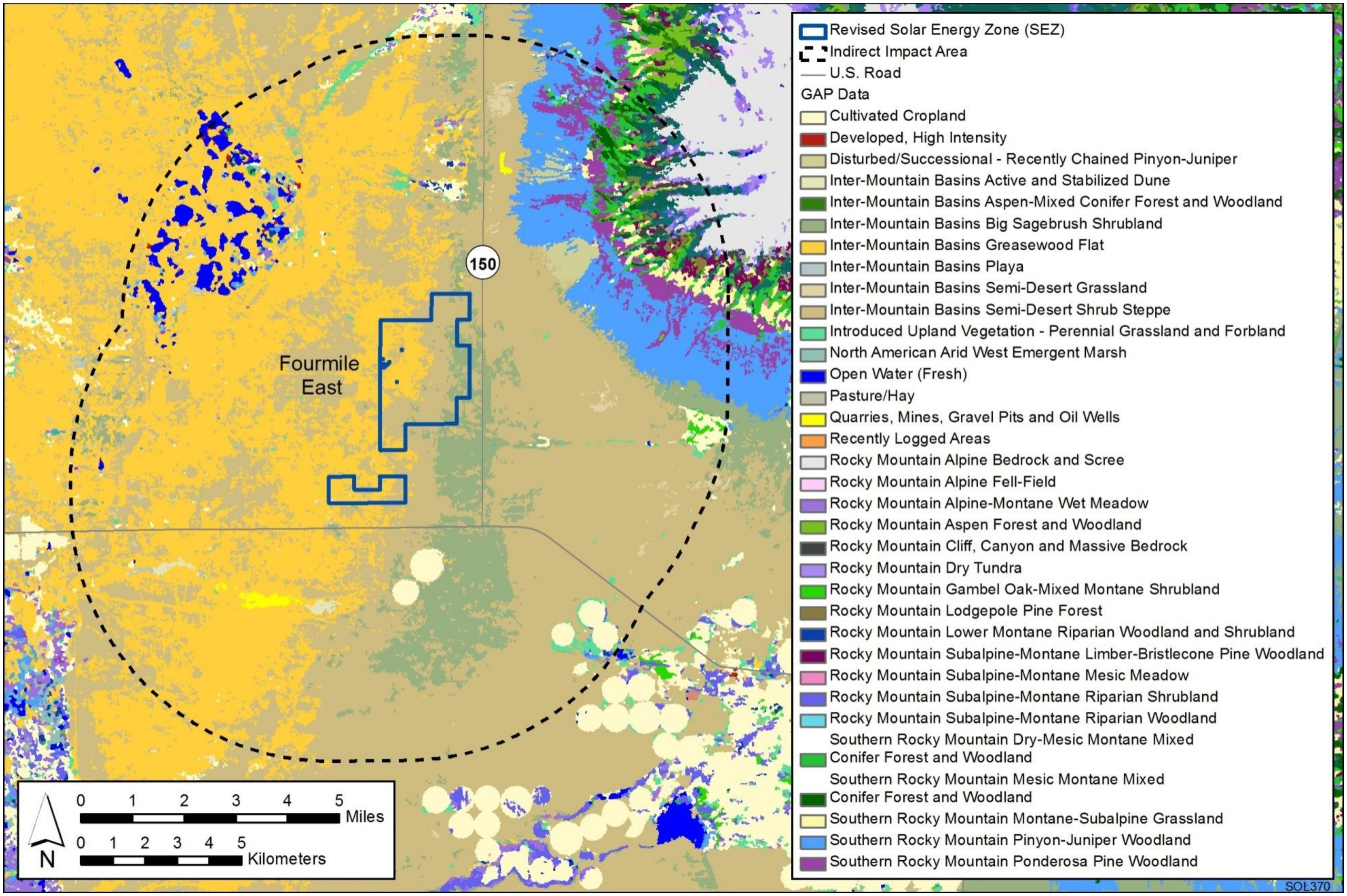

FIGURE 10.3.10.1-1 Land Cover Types within the Proposed Fourmile East SEZ as Revised

Direct impacts on the NWI-mapped wetlands that occur within the excluded and non-developable portions of the SEZ or in the previously identified transmission corridor would not occur. However, direct impacts on unmapped wetlands within the remaining developable areas of the SEZ could still occur. In addition, indirect impacts on wetlands within or near the SEZ, as described in the Draft Solar PEIS, could occur.

10.3.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

As presented in the Draft Solar PEIS, land disturbance from project activities and indirect effects of construction and operation within the Fourmile East SEZ could potentially result in the establishment or expansion of noxious weeds and invasive species populations, potentially including those species listed in Section 10.3.10.1 in the Draft Solar PEIS. Impacts such as reduced restoration success and possible widespread habitat degradation could still occur; however, a small reduction in the potential for such impacts would result from the reduced developable area of the SEZ.

10.3.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific species and habitats will determine how programmatic design features are applied, for example:

- All wetland, playa, dry wash, and sand dune habitats and sand transport areas, within the Fourmile East SEZ shall be avoided to the extent practicable, and any impacts shall be minimized and mitigated in consultation with appropriate agencies. A buffer area shall be maintained around wetlands and dry washes to reduce the potential for impacts on these habitats on or near the SEZ.

- Appropriate engineering controls shall be used to minimize impacts on wetland, playa, dry wash, and riparian habitats, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls will be determined through agency consultation.

- Groundwater withdrawals shall be limited to reduce the potential for indirect impacts on wetland habitats or springs that are associated with groundwater discharge, such as the Blanca wetlands.

It is anticipated that implementation of these programmatic design features will reduce a high potential for impacts from invasive species and impacts on wetlands, sand dunes, playas, springs, dry washes, and riparian habitats to a minimal potential for impact. Residual impacts on wetlands could result from remaining groundwater withdrawal and the like; however, it is anticipated that these impacts would be avoided in the majority of instances.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for vegetation in the proposed Fourmile East SEZ have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.11 Wildlife and Aquatic Biota

For the assessment of potential impacts on wildlife and aquatic biota, overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the species' habitat within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of the species' habitat would be lost; and (3) *large*: >10% of the species' habitat would be lost.

10.3.11.1 Amphibians and Reptiles

10.3.11.1.1 Affected Environment

As presented in the Draft Solar PEIS, amphibian and reptile species expected to occur within the SEZ include the Great Plains toad (*Bufo cognatus*), Woodhouse's toad (*Bufo woodhousii*), fence lizard (*Sceloporus undulatus*), gopher snake (*Pituophis catenifer*), western rattlesnake (*Crotalus viridis*), short-horned lizard (*Phrynosoma hernandesi*), and western terrestrial garter snake (*Thamnophis elegans*). The reduction in the size of the Fourmile East SEZ does not alter the potential for these species to occur in the affected area.

10.3.11.1.2 Impacts

As presented in the Draft Solar PEIS, solar energy development within the Fourmile East SEZ could affect potentially suitable habitats for several amphibian and reptile species. The analysis presented in the Draft Solar PEIS for the original Fourmile East SEZ boundaries indicated that development would result in a small overall impact on representative amphibian and reptile species (Table 10.3.11.1-1 in the Draft Solar PEIS). Development within the revised boundaries of the Fourmile East SEZ could still affect the same species evaluated in the Draft Solar PEIS; however, the reduction in the developable area would result in reduced (and still small) impact levels compared to original estimates in the Draft Solar PEIS.

10.3.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that will reduce impacts on amphibian and reptile species are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific species and habitats will determine how programmatic design features are applied, for example:

- Appropriate engineering controls shall be used to minimize impacts on the washes that drain off of the Sangre de Cristo Mountains and on Smith Reservoir resulting from surface water runoff, erosion, sedimentation, accidental spills, or fugitive dust deposition to these habitats.

With the implementation of required programmatic design features, impacts on amphibian and reptile species would be small.

Because of the changes to the SEZ boundaries, the SEZ-specific design feature identified in Section 11.3.11.1.3 of the Draft Solar PEIS (i.e., wetland habitats should be avoided) is no longer applicable. On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for amphibian and reptile species in the proposed Fourmile East SEZ have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.11.2 Birds

10.3.11.2.1 Affected Environment

As presented in the Draft Solar PEIS, a large number of bird species could occur or have potentially suitable habitat within the affected area of the proposed Fourmile East SEZ. Representative bird species identified in the Draft Solar PEIS included Brewer's blackbird (*Euphagus cyanocephalus*), Brewer's sparrow (*Spizella breweri*), common nighthawk (*Chordeiles minor*), horned lark (*Eremophila alpestris*), vesper sparrow (*Pooecetes gramineus*), western meadowlark (*Sturnella neglecta*), American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis*), short-eared owl (*Asio flammeus*), Swainson's hawk (*Buteo swainsoni*), and mourning dove (*Zenaida macroura*). The reduction in the size of the Fourmile East SEZ does not alter the potential for these species or other bird species to occur in the affected area.

10.3.11.2.2 Impacts

As presented in the Draft Solar PEIS, solar energy development within the Fourmile East SEZ could affect potentially suitable habitats of bird species. The analysis presented in the Draft Solar PES for the original Fourmile East SEZ boundaries indicated that development would result in a small overall impact on the representative bird species (Table 10.3.11.2-1 in the Draft Solar PEIS). Development within the revised boundaries of the Fourmile East SEZ could still affect the same species evaluated in the Draft Solar PEIS; however, the reduction in the developable area would result in reduced (and still small) impact levels compared to original estimates in the Draft Solar PEIS.

10.3.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on bird species are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific species and habitats will determine how programmatic design features are applied, for example:

- Appropriate engineering controls shall be used to minimize impacts resulting from surface water runoff, erosion, sedimentation, accidental spills, or fugitive dust deposition.

- If present, prairie dog colonies (which could provide habitat or a food source for some raptor species) shall be avoided to the extent practicable.

If these programmatic design features are implemented, impacts on bird species will be reduced.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design feature for birds has been identified:

- If present, prairie dog colonies (which could provide habitat or a food source for some raptor species) should be avoided to the extent practicable.

If SEZ-specific design features are implemented in addition to required programmatic design features, it is anticipated that impacts on bird species would be small. The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.11.3 Mammals

10.3.11.3.1 Affected Environment

As presented in the Draft Solar PEIS, a large number of mammal species were identified that could occur or have potentially suitable habitat within the affected area of the proposed Fourmile East SEZ. Representative mammal species identified in the Draft Solar PEIS included (1) big game species: the American black bear (*Ursus americanus*), bighorn sheep (*Ovis canadensis*), cougar (*Puma concolor*), elk (*Cervis canadensis*), mule deer (*Odocoileus hemionus*), and pronghorn (*Antilocapra americana*); (2) furbearers and small game species: the American badger (*Taxidea taxus*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), and white-tailed jackrabbit (*Lepus townsendii*); and (3) small nongame species: the big brown bat (*Eptesicus fuscus*), deer mouse (*Peromyscus maniculatus*), least chipmunk (*Tamias minimus*), little brown myotis (*Myotis lucifugus*), northern pocket gopher (*Thomomys talpoides*), Ord's kangaroo rat (*Dipodomys ordii*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), and western small-footed myotis (*Myotis ciliolabrum*). The reduction in the size of the Fourmile East SEZ does not alter the potential for these species or any additional mammal species to occur in the affected area.

10.3.11.3.2 Impacts

As presented in the Draft Solar PEIS, solar energy development within the Fourmile East SEZ could affect potentially suitable habitats of mammal species. The analysis presented in the Draft Solar PEIS for the original Fourmile East SEZ boundaries indicated that development would result in a small overall impact on all representative mammal species analyzed (Table 10.3.11.3-1 in the Draft Solar PEIS). Development within the revised boundaries for the Fourmile East SEZ could still affect the same representative mammal species evaluated in the Draft Solar PEIS; however, the reduction in the developable area would result in reduced (and still small) impact levels compared to original estimates in the Draft Solar PEIS. The 213-acre (0.9-km^2) portion of the SEZ that overlapped elk summer range for the original Fourmile East SEZ configuration is largely excluded from the revised SEZ.

10.3.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific species and habitats will determine how programmatic design features are applied, for example:

- Pre-disturbance surveys shall be conducted within the SEZ to determine the use of the SEZ as a movement or migratory corridor or as important habitat for elk, mule deer, and pronghorn. If such use is identified, mitigation using spatial strategies, temporal strategies, or both shall be developed in coordination with appropriate federal or state agencies.

- Prairie dog colonies shall be avoided to the extent practicable to reduce impacts on species such as desert cottontail and thirteen-lined ground squirrel.

If the programmatic design features are implemented, impacts on mammal species will be reduced. On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design features have been identified:

- To the extent practicable, construction activities should be avoided while pronghorn are on their winter range within the immediate area of the proposed Fourmile East SEZ.

- Prairie dog colonies should be avoided to the extent practicable to reduce impacts on species such as desert cottontail and thirteen-lined ground squirrel.

If SEZ-specific design features are implemented in addition to required programmatic design features, impacts on mammal species would be small. The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.11.4 Aquatic Biota

10.3.11.4.1 Affected Environment

There are no permanent water bodies or perennial streams within the boundaries of the Fourmile East SEZ or the area of indirect effects. A number of ephemeral washes pass through the SEZ that do not extend directly to nearby perennial streams. The boundaries of the Fourmile East SEZ have been reduced compared to the boundaries given in the Draft Solar PEIS. Based on these changes, updates to the Draft Solar PEIS include the following:

- Outside of the indirect effects area, but within 50 mi (80 km) of the SEZ, there are approximately 967 mi (1,556 km) of perennial streams, 47 mi (76 km) of intermittent streams, and 192 mi (309 km) of canals.
- There are approximately 6,463 acres (26.1 km^2) of lake and reservoir habitat within 50 mi (80 km) of the SEZ.
- Wetlands within the SEZ have been identified as non-development areas.
- The route of a new transmission line described in the Draft Solar PEIS is no longer assumed.

Aquatic biota present in the SEZ have not been characterized. As stated in Appendix C of the Supplement to the Draft Solar PEIS, site surveys can be conducted at the project-specific level to characterize the aquatic biota, if present, in wetlands within the SEZ.

10.3.11.4.2 Impacts

The types of impacts on aquatic habitats and biota that could occur from development of utility-scale solar energy facilities are discussed in Section 5.10.3 of the Draft Solar PEIS and this Final Solar PEIS. Aquatic habitats, including wetland areas, present on or near the Fourmile East SEZ could be affected by solar energy development in a number of ways, including (1) direct disturbance, (2) deposition of sediments, (3) changes in water quantity, and (4) degradation of water quality. The impact assessment provided in the Draft Solar PEIS remains valid, with the following updates:

- The amount of surface water features within the SEZ and in the area of indirect effects that could potentially be affected by solar energy development is less because the size of the SEZ has been reduced.

- The small emergent wetlands located along the western edge of the SEZ have been identified as non-development areas; therefore, construction activities would not directly affect wetlands. However, as described in the Draft Solar PEIS, the wetlands could be affected indirectly by solar development activities within the SEZ. The amount of aquatic habitat provided by the wetlands within the Fourmile East SEZ is less than 1% of total wetland surface area in the 50-mi (80-km) SEZ region. Consequently, the potential impacts on populations of aquatic biota from direct alteration would be small.

10.3.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features applicable to aquatic species are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific resources and conditions will determine how programmatic design features are applied, for example:

- Undisturbed buffer areas and sediment and erosion controls shall be maintained around the wetlands along the western boundary of the SEZ.

- Development shall avoid any additional wetlands identified during future site-specific fieldwork.

- The use of heavy machinery and pesticides shall be avoided within the immediate catchment basins for the wetlands along the western boundary of the SEZ.

It is anticipated that implementation of the programmatic design features will reduce impacts on aquatic biota, and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in nearby aquatic habitats, the potential impacts on aquatic biota from solar energy development at the Fourmile East SEZ would be small.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for water resources have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.12 Special Status Species

10.3.12.1 Affected Environment

As presented in the Draft Solar PEIS, 59 special status species were identified that could occur or have potentially suitable habitat within the affected area of the proposed Fourmile East SEZ. The reduction in the size of the Fourmile East SEZ does not alter the potential for these species or any additional special status species to occur in the affected area. However, field surveys conducted for the BLM following the publication of the Draft Solar PEIS have indicated that one additional special status bat species could occur in the SEZ affected area—the fringed myotis (*Myotis thysanodes*). Figure 10.3.12.1-1 shows the known or potential occurrences of species in the affected area of the revised Fourmile East SEZ that are listed, proposed, or candidates for listing under the ESA.

Following the publication of the Draft Solar PEIS, the BLM conducted field surveys for special status bat species, as well as Gunnison prairie dog (*Cynomys gunnisoni*) and western burrowing owl (*Athene cunicularia*), in the Fourmile East SEZ. Surveys for bat species were conducted in the SEZ by using passive and active acoustic monitoring techniques at various times between June 16, 2011, and October 15, 2011 (Rodriguez 2011). Survey results indicated high bat activity during night hours within the SEZ. The big free-tailed bat (*Nyctinomops macrotis*) was the only special status bat species recorded on the SEZ. However, the documented presence of the fringed myotis in the De Tilla Gulch SEZ suggests that the fringed myotis could occur throughout the San Luis Valley and potentially within the Fourmile East SEZ. No roosting habitat for any bat species was observed on the SEZ (Rodriguez 2011). Additional life ecological and natural history information for the fringed myotis is provided below.

Field surveys for Gunnison prairie dog and western burrowing owl were conducted on July 14, 2011 (Garcia and Harvey 2011). No Gunnison prairie dog activity was recorded in any portion of the SEZ. However, there are established Gunnison prairie dog colonies 10 mi (16 km) north of the SEZ. Burrowing owls were not recorded on the SEZ during the field surveys. However, burrowing owls may nest among prairie dog colonies surrounding the SEZ; the Fourmile East SEZ may occur within the home range of any of these individuals (Garcia and Harvey 2011).

Fringed Myotis. The fringed myotis is a year-round resident in western Colorado, where it forages in a variety of habitats including ponderosa pine woodlands, greasewood flats, oakbrush, and shrublands. This species was not evaluated for the Fourmile East SEZ in the Draft Solar PEIS. The species roosts in caves, rock crevices, or in buildings. The fringed myotis was not recorded on the Fourmile East SEZ during field surveys conducted in 2011 (Rodriguez 2011). However, fringed myotis was recorded on the De Tilla Gulch SEZ, suggesting that the species could occur elsewhere in the San Luis Valley and potentially within the revised area of the Fourmile East SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat for the fringed myotis could occur on the revised area of the Fourmile

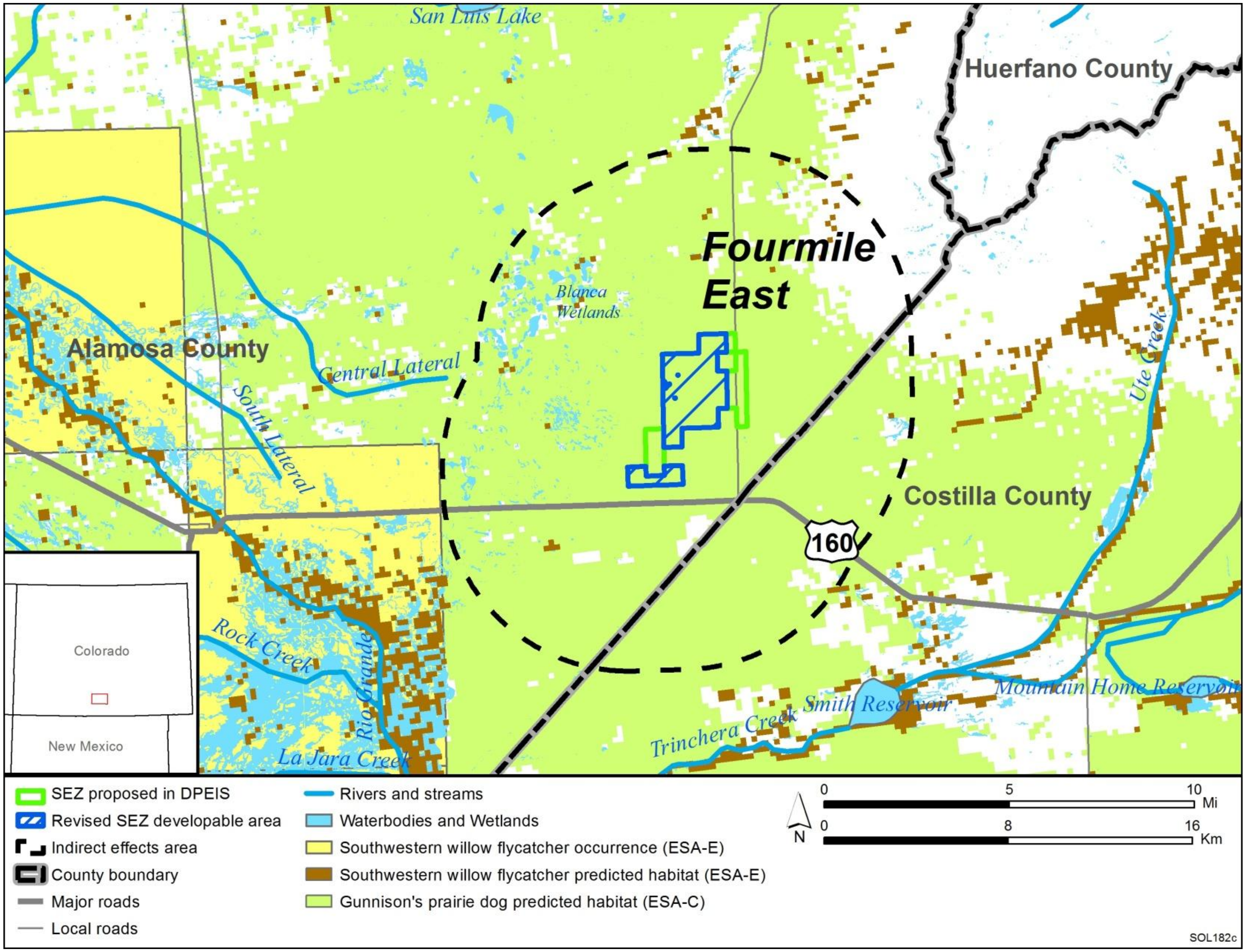

FIGURE 10.3.12.1-1 Developable Area for the Proposed Fourmile East SEZ as Revised and Known or Potential Occurrences of Species Listed as Threatened or Endangered, Proposed, or Candidates for Listing under the ESA

East SEZ and throughout portions of the area of indirect effects (Table 10.3.12.1-1). There is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the area of direct effects.

10.3.12.2 Impacts

Overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the special status species' habitat within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of the special status species' habitat would be lost; and (3) *large*: >10% of the special status species' habitat would be lost.

As presented in the Draft Solar PEIS, solar energy development within the Fourmile East SEZ could affect potentially suitable habitats of special status species. The analysis presented in the Draft Solar PEIS for the original Fourmile East SEZ boundaries indicated that development would result in no impact or a small overall impact on all special status species (Table 10.3.12.1-1 in the Draft Solar PEIS). Development within the revised area of the Fourmile SEZ could still affect the same 59 species evaluated in the Draft Solar PEIS; however, the reduction in the developable area would result in reduced (and still small) impact levels compared to original estimates in the Draft Solar PEIS.

Field surveys conducted for the BLM following the publication of the Draft Solar PEIS indicated that one additional special status bat species could occur in the SEZ affected area—the fringed myotis. Impacts on this species are described below.

Fringed Myotis. The fringed myotis is a year-round resident in southwestern Colorado and is known to occur within the San Luis Valley. Although this species is not known to occur in the proposed Fourmile East SEZ, field surveys conducted in 2011 documented the presence of this species in the De Tilla Gulch SEZ (Rodriguez 2011). According to the SWReGAP habitat suitability model, approximately 2,800 acres (11.3 km^2) of suitable foraging habitat on the revised area of the Fourmile East SEZ may be directly affected by construction and operations (Table 10.3.12.1-1). This direct effects area represents less than 0.1% of potentially suitable habitat in the SEZ region. About 83,000 acres (336 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.2% of the available suitable habitat in the region (Table 10.3.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. There is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the area of direct effects; however, it is possible for individuals to roost in nearby habitats within the area of indirect effects (Rodriguez 2011).

The overall impact on the fringed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the revised area of the Fourmile East SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable

TABLE 10.3.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Be Affected by Solar Energy Development on the Proposed Fourmile East SEZ as Revised[a]

				Maximum Area of Potential Habitat Affected[d]		Overall Impact
Common Name	Scientific Name	Listing Status[b]	Habitat[c]	Within SEZ (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Magnitude[g] and Species-Specific Mitigation[h]
Mammals						
Fringed myotis	*Myotis thysanodes*	BLM-S; FWS-SC	Summer or year-round resident in wide range of habitats, including woodland, riparian, and shrubland habitats. Roosts in caves, crevices, and buildings. About 3,800,000 acres[i] of potentially suitable habitat occurs within the SEZ region.	2,800 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	83,000 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

[a] The species presented in this table represent new species identified following publication of the Draft Solar PEIS or a re-evaluation of those species that were determined to have moderate or large impacts in the Draft Solar PEIS. The other special status species for this SEZ are identified in Table 10.3.12.1-1 of the Draft Solar PEIS.

[b] BLM-S = listed as a sensitive species by the BLM; FWS-SC = USFWS species of concern.

[c] Potentially suitable habitat was determined using SWReGAP habitat suitability models (USGS 2007). Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[d] Maximum area of potential habitat that could be affected relative to availability within the analysis area. Habitat availability for each species within the analysis area was determined using SWReGAP habitat suitability models (USGS 2007). This approach probably overestimates the amount of suitable habitat in the project area.

[e] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[f] Area of indirect effects was assumed to be the area adjacent to the SEZ and within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff or dust from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[g] Overall impact magnitude categories were based on professional judgment and include (1) *small*: ≤1% of the population or its habitat would be lost, and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat, would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; and (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Design features would reduce most indirect effects to negligible levels.

[h] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[i] To convert acres to km^2, multiply by 0.004047.

foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

10.3.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific resources and conditions will determine how programmatic design features are applied, for example:

- Pre-disturbance surveys shall be conducted within the SEZ to determine the presence and abundance of special status species, including those identified in Table 10.3.12.1-1 of the Draft Solar PEIS, as well as the fringed myotis. Disturbance to occupied habitats for these species shall be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible, translocation of individuals from areas of direct effects or compensatory mitigation of direct effects on occupied habitats may be used to reduce impacts. A comprehensive mitigation strategy for special status species that uses one or more of these options to offset the impacts of development shall be developed in coordination with the appropriate federal and state agencies.

- Avoiding or limiting groundwater withdrawals for solar energy development on the SEZ shall be employed to reduce impacts on groundwater-dependent special status species, including those species that may occur in riparian or aquatic habitats supported by groundwater. These species include the southwestern willow flycatcher and western snowy plover.

- Coordination with the USFWS and CDOW shall be conducted to address the potential for impacts on the Gunnison’s prairie dog, a candidate for listing under the ESA. Coordination would identify an appropriate survey protocol, avoidance measures, and, potentially, translocation or compensatory mitigation.

If the programmatic design features are implemented, it is anticipated that the majority of impacts on the special status species from habitat disturbance and groundwater use would be reduced.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for special status species in the proposed Fourmile East SEZ have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.13 Air Quality and Climate

10.3.13.1 Affected Environment

Except as noted below, the information on air quality and climate presented in the affected environment section of the Draft Solar PEIS remains valid.

10.3.13.1.1 Existing Air Emissions

The Draft Solar PEIS presented Alamosa County emissions data for 2002. More recent data for 2008 (CDPHE 2011) were reviewed. The two emissions inventories are from different sources and assumptions. In the more recent data, emissions of NO_x, CO, and VOCs were lower, while emissions of SO_2, PM_{10} and $PM_{2.5}$ were higher. These changes would not affect modeled air quality impacts presented in this update.

10.3.13.1.2 Air Quality

The calendar quarterly average NAAQS of 1.5 µg/m^3 for lead (Pb) presented in Table 10.3.13.1-2 of the Draft Solar PEIS has been replaced by the rolling 3-month standard (0.15 µg/m^3). The federal 24-hour and annual SO_2, 1-hour O_3, and annual PM_{10} standards have been revoked as well (EPA 2011). All Colorado SAAQS, except 3-hour SO_2 standard of 700 µg/m^3, have been revoked since publication of the Draft Solar PEIS. These changes will not affect the modeled air quality impacts presented in this update.

The size of the proposed Fourmile East SEZ was reduced by about 26%, from 3,882 acres (15.7 km^2) to 2,882 acres (11.7 km^2). However, distances to the nearest Class I areas remain the same as in the Draft Solar PEIS.

10.3.13.2 Impacts

10.3.13.2.1 Construction

Methods and Assumptions

Except for the area disturbed at any one time during construction, the methods and assumptions have not changed from those presented in the Draft Solar PEIS. Based on the reduction in the area of the proposed Fourmile East SEZ, air quality for this Final Solar PEIS was remodeled assuming that 2,306 acres (9.3 km^2), 80% of the updated developable area, would be disturbed at any one time. The Draft Solar PEIS assumed disturbance of an area of 3,000 acres (12.1 km^2).

Results

Since the annual PM_{10} standard has been rescinded, the discussion of annual PM_{10} impacts in the Draft Solar PEIS is no longer applicable. Table 10.3.13.2-1 has been updated for this Final Solar PEIS. The concentration values in the table are based on updated air quality modeling reflecting the updated boundaries of the proposed SEZ.

Given the reduced area of the proposed SEZ, the concentrations predicted for this Final Solar PEIS are less than or equal to those predicted in the Draft Solar PEIS, but the conclusions presented in the Draft Solar PEIS remain valid.[1] Predicted 24-hour PM_{10} and 24-hour $PM_{2.5}$ concentration levels could exceed NAAQS levels used for comparison at the SEZ boundaries and in the immediately surrounding area during the construction phase of a solar development. These high particulate levels would be limited to the immediate area surrounding the SEZ boundaries and would decrease quickly with distance. Predicted total concentrations for annual $PM_{2.5}$ would be below the standard level used for comparison.

At the nearest residence, about 0.8 mi (1.3 km) southwest of the proposed SEZ, predicted maximum 24-hour PM_{10} concentration increments would be about 107 $\mu g/m^3$; predicted concentrations at the nearby towns of Alamosa, Blanca, Estrella, Mosca, Fort Garland, La Jara, and Sanford would be less than 16 $\mu g/m^3$. The conclusion of the Draft Solar PEIS that total particulate levels (background plus the increment due to construction activities) at these locations would not exceed standard levels remains valid.

Consistent with the conclusions of the Draft Solar PEIS, construction activities could result in concentrations above Class I PSD PM_{10} increment levels at the nearest federal Class I area (the Great Sand Dunes WA), but the PM_{10} increments would not be exceeded at other nearby Class I areas (La Garita WA and Weminuche WA, and Wheeler Peak WA, New Mexico).

Overall, predicted 24-hour PM_{10} and 24-hour $PM_{2.5}$ concentration levels could exceed standard levels used for comparison at the SEZ boundaries and immediately surrounding areas during the construction phase of a solar development. To reduce potential impacts on ambient air quality and in compliance with BLM design features, aggressive dust control measures would be used. Potential air quality impacts on neighboring communities would be much lower. Predicted total concentrations for annual $PM_{2.5}$ would be below the standard level. Modeling indicates that construction activities could result in concentrations above Class I PSD PM_{10} increment levels at the nearest federal Class I area, Great Sand Dunes WA. However, construction activities are not subject to the PSD program; the comparison is made as an indicator of possible dust levels in the WA during the limited construction period and as a screen to gage the size of the potential

[1] At this programmatic level, detailed information on construction activities, such as facility size, type of solar technology, heavy equipment fleet, activity level, work schedule, and so on, is not known; thus air quality modeling cannot be conducted. It has been assumed that 80% of the developable area of 2,882 acres (9.3 km^2) would be disturbed continuously; thus, the modeling results and discussion here should be interpreted in that context. During the site-specific project phase, more detailed information would be available and more realistic air quality modeling analysis could be conducted. It is likely that impacts on ambient air quality predicted for specific projects would be much lower than those presented in this Final Solar PEIS.

TABLE 10.3.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Fourmile East SEZ as Revised

			Concentration (μg/m³)				Percentage of NAAQS	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background	Total	NAAQS	Increment	Total
PM_{10}	24 hours	H6H	428	27.0	455	150	285	303
$PM_{2.5}$	24 hours	H8H	29.5	16.0	45.5	35	84	130
	Annual	–[c]	7.1	4.0	11.1	15	47	74

[a] $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm.

[b] Concentrations for attainment demonstration are presented. H6H = highest of the sixth-highest concentrations at each receptor over the 5-year period. H8H = highest of the multiyear average of the eighth-highest concentrations at each receptor over the 5-year period. For the annual average, multiyear averages of annual means over the 5-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

[c] A dash indicates not applicable.

Source: Chick (2009) for background concentration data.

impact. Therefore, it is anticipated that the potential impacts of construction activities on ambient air quality would be moderate and temporary.

With the reduced size of the Fourmile East SEZ, emissions from construction equipment and vehicles would be less than those estimated in the Draft Solar PEIS. Any potential impacts on AQRVs at nearby federal Class I areas would be less; thus the conclusions in the Draft Solar PEIS remain valid. Emissions from construction-related equipment and vehicles are temporary and could cause some unavoidable but short-term impacts.

10.3.13.2.2 Operations

The reduction in the size of the proposed Fourmile East SEZ by about 26%, from 3,882 acres (15.7 km²) to 2,882 acres (11.7 km²), reduces the generating capacity and annual power generation and thus reduces the potentially avoided emissions presented in the Draft Solar PEIS. Total revised power generation capacity ranging from 256 to 461 MW is estimated for the Fourmile East SEZ for various solar technologies. As explained in the Draft Solar PEIS, the estimated amount of emissions avoided for the solar technologies evaluated depends only on the megawatts of conventional fossil fuel–generated power avoided. Updated estimates for emissions potentially avoided by a solar facility can be obtained from the table in the Draft Solar PEIS by reducing the tabulated estimates by about 26%, as shown in the revised

Table 10.3.13.2-2. For example, for the technologies estimated to require 9 acres/MW (power tower, dish engine, and PV), up to 684 tons per year (= 74.25% × the low-end value of 922 tons per year tabulated in the Draft Solar PEIS) of NO_X could be avoided by full solar development of the proposed Fourmile East SEZ as revised for this Final Solar PEIS. Although the total emissions avoided by full solar development of the proposed Fourmile East SEZ are reduced from those presented in the Draft Solar PEIS, the conclusions of the Draft Solar PEIS remain valid. Solar facilities built in the Fourmile East SEZ could avoid relatively more fossil fuel emissions than those built in other states with less reliance on fossil fuel–generated power.

10.3.13.2.3 Decommissioning and Reclamation

The discussion in the Draft Solar PEIS remains valid. Decommissioning and reclamation activities would be of short duration, and their potential impacts on air quality would be moderate and temporary.

10.3.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce air quality impacts are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Limiting dust generation during construction and operations is a required programmatic design feature under the BLM Solar Energy Program. These extensive fugitive dust control measures would keep off-site PM levels as low as possible during construction.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for air quality for the proposed Fourmile East SEZ have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.14 Visual Resources

10.3.14.1 Affected Environment

The boundaries of the proposed Fourmile East SEZ have been revised to eliminate 999 acres (4 km^2), mainly along the eastern boundary of the SEZ, as well as a small area on the west side of the proposed SEZ. The proposed SEZ is now approximately 2.5 mi (4.0 km) north to south (at its greatest extent) and 1.8 mi (2.9 km) east to west (at its greatest extent). The remaining developable area within the SEZ is 2,882 acres (11.7 km^2). Because of the reduction in size of the SEZ, the total acreage of the lands visible within the 25-mi (40-km) viewshed of the SEZ has decreased.

TABLE 10.3.13.2-2 Annual Emissions from Combustion-Related Power Generation Avoided by Full Solar Development of the Proposed Fourmile East SEZ as Revised

Area Size (acres)[a]	Capacity (MW)[b]	Power Generation (GWh/yr)[c]	Emissions Avoided (tons/yr; 10^3 tons/yr for CO_2)[d]			
			SO_2	NO_x	Hg	CO_2
2,882	256–461	449–808	594–1,068	684–1,232	0.004–0.007	443–798
Percentage of total emissions from electric power systems in the state of Colorado[e]			0.94–1.7%	0.94–1.7%	0.94–1.7%	0.94–1.7%
Percentage of total emissions from all source categories in the state of Colorado[f]			0.50–0.91%	0.17–0.30%	–[g]	0.43–0.77%
Percentage of total emissions from electric power systems in the six-state study area[e]			0.24–0.43%	0.19–0.33%	0.13–0.24%	0.17–0.30%
Percentage of total emissions from all source categories in the six-state study area[f]			0.13–0.23%	0.03–0.05%	–	0.05–0.10%

[a] To convert acres to km^2, multiply by 0.004047.

[b] It is assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.020 km^2) per MW (for parabolic trough technology) to 9 acres (0.036 km^2) per MW (power tower, dish engine, and photovoltaic technologies) would be required.

[c] Assumed a capacity factor of 20%.

[d] Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 2.64, 3.05, 1.71×10^{-5}, and 1,976 lb/MWh, respectively, were used for the state of Colorado.

[e] Emission data for all air pollutants are for 2005.

[f] Emission data for SO_2 and NO_x are for 2002, while those for CO_2 are for 2005.

[g] A dash indicates not estimated.

Sources: EPA (2009a,b); WRAP (2009).

Because of the reduction in land available for development in the eastern portions of the SEZ, CO 150 no longer passes through the SEZ. It now runs parallel to the eastern boundary of the SEZ, at a distance of approximately 0.25 mi (0.40 km). This portion of CO 150 is also designated as the Los Caminos Antiguos Scenic Byway.

An updated VRI map for the SEZ and surrounding lands is shown in Figure 10.3.14.1-1; it provides information from the BLM's 2009 VRI, which was finalized in October 2011 (BLM 2011a). The value for the SEZ still is VRI Class III.

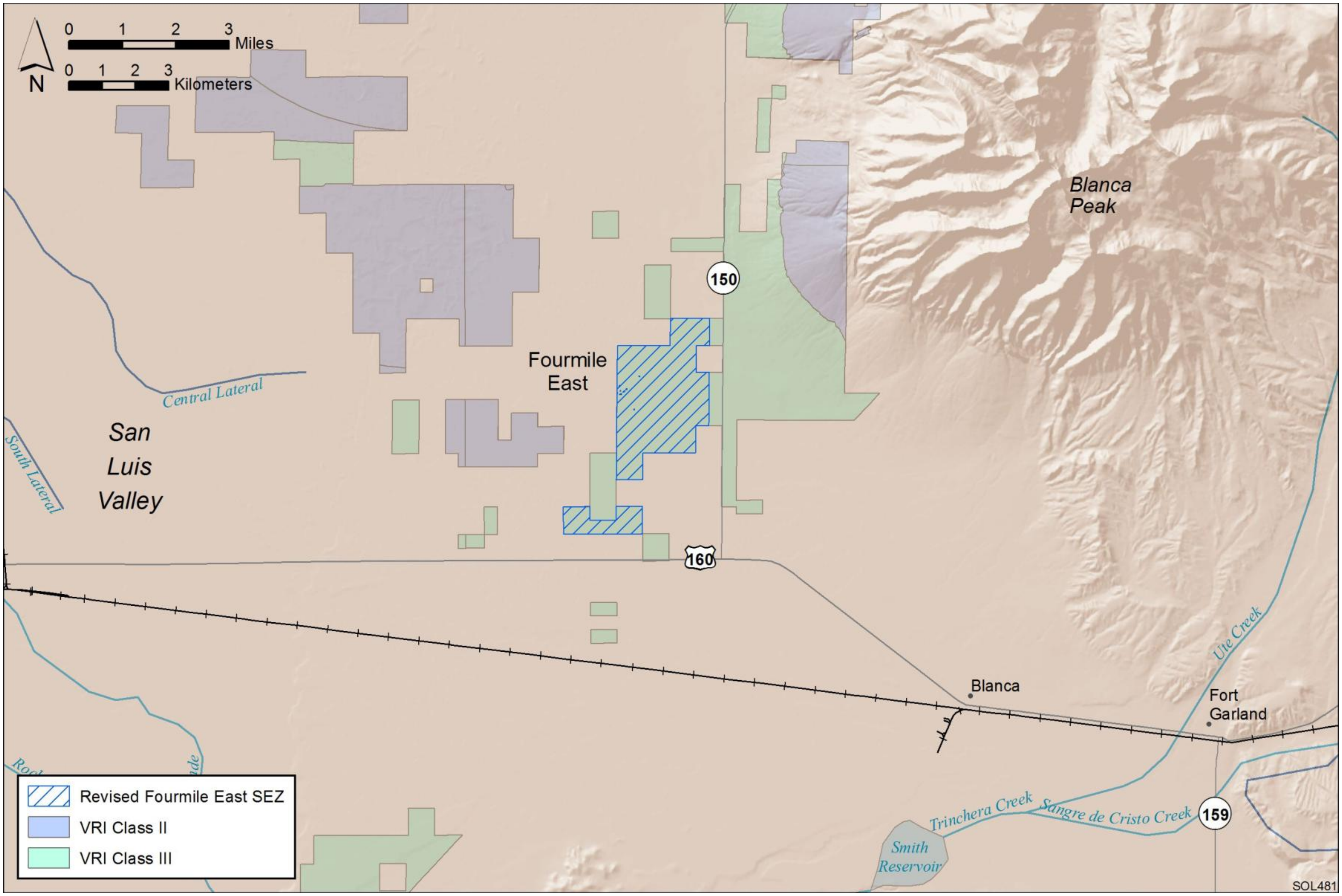

FIGURE 10.3.14.1-1 Visual Resource Inventory Values for the Proposed Fourmile East SEZ as Revised

Lands in the La Jara Field Office within the 25-mi (40-km), 650-ft (198-m) viewshed of the revised SEZ include 21,087 acres (85.3 km^2) of VRI Class II areas; 18,436 acres (74.6 km^2) of VRI Class III areas; and 21 acres (0.1 km^2) of VRI Class IV areas.

10.3.14.2 Impacts

The reduction in size of the SEZ would reduce the total visual impacts associated with solar energy development in the SEZ. It would limit the total amount of solar facility infrastructure that would be visible and would reduce the geographic extent of the visible infrastructure.

The reduction in size of the SEZ proposed in the Supplement to the Draft Solar PEIS eliminated approximately 26% of the original SEZ. The resulting visual contrast reduction for any given point within view of the SEZ would vary greatly depending on the viewpoint's distance and direction from the SEZ. Contrast reduction generally would be greatest for viewpoints closest to the portions of the SEZ that were eliminated and especially for those that had broad, wide-angle views of these areas. In general, contrast reductions also would be larger for elevated viewpoints relative to non-elevated viewpoints, because the reduction in area of the solar facilities would be more apparent when looking down at the SEZ than when looking across it.

10.3.14.2.1 Impacts on the Proposed Fourmile East SEZ

Although the reduction in size of the SEZ would reduce visual contrasts associated with solar development, solar development still would involve major modification of the existing character of the landscape; it likely would dominate the views from most locations within the SEZ. Additional impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines. In general, strong visual contrasts from solar development still would be expected for viewing locations within the SEZ.

10.3.14.2.2 Impacts on Lands Surrounding the Proposed Fourmile East SEZ

For the Draft Solar PEIS, preliminary viewshed analyses were conducted to identify which lands surrounding the proposed SEZ could have views of solar facilities in at least some portion of the SEZ (see Appendices M and N of the Draft Solar PEIS for important information on assumptions and limitations of the methods used). Four viewshed analyses were conducted, assuming four different heights representative of project elements associated with potential solar energy technologies: PV and parabolic trough arrays, 24.6 ft (7.5 m); solar dishes and power blocks for CSP technologies, 38 ft (11.6 m); transmission towers and short solar power towers, 150 ft (45.7 m); and tall solar power towers, 650 ft (198.1 m).

These same viewsheds were recalculated in order to account for the boundary changes described in the Supplement to the Draft Solar PEIS. Figure 10.3.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored portions indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded light brown and the additional areas shaded light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown and light purple and the additional areas shaded dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, and dark purple and at least the upper portions of power tower receivers could be visible from the additional areas shaded medium brown.

10.3.14.2.3 Impacts on Selected Federal-, State-, and BLM-Designated Sensitive Visual Resource Areas and Other Lands and Resources

Figure 10.3.14.2-2 shows the results of a GIS analysis that overlays selected federal-, state-, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds, in order to illustrate which of these sensitive visual resource areas could have views of solar facilities within the SEZ and therefore potentially would be subject to visual impacts from those facilities. Distance zones that correspond with BLM's VRM system-specified foreground-middleground distance (5 mi [8 km]), background distance (15 mi [24.1 km]), and a 25-mi (40.2-km) distance zone are shown as well, in order to indicate the effect of distance from the SEZ on impact levels, which are highly dependent on distance. A similar analysis was conducted for the Draft Solar PEIS.

The scenic resources included in the analysis were as follows:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;

- Congressionally authorized Wilderness Areas;

- Wilderness Study Areas;

- National Wild and Scenic Rivers;

- Congressionally authorized Wild and Scenic Study Rivers;

- National Scenic Trails and National Historic Trails;

- National Historic Landmarks and National Natural Landmarks;

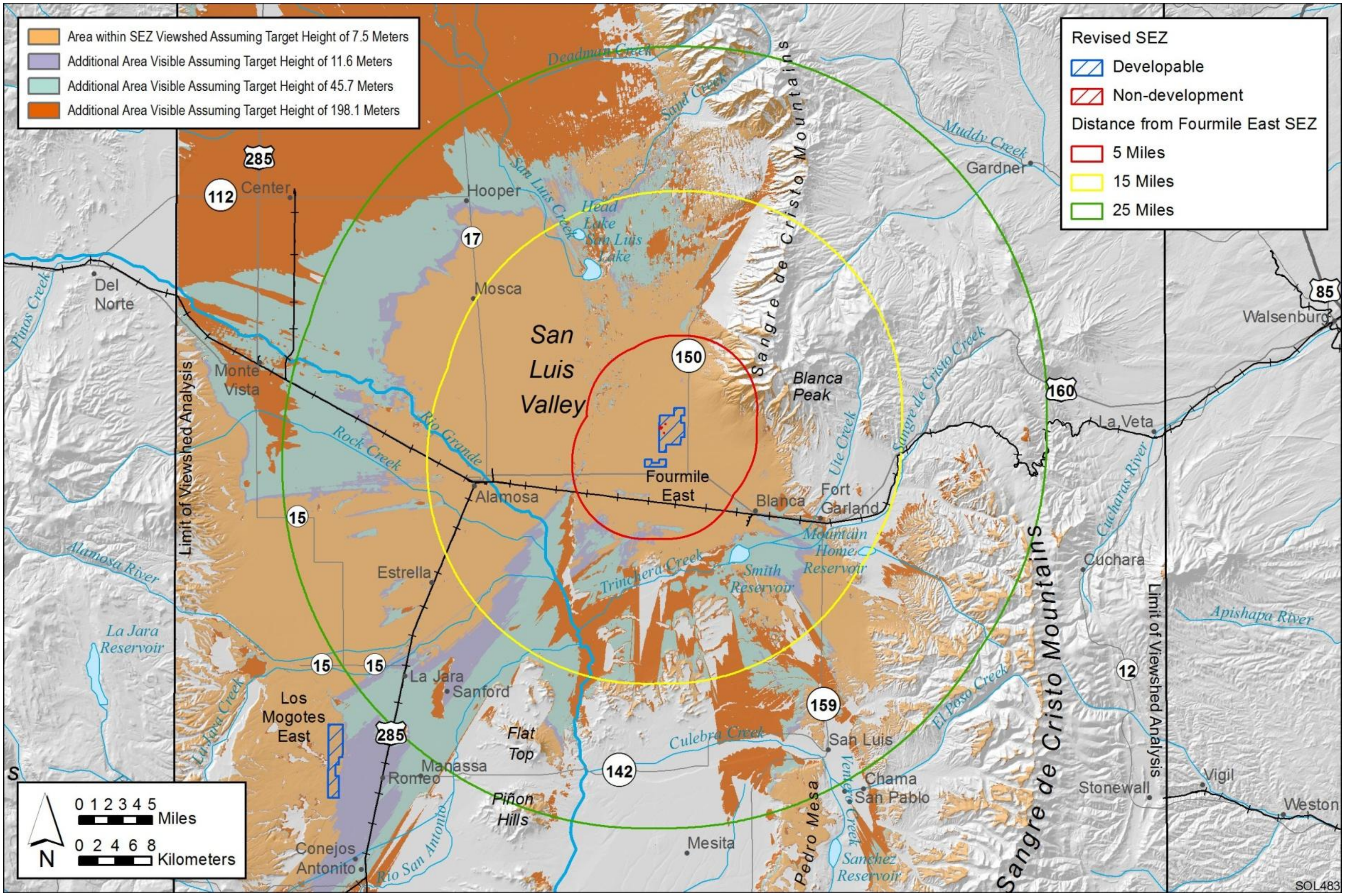

FIGURE 10.3.14.2-1 Viewshed Analyses for the Proposed Fourmile East SEZ as Revised and Surrounding Lands, Assuming Viewshed Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development and/or associated structures within the SEZ could be visible)

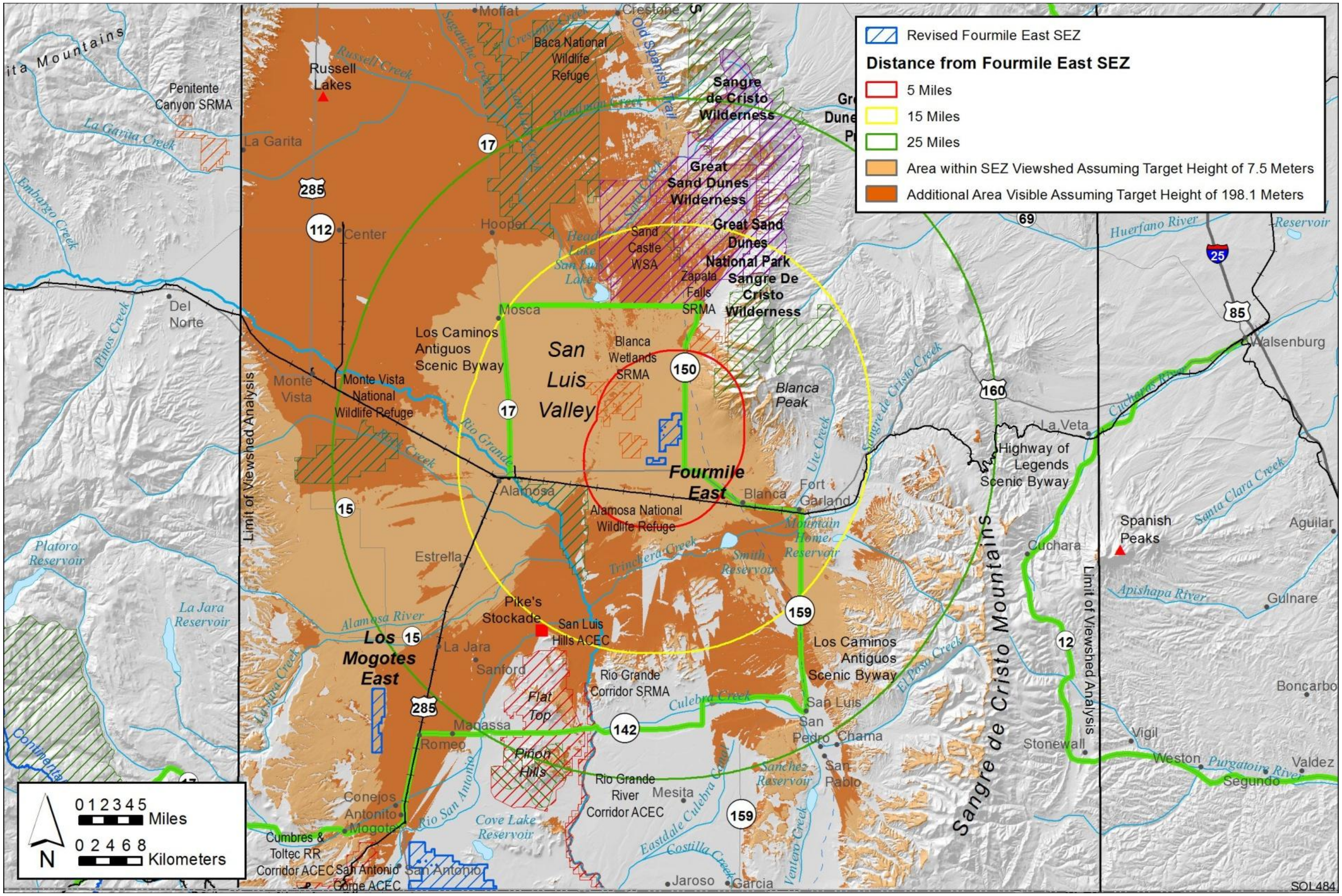

FIGURE 10.3.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Fourmile East SEZ as Revised

- All-American Roads, National Scenic Byways, State Scenic Highways, and BLM- and USFS-designated scenic highways/byways;

- BLM-designated Special Recreation Management Areas; and

- ACECs designated because of outstanding scenic qualities.

The results of the GIS analysis are summarized in Table 10.3.14.2-1. The change in size of the SEZ alters the viewshed, such that the visibility of the SEZ and solar facilities within the SEZ from the surrounding lands would be reduced. With the reduction in size of the SEZ, solar energy development within the SEZ would be expected to create minimal or weak visual contrasts for viewers within many of the surrounding scenic resource areas and other resources listed in Table 10.3.14.2-1. Exceptions include the Sangre de Cristo Wilderness Area, the Old Spanish National Historic Trail, Blanca Wetlands Special Recreation Management Area, Zapata Falls SRMA, and the Los Caminos Antiguos Scenic Byway. In these areas, moderate or strong visual contrasts still could occur.

Solar development on lands in the SEZ visible from and in close proximity to the Sangre de Cristo WA and portions of the Old Spanish National Historic Trail has a higher potential to cause visual impacts on these areas. As such, the BLM has identified areas in the SEZ visible from and within 3 mi (4.8 km) of the Sangre de Cristo WA and of the centerline of the high-potential segment of the Old Spanish National Historic Trail as potential high visual sensitivity areas, where solar development would be subject to specific additional design features that will be identified when project-specific environmental analyses are conducted. The BLM also has identified areas in the SEZ visible from and between 3 mi (4.8 km) and 5 mi (8 km) of the Sangre de Cristo WA and of the centerline of the high-potential segment of the Old Spanish National Historic Trail as potential moderate visual sensitivity areas, where solar development also would be subject to specific, additional design features to be identified in conjunction with project-specific analysis.

In addition to these areas, impacts on other lands and resources were evaluated: the surrounding communities of Alamosa, Blanca, and Mosca; the West Fork of the North Branch of the Old Spanish National Historic Trail; Blanca Peak; and the Rio Grande Scenic Railroad.

10.3.14.2.4 Summary of Visual Resource Impacts for the Proposed Fourmile East SEZ

The visual contrast analysis in the Draft Solar PEIS determined that because there could be multiple solar facilities within the Fourmile East SEZ, a variety of technologies employed, and a range of supporting facilities required, solar development within the SEZ would make it essentially industrial in appearance and would contrast strongly with the surrounding, mostly natural-appearing landscape.

The elimination of acreage within the SEZ would reduce the visual contrast associated with solar facilities as seen both within the SEZ and from surrounding lands in both daytime and

TABLE 10.3.14.2-1 Selected Potentially Affected Sensitive Visual Resources within a 25-mi (40-km) Viewshed of the Proposed Fourmile East SEZ as Revised, Assuming a Target Height of 650 ft (198.1 m)

		Feature Area or Linear Distance[c]		
			Visible Between	
Feature Type	Feature Name (Total Acreage/ Linear Distance)[a,b]	Visible within 5 mi	5 and 15 mi	15 and 25 mi
National Park	Great Sand Dunes (80,913 acres)	0 acres	34,678 acres (43%)	23,153 acres (29%)
National Preserve	Great Sand Dunes (41,670 acres)	0 acres	48 acres (0%)	5,866 acres (14%)
National Historic Trail	Old Spanish[d] (2,700 mi)	12 mi (0%)	19.7 mi (1%)	13.1 mi (0%)
National Historic Landmark	Pike's Stockade (4 acres)	0 acres	0 acres	4 acres (100%)
WAs	Great Sand Dunes (32,846 acres)	0 acres	8,629 acres (26%)	9,174 acres (28%)
	Sangre de Cristo (217,695 acres)	1,194 acres (1%)	2,339 acres (1%)	6,623 acres (3%)
WSAs	San Luis Hills (10,896 acres)	0 acres	0 acres	956 acres (9%)
	Sand Castle (1,097 acres)	0 acres	884 acres (81%)	67 acres (6%)
NWRs	Alamosa (12,098 acres)	0 acres	11,215 acres (93%)	0 acres
	Monte Vista (14,761 acres)	0 acres	0 acres	10,230 acres (69%)
	Baca (92,596 acres)	0 acres	928 acres (1%)	46,249 acres (50%)
ACECs	San Luis Hills (39,421 acres)	0 acres	0 acres	5,489 acres (14%)
	Rio Grande River Corridor (4,644 acres)	0 acres	0 acres	132 acres (3%)
Scenic Highways/Byways	Los Caminos Antiguos[e] (129 mi)	13.1 mi (10%)	45.0 mi (35%)	8.4 mi (7%)

TABLE 10.3.14.2-1 (Cont.)

Feature Type	Feature Name (Total Acreage/ Linear Distance)[a,b]	Feature Area or Linear Distance[c]		
		Visible within 5 mi	Visible Between 5 and 15 mi	Visible Between 15 and 25 mi
SRMAs	Blanca Wetlands (8,598 acres)	7,515 acres (87%)	1,065 acres (12%)	0 acres
	Rio Grande River Corridor (4,367 acres)	0 acres	0 acres	320 acres (7 %)
	Zapata Falls (3,702 acres)	20 acres (1%)	2,315 acres (63%)	0 acres

[a] To convert acres to km^2, multiply by 0.004047.

[b] To convert mi to km, multiply by 1.609.

[c] Percentage of total feature acreage or road length viewable.

[d] Source: BLM (2011b).

[e] Source: America's Byways (2011).

nighttime views. The reductions in visual contrast resulting from the revision can be summarized as follows:

- Within the Fourmile East SEZ: Contrasts experienced by viewers within the eastern portion of the SEZ and within a small portion of the west side of the SEZ would be reduced due to the elimination of 999 acres (4.0 km^2) from the SEZ. However, strong contrasts still would result in the remaining developable area.

- Great Sand Dunes National Park (NP): A very slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak contrasts. Contrast levels still would generally be higher at higher elevation viewpoints and at viewpoints in the western portion of the national park.

- Great Sand Dunes National Preserve: A very slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause minimal to weak contrasts.

- Great Sand Dunes WA: A very slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak contrasts.

- Sangre de Cristo WA: A slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak to strong contrasts, depending on viewer location in the WA. Stronger contrasts would be observed from elevated viewpoints, in which viewers would look down onto the SEZ.

- San Luis Hills WSA: A very slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause minimal to weak contrasts.

- Sand Castle WSA: A very slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak contrasts.

- Old Spanish National Historic Trail: A reduction in contrasts would result due to the elimination of acreage to the east and west of CO 150. The Old Spanish National Historic Trail was approximately 1 mi (1.6 km) east of the SEZ, as it was originally proposed in the Draft Solar PEIS. It is now approximately 1.3 mi (2.1 km) away at the point of closest approach. Solar development within the SEZ still would cause strong contrasts for Trail users immediately to the east of the SEZ, where generally open views of the solar development would be present. Lower contrasts would be observed from locations on the Trail farther from the SEZ.

- Pike's Stockade National Historic Landmark: No reduction in contrasts would be anticipated; solar development within the SEZ still would cause minimal contrasts.

- Alamosa NWR: No reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak contrasts.

- Baca NWR: No reduction in contrasts would be anticipated; solar development within the SEZ still would cause minimal to weak contrasts.

- Monte Vista NWR: No reduction in contrasts would be anticipated; solar development within the SEZ still would cause minimal contrasts.

- Rio Grande River Corridor ACEC: No reduction in contrasts would be anticipated; solar development within the SEZ still would cause minimal contrasts.

- San Luis Hills ACEC: A very slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause minimal to weak contrasts.

- Blanca Wetlands SRMA: A slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak to strong contrasts, dependent on the viewer location within the SRMA.

- Rio Grande Corridor SRMA: See above for the Rio Grande River Corridor ACEC.

- Zapata Falls SRMA: A slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak to moderate contrasts.

- Los Caminos Antiguos Scenic Byway: Portions of the byway were located within the SEZ as it was originally proposed in the Draft Solar PEIS. Portions of this byway are now approximately 0.25 mi (0.4 km) from the SEZ at the point of closest approach. A reduction in contrasts would be anticipated in those locations that once were part of the SEZ, as solar development would no longer be immediately adjacent to the byway; however, solar development within the SEZ still would cause strong contrasts for byway travelers on those portions of the byway nearest to the SEZ, where generally open views of the solar development would be present. Lower contrasts would be observed from locations on the byway farther from the SEZ.

- West Fork of the North Branch of the Old Spanish Trail: No reduction in contrasts would be anticipated; solar development within the SEZ still would cause minimal contrasts.

- Blanca Peak: A slight reduction in contrasts would be anticipated. Views from Blanca Peak would have full visibility of the SEZ; therefore, solar development within the SEZ still would cause moderate contrasts.

- Alamosa: A very slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause minimal to weak contrasts.

- Blanca: A slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak contrasts.

- Mosca: A very slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause minimal to weak contrasts.

- Rio Grande Scenic Railway: A slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause strong contrasts for some points on the railroad.

In addition to these areas, the Trujillo Homestead National Historic Landmark is located within the 650-ft (198.1-m) viewshed. The landmark was designated in early 2012, although the property was listed on the NRHP since February 2004 (DOI 2012; History Colorado 2011). The property is located approximately 7.5 mi (12.1 km) east of Hooper. Because of the distance and the relative elevation of the homestead as compared to the SEZ, the expected contrast levels would be minimal.

10.3.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on visual resources are described in Section A.2.2 of Appendix A of this Final Solar PEIS. While application of the programmatic design features would reduce potential visual impacts somewhat, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas would be the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures generally would be limited. Utility-scale solar energy development using any of the solar technologies analyzed in this Final Solar PEIS and at the scale analyzed would be expected to result in large adverse visual impacts that could not be mitigated.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design features for visual resources in the proposed Fourmile East SEZ have been identified:

- The development of power tower facilities should be prohibited within the SEZ. The San Luis Valley is a regionally important tourist destination and is an area with many small communities and numerous important historic, cultural, and recreational resources. The valley contains numerous historic sites, two scenic railways, two scenic highways, several wildlife refuges, Great Sand Dunes NP and Preserve, the Rio Grande WSR, congressionally designated WAs, the Sangre de Cristo NHA, and various other attractions that draw tourists to the region. A number of these areas overlook the San Luis Valley from the surrounding mountains and include elevated viewpoints that would have clear views of power tower facilities in the Valley. The height of solar power tower receiver structures, combined with the intense light generated by the receivers atop the towers, would be expected to create strong visual contrasts that could not be effectively screened from view for most areas surrounding the SEZ. The effective area of impact from power tower structures is much larger than that for comparably rated lower height facilities, which makes it more likely that they would conflict with the growing tourism focus of the Valley. In addition, for power towers higher than 200 ft (61 m), hazard navigation lighting that could be visible for very long distances would likely be required. Prohibiting the development of power tower facilities would remove this source of impacts, thus substantially reducing potential visual impacts on the Old Spanish National Historic Trail, Sangre de Cristo WA, and the Los Caminos Antiguos Scenic Byway.

- Special visual impact mitigation shall be considered for solar development on lands in the SEZ visible from and within 5 mi (8 km) of the Sangre de Cristo WA and of the centerline of the high-potential segment of the Old Spanish National Historic Trail. Solar development on lands in the SEZ visible from and in close proximity to the Sangre de Cristo WA and portions of the Old Spanish National Historic Trail has a higher potential to cause visual impacts on the roadway. As such, the BLM has identified areas in the SEZ visible from and within 3 mi (5 km) of the Sangre de Cristo WA and of the centerline of the high-potential segment of the Old Spanish National Historic Trail as potential high visual sensitivity areas, where solar development would be subject to specific additional design features that will be identified when project-specific environmental analyses are conducted. The BLM also has identified areas in the SEZ visible from and between 3 mi (5 km) and 5 mi (8 km) of the Sangre de Cristo WA and of the centerline of the high-potential segment of the Old Spanish National Historic Trail as potential moderate visual sensitivity areas, where solar development also would be subject to specific, additional design features to be identified in conjunction with project-specific analysis.

The need for additional SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.15 Acoustic Environment

10.3.15.1 Affected Environment

The size of the proposed Fourmile East SEZ was reduced by about 26%, from 3,882 acres (15.7 km^2) to 2,882 acres (11.7 km^2). As noted below, with this change in the proposed boundaries, distances to the sensitive receptors are greater than or equal to those in the Draft Solar PEIS.

10.3.15.2 Impacts

Based on the boundary changes and reduced size of the proposed Fourmile East SEZ, noise impacts from construction and operations were remodeled for this Final Solar PEIS. The distance to the nearest residence remained the same as in the Draft Solar PEIS.

10.3.15.2.1 Construction

Except as noted below for impacts on specially designated areas, the conclusions in the Draft Solar PEIS remain valid for this Final Solar PEIS.

The distance to the closest residence is about 0.8 mi (1.3 km) southwest of the SEZ. For construction activities occurring near the closest residence, estimated noise levels at this residence would be about 44 dBA, which is somewhat higher than a typical daytime mean rural background level of 40 dBA. However, estimated 43 dBA L_{dn} at this residence falls well below the EPA guideline of 55 dBA L_{dn} for residential areas.

On the basis of comments received and recent references as applicable, this Final Solar PEIS used an updated approximate significance threshold of 55 dBA corresponding to the onset of adverse physiological impacts (Barber et al. 2010) to update the analysis of potential noise impacts on terrestrial wildlife in areas of special concern. As a result of this updated analysis, the conclusion in the Draft Solar PEIS that wildlife would not be adversely affected has been updated for this Final Solar PEIS as follows. With construction activities occurring near the western SEZ boundary, estimated noise level at the boundary of the Blanca Wetlands SRMA/ACEC (about 0.5 mi [0.8 km] to the west) is about 50 dBA. This estimated level is below the updated significance threshold; thus noise from construction in the proposed Fourmile East SEZ is not anticipated to adversely affect wildlife in the nearby specially designated area. However, as discussed in Section 5.10.2 of this Final Solar PEIS, there is the potential for other effects to occur at lower noise levels (Barber et al. 2011). With these impacts and the potential for impacts at lower noise levels, impacts on terrestrial wildlife from construction noise would have to be considered on a project-specific basis, including site-specific background levels and hearing sensitivity for site-specific terrestrial wildlife of concern.

With the updated boundaries, the distance to the Old Spanish National Historic Trail increased to about 1.2 mi (2.0 km) east of the SEZ boundary. For construction activities occurring near the northeastern SEZ boundary, the updated estimated noise level at the Old Spanish National Historic Trail would be about 42 dBA, which is just above the typical daytime mean rural background level of 40 dBA but less than a just noticeable difference of 3 dBA. The conclusion in the Draft Solar PEIS that construction occurring near the eastern SEZ boundary would result in minor noise impacts on the Old Spanish National Historic Trail is updated for this Final Solar PEIS to conclude that the noise impacts would be negligible and temporary.

Overall, construction activities would cause some unavoidable but localized short-term impacts on neighboring communities, particularly for activities occurring near the southwestern proposed SEZ boundary, close to nearby residences. No adverse vibration impacts are anticipated from construction activities, including pile driving for dish engines.

10.3.15.2.2 Operations

With the decrease in size of the proposed SEZ, the updated noise estimates in this Final Solar PEIS remain the same as or less than as those in the Draft Solar PEIS, and, except as noted below for wildlife impacts in specially designated areas, the conclusions presented in the Draft Solar PEIS remain valid.

Parabolic Trough and Power Tower

If TES were not used for parabolic trough and power tower technologies (12 hours of daytime operations only), the estimated noise level from the power block would be about 42 dBA at the nearest residence, located 0.8 mi (1.3 km) from the SEZ boundary, which is a little higher than the typical daytime mean rural background level of 40 dBA. The day-night average noise level of 43 dBA L_{dn} would be well below the EPA guideline of 55 dBA L_{dn} for residential areas. If TES were used, the estimated nighttime noise level of 52 dBA at the nearest residence would be higher than the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 53 dBA L_{dn}, which is lower than EPA guideline of 55 dBA L_{dn} for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms. Thus it is likely that noise levels would be lower than 53 dBA L_{dn} at the nearest residence, even if TES were used at a solar facility. Nonetheless, operating parabolic trough or power tower facilities using TES and located near the southwestern SEZ boundary could result in noise impacts on the nearest residence, depending on background noise levels and meteorological conditions.

As stated above under construction impacts, for this Final Solar PEIS an updated approximate significance threshold of 55 dBA was used to evaluate potential noise impacts on terrestrial wildlife in areas of special concern. With TES operating near the western SEZ boundary, estimated daytime and nighttime noise levels at the boundary of the Blanca Wetlands SRMA/ACEC (about 0.5 mi [0.8 km] to the west) would be about 45 and 55 dBA, respectively. These estimated levels are below and the same as the significance threshold, respectively; thus noise from operations of a parabolic trough or power tower facility equipped with TES in the proposed Fourmile East SEZ is not anticipated to adversely affect wildlife in the nearby specially designated area. However, as discussed in Section 5.10.2, there is the potential for other effects to occur at lower noise levels (Barber et al. 2011). With these impacts and the potential for impacts at lower noise levels, noise impacts on terrestrial wildlife from a parabolic trough or power tower facility equipped with TES would have to be considered on a project-specific basis, including site-specific background levels and hearing sensitivity for site-specific terrestrial wildlife of concern.

Associated with operations of a parabolic trough or power tower facility equipped with TES occurring at the northeastern SEZ, the estimated daytime and nighttime noise levels at the Old Spanish National Historic Trail (about 1.2 mi [2.0 km] to the east) would be about 39 and 49 dBA, respectively, which are just below and far above the typical daytime and nighttime mean rural background levels of 40 and 30 dBA. Accordingly, a parabolic trough or power tower facility located near the northeastern SEZ boundary could result in noise impacts on the Old Spanish National Historic Trail during nighttime hours.

Dish Engines

The reduced size of the proposed SEZ would reduce the maximum potential number of dish engines. The estimated noise level at the nearest residence, about 0.8 mi (1.3 km) from the SEZ boundary, would be about 42 dBA, which is somewhat higher than the typical daytime mean rural background level of 40 dBA, and the estimated 43 dBA L_{dn} at this residence is well below the EPA guideline of 55 dBA L_{dn} for residential areas. On the basis of other attenuation mechanisms, noise levels at the nearest residence would be lower than the values estimated above. The conclusion in the Draft Solar PEIS that noise from dish engines could adversely affect the nearest residence is updated for this Final Solar PEIS to conclude that noise from dish engines could minimally affect the nearest residence, depending on background noise levels and meteorological conditions.

As stated above under construction impacts, for this Final Solar PEIS an updated approximate significance threshold of 55 dBA was used to evaluate potential noise impacts on terrestrial wildlife in areas of special concern. The estimated noise level from operation of a dish engine solar facility at the boundary of the Blanca Wetlands SRMA/ACEC (about 0.5 mi [0.8 km] to the west) would be about 46 dBA. This estimated level is below the significance threshold; thus noise from operations in the proposed Fourmile East SEZ is not anticipated to adversely affect wildlife in the nearby specially designated area. However, as discussed in Section 5.10.2, there is the potential for other effects to occur at lower noise levels (Barber et al. 2011). With these impacts and the potential for impacts at lower noise levels, noise impacts on terrestrial wildlife from a dish engine facility would have to be considered on a project-specific basis, including consideration of site-specific background levels and hearing sensitivity for site-specific terrestrial wildlife of concern.

Assuming full build-out of the SEZ with dish engine facilities, the estimated noise level at the Old Spanish National Historic Trail, about 1.2 mi (2.0 km) to the east of the SEZ, would be about 43 dBA, which is above the typical daytime mean rural background level of 40 dBA but comparable to a just noticeable difference of 3 dBA. Thus, dish engine noise from the proposed Fourmile East SEZ is unlikely to affect users of the Old Spanish National Historic Trail.

Changes in the proposed Fourmile East SEZ boundaries would not alter the discussions of vibration, transformer and switchyard noise, and corona discharge presented in the Draft Solar PEIS. Noise impacts from transmission line corona discharge would be negligible.

10.3.15.1.3 Decommissioning and Reclamation

The discussion in the Draft Solar PEIS remains valid. Decommissioning and reclamation activities would be of short duration, and their potential noise impacts would be minor and temporary. Potential noise and vibration impacts on surrounding communities would be minimal.

10.3.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce noise impacts are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide some protection from noise impacts.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for noise for the proposed Fourmile East SEZ have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.16 Paleontological Resources

10.3.16.1 Affected Environment

Data provided in the Draft Solar PEIS remain valid, with the following update:

- The BLM Regional Paleontologist may have additional information regarding the paleontological potential of the SEZ and be able to verify the PFYC of the SEZ as Class 1 and 4/5 as used in the Draft Solar PEIS.

10.3.16.2 Impacts

The assessment provided in the Draft Solar PEIS remains valid. Impacts on significant paleontological resources are possible in those areas where the Alamosa Formation is determined to be at a depth that could be affected by solar energy development. However, a more detailed look at the geological deposits is necessary to determine whether a paleontological survey is warranted.

10.3.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Impacts would be minimized through the implementation of required programmatic design features, including a stop-work stipulation in the event that paleontological resources are encountered during construction, as described in Section A.2.2 of Appendix A.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes in the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design feature for paleontological resources has been identified:

- The depth of the Alamosa Formation within the proposed Fourmile East SEZ should be determined to identify any design features that might be needed in that area if solar energy development occurs.

The need for and nature of additional SEZ-specific design features will depend on results of future paleontological investigations. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

As additional information on paleontological resources (e.g., from regional paleontologists or from new surveys) becomes available, the BLM will post the data to the project Web site (http://solareis.anl.gov) for use by applicants, the BLM, and other stakeholders.

10.3.17 Cultural Resources

10.3.17.1 Affected Environment

Data provided in the Draft Solar PEIS remain valid, with the following updates:

- The six archaeological sites located in the footprint of the proposed Fourmile East SEZ in the Draft Solar PEIS are no longer located in the SEZ; however, the potential exists for additional cultural resources to be discovered in the SEZ.

- The distance to the Old Spanish National Historic Trail, located to the east of the proposed Fourmile East SEZ, has been increased from 1 mi (1.6 km) to about 1.3 mi (2.1 km).

- The Trujillo Homestead National Historic Landmark, designated in January 2012, encompasses approximately 35 acres (0.14 km^2) of land about 15 mi (24 km) north of the Fourmile East SEZ and consists of two nineteenth-century Hispanic ranch properties (see Section 10.1.17.1 of this Final Solar PEIS for details).

- Additional information may be available to characterize the SEZ and its surrounding area in the future (after this Final Solar PEIS is completed), as follows:
  - Results of an ethnographic study currently being conducted by TRC Solutions, which focuses on Native American use of lands being analyzed for solar development within the San Luis Valley. The study will discuss sensitive and traditional use areas. Interviews with tribal members and field visits will facilitate the identification of resources and sites of traditional and religious importance to tribes.
  - Results of a Class II sample survey of the SEZ designed to obtain a statistically valid sample of archeological properties and their distribution within the SEZ. Results from the ethnographic study and the sample inventory can be combined to project cultural sensitivity zones as an aid in planning future solar developments.
  - Identification of the location of the Old Spanish National Historic Trail in the vicinity of the SEZ and viewshed analyses from key observation points

along the Trail. A high potential segment of the Trail has been identified directly to the northeast from Crestone, Colorado, to the SEZ. It is clearly within the viewshed of the SEZ and would be affected visually. A mitigation strategy would need to be developed to address unavoidable impacts on the Old Spanish National Historic Trail.

– Continuation of government-to-government consultation as described in Section 2.4.3 of the Supplement to the Draft Solar PEIS and IM 2012-032 (BLM 2011c), including follow-up to recent ethnographic studies covering some SEZs in Nevada and Utah with tribes not included in the original studies to determine whether those tribes have similar concerns.

10.3.17.2 Impacts

Impacts on significant cultural resources are highly likely in the proposed Fourmile East SEZ. Cultural resource surveys would need to be conducted to identify significant cultural prehistoric and historic resources, and a survey of the Old Spanish National Historic Trail would need to occur to determine the location, integrity, and significance of portions of the Trail from which future potential development in the SEZ could be viewed. The assessment provided in the Draft Solar PEIS remains valid, with the following updates:

- The increase in distance from the SEZ boundary to the Old Spanish National Historic Trail from 1 mi (1.6 km) to about 1.3 mi (2.1 km) is not sufficient to mitigate potential visual impacts from solar energy development on the Trail (see Section 10.3.14.2).

- Little to no visual contrast is expected from the viewpoint of the Trujillo Homestead National Historic Landmark toward the Fourmile East SEZ; therefore no adverse effect on this historic property is anticipated.

- Impacts on significant cultural resources and cultural landscapes associated with American Latino heritage are possible throughout the San Luis Valley.

10.3.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on cultural resources are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Programmatic design features will be applied to address SEZ-specific resources and conditions, for example:

- For projects in the Fourmile East SEZ that are located within the viewshed of the Old Spanish National Historic Trail, a National Trail inventory will be required to determine the area of possible adverse impact on resources, qualities, values, and associated settings of the trail; to prevent substantial interference; and to determine any areas unsuitable for development. Residual impacts will be avoided, minimized, and/or mitigated to the extent practicable according to program policy standards. Programmatic design features have been included in BLM's Solar Energy Program to address impacts on National Historic Trails (see Section A.2.2.23 of Appendix A).

Programmatic design features also assume that the necessary surveys, evaluations, and consultations will occur. Ongoing consultation with the Colorado SHPO and the appropriate Native American governments would be conducted during the development of the proposed Fourmile East SEZ. It is likely that some adverse effects on significant resources in the valley could be mitigated to some degree through such efforts, although not enough to eliminate the adverse effects unless significant resources are avoided entirely.

Even assuming the implementation of programmatic design features, adverse effects on historic properties in the proposed Fourmile East SEZ are likely to occur. Factors in addition to those addressed above for the Old Spanish National Historic Trail that lead to this conclusion include the following: (1) the area's high potential to contain significant cultural sites, including Native American human remains and associated cultural items; and (2) its proximity to (and visual impacts on) at least three areas previously identified as traditionally significant to the Navajo and the Tewa Clans of the Upper Rio Grande Pueblos, and possibly the Ute and Jicarilla Apache (i.e., the Great Sand Dunes, San Luis Lakes, and Blanca Peak.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design features for cultural resources in the proposed Fourmile East SEZ have been identified:

- Development of an MOA may be needed among the BLM, Colorado SHPO, and other parties, such as the ACHP, to address the adverse effects of solar energy development on historic properties. The agreement may specify avoidance, minimization, or mitigation measures. Should an MOA be developed to resolve adverse effects on the Old Spanish National Historic Trail, the Trail Administration for the Old Spanish Trail (BLM-NMSO and National Park Service [NPS] Intermountain Trails Office, Santa Fe) should be included in the development of that MOA.

- The possibility of encountering Native American human remains in the vicinity of the proposed Fourmile East SEZ should be discussed during consultation. Tribal participation in the Section 106 process will take place according to the Solar Programmatic Agreement (PA), including opportunities for tribal input regarding inventory design and treatment decisions and procedures for inadvertent discoveries during construction and operations.

The need for and nature of additional SEZ-specific design features would depend on the findings of future investigations. Some SEZ-specific design features may be established through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.18 Native American Concerns

10.3.18.1 Affected Environment

Data provided in the Draft Solar PEIS remain valid but will be supplemented in the future by the results of the ethnographic study being completed in the San Luis Valley (see Section 10.1.17.1).

10.3.18.2 Impacts

The description of potential concerns provided in the Draft Solar PEIS remains valid. No direct impacts from solar energy development are likely to occur on known culturally significant areas (i.e., San Luis Lakes, the Great Sand Dunes, and Blanca Peak); however, indirect visual and auditory impacts are possible. Because tribes typically regard archaeological sites and the remains of their ancestors as culturally important, the high probability of prehistoric resources in the SEZ could be a concern to Native Americans. It is likely that traditional plant and animal habitats would be directly affected with solar energy development in the proposed Fourmile East SEZ.

10.3.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on Native American concerns are described in Section A.2.2 of Appendix A of this Final Solar PEIS. For example, impacts would be minimized through the avoidance of sacred sites, water sources, and tribally important plant and animal species. Programmatic design features require that the necessary surveys, evaluations, and consultations would occur. The tribes would be notified regarding the results of archaeological surveys, and they would be contacted immediately upon any discovery of Native American human remains and associated cultural items.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes in SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features to address Native American concerns in the proposed Fourmile East SEZ have been identified. The need for and nature of SEZ-specific design features would be determined during government-to-government consultation with affected tribes as part of the process of preparing parcels for competitive offer and subsequent project-specific analysis. Potentially significant sites and landscapes in the vicinity of the SEZ associated with Blanca Peak, Great Sand Dunes, and San Luis Lakes, as well as trail systems, mountain springs, mineral resources, burial sites, ceremonial areas, water resources, and plant and animal resources, should be considered and discussed during consultation.

10.3.19 Socioeconomics

10.3.19.1 Affected Environment

Although the boundaries of the Fourmile East SEZ have been reduced compared to the boundaries given in the Draft Solar PEIS, the socioeconomic ROI, the area in which site employees would live and spend their wages and salaries, and into which any in-migration would occur, includes the same counties and communities as described in the Draft Solar PEIS; that is, no updates to the affected environment information given in the Draft Solar PEIS are required.

10.3.19.2 Impacts

Socioeconomic resources in the ROI around the SEZ could be affected by solar energy development through the creation of direct and indirect employment and income, the generation of direct sales and income taxes, SEZ acreage rental and capacity payments to BLM, the in-migration of solar facility workers and their families, and impacts on local housing markets and on local community service employment. The impact assessment provided in the Draft Solar PEIS remains valid, with the following updates.

10.3.19.2.1 Solar Trough

Construction

Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technologies would be 2,156 jobs (Table 10.3.19.2-1). Construction activities would constitute 9.2% of total ROI employment. A solar development would also produce $117.3 million in income. Direct sales taxes would be $0.1 million; direct income taxes, $4.6 million.

With the scale of construction activities and the low likelihood that the entire construction workforce in the required occupational categories would be available in the ROI, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with up to 1,405 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with up to 485 rental units expected to be occupied in the ROI. This occupancy rate would represent 35.5% of the vacant rental units expected to be available in the ROI.

TABLE 10.3.19.2-1 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Fourmile East SEZ as Revised with Trough Facilities

Parameter	Maximum Annual Construction Impacts[a]	Annual Operations Impacts[b]
Employment (no.)		
Direct	1,262	100
Total	2,156	151
Income[c]		
Total	117.3	4.9
Direct state taxes[c]		
Sales	0.1	0.1
Income	4.6	0.1
BLM payments[c]		
Rental	NA[d]	0.2
Capacity[e]	NA	3.0
In-migrants (no.)	1,405	64
Vacant housing[f] (no.)	485	40
Local community service employment		
Teachers (no.)	19	1
Physicians (no.)	2	0
Public safety (no.)	2	0

[a] Construction impacts were based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 461 MW (corresponding to 2,306 acres [9 km^2] of land disturbance) could be built.

[b] Operations impacts were based on full build-out of the site, producing a total output of 461 MW.

[c] Values are reported in $ million 2008.

[d] NA = not applicable.

[e] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

[f] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, up to 19 new teachers, 2 physicians, and 2 public safety employees (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 2.9% of total ROI employment expected in these occupations.

Operations

Total operations employment impacts on the ROI (including direct and indirect impacts) of a full build-out of the SEZ using solar trough technologies would be 151 jobs (Table 10.3.19.2-1). Such a solar development would also produce $4.9 million in income. Direct sales taxes would be $0.1 million; direct income taxes, $0.1 million. Based on fees established by the BLM (BLM 2010), acreage rental payments would be $0.2 million, and solar generating capacity payments, at least $3.0 million.

As for the construction workforce, operation of a solar facility likely would require some in-migration of workers and their families from outside the ROI, with up to 64 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with up to 40 owner-occupied units expected to be occupied in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI.

10.3.19.2.2 Power Tower

Construction

Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be 859 jobs (Table 10.3.19.2-2). Construction activities would constitute 3.7% of total ROI employment. Such a solar development would also produce $46.7 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $1.8 million.

With the scale of construction activities and the low likelihood that the entire construction workforce in the required occupational categories would be available in the local workforce, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with up to 590 persons in-migrating into

TABLE 10.3.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Fourmile East SEZ as Revised with Power Tower Facilities

Parameter	Maximum Annual Construction Impacts[a]	Annual Operations Impacts[b]
Employment (no.)		
Direct	503	52
Total	859	72
Income[c]		
Total	46.7	2.2
Direct state taxes[c]		
Sales	<0.1	<0.1
Income	1.8	0.1
BLM payments[c]		
Rental	NA[d]	0.2
Capacity[e]	NA	1.7
In-migrants (no.)	590	33
Vacant housing[f] (no.)	193	21
Local community service employment		
Teachers (no.)	8	0
Physicians (no.)	1	0
Public safety (no.)	1	0

[a] Construction impacts were based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 256 MW (corresponding to 2,306 acres [9 km^2] of land disturbance) could be built.

[b] Operations impacts were based on full build-out of the site, producing a total output of 256 MW.

[c] Values are reported in $ million 2008.

[d] NA = not applicable.

[e] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

[f] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with up to 193 rental units expected to be occupied in the ROI. This occupancy rate would represent 14.1% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, up to eight new teachers, one physician, and one public safety employee (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 1.2% of total ROI employment expected in these occupations.

Operations

Total operations employment impacts on the ROI (including direct and indirect impacts) of a full build-out of the SEZ using power tower technologies would be 72 jobs (Table 10.3.19.2-2). Such a solar development would also produce $2.2 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.1 million. Based on fees established by the BLM (BLM 2010), acreage rental payments would be $0.2 million, and solar generating capacity payments, at least $1.7 million.

As for the construction workforce, operation of a solar facility likely would require some in-migration of workers and their families from outside the ROI, with up to 33 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with up to 21 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

10.3.19.2.3 Dish Engine

Construction

Total construction employment impacts on the ROI (including direct and indirect impacts) from the use of dish engine technologies would be 349 jobs (Table 10.3.19.2-3). Construction activities would constitute 1.5% of total ROI employment. Such a solar development would also produce $19.0 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.7 million.

TABLE 10.3.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Fourmile East SEZ as Revised with Dish Engine Facilities

Parameter	Maximum Annual Construction Impacts[a]	Annual Operations Impacts[b]
Employment (no.)		
Direct	204	50
Total	349	70
Income[c]		
Total	19.0	2.2
Direct state taxes[c]		
Sales	<0.1	<0.1
Income	0.7	0.1
BLM payments[c]		
Rental	NA[d]	0.2
Capacity[e]	NA	1.7
In-migrants (no.)	227	32
Vacant housing[f] (no.)	79	20
Local community service employment		
Teachers (no.)	3	0
Physicians (no.)	0	0
Public safety (no.)	0	0

a Construction impacts were based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 256 MW (corresponding to 2,306 acres [9 km^2] of land disturbance) could be built.

b Operations impacts were based on full build-out of the site, producing a total output of 256 MW.

c Values are reported in $ million 2008.

d NA = not applicable.

e The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

f Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

With the scale of construction activities and the low likelihood that the entire construction workforce in the required occupational categories would be available in the local workforce, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with up to 227 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with up to 79 rental units expected to be occupied in the ROI. This occupancy rate would represent 5.8% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, up to three new teachers would be required in the ROI. This increase would represent 0.5% of total ROI employment expected in this occupation.

Operations

Total operations employment impacts in the ROI (including direct and indirect impacts) of a full build-out of the SEZ using dish engine technologies would be 70 jobs (Table 10.3.19.2-3). Such a solar development would also produce $2.2 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.1 million. Based on fees established by the BLM (BLM 2010), acreage rental payments would be $0.2 million, and solar generating capacity payments, at least $1.7 million.

As for the construction workforce, operation of a solar facility likely would require some in-migration of workers and their families from outside the ROI, with up to 32 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with up to 20 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

10.3.19.2.4 Photovoltaic

Construction

Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be 163 jobs (Table 10.3.19.2-4). Construction activities

TABLE 10.3.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Fourmile East SEZ as Revised with PV Facilities

Parameter	Maximum Annual Construction Impacts[a]	Annual Operations Impacts[b]
Employment (no.)		
Direct	95	5
Total	163	7
Income[c]		
Total	8.9	0.2
Direct state taxes[c]		
Sales	<0.1	<0.1
Income	0.3	<0.1
BLM payments[c]		
Rental	NA[d]	0.2
Capacity[e]	NA	1.3
In-migrants (no.)	106	3
Vacant housing[f] (no.)	37	2
Local community service employment		
Teachers (no.)	1	0
Physicians (no.)	0	0
Public safety (no.)	0	0

a Construction impacts were based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 256 MW (corresponding to 2,306 acres [9 km^2] of land disturbance) could be built.

b Operations impacts were based on full build-out of the site, producing a total output of 256 MW.

c Values are reported in $ million 2008.

d NA = not applicable.

e The BLM annual capacity payment was based on a fee of $5,256 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010), assuming full build-out of the site.

f Construction activities would affect vacant rental housing; operations activities would affect owner-occupied housing.

would constitute 0.7% of total ROI employment. Such a solar development would also produce $8.9 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.3 million.

With the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with up to 106 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with up to 37 rental units expected to be occupied in the ROI. This occupancy rate would represent 2.7% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI. This increase would represent 0.2% of total ROI employment expected in this occupation.

Operations

Total operations employment impacts in the ROI (including direct and indirect impacts) of a full build-out of the SEZ using PV technologies would be 7 jobs (Table 10.3.19.2-4). Such a solar development would also produce $0.2 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, less than $0.1 million. Based on fees established by the BLM (BLM 2010), acreage rental payments would be $0.2 million, and solar generating capacity payments, at least $1.3 million.

As for the construction workforce, operation of a solar facility likely would require some in-migration of workers and their families from outside the ROI, with up to three persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with up to two owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

10.3.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce socioeconomic impacts are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will reduce the potential for socioeconomic impacts during all project phases.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features to address socioeconomic impacts in the proposed Fourmile East SEZ have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.20 Environmental Justice

10.3.20.1 Affected Environment

The data presented in the Draft Solar PEIS have changed due to the change in boundaries of the proposed Fourmile East SEZ. The affected environment information presented in the Draft Solar PEIS has also changed, as reflected in the following discussion.

The data in Table 10.3.20.1-1 show the minority and low-income composition of the total population located within a 50-mi (80-km) radius of the proposed SEZ based on 2000 Census data and CEQ guidelines (CEQ 1997). Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals also identifying themselves as being part of one or more of the population groups listed in the table.

A large number of minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius in Colorado, 43.2% of the population is classified as minority, while 18.5% is classified as low-income. The number of minority or low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the radius; that is, there are no minority or low-income populations in the Colorado portion of the 50-mi (80-km) area based on 2000 Census data and CEQ guidelines.

Within the 50-mi (80-km) radius in New Mexico, 55.6% of the population is classified as minority, while 17.4% is classified as low-income. Although the number of minority individuals does not exceed the state average by 20 percentage points or more, the number of minority individuals exceeds 50% of the total population in the radius area, meaning that there are minority populations in the 50-mi (80-km) radius based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the radius; that is, there are no low-income populations in the New Mexico portion of the 50-mi (80 km) area.

In the Colorado portion of the 50-mi (80-km) radius, more than 50% of the population in all but one of the block groups in Conejos County is made up of minority population groups,

TABLE 10.3.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Fourmile East SEZ as Revised

Parameter	Colorado	New Mexico
Total population	66,670	9,859
White, non-Hispanic	37,871	4,374
Hispanic or Latino	26,485	5,147
Non-Hispanic or Latino minorities	2,314	338
One race	1,464	171
Black or African American	404	18
American Indian or Alaskan Native	666	93
Asian	262	30
Native Hawaiian or other Pacific Islander	26	3
Some other race	106	27
Two or more races	850	167
Total minority	28,799	5,485
Low-income	11,886	1,720
Percentage minority	43.2	55.6
State percentage minority	25.5	55.3
Percentage low-income	18.5	17.4
State percentage low-income	9.3	18.4

Sources: U.S. Bureau of the Census (2009a,b).

together with all the block groups in adjacent Costilla County. Block groups in the cities of Alamosa (Alamosa County), Monte Vista and Del Norte (both in Rio Grande County), Center (Saguache County), and Walsenburg (Huerfano County) are also more than 50% minority. In the New Mexico portion of the radius, Rio Arriba County has one block group in which the minority population is more than 20 percentage points higher than the state average, while there are two block groups with more than a 50% minority in Taos County.

Low-income populations in the 50-mi (80-km) radius are limited to two block groups in the Colorado portion, in the cities of San Luis (Costilla County) and Alamosa, both of which have low-income population shares that are more than 20 percentage points higher than the state average.

Figures 10.3.20.1-1 and 10.3.20.1-2 show the locations of minority and low-income population groups in the 50-mi (80-km) radius around the boundary of the SEZ.

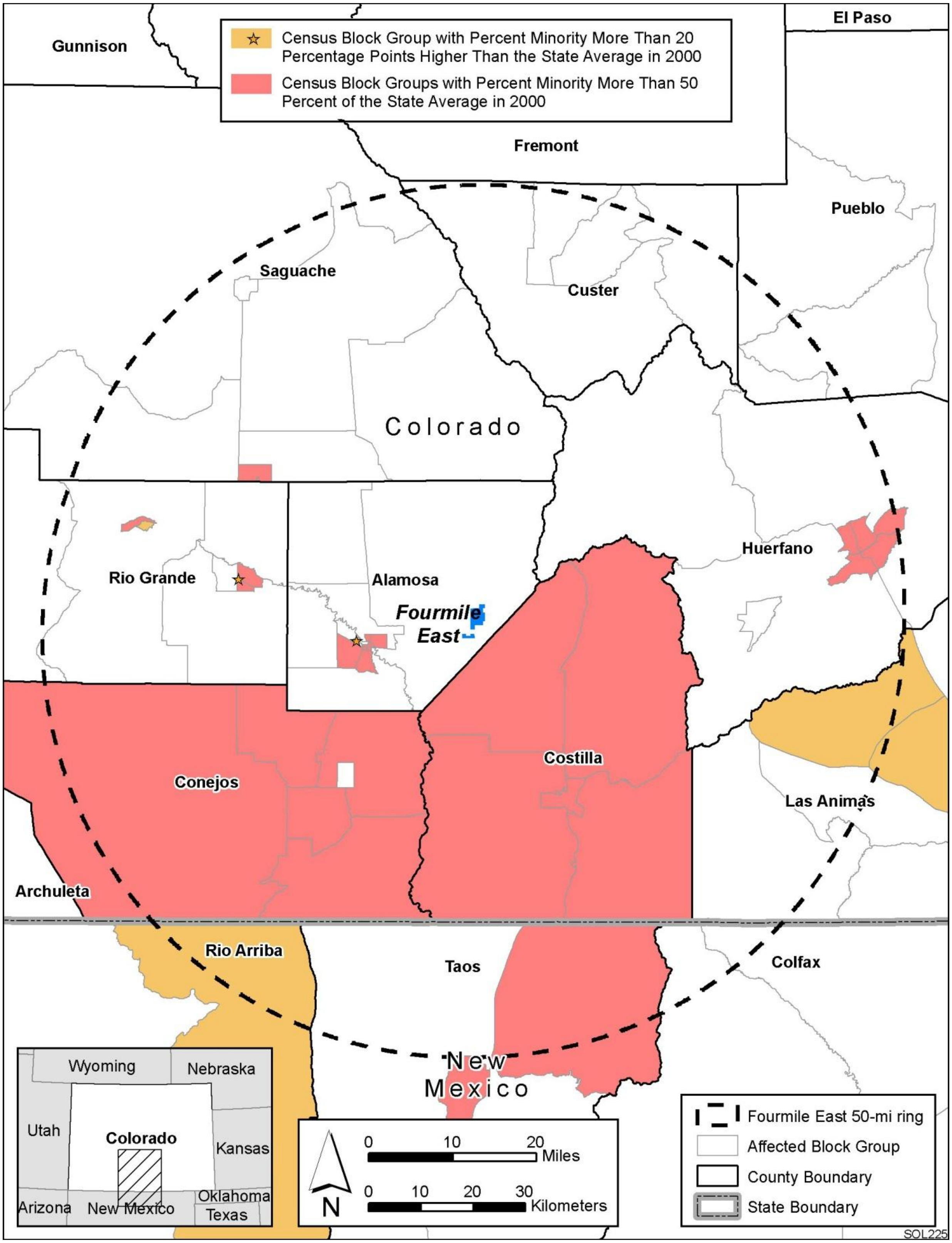

FIGURE 10.3.20.1-1 Minority Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Fourmile East SEZ as Revised

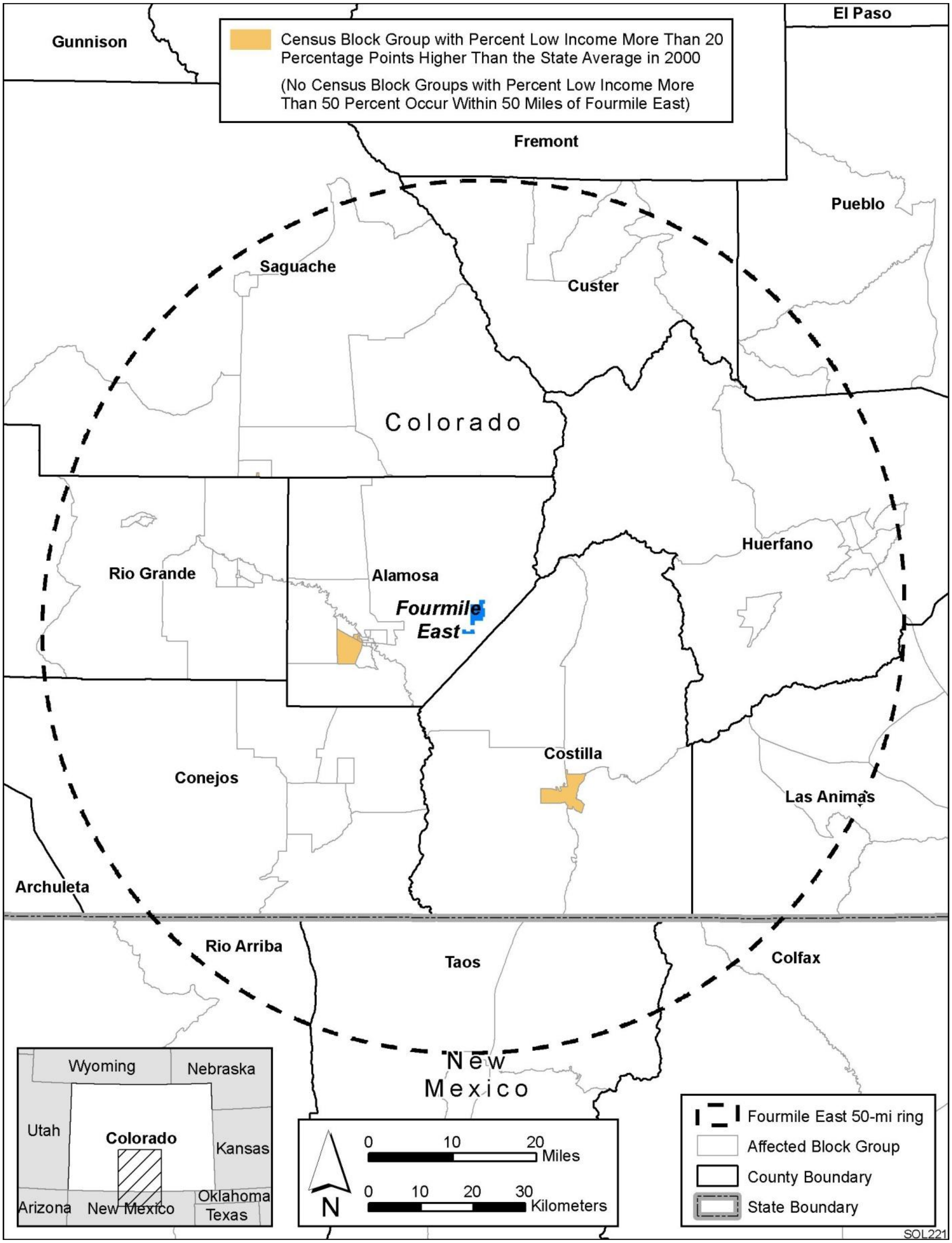

FIGURE 10.3.20.1-2 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Fourmile East SEZ as Revised

10.3.20.2 Impacts

Potential impacts (e.g., from noise and dust during construction and operations, visual impacts, cultural impacts, and effects on property values) on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Although impacts are likely to be small, there are minority populations defined by CEQ guidelines (CEQ 1997) (see Section 10.3.20.1 of the Draft Solar PEIS) within the New Mexico portion of the 50-mi (80-km) radius around the boundary of the SEZ; thus any adverse impacts of solar projects would disproportionately affect minority populations. Further analysis of these impacts would be included in subsequent NEPA reviews of individual solar projects. Because there are no low-income populations within the 50-mi (80-km) radius, according to CEQ guidelines, there would be no impacts on low-income populations.

10.3.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce potential environmental justice impacts are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will reduce the potential for environmental justice impacts.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for environmental justice in the proposed Fourmile East SEZ have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.21 Transportation

10.3.21.1 Affected Environment

The reduction in size of the SEZ does not change the information on affected environment for transportation provided in the Draft Solar PEIS.

10.3.21.2 Impacts

As stated in the Draft Solar PEIS, the primary transportation impacts are anticipated to be from commuting worker traffic. U.S. 160 provides a regional traffic corridor that could experience moderate impacts for projects that may have up to 1,000 daily workers with an additional 2,000 vehicle trips per day (maximum). Some parts of U.S. 160 could experience approximately a 50% increase in the daily traffic load, and the amount of traffic currently on CO 150 could increase approximately threefold. Local road improvements would be necessary in any portion of the SEZ along U.S. 160 that might be developed so as not to overwhelm the local roads near any site access point(s). CO 150 and any other access roads connected to it would require road improvements to handle the additional traffic.

Solar development within the SEZ would affect public access along OHV routes that are designated open and available for public use. Although open routes crossing areas granted ROWs for solar facilities could be redesignated as closed (see Section 5.5.1 of the Draft Solar PEIS), a programmatic design feature has been included under Recreation (Section A.2.2.6.1 of Appendix A) that requires consideration of replacement of lost OHV route acreage and of access across and to public lands.

10.3.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce transportation impacts are described in Section A.2.2 of Appendix A of this Final Solar PEIS. The programmatic design features, including local road improvements, multiple site access locations, staggered work schedules, and ride-sharing, will all provide some relief to traffic congestion on local roads leading to the SEZ. Depending on the location of solar facilities within the SEZ, more specific access locations and local road improvements could be implemented.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features to address transportation impacts in the proposed Fourmile East SEZ have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.3.22 Cumulative Impacts

The analysis of potential impacts in the vicinity of the proposed Fourmile East SEZ presented in the Draft Solar PEIS is still generally applicable for this Final Solar PEIS, although the impacts would be decreased because the size of the proposed SEZ has been reduced to 2,883 acres (11.7 km^2). The following sections include an update to the information presented in the Draft Solar PEIS regarding cumulative effects for the proposed Fourmile East SEZ.

10.3.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impact analysis has not changed. The extent varies on the basis of the nature of the resource being evaluated and the distance at which an impact may occur (thus, e.g., air quality impacts may have a greater regional extent than cultural resources impacts). Lands around the SEZ are privately owned or administered by the USFS, NPS, or the BLM. The BLM administers approximately 11% of the lands within a 50-mi (80-km) radius of the Fourmile East SEZ.

10.3.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The proposed Fourmile East SEZ decreased from 3,882 acres (15.7 km^2) to 2,883 acres (11.7 km^2). The Draft Solar PEIS included three other proposed SEZs in Colorado: Antonito Southeast, De Tilla Gulch, and Los Mogotes East. All these proposed SEZs are being carried forward to the Final Solar PEIS; the areas of the De Tilla Gulch and Los Mogotes East SEZs have been decreased.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to energy production and distribution, including potential solar energy projects under the proposed action (Section 10.3.22.2.1); and (2) other ongoing and reasonably foreseeable actions, including those related to electric power generation and distribution, wildlife management, and military facility improvement (Section 10.3.22.2.2). Together, these actions and trends have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

10.3.22.2.1 Energy Production and Distribution

The list of reasonably foreseeable future actions near the proposed Fourmile East SEZ has been updated and is presented in Table 10.3.22.2-1. Projects listed in the table are shown in Figure 10.3.22.2-1.

Xcel Energy (Public Service Company of Colorado) has submitted a transmission planning report to the Colorado Public Utility Commission stating that it intends to end its involvement in the proposed San Luis Valley–Calumet-Comanche Transmission project (Heide 2011). The project itself has not been cancelled.

10.3.22.2.2 Other Actions

None of the major ongoing and foreseeable actions within 50 mi (80 km) of the proposed Fourmile East SEZ that were listed in Table 10.3.22.2-3 of the Draft Solar PEIS have had a change in their status.

10.3.22.3 General Trends

The information on general trends presented in the Draft Solar PEIS remains valid.

10.3.22.4 Cumulative Impacts on Resources

Total disturbance over 20 years in the proposed Fourmile East SEZ would be about 2,306 acres (9.4 km^2) (80% of the entire proposed SEZ). This development would contribute incrementally to the impacts from other past, present and reasonably foreseeable future actions

TABLE 10.3.22.2-1 Ongoing and Reasonably Foreseeable Future Actions Related to Energy Development and Distribution near the Proposed Fourmile East SEZ as Revised and in the San Luis Valley[a]

Description	Status	Resources Affected	Primary Impact Location
Renewable Energy Development			
San Luis Valley Generation Development Area (GDA) (Solar) Designation	Ongoing	Land use	San Luis Valley
Xcel Energy/SunEdison Project, 8.2-MW PV	**Operating**	Land use, ecological resources, visual	San Luis Valley GDA
San Luis Valley Solar Ranch (formerly Alamosa Solar Generating Project), 30-MW PV	**Operating[b]**	Land use, ecological resources, visual	San Luis Valley GDA
Greater Sandhill Solar Project, 19-MW PV	**Operating[b]**	Land use, ecological resources, visual	San Luis Valley GDA
San Luis Valley Solar Project, Tessera Solar, 200-MW dish engine, **changed to 145-MW, 1,500 acres[c]**	**New proposal[d]**	Land use, ecological resources, visual, cultural	San Luis Valley GDA
Solar Reserve; 200-MW solar tower	**Application submitted for land-use permit[e]**	Land use, ecological resources, visual	San Luis Valley GDA (Saguache)
Alamosa Solar Generating Project (formerly Cogentrix Solar Services), 30-MW high-concentration PV	**Under construction[b]**	Land use, ecological resources, visual	San Luis Valley GDA
Lincoln Renewables, 37-MW PV	County Permit approved	Land use, ecological resources, visual	San Luis Valley GDA
NextEra, 30-MW PV	County Permit approved	Land use, ecological resources, visual	San Luis Valley GDA
Transmission and Distribution Systems			
San Luis Valley–Calumet-Comanche Transmission Project	**Proposed[f]**	Land use, ecological resources, visual, cultural	San Luis Valley (select counties)

a Projects with status changed from that given in the Draft Solar PEIS are shown in bold text.

b See SEIA (2012) for details.

c To convert acres to km^2, multiply by 0.004047.

d See Solar Feeds (2012) for details.

e See Tetra Tech EC, Inc. (2011).

f See Heide (2011) for details.

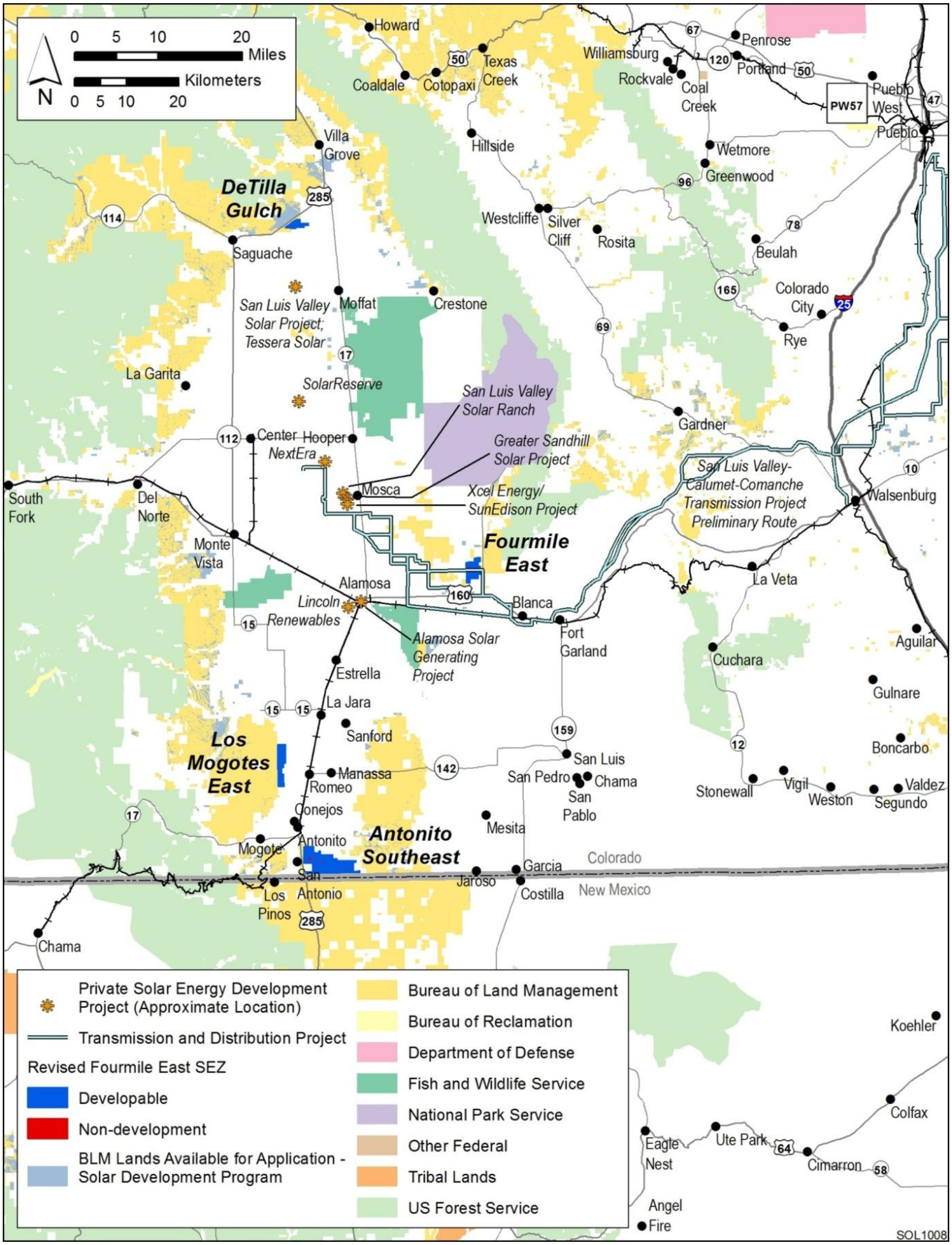

FIGURE 10.3.22.2-1 Locations of Existing and Reasonably Foreseeable Renewable Energy Projects on Public Land within a 5-mi (80-km) Radius of the Proposed Fourmile East SEZ as Revised

in the region as described in the Draft Solar PEIS. Primary impacts from development in the Fourmile East SEZ may include impacts on water quantity and quality, air quality, ecological resources such as habitat and species, cultural and visual resources, and specially designated lands.

No additional major actions have been identified within 50 mi (80 km) of the SEZ. As a result of the reduction in the developable area of the SEZ, the incremental cumulative impacts associated with development in the proposed Fourmile East SEZ during construction, operation, and decommissioning are expected to be the same or less than those projected in the Draft Solar PEIS.

On the basis of comments received on the Draft Solar PEIS, cumulative impacts on recreation in the San Luis Valley have been reconsidered. While it is unlikely that the proposed Fourmile East SEZ would have a large impact on recreational use or tourism throughout the Valley, cumulative impacts could occur because it is one of four potential SEZs totaling about 16,300 acres (66 km^2) on public lands, and there are additional solar energy developments on private land. The location of the SEZ along the main route into Great Sand Dunes National Park has the potential of influencing the impressions of recreational visitors traveling to the park. Because most of the land on the valley floor of the San Luis Valley is private and is heavily developed for agricultural use, undeveloped public lands around the valley provide accessible areas for public recreation. Although it is believed the recreation use of the proposed SEZ is low, the loss of public access to such areas cumulatively leads to an overall reduction in the availability of recreation that can become significant.

10.3.23 Transmission Analysis

The methodology for this transmission analysis is described in Appendix G of this Final Solar PEIS. This section presents the results of the transmission analysis for the Fourmile East SEZ, including the identification of potential load areas to be served by power generated at the SEZ and the results of the DLT analysis. Unlike Sections 10.3.2 through 10.3.22, this section is not an update of previous analysis for the Fourmile East SEZ; this analysis was not presented in the Draft Solar PEIS. However, the methodology and a test case analysis were presented in the Supplement to the Draft Solar PEIS. Comments received on the material presented in the Supplement were used to improve the methodology for the assessment presented in this Final Solar PEIS.

On the basis of its size, the assumption of a minimum of 5 acres (0.02 km^2) of land required per MW, and the assumption of a maximum of 80% of the land area developed, the Fourmile East SEZ is estimated to have the potential to generate 461 MW of marketable solar power at full build-out.

10.3.23.1 Identification and Characterization of Load Areas

The primary candidates for Fourmile East SEZ load areas are the major surrounding cities. Figure 10.3.23.1-1 shows the possible load areas for the Fourmile East SEZ and the estimated portion of their market that could be served by solar generation. Possible load areas for the Fourmile East SEZ include Pueblo, Colorado Springs, and Denver, Colorado; Farmington, Albuquerque, and Santa Fe, New Mexico; Salt Lake City, Utah; Phoenix, Arizona; and Las Vegas, Nevada.

The two load area groups examined for Fourmile East SEZ are as follows:

1. Pueblo, Colorado Springs, and Denver, Colorado, and

2. Farmington and Albuquerque, New Mexico.

Figure 10.3.23.1-2 shows the most economically viable transmission scheme for the Fourmile East SEZ (transmission scheme 1), and Figure 10.3.23.1-3 shows an alternative transmission scheme (transmission scheme 2) that represents a logical choice should transmission scheme 1 be infeasible. As described in Appendix G, the alternative shown in transmission scheme 2 represents the optimum choice if one or more of the primary linkages in transmission scheme 1 are excluded from consideration. The groups provide for linking loads along alternative routes so that the SEZ's output of 461 MW could be fully allocated.

Table 10.3.23.1-1 summarizes and groups the load areas according to their associated transmission scheme and provides details on how the megawatt load for each area was estimated.

10.3.23.2 Findings for the DLT Analysis

The DLT analysis approach assumes that the Fourmile East SEZ will require all new construction for transmission lines (i.e., dedicated lines) and substations. The new transmission lines(s) would directly convey the 461-MW output of the Fourmile East SEZ to the prospective load areas for each possible transmission scheme. The approach also assumes that all existing transmission lines in the WECC region are saturated and have little or no available capacity to accommodate the SEZ's output throughout the entire 10-year study horizon.

Figures 10.3.23.1-1 and 10.3.23.1-2 display the pathways that new dedicated lines might follow to distribute solar power generated at the Fourmile East SEZ via the two identified transmission schemes described in Table 10.3.23.1-1. These pathways parallel existing 500-, 345-, 230-kV, and lower voltage lines. The intent of following existing lines is to avoid pathways that may be infeasible due to topographical limitations or other reasons.

For transmission scheme 1, serving load centers to the north, a new line would be constructed to connect with Pueblo (52 MW), Colorado Springs (210 MW), and Denver (1,272 MW), so that the 461-MW output of the Fourmile East SEZ could be fully utilized (Figure 10.3.23.1-2). This particular scheme has three segments. The first segment is from the

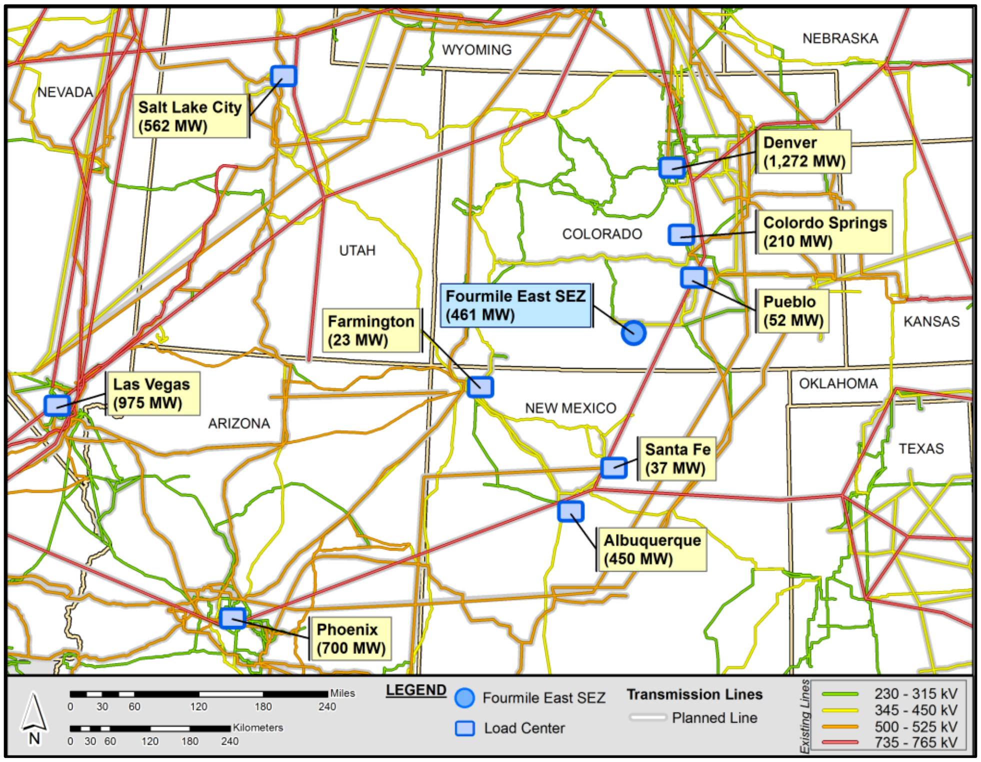

FIGURE 10.3.23.1-1 Location of the Proposed Fourmile East SEZ and Possible Load Areas (Source for background map: Platts 2011)

SEZ, running about 105 mi (169 km) northeast to Pueblo. On the basis of engineering and operational considerations, this segment would require a single-circuit 345-kV bundle of two conductor (Bof2) transmission design. The second leg goes north about 43 mi (69 km) from Pueblo to Colorado Springs. The third and final leg extends 63 mi (101 km) farther north to Denver. The transmission configuration options were determined by using the line "loadability" curve provided in American Electric Power's *Transmission Facts* (AEP 2010). Appendix G documents the line options used for this analysis and describes how the load area groupings were determined.

For transmission scheme 2, serving load centers to the southwest, Figure 10.3.23.1-3 shows that new lines would be constructed to connect with Farmington (23 MW) and Albuquerque (450 MW), so that the 461-MW output of the Fourmile East SEZ could be fully utilized. This scheme has two segments. The first segment, from the SEZ to Farmington, is 331 mi (533 km) long, and the second segment, from Farmington to Albuquerque, is about 173 mi (278 km) long. Again, the transmission configuration for each leg, or segment, varies and was determined by using the line "loadability" curve provided in American Electric Power's *Transmission Facts* (AEP 2010), with the constraint that the full output of the SEZ (461 MW) would be completely marketed.

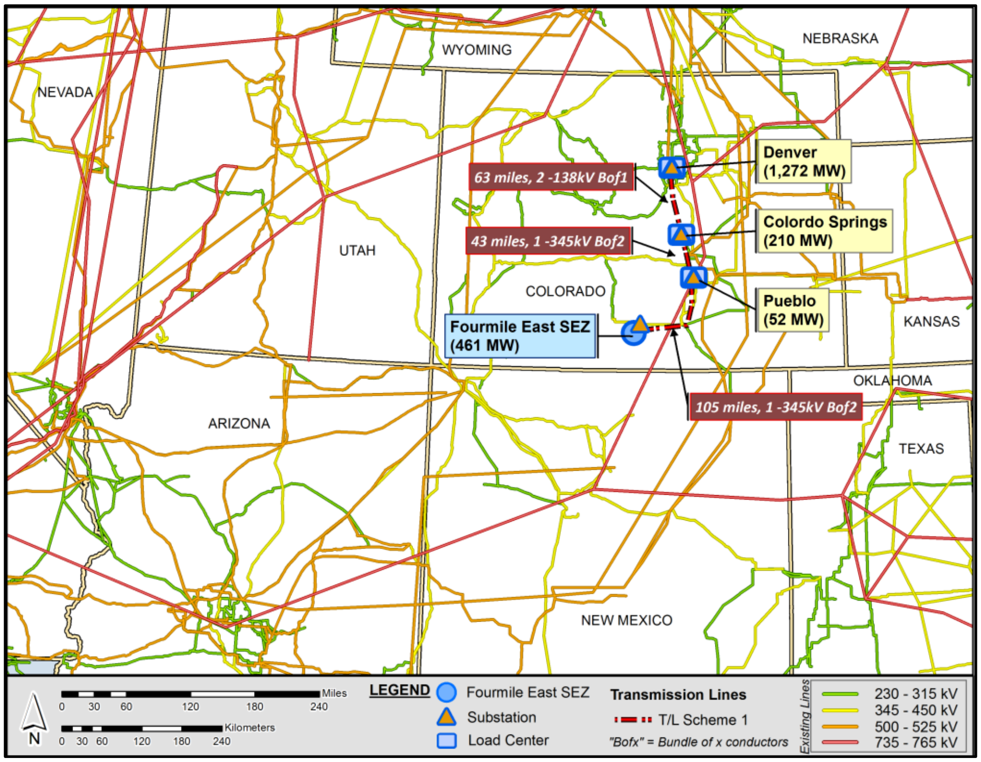

FIGURE 10.3.23.1-2 Transmission Scheme 1 for the Proposed Fourmile East SEZ (Source for background map: Platts 2011)

Table 10.3.23.2-1 summarizes the distances to the various load areas over which new transmission lines would need to be constructed, as well as the assumed number of substations that would be required. One substation is assumed to be installed at each load area and an additional one at the SEZ. Thus, in general, the total number of substations per scheme is simply equal to the number of load areas associated with the scheme plus one. Substations at the load areas would consist of one or more step-down transformers, while the originating substation at the SEZ would consist of several step-up transformers. The originating substation would have a rating of at least 461 MW (to match the plant's output), while the combined load substations would have a similar total rating of 461 MW. For schemes that require the branching of the lines, a switching substation is assumed to be constructed at the appropriate junction. In general, switching stations carry no local load but are assumed to be equipped with switching gears (e.g., circuit breakers and connecting switches) to reroute power as well as, in some cases, with additional equipment to regulate voltage.

Table 10.3.23.2-2 provides an estimate of the total land area disturbed for construction of new transmission facilities under each of the schemes evaluated. The most favorable transmission scheme with respect to minimizing costs and the area disturbed would be scheme 1, which would serve Pueblo, Colorado Springs, and Denver and for which the construction of new transmission lines and substations is estimated to disturb about 3,761 acres (15.2 km^2) of land. The less favorable transmission scheme with respect to minimizing costs and the area disturbed would be scheme 2 (serving Farmington and Albuquerque). For this scheme, the construction of

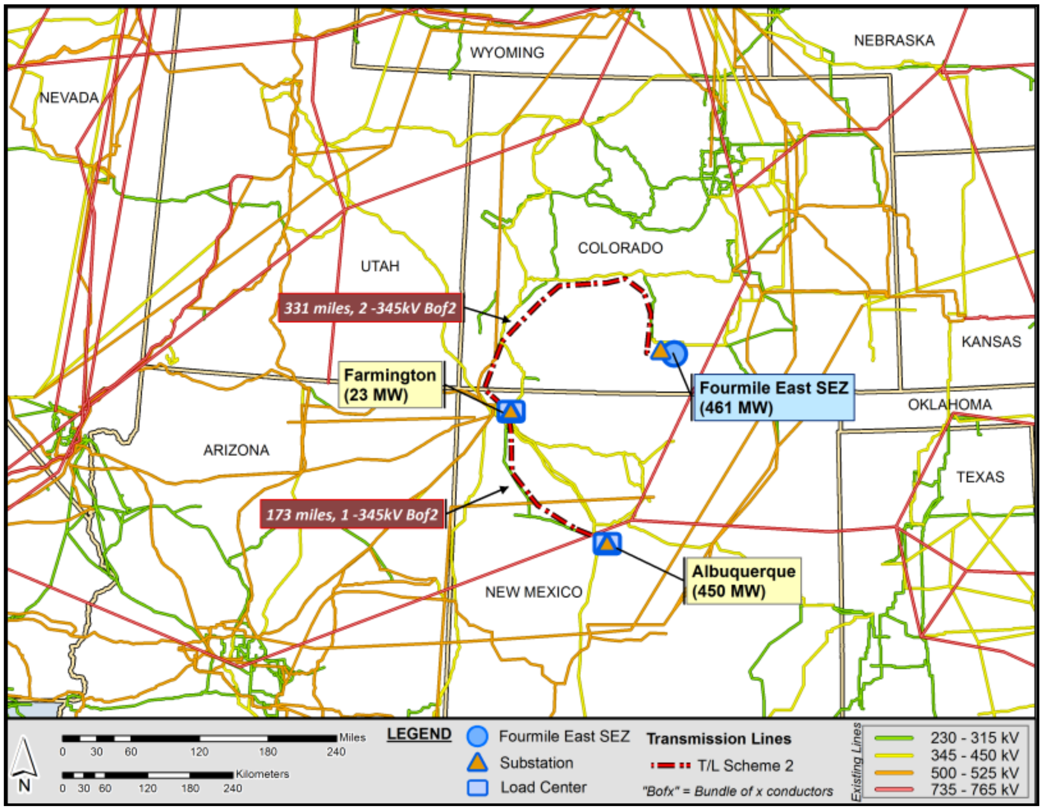

FIGURE 10.3.23.1-3 Transmission Scheme 2 for the Proposed Fourmile East SEZ (Source for background map: Platts 2011)

TABLE 10.3.23.1-1 Candidate Load Area Characteristics for the Proposed Fourmile East SEZ

Transmission Scheme	City/Load Area Name	Position Relative to SEZ	2010 Population[c]	Estimated Total Peak Load (MW)	Estimated Peak Solar Market (MW)
1	Pueblo, Colorado[a]	North	105,000	262	52
	Colorado Springs, Colorado[a]	North	420,000	1,050	210
	Denver, Colorado[b]	North	2,543,000	6,358	1,272
2	Farmington, New Mexico[a]	Southwest	46,000	115	23
	Albuquerque, New Mexico[b]	South	900,000	2,269	450

[a] The load area represents the city named.

[b] The load area represents the metropolitan area (i.e., the identified city plus adjacent communities).

[c] City and metropolitan area population data are from 2010 Census data (U.S. Bureau of the Census 2010).

TABLE 10.3.23.2-1 Potential Transmission Schemes, Estimated Solar Markets, and Distances to Load Areas for the Proposed Fourmile East SEZ

Transmission Scheme	City/Load Area Name	Estimated Peak Solar Market (MW)[c]	Total Solar Market (MW)	Sequential Distance (mi)[d]	Total Distance (mi)[d]	Line Voltage (kV)	No. of Substations
1	Pueblo, Colorado[a]	52	1,534	105	211	345, 138	4
	Colorado Springs, Colorado[a]	210		43			
	Denver, Colorado[b]	1,272		63			
2	Farmington, New Mexico[a]	23	473	331	504	345	3
	Albuquerque, New Mexico[b]	450		173			

[a] The load area represents the city named.

[b] The load area represents the metropolitan area (i.e., the identified city plus adjacent communities).

[c] From Table 10.3.23.1-1.

[d] To convert mi to km, multiply by 1.6093.

TABLE 10.3.23.2-2 Comparison of the Various Transmission Line Configurations with Respect to Land Use Requirements for the Proposed Fourmile East SEZ

				Land Use (acres)[d]		
Transmission Scheme	City/Load Area Name	Total Distance (mi)[c]	No. of Substations	Transmission Line	Substation	Total
1	Pueblo, Colorado[a]	211	4	3,750.3	10.2	3,760.5
	Colorado Springs, Colorado[a]					
	Denver, Colorado[b]					
2	Farmington, New Mexico[a]	504	3	10,690.9	10.2	10,701.1
	Albuquerque, New Mexico[b]					

[a] The load area represents the city named.

[b] The load area represents the metropolitan area (i.e., the identified city plus adjacent communities).

[c] To convert mi to km, multiply by 1.6093.

[d] To convert acres to km^2, multiply by 0.004047.

new transmission lines and substations is estimated to disturb a land area on the order of 10,701 acres (43.3 km^2).

Table 10.3.23.2-3 shows the estimated NPV of both transmission schemes and takes into account the cost of constructing the lines, the substations, and the projected revenue stream over the 10-year horizon. A positive NPV indicates that revenues more than offset investments. This calculation does not include the cost of producing electricity.

The most economically attractive configuration (transmission scheme 1) has the highest positive NPV and serves the Colorado cities of Pueblo, Colorado Springs, and Denver. The secondary case (transmission scheme 2), which excludes one or more of the primary pathways used in scheme 1, is less economically attractive and focuses on delivering power to Farmington and Albuquerque. For the assumed utilization factor of 20%, scheme 2 exhibits a negative NPV, implying that this option may not be economically viable under the current assumptions.

Table 10.3.23.2-4 shows the effect of varying the value of the utilization factor on the NPV of the transmission schemes. The table shows that at about 50% utilization, NPVs for both schemes are positive. It also shows that as the utilization factor is increased, the economic viability of the lines also increases. Utilization factors can be raised by allowing the new dedicated lines to market other power generation outputs in the region in addition to that of its associated SEZ.

The findings of the DLT analysis for the proposed Fourmile East SEZ are as follows:

- Transmission scheme 1, which identifies the cities of Pueblo, Colorado Springs, and Denver (in that specific sequence) as the primary markets, represents the most favorable option based on NPV and land use requirements. This scheme would result in new land disturbance of about 3,761 acres (15.2 km^2).

- Transmission scheme 2, which represents an alternative configuration, identifies Farmington and Albuquerque as the primary market. In terms of defining potential upper-bound impacts of new transmission infrastructure development, this configuration would result in new land disturbance of about 10,701 acres (43.3 km^2). In terms of NPV, however, this scheme may not be economically viable under the current assumptions.

- Other load area configurations are possible but would be less favorable than scheme 1 in terms of NPV and, in most cases, also in terms of land use requirements. If new electricity generation at the proposed Fourmile East SEZ is not sent to either of the two markets identified above, the potential upper-bound impacts in terms of cost would be greater.

- The analysis of transmission requirements for the proposed Fourmile East SEZ would be expected to show lower costs and less land disturbance if solar-eligible load assumptions were increased, although the magnitude of those

TABLE 10.3.23.2-3 Comparison of Potential Transmission Lines with Respect to NPV (Base Case) for the Proposed Fourmile East SEZ

Transmission Scheme	City/Load Area Name	Present Value Transmission Line Cost ($ million)	Present Value Substation Cost ($ million)	Annual Sales Revenue ($ million)	Present Worth of Revenue Stream ($ million)	NPV ($ million)
1	Pueblo, Colorado[a] Colorado Springs, Colorado[a] Denver, Colorado[b]	373.7	28.0	74.3	573.6	171.9
2	Farmington, New Mexico[a] Albuquerque, New Mexico[b]	1,208.1	28.0	74.3	573.6	−662.5

a The load area represents the city named.

b The load area represents the metropolitan area (i.e., the identified city plus adjacent communities).

TABLE 10.3.23.2-4 Effect of Varying the Utilization Factor on the NPV of the Transmission Schemes for the Proposed Fourmile East SEZ

Transmission Scheme	City/Load Area Name	NPV ($ million) at Different Utilization Factors					
		20%	30%	40%	50%	60%	70%
1	Pueblo, Colorado[a] Colorado Springs, Colorado[a] Denver, Colorado[b]	171.9	458.7	745.6	1,032.3	1,319.1	1,605.9
2	Farmington, New Mexico[a] Albuquerque, New Mexico[b]	−662.5	−375.7	−88.9	197.9	484.7	771.5

a The load area represents the city named.

b The load area represents the metropolitan area (i.e., the identified city plus adjacent communities).

changes would vary due to a number of factors. In general, for cases such as the Fourmile East SEZ that show multiple load areas being served to accommodate the specified capacity, the estimated costs and land disturbance would be affected by increasing the solar-eligible load assumption. By increasing the eligible loads at all load areas, the transmission routing and configuration solutions can take advantage of shorter line distances and deliveries to fewer load areas, thus reducing costs and land disturbed. In general, SEZs that show the greatest number of load areas served and greatest distances required for new transmission lines (e.g., Riverside East) would show the greatest decrease in impacts as a result of increasing the solar-eligible load assumption from 20% to a higher percentage.

10.3.24 Impacts of the Withdrawal

The BLM is proposing to withdraw 2,883 acres (12 km^2) of public land comprising the proposed Fourmile East SEZ from settlement, sale, location, or entry under the general land laws, including the mining laws, for a period of 20 years (see Section 2.2.2.2.4 of the Final Solar PEIS). The public lands would be withdrawn, subject to valid existing rights, from settlement, sale, location, or entry under the general land laws, including the mining laws. This means that the lands could not be appropriated, sold, or exchanged during the term of the withdrawal, and new mining claims could not be filed on the withdrawn lands. Mining claims filed prior to the segregation or withdrawal of the identified lands would take precedence over future solar energy development. The withdrawn lands would remain open to the mineral leasing, geothermal leasing, and mineral material laws, and the BLM could elect to lease the oil, gas, coal, or geothermal steam resources, or to sell common-variety mineral materials, such as sand and gravel, contained in the withdrawn lands. In addition, the BLM would retain the discretion to authorize linear and renewable energy ROWs on the withdrawn lands.

The purpose of the proposed land withdrawal is to minimize the potential for conflicts between mineral development and solar energy development for the proposed 20-year withdrawal period. Under the land withdrawal, there would be no mining-related surface development, such as the establishment of open pit mining, construction of roads for hauling materials, extraction of ores from tunnels or adits, or construction of facilities to process the material mined, that could preclude use of the SEZ for solar energy development. For the Fourmile East SEZ, the impacts of the proposed withdrawal on mineral resources and related economic activity and employment are expected to be negligible because the mineral potential of the lands within the SEZ is low (BLM 2012). There has been no documented mining within the SEZ, and there are no known locatable mineral deposits within the land withdrawal area. According to the LR2000 (accessed in January 2012), there are no recorded mining claims within the land withdrawal area.

Although the mineral potential of the lands within the Fourmile East SEZ is low, the proposed withdrawal of lands within the SEZ would preclude many types of mining activity over a 20-year period, resulting in the avoidance of potential mining-related adverse impacts. Impacts commonly related to mining development include increased soil erosion and sedimentation, water use, generation of contaminated water in need of treatment, creation of lagoons and ponds (hazardous to wildlife), toxic runoff, air pollution, establishment of noxious weeds and invasive species, habitat destruction or fragmentation, disturbance of wildlife, blockage of migration corridors, increased visual contrast, noise, destruction of cultural artifacts and fossils and/or their context, disruption of landscapes and sacred places of interest to tribes, increased traffic and related emissions, and conflicts with other land uses (e.g., recreational).

10.3.25 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this Final Solar PEIS. It is likely that at the time of publication of this Final Solar PEIS, some of these Web pages may no longer be

available or the URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this Final Solar PEIS.

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10.3.26 Errata for the Proposed Fourmile East SEZ

This section presents corrections to material presented in the Draft Solar PEIS and the Supplement to the Draft. The need for these corrections was identified in several ways: through comments received on the Draft Solar PEIS and the Supplement to the Draft (and verified by the authors), through new information obtained by the authors subsequent to publication of the Draft Solar PEIS and the Supplement to the Draft, or through additional review of the original material by the authors. Table 10.3.26-1 provides corrections to information presented in the Draft Solar PEIS and the Supplement to the Draft.

TABLE 10.3.26-1 Errata for the Proposed Fourmile East SEZ (Section 10.3 of the Draft Solar PEIS and Section C.3.3 of the Supplement to the Draft Solar PEIS)

Section No.	Page No.	Line No.	Figure No.	Table No.	Correction
10.3.3.1	10.3-23	35–36			“Portions of State Highways 17, 150, and 159 and Alamosa County Road 6N have been designated by the state and the BLM as part of the Los Caminos Antiguos Scenic Byway,” should read, “Portions of State Highways 17, 150, and 159 and Alamosa County Road 6N have been designated as part of the Los Caminos Antiguos Scenic Byway by the Colorado Scenic and Historic Byway Commission with final approval by the Colorado Transportation Commission.”
10.3.11.2					All uses of the term “neotropical migrants” in the text and tables of this section should be replaced with the term “passerines.”
10.3.14.2.2	10.3-3	22–23			“It is located 5.1 mi (8.2 km) east–southeast of the SEZ at the closest point of approach,” should read, “It is located 5.0 mi (8.0 km) west–southwest of the SEZ at the closest point of approach.”
10.3.14.22	10.2-214	13–15			“At night, if sufficiently tall, power towers in the SEZ could have red or white flashing hazard navigation lighting that would likely be visible from the location in the National Park,” should read, “At night, if sufficiently tall, power towers in the SEZ could have red or white flashing hazard navigation lighting that would likely be visible from the location in the WA.”
10.3.14.22	10.2-214	19–21			“Under the 80% development scenario analyzed in this PEIS, solar energy development within the SEZ would be expected to create strong visual contrasts for viewers within the national park,” should read, “Under the 80% development scenario analyzed in this PEIS, solar energy development within the SEZ would be expected to create strong visual contrasts for viewers within the WA.”

10.4 LOS MOGOTES EAST

10.4.1 Background and Summary of Impacts

10.4.1.1 General Information

The proposed Los Mogotes East SEZ is located in Conejos County in south-central Colorado, about 12 mi (19 km) north of the New Mexico border. In 2008, the county population was 8,745, while the four-county region surrounding the SEZ—Alamosa, Conejos, Costilla, and Rio Grande Counties—had a total population of 39,759. The largest nearby town is Alamosa, which had a 2008 population of 8,745 and is located about 22 mi (35 km) to the northeast on U.S. 285. This highway is located about 3 mi (5 km) east of the SEZ. The town of Romeo is located about 3 mi (5 km) directly to the east of the SEZ on U.S. 285. The SLRG Railroad serves the area. As of October 28, 2011, there were no pending solar project applications within or adjacent to the SEZ.

As published in the Draft Solar PEIS (BLM and DOE 2010), the proposed Los Mogotes East SEZ had a total area of 5,918 acres (24 km^2) (see Figure 10.4.1.1-1). In the Supplement to the Draft Solar PEIS (BLM and DOE 2011), the SEZ boundaries were revised, eliminating more than half of the area, that is, 3,268 acres (13.2 km^2) on the western side of the SEZ (see Figure 10.4.1.1-2). Excluding this area will avoid or minimize impacts on significant cultural resources; grazing allotments; an important riparian area; Gunnison prairie dog, burrowing owl, ferruginous hawk, mountain plover, pronghorn birthing and winter habitat; and visual resources. The remaining SEZ area is 2,650 acres (10.7 km^2). No additional areas for non-development were identified within the SEZ.

Because of the extensive potential impacts from solar development in the portion of the Los Mogotes East SEZ that has been eliminated, those lands are proposed as solar ROW exclusion areas; that is, applications for solar development on those lands will not be accepted by the BLM.

The analyses in the following sections update the affected environment and potential environmental, cultural, and socioeconomic impacts associated with utility-scale solar energy development in the proposed Los Mogotes East SEZ as described in the Draft Solar PEIS.

10.4.1.2 Development Assumptions for the Impact Analysis

Maximum development of the proposed Los Mogotes East SEZ is assumed to be 80% of the total SEZ area over a period of 20 years, a maximum of 2,120 acres (8.58 km^2) (Table 10.4.1.2-1). Full development of the Los Mogotes East SEZ would allow development of facilities with an estimated total of between 236 MW (dish engine or PV technologies, 9 acres/MW [0.04 km^2/MW]) and 424 MW (solar trough technologies, 5 acres/MW [0.02 km^2/MW]) of electrical power capacity.

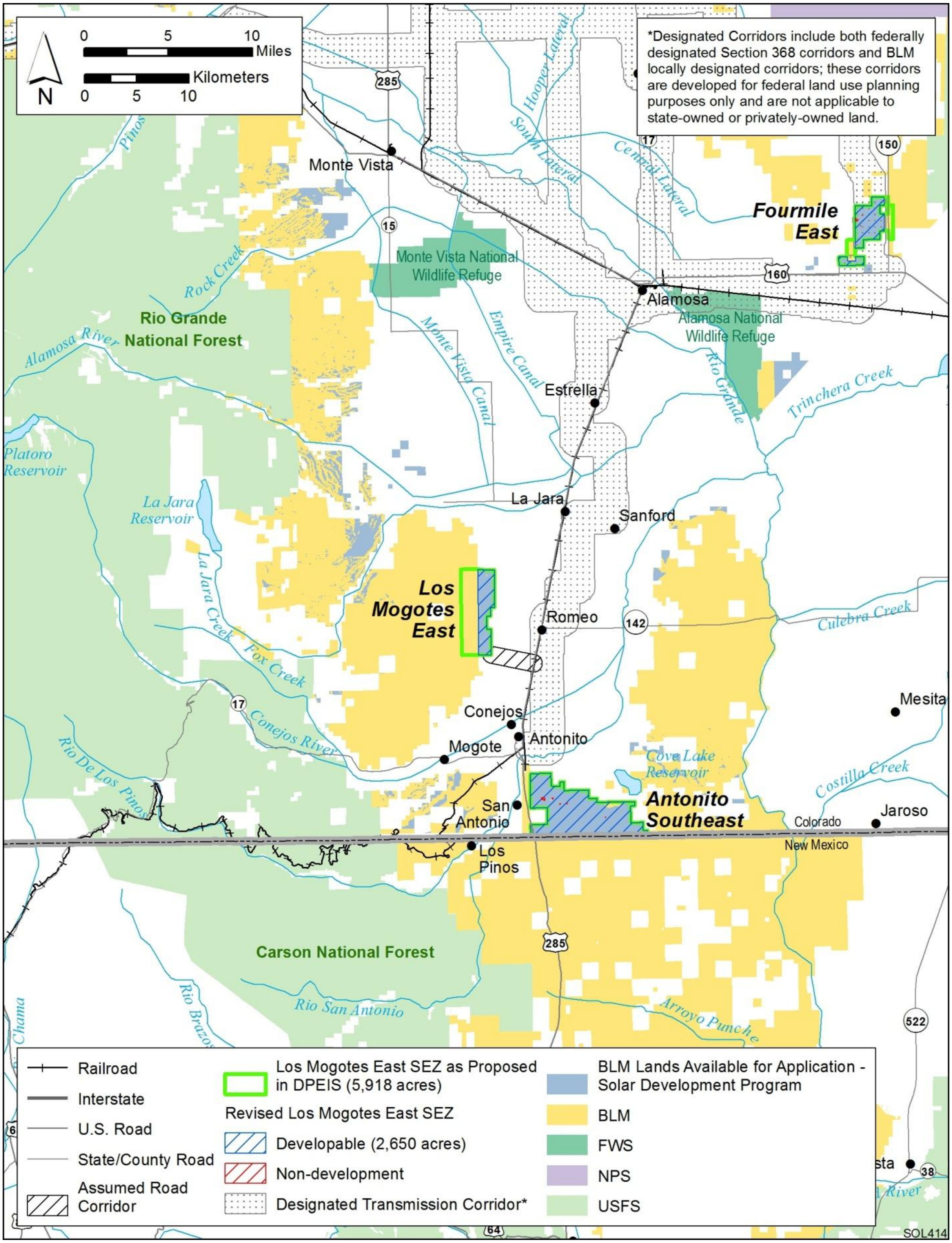

FIGURE 10.4.1.1-1 Proposed Los Mogotes East SEZ as Revised

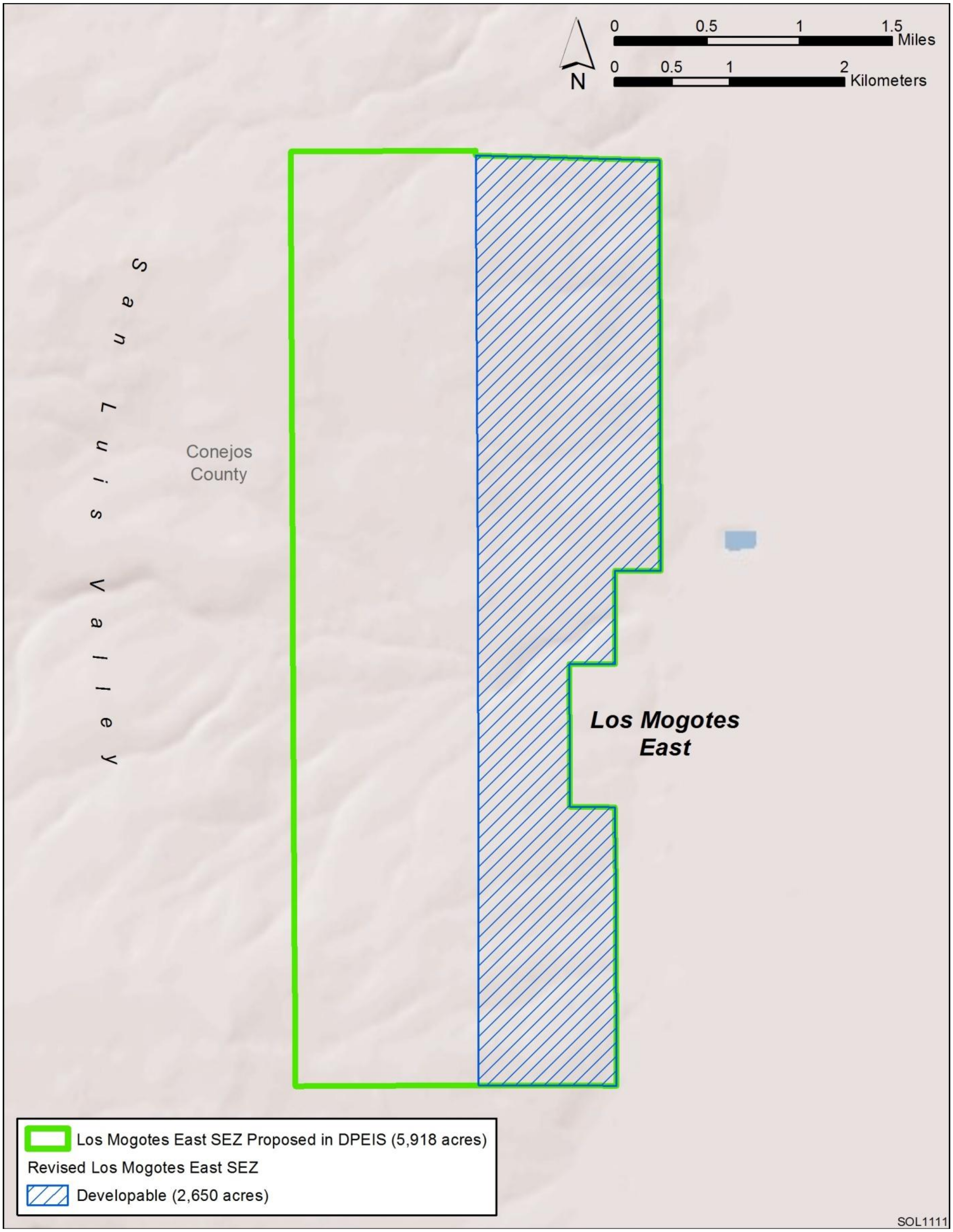

FIGURE 10.4.1.1-2 Developable and Non-development Areas for the Proposed Los Mogotes East SEZ as Revised

TABLE 10.4.1.2-1 Assumed Development Acreages, Solar MW Output, and Nearest Major Access Road and Transmission Line for the Proposed Los Mogotes East SEZ as Revised

Total Developable Acreage and Assumed Development Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S., or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Assumed Area of Road ROW	Distance to Nearest BLM Designated Corridor[e]
2,650 acres[a] and 2,120 acres	236 MW[b] 424 MW[c]	3 mi[d] (U.S. 285)	Adjacent and 69 kV	22 acres	NA[f]

[a] To convert acres to km^2, multiply by 0.004047.

[b] Maximum power output if the SEZ was fully developed using power tower, dish engine, or PV technologies, assuming 9 acres/MW (0.04 km^2/MW) of land required.

[c] Maximum power output if the SEZ were fully developed using solar trough technologies, assuming 5 acres/MW (0.02 km^2/MW) of land required.

[d] To convert mi to km, multiply by 1.609.

[e] BLM-designated corridors are developed for federal land use planning purposes only and are not applicable to state-owned or privately owned land.

[f] NA = no BLM-designated corridor is near the proposed Los Mogotes East SEZ.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. For the proposed Los Mogotes East SEZ, updated data indicate that the nearest existing transmission line is a 69-kV line located about 3 mi (5 km) to the east of the SEZ (the Draft Solar PEIS had indicated that there was a 69-kV transmission line adjacent to the proposed SEZ). It is possible that this existing line could be used to provide access from the SEZ to the transmission grid, but the 69-kV capacity of the existing line would not be adequate for 236 to 424 MW of new capacity. Therefore, at full build-out capacity, new transmission lines and possibly upgrades of existing transmission lines would be required to bring electricity from the proposed Los Mogotes East SEZ to load centers. An assessment of the most likely load center destinations for power generated at the Los Mogotes East SEZ and a general assessment of the impacts of constructing and operating new transmission facilities to those load centers is provided in Section 10.4.23. In addition, the generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5 of this Final Solar PEIS. Project-specific analyses would also be required to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

For the proposed Los Mogotes East SEZ, U.S. 285 runs north–south about 3 mi (5 km) to the east of the SEZ. Assuming construction of a new access road to reach U.S. 285 would be needed to support construction and operation of solar facilities, approximately 22 acres (0.09 km^2) of land disturbance would occur (a 60-ft [18.3-m] wide ROW was assumed), as summarized in Table 10.4.1.2-1.

10.4.1.3 Programmatic and SEZ-Specific Design Features

The proposed programmatic design features for each resource area to be required under the BLM Solar Energy Program are presented in Section A.2.2 of Appendix A of this Final Solar PEIS. These programmatic design features are intended to avoid, minimize, and/or mitigate adverse impacts from solar energy development and will be required for development on all BLM-administered lands, including SEZ and non-SEZ lands.

The discussions below addressing potential impacts of solar energy development on specific resource areas (Sections 10.4.2 through 10.4.22) also provide an assessment of the effectiveness of the programmatic design features in mitigating adverse impacts from solar development within the SEZ. SEZ-specific design features to address impacts specific to the proposed Los Mogotes East SEZ may be required in addition to the programmatic design features. The proposed SEZ-specific design features for the Los Mogotes East SEZ have been updated on the basis of revisions to the SEZ since the Draft Solar PEIS (such as boundary changes and the identification of non-development areas) and on the basis of comments received on the Draft Solar PEIS and the Supplement to the Draft. All applicable SEZ-specific design features identified to date (including those from the Draft Solar PEIS that are still applicable) are presented in Sections 10.4.2 through 10.4.22.

10.4.2 Lands and Realty

10.4.2.1 Affected Environment

The proposed Los Mogotes East SEZ has been reduced in size to 2,650 acres (10.7 km^2) by moving the western boundary of the SEZ to the east. Three county roads provide access to the SEZ, and two roads cross the area and provide access to a well-blocked area of public land west of the proposed SEZ. Two sections of state-owned land abut the SEZ, one on the north and one on the south.

10.4.2.2 Impacts

Solar development in the proposed SEZ would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Because the SEZ is undeveloped and rural, utility-scale solar energy development would introduce a new and discordant land use in the area. Access routes to lands west of the SEZ could be affected by solar energy development if legal access through the SEZ is not maintained. If the public lands are developed for solar energy production, similar development could be induced on neighboring state and private lands with landowner agreement.

10.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on lands and realty activities are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide some mitigation for identified impacts but will not mitigate all adverse impacts. For example, impacts related to the exclusion of many existing and potential uses of the public land; the visual impact of an industrial-type solar facility within an otherwise rural area; and induced land use changes, if any, on nearby or adjacent state and private lands may not be fully mitigated.

No SEZ-specific design features for lands and realty have been identified through this Final Solar PEIS. Some SEZ-specific design features may be established for parcels within the Los Mogotes East SEZ through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.3 Specially Designated Areas and Lands with Wilderness Characteristics

10.4.3.1 Affected Environment

There are six categories of specially designated areas within 25 mi (40 km) of the proposed Los Mogotes East SEZ. The affected environment section of the Draft Solar PEIS accurately describes these areas with one addition. A recently maintained inventory of wilderness characteristics determined that public lands within the proposed SEZ do not contain wilderness characteristics.

10.4.3.2 Impacts

Solar energy development of the SEZ will still result in the development of a very large industrial site in an area that otherwise is currently rural and undeveloped. The level of visual impacts on specially designated areas would be affected by the types of solar technologies deployed within the SEZ. Shorter facilities, facilities with less reflectivity, and facilities that do not use wet cooling would be expected to have less potential for adverse visual impact on these areas.

Elevated viewpoints such as the slightly elevated portions of the CTSR or nearby viewpoints such as the West Fork of the North Branch of the Old Spanish Trail or the Los Caminos Antiguos Scenic Byway would have significant views of development within the SEZ and would likely be adversely affected. Site-specific analysis, including consideration of the potential for visible glint and glare from solar panels, and the visibility of structures, will need to be completed before impacts can be fully assessed and potential mitigation measures considered. Travelers coming north or west on the Los Caminos Antiguos Scenic Byway would be looking directly into the SEZ, and development within the SEZ would be very visible, having the potential to detract from the visitor experience. The route of a portion of the West Fork of the

North Branch of the Old Spanish Trail parallels and passes within 1.0 mi (1.6 km) of the SEZ. Solar development in the SEZ may have a major impact on the historic and visual integrity of the Trail, depending on the determination of the integrity and historical significance of the portion of the Trail from which solar development could be seen. Development within the SEZ also may be inconsistent with the purposes for which the Sangre de Cristo NHA was designated.

The Los Mogotes ACEC, which is located 2 mi (3.2 km) west of the ACEC, is designated for protection of wildlife resources. Development of solar energy facilities in the SEZ has the potential to introduce additional vehicular and human presence in or near the ACEC that could impair its overall value to wildlife.

10.4.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on specially designated areas are described in Section A.2.2 of Appendix A of this Final Solar PEIS (design features for specially designated areas, cultural resources, and visual resources would address impacts). Implementing the programmatic design features will provide some mitigation for the identified impacts but would not eliminate potential impacts on the Los Caminos Antiguos Scenic Byway. Impacts on the Sangre de Cristo National Heritage Area also may not be mitigated by the programmatic design features. Programmatic design features will be applied to address SEZ-specific resources and conditions, for example:

- For projects in the Los Mogotes SEZ that are located within the viewshed of the West Fork of the North Branch of the Old Spanish Trail, a National Trail inventory will be required to determine the area of possible adverse impact on resources, qualities, values, and associated settings of the Trail; to prevent substantial interference; and to determine any areas unsuitable for development. Residual impacts will be avoided, minimized, and/or mitigated to the extent practicable according to program policy standards. Programmatic design features have been included in BLM's Solar Energy Program to address impacts on National Historic Trails (see Section A.2.2.23 of Appendix A).

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design feature has been identified:

- Early consultation should be initiated with the entity responsible for developing the management plan for the Sangre de Cristo NHA to understand how development of the SEZ could be consistent with NHA plans and goals.

The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.4 Rangeland Resources

10.4.4.1 Livestock Grazing

10.4.4.1.1 Affected Environment

Although the proposed SEZ has been reduced in size, it still includes portions of three seasonal grazing allotments: Ciscom Flat (#14212), Capulin (#14207), and Little Mogotes (#24222). The allotments are used by four permittees and support a total forage production of 2,337 AUMs per year. There are livestock management facilities, including fences and watering places in the SEZ. Table 10.4.4.1-1 summarizes key acreage and production data for these allotments.

10.4.4.1.2 Impacts

Should utility-scale solar development occur within the SEZ, grazing would be excluded from the areas developed, as provided for in the BLM grazing regulations (43 CFR Part 4100). The reduction in the size of the proposed SEZ has reduced the potential impact on all three allotments, especially on the Ciscom Flat allotment. Even with the reduction in the size of the SEZ, there still would be a major impact on the Ciscom Flat allotment that may have serious long-term consequences for this operation. The impact on the other two allotments would be substantially less, but the actual significance of their losses is undetermined at this time. While the specific situation of each of the grazing permittees is not known, loss of a portion of their grazing permit would be an adverse impact on them. Economic losses would not be limited to the value of the lost grazing opportunity but would extend also to the value of the overall ranch operations including any private lands tied to the grazing operations. While permittees would be reimbursed for their portion of the value of range improvements on their permits, this would not cover their economic loss. By using the simplified methodology utilized in the Draft Solar PEIS, the estimated losses by allotment are shown in Table 10.4.4.1-1 Actual losses would be determined based on the amount of actual forage lost on the lands excluded from the grazing permits, not on the percentage of the allotment that is lost.

10.4.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on livestock grazing are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide some mitigation for identified impacts, but they would not mitigate the loss of livestock AUMs or the loss of value in ranching operations including private land values.

TABLE 10.4.4.1-1 Grazing Allotments within the Proposed Los Mogotes East SEZ as Revised

Allotment	Total Acres[a]	Percentage Total in SEZ[b]	Active BLM AUMs	Estimated Loss of AUMs	No. of Permittees
Ciscom Flat	4,320	38	191	73	1
Capulin	8,790	3.4	742	25	1
Little Mogotes	13,803	6.4	1,404	90	2

[a] Total acreage, including public and state land, and AUMs, is from the BLM Rangeland Administration System report (BLM 2008). To convert acres to km^2, multiply by 0.004047.

[b] Represents the percentage of public land in the allotment, within the SEZ.

No SEZ-specific design features to protect livestock grazing have been identified in this Final Solar PEIS. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.4.2 Wild Horses and Burros

10.4.4.2.1 Affected Environment

As presented in the Draft Solar PEIS, no wild horse or burro HMAs occur within the proposed Los Mogotes East SEZ or in proximity to it. The reduction of the SEZ to less than half its original size does not alter these data.

10.4.4.2.2 Impacts

As presented in the Draft Solar PEIS, solar energy development within the proposed Los Mogotes East SEZ would not affect wild horses and burros. The reduction in size of the SEZ does not affect this conclusion.

10.4.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

Because solar energy development within the proposed Los Mogotes East SEZ would not affect wild horses and burros, no SEZ-specific design features to address wild horses and burros have been identified in this Final Solar PEIS.

10.4.5 Recreation

10.4.5.1 Affected Environment

The area of the proposed Los Mogotes East SEZ has been reduced by about 55%, to 2,650 acres (10.7 km^2) by moving the western boundary of the SEZ to the east.

Commentors have pointed out that most of the recreation discussion in the Draft Solar PEIS focused internally within the SEZ and did not address the larger part that public and other federal lands play in the landscape and tourism economy of the San Luis Valley. A summary of the better known attractions within the valley includes Great Sand Dunes National Park and Preserve, the Old Spanish Trail, two scenic railroads, the Los Caminos Antiguos Scenic Byway, the Sangre de Cristo Mountains, three national wildlife refuges, and numerous designated wilderness areas; these are among the highlights of the recreational and tourism opportunities in the area. The Los Mogotes East SEZ is adjacent to U.S. 285, which is the major access route into the Valley from the south and which is a part of the Los Caminos Antiguos Scenic Byway. Tourism is an important part of the Valley economy and is an important focus for future economic growth.

While the public land within the proposed Los Mogotes East SEZ is flat and generally unremarkable, it is also large and conspicuous because it is undeveloped and is readily accessible to recreational users. It also adjoins a large block of public lands to the west. As described in the Draft Solar PEIS, the area supports a range of dispersed recreation activities, although it is believed that levels of recreational use are low. The CDOW has commented the area is important habitat for pronghorn antelope, an important species for hunting in the area. More detailed information on impacts on these species can be found in Section 10.4.11.3.2 of the Draft Solar PEIS.

10.4.5.2 Impacts

Solar development of the proposed Los Mogotes East SEZ still will be readily visible to travelers on U.S. 285 and on the Los Caminos Antiguos Scenic Byway. Since the proposed SEZ is large, solar development of the area has the potential to influence the impressions of recreational and tourism visitors entering the San Luis Valley via routes near the SEZ. Whether there would be a potential impact on recreation and tourism in the valley because of the solar development along these access routes is unknown. There may be potential to provide interpretive activities focused on solar energy and development that would be of interest to travelers.

Because the route of the Old Spanish Trail is so near the SEZ, it is anticipated that the viewshed of the Trail would be adversely affected by solar development within the SEZ and may reduce the potential future recreational attraction of the Trail. However, the integrity and historical significance of the portion of the Trail near to the proposed SEZ remain undetermined.

Visual impacts on surrounding recreational use areas would be greater with taller solar facilities such as power towers and facilities with wet cooling. Visitors to areas located at higher elevations than the SEZ (e.g., San Luis Hills ACEC and WSA, CTSR) will see the solar development within the SEZ, but the impact on recreational use of these areas is unknown at this time. The types of solar technologies employed and whether there is significant glint or glare from reflective surfaces of solar facilities would play a large role in the extent of visibility of solar development. The focus and intent of the relatively new Sangre de Cristo NHA is not yet well defined, so it has not been possible to assess how solar development may interact with the objectives of the NHA.

The CDOW has commented there is a specific concern about the loss of pronghorn antelope habitat in Game Management Unit (GMU) 81, where the SEZ is located. There are limited antelope hunting permits issued in the GMU, and reductions in habitat that would occur due to solar development within the SEZ could result in a reduction in antelope hunting opportunities. However, the overall impact on pronghorn was estimated to be small in this assessment (see Section 10.4.11.4.2 of the Draft Solar PEIS), because only a small portion of the available habitat in the valley occurs within the proposed SEZ.

In addition, lands that are outside of the proposed SEZ may be acquired or managed for mitigation of impacts on other resources (e.g., sensitive species). Managing these lands for mitigation could further exclude or restrict recreational use, potentially, leading to additional losses in recreational opportunities in the region. The impact of acquisition and management of mitigation lands would be considered as a part of the environmental analysis of specific solar energy projects.

10.4.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on recreational resources are described in Section A.2.2 of Appendix A of this Final Solar PEIS (design features for both specially designated areas and visual resources also would address some impacts). Some additional SEZ-specific design features may be established when specific projects are being considered within the SEZ. Implementing the programmatic design features will provide some mitigation for the identified impacts but will not mitigate the loss of recreational access to public lands developed for solar energy production. Likewise, a loss of wildlife-related hunting recreation would not be mitigated.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses, and consideration of comments received as applicable, the following SEZ-specific design feature has been identified:

- Tourism is an important economic growth area for the San Luis Valley, and the proposed Los Mogotes East SEZ is located in a visible location adjacent to a principal highway route into the Valley. Because of the location of the SEZ, there is potential to influence visitors' perception of the tourism climate in the

Valley. As projects are proposed for the SEZ, the potential impacts on tourism should be considered and reviewed with local community leaders.

The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.6 Military and Civilian Aviation

10.4.6.1 Affected Environment

There are no identified military or civilian aviation uses in close proximity to the proposed Los Mogotes East SEZ.

10.4.6.2 Impacts

There are no identified impacts on military or civilian aviation facilities associated with the proposed Los Mogotes East SEZ.

10.4.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on military and civilian aviation are described in Section A.2.2 of Appendix A of this Final Solar PEIS. The programmatic design features require early coordination with the DoD to identify and mitigate, if possible, any potential impacts on the use of military airspace.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, no SEZ-specific design features to protect military or civilian airspace for the proposed Los Mogotes East SEZ have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.7 Geologic Setting and Soil Resources

10.4.7.1 Affected Environment

10.4.7.1.1 Geologic Setting

Data provided in the Draft Solar PEIS remain valid, with the following update:

- The terrain of the proposed Los Mogotes East SEZ is relatively flat with a gentle dip to the east (Figure 10.4.7.1-1). The boundaries of the SEZ have been changed to eliminate more than half of the area, 3,268 acres (13.2 km^2), on the western side of the site. Based on these changes, the elevations range from about 7,850 ft (2,393 m) along the new western site boundary to about 7,710 ft (2,350 m) along its eastern boundary.

10.4.7.1.2 Soil Resources

Data provided in the Draft Solar PEIS remain valid, with the following updates:

- Soils within the proposed Los Mogotes East SEZ as revised are predominantly the very stony and cobbly loams of the Travelers and Garita Series, which now make up about 95% of the soil coverage at the site.

- Soil unit coverage at the proposed Los Mogotes East SEZ as revised is shown in Figure 10.4.7.1-2. The new SEZ boundaries eliminate 2,333 acres (9.4 km^2) of the Travelers very stony loam (1 to 3% slopes), 465 acres (1.9 km^2) of the Garita cobbly loam (3 to 25% slopes), 454 acres (1.8 km^2; all) of the Travelers very stony loam (3 to 25%), and 4 acres (0.016 km^2) of the Monte loam (0 to 1% slopes) (Table 10.4.7.1-1).

10.4.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar project. The assessment provided in the Draft Solar PEIS remains valid, with the following update:

- Impacts related to wind erodibility are reduced because the new SEZ boundaries eliminate 469 acres (1.9 km^2) of moderately erodible soils from development.

10.4.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on soils are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will reduce the potential for soil impacts during all project phases.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and considering comments received as applicable, no SEZ-specific design features were identified for soil resources at the proposed

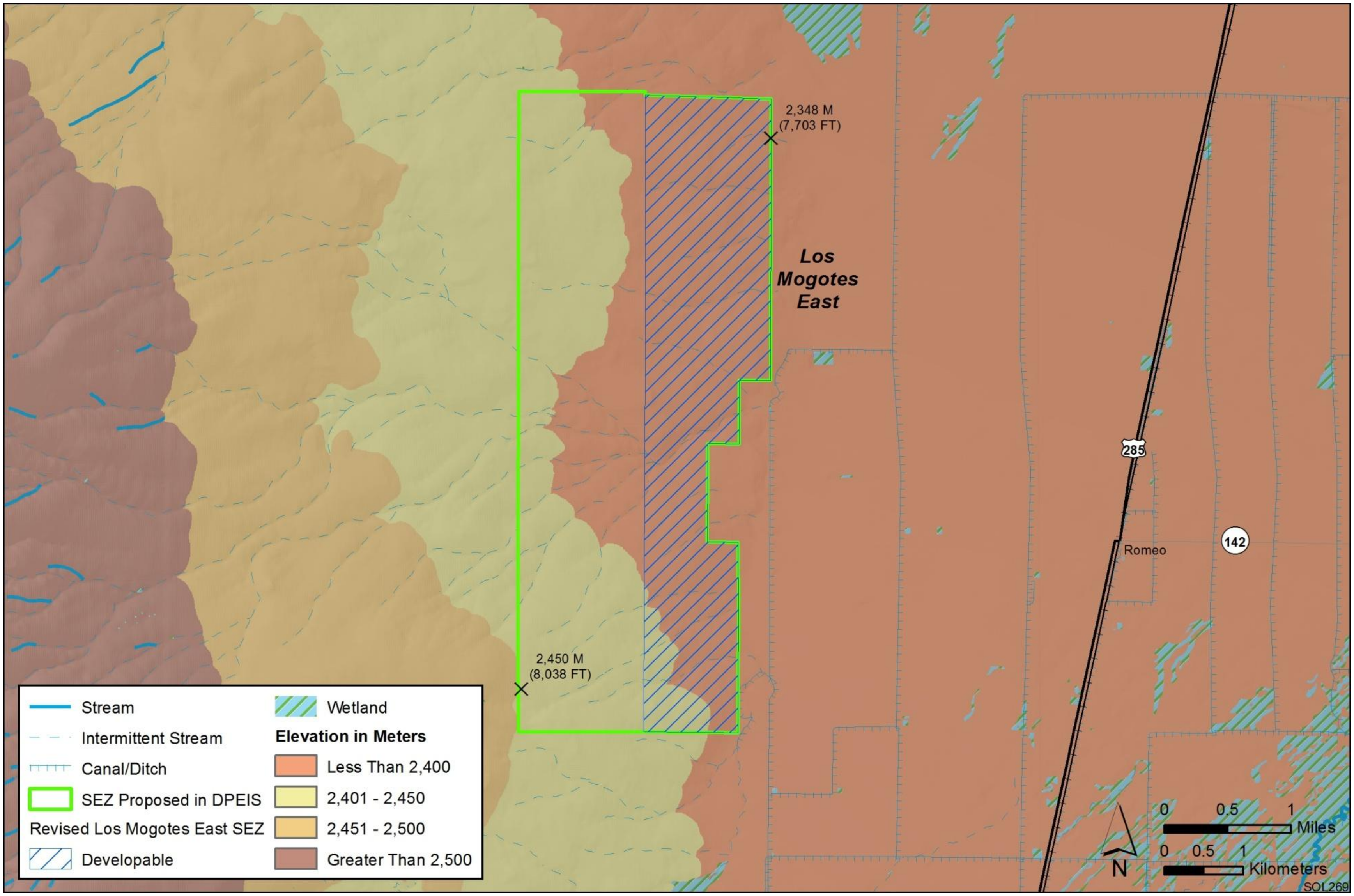

FIGURE 10.4.7.1-1 General Terrain of the Proposed Los Mogotes East SEZ as Revised

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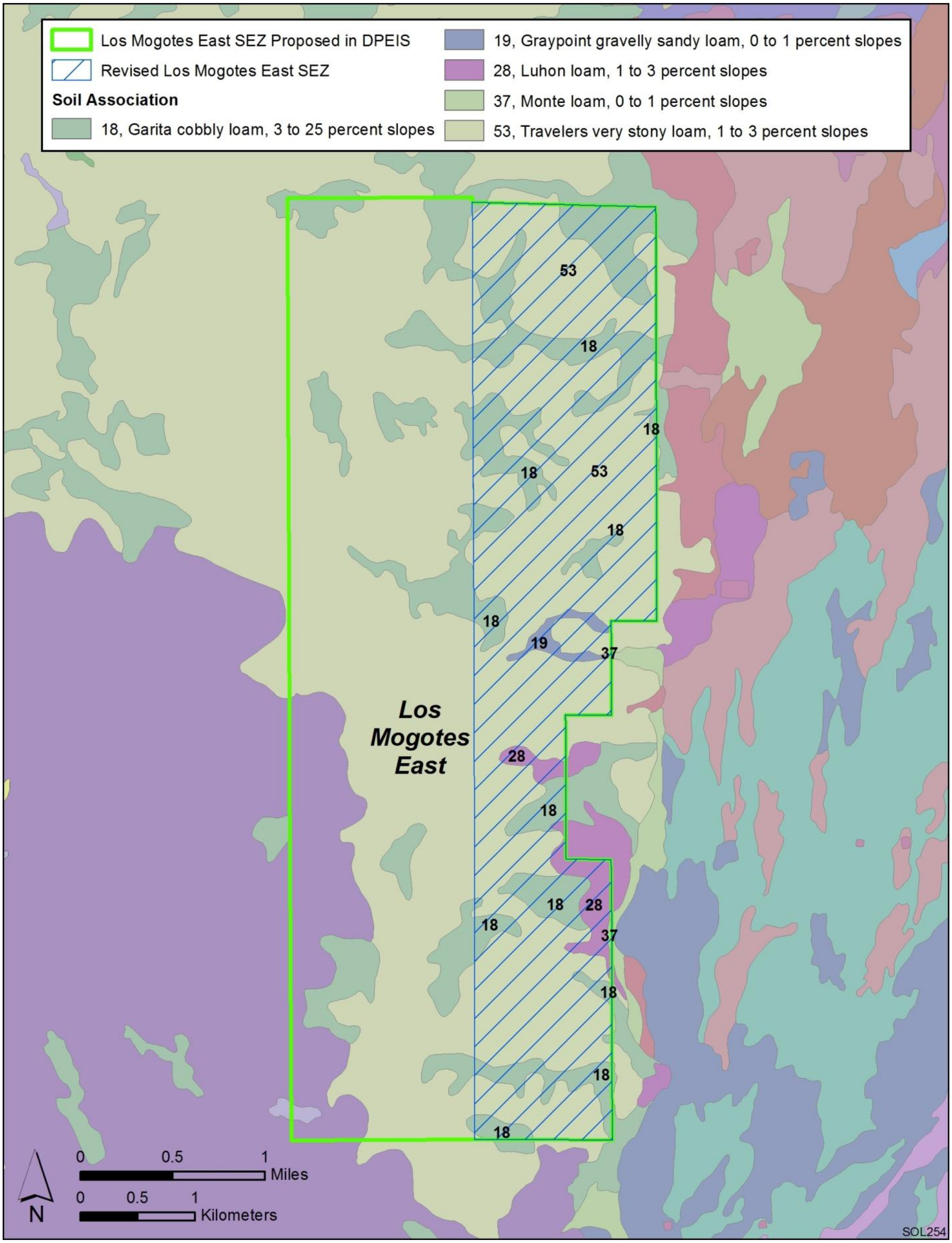

2 **FIGURE 10.4.7.1-2 Soil Map for the Proposed Los Mogotes East SEZ as Revised (NRCS 2008)**

TABLE 10.4.7.1-1 Summary of Soil Map Units within the Proposed Los Mogotes East SEZ as Revised

Map Unit Symbol	Map Unit Name	Erosion Potential		Description	Area in Acres[c] (percentage of SEZ)
		Water[a]	Wind[b]		
53	Travelers very stony loam (1 to 3%)	Slight	Low (WEG 8)[d]	Nearly level soils on mesas and hillslopes capped by basalts, andesite, and/or rhyolite. Parent material consists of thin calcareous sediments weathered from basalt. Shallow and well to somewhat excessively drained, with high surface-runoff potential (low infiltration rate) and moderate to moderately rapid permeability. Available water capacity is very low. Used mainly as rangeland. Susceptible to compaction.	1,916 (72.3)
18	Garita cobbly loam (3 to 25%)	Slight	Moderate (WEG 4)	Nearly level to gently sloping soils on alluvial fans and fan terraces. Parent material consists of thick calcareous and gravelly alluvium derived from basalt. Deep and well drained, with moderate surface-runoff potential and moderate permeability. Available water capacity is low. Used mainly as native pastureland. Susceptible to compaction.	610 (23.01)
53	Travelers very stony loam (3 to 25%)	Slight	Low (WEG 8)	Nearly level to gently sloping soils on mesas and hill slopes capped by basalts, andesite, and/or rhyolite. Parent material consists of thin calcareous material weathered from basalt. Shallow and well to somewhat excessively drained, with high surface-runoff potential (low infiltration rate) and moderate to moderately rapid permeability. Available water capacity is very low. Used mainly as rangeland. Susceptible to compaction.	454 (8)
28	Luhon loam (1 to 3%)	Slight	Moderate (WEG 4)	Nearly level soils on alluvial fans and valley side slopes. Parent material consists of mixed calcareous alluvium. Deep and well drained with moderate surface-runoff potential and moderate permeability. Available water capacity is high. Used mainly as native pastureland; prime farmland if irrigated.[e] Susceptible to compaction; severe rutting hazard.	90 (3.4)

TABLE 10.4.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Erosion Potential: Water[a]	Erosion Potential: Wind[b]	Description	Area in Acres[c] (percentage of SEZ)
19	Graypoint gravelly sandy loam (0 to 1%)	Slight	Moderate (WEG 4)	Nearly level soils on broad fans and fan terraces. Formed in alluvium derived from basalt. Deep and somewhat poorly drained, with moderate surface-runoff potential and moderate permeability. Shrink-swell potential is low to moderate. Available water capacity is low. Used mainly as rangeland and irrigated cropland, pasture, and hay land. Susceptible to compaction.	32 (1.2)
37, 38	Monte loam (0 to 3%)	Slight	Moderate (WEG 4)	Nearly level soils on alluvial fans and floodplains. Parent material consists of alluvium derived from rhyolite and latite. Soils are deep and well drained, with moderate surface-runoff potential and moderate permeability. Available water capacity is high. Used mainly for native rangeland and irrigated cropland; prime farmland if irrigated. Susceptible to compaction; severe rutting hazard.	3 (<1)

[a] Water erosion potential rates the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. The ratings are based on slope and soil erosion factor K and represent soil loss caused by sheet or rill erosion where 50 to 75% of the surface has been exposed by ground disturbance. A rating of “slight” indicates that erosion is unlikely under ordinary climatic conditions.

[b] Wind erosion potential here is based on the wind erodibility group (WEG) designation: groups 1 and 2, high; groups 3 through 6, moderate; and groups 7 and 8, low (see footnote d for further explanation).

[c] To convert acres to km^2, multiply by 0.004047.

[d] WEGs are based on soil texture, content of organic matter, effervescence of carbonates, content of rock fragments, and mineralogy, and also take into account soil moisture, surface cover, soil surface roughness, wind velocity and direction, and the length of unsheltered distance (USDA 2004). Groups range in value from 1 (most susceptible to wind erosion) to 8 (least susceptible to wind erosion). The NRCS provides a wind erodibility index, expressed as an erosion rate in tons per acre (4,000 m^2) per year, for each of the wind erodibility groups: WEG 1, 220 tons (200 metric tons) per acre (4,000 m^2) per year (average); WEG 2, 134 tons (122 metric tons) per acre (4,000 m^2) per year; WEGs 3 and 4 (and 4L), 86 tons (78 metric tons) per acre (4,000 m^2) per year; WEG 5, 56 tons (51 metric tons) per acre (4,000 m^2) per year; WEG 6, 48 tons (44 metric tons) per acre (4,000 m^2) per year; WEG 7, 38 tons (34 metric tons) per acre (4,000 m^2) per year; and WEG 8, 0 tons (0 metric tons) per acre (4,000 m^2) per year.

[e] Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses.

Source: NRCS (2009).

Los Mogotes East SEZ. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.8 Minerals (Fluids, Solids, and Geothermal Resources)

A mineral potential assessment for the proposed Los Mogotes East SEZ has been prepared and reviewed by BLM mineral specialists knowledgeable about the region where the SEZ is located (BLM 2012). The BLM is proposing to withdraw the SEZ from settlement, sale, location, or entry under the general land laws, including the mining laws, for a period of 20 years (see Section 2.2.2.2.4 of the Final Solar PEIS). The potential impacts of this withdrawal are discussed in Section 10.4.24.

10.4.8.1 Affected Environment

There are no oil and gas leases, mining claims, or geothermal leases located in the proposed SEZ. The description in the Draft Solar PEIS remains valid.

10.4.8.2 Impacts

There are no anticipated impacts on mineral resources from the development of solar energy facilities in the proposed SEZ. The analysis of impacts on mineral resources in the Draft Solar PEIS remains valid.

10.4.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that will reduce impacts on mineral resources are described in Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide adequate protection of mineral resources.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for minerals have been identified in this Final Solar PEIS. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.9 Water Resources

10.4.9.1 Affected Environment

The overall size of the Los Mogotes East SEZ has been reduced by 55% from the area described in the Draft Solar PEIS, resulting in a total area of 2,650 acres (10.7 km^2). The description of the affected environment given in the Draft Solar PEIS relevant to water resources at the Los Mogotes East SEZ remains valid and is summarized in the following paragraphs.

The Los Mogotes East SEZ is within the Rio Grande Headwaters subbasin of the Rio Grande hydrologic region. The SEZ is located in the southern portion of the San Luis Valley bounded by the San Juan Mountains to the west and the Sangre de Cristo Mountains to the east. Precipitation and snowfall in the southern part of the valley is about 7 in./yr (18 cm/yr) and 25 in./yr (64 cm/yr), respectively, with much greater amounts in the surrounding mountains. Pan evaporation rates are estimated to be on the order of 54 in./yr (137 cm/yr). No permanent surface water features or wetlands have been identified within the SEZ. There are several intermittent/ephemeral washes within the SEZ that drain across the site from the west to east. Flood hazards have not been identified, but intermittent flooding may occur along the intermittent/ephemeral washes. Groundwater in the San Luis Valley is primarily in basin-fill deposits with an upper unconfined aquifer and a lower confined aquifer, which are separated by a series of confining clay layers and unfractured volcanic rocks. There are no confining clay layers in the vicinity of the Los Mogotes East SEZ; however, a basalt layer that is near the surface acts as a confining unit over the basin-fill aquifer. Groundwater monitoring wells near the SEZ have reported depths to groundwater ranging from 15 to 35 ft (5 to 11 m) and indicate a groundwater flow from west to east. Water quality in the aquifers of the San Luis Valley varies, but total dissolved solids concentrations in the southern portion of the valley are generally below maximum contaminant levels.

The Los Mogotes East SEZ is located in the Colorado Division 3 management zone (Rio Grande Basin) of the Colorado DWR, where both surface water and groundwater rights are overappropriated. The Rio Grande Compact of 1938 obligates Colorado to meet water delivery schedules to New Mexico and governs much of the water management decision making in the San Luis Valley. In order to balance water uses within the San Luis Valley and to meet treaty obligations, several water management mechanisms have been developed that affect existing water rights and water rights transfers. The two primary water management considerations affecting solar energy development are the need for an augmentation water plan and the rules set by the recently formed Special Improvement District Number 1 (Subdistrict #1). Augmentation water plans were described in the Draft Solar PEIS (Section 10.4.9.1.3), but they essentially require junior water rights holders to have additional water reserves to ensure that more senior water rights are not hindered. The water management plan for Subdistrict #1 was ruled on in June 2010 and places restrictions on groundwater withdrawals in an effort to restore groundwater levels in the unconfined aquifer. None of the Colorado SEZs are located within the boundaries of Subdistrict #1, which primarily includes central portions of the San Luis Valley currently used for agriculture. However, because water rights are overappropriated in the San Luis Valley and largely clustered within Subdistrict #1, it is likely that any new water diversions and water rights transfers would involve these new groundwater management considerations.

In addition to the water resources information provided in the Draft Solar PEIS, this section provides a planning-level inventory of available climate, surface water, and groundwater monitoring stations within the immediate vicinity of the Los Mogotes East SEZ and surrounding basin. Additional data regarding climate, surface water, and groundwater conditions are presented in Tables 10.4.9.1-1 through 10.4.9.1-7 and in Figures 10.4.9.1-1 and 10.4.9.1-2.

TABLE 10.4.9.1-1 Watershed and Water Management Basin Information Relevant to the Proposed Los Mogotes East SEZ as Revised

Basin	Name	Area (acres)[b]
Subregion (HUC4)[a]	Rio Grande Headwaters (1301)	4,888,552
Cataloging unit (HUC8)	Alamosa–Trinchera (13010002)	1,647,652
Groundwater basin	San Luis Valley	2,000,000
SEZ	Los Mogotes East	2,650

[a] HUC = Hydrologic Unit Code; a USGS system for characterizing nested watersheds that includes large-scale subregions (HUC4) and small-scale cataloging units (HUC8).

[b] To convert acres to km^2, multiply by 0.004047.

TABLE 10.4.9.1-2 Climate Station Information Relevant to the Proposed Los Mogotes East SEZ as Revised

Climate Station (COOP ID[a])	Elevation[b] (ft)[c]	Distance to SEZ (mi)[d]	Period of Record	Mean Annual Precipitation (in.)[e]	Mean Annual Snowfall (in.)
Conejos 3 NNW, Colorado (051816)	7,907	9	1904–1960	7.93	21.40
Manassa, Colorado (055322)	7,690	11	1893–2011	7.27	24.80
Platoro, Colorado (056559)	9,834	27	1949–1991	27.10	237.30
Waverly 1W, Colorado (058860)	7,603	17	2004–2011	7.61	31.90

[a] National Weather Service's Cooperative Station Network station identification code.

[b] Surface elevations for the proposed Los Mogotes East SEZ range from 7,710 to 8,030 ft.

[c] To convert ft to m, multiply by 0.3048.

[d] To convert mi to km, multiply by 1.6093.

[e] To convert in. to cm, multiply by 2.540.

Source: NOAA (2012).

TABLE 10.4.9.1-3 Total Lengths of Selected Streams at the Subregion, Cataloging Unit, and SEZ Scale Relevant to the Proposed Los Mogotes East SEZ as Revised

Water Feature	Subregion, HUC4 (ft)[a]	Cataloging Unit, HUC8 (ft)	SEZ (ft)
Unclassified streams	19,502	6,556	0
Perennial streams	14,694,407	3,488,426	0
Intermittent/ephemeral streams	94,288,163	30,056,019	46,981
Canals	12,151,458	5,521,867	0

[a] To convert ft to m, multiply by 0.3048.

Source: USGS (2012a).

TABLE 10.4.9.1-4 Stream Discharge Information Relevant to the Proposed Los Mogotes East SEZ as Revised

	Station (USGS ID)		
Parameter	La Jara Creek at Gallegos Ranch, near Capulin, Colorado (08238000)	La Jara Creek near Capulin, Colorado (08238010)	Conejos River near Mogote, Colorado (08246500)
Period of record	1916–1982	1925–1935	1903–2010
No. of observations	54	10	102
Discharge, median (ft^3/s)[a]	254	211	2,260
Discharge, range (ft^3/s)	30–653	93–670	441–9,000
Discharge, most recent observation (ft^3/s)	166	111	2,330
Distance to SEZ (mi)[b]	8	7	12

[a] To convert ft^3 to m^3, multiply by 0.0283.

[b] To convert mi to km, multiply by 1.6093.

Source: USGS (2012b).

TABLE 10.4.9.1-5 Surface Water Quality Data Relevant to the Proposed Los Mogotes East SEZ as Revised

	Station (USGS ID)[a]		
Parameter	08238000	08246500	371634106092301
Period of record	1978–1981	1967–2002	1995–1996
No. of records	67	209	13
Temperature (°C)[b]	6.5 (0–19)	6 (0–19.5)	14 (0–21)
Total dissolved solids (mg/L)	NA[c]	70 (37–77)	NA
Dissolved oxygen (mg/L)	NA	8.4	8.6 (6.2–11)
pH	NA	7.15 (6.8–8.3)	8.4 (6.2–8.8)
Total nitrogen (mg/L)	NA	<0.14	NA
Phosphorus (mg/L as P)	NA	0.015	NA
Organic carbon (mg/L)	NA	1.8	NA
Calcium (mg/L)	NA	12.5 (6–16)	NA
Magnesium (mg/L)	NA	1.795 (1–2.7)	NA
Sodium (mg/L)	NA	2.7 (1–3.2)	NA
Chloride (mg/L)	NA	1.1 (0.5–2.5)	NA
Sulfate (mg/L)	NA	4.1 (2.41–5)	NA
Arsenic (μg/L)	NA	1	NA
Copper (μg/L)	NA	0.3	NA
Zinc (μg/L)	NA	< 1.0	NA
Nickel (μg/L)	NA	0.47)	NA

[a] Median values are listed; the range in values is shown in parentheses.

[b] To convert °C to °F, multiply by 1.8, then add 32.

[c] NA = no data collected for this parameter.

Source: USGS (2012b).

Fieldwork and hydrologic analyses needed to determine 100-year floodplains and jurisdictional water bodies would need to be coordinated with appropriate federal, state, and local agencies. Areas within the Los Mogotes East SEZ that are found to be within a 100-year floodplain will be identified as non-development areas. Any water features within the Los Mogotes East SEZ determined to be jurisdictional will be subject to the permitting process described in the CWA.

10.4.9.2 Impacts

10.4.9.2.1 Land Disturbance Impacts on Water Resources

The discussion of land disturbance effects on water resources in the Draft Solar PEIS remains valid. As stated in the Draft Solar PEIS, land disturbance impacts in the vicinity of the proposed Los Mogotes East SEZ could potentially affect drainage patterns and groundwater recharge. The alteration of natural drainage pathways during construction can lead to impacts

TABLE 10.4.9.1-6 Water Quality Data from Groundwater Samples Relevant to the Proposed Los Mogotes East SEZ as Revised

	Station (USGS ID)[a]	
Parameter	370936106010501	371330105564601
Period of record	1993–2000	1981
No. of records	2	1
Temperature (°C)[b]	15.25 (15–15.5)	15
Total dissolved solids (mg/L)	67	NA[c]
Dissolved oxygen (mg/L)	6.6	NA
pH	7.3 (7.2–7.4)	NA
Nitrate + nitrite (mg/L as N)	0.07	0.35
Phosphate (mg/L)	0.199	NA
Organic carbon (mg/L)	0.8	NA
Calcium (mg/L)	11.6	17
Magnesium (mg/L)	1.7	3.1
Sodium (mg/L)	2.1	7.7
Chloride (mg/L)	0.29	NA
Sulfate (mg/L)	1.81	NA
Arsenic (μg/L)	NA	NA

[a] Median values are listed; the range in values is shown in parentheses.

[b] To convert °C to °F, multiply by 1.8, then add 32.

[c] NA = no data collected for this parameter.

Source: USGS (2012b).

TABLE 10.4.9.1-7 Groundwater Surface Elevations Relevant to the Proposed Los Mogotes East SEZ as Revised

	Station (USGS ID)		
Parameter	371330106002101	370936106010501	371612106023501
Period of record	1980–2011	1993–2005	1969–2011
No. of observations	369	9	39
Surface elevation (ft)[a]	7,655	7,782	7,677
Well depth (ft)	32	25	22
Depth to water, median (ft)	4.99	14.92	6
Depth to water, range (ft)	1.4–9.96	8.77–17.7	4.42–9.73
Depth to water, most recent observation (ft)	6.1	15.25	6.82
Distance to SEZ (mi)[b]	3	3	5

[a] To convert ft to m, multiply by 0.3048.

[b] To convert mi to km, multiply by 1.6093.

Source: USGS (2012b).

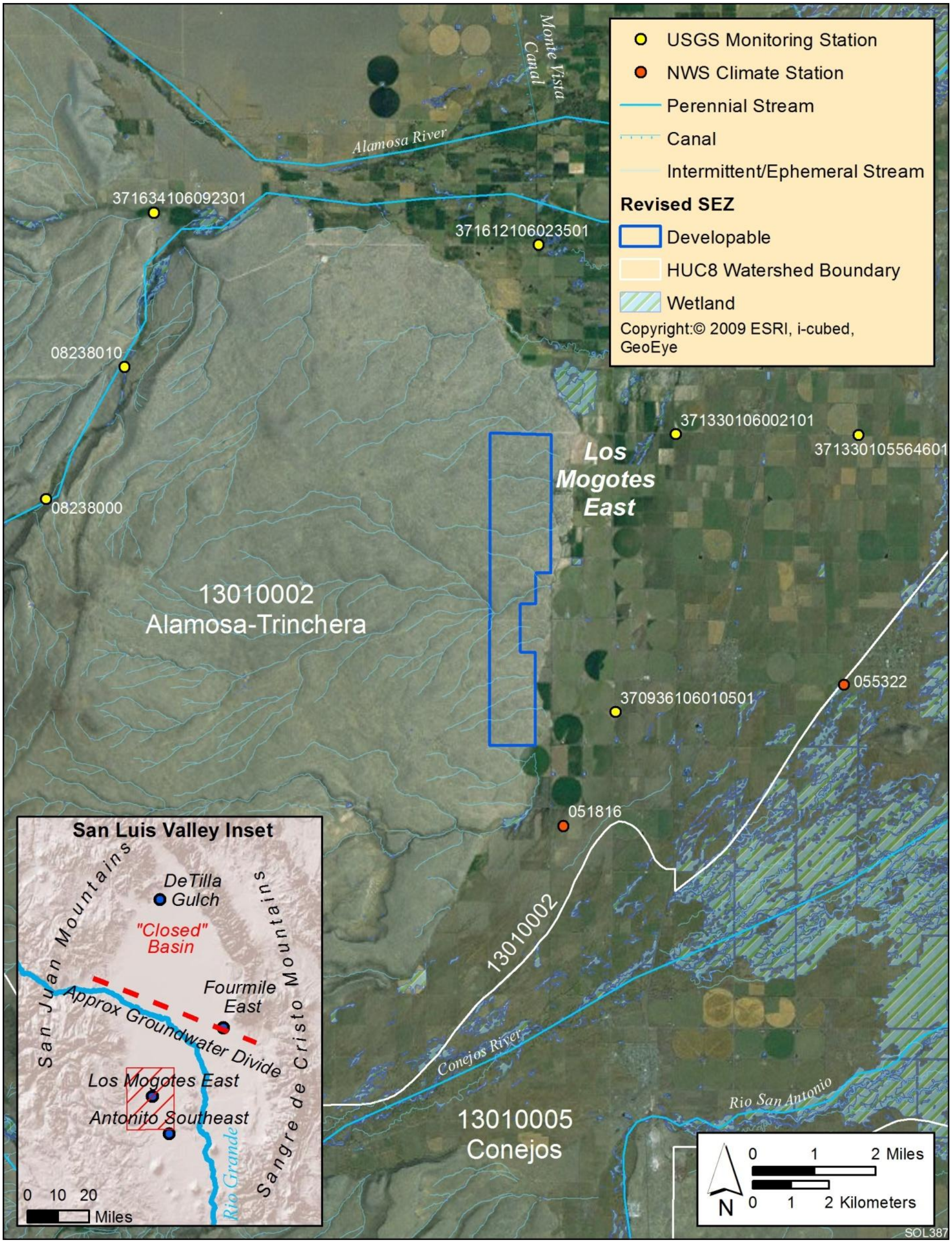

FIGURE 10.4.9.1-1 Surface Water Features near the Proposed Los Mogotes East SEZ as Revised

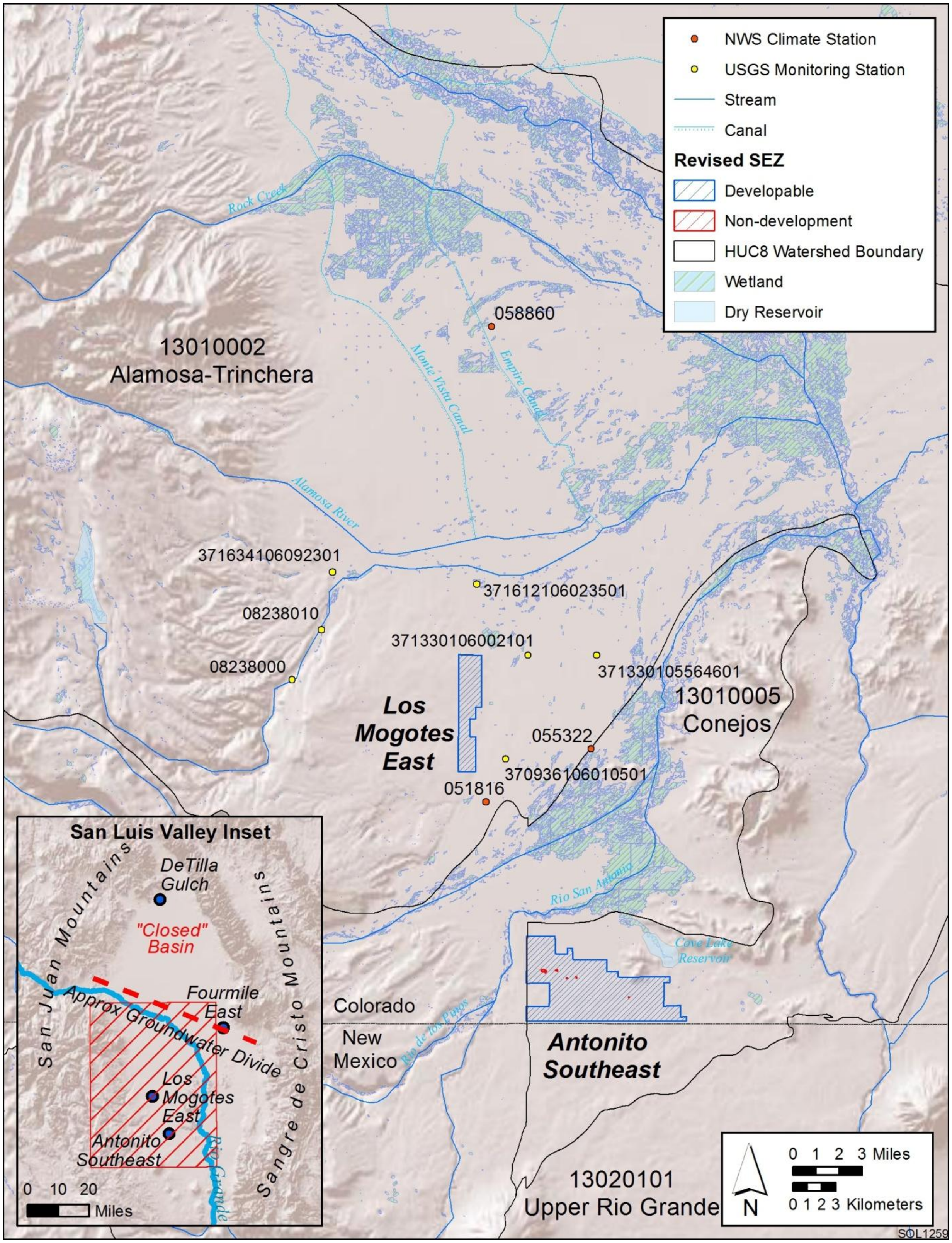

FIGURE 10.4.9.1-2 Surface Water and Groundwater Features within the Rio Grande Basin, Which Includes the Proposed Los Mogotes East SEZ as Revised

related to flooding, loss of water delivery to downstream regions, and changes to riparian vegetation and habitats. The alteration of the SEZ boundaries removed several intermittent/ephemeral stream reaches, which reduces the potential for adverse impacts associated with land disturbance activities.

Land clearing, land leveling, and vegetation removal during the development of the SEZ have the potential to disrupt intermittent/ephemeral stream channels. Several programmatic design features described in Section A.2.2 of Appendix A of this Final Solar PEIS would avoid, minimize, and/or mitigate impacts associated with the disruption of intermittent/ephemeral water features. Additional analyses of intermittent/ephemeral streams are presented in this update, including an evaluation of functional aspects of stream channels with respect to groundwater recharge, flood conveyance, sediment transport, geomorphology, and ecological habitats. Only a summary of the results from these surface water analyses is presented in this section; more information on methods and results is presented in Appendix O.

The study region considered for the intermittent/ephemeral stream evaluation relevant to the Los Mogotes East SEZ is a subset of the Alamosa–Trinchera watershed (HUC8), for which information regarding stream channels is presented in Tables 10.4.9.1-3 and 10.4.9.1-4 of this Final Solar PEIS. The results of the intermittent/ephemeral stream evaluation are shown in Figure 10.4.9.2-1, which depicts flow lines from the National Hydrography Dataset (USGS 2012a) labeled as low, moderate, and high sensitivity to land disturbance. Within the study area, 83% of the intermittent/ephemeral stream channels had low sensitivity and 17% had moderate sensitivity to land disturbance. All the intermittent/ephemeral channel reaches within the Los Mogotes East SEZ were classified as having low sensitivity to land disturbance, but some of these channels transition to having moderate sensitivity to land disturbance immediately down-gradient of the SEZ.

10.4.9.2.2 Water Use Requirements for Solar Energy Technologies

Changes in the Los Mogotes East SEZ boundaries resulted in changes to the estimated water use requirements and a reduction in the land affected by surface disturbances. This section presents changes in water use estimates for the reduced SEZ area and additional analyses pertaining to groundwater. The additional analyses of groundwater include a basin-scale water budget and a simplified, one-dimensional groundwater model of potential groundwater drawdown. Only a summary of the results from these groundwater analyses is presented in this section; more information on methods and results is presented in Appendix O.

Table 10.4.9.2-1 presents the revised estimates of water requirements for both construction and operation of solar facilities at the Los Mogotes East SEZ, assuming full build-out of the SEZ and accounting for its decreased size. The reduction in area of 55% has resulted in an approximately equal reduction in total water use requirements.

The Los Mogotes East SEZ is located in the San Luis Valley, where both surface waters and groundwater are managed conjunctively. Previous studies on water resources in the San Luis Valley typically present a basin-scale water balance, which considers inputs and

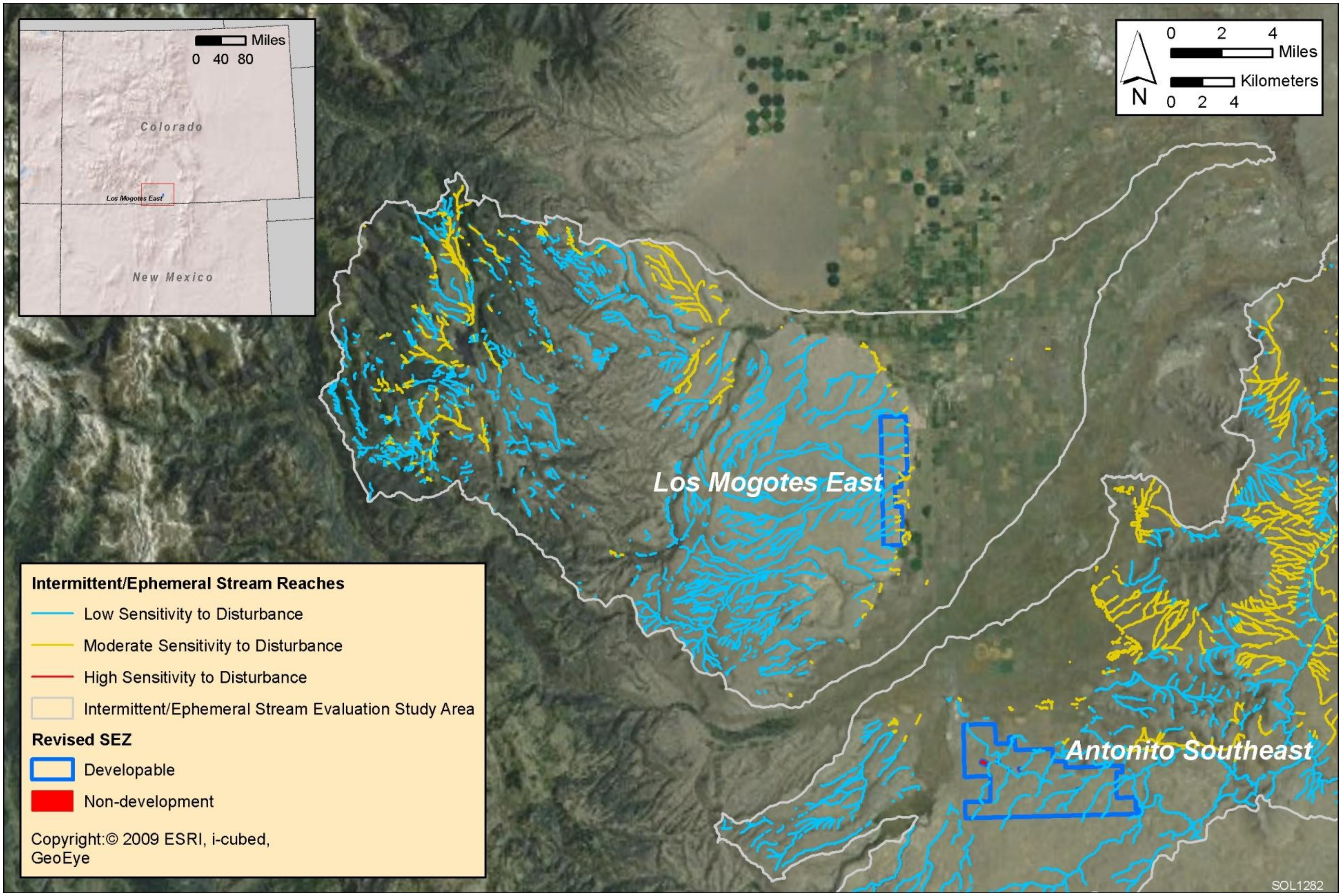

FIGURE 10.4.9.2-1 Intermittent/Ephemeral Stream Channel Sensitivity to Surface Disturbances in the Vicinity of the Proposed Los Mogotes East SEZ as Revised

TABLE 10.4.9.2-1 Estimated Water Requirements for the Proposed Los Mogotes East SEZ as Revised[a]

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Construction—Peak Year				
Water use requirements				
Fugitive dust control (ac-ft)[b]	612	649	649	649
Potable supply for workforce (ac-ft)	74	32	13	7
Total water use requirements (ac-ft)	686	681	662	656
Wastewater generated				
Sanitary wastewater (ac-ft)	74	32	13	7
Operations				
Water use requirements				
Mirror/panel washing (ac-ft/yr)	212	118	118	12
Potable supply for workforce (ac-ft/yr)	6	3	3	<1
Dry cooling (ac-ft/yr)	85–424	47–236	NA	NA
Wet cooling (ac-ft/yr)	1,908–6,148	1,060–3,416	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA[c]	NA	121	12
Dry-cooled technologies (ac-ft/yr)	303–642	168–357	NA	NA
Wet-cooled technologies (ac-ft/yr)	2,126–6,366	1,181–3,537	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)	120	67	NA	NA
Sanitary wastewater (ac-ft/yr)	6	3	3	<1

[a] See Section M.9.2 of Appendix M of the Draft Solar PEIS for methods used in estimating water use requirements.

[b] To convert ac-ft to m^3, multiply by 1,234.

[c] NA = not applicable.

outputs of water via precipitation, surface water flows, and groundwater (e.g., Mayo et al. 2007). Table 10.4.9.2-2 presents an example water balance for the San Luis Valley that considers all water inputs and outputs from the valley. As noted by Mayo et al. (2007), it is difficult to reconcile some of the historical water budgets presented for the San Luis Valley; however, it can generally be stated that the water budget is predominately a balance of precipitation and stream flow inputs with output dominated by evapotranspiration by agricultural lands, riparian areas, and meadows.

The estimated total water use requirements during the peak construction year are as high as 686 ac-ft/yr (846,200 m^3/yr), which does not constitute a significant amount given the short duration of this water demand relative to water resources within the region. The long duration of groundwater pumping during operations (20 years) poses a greater threat to groundwater resources. This analysis considered low, medium, and high groundwater pumping scenarios that

TABLE 10.4.9.2-2 Water Budget for the San Luis Valley, Which Includes the Proposed Los Mogotes East SEZ as Revised

Process	Amount
Inputs	
Precipitation (ac-ft/yr)[a]	1,086,356
Streams draining Sangre de Cristo Mts. (ac-ft/yr)	214,839
Streams draining San Juan Mts. (ac-ft/yr)	1,321,463
Groundwater underflow (ac-ft/yr)	721,535
Outputs	
Evapotranspiration (ac-ft/yr)	2,245,676
Rio Grande discharge (ac-ft/yr)	332,392
Groundwater underflow (ac-ft/yr)	72,964
Groundwater pumping (ac-ft/yr)[b]	641,214
Groundwater Storage	
Storage (ac-ft)	2,026,783

[a] To convert ac-ft to m^3, multiply by 1,234.

[b] Colorado DWR (2004).

Source: Mayo et al. (2007).

represent full build-out of the SEZ, assuming PV, dry-cooled parabolic trough, and wet-cooled parabolic trough, respectively (a 30% operational time was considered for all solar facility types on the basis of operations estimates for proposed utility-scale solar energy facilities). The low, medium, and high pumping scenarios result in groundwater withdrawals that range from 12 to 2,126 ac-ft/yr (14,800 to 2.6 million m^3/yr), or 240 to 42,520 ac-ft (296,000 to 52.4 million m^3) over the 20-year operational period. From a groundwater budgeting perspective, the high pumping scenario over the 20-year analysis period represents 2% of the groundwater storage, and its annual pumping rate is on the order of 0.3% of the current annual groundwater withdrawals in the basin. The amounts of estimated groundwater withdrawals for the low and medium pumping scenarios do not represent significant quantities in comparison to the water budget of the San Luis Valley.

Examining groundwater withdrawals with respect to a basin-scale water budget allows for an assessment of potential impacts only to an order of magnitude approximation of basin-scale estimates of complex groundwater processes. In addition, a water budget approach ignores the temporal and spatial components of how groundwater withdrawals affect groundwater surface elevations, groundwater flow rates, and connectivity to surface water features such as streams, wetlands, playas, and riparian vegetation. A one-dimensional groundwater modeling analysis was performed to present a simplified depiction of the spatial and temporal effects of groundwater withdrawals by examining groundwater drawdown in a radial direction around the center of the SEZ for the low, medium, and high pumping scenarios, considering pumping from the upper unconfined aquifer and lower confined aquifer separately. A detailed discussion of the groundwater modeling analysis is presented in Appendix O. It should be noted, however, that the aquifer parameters used for the one-dimensional groundwater model (Table 10.4.9.2-3) represent available literature data, and that the model aggregates these value ranges into a simplistic representation of the aquifers.

Depth to groundwater in the unconfined aquifer is typically on the order of 15 to 35 ft (5 to 11 m) in the vicinity of the Los Mogotes East SEZ, and the confined aquifer is on the order of 200 to 300 ft (61 to 91 m) below the surface. The one-dimensional groundwater modeling results for the upper unconfined aquifer suggest that groundwater drawdown in the vicinity of the SEZ (approximately a 2-mi [3.2-km] radius) ranges from up to 15 ft (5 m) for the high pumping scenario, up to 3 ft (1 m) for the medium pumping scenario, and less than 1 ft (0.3 m) for the low pumping scenario (Figure 10.4.9.2-2). The extent of groundwater drawdown is primarily restricted to the vicinity of the SEZ for all pumping scenarios. The modeling results for the lower confined aquifer suggest significant groundwater drawdown occurs for the high pumping scenario, ranging from 7 to 25 ft (9 to 24 m) and extending more than 50 mi (80 km) from the

TABLE 10.4.9.2-3 Aquifer Characteristics and Assumptions Used in the One-Dimensional Groundwater Model for the Proposed Los Mogotes East SEZ as Revised

Parameter	Value
Upper, unconfined aquifer	
Aquifer type/conditions	Unconfined/basin fill
Aquifer thickness (ft)[a,b]	100
Hydraulic conductivity (ft/day)	200
Transmissivity (ft^2/day)	20,000
Specific yield	0.24
Lower, confined aquifer	
Aquifer type/conditions	Confined/basin fill
Aquifer thickness (ft)	500
Hydraulic conductivity (ft/day)	50
Transmissivity (ft^2/day)	25,000
Storage coefficient	0.0000025
Upper and lower aquifer	
Analysis period (yr)	20
High pumping scenario (ac-ft/yr)[c]	2,126
Medium pumping scenario (ac-ft/yr)	303
Low pumping scenario (ac-ft/yr)	12

[a] To convert ft to m, multiply by 0.3048.

[b] Mayo et al. (2007).

[c] To convert ac-ft to m^3, multiply by 1,234.

Source: Colorado DWR (2004).

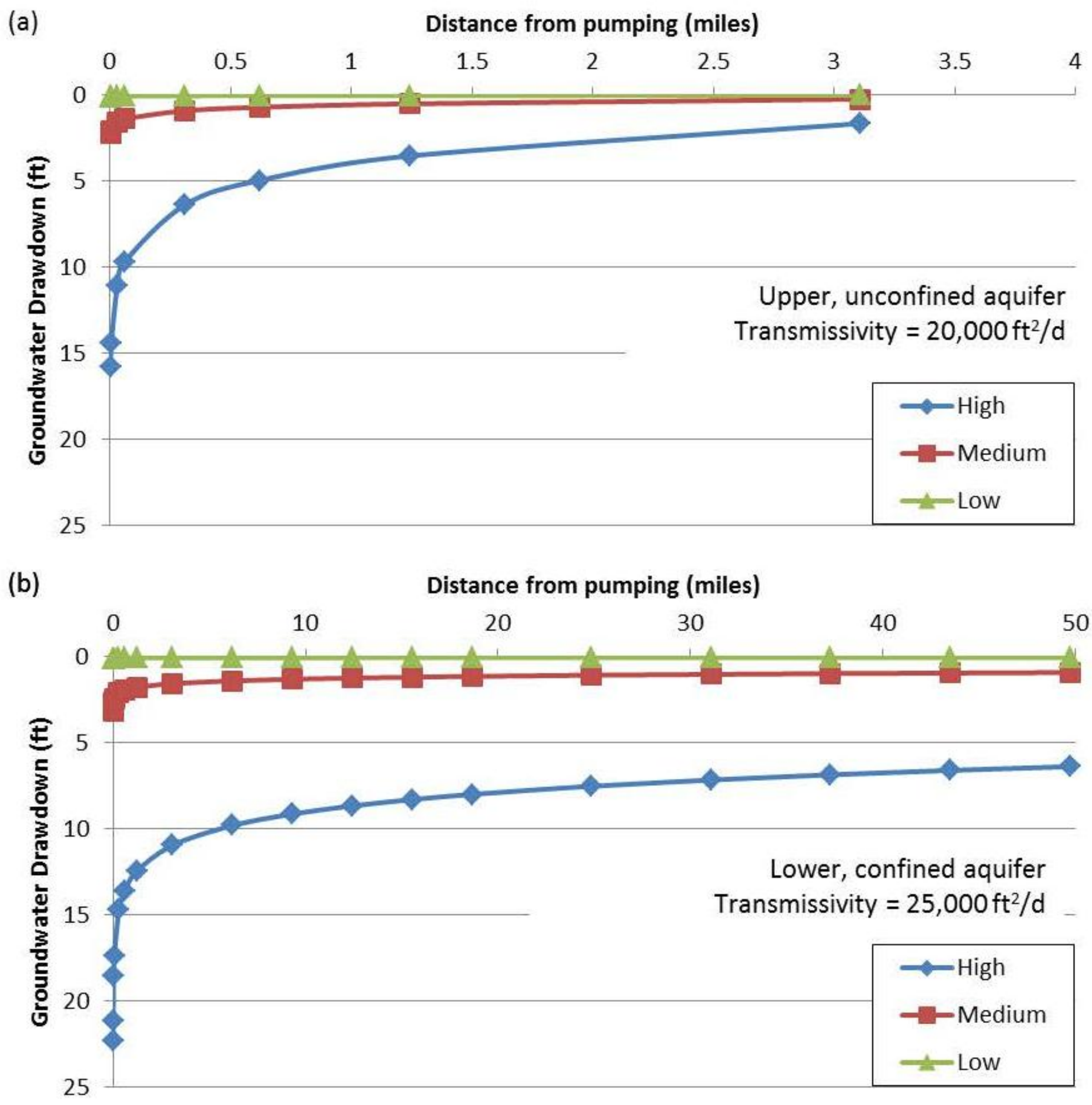

FIGURE 10.4.9.2-2 Estimated One-Dimensional Groundwater Drawdown in (a) Upper Unconfined Aquifer and (b) Lower Confined Aquifer Resulting from High, Medium, and Low Groundwater Pumping Scenarios over the 20-Year Operational Period at the Proposed Los Mogotes East SEZ as Revised

SEZ (Figure 10.4.9.2-2). The low and medium pumping scenarios have a much lower impact on groundwater drawdown, from 0 to 3 ft (0 to 1 m).

The comparison of water use requirements to the basin-scale water budget and the one-dimensional groundwater modeling gives mixed results. From a groundwater budgeting perspective, the three pumping scenarios considered are not significant relative to the amounts of water moved through the San Luis Valley. Groundwater modeling results suggest that the high pumping scenario would have a localized groundwater drawdown effect if groundwater were extracted from the unconfined aquifer, but a more significant impact extending more than 50 mi (80 km) away from the SEZ if withdrawn from the confined aquifer. As stated in Section 10.4.9.1, water management of the San Luis Valley is restrictive, given its overappropriated nature in water rights and its obligations to maintain flows in the Rio Grande. Ultimately, any proposed groundwater withdrawals for solar energy facilities would be reviewed for impacts by the Colorado DWR and would be subject to the rules and court decisions outlined in Case Numbers 06CV64 and 07CW52 (Colorado District Court 2010).

10.4.9.2.3 Off-Site Impacts: Roads and Transmission Lines

As stated in the Draft Solar PEIS, impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. Water needed for transmission line construction activities (e.g., for soil compaction, dust suppression, and potable supply for workers) could be trucked to the construction area from an off-site source. If this occurred, water use impacts at the SEZ would be negligible. The Draft Solar PEIS assessment of impacts on water resources from road and transmission line construction remains valid.

10.4.9.2.4 Summary of Impacts on Water Resources

The additional information and analyses of water resources presented in this update agree with the information provided in the Draft Solar PEIS, which indicates that the San Luis Valley is a high-elevation basin, with predominately agricultural land use, and is the headwaters of the Rio Grande, where surface water and groundwater processes are coupled and managed jointly. Groundwater in the San Luis Valley is found in both the upper unconfined aquifer and lower confined aquifer, and historical diversions of both surface water and groundwater for irrigation have affected streamflows and groundwater levels. Water management plays a significant role in the San Luis Valley, because it pertains to ensuring river flows in the Rio Grande according to the Rio Grande Compact, which is the primary responsibility of the Colorado DWR.

Disturbance to intermittent/ephemeral stream channels within the Los Mogotes East SEZ should not have a significant impact on the critical functions of groundwater recharge, sediment transport, flood conveyance, and ecological habitat, given the relatively small footprint of the SEZ with respect to the study area along with the low sensitivity to land disturbances of identified intermittent/ephemeral streams. Several short reaches of intermittent/ephemeral stream channels with moderate sensitivity to land disturbance are located immediately downgradient of the SEZ; thus reducing off-site impacts associated with runoff is an important consideration for siting and construction phases. Groundwater withdrawals pose the greatest threat to water resources in the San Luis Valley. The water budgeting and groundwater modeling analyses suggest that significant groundwater drawdown could occur both locally and off-site under the high pumping scenario if groundwater were extracted from either the unconfined or confined aquifer. The low and medium pumping scenarios are preferable, because estimated groundwater drawdown is much less. Ultimately, the process of transferring water rights established by the Colorado DWR will determine how much water can be used by proposed solar facilities. As stated in the Draft Solar PEIS, given the restrictive nature of water rights and the need for augmentation water reserves, it would be difficult for any projects seeking more than 1,000 ac-ft/yr (1.2 million m^3/yr) of water to be successful in obtaining the needed water rights (McDermott 2010).

Predicting impacts associated with groundwater withdrawals is often difficult, given the heterogeneity of aquifer characteristics, the long time period between the onset of pumping and its effects, and limited data. Another consideration relevant to the San Luis Valley is that the transfer of water rights will likely come from the purchase of existing irrigation water rights, which will result in a change in the location of the point of diversion and a change in land use patterns in the basin, both of which can affect groundwater processes. One of the primary mitigation measures to protect water resources is the implementation of long-term monitoring and adaptive management (see Section A.2.4 of Appendix A). For groundwater, this requires a combination of monitoring and modeling to fully identify the temporal and spatial extent of potential impacts. Water management in the San Luis Valley relies on several water monitoring and modeling tools developed by the Colorado DWR and the CWCB that are a part of the Colorado's Decision Support Systems (available at http://cdss.state.co.us/Pages/CDSSHome.aspx), and these tools should be implemented with respect to long-term monitoring and adaptive management strategies for solar energy development occurring within the San Luis Valley.

10.4.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on surface water and groundwater are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide some protection of and reduce impacts on water resources.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses, and consideration of comments received as applicable, the following SEZ-specific design feature has been identified:

- Groundwater analyses suggest full build-out of wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed wet-cooled projects would have to reduce water requirements to less than approximately 1,000 ac-ft/yr (1.2 million m^3/yr) in order to secure water rights and comply with water management in the San Luis Valley.

The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.10 Vegetation

10.4.10.1 Affected Environment

As presented in Section 10.4.10.1 of the Draft Solar PEIS, 5 cover types were identified within the area of the proposed Los Mogotes East SEZ, 12 cover types were identified within the access road corridor, and 26 cover types were identified within 5 mi (8 km) of the SEZ boundary (the indirect impact area). Sensitive habitats on the SEZ include ephemeral washes. Because of the SEZ boundary changes, the Inter-Mountain Basins Mixed Salt Desert Scrub cover type no longer occurs within the SEZ. Figure 10.4.10.1-1 shows the cover types within the affected area of the Los Mogotes East SEZ as revised.

10.4.10.2 Impacts

As presented in the Draft Solar PEIS, the construction of solar energy facilities within the proposed Los Mogotes East SEZ would result in direct impacts on plant communities because of the removal of vegetation within the facility footprint during land-clearing and land-grading operations. Approximately 80% of the SEZ would be expected to be cleared with full development of the SEZ. As a result of the new configuration of the SEZ boundary, approximately 2,120 acres (8.58 km^2) would be cleared.

Overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of a cover type would be lost; and (3) *large*: >10% of a cover type would be lost.

10.4.10.2.1 Impacts on Native Species

The analysis presented in the Draft Solar PEIS for the original Los Mogotes East SEZ developable area indicated that development would result in a moderate impact on one land cover type and a small impact on all other land cover types occurring within the SEZ (Table 10.4.10.1-1 in the Draft Solar PEIS). Development within the revised Los Mogotes East SEZ could still directly affect most of the cover types evaluated in the Draft Solar PEIS, with the exception of Inter-Mountain Basins Mixed Salt Desert Scrub (previously a moderate impact); the reduction in the developable area would result in reduced (and still small) impact levels on all other cover types in the affected area.

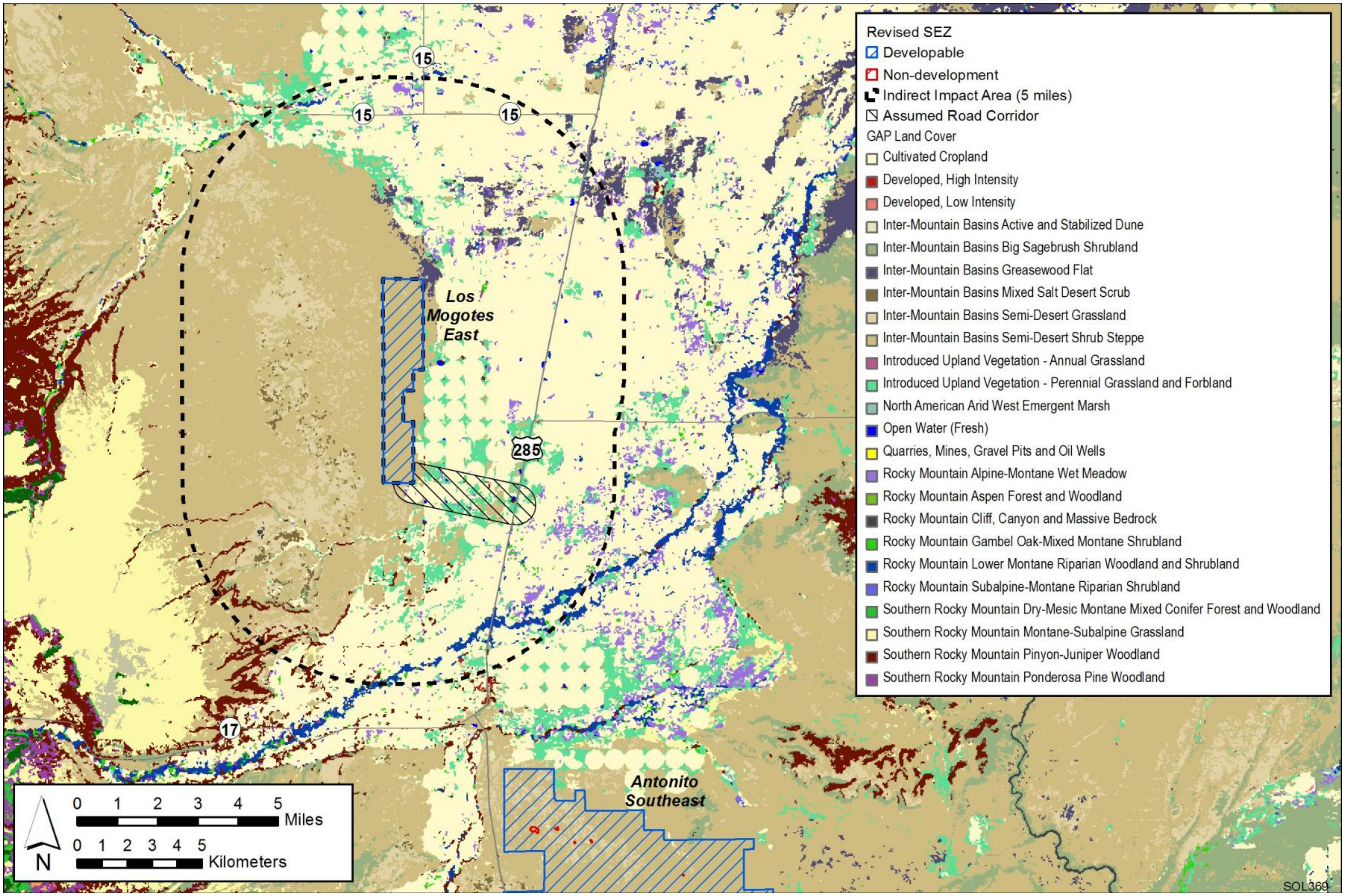

FIGURE 10.4.10.1-1 Land Cover Types within the Proposed Los Mogotes East SEZ as Revised

Direct impacts could still occur on unmapped wetlands within the remaining developable areas of the SEZ. In addition, indirect impacts on wetlands within or near the SEZ, as described in the Draft Solar PEIS, could occur.

10.4.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

As presented in the Draft Solar PEIS, land disturbance from project activities and indirect effects of construction and operation within the Los Mogotes East SEZ could potentially result in the establishment or expansion of noxious weeds and invasive species populations, potentially including those species listed in Section 10.4.10.1 in the Draft Solar PEIS. Impacts, such as reduced restoration success and possible widespread habitat degradation, could still occur; however, a small reduction in the potential for such impacts would result from the reduced developable area of the SEZ.

10.4.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific species and habitats will determine how programmatic design features are applied, for example:

- All dry wash habitats within the SEZ and all wetland and dry wash habitats within the assumed access road corridor shall be avoided to the extent practicable, and any impacts minimized and mitigated in consultation with appropriate agencies. A buffer area shall be maintained around wetlands and dry washes to reduce the potential for impacts on these habitats on or near the SEZ.

- Appropriate engineering controls shall be used to minimize impacts on wetland, dry wash, and riparian habitats, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Maintaining sediment and erosion controls along drainages would reduce the potential for impacts on wetlands near or downgradient from the SEZ. Appropriate buffers and engineering controls will be determined through agency consultation.

- Groundwater withdrawals shall be limited to reduce the potential for indirect impacts on wetland habitats or springs that are associated with groundwater discharge, such as the wetlands along the Conejos River.

It is anticipated that implementation of these programmatic design features will reduce a high potential for impacts from invasive species and impacts on wetlands, springs, dry washes, and riparian habitats to a minimal potential for impact. Residual impacts on wetlands could result from remaining groundwater withdrawal and so forth; however, it is anticipated that these impacts would be avoided in the majority of instances.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.11 Wildlife and Aquatic Biota

For the assessment of potential impacts on wildlife and aquatic biota, overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the species' habitat within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of the species' habitat would be lost; and (3) *large*: >10% of the species' habitat would be lost.

10.4.11.1 Amphibians and Reptiles

10.4.11.1.1 Affected Environment

As presented in the Draft Solar PEIS, representative amphibian and reptile species expected to occur within the Los Mogotes East SEZ include the Woodhouse's toad (*Bufo woodhousii*), fence lizard (*Sceloporus undulatus*), gopher snake (*Pituophis catenifer*), western rattlesnake (*Crotalus viridis*), short-horned lizard (*Phrynosoma hernandesi*), and western terrestrial garter snake (*Thamnophis elegans*). The reduction in the size of the Los Mogotes East SEZ does not alter the potential for these species to occur in the affected area.

10.4.11.1.2 Impacts

As presented in the Draft Solar PEIS, solar energy development within the Los Mogotes East SEZ could affect potentially suitable habitats for several amphibian and reptile species. The analysis presented in the Draft Solar PEIS indicated that development would result in a small overall impact on representative amphibian and reptile species (Table 10.4.11.1-1 in the Draft Solar PEIS). Development within the revised boundaries of the Los Mogotes East SEZ could still affect the same species evaluated in the Draft Solar PEIS; however, the reduction in the developable area would result in reduced (and still small) impact levels compared to original estimates in the Draft Solar PEIS.

10.4.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that will reduce impacts on amphibian and reptile species are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific species and habitats will guide how programmatic design features for amphibians and reptiles are applied, for example:

- Wash habitats within the SEZ shall be avoided to the extent practicable.

- Appropriate engineering controls shall be used to minimize impacts on palustrine wetlands surrounding the SEZ resulting from surface water runoff, erosion, sedimentation, accidental spills, or fugitive dust deposition to these habitats.

With the implementation of required programmatic design features, impacts on amphibian and reptile species would be reduced.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design feature has been identified:

- The access road should be sited and constructed to minimize impacts on wetlands (if present within the finalized access road location).

If SEZ-specific design features are implemented in addition to required programmatic design features, impacts on amphibian and reptile species would be small. The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.11.2 Birds

10.4.11.2.1 Affected Environment

As presented in the Draft Solar PEIS, a large number of bird species could occur or have potentially suitable habitat within the affected area of the proposed Los Mogotes East SEZ. Representative bird species identified in the Draft Solar PEIS included Brewer’s blackbird (*Euphagus cyanocephalus*), Brewer’s sparrow (*Spizella breweri*), common nighthawk (*Chordeiles minor*), horned lark (*Eremophila alpestris*), vesper sparrow (*Pooecetes gramineus*), western meadowlark (*Sturnella neglecta*), American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis*), short-eared owl (*Asio flammeus*), Swainson’s hawk (*Buteo swainsoni*), turkey vulture (*Cathartes aura*), and mourning dove (*Zenaida macroura*). The reduction in the size of the reconfigured Los Mogotes East SEZ does not alter the potential for these species or other bird species to occur in the affected area.

10.4.11.2.2 Impacts

As presented in the Draft Solar PEIS, solar energy development within the Los Mogotes East SEZ could affect potentially suitable habitats of bird species. The analysis presented in the

Draft Solar PEIS for the original Los Mogotes East SEZ boundaries indicated that development would result in a small overall impact on the representative bird species (Table 10.4.11.2-1 in the Draft Solar PEIS). Development within the revised boundaries of the Los Mogotes East SEZ could still affect the same species evaluated in the Draft Solar PEIS; however, the reduction in the developable area would result in reduced (and still small) impact levels compared to original estimates in the Draft Solar PEIS.

10.4.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on bird species are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific species and habitats will determine how programmatic design features are applied, for example:

- Appropriate engineering controls shall be used to minimize impacts resulting from surface water runoff, erosion, sedimentation, accidental spills, or fugitive dust deposition.

If the programmatic design features are implemented, impacts on bird species will be reduced.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design features have been identified:

- The access road should be sited and constructed to minimize impacts on wetlands and riparian areas (if present within the finalized access road location).

- If present, prairie dog colonies (which could provide habitat or a food source for some raptor species) should be avoided to the extent practicable. This design feature has been at least partly met as the revised SEZ now avoids known Gunnison prairie dog habitat.

If these SEZ-specific design features are implemented in addition to required programmatic design features, impacts on bird species would be small. The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.11.3 Mammals

10.4.11.3.1 Affected Environment

As presented in the Draft Solar PEIS, a large number of mammal species were identified that could occur or have potentially suitable habitat within the affected area of the proposed

Los Mogotes East SEZ. Representative mammal species identified in the Draft Solar PEIS included (1) big game species: the American black bear (*Ursus americanus*), bighorn sheep (*Ovis canadensis*), cougar (*Puma concolor*), elk (*Cervis canadensis*), mule deer (*Odocoileus hemionus*), and pronghorn (*Antilocapra americana*); (2) furbearers and small game species: the American badger (*Taxidea taxus*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), and white-tailed jackrabbit (*Lepus townsendii*); and (3) small nongame species: the big brown bat (*Eptesicus fuscus*), deer mouse (*Peromyscus maniculatus*), least chipmunk (*Tamias minimus*), little brown myotis (*Myotis lucifugus*), northern pocket gopher (*Thomomys talpoides*), Ord's kangaroo rat (*Dipodomys ordii*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), and western small-footed myotis (*Myotis ciliolabrum*). The reduction in the size of the Los Mogotes East SEZ does not alter the potential for these species or any additional mammal species to occur in the affected area.

10.4.11.3.2 Impacts

As presented in the Draft Solar PEIS, solar energy development within the Los Mogotes East SEZ could affect potentially suitable habitats of mammal species. The analysis presented in the Draft Solar PEIS for the original Los Mogotes East SEZ boundaries indicated that development would result in a small overall impact on all representative mammal species analyzed (Table 10.4.11.3-1 in the Draft Solar PEIS). Development within the revised boundaries of the Los Mogotes East SEZ could still affect the same representative mammal species evaluated in the Draft Solar PEIS; however, the reduction in the developable area would result in reduced (and still small) impact levels compared to original estimates in the Draft Solar PEIS.

Based on mapped activity areas, direct potential loss of overall range, winter range, and severe winter range for elk; overall range for mule deer; and overall range and severe winter range for pronghorn would be reduced from 4,734 acres (19.2 km^2) to 2,120 acres (8.6 km^2) for the revised Los Mogotes East SEZ. Impact levels for these activity areas would still be small, except for pronghorn severe winter range, where the impact would remain moderate. The 135 acres (0.5 km^2) of mule deer winter range and all or most of the 3,145 acres (12.7 km^2) of pronghorn winter concentration area potentially directly affected by solar development for the original Los Mogotes East SEZ boundaries in the Draft Solar PEIS would not be affected for the revised SEZ, because these activity areas are wholly or mostly within the acreage eliminated from the SEZ, respectively.

10.4.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on mammal species are described in Section A.2.2 of Appendix A of this Final Solar PEIS. With implementation of required programmatic design features, impacts on mammal species would be reduced.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following SEZ-specific design features for mammals have been identified.

- Development in the 135-acre (0.55-km^2) portion of the SEZ that overlaps the mule deer winter range should be avoided. This design feature is no longer applicable as the revised SEZ now avoids this mule deer activity area.

- Prairie dog colonies should be avoided to the extent practicable to reduce impacts on species such as desert cottontail and thirteen-lined ground squirrel. This design feature has been at least partly met, as the revised SEZ now avoids known Gunnison prairie dog habitat.

- Construction should be curtailed during winter when big game species are present.

- Where big game winter ranges intersect or are close to the SEZ, motorized vehicles and other human disturbances should be controlled (e.g., through temporary road closures when big game are present).

- Loss of pronghorn winter concentration area should be minimized. This design feature has largely been met, as the revised SEZ now avoids all or most of this pronghorn activity area.

The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.11.4 Aquatic Biota

10.4.11.4.1 Affected Environment

There are no permanent water bodies or perennial streams within the boundaries of the proposed Los Mogotes East SEZ or the area of indirect effects, although rain events may give rise to ephemeral pools on occasion. A number of ephemeral washes pass through the SEZ but do not extend directly to nearby perennial streams. The boundaries of the Los Mogotes East SEZ have been reduced compared to the boundaries given in the Draft Solar PEIS. Based on these changes, updates to the Draft Solar PEIS include the following:

- Approximately 16 mi (26 km) of perennial stream habitat associated with three streams falls within the assumed area of indirect effects within 5 mi (8 km) of the SEZ, including approximately 7 mi (11 km) of the lower portion of La Jara Creek, a 5-mi (8-km) section of the Conejos River, and a 3-mi (5-km) segment of the lower Alamosa River.

- Outside of the area of indirect effects but within 50 mi (80 km) of the SEZ, there are approximately 869 mi (1,938 km) of perennial streams, 198 mi (319 km) of intermittent streams, and 177 mi (285 km) of canals.

- There are approximately 10,725 acres (4,340 km^2) of lake and reservoir habitat within 50 mi (80 km) of the SEZ. There are no lakes or reservoirs within the areas considered for analysis of direct or indirect effects. The nearest such habitat is La Jara Reservoir, approximately 11 mi (17 km) to the southeast of the SEZ.

Aquatic biota present the SEZ have not been characterized. As stated in Appendix C of the Supplement to the Draft Solar PEIS, site surveys can be conducted at the project-specific level to characterize the aquatic biota, if present, in washes, dry lakes, and wetlands within the SEZ.

10.4.11.4.2 Impacts

The types of impacts that could occur on aquatic habitats and biota from development of utility-scale solar energy facilities are identified in Section 5.10.2.4 of the Draft Solar PEIS and this Final Solar PEIS. Aquatic habitats present on or near the Los Mogotes East SEZ could be affected by solar energy development in a number of ways, including (1) direct disturbance, (2) deposition of sediments, (3) changes in water quantity, and (4) degradation of water quality. The impact assessment provided in the Draft Solar PEIS remains valid, with the following update:

- The amount of surface water features within the SEZ and in the area of indirect effects that could potentially be affected by solar energy development is less because the size of the SEZ has been reduced.

10.4.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on aquatic species are described in Section A.2.2 of Appendix A of this Final Solar PEIS. SEZ-specific resources and conditions will guide how programmatic design features are applied, for example:

- Undisturbed buffer areas and sediment and erosion controls shall be maintained around drainages associated with wetland areas located in the immediate vicinity of the SEZ.

It is anticipated that implementation of the programmatic design features will reduce impacts on aquatic biota, and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in nearby aquatic habitats, the potential impacts on aquatic biota from solar energy development at the Los Mogotes East SEZ would be negligible.

On the basis of the impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for aquatic biota have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.12 Special Status Species

10.4.12.1 Affected Environment

There were 51 special status species identified in the Draft Solar PEIS that could occur or have potentially suitable habitat within the affected area of the proposed Los Mogotes East SEZ. The reduction in the size of the Los Mogotes East SEZ does not alter the potential for these species to occur in the affected area.

Since publication of the Draft Solar PEIS, three additional special status species have been identified—Mexican spotted owl (*Strix occidentalis lucida*), western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), and fringed myotis (*Myotis thysanodes*)—that could occur in the affected area of the Los Mogotes East SEZ based on known occurrences and the presence of potentially suitable habitat. These three additional species are discussed in the remainder of this section.

Following the publication of the Draft Solar PEIS, the BLM conducted field surveys for special status bat species, as well as Gunnison prairie dog (*Cynomys gunnisoni*) and western burrowing owl (*Athene cunicularia*), in the Los Mogotes East SEZ. Surveys for bat species were conducted in the SEZ by using passive and active acoustic monitoring techniques at various times between June 16, 2011, and October 15, 2011 (Rodriguez 2011). The big free-tailed bat (*Nyctinomops macrotis*) was the only special status bat species recorded on the SEZ. However, the documented presence of the fringed myotis in the De Tilla Gulch SEZ suggests that the fringed myotis could occur throughout the San Luis Valley and potentially within the Los Mogotes East SEZ. No roosting habitat for this species was observed on the SEZ (Rodriguez 2011).

Field surveys for Gunnison prairie dog and western burrowing owl were conducted on July 26, 2011 (Garcia and Harvey 2011). No Gunnison prairie dog activity was recorded in any portion of the SEZ. However, there are established Gunnison prairie dog colonies within 2 mi (3 km) north of the SEZ. Burrowing owls were not recorded on the SEZ during the field surveys. However, burrowing owls were observed among prairie dog colonies on Colorado state land within 3 mi (2 km) north of the SEZ. On June 4, 2008, a burrowing owl was observed approximately 1 mi (1.6 km) west of the Los Mogotes East SEZ. On the basis of this information, the Los Mogotes East SEZ could be utilized by the western burrowing owl for either nesting or foraging habitat (Garcia and Harvey 2011).

Mexican Spotted Owl. The Mexican spotted owl was listed as a threatened species under the ESA on March 16, 1993 (USFWS 1993). Critical habitat for this species was designated on June 6, 1995 (USFWS 1995), but several court rulings resulted in the USFWS removing the critical habitat designation on March 25, 1998 (USFWS 1998). In March 2000, the USFWS was ordered by the courts to propose critical habitat, resulting in the current designation that includes 4.6 million acres (18,616 km^2) in Arizona, Colorado, New Mexico, and Utah on federal lands (USFWS 2004). A recovery plan for the Mexican spotted owl was published in December 1995 and later revised in June 2011 (USFWS 2011). At the time of federal listing in 1993, the total population of Mexican spotted owls was estimated at 2,100.

The Mexican spotted owl occurs from southern British Columbia, Canada, to central Mexico. The primary habitat of the spotted owl is steep rocky canyons, although mature coniferous forests are also important habitat. The spotted owl occupies closed canopy forests in steep canyons with uneven-aged tree stands with high basal area, with an abundance of snags and downed logs (NatureServe 2010; USFWS 2011).

The Mexican spotted owl feeds mainly on rodents but also consumes rabbits, birds, reptiles, and insects. Nest sites are in trees (typically those with broken tops), tree trunk cavities, and cliffs along canyon walls. Breeding takes place in the spring (March) with egg-laying in late March or early April. After a 30-day incubation period, hatching occurs and fledging takes place in 4 to 5 weeks. The young depend on the adults for food in the summer and eventually disperse from the nesting area in the fall (NatureServe 2010; USFWS 2011).

The Mexican spotted owl is known to occur in Conejos County, Colorado, and potentially suitable habitat for this species may occur in the affected area of the Los Mogotes East SEZ. Potentially suitable habitat for this species does not occur on the SEZ. However, the SWReGAP habitat suitability model for the spotted owl (*S. occidentalis*) identified approximately 14 acres (<0.1 km^2) of potentially suitable habitat within the assumed access road corridor and an additional 3,000 acres (12 km^2) of potentially suitable habitat within the area of indirect effects (Figure 10.4.12.1-1; Table 10.4.12.1-1). Designated critical habitat for the Mexican spotted owl does not occur in the affected area.

Western Yellow-Billed Cuckoo. The western yellow-billed cuckoo is a candidate for listing under the ESA and has the potential to occur in the affected area. The western yellow-billed cuckoo is a neotropical migrant bird that inhabits large riparian woodlands in the western United States. This species is not known to occur in Conejos County, Colorado, but it has been documented in nearby counties such as La Plata and Rio Grande Counties, Colorado. Although the SWReGAP habitat suitability model for the western yellow-billed cuckoo does not identify any suitable habitat for this species within the SEZ or assumed access road corridor, approximately 215 acres (1 km^2) of potentially suitable riparian habitat occurs within the area of indirect effects along the Conejos River (Figure 10.4.12.1-1; Table 10.4.12.1-1). Potentially suitable habitat may also occur in the area of indirect effects along La Jara Creek. Additional basic information on life history, habitat needs, and threats to populations of this species is provided in Appendix J.

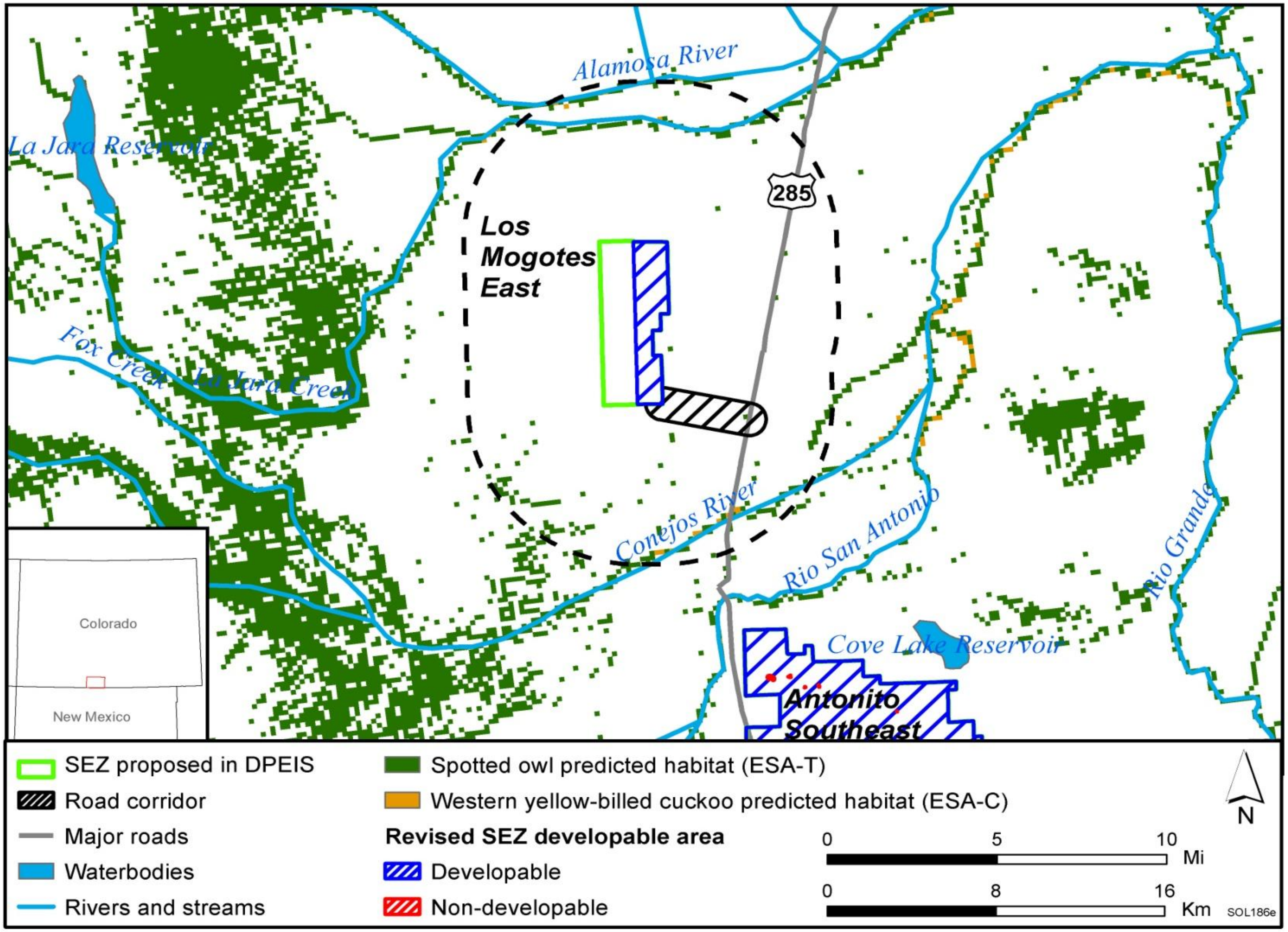

FIGURE 10.4.12.1-1 Developable Area for the Proposed Los Mogotes East SEZ as Revised and Distribution of Potentially Suitable Habitat for the Mexican Spotted Owl and Western Yellow-Billed Cuckoo

TABLE 10.4.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Additional Special Status Species That Could Be Affected by Solar Energy Development on the Proposed Los Mogotes East SEZ as Revised[a]

				Maximum Area of Potential Habitat Affected[d]			
Common Name	Scientific Name	Listing Status[b]	Habitat[c]	Within SEZ (Direct Effects)[e]	Road Corridor (Direct Effects)[f]	Outside SEZ (Indirect Effects)[g]	Overall Impact Magnitude[h] and Species-Specific Mitigation[i]
Birds							
Mexican spotted owl	*Strix occidentalis lucida*	ESA-T; CO-T; CO-S1	Inhabits deep, sheer-walled canyons in old-age, mixed coniferous forests. Known to occur in Conejos County, Colorado. About 679,500 acres[j] of potentially suitable habitat occurs in the SEZ region.	0 acres	14 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	3,000 acres of potentially suitable habitat (0.4% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	ESA-C	Breeds in scattered areas along the lower Colorado River and larger bodies of water in the southwestern United States. Primarily associated with riparian cottonwood and willow forests with dense understory foliage. Known to occur in Conejos County, Colorado. About 2,500 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	0 acres	215 acres of potentially suitable habitat (8.6% of available potentially suitable habitat)	Small overall impact; no direct impact. Avoiding or limiting groundwater withdrawals for solar energy development on the SEZ could reduce impacts on this species.
Mammals							
Fringed myotis	*Myotis thysanodes*	BLM-S; FWS-SC	Summer or year-round resident in wide range of habitats, including woodland, riparian, and shrubland habitats. Roosts in caves, crevices, and buildings. About 3,484,000 acres of potentially suitable habitat occurs within the SEZ region.	2,650 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	24 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	86,500 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

TABLE 10.4.12.1-1 (Cont.)

[a] The species presented in this table represent new species identified following publication of the Draft Solar PEIS or a re-evaluation of those species that were determined to have moderate or large impacts in the Draft Solar PEIS. The other special status species for this SEZ are identified in Table 10.4.12.1-1 of the Draft Solar PEIS.

[b] BLM-S = listed as a sensitive species by the BLM; CO-S1 = ranked as S1 in the state of Colorado; CO-T = listed as threatened in the state of Colorado; ESA-C = candidate for listing under the ESA; ESA-T = listed as threatened under the ESA; FWS-SC = USFWS species of concern.

[c] Potentially suitable habitat was determined using SWReGAP habitat suitability models (USGS 2007). Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[d] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability models (USGS 2007). This approach probably overestimates the amount of suitable habitat in the project area.

[e] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[f] For access road development, direct effects were estimated within a 60-ft (18-m) wide, 3-mi (5-km) long access road from the SEZ to the nearest state highway. Direct impacts within this area were determined from the proportion of potentially suitable habitat within the 1-mi (1.6-km) wide road corridor.

[g] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and the portion of the access road corridor where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from facilities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[h] Overall impact magnitude categories were based on professional judgment and include (1) *small*: ≤1% of the population or its habitat would be lost, and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat, would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; and (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[i] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[j] To convert acres to km^2, multiply by 0.004047.

Fringed Myotis. The fringed myotis is a year-round resident in western Colorado, where it forages in a variety of habitats including ponderosa pine woodlands, greasewood flats, oakbrush, and shrublands. This species was not evaluated for the Los Mogotes East SEZ in the Draft Solar PEIS. The species roosts in caves, rock crevices, or buildings. The fringed myotis was not recorded on the Los Mogotes East SEZ during field surveys conducted in 2011 (Rodriguez 2011). However, fringed myotis was recorded on the De Tilla Gulch SEZ, suggesting that the species could occur elsewhere in the San Luis Valley and potentially within the Los Mogotes East SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat for the fringed myotis could occur on the SEZ and throughout portions of the area of indirect effects (Table 10.4.12.1-1). There is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the area of direct effects.

10.4.12.2 Impacts

Overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the special status species' habitat within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of the special status species' habitat would be lost; and (3) *large*: >10% of the special status species' habitat would be lost.

As presented in the Draft Solar PEIS, solar energy development within the Los Mogotes East SEZ could affect potentially suitable habitats of special status species. The analysis presented in the Draft Solar PEIS for the original Los Mogotes East SEZ developable area indicated that development would result in no impact or a small overall impact on all special status species (Table 10.4.12.1-1 in the Draft Solar PEIS). Development within the revised Los Mogotes East SEZ could still affect the same 51 species evaluated in the Draft Solar PEIS; however, the reduction in the developable area would result in reduced (and still small) impact levels compared to original estimates in the Draft Solar PEIS.

Impacts on the Mexican spotted owl, western yellow-billed cuckoo, and fringed myotis, special status species identified since publication of the Draft Solar PEIS to potentially occur within the affected area of the Los Mogotes East SEZ, are discussed below and in Table 10.4.12.1-1. The impact assessment for these additional species was carried out in the same way as those species analyzed in the Draft Solar PEIS (Section 10.4.12.2 of the Draft Solar PEIS).

Mexican Spotted Owl. The Mexican spotted owl is known to occur in Conejos County, Colorado, and according to the SWReGAP habitat suitability model for the spotted owl, suitable habitat for the species does not occur anywhere within the Los Mogotes East SEZ. However, approximately 14 acres (<0.1 km^2) of potentially suitable year-round habitat in the assumed access road corridor could be directly affected by construction and operations (Table 10.4.12.1-1). This direct effects area represents less than 0.1% of available suitable habitat in the SEZ region. About 3,000 acres (12 km^2) of potentially suitable year-round habitat occurs within the area of indirect effects (Figure 10.4.12.1-1). The amount of potentially suitable habitat within the indirect effects area represents about 0.4% of the available suitable habitat in the SEZ region (Table 10.4.12.1-1).

The overall impact on the Mexican spotted owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small, because the amount of potentially suitable foraging and nesting habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Western Yellow-Billed Cuckoo. The western yellow-billed cuckoo is known to occur in Conejos County, Colorado, and potentially suitable habitat occurs in the affected area of the Los Mogotes East SEZ. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ. However, the SWReGAP habitat suitability model indicates approximately 215 acres (1 km^2) of potentially suitable habitat in the area of indirect effects, primarily along the Conejos River (Figure 10.4.12.1-1). This indirect effects area represents about 8.6% of the available suitable habitat in the region (Table 10.4.12.1-1).

The overall impact on the western yellow-billed cuckoo from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small, because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Fringed Myotis. The fringed myotis is a year-round resident in southwestern Colorado and is known to occur within the San Luis Valley. Although this species is not known to occur in the proposed Los Mogotes East SEZ, field surveys conducted in 2011 documented the presence of this species in the De Tilla Gulch SEZ (Rodriguez 2011). According to the SWReGAP habitat suitability model, approximately 2,650 acres (11 km^2) of suitable foraging habitat in the revised Los Mogotes East SEZ may be directly affected by construction and operations (Table 10.4.12.1-1). This direct effects area represents less than 0.1% of potentially suitable habitat in the SEZ region. About 86,500 acres (350 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.5% of the available suitable habitat in the region (Table 10.4.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. There is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the area of direct effects; however, it is possible for individuals to roost in nearby habitats within the area of indirect effects (Rodriguez 2011).

The overall impact on the fringed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the revised Los Mogotes East SEZ is considered small, because the amount of potentially suitable foraging habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible, because potentially suitable habitat is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

10.4.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features are described in Appendix A of this Final Solar PEIS. SEZ-specific conditions will be considered when programmatic design features are applied, for example:

- Pre-disturbance surveys shall be conducted within the SEZ to determine the presence and abundance of special status species including those identified in Table 10.4.12.1-1 of the Draft Solar PEIS, as well as those identified in Table 10.4.12.1-1 of this Final Solar PEIS. Disturbance of occupied habitats for these species shall be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible, translocation of individuals from areas of direct effects or compensatory mitigation of direct effects on occupied habitats may be used to reduce impacts. A comprehensive mitigation strategy for special status species that uses one or more of these options to offset the impacts of projects shall be developed in coordination with the appropriate federal and state agencies.

- Avoidance or minimization of disturbance to wetland and riparian habitats within the SEZ shall be employed to reduce impacts on halfmoon milkvetch (*Astragalus allochrous* var. *playanus)*, least moonwort (*Botrychium simplex*), Rocky Mountain blazing-star (*Liatris ligulistylis*), Rio Grande chub (*Gila pandora*), Rio Grande sucker (*Catostomus plebius*), milk snake (*Lampropeltis triangulum*), bald eagle (*Haliaeetus leucocephalus*), Barrow's goldeneye (*Bucephala islandica*), ferruginous hawk (*Buteo regalis*), and southwestern willow flycatcher (*Empidonax traillii extimus*).

- Avoiding or limiting groundwater withdrawals for solar energy development on the SEZ shall be employed to reduce impacts on groundwater-dependent special status species, including those species that may occur in riparian or aquatic habitats supported by groundwater. These species include the southwestern willow flycatcher and the western yellow-billed cuckoo.

- Consultations with the USFWS and CDOW shall be conducted to address the potential for impacts on the Mexican spotted owl and southwestern willow flycatcher, which are species listed under the ESA. Consultation would identify an appropriate survey protocol, avoidance measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.

- Coordination with the USFWS and CDOW should be conducted to address the potential for impacts on the Gunnison's prairie dog (*Cynomys gunnisoni*) and northern leopard frog (*Rana pipiens*)—species that are either candidates or under review for listing under the ESA. Coordination would identify an appropriate survey protocol, avoidance measures, and, potentially, translocation or compensatory mitigation.

If the programmatic design features are implemented, it is anticipated that the majority of impacts on the special status species from habitat disturbance and groundwater use would be reduced.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for special status species have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.13 Air Quality and Climate

10.4.13.1 Affected Environment

Except as noted below, the information for air quality and climate presented in the affected environment section of the Draft Solar PEIS remains essentially unchanged.

10.4.13.1.1 Existing Air Emissions

The Draft Solar PEIS presented Conejos County emissions data for 2002. More recent data for 2008 (CDPHE 2011) were reviewed. The two emissions inventories are from different sources and assumptions. All emissions in the 2008 data were lower than those in the 2002 data; all criteria air pollutants were much lower, but VOCs were about half of those in the 2002 data. These changes would not affect modeled air quality impacts presented in this update.

10.4.13.1.2 Air Quality

The calendar quarterly average NAAQS of 1.5 μg/m^3 for lead (Pb) presented in Table 10.4.13.1-2 of the Draft Solar PEIS has been replaced by the rolling 3-month standard (0.15 μg/m^3). The federal 24-hour and annual SO_2, 1-hour O_3, and annual PM_{10} standards have been revoked as well (EPA 2011). All Colorado SAAQS, except the 3-hour SO_2 standard of 700 μg/m^3, have been revoked since the Draft Solar PEIS. These changes will not affect the modeled air quality impacts presented in this update.

The size of the proposed Los Mogotes East SEZ was reduced by about 55%, from 5,918 acres (23.9 km^2) to 2,650 acres (10.7 km^2) by removing the western half of the originally proposed SEZ. Based on this reduction, the distances from the proposed SEZ to the Great Sand

Dunes WA and Wheeler Peak WA in New Mexico did not change, and the distances to Weminuche WA and La Garita WA increased by about 1 mi (1.6 km).

10.4.13.2 Impacts

10.4.13.2.1 Construction

Methods and Assumptions

Except for the area disturbed at any one time during construction, the methods and modeling assumptions have not changed from those presented in the Draft Solar PEIS. Based on the reduction in the area of the proposed Los Mogotes East SEZ, air quality for this Final Solar PEIS was remodeled by assuming that 2,120 acres (8.6 km^2), 80% of the updated developable area, would be disturbed at any one time. The Draft Solar PEIS assumed disturbance of an area of 3,000 acres (12.1 km^2).

Results

Since the annual PM_{10} standard has been rescinded, the discussion of annual PM_{10} impacts in the Draft Solar PEIS is no longer applicable, and Table 10.4.13.2-1 has been updated for this Final Solar PEIS. The concentration values in the table are based on updated air quality modeling reflecting the updated boundaries of the proposed SEZ.

With the reduced area of the proposed SEZ, the concentrations predicted for this Final Solar PEIS are less than those predicted in the Draft Solar PEIS, but the conclusions presented in the Draft Solar PEIS remain valid.[1] Predicted 24-hour PM_{10} and 24-hour $PM_{2.5}$ concentration levels could exceed NAAQS levels used for comparison at the SEZ boundaries and in the immediately surrounding area during the construction phase of a solar development. These high particulate levels would be limited to the immediate area surrounding the SEZ boundaries and would decrease quickly with distance. Predicted total concentrations for annual $PM_{2.5}$ would be below the standard level used for comparison.

The updated analysis conducted for this Final Solar PEIS predicted lower concentrations at all modeled locations than those in the Draft Solar PEIS. For 24-hr PM_{10}, the concentration at

[1] At this programmatic level, detailed information on construction activities, such as facility size, type of solar technology, heavy equipment fleet, activity level, work schedule, and so on, is not known; thus air quality modeling cannot be conducted. It has been assumed that 80% of the developable area of 2,650 acres (10.7 km^2) would be disturbed continuously; thus the modeling results and discussion here should be interpreted in that context. During the site-specific project phase, more detailed information would be available and more realistic air quality modeling analysis could be conducted. It is likely that impacts on ambient air quality predicted for specific projects would be much lower than those in this Final Solar PEIS.

TABLE 10.4.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Los Mogotes East SEZ as Revised

			Concentration ($\mu g/m^3$)				Percentage of NAAQS	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background	Total	NAAQS	Increment	Total
PM_{10}	24 hours	H6H	374	27	401	150	249	267
$PM_{2.5}$	24 hours	H8H	26.0	16	42.0	35	74	120
	Annual	–[c]	6.3	4	10.3	15	42	68

[a] $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 µm; PM_{10} = particulate matter with a diameter of ≤10 µm.

[b] Concentrations for attainment demonstration are presented. H6H = highest of the sixth-highest concentrations at each receptor over the 5-year period. H8H = highest of the multiyear average of the eighth-highest concentrations at each receptor over the 5-year period. For the annual average, multiyear averages of annual means over the 5-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

[c] A dash indicates not applicable.

Source: Chick (2009) for background concentration data.

the nearest residence about 0.4 mi (0.6 km) east of the SEZ changed from above to below the standard level used for comparison. The updated concentration at the second nearest residence about 0.6 mi (1.0 km) north of the SEZ was above the standard level used for comparison. However, construction activities are not subject to the PSD program; the comparison is made as an indicator of possible dust levels at the residence during the limited construction period and as a screen to gage the size of the potential impact. Therefore, it is anticipated that the potential impacts of construction activities on ambient air quality would be moderate and temporary.

Other locations modeled include the communities of Antonito, Conejos, Romeo, La Jara, Manassa, Estrella, Sanford, and San Antonio. At these communities, the conclusions of the Draft Solar PEIS that total predicted concentrations would be below the standard level used for comparison remain valid.

With the reduced area of the proposed SEZ, updated 24-hour and annual PM_{10} concentration increments the nearest Class I area, Great Sand Dunes WA, would be lower than those in the Draft Solar PEIS, about 6.9 and 0.14 $\mu g/m^3$, or 87% and 4%, respectively, of the allowable PSD increment levels for Class I areas. The conclusion in the Draft Solar PEIS that 24-hr PM_{10} PSD Class I increments could be exceeded in the Great Sand Dunes WA is updated for this Final Solar PEIS to conclude that all Class I PSD increments for PM_{10} would be met at the nearest Class I area. The conclusion of the Draft Solar PEIS that concentration increments at the other three Class I areas (La Garita WA and Weminuche WA in Colorado, and Wheeler Peak

WA in New Mexico) would be much lower than those at the Great Sand Dunes WA and thus would not be exceeded remains valid.

With the reduced size of the Los Mogotes East SEZ, emissions from construction equipment and vehicles would be less than those discussed in the Draft Solar PEIS. Any potential impacts on AQRVs at nearby federal Class I areas would be less. The conclusions in the Draft Solar PEIS remain valid. Emissions from construction-related equipment and vehicles are temporary in nature and could cause some unavoidable but short-term impacts.

10.4.13.2.2 Operations

The reduction in the size of the proposed Los Mogotes East SEZ by about 55% from 5,918 acres (23.9 km^2) to 2,650 acres (10.7 km^2) reduces the generating capacity and annual power generation and thus reduces the potentially avoided emissions presented in the Draft Solar PEIS. Total revised power generation capacity ranging from 236 to 424 MW is estimated for the Los Mogotes East SEZ for various solar technologies. As explained in the Draft Solar PEIS, the estimated amount of emissions avoided for the solar technologies evaluated depends only on the megawatts of conventional fossil fuel–generated power avoided. Updated estimates for emissions potentially avoided by a solar facility can be obtained from the table in the Draft Solar PEIS by reducing the tabulated estimates by about 55%, as shown in the revised Table 10.4.13.2-2. For example, for the technologies estimated to require 9 acres/MW (power tower, dish engine, and PV), up to 629 tons per year (= 44.78% × [the low-end value of 1,405 tons per year tabulated in the Draft Solar PEIS]) of NO_X could be avoided by full solar development of the proposed Los Mogotes East SEZ as revised for this Final Solar PEIS. Although the total emissions avoided by full solar development of the proposed SEZ are considerably reduced from those presented in the Draft Solar PEIS, the conclusions of the Draft remain valid. Solar facilities built in the Los Mogotes East SEZ could avoid relatively more fossil fuel emissions than those built in other states that rely less on fossil fuel–generated power.

10.4.13.2.3 Decommissioning and Reclamation

The discussion in the Draft Solar PEIS remains valid. Decommissioning and reclamation activities would be of short duration, and their potential air impacts would be moderate and temporary.

10.4.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce air quality impacts are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Limiting dust generation during construction and operations is a required programmatic design feature under the BLM Solar Energy Program. These extensive fugitive dust control measures would keep off-site PM levels as low as possible during construction.

TABLE 10.4.13.2-2 Annual Emissions from Combustion-Related Power Generation Avoided by Full Solar Development of the Proposed Los Mogotes East SEZ as Revised

Area Size (acres)[a]	Capacity (MW)[b]	Power Generation (GWh/yr)[c]	Emissions Avoided (tons/yr; 10^3 tons/yr for CO_2)[d]			
			SO_2	NO_x	Hg	CO_2
2,650	236–424	413–743	546–982	629–1,133	0.004–0.006	408–734
Percentage of total emissions from electric power systems in the state of Colorado[e]			0.87–1.6%	0.87–1.6%	0.87–1.6%	0.87–1.6%
Percentage of total emissions from all source categories in the state of Colorado[f]			0.46–0.83%	0.15–0.28%	–[g]	0.39–0.71%
Percentage of total emissions from electric power systems in the six-state study area[e]			0.22–0.39%	0.17–0.31%	0.12–0.22%	0.16–0.28%
Percentage of total emissions from all source categories in the six-state study area[f]			0.12–0.21%	0.02–0.04%	–	0.05–0.09%

[a] To convert acres to km^2, multiply by 0.004047.

[b] It is assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.020 km^2) per MW (for parabolic trough technology) to 9 acres (0.036 km^2) per MW (power tower, dish engine, and photovoltaic technologies) would be required.

[c] Assumed a capacity factor of 20%.

[d] Composite combustion-related emission factors for SO_2, NO_X, Hg, and CO_2 of 2.64, 3.05,1.71 × 10^{-5}, and 1,976 lb/MWh, respectively, were used for the state of Colorado.

[e] Emission data for all air pollutants are for 2005.

[f] Emission data for SO_2 and NO_x are for 2002, while those for CO_2 are for 2005.

[g] A dash indicates not estimated.

Sources: EPA (2009a,b); WRAP (2009).

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for air quality have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.14 Visual Resources

10.4.14.1 Affected Environment

The proposed Los Mogotes East SEZ, as revised, extends approximately 5.0 mi (8.0 km) north to south and 1.0 mi (1.6 km) east to west. The SEZ has been revised to eliminate 3,268 acres (13.2 km^2), primarily within the western half of the SEZ. The proposed Los Mogotes East SEZ now occupies an area of 2,650 acres (10.7 km^2). Because of the reduction in the size of the SEZ, the total acreage of the lands visible within the 25-mi (40-km) viewshed of the SEZ has decreased.

An updated visual resources inventory (VRI) map for the SEZ and surrounding lands is shown in Figure 10.4.14.1-1; it provides information from the BLM's September 2010 VRI, which was finalized in October 2011 (BLM 2011a). As shown, the VRI value for the SEZ still is VRI Class III, indicating moderate relative visual values.

Lands in the La Jara Field Office within the 25-mi (40-km), 650-ft (198-m) viewshed of the revised SEZ include 42,978 acres (173.9 km^2) of VRI Class II areas; 50,825 acres (205.7 km^2) of VRI Class III areas; and 23,210 acres (93.9 km^2) of VRI Class IV areas.

10.4.14.2 Impacts

The reduction in size of the SEZ would reduce the total visual impacts associated with solar energy development in the SEZ. It would limit the total amount of solar facility infrastructure that would be visible and would reduce the geographic extent of the visible infrastructure.

The reduction in size of the SEZ eliminated approximately 55% of the original SEZ. The resulting visual contrast reduction for any given point within view of the SEZ would vary greatly depending on the viewpoint's distance and direction from the SEZ. Contrast reduction generally would be greatest for viewpoints closest to the portions of the SEZ that were eliminated, especially for those that had wide-angle views of these areas. In general, contrast reductions also would be larger for elevated viewpoints relative to non-elevated viewpoints, because the reduction in area of the solar facilities would be more apparent when looking down at the SEZ than when looking across it.

10.4.14.2.1 Impacts on the Proposed Los Mogotes East SEZ

Although the reduction in the size of the SEZ would reduce visual contrasts associated with solar development, solar development within the SEZ still would involve major modification of the existing character of the landscape and would likely dominate the views from most locations within the SEZ. Additional impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric

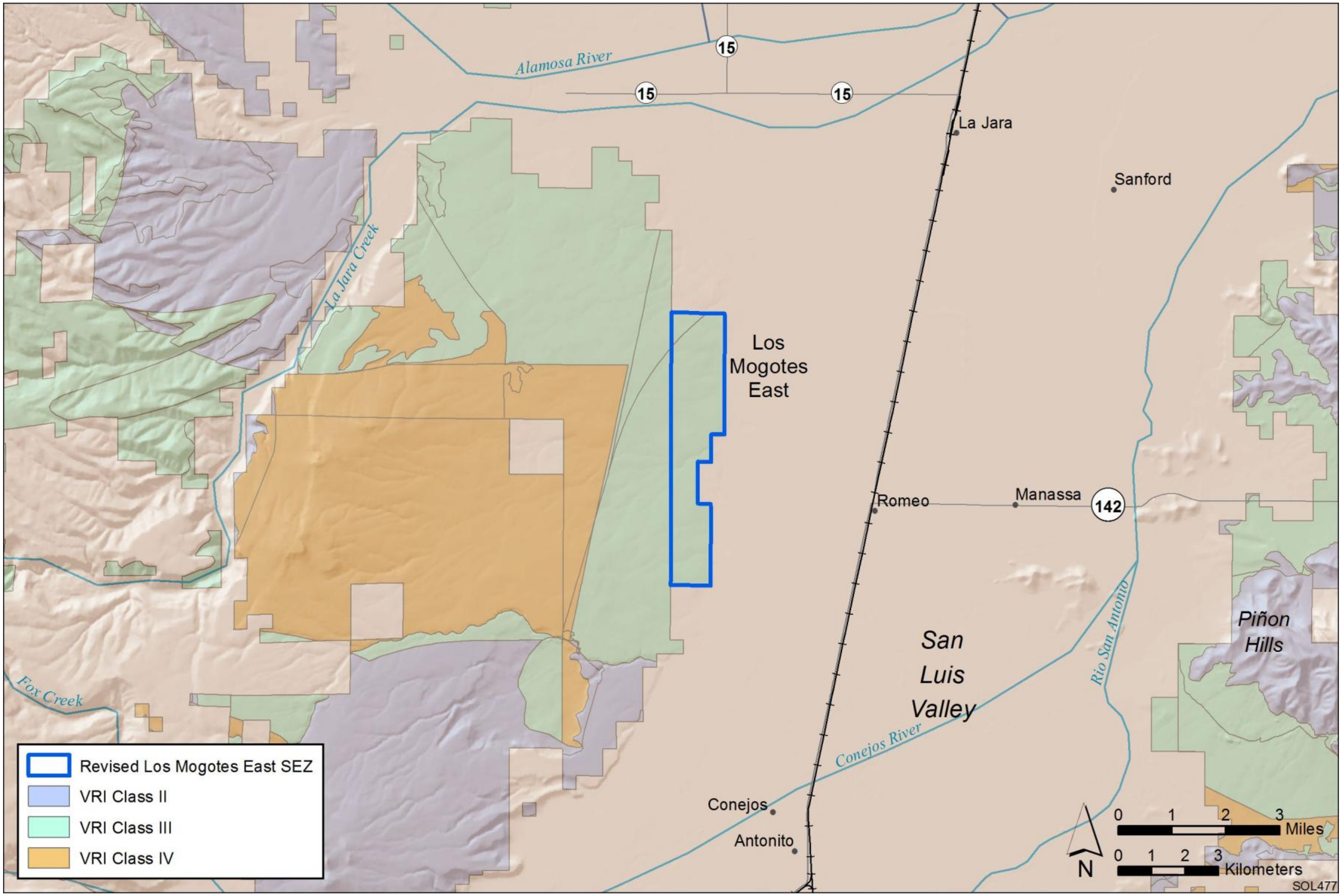

FIGURE 10.4.14.1-1 Visual Resource Inventory Values for the Proposed Los Mogotes East SEZ as Revised

transmission lines. In general, strong visual contrasts from solar development still would be expected to be observed from viewing locations within the SEZ.

10.4.14.2.2 Impacts on Lands Surrounding the Proposed Los Mogotes East SEZ

For the Draft Solar PEIS, preliminary viewshed analyses were conducted to identify which lands surrounding the proposed SEZ could have views of solar facilities in at least some portion of the SEZ (see Appendixes M and N of the Draft Solar PEIS for important information on assumptions and limitations of the methods used). Four viewshed analyses were conducted, assuming four different heights representative of project elements associated with potential solar energy technologies: PV and parabolic trough arrays, 24.6 ft (7.5 m); solar dishes and power blocks for CSP technologies, 38 ft (11.6 m); transmission towers and short solar power towers, 150 ft (45.7 m); and tall solar power towers, 650 ft (198.1 m).

These same viewsheds were recalculated in order to account for the boundary changes described in the Supplement to the Draft Solar PEIS. Figure 10.4.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored portions indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded light brown and the additional areas shaded light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown, light purple, and the additional areas shaded dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, dark purple, and at least the upper portions of power tower receivers could be visible from the additional areas shaded medium brown.

10.4.14.2.3 Impacts on Selected Federal-, State-, and BLM-Designated Sensitive Visual Resource Areas and Other Lands and Resources

Figure 10.4.14.2-2 shows the results of a GIS analysis that overlays selected federal-, state-, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds, in order to illustrate which of these sensitive visual resource areas could have views of solar facilities within the SEZ and therefore potentially would be subject to visual impacts from those facilities. Distance zones that correspond with BLM's VRM system-specified foreground-middleground distance (5 mi [8 km]), background distance (15 mi [24 km]), and a 25-mi (40-km) distance zone are shown as well, in order to indicate the effect of distance from the SEZ on impact levels, which are highly dependent on distance. A similar analysis was conducted for the Draft Solar PEIS.

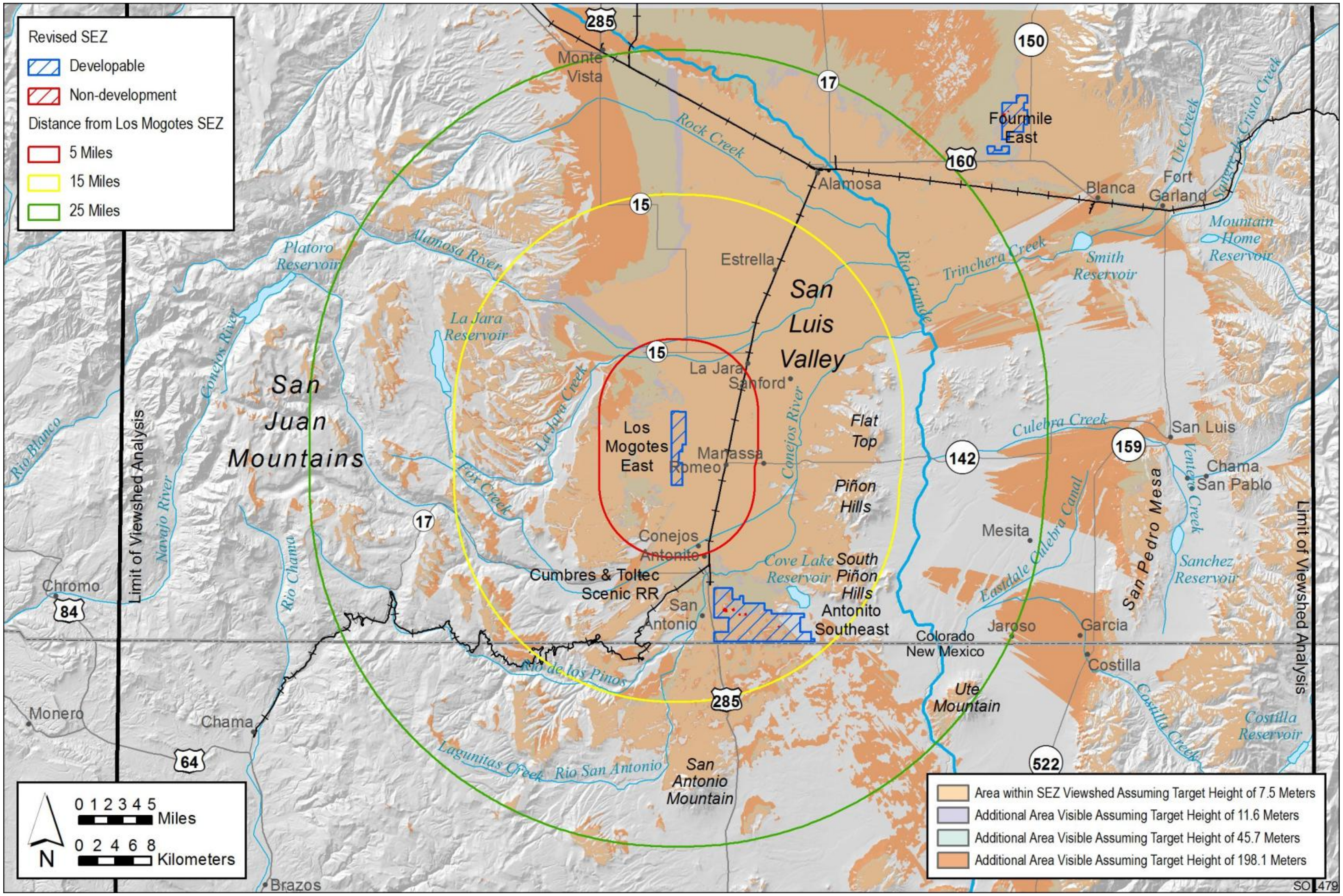

FIGURE 10.4.14.2-1 Viewshed Analyses for the Proposed Los Mogotes East SEZ as Revised and Surrounding Lands, Assuming Viewshed Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development and/or associated structures within the SEZ could be visible)

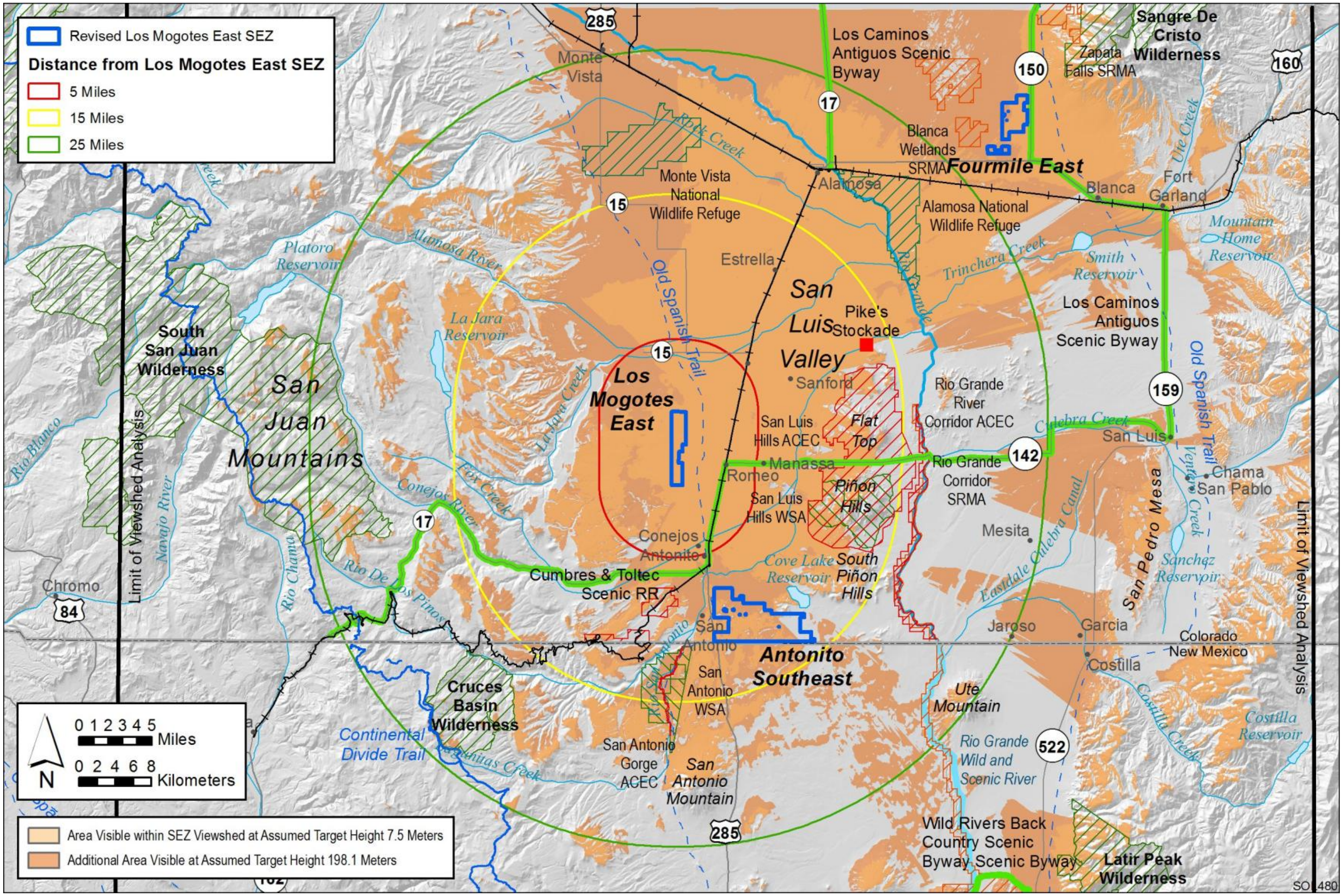

FIGURE 10.4.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Los Mogotes East SEZ as Revised

The scenic resources included in the viewshed analyses were as follows:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;

- Congressionally authorized Wilderness Areas;

- Wilderness Study Areas;

- National Wild and Scenic Rivers;

- Congressionally authorized Wild and Scenic Study Rivers;

- National Scenic Trails and National Historic Trails;

- National Historic Landmarks and National Natural Landmarks;

- All-American Roads, National Scenic Byways, State Scenic Highways, and BLM- and USFS-designated scenic highways/byways;

- BLM-designated Special Recreation Management Areas; and

- ACECs designated because of outstanding scenic qualities.

The results of the GIS analyses are summarized in Table 10.4.14.2-1. The change in size of the SEZ alters the viewshed, such that the visibility of the SEZ and solar facilities within the SEZ from the surrounding lands would be reduced. With the reduction in size of the SEZ, solar energy development within the SEZ would be expected to create minimal or weak visual contrasts for viewers within most of the surrounding scenic resource areas and other resources listed in Table 10.4.14.2-1. Exceptions include the San Luis Hills WSA and ACEC and the Los Antiguos Caminos Scenic Byway. In these three areas, moderate or strong visual contrasts still could occur.

In addition to these areas, impacts on other lands and resource areas also were evaluated. These areas include the surrounding communities of Antonito, Conejos, La Jara, Manassa, Romeo, and Sanford; the CTSR; and the West Fork of the North Branch of the Old Spanish Trail.

10.4.14.2.4 Summary of Visual Resource Impacts for the Proposed Los Mogotes East SEZ

The visual contrast analysis in the Draft Solar PEIS determined that because there could be multiple solar facilities within the Los Mogotes East SEZ, a variety of technologies employed, and a range of supporting facilities required, solar development within the SEZ would make it

TABLE 10.4.14.2-1 Selected Potentially Affected Sensitive Visual Resources within a 25-mi (40-km) Viewshed of the Proposed Los Mogotes East SEZ as Revised, Assuming a Target Height of 650 ft (198.1 m)

Feature Type	Feature Name (Total Acreage/ Linear Distance)[a,b]	Feature Area or Linear Distance[c]		
			Visible Between	
		Visible within 5 mi	0 and 15 mi	0 and 25 mi
WAs	Cruces Basin (18,876 acres)	0 acres	0 acres	1,052 acres (6%)
	South San Juan (160,832 acres)	0 acres	0 acres	2,997 acres (2%)
WSAs	San Antonio (7,321 acres)	0 acres	3,890 acres (53%)	2,158 acres (29%)
	San Luis Hills (10,896 acres)	0 acres	3,245 acres (30%)	0 acres
National Scenic Trail	Continental Divide (591 mi)[d]	0 mi	0 mi	5.9 mi (1%)
National Historic Landmark	Pike’s Stockade (4 acres)	0 acres	4 acres (100%)	0 acres
NWRs	Alamosa (12,098 acres)	0 acres	0 acres	12,062 acres (100%)
	Monte Vista (14,761 acres)	0 acres	0 acres	14,713 acres (100%)
ACECs designated for outstanding scenic values	San Luis Hills (39,421 acres)	0 acres	15,475 acres (39%)	0 acres (0%)
	CTSR Corridor (3,868 acres)	0 acres	1,577 acres (41%)	0 acres
	San Antonio Gorge (377 acres)	0 acres	131 acres (35%)	30 acres (8%)
Scenic Highway/ Byway	Los Caminos Antiguos (129 mi)[e]	8.3 mi (6%)	15.0 mi (11%)	8.2 mi (6%)

[a] To convert acres to km^2, multiply by 0.004047.

[b] To convert mi to km, multiply by 1.609.

[c] Percentage of total feature acreage or road length viewable.

[d] Mileage of Colorado portion of the Trail built as of 2009. Source: Continental Divide Trail Association (2012).

[e] Source: America’s Byways (2011).

essentially industrial in appearance and would contrast strongly with the surrounding mostly natural-appearing landscape.

The reduction in size of the SEZ would reduce the visual contrast associated with solar facilities as seen both within the SEZ and from surrounding lands in both daytime and nighttime views. The reductions in visual contrast can be summarized as follows:

- Within the Los Mogotes East SEZ: Contrasts experienced by viewers within the western portion of the SEZ would be reduced because of the elimination of more than half the total area of the SEZ, as it was originally proposed in the Draft Solar PEIS. However, strong contrasts still could be observed in the remaining developable area.

- Cruces Basin WA: A slight reduction in contrasts would be anticipated because of the elimination of acreage in the western half of the SEZ; solar development within the SEZ still would cause minimal to weak contrasts.

- South San Juan WA: A slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause minimal to weak contrasts.

- San Antonio WSA: A slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause minimal to weak contrasts, depending on viewer location in the WSA.

- San Luis Hills WSA: A reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak to moderate contrasts, depending on viewer location in the WSA.

- Continental Divide National Scenic Trail: A slight reduction in contrasts would be anticipated due to the elimination of acreage in the western half of the SEZ; solar development within the SEZ still would cause minimal to weak contrasts, depending on viewer location on the trail.

- Pike’s Stockade National Historic Landmark: A slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause minimal to weak contrasts.

- Alamosa NWR: A very slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause minimal contrasts.

- Monte Vista NWR: A very slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause minimal contrasts.

- San Luis Hills ACEC: A reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak to moderate contrasts.

- CTSR Corridor ACEC: A reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak contrasts.

- San Antonio Gorge ACEC: No impacts are anticipated since the creek and ACEC are within a canyon.

- Los Caminos Antiguos Scenic Byway: A very slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak to strong contrasts, depending on viewer location on the byway.

- Antonito: A slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak contrasts.

- Conejos: A slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak contrasts.

- La Jara: A slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause moderate contrasts.

- Manassa: A slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause strong contrasts.

- Romeo: A slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause strong contrasts.

- Sanford: A slight reduction in contrasts would be anticipated; solar development within the SEZ still would cause moderate to strong contrasts.

- CTSR: A reduction in contrasts would be anticipated; solar development within the SEZ still would cause weak contrasts.

- West Fork of the North Branch of the Old Spanish Trail: A reduction in contrasts would be anticipated because of the elimination of acreage in the western half of the SEZ; however, solar development within the SEZ still would cause minimal to strong contrasts depending on observer location on the Trail.

In addition, the proposed Antonito Southeast SEZ is relatively close to the proposed Los Mogotes East SEZ (approximately 7 mi [11.3 km]). A majority of the Antonito Southeast SEZ is located within the 25-mi (40-km) viewshed of the Los Mogotes East SEZ, and some of the sensitive visual resource areas discussed above may be subject to impacts associated with both SEZs.

10.4.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on visual resources are described in Section A.2.2 of Appendix A of this Final Solar PEIS. While application of the programmatic design features would reduce potential visual impacts somewhat, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. With the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas would be the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures generally would be limited. Utility-scale solar energy development using any of the solar technologies analyzed in the PEIS and at the scale analyzed would be expected to result in large adverse visual impacts that could not be mitigated.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, the following proposed SEZ-specific design feature for the SEZ has been identified:

- The development of power tower facilities should be prohibited within the SEZ. The San Luis Valley is a regionally important tourist destination and is an area with many small communities and numerous important historic, cultural, and recreational resources. The valley contains numerous historic sites, two scenic railways, two scenic highways, several wildlife refuges, Great Sand Dunes NP and Preserve, the Rio Grande WSR, congressionally designated WAs, the Sangre de Cristo NHA, and various other attractions that draw tourists to the region. A number of these areas overlook the San Luis Valley from the surrounding mountains and include elevated viewpoints that would have clear views of power tower facilities in the Valley. The height of solar power tower receiver structures, combined with the intense light generated by the receivers atop the towers, would be expected to create strong visual contrasts that could not be effectively screened from view for most areas surrounding the SEZ. The effective area of impact from power tower structures is much larger than that for comparably rated lower height facilities, which makes it more likely that they would conflict with the growing tourism focus of the Valley. In addition, for power towers exceeding 200 ft (61 m) in height, hazard navigation lighting that could be visible for very long distances would likely be required. Prohibiting the development of power tower facilities would remove this source of impacts, thus substantially reducing potential visual impacts on the West Fork of the North Branch of the Old Spanish Trail; the Los Caminos Antiguos Scenic Byway; the other sensitive visual resource areas identified above; and the communities of Antonito, Conejos, La Jara, Manassa, Romeo, and Sanford.

The need for additional SEZ-specific design features will be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.15 Acoustic Environment

10.4.15.1 Affected Environment

The size of the proposed Los Mogotes East SEZ was reduced by about 55%, from 5,918 acres (23.9 km^2) to 2,650 acres (10.7 km^2) by removing the western half of the originally proposed SEZ. Distances to the nearest residences and towns, which are all located north, east, or south of the SEZ, remain the same as in the Draft Solar PEIS. The updated distance to the Los Mogotes ACEC, located to the west, is about 2 mi (3.2 km), greater than the distance of about 1 mi (1.6 km) in the Draft Solar PEIS.

10.4.15.2 Impacts

Based on the boundary changes and reduced size of the proposed Los Mogotes East SEZ, noise impacts from construction and operations were remodeled for this Final Solar PEIS. Distances from the SEZ to the nearest residences and towns have not changed, and except as noted below for impacts on specially designated areas and impacts from operating dish engine facilities, the conclusions of the Draft Solar PEIS remain valid.

10.4.15.2.1 Construction

Except as noted below for impacts in specially designated areas, the conclusions in the Draft Solar PEIS remain valid.

On the basis of comments received and recent references as applicable, this Final Solar PEIS used an updated approximate significance threshold of 55 dBA corresponding to the onset of adverse physiological impacts (Barber et al. 2010) to update the analysis of potential noise impacts on terrestrial wildlife in areas of special concern. As a result of this updated analysis, the conclusion in the Draft Solar PEIS that wildlife would not be adversely affected has been updated for this Final Solar PEIS as follows. With construction activities occurring near the southwestern SEZ boundary, the estimated noise level at the boundary of the Los Mogotes ACEC (about 2 mi [3 km] to the west) is about 34 dBA. This estimated level is below the updated significance threshold, and thus noise from construction in the proposed Los Mogotes East SEZ is not anticipated to adversely affect wildlife in the nearby specially designated areas. However, as discussed in Section 5.10.2 of this Final Solar PEIS, there is the potential for other effects (e.g., startle or masking) to occur at lower noise levels (Barber et al. 2011). With these impacts and the potential for impacts at lower noise levels, impacts on terrestrial wildlife from construction noise would have to be considered on a project-specific basis, including site-specific background levels and hearing sensitivity for site-specific terrestrial wildlife of concern. However, even considering potential impacts at these lower noise levels, construction noise at the SEZ would not be anticipated to affect wildlife there.

For construction activities occurring near the eastern SEZ boundary, the estimated noise level at the West Fork of the North Branch of the Old Spanish Trail (about 1.0 mi [1.6 km] to the east) would be about 42 dBA, which is just above the typical daytime mean rural background level of 40 dBA but less than a just noticeable difference of 3 dBA. The conclusion in the Draft Solar PEIS that construction occurring near the eastern SEZ boundary would result in minor noise impacts on the West Fork of the North Branch of the Old Spanish Trail is updated for this Final Solar PEIS to conclude that the noise impacts would be negligible and temporary.

Overall, construction would cause some unavoidable but localized short-term impacts on neighboring communities, particularly for activities occurring near the eastern proposed SEZ boundary, close to the nearby residences. No adverse vibration impacts are anticipated from construction activities, including pile driving for dish engines.

10.4.15.2.2 Operations

The conclusions presented in the Draft Solar PEIS remain valid, except as noted below for impacts from TES and dish engine facilities near residences or in specially designated areas.

Parabolic Trough and Power Tower

If TES were not used for parabolic trough and power tower technologies (12 hours of daytime operations only), estimated noise levels at the nearest residence about 0.4 mi (0.6 km) from the SEZ boundary would be about 45 dBA, which exceeds the typical daytime mean rural background of 40 dBA. The day-night average noise level of 44 dBA L_{dn} would be well below the EPA guideline of 55 dBA L_{dn} for residential areas. If TES were used, the estimated nighttime noise level at the nearest residence would be about 55 dBA, which is significantly higher than the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 57 dBA L_{dn}, which is a little higher than the EPA guideline of 55 dBA L_{dn} for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms. Thus, it is likely that noise levels would be lower than 53 dBA L_{dn} at the nearest residence, even if TES were used at a solar facility. Nonetheless, operating parabolic trough or power tower facilities with TES located near the southeastern SEZ boundary could result in noise impacts on the nearest residence, depending on background noise levels and meteorological conditions.

As stated above under construction impacts, for this Final Solar PEIS an updated approximate significance threshold of 55 dBA was used to evaluate potential noise impacts on terrestrial wildlife in areas of special concern. With TES operating near the western SEZ boundary, estimated daytime and nighttime noise levels at the boundary of the Los Mogotes ACEC (about 2 mi [3 km] to the west) would be about 36 and 46 dBA, respectively. These estimated levels are below the significance threshold; thus, noise from operations in the proposed Los Mogotes East SEZ is not anticipated to adversely affect wildlife in the nearby specially designated area. However, as discussed in Section 5.10.2, there is the potential for other effects (e.g., startle) to occur at lower noise levels (Barber et al. 2011). With these impacts and the potential for impacts at lower noise levels, noise impacts on terrestrial wildlife from a parabolic trough or power tower facility equipped with TES would have to be considered on a project-specific basis, including site-specific background levels and hearing sensitivity for site-specific terrestrial wildlife of concern.

Associated with operation of a parabolic trough or power tower facility equipped with TES occurring at the eastern boundary of the SEZ, the estimated daytime and nighttime noise levels at the West Fork of the North Branch of the Old Spanish Trail (about 1.0 mi [1.6 km] to the east) would be about 41 and 51 dBA, respectively, which are comparable to and far above the typical daytime and nighttime mean rural background levels of 40 and 30 dBA. Accordingly, operation of a solar facility with TES located near the eastern SEZ boundary could result in noise impacts on the West Fork of the North Branch of the Old Spanish Trail during nighttime hours.

Dish Engines

The reduced size of the proposed Los Mogotes East SEZ would reduce the maximum potential number of 25-kW dish engines to 9,420 covering 2,120 acres (8.6 km^2); the Draft Solar PEIS modeled 21,040 dish engines covering 4,734 acres (19.2 km^2). The estimated noise level at the nearest residence about 0.4 mi (0.6 km) from the SEZ boundary would be about 47 dBA, which is higher than the typical daytime mean rural background level of 40 dBA. The estimated day-night average noise level of 46 dBA L_{dn} at these residences is below the EPA guideline of 55 dBA L_{dn} for residential areas. The conclusion of the Draft Solar PEIS that noise from dish engines could cause adverse impacts on the nearest residence, depending on background noise levels and meteorological conditions, remains valid.

As stated above under construction impacts, for this Final Solar PEIS an updated approximate significance threshold of 55 dBA was used to evaluate potential noise impacts on terrestrial wildlife in areas of special concern. The estimated noise level from operation of a dish engine solar facility at the boundary of the Los Mogotes ACEC (about 2 mi [3 km] to the west) is about 41 dBA. This estimated level is below the significance threshold; thus, noise from operations in the proposed Los Mogotes East SEZ is not anticipated to adversely affect wildlife in the nearby specially designated area. However, as discussed in Section 5.10.2, there is the potential for other effects to occur at lower noise levels (Barber et al. 2011). With these impacts and the potential for impacts at lower noise levels, noise impacts on terrestrial wildlife from a dish engine facility would have to be considered on a project-specific basis, including site-specific background levels and hearing sensitivity for site-specific terrestrial wildlife of concern.

Assuming full build-out of the SEZ with dish engine facilities, the estimated noise level at the West Fork of the North Branch of the Old Spanish Trail (about 1.0 mi [1.6 km] to the east of the SEZ) would be about 46 dBA, which is above the typical daytime mean rural background level of 40 dBA. Dish engine noise from the SEZ could result in minor noise impacts on the West Fork of the North Branch of the Old Spanish Trail.

Changes in the proposed Los Mogotes East SEZ boundaries would not alter the discussions of vibration, transformer and switchyard noise, and transmission line corona discharge presented in the Draft Solar PEIS. Noise impacts from vibration and transformer and switchyard noise would be minimal. Noise impacts from transmission line corona discharge would be negligible.

10.4.15.2.3 Decommissioning and Reclamation

The conclusions on decommissioning and reclamation in the proposed Los Mogotes East SEZ as presented in the Draft Solar PEIS remain valid. Decommissioning and reclamation activities would be of short duration, and their potential noise impacts would be minor and temporary. Potential noise and vibration impacts on surrounding communities would be minimal.

10.4.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce noise impacts are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Implementing the programmatic design features will provide some protection from noise impacts.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for noise were identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.16 Paleontological Resources

10.4.16.1 Affected Environment

Data provided in the Draft Solar PEIS remain valid, with the following updates:

- The ratio of the PFYC in the SEZ has changed with the new footprint; the Class 1 areas of low potential have been reduced from 88% to 73% of the SEZ, and the Class 4/5 areas of higher paleontological potential have been increased from 12% to 27% of the SEZ. In the Class 4/5 areas, the depth of the Alamosa Formation would need to be determined.

- The BLM Regional Paleontologist may have additional information regarding the paleontological potential of the SEZ and be able to verify the PFYCs of the SEZ as Class 1 and Class 4/5 as used in the Draft Solar PEIS.

10.4.16.2 Impacts

The assessment provided in the Draft Solar PEIS remains valid. Impacts on significant paleontological resources in the PFYC Class 1 areas are unlikely. In the PFYC Class 4/5 areas, impacts on significant paleontological resources have a greater potential to occur. However, a more detailed look at the geological deposits is needed to determine whether a paleontological survey is warranted.

10.4.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Impacts would be minimized through the implementation of required programmatic design features, including a stop-work stipulation in the event that paleontological resources are encountered during construction, as described in Section A.2.2 of Appendix A.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, the following SEZ-specific design feature for paleontological resources has been identified:

- Avoidance of PFYC Class 4/5 areas is recommended for development within the proposed Los Mogotes East SEZ and for access road placement. Where avoidance of Class 4/5 deposits is not possible, a paleontological survey would be required.

Additional SEZ-specific design features would depend on the results of future paleontological investigations. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

As additional information on paleontological resources (e.g., from regional paleontologists or from new surveys) becomes available, the BLM will post the data to a public Web site for use by applicants, the BLM, and other stakeholders.

10.4.17 Cultural Resources

10.4.17.1 Affected Environment

Data provided in the Draft Solar PEIS remain valid, with the following updates:

- The new footprint of the SEZ does not include the areas that had been previously surveyed for cultural resources, bringing the percentage of area surveyed down from 0.02% to 0.0%.

- Additional information may be available to characterize the SEZ and its surrounding area in the future (after this Final Solar PEIS is completed), as follows:
  - Results of an ethnographic study currently being conducted by TRC Solutions, which focuses on Native American use of lands being analyzed for solar development within the San Luis Valley. The study will discuss sensitive and traditional use areas. Interviews with tribal members and field visits will facilitate the identification of resources and sites of traditional and religious importance to tribes.
  - Results of a Class II sample survey of the SEZ designed to obtain a statistically valid sample of archeological properties and their distribution within the SEZ. Results from the ethnographic study and the sample inventory can be combined to project cultural sensitivity zones as an aid in planning future solar developments.
  - Identification of the integrity and historical significance of the portion of the West Fork of the North Branch of the Old Spanish National Historic Trail in the vicinity of the SEZ and viewshed analyses from key observation points along the Trail. If this portion of the Trail is determined significant, a mitigation strategy would need to be developed to address unavoidable impacts on the Trail.
  - Continuation of government-to-government consultation, as described in Section 2.4.3 of the Supplement to the Draft Solar PEIS and IM 2012-032 (BLM 2011b), including follow-up to recent ethnographic studies covering some SEZs in Nevada and Utah with tribes not included in the original studies to determine whether those tribes have similar concerns.

10.4.17.2 Impacts

The assessment provided in the Draft Solar PEIS remains valid. Impacts on significant cultural resources are possible in the proposed Los Mogotes East SEZ. While no sites have been identified in the SEZ, many significant archaeological sites have been located in close proximity to the SEZ. A survey of the West Fork of the North Branch of the Old Spanish Trail is needed to determine its location, integrity, and the significance of portions of the Trail from which future potential development in the SEZ could be viewed. The assessment provided in the Draft Solar PEIS remains valid with the following update:

- Impacts on significant cultural resources and cultural landscapes associated with American Latino heritage are possible throughout the San Luis Valley.

10.4.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on cultural resources are described in Section A.2.2 of Appendix A of this Final Solar PEIS. Programmatic design features will be applied to address SEZ-specific resources and conditions, for example:

- For projects in the Los Mogotes SEZ that are located within the viewshed of the West Fork of the North Branch of the Old Spanish Trail, a National Trail inventory will be required to determine the area of possible adverse impact on resources, qualities, values, and associated settings of the Trail; to prevent substantial interference; and to determine any areas unsuitable for development. Residual impacts will be avoided, minimized, and/or mitigated to the extent practicable according to program policy standards. Programmatic design features have been included in BLM's Solar Energy Program to address impacts on National Historic Trails (see Section A.2.2.23 of Appendix A).

Programmatic design features also assume that the necessary surveys, evaluations, and consultations will occur. Ongoing consultation with the Colorado SHPO and the appropriate Native American governments would be conducted during the development of the proposed Los Mogotes East SEZ. It is likely that adverse effects on significant resources in the valley could be mitigated to some degree through such efforts, although mitigation will not eliminate the adverse effects unless significant resources are avoided entirely.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, the following SEZ-specific design features have been identified:

- Development of an MOA may be needed among the BLM, Colorado SHPO, and other parties, such as the ACHP, to address the adverse effects of solar energy development on historic properties. The agreement may specify avoidance, minimization, or mitigation measures. Should an MOA be developed to resolve adverse effects on the West Fork of the North Branch of the Old Spanish Trail, the Trail Administration for the Old Spanish Trail (BLM-NMSO and National Park Service [NPS] Intermountain Trails Office, Santa Fe) should be included in the development of that MOA.

- Additional coordination with the CTSR Commission is recommended to address possible mitigation measures for reducing visual impacts on the CTSR.

The need for and nature of additional SEZ-specific design features will depend on the results of future investigations. Some additional SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.18 Native American Concerns

10.4.18.1 Affected Environment

Data provided in the Draft Solar PEIS remain valid but will be supplemented in the future by the results of the ethnographic study being completed in the San Luis Valley (see Section 10.1.17.1).

10.4.18.2 Impacts

The description of potential concerns provided in the Draft Solar PEIS remains valid. No direct impacts from solar energy development are likely to occur to culturally significant areas (i.e., San Luis Lakes, the Great Sand Dunes, and Blanca Peak); however, indirect visual and auditory impacts are possible. It is likely that traditional plant resources and animal habitats would be directly affected with solar energy development in the proposed Los Mogotes East SEZ.

10.4.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce impacts on Native American concerns are described in Section A.2.2 of Appendix A of this Final Solar PEIS. For example, impacts would be minimized through the implementation of required programmatic design features such as avoidance of sacred sites, water sources, and tribally important plant and animal species. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur. The tribes would be notified regarding the results of archaeological surveys, and they would be contacted immediately upon any discovery of Native American human remains and associated cultural items.

On the basis of impact analyses conducted for the Draft Solar PEIS and consideration of comments received as applicable, no SEZ-specific design features to address Native American concerns have been identified. The need for and nature of SEZ-specific design features would be determined during government-to-government consultation with affected tribes as part of the process of preparing parcels for competitive offer and subsequent project-specific analysis. Potentially significant sites and landscapes the SEZ associated with Blanca Peak, Great Sand Dunes, and San Luis Lakes, as well as trail systems, mountain springs, mineral resources, burial sites, ceremonial areas, water resources, and plant and animal resources, should be considered and discussed during consultation.

10.4.19 Socioeconomics

10.4.19.1 Affected Environment

Although the boundaries of the Los Mogotes East SEZ have been reduced compared to the boundaries given in the Draft Solar PEIS, the socioeconomic ROI, the area in which site employees would live and spend their wages and salaries, and into which any in-migration would occur, includes the same counties and communities as described in the Draft Solar PEIS, meaning that no updates to the affected environment information given in the Draft Solar PEIS are required.

10.4.19.2 Impacts

Socioeconomic resources in the ROI around the SEZ could be affected by solar energy development through the creation of direct and indirect employment and income, the generation of direct sales and income taxes, SEZ acreage rental and capacity payments to BLM, the in-migration of solar facility workers and their families, impacts on local housing markets, and on local community service employment. The impact assessment provided in the Draft Solar PEIS remains valid, with the following updates.

10.4.19.2.1 Solar Trough

Construction

Total construction employment impacts in the ROI (including direct and indirect impacts) in 2021 from the use of solar trough technologies would be 2,039 jobs (Table 10.4.19.2-1). Construction activities would constitute 3.1% of total ROI employment. A solar development would also produce $108.6 million in income. Direct sales taxes would be $0.1 million; direct income taxes, $4.2 million.

With the scale of construction activities and the low likelihood that the entire construction workforce in the required occupational categories would be available in the ROI, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with up to 1,291 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with up to 446 rental units expected to be occupied in the ROI. This occupancy rate would represent 13.8% of the vacant rental units expected to be available in the ROI.

TABLE 10.4.19.2-1 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Los Mogotes East SEZ as Revised with Trough Facilities

Parameter	Maximum Annual Construction Impacts[a]	Annual Operations Impacts[b]
Employment (no.)		
Direct	1,160	92
Total	2,039	145
Income[c]		
Total	108.6	4.6
Direct state taxes[c]		
Sales	0.1	0.1
Income	4.2	0.1
BLM payments[c]		
Rental	NA[d]	0.2
Capacity[e]	NA	2.8
In-migrants (no.)	1,291	59
Vacant housing[f] (no.)	446	37
Local community service employment		
Teachers (no.)	15	1
Physicians (no.)	2	0
Public safety (no.)	1	0

a Construction impacts were based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 424 MW (corresponding to 2,120 acres [9 km^2] of land disturbance) could be built.

b Operations impacts were based on full build-out of the site, producing a total output of 424 MW.

c Values are reported in $ million 2008.

d NA = not applicable.

e The BLM annual capacity payment was based on a fee of $6,570/MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884/MW.

f Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, up to 15 new teachers, 2 physicians, and 1 public safety employee (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 1.4% of total ROI employment expected in these occupations.

Operations

Total operations employment impacts in the ROI (including direct and indirect impacts) of a full build-out of the SEZ using solar trough technologies would be 145 jobs (Table 10.4.19.2-1). Such a solar development would also produce $4.6 million in income. Direct sales taxes would be $0.1 million; direct income taxes, $0.1 million. Based on fees established by the BLM (BLM 2010), acreage rental payments would be $0.2 million, and solar generating capacity payments at least $2.8 million.

As for the construction workforce, operation of a solar facility likely would require some in-migration of workers and their families from outside the ROI, with up to 59 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with up to 37 owner-occupied units expected to be occupied in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI.

10.4.19.2.2 Power Tower

Construction

Total construction employment impacts in the ROI (including direct and indirect impacts) in 2021 from the use of power tower technologies would be 812 jobs (Table 10.4.19.2-2). Construction activities would constitute 1.2% of total ROI employment. Such a solar development would also produce $43.3 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $1.7 million.

With the scale of construction activities and the low likelihood that the entire construction workforce in the required occupational categories would be available in the ROI, construction of a solar facility would mean that some in-migration of workers and their families

TABLE 10.4.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Los Mogotes East SEZ as Revised with Power Tower Facilities

Parameter	Maximum Annual Construction Impacts[a]	Annual Operations Impacts[b]
Employment (no.)		
Direct	462	48
Total	812	67
Income[c]		
Total	43.3	2.1
Direct state taxes[c]		
Sales	<0.1	<0.1
Income	1.7	0.1
BLM payments[c]		
Rental	NA[d]	0.2
Capacity[e]	NA	1.5
In-migrants (no.)	514	30
Vacant housing[f] (no.)	178	19
Local community service employment		
Teachers (no.)	6	0
Physicians (no.)	1	0
Public safety (no.)	1	0

[a] Construction impacts were based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 236 MW (corresponding to 2,120 acres [12 km^2] of land disturbance) could be built.

[b] Operations impacts were based on full build-out of the site, producing a total output of 236 MW.

[c] Values are reported in $ million 2008.

[d] NA = not applicable.

[e] The BLM annual capacity payment was based on a fee of $6,570/MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884/MW.

[f] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

from outside the ROI would be required, with up to 514 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with up to 178 rental units expected to be occupied in the ROI. This occupancy rate would represent 5.5% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, up to six new teachers, one physician, and one public safety employee (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 0.5% of total ROI employment expected in these occupations.

Operations

Total operations employment impacts in the ROI (including direct and indirect impacts) of a full build-out of the SEZ using power tower technologies would be 67 jobs (Table 10.4.19.2-2). Such a solar development would also produce $2.1 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.1 million. Based on fees established by the BLM (BLM 2010), acreage rental payments would be $0.2 million, and solar generating capacity payments, at least $1.5 million.

As for the construction workforce, operation of a solar facility likely would require some in-migration of workers and their families from outside the ROI, with up to 30 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with up to 19 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

10.4.19.2.3 Dish Engine

Construction

Total construction employment impacts in the ROI (including direct and indirect impacts) in 2021 using dish engine technologies would be 330 jobs (Table 10.4.19.2-3). Construction activities would constitute 0.5% of total ROI employment. Such a solar development would also

TABLE 10.4.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Los Mogotes East SEZ as Revised with Dish Engine Facilities

Parameter	Maximum Annual Construction Impacts[a]	Annual Operations Impacts[b]
Employment (no.)		
Direct	188	46
Total	330	66
Income[c]		
Total	17.6	2.0
Direct state taxes[c]		
Sales	<0.1	<0.1
Income	0.7	0.1
BLM payments[c]		
Rental	NA[d]	0.2
Capacity[e]	NA	1.5
In-migrants (no.)	209	30
Vacant housing[f] (no.)	72	18
Local community service employment		
Teachers (no.)	2	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts were based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 236 MW (corresponding to 2,120 acres [12 km^2] of land disturbance) could be built.

[b] Operations impacts were based on full build-out of the site, producing a total output of 236 MW.

[c] Values are reported in $ million 2008.

[d] NA = not applicable.

[e] The BLM annual capacity payment was based on a fee of $6,570/MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884/MW.

[f] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

produce $17.6 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.7 million.

With the scale of construction activities and the low likelihood that the entire construction workforce in the required occupational categories would be available in the ROI, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with up to 209 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with up to 72 rental units expected to be occupied in the ROI. This occupancy rate would represent 2.2% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would also affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, up to two new teachers would be required in the ROI. These increases would represent 0.2% of total ROI employment expected in these occupations.

Operations

Total operations employment impacts in the ROI (including direct and indirect impacts) of a full build-out of the SEZ using dish engine technologies would be 66 jobs (Table 10.4.19.2-3). Such a solar development would also produce $2.0 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.1 million. Based on fees established by the BLM (BLM 2010), acreage rental payments would be $0.2 million, and solar generating capacity payments, at least $1.5 million.

As for the construction workforce, operation of a solar facility likely would require some in-migration of workers and their families from outside the ROI, with up to 30 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with up to 18 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

10.4.19.2.4 Photovoltaic

Construction

Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be 154 jobs (Table 10.4.19.2-4). Construction activities would constitute 0.2% of total ROI employment. Such a solar development would also produce $8.2 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.3 million.

With the scale of construction activities and the low likelihood that the entire construction workforce in the required occupational categories would be available in the ROI, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with up to 98 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with up to 34 rental units expected to be occupied in the ROI. This occupancy rate would represent 1.0% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI. This increase would represent 0.1% of total ROI employment expected in this occupation.

Operations

Total operations employment impacts in the ROI (including direct and indirect impacts) of a full build-out on the SEZ using PV technologies would be seven jobs (Table 10.4.19.2-4). Such a solar development would also produce $0.2 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, less than $0.1 million. Based on fees established by the BLM (BLM 2010), acreage rental payments would be $0.2 million, and solar generating capacity payments at least $1.2 million.

As for the construction workforce, operation of a solar facility likely would require some in-migration of workers and their families from outside the ROI, with up to three persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with up to two owner-occupied units expected to be required in the ROI.

TABLE 10.4.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Los Mogotes East SEZ as Revised with PV Facilities

Parameter	Maximum Annual Construction Impacts[a]	Annual Operation Impacts[b]
Employment (no.)		
Direct	88	5
Total	154	7
Income[c]		
Total	8.2	0.2
Direct state taxes[c]		
Sales	<0.1	<0.1
Income	0.3	<0.1
BLM payments[c]		
Rental	NA[d]	0.2
Capacity[e]	NA	1.2
In-migrants (no.)	98	3
Vacant housing[f] (no.)	34	2
Local community service employment		
Teachers (no.)	1	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts were based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 236 MW (corresponding to 2,120 acres [12 km^2] of land disturbance) could be built.

[b] Operations impacts were based on full build-out of the site, producing a total output of 236 MW.

[c] Values are reported in $ million 2008.

[d] NA = not applicable.

[e] The BLM annual capacity payment was based on a fee of $5,256/MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010), assuming full build-out of the site.

[f] Construction activities would affect vacant rental housing; operations activities would affect owner-occupied housing.

No new community service employment would be required to meet existing levels of service in the ROI.

10.4.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that will reduce socioeconomic impacts are described in Appendix A of this Final Solar PEIS. Implementing the programmatic design features will reduce the potential for socioeconomic impacts during all project phases.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features to address socioeconomic impacts have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.20 Environmental Justice

10.4.20.1 Affected Environment

The data presented in the Draft Solar PEIS have changed due to the change in boundaries of the proposed Los Mogotes East SEZ.

The data in Table 10.4.20.1-1 show the minority and low-income composition of the total population located within a 50-mi (80-km) radius of the proposed SEZ based on 2000 Census data and CEQ guidelines (CEQ 1997). Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals also identifying themselves as being part of one or more of the population groups listed in the table.

A large number of minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius in Colorado, 47.3% of the population is classified as minority, while 19.5% is classified as low-income. Although the number of minority individuals does not exceed 50% of the total population in the area, the number of minority individuals exceeds the state average by 20 percentage points or more; that is, there is a minority population in the Colorado portion of the 50-mi (80-km) area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area; that is, there are no low-income populations in the Colorado portion of the SEZ.

Within the 50-mi (80-km) radius in New Mexico, 58.0% of the population is classified as minority, while 18.4% is classified as low-income. Although the number of minority individuals does not exceed the state average by 20 percentage points or more, the minority population

TABLE 10.4.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Los Mogotes East SEZ as Revised

Parameter	Colorado	New Mexico
Total population	50,396	20,278
White, non-Hispanic	26,572	8,513
Hispanic or Latino	22,256	10,971
Non-Hispanic or Latino minorities	1,568	794
One race	977	489
Black or African American	163	44
American Indian or Alaskan Native	497	328
Asian	219	69
Native Hawaiian or other Pacific Islander	18	5
Some other race	80	43
Two or more races	591	305
Total minority	23,824	11,765
Low-income	9,574	3,712
Percentage minority	47.3	58.0
State percent minority	25.5	55.3
Percentage low-income	19.5	18.4
State percent low-income	9.3	18.4

Sources: U.S. Bureau of the Census (2009a,b).

exceeds 50% of the total population in the area, meaning that there are minority populations in the New Mexico portion of the 50-mi (80-km) area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area, meaning that there are no low-income populations in the New Mexico portion of the 50-mi (80-km) area.

In the Colorado portion of the 50-mi (80-km) radius around the SEZ, more than 50% of the population in all but one of the block groups in Conejos County is made up of minority population groups, together with all the block groups in the adjacent Costilla County. Block groups in the cities of Alamosa (Alamosa County), Monte Vista and Del Norte (both in Rio Grande County), and Center (Saguache County) are also more than 50% minority. In the New Mexico portion of the area, Rio Arriba County has three block groups in which the minority population is more than 20 percentage points higher than the state average and one block group that is more than 50% minority, while Taos County has three block groups with more than 50%

minority, and one block group where the minority population is 20 percentage points higher than the state average.

Low-income populations in the 50-mi (80-km) radius are limited to five block groups in the Colorado portion, in the cities of San Luis (Costilla County), Center (Saguache County) and Alamosa, all of which have low-income population shares that are more than 20 percentage points higher than the state average.

Figures 10.4.20.1-1 and 10.4.20.1-2 show the locations of minority and low-income population groups in the 50-mi (80-km) radius around the boundary of the SEZ.

10.4.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy projects are described in detail in Section 5.18. These impacts will be minimized through the implementation of programmatic design features described in Section A.2.2 of Appendix A, which address the underlying environmental impacts contributing to the concerns. The potentially relevant environmental impacts associated with solar development within the proposed SEZ include noise and dust during the construction of solar facilities; noise and EMF effects associated with solar project operations; the visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values as areas of concern that might potentially affect minority and low-income populations.

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Although impacts are likely to be small, there are minority populations defined by CEQ guidelines (see Section 10.4.20.1) within both the Colorado and New Mexico portions of the 50-mi (80-km) radius around the boundary of the SEZ; thus, any adverse impacts of solar projects would disproportionately affect minority populations. Further analysis of these impacts would be included in subsequent NEPA reviews of individual solar projects. Because there are no low-income populations within the 50-mi (80-km) radius, according to CEQ guidelines, there would not be any impacts on low-income populations.

10.4.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce potential environmental justice impacts are described in Appendix A of this Final Solar PEIS. Implementing the programmatic design features will reduce the potential for environmental justice impacts.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features for environmental justice have been identified. Some

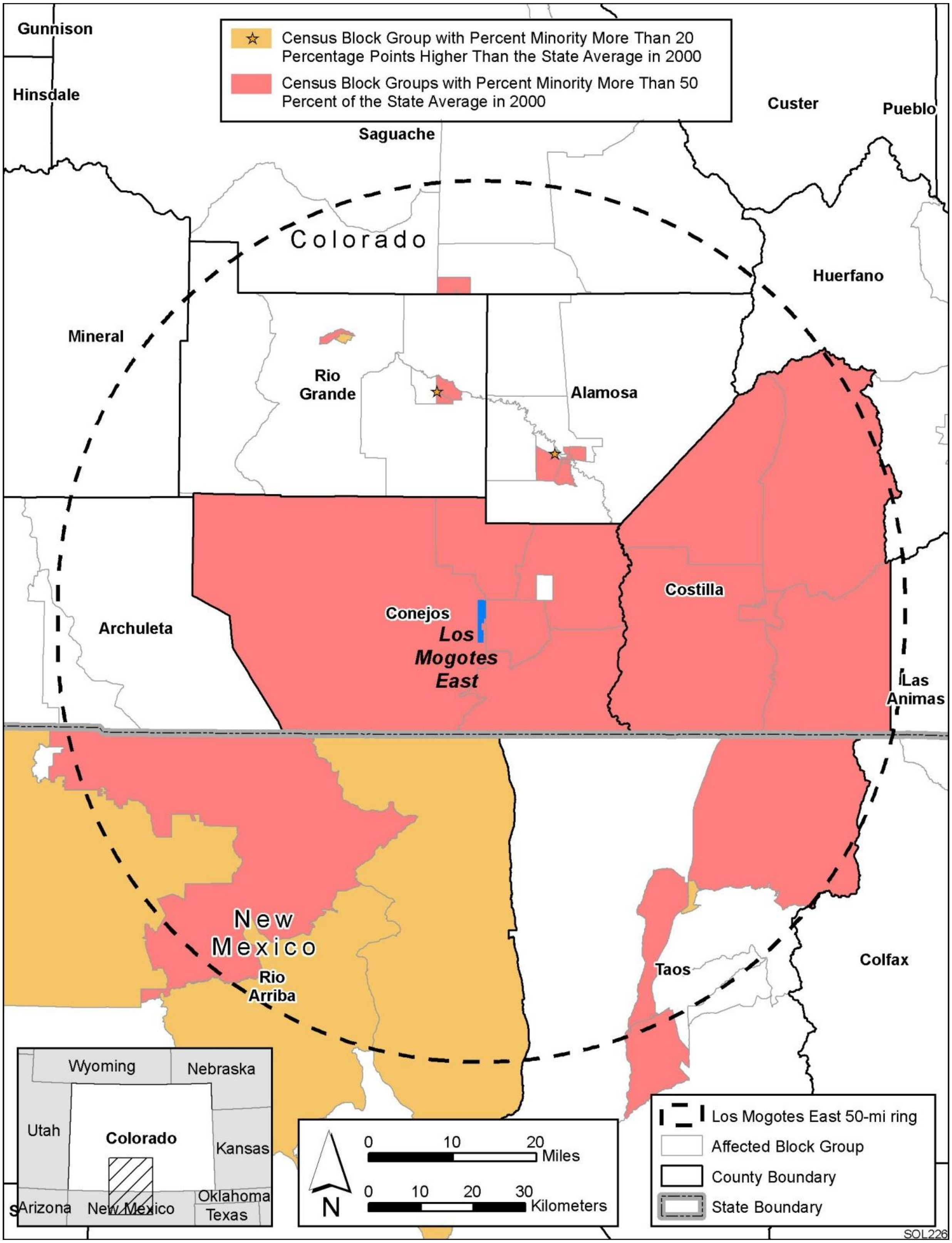

FIGURE 10.4.20.1-1 Minority Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Los Mogotes East SEZ as Revised

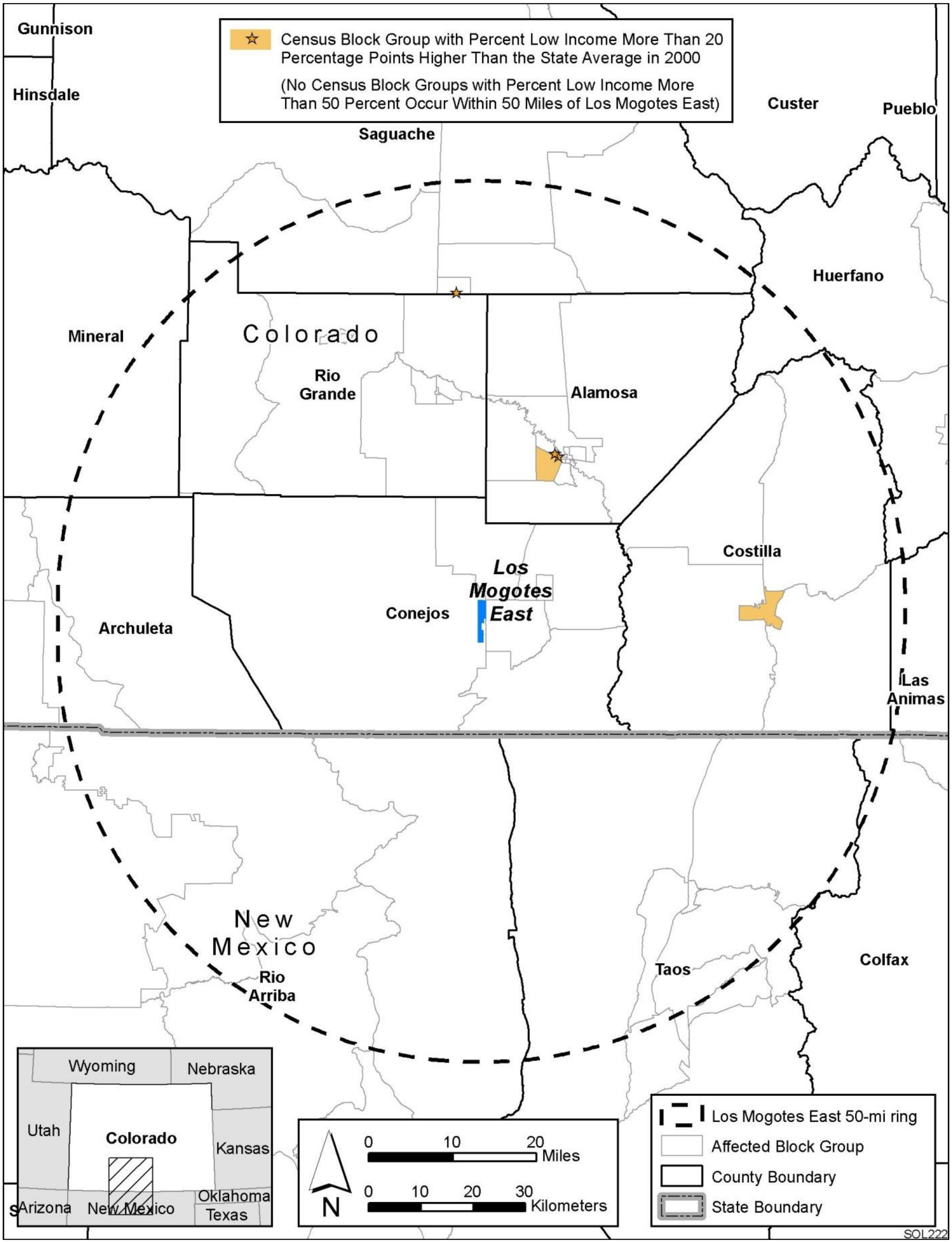

FIGURE 10.4.20.1-2 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Los Mogotes East SEZ as Revised

SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.21 Transportation

10.4.21.1 Affected Environment

The reduction in size of the SEZ does not change the information on affected environment for transportation presented in the Draft Solar PEIS.

10.4.21.2 Impacts

As stated in the Draft Solar PEIS, the primary transportation impacts are anticipated to be from commuting worker traffic. U.S. 285 provides a regional traffic corridor that could experience moderate impacts for single projects that may have up to 1,000 daily workers with an additional 2,000 vehicle trips per day (maximum), an increase that is about half of the current daily traffic levels for U.S. 285. In addition, local road improvements might be necessary on the county roads between U.S. 285 and the SEZ. Improvements would be necessary in any portion of the SEZ that might be developed so as not to overwhelm the local roads near any site access point(s).

Solar development within the SEZ would affect public access along OHV routes that are designated open and available for public use. Although open routes crossing areas granted ROWs for solar facilities could be redesignated as closed (see Section 5.5.1 of the Draft Solar PEIS), a programmatic design feature has been included under Recreation (Section A.2.2.6.1 of Appendix A) that requires consideration of replacement of lost OHV route acreage and of access across and to public lands.

10.4.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

Required programmatic design features that would reduce transportation impacts are described in Appendix A of this Final Solar PEIS. The programmatic design features, including local road improvements, multiple site access locations, staggered work schedules, and ride-sharing, will all provide some relief to traffic congestion on local roads leading to the SEZ. Depending on the location of solar facilities within the SEZ, more specific access locations and local road improvements could be implemented.

On the basis of impact analyses conducted for the Draft Solar PEIS, updates to those analyses due to changes to the SEZ boundaries, and consideration of comments received as applicable, no SEZ-specific design features to address transportation impacts have been identified. Some SEZ-specific design features may be identified through the process of preparing parcels for competitive offer and subsequent project-specific analysis.

10.4.22 Cumulative Impacts

The analysis of potential impacts in the vicinity of the proposed Los Mogotes East SEZ presented in the Draft Solar PEIS is still generally applicable for this Final Solar PEIS, although the impacts would be decreased because the size of the proposed SEZ has been reduced to 2,650 acres (10.7 km^2). The following sections include an update to the information presented in the Draft Solar PEIS regarding cumulative effects for the proposed Los Mogotes East SEZ.

10.4.22.1 Geographic Extent of the Cumulative Impact Analysis

The geographic extent of the cumulative impact analysis has not changed. The extent varies on the basis of the nature of the resource being evaluated and the distance at which an impact may occur (thus, e.g., air quality impacts may have a greater regional extent than cultural resources impacts). Lands around the SEZ are privately owned or administered by the USFS, NPS, or BLM. The BLM administers approximately 11% of the lands within a 50-mi (80-km) radius of the Los Mogotes East SEZ.

10.4.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The proposed Los Mogotes East SEZ decreased from 5,918 acres (24.0 km^2) to 2,650 acres (10.7 km^2). The Draft Solar PEIS included three other proposed SEZs in Colorado: Antonito Southwest, De Tilla Gulch, and Fourmile East. All these proposed SEZs are being carried forward to the Final Solar PEIS; the areas of the De Tilla Gulch and Fourmile East SEZs have been reduced.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to energy production and distribution, including potential solar energy projects under the proposed action (Section 10.4.22.2.1); and (2) other ongoing and reasonably foreseeable actions, including those related to electric power generation and distribution, wildlife management, and military facility improvement (Section 10.4.22.2.2). Together, these actions and trends have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

10.4.22.2.1 Energy Production and Distribution

The list of reasonably foreseeable future actions near the proposed Los Mogotes East SEZ has been updated and is presented in Table 10.4.22.2-1. Projects listed in the table are shown in Figure 10.4.22.2-1.

Xcel Energy (Public Service Company of Colorado) has submitted a transmission planning report to the Colorado Public Utility Commission stating that it intends to end its involvement in the proposed San Luis Valley–Calumet-Comanche Transmission project (Heide 2011). The project itself has not been cancelled.

TABLE 10.4.22.2-1 Ongoing and Reasonably Foreseeable Future Actions Related to Energy Development and Distribution near the Proposed Los Mogotes East SEZ as Revised and in the San Luis Valley[a]

Description	Status	Resources Affected	Primary Impact Location
Renewable Energy Development			
San Luis Valley Generation Development Area (GDA) (Solar) Designation	Ongoing	Land use	San Luis Valley
Xcel Energy/SunEdison Project, 8.2-MW PV	**Operating**	Land use, ecological resources, visual	San Luis Valley GDA
San Luis Valley Solar Ranch (formerly Alamosa Solar Generating Project), 30-MW PV	**Operating[b]**	Land use, ecological resources, visual	San Luis Valley GDA
Greater Sandhill Solar Project, 19-MW PV	**Operating[b]**	Land use, ecological resources, visual	San Luis Valley GDA
San Luis Valley Solar Project; Tessera Solar, 200 MW, dish engine, **changed to 145 MW, 1,500 acres[c]**	**New proposal[d]**	Land use, ecological resources, visual, cultural	San Luis Valley GDA
Solar Reserve; 200-MW solar tower	**Application submitted for land-use permit[e]**	Land use, ecological resources, visual	San Luis Valley GDA (Saguache)
Alamosa Solar Generating Project (formerly Cogentrix Solar Services), 30-MW high-concentration PV	**Under construction[b]**	Land use, ecological resources, visual	San Luis Valley GDA
Lincoln Renewables, 37-MW PV	County Permit approved	Land use, ecological resources, visual	San Luis Valley GDA
NextEra, 30-MW PV	County Permit approved	Land use, ecological resources, visual	San Luis Valley GDA
Transmission and Distribution Systems			
San Luis Valley–Calumet-Comanche Transmission Project	**Proposed[f]**	Land use, ecological resources, visual, cultural	San Luis Valley (select counties)

[a] Projects with status changed from that given in the Draft Solar PEIS are shown in bold text.

[b] See SEIA (2012) for details.

[c] To convert acres to km^2, multiply by 0.004047.

[d] See Solar Feeds (2012) for details.

[e] See Tetra Tech EC, Inc. (2011) for details.

[f] See Heide (2011) for details.

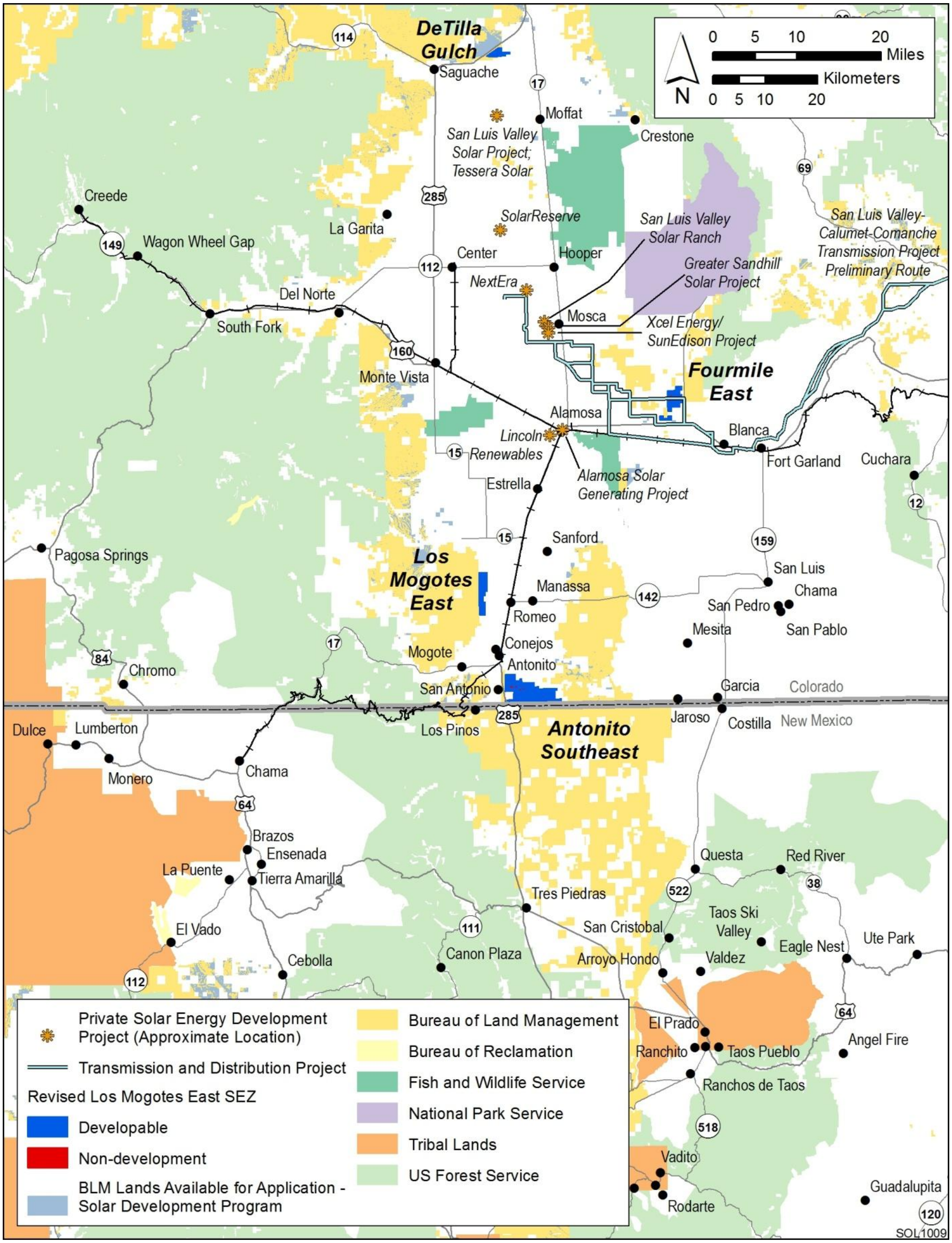

FIGURE 10.4.22.2-1 Locations of Existing and Reasonably Foreseeable Renewable Energy Projects on Public Land within a 50-mi (80-km) Radius of the Proposed Los Mogotes East SEZ as Revised

10.4.22.2.2 Other Actions

None of the major ongoing and foreseeable actions within 50 mi (80 km) of the proposed Los Mogotes East SEZ that were listed in Table 10.4.22.2-3 of the Draft Solar PEIS have had a change in their status.

10.4.22.3 General Trends

The information on general trends presented in the Draft Solar PEIS remains valid.

10.4.22.4 Cumulative Impacts on Resources

Total disturbance in the proposed Los Mogotes East SEZ over 20 years is assumed to be about 2,120 acres (8.6 km^2) (80% of the entire proposed SEZ). This development would contribute incrementally to the impacts from other past, present, and reasonably foreseeable future actions in the region as described in the Draft Solar PEIS. Primary impacts from development in the Los Mogotes East SEZ may include impacts on water quantity and quality, air quality, ecological resources such as habitat and species, cultural and visual resources, and specially designated lands.

No additional major actions have been identified within 50 mi (80 km) of the SEZ. As a result of the reduction in the developable area of the SEZ as well as that of the nearby Fourmile East SEZ, the incremental cumulative impacts associated with development in the proposed Los Mogotes East SEZ during construction, operation, and decommissioning are expected to be the same or less than those discussed in the Draft Solar PEIS.

On the basis of comments received on the Draft Solar PEIS, cumulative impacts on recreation in the San Luis Valley have been reconsidered. While it is unlikely that the proposed Los Mogotes East SEZ would have a large impact on recreational use or tourism throughout the valley, cumulative impacts could occur because it is one of four proposed SEZs totaling about 16,300 acres (66 km^2) on public lands, and there are additional solar energy developments on private lands. Because most of the land on the valley floor of the San Luis Valley is private and is heavily developed for agricultural use, undeveloped public lands around the valley provide accessible areas for public recreation. Although it is believed the recreational use of the proposed SEZ is low, the loss of public access to such areas cumulatively leads to an overall reduction in the availability of recreation that can become significant.

10.4.23 Transmission Analysis

The methodology for this transmission analysis is described in Appendix G of this Final Solar PEIS. This section presents the results of the transmission analysis for the Los Mogotes East SEZ, including the identification of potential load areas to be served by power generated at the SEZ and the results of the DLT analysis. Unlike Sections 10.4.2 through 10.4.22, this section is not an update of previous analysis for the Los Mogotes East SEZ; this analysis was not presented in the Draft Solar PEIS. However, the methodology and a test case analysis were presented in the Supplement to the Draft Solar PEIS. Comments received on the material presented in the Supplement were used to improve the methodology for the assessment presented in this Final Solar PEIS.

On the basis of its size, the assumption of a minimum of 5 acres (0.02 km^2) of land required per MW, and the assumption of a maximum of 80% of the land area developed, the Los Mogotes East SEZ is estimated to have the potential to generate 424 MW of marketable solar power at full build-out.

10.4.23.1 Identification and Characterization of Load Areas

The primary candidates for Los Mogotes East SEZ load areas are the major surrounding cities. Figure 10.4.23.1-1 shows the possible load areas for the Los Mogotes East SEZ and the estimated portion of their market that could be served by solar generation. Possible load areas for the Los Mogotes East SEZ include Pueblo, Colorado Springs, and Denver, Colorado; Farmington, Albuquerque, and Santa Fe, New Mexico; Salt Lake City, Utah; Phoenix, Arizona; and Las Vegas, Nevada.

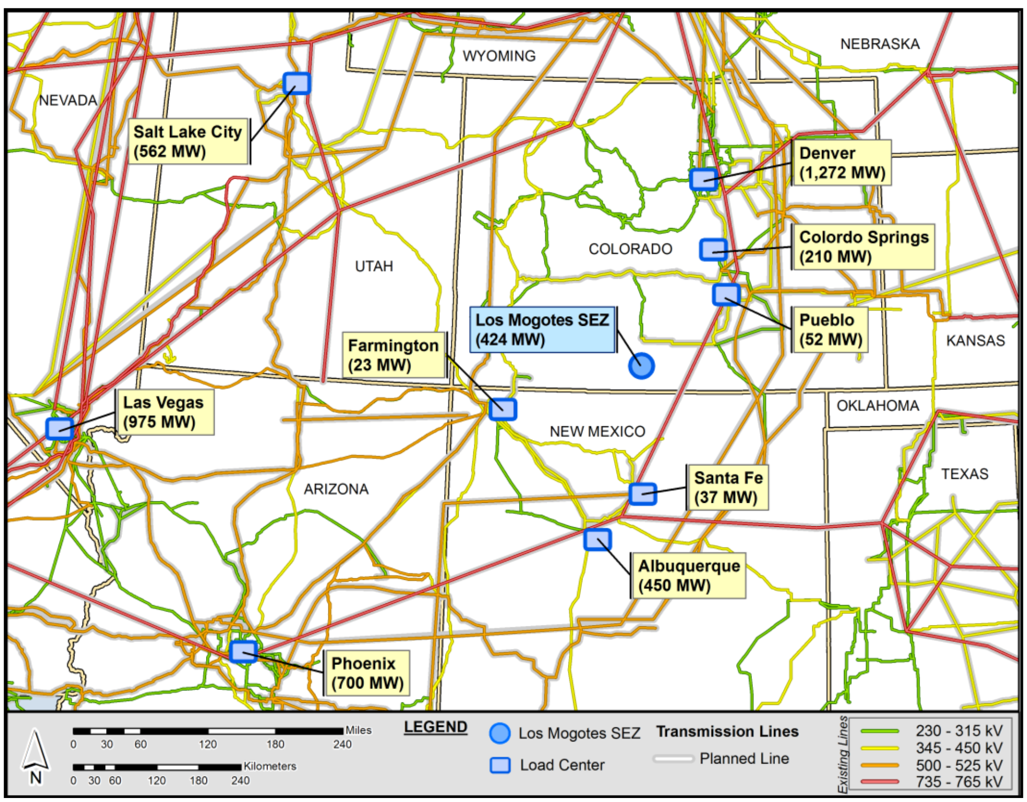

FIGURE 10.4.23.1-1 Locations of the Proposed Los Mogotes East SEZ and Possible Load Areas (Source for background map: Platts 2011)

The two load area groups examined for the Los Mogotes East SEZ are as follows:

1. Pueblo, Colorado Springs, and Denver, Colorado, and

2. Farmington and Albuquerque, New Mexico.

Figure 10.4.23.1-2 shows the most economically viable transmission scheme for the Los Mogotes East SEZ (transmission scheme 1), and Figure 10.4.23.1-3 shows an alternative transmission scheme (transmission scheme 2) that represents a logical choice should transmission scheme 1 be infeasible. As described in Appendix G, the alternative shown in transmission scheme 2 represents the optimum choice if one or more of the primary linkages in transmission scheme 1 are excluded from consideration. The groups provide for linking loads along alternative routes so that the SEZ's output of 424 MW could be fully allocated.

Table 10.4.23.1-1 summarizes and groups the load areas according to their associated transmission scheme and provides details on how the megawatt load for each area was estimated.

10.4.23.2 Findings for the DLT Analysis

The DLT analysis approach assumes that the proposed Los Mogotes East SEZ will require all new construction for transmission lines (i.e., dedicated lines) and substations. The

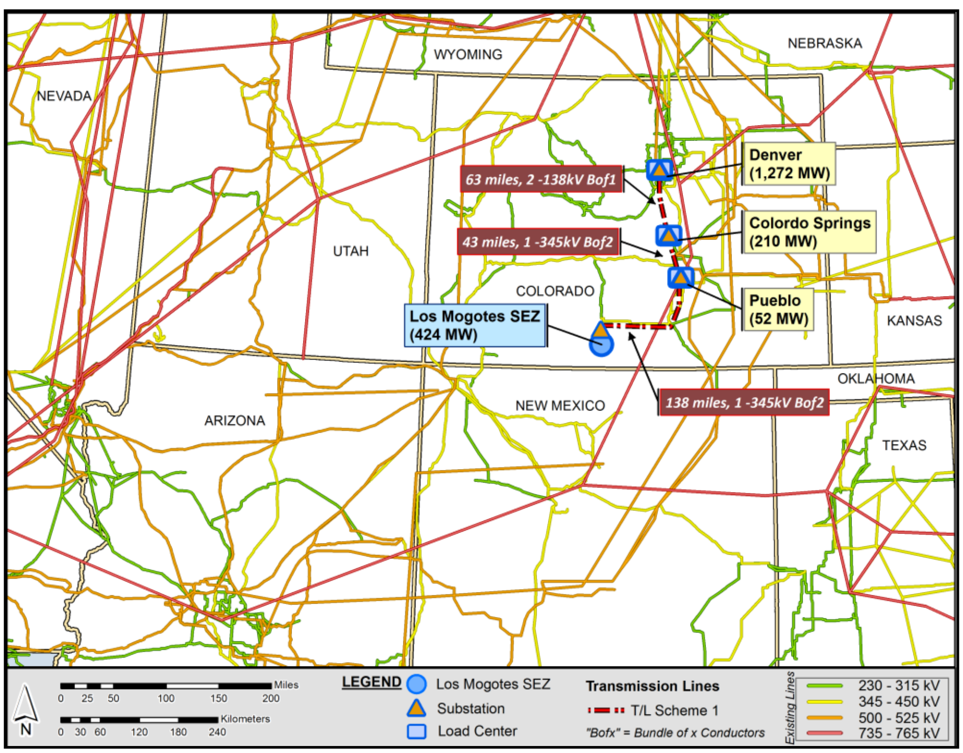

FIGURE 10.4.23.1-2 Transmission Scheme 1 for the Proposed Los Mogotes East SEZ (Source for background map: Platts 2011)

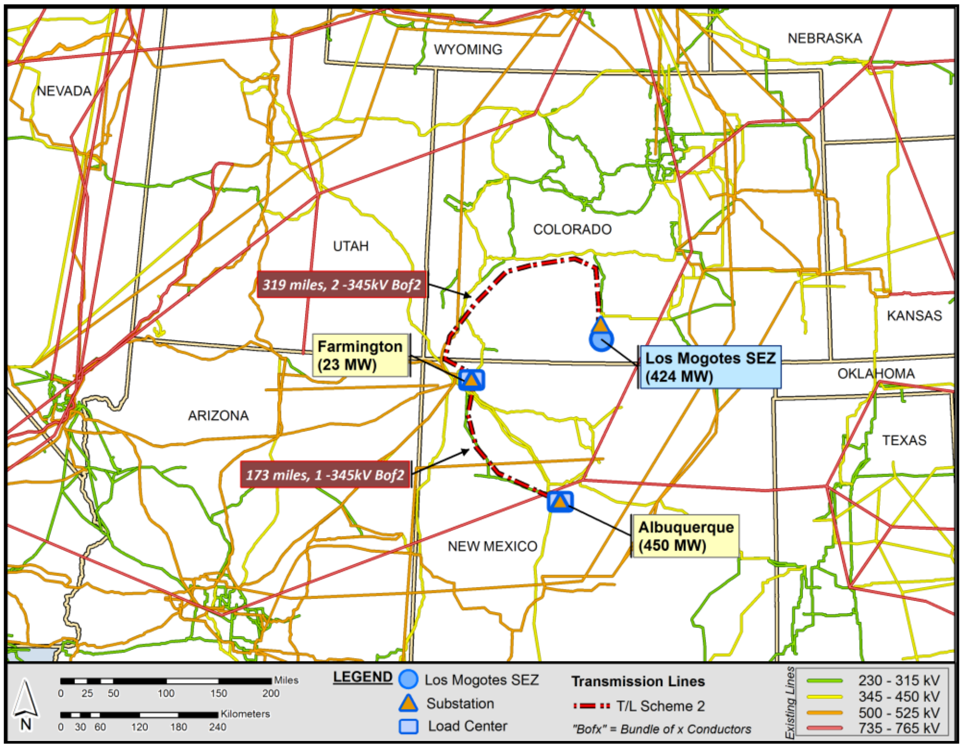

FIGURE 10.4.23.1-3 Transmission Scheme 2 for the Proposed Los Mogotes East SEZ (Source for background map: Platts 2011)

new transmission lines(s) would directly convey the 424-MW output of the Los Mogotes East SEZ to the prospective load areas for each possible transmission scheme. The approach also assumes that all existing transmission lines in the WECC region are saturated and have little or no available capacity to accommodate the SEZ's output throughout the entire 10-year study horizon.

Figures 10.4.23.1-2 and 10.4.23.1-3 display the pathways that new dedicated lines might follow to distribute solar power generated at the Los Mogotes East SEZ via the two identified transmission schemes described in Table 10.4.23.1-1. These pathways parallel existing 500-, 345-, 230-kV, and lower voltage lines. The intent of following existing lines is to avoid pathways that may be infeasible due to topographical limitations or other concerns.

For transmission scheme 1, serving load centers to the north, a new line would be constructed to connect with Pueblo (52 MW), Colorado Springs (210 MW), and Denver (1,272 MW), so that the 424-MW output of the Los Mogotes East SEZ could be fully utilized (Figure 10.4.23.1-2). This particular scheme has three segments. The first segment extends northeast from the SEZ to Pueblo over a distance of about 138 mi (222 km). On the basis of engineering and operational considerations, this segment would require a single-circuit 345-kV bundle of two conductors (Bof2) transmission design. The second leg goes north about 43 mi (69 km) from Pueblo to Colorado Springs. The third and final leg extends 63 mi (101 km) farther north to Denver. The transmission configuration options were determined by using the line "loadability" curve in American Electric Power's *Transmission Facts* (AEP 2010). Appendix G

TABLE 10.4.23.1-1 Candidate Load Area Characteristics for the Proposed Los Mogotes East SEZ

Transmission Scheme	City/Load Area Name	Position Relative to SEZ	2010 Population[c]	Estimated Total Peak Load (MW)	Estimated Peak Solar Market (MW)
1	Pueblo, Colorado[a]	North	104,877	262	52
	Colorado Springs, Colorado[a]	North	419,848	1,050	210
	Denver, Colorado[b]	North	2,543,000	6,358	1,272
2	Farmington, New Mexico[a]	Southwest	46,000	115	23
	Albuquerque, New Mexico[b]	South	907,775	2,269	450

[a] The load area represents the city named.

[b] The load area represents the metropolitan area (i.e., the identified city plus adjacent communities).

[c] City and metropolitan area population data are from 2010 Census data (U.S. Bureau of the Census 2010).

documents the line options used for this analysis and describes how the load area groupings were determined.

For transmission scheme 2, serving load centers to the southwest, Figure 10.4.23.1-3 shows that new lines would be constructed to connect with Farmington (23 MW) and Albuquerque (450 MW), so that the 424-MW output of the Los Mogotes East SEZ could be fully utilized. This scheme has two segments. The first segment, from the SEZ to Farmington, is 319 mi (513 km) long, and the second segment, from Farmington to Albuquerque, is about 173 mi (278 km) long. Again, the transmission configuration for each leg or segment varies and was determined by using the line "loadability" curve in American Electric Power's *Transmission Facts* (AEP 2010), with the constraint that the full output of the SEZ (424 MW) would be completely marketed.

Table 10.4.23.2-1 summarizes the distances to the various load areas over which new transmission lines would need to be constructed, as well as the assumed number of substations that would be required. One substation is assumed to be installed at each load area and an additional one at the SEZ. Thus, in general, the total number of substations per scheme is simply equal to the number of load areas associated with the scheme plus one. Substations at the load areas would consist of one or more step-down transformers, while the originating substation at the SEZ would consist of several step-up transformers. The originating substation would have a rating of at least 424 MW (to match the plant's output), while the combined load substations would have a similar total rating of 424 MW. For schemes that require the branching of the lines, a switching substation is assumed to be constructed at the appropriate junction. In general, switching stations carry no local load but are assumed to be equipped with switching gears

TABLE 10.4.23.2-1 Potential Transmission Schemes, Estimated Solar Markets, and Distances to Load Areas for the Proposed Los Mogotes SEZ

Transmission Scheme	City/Load Area Name	Estimated Peak Solar Market (MW)[c]	Total Solar Market (MW)	Sequential Distance (mi)[d]	Total Distance (mi)[d]	Line Voltage (kV)	No. of Substations
1	Pueblo, Colorado[a]	52	1,534	138	244	345,	4
	Colorado Springs, Colorado[a]	210		43		138	
	Denver, Colorado[b]	1,272		63			
2	Farmington, New Mexico[a]	23	473	331	492	345	3
	Albuquerque, New Mexico[b]	450		173			

[a] The load area represents the city named.

[b] The load area represents the metropolitan area (i.e., the identified city plus adjacent communities).

[c] From Table 10.4.23.1-1.

[d] To convert mi to km, multiply by 1.6093.

(e.g., circuit breakers and connecting switches) to reroute power as well as, in some cases, with additional equipment to regulate voltage.

Table 10.4.23.2-2 provides an estimate of the total land area disturbed for construction of new transmission facilities under each of the schemes evaluated. The most favorable transmission scheme with respect to minimizing costs and the area disturbed would be scheme 1, which would serve the cities of Pueblo, Colorado Springs, and Denver and for which the construction of new transmission lines and substations is estimated to disturb about 4,460 acres (18 km^2) of land. The less favorable transmission scheme with respect to minimizing costs and the area disturbed would be scheme 2 (serving Farmington and Albuquerque). For this scheme, the construction of new transmission lines and substations is estimated to disturb a land area on the order of 10,447 acres (42.3 km^2).

Table 10.4.23.2-3 shows the estimated NPV of both transmission schemes and takes into account the cost of constructing the lines and the substations and the projected revenue stream over the 10-year horizon. A positive NPV indicates that revenues more than offset investments. This calculation does not include the cost of producing electricity.

The most economically attractive configuration (transmission scheme 1) has the highest positive NPV and serves the Colorado cities of Pueblo, Colorado Springs, and Denver. The secondary case (transmission scheme 2), which excludes one or more of the primary pathways used in scheme 1, is less economically attractive and focuses on delivering power to Farmington and Albuquerque. For the assumed utilization factor of 20%, scheme 2 exhibits a negative NPV, implying that this option may not be economically viable under the current assumptions.

TABLE 10.4.23.2-2 Comparison of the Various Transmission Line Configurations with Respect to Land Use Requirements for the Proposed Los Mogotes East SEZ

Transmission Scheme	City/Load Area Name	Total Distance (mi)[c]	No. of Substations	Land Use (acres)[d] Transmission Line	Substation	Total
1	Pueblo, Colorado[a] Colorado Springs, Colorado[a] Denver, Colorado[b]	244	4	4,450.3	10.2	4,460.5
2	Farmington, New Mexico[a] Albuquerque, New Mexico[b]	492	3	10,436.4	10.2	10,446.6

[a] The load area represents the city named.

[b] The load area represents the metropolitan area (i.e., the identified city plus adjacent communities).

[c] To convert mi to km, multiply by 1.6093.

[d] To convert acres to km^2, multiply by 0.004047.

TABLE 10.4.23.2-3 Comparison of Potential Transmission Lines with Respect to NPV (Base Case) for the Proposed Los Mogotes SEZ

Transmission Scheme	City/Load Area Name	Present Value Transmission Line Cost ($ million)	Present Value Substation Cost ($ million)	Annual Sales Revenue ($ million)	Present Worth of Revenue Stream ($ million)	NPV ($ million)
1	Pueblo, Colorado[a] Colorado Springs, Colorado[a] Denver, Colorado[b]	446.3	28.0	74.3	573.6	99.3
2	Farmington, New Mexico[a] Albuquerque, New Mexico[b]	1,178.1	28.0	74.3	573.8	−632.5

[a] The load area represents the city named.

[b] The load area represents the metropolitan area (i.e., the identified city plus adjacent communities).

Table 10.4.23.2-4 shows the effect of varying the value of the utilization factor on the NPV of the transmission schemes. The table shows that at about 50% utilization, NPVs for both schemes are positive. It also shows that as the utilization factor is increased, the economic viability of the lines also increases. Utilization factors can be raised by allowing the new dedicated lines to market other power generation outputs in the region in addition to that of its associated SEZ.

TABLE 10.4.23.2-4 Effect of Varying the Utilization Factor on the NPV of the Transmission Schemes for the Proposed Los Mogotes East SEZ

Transmission Scheme	City/Load Area Name	NPV ($ million) at Different Utilization Factors					
		20%	30%	40%	50%	60%	70%
1	Pueblo, Colorado[a] Colorado Springs, Colorado[a] Denver, Colorado[b]	99.3	386.1	672.9	959.7	1,246.5	1,533.3
2	Farmington, New Mexico[a] Albuquerque, New Mexico[b]	−632.5	−345.7	−58.9	227.9	514.7	802.5

[a] The load area represents the city named.

[b] The load area represents the metropolitan area (i.e., the identified city plus adjacent communities).

The findings of the DLT analysis for the proposed Los Mogotes East SEZ are as follows:

- Transmission scheme 1, which identifies the cities of Pueblo, Colorado Springs, and Denver (in that specific sequence) as the primary markets, represents the most favorable option based on NPV and land use requirements. This scheme would result in new land disturbance of about 4,460 acres (18 km^2).

- Transmission scheme 2, which represents an alternative configuration, serves Farmington and Albuquerque. In terms of defining potential upper-bound impacts of new transmission infrastructure development, this configuration would result in new land disturbance of about 10,447 acres (42.3 km^2). In terms of NPV, however, this scheme may not be economically viable under the current assumptions.

- Other load area configurations are possible but would be less favorable than scheme 1 in terms of NPV and, in most cases, also in terms of land use requirements. If new electricity generation at the proposed Los Mogotes East SEZ is not sent to either of the two markets identified above, the potential upper-bound impacts in terms of cost would be greater.

- The analysis of transmission requirements for the proposed Los Mogotes East SEZ would be expected to show lower costs and less land disturbance if solar-eligible load assumptions were increased, although the magnitude of those changes would vary due to a number of factors. In general, for cases such as the Los Mogotes East SEZ that show multiple load areas being served to accommodate the specified capacity, the estimated costs and land disturbance would be affected by increasing the solar-eligible load assumption. By increasing the eligible loads at all load areas, the transmission routing and configuration solutions can take advantage of shorter line distances and deliveries to fewer load areas, thus reducing costs and land disturbed. In general, SEZs that show the greatest number of load areas served and greatest distances required for new transmission lines (e.g., Riverside East) would show the greatest decrease in impacts as a result of increasing the solar-eligible load assumption from 20% to a higher percentage.

10.4.24 Impacts of the Withdrawal

The BLM proposes to withdraw 16,797 acres (67 km^2) of public land comprising the proposed Los Mogotes East SEZ from settlement, sale, location, or entry under the general land laws, including the mining laws, for a period of 20 years (see Section 2.2.2.2.4 of the Final Solar PEIS). The public lands would be withdrawn, subject to valid existing rights, from settlement, sale, location, or entry under the general land laws, including the mining laws. This means that the lands could not be appropriated, sold, or exchanged during the term of the withdrawal, and new mining claims could not be filed on the withdrawn lands. Mining claims filed prior to the segregation or withdrawal of the identified lands would take precedence over future solar energy development. The withdrawn lands would remain open to the mineral leasing, geothermal leasing, and mineral material laws, and the BLM could elect to lease the oil, gas, coal, or geothermal steam resources, or to sell common variety-mineral materials, such as sand and gravel, contained in the withdrawn lands. In addition, the BLM would retain the discretion to authorize linear and renewable energy ROWs on the withdrawn lands.

The purpose of the proposed land withdrawal is to minimize the potential for conflicts between mineral development and solar energy development for the proposed 20-year withdrawal period. Under the land withdrawal, there would be no mining-related surface development, such as the establishment of open pit mining, construction of roads for hauling materials, extraction of ores from tunnels or adits, or construction of facilities to process the material mined, that could preclude use of the SEZ for solar energy development. For the Los Mogotes East SEZ, the impacts of the proposed withdrawal on mineral resources and related economic activity and employment are expected to be negligible because the mineral potential of the lands within the SEZ is low (BLM 2012). There has been no documented mining within the SEZ, and there are no known locatable mineral deposits within the land withdrawal area. According to the LR2000 (accessed in January 2012), there are no recorded mining claims within the land withdrawal area.

Although the mineral potential of the lands within the Los Mogotes East SEZ is low, the proposed withdrawal of lands within the SEZ would preclude many types of mining activity over a 20-year period, resulting in the avoidance of potential mining related adverse impacts. Impacts commonly related to mining development include increased soil erosion and sedimentation, water use, generation of contaminated water in need of treatment, creation of lagoons and ponds (hazardous to wildlife), toxic runoff, air pollution, establishment of noxious weeds and invasive species, habitat destruction or fragmentation, disturbance of wildlife, blockage of migration corridors, increased visual contrast, noise, destruction of cultural artifacts and fossils and/or their context, disruption of landscapes and sacred places of interest to tribes, increased traffic and related emissions, and conflicts with other land uses (e.g., recreational).

10.4.25 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this Final Solar PEIS. It is likely that at the time of publication of this Final Solar PEIS, some of these Web pages may no longer be available or the URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this Final Solar PEIS.

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10.4.26 Errata for the Proposed Los Mogotes East SEZ

This section presents corrections to material presented in the Draft Solar PEIS and the Supplement to the Draft. The need for these corrections was identified in several ways: through comments received on the Draft Solar PEIS and the Supplement to the Draft (and verified by the authors), through new information obtained by the authors subsequent to publication of the Draft Solar PEIS and the Supplement to the Draft, or through additional review of the original material by the authors. Table 10.4.26-1 provides corrections to information presented in the Draft Solar PEIS and the Supplement to the Draft.

TABLE 10.4.26-1 Errata for the Proposed Los Mogotes East SEZ (Section 10.1.4 of the Draft Solar PEIS and Section C.3.4 of the Supplement to the Draft Solar PEIS)

Section No.	Page No.	Line No.	Figure No.	Table No.	Correction
10.4.1.2	10.4-3	24–25			“The nearest existing transmission line is a 69-kV line adjacent to the SEZ,” should read, “The nearest existing transmission line is a 69-kV line located about 3 mi (5 km) to the east of the SEZ.”
10.4.5.1	10.4-31	10			The text indicates that quail are hunted in the area. The Colorado Division of Wildlife has commented that quail are not found in this area.
10.4.11.2					All uses of the term “neotropical migrants” in the text and tables of this section should be replaced with the term “passerines.”
10.4.14.2	10.4-225	28–29	10.4.14.2-9		The text reads “The West Fork is visible as a blue dashed line near the eastern boundary of the SEZ on Figure 10.4.14.2-9.” This line did not appear in the figure. This information is shown correctly in Figure 10.4.14.2-2 of this Final Solar PEIS.