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

UNITS OF MEASURE

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

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.

10.2 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.

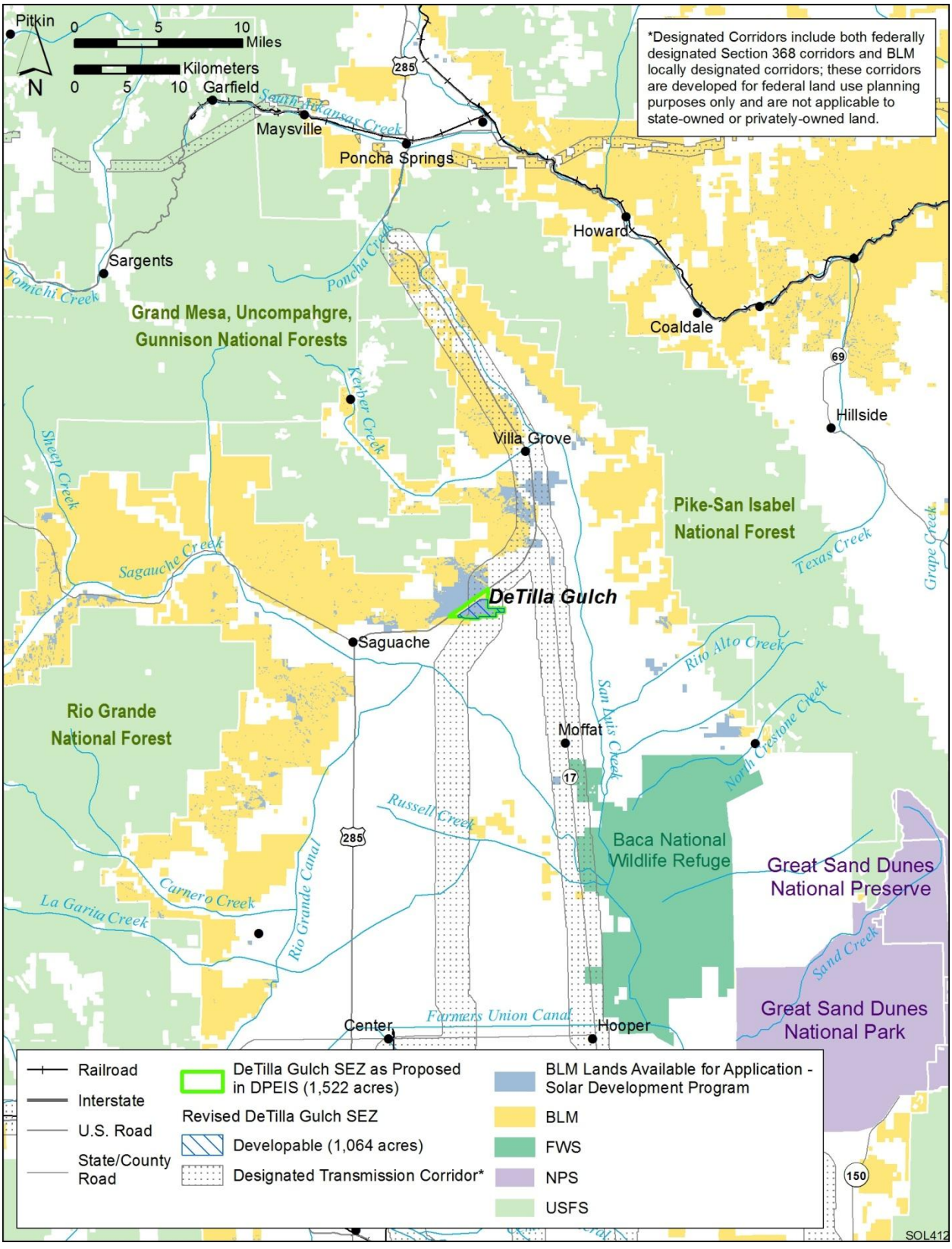

FIGURE 10.2.1.1-1 Proposed De Tilla Gulch SEZ as Revised

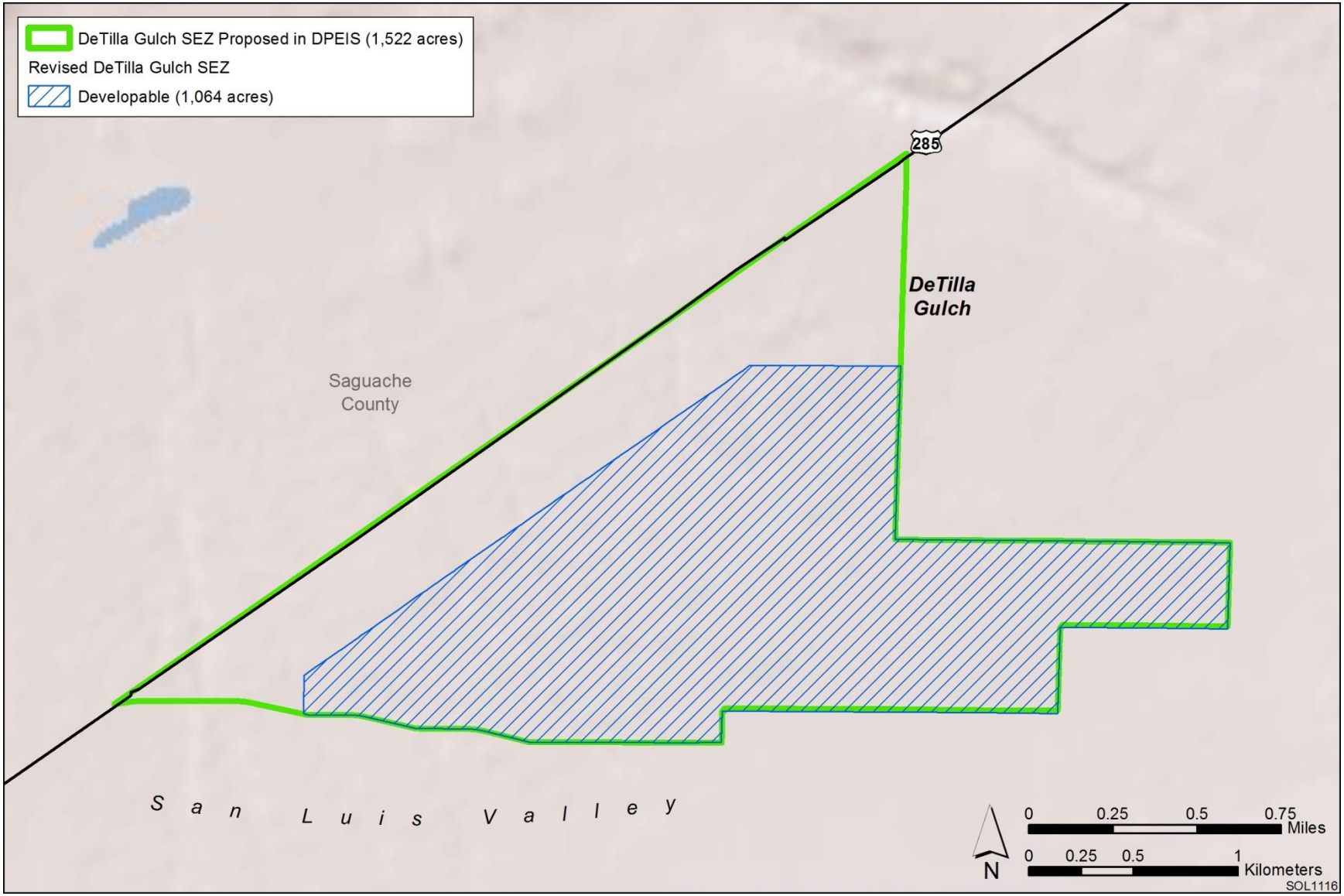

FIGURE 10.2.1.1-2 Developable Area for the Proposed De Tilla Gulch SEZ as Revised

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).

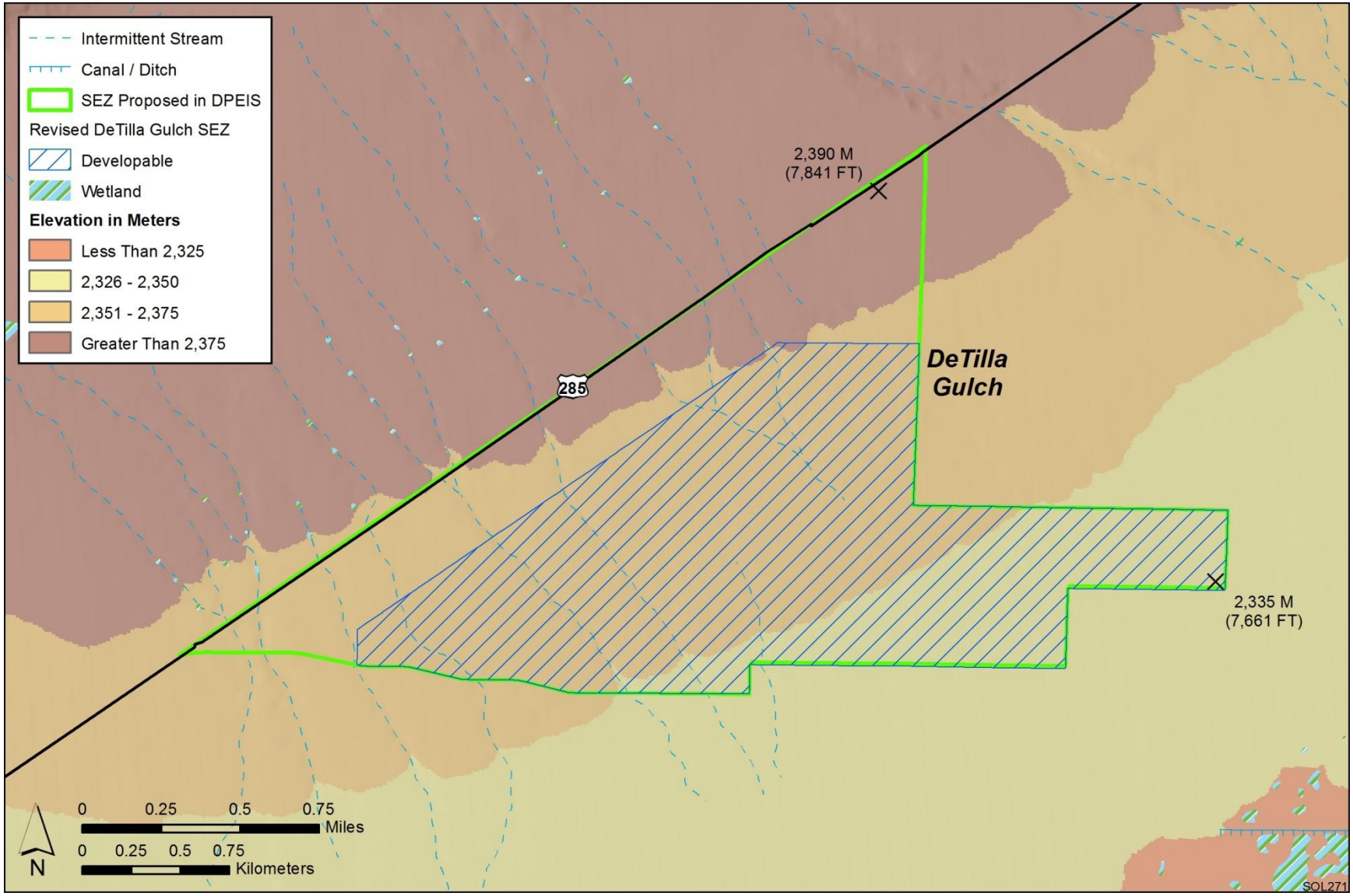

FIGURE 10.2.7.1-1 General Terrain of the Proposed De Tilla Gulch SEZ as Revised

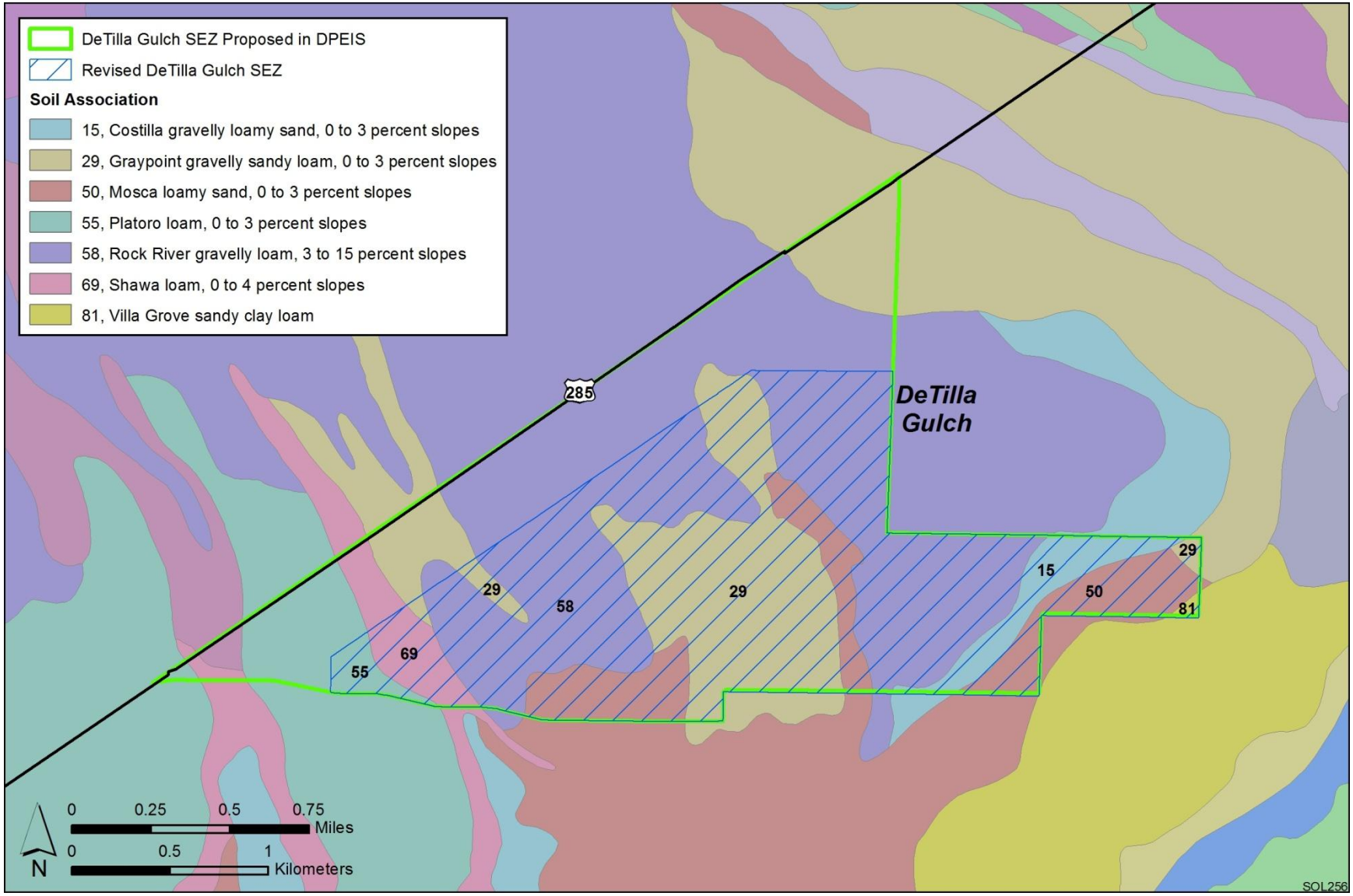

FIGURE 10.2.7.1-2 Soil Map for the Proposed De Tilla Gulch SEZ as Revised (NRCS 2008)

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		Description	Area in Acres[c] (Percentage of SEZ)
		Water[a]	Wind[b]		
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		Description	Area in Acres[c] (Percentage of SEZ)
		Water[a]	Wind[b]		
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.)

[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

Parameter	Station (USGS ID) 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

Parameter	Station (USGS ID)[a]	
	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).

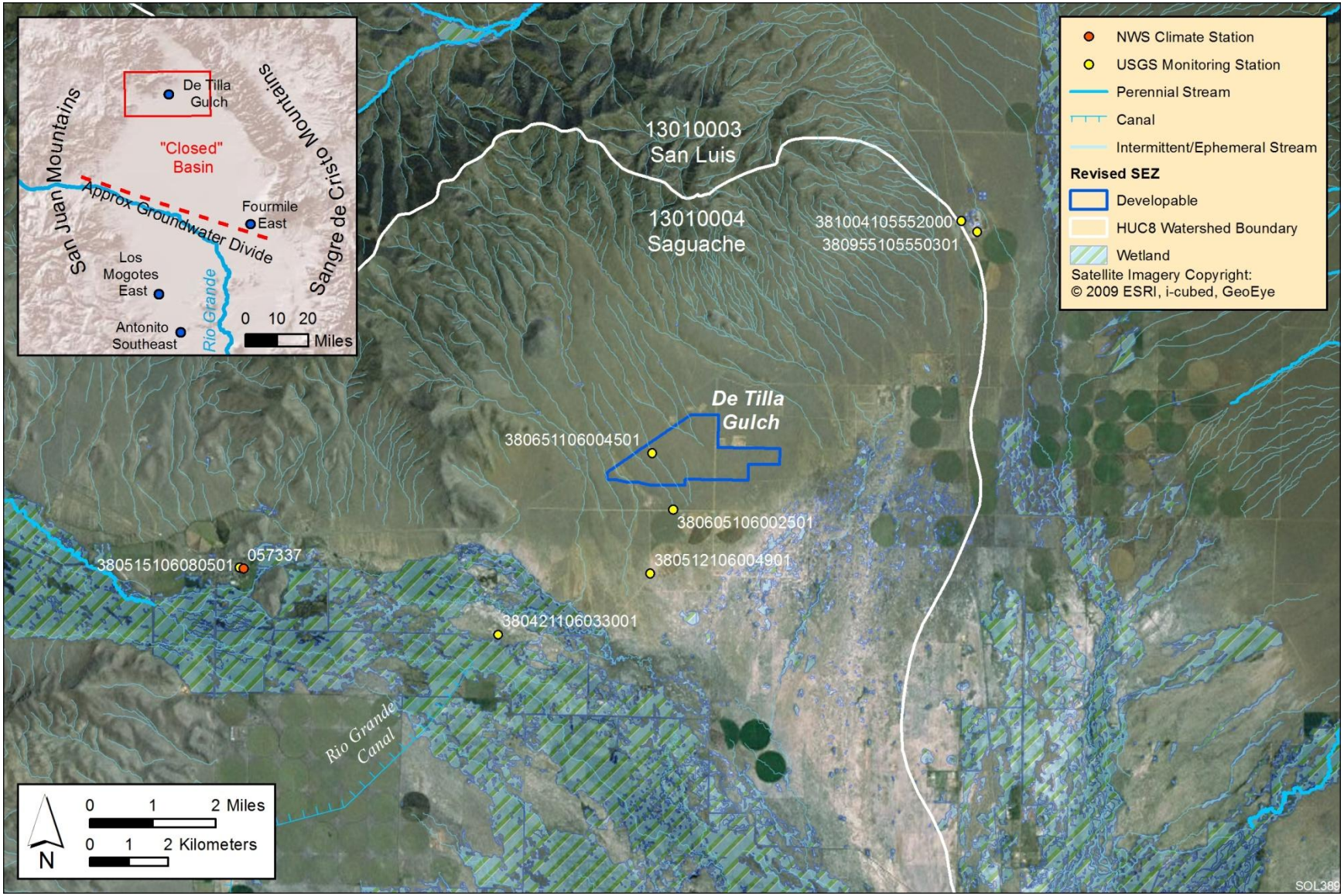

FIGURE 10.2.9.1-1 Water Features near the Proposed De Tilla Gulch SEZ as Revised

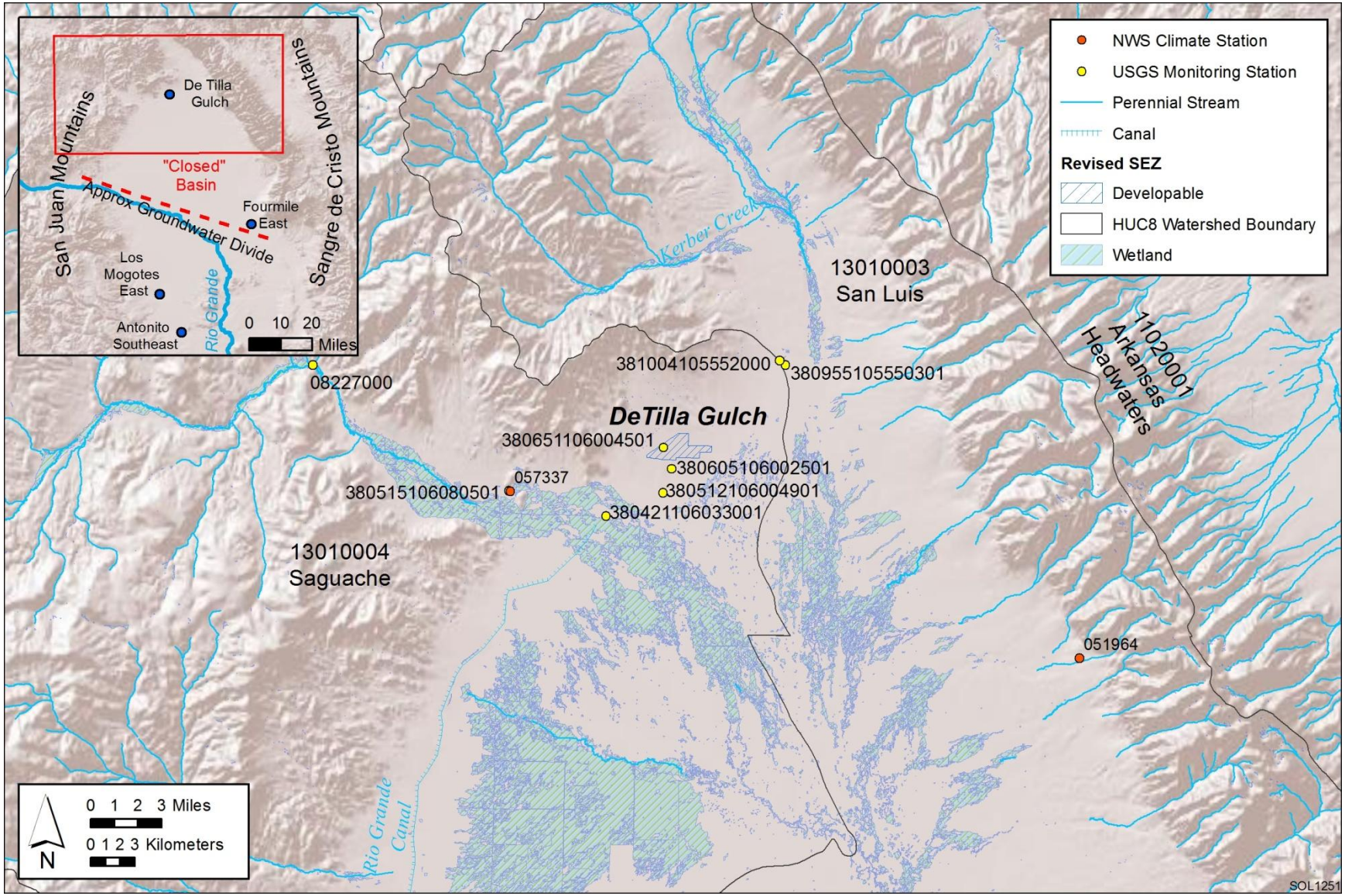

FIGURE 10.2.9.1-2 Water Features within the Sagauche Watershed, Which Includes the Proposed De Tilla Gulch SEZ as Revised

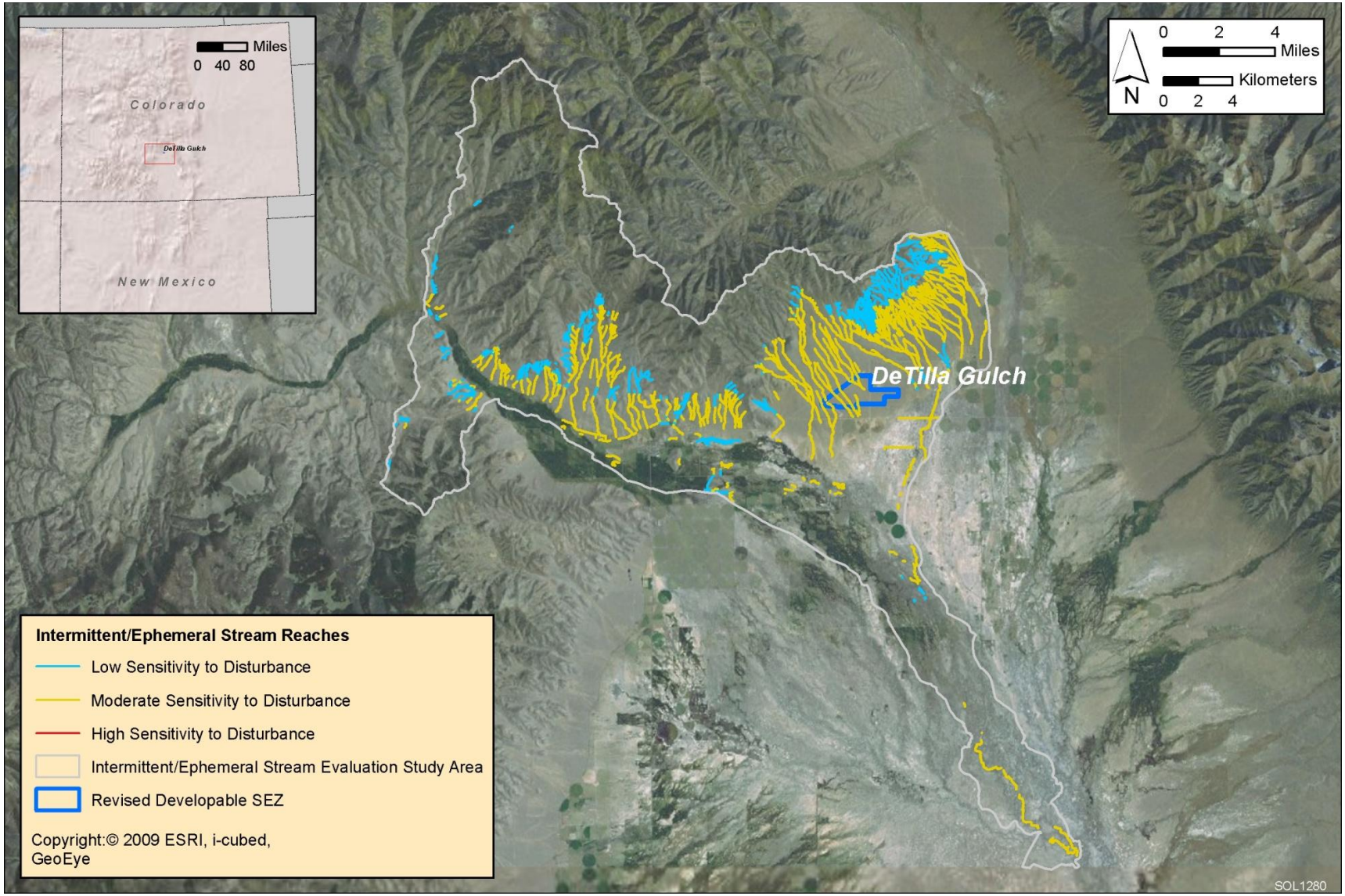

FIGURE 10.2.9.2-1 Intermittent/Ephemeral Stream Channel Sensitivity to Surface Disturbances in the Vicinity of the Proposed De Tilla Gulch SEZ as Revised

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).

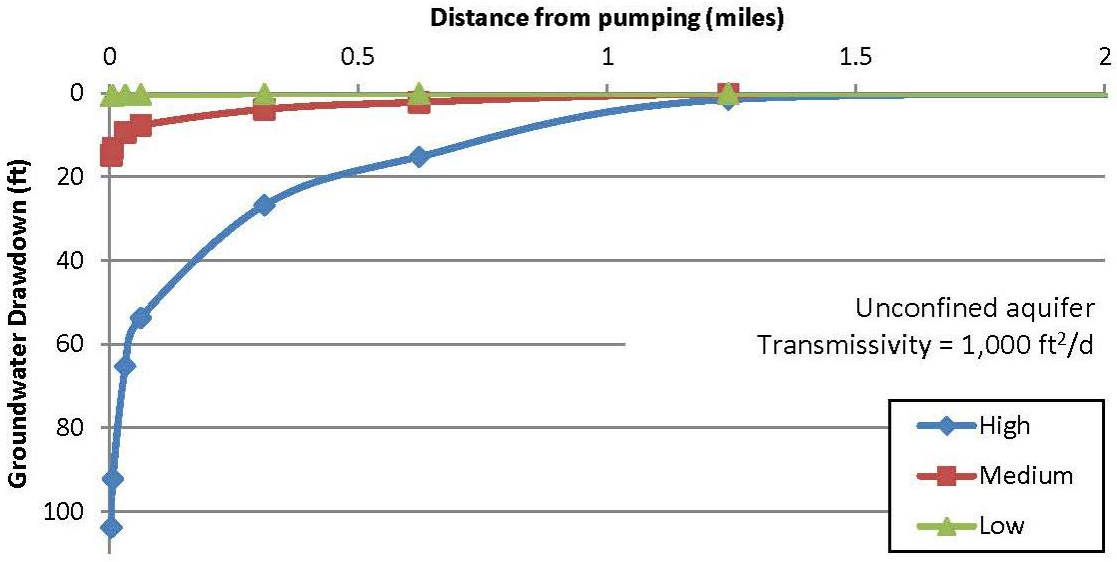

FIGURE 10.2.9.2-2 Estimated One-Dimensional Groundwater Drawdown Resulting from High, Medium, and Low Groundwater Pumping Scenarios over the 20-Year Operational Period at the Proposed De Tilla Gulch SEZ as Revised

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.

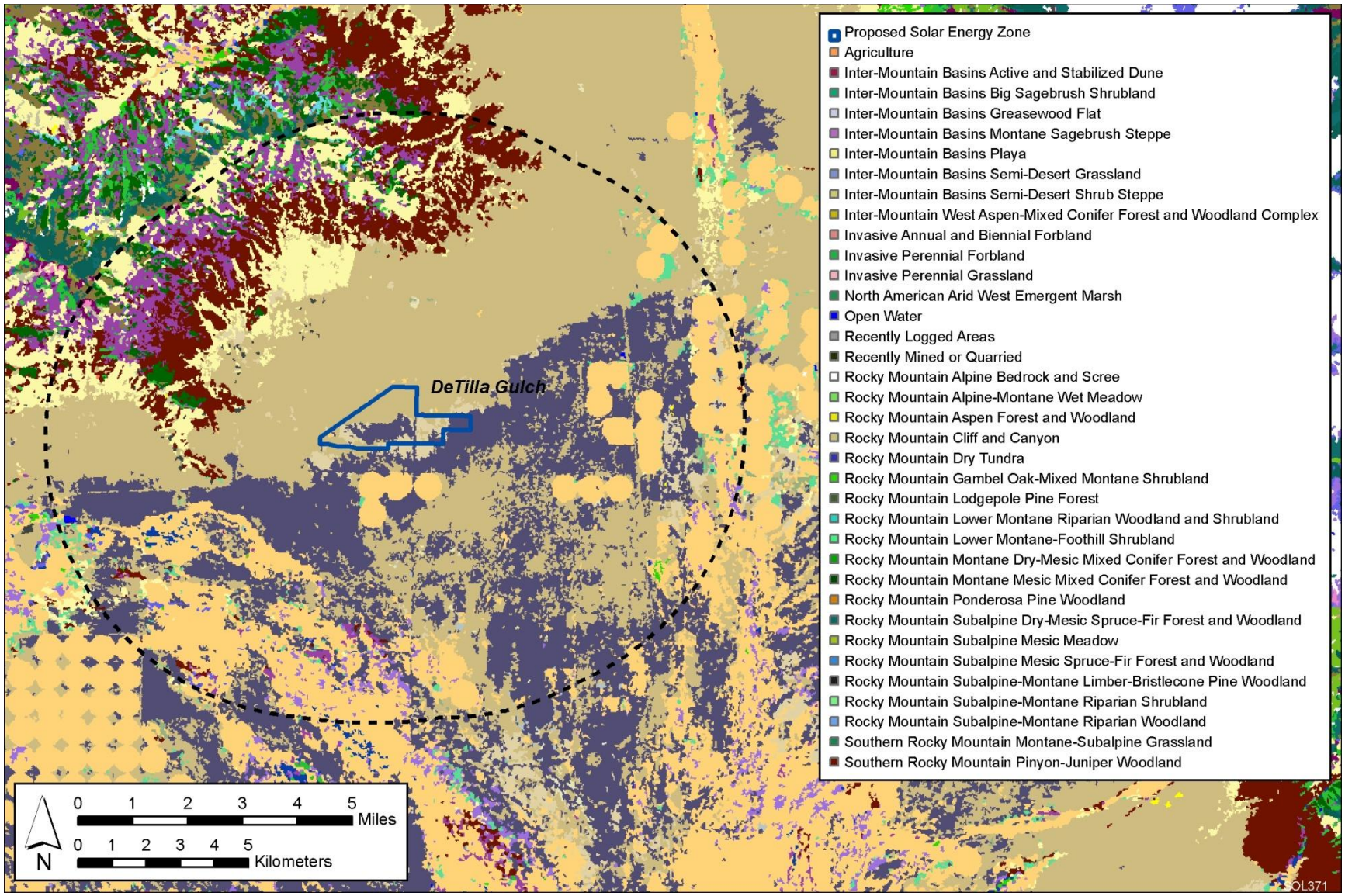

FIGURE 10.2.10.1-1 Land Cover Types within the Proposed De Tilla Gulch SEZ as Revised

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

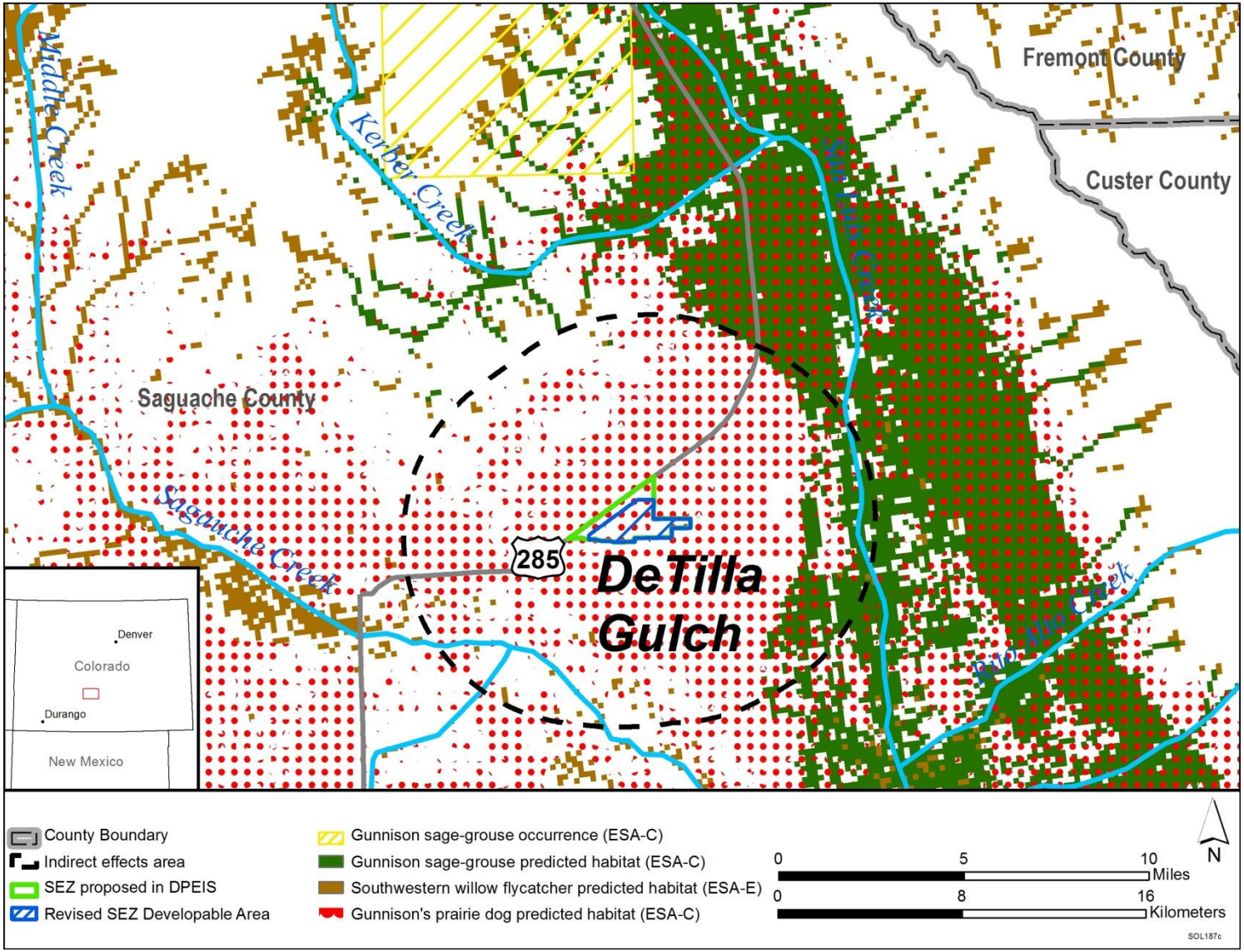

FIGURE 10.2.12.1-1 Developable Area for the Proposed De Tilla Gulch SEZ as Revised and Known or Potential Occurrences of Species Listed as Threatened or Endangered, Proposed, or Candidates for Listing under the ESA

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]		Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
				Within SEZ (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	
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.

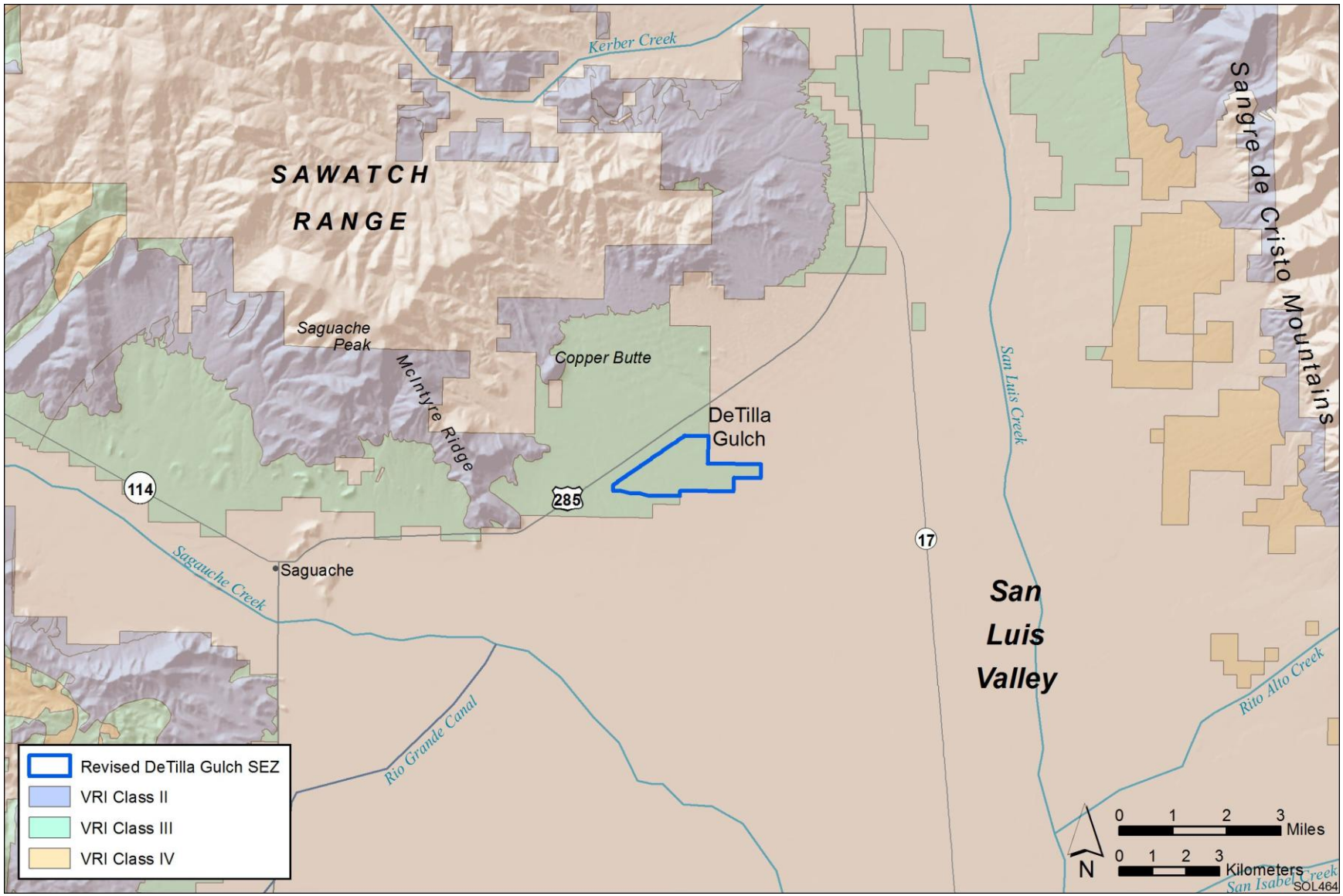

FIGURE 10.2.14.1-1 Visual Resource Inventory Values for the Proposed De Tilla Gulch SEZ as Revised

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;

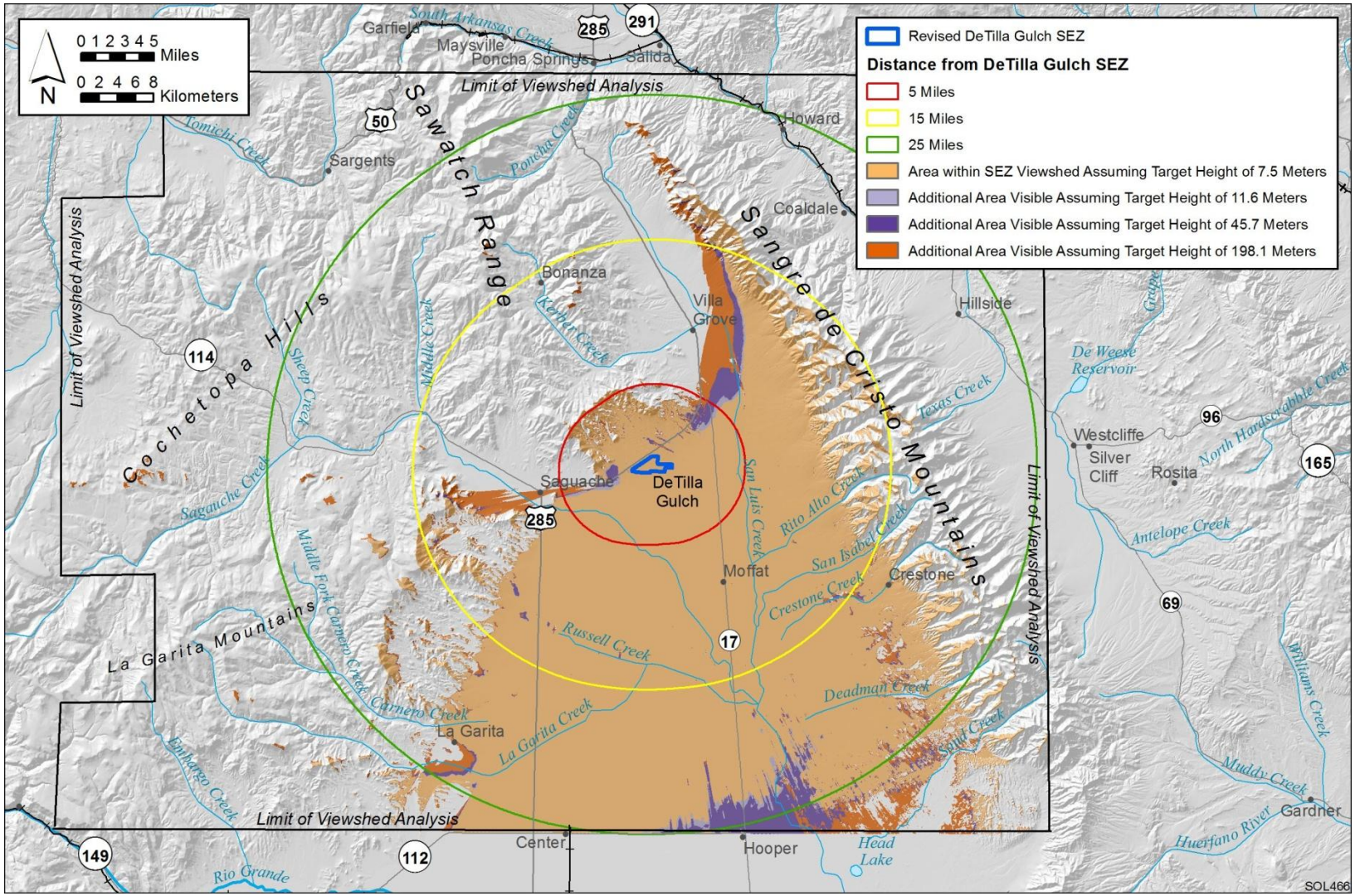

FIGURE 10.2.14.2-1 Viewshed Analyses for the Proposed De Tilla Gulch SEZ as Revised and Surrounding Lands, Assuming Viewshed Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development and/or associated structures within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

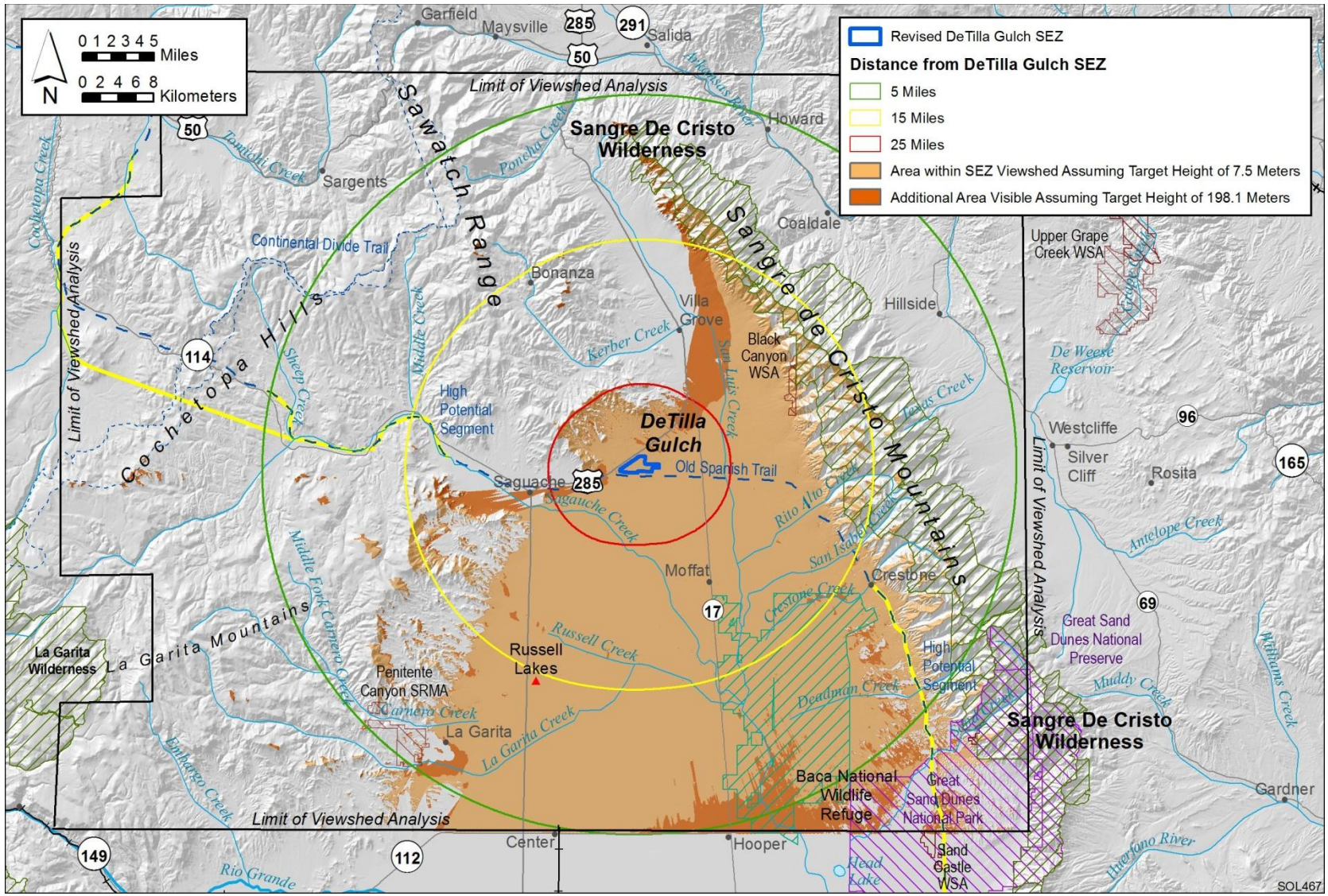

FIGURE 10.2.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed De Tilla Gulch SEZ as Revised

- 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.

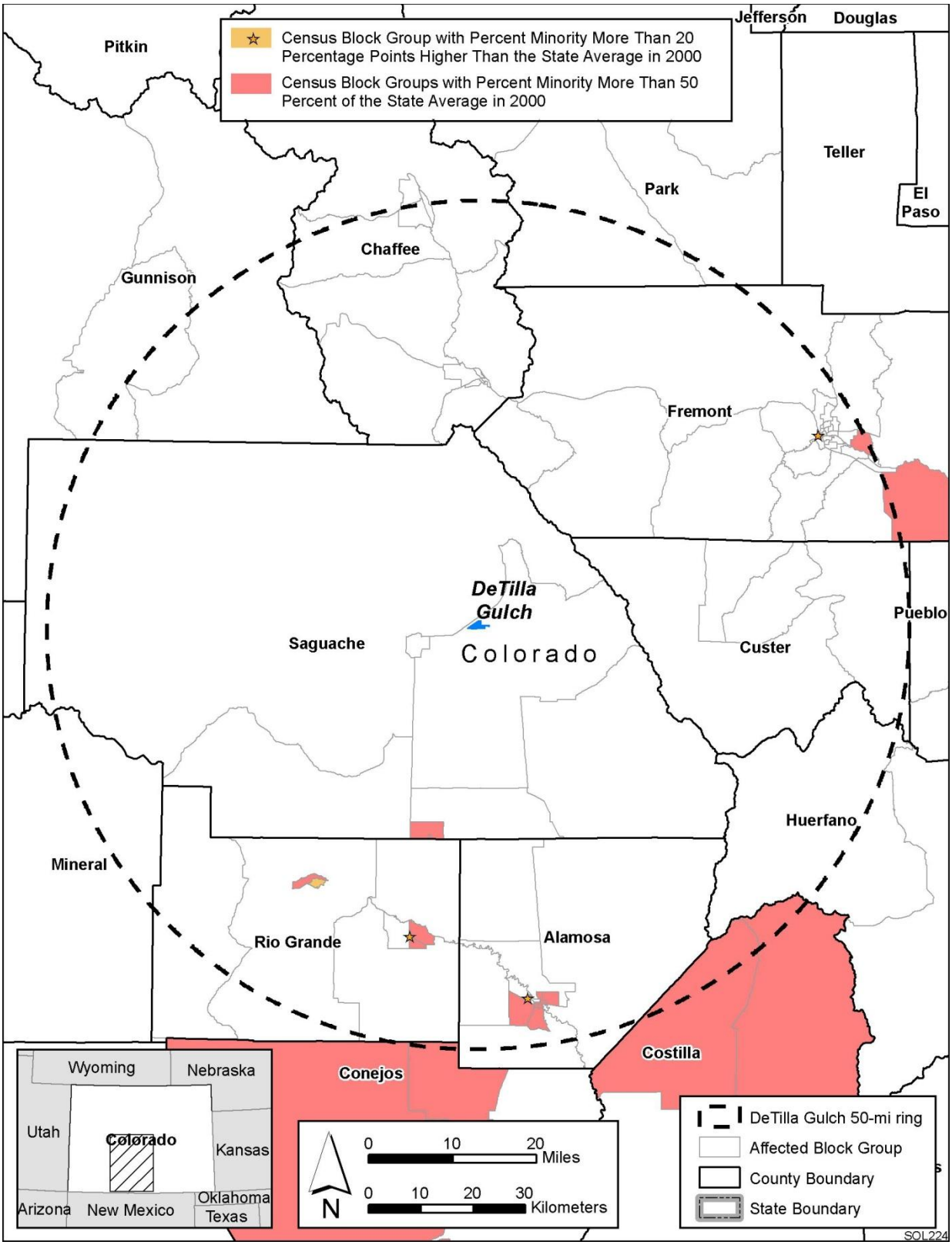

FIGURE 10.2.20.1-1 Minority Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed De Tilla Gulch SEZ as Revised

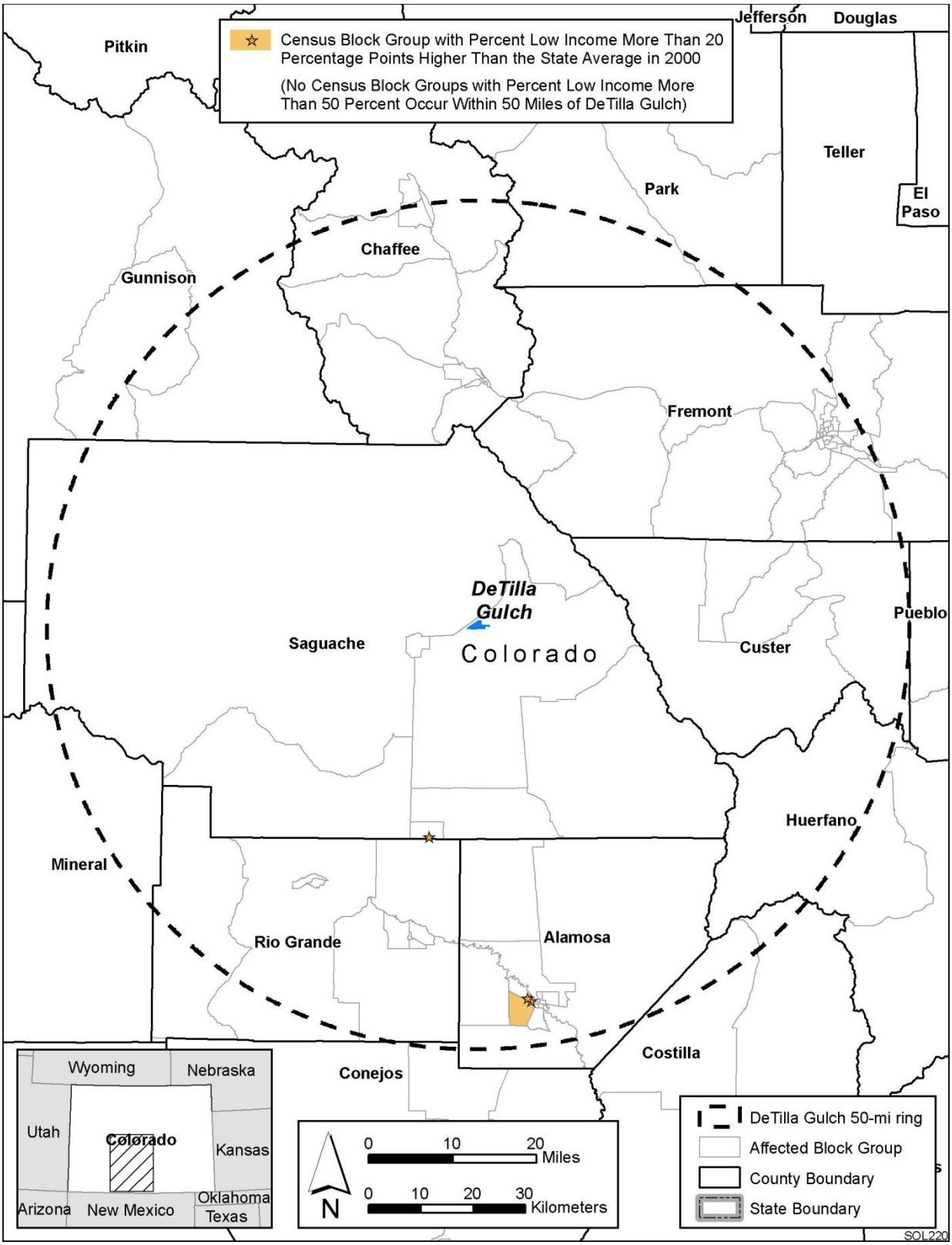

FIGURE 10.2.20.1-2 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed De Tilla Gulch SEZ as Revised

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.

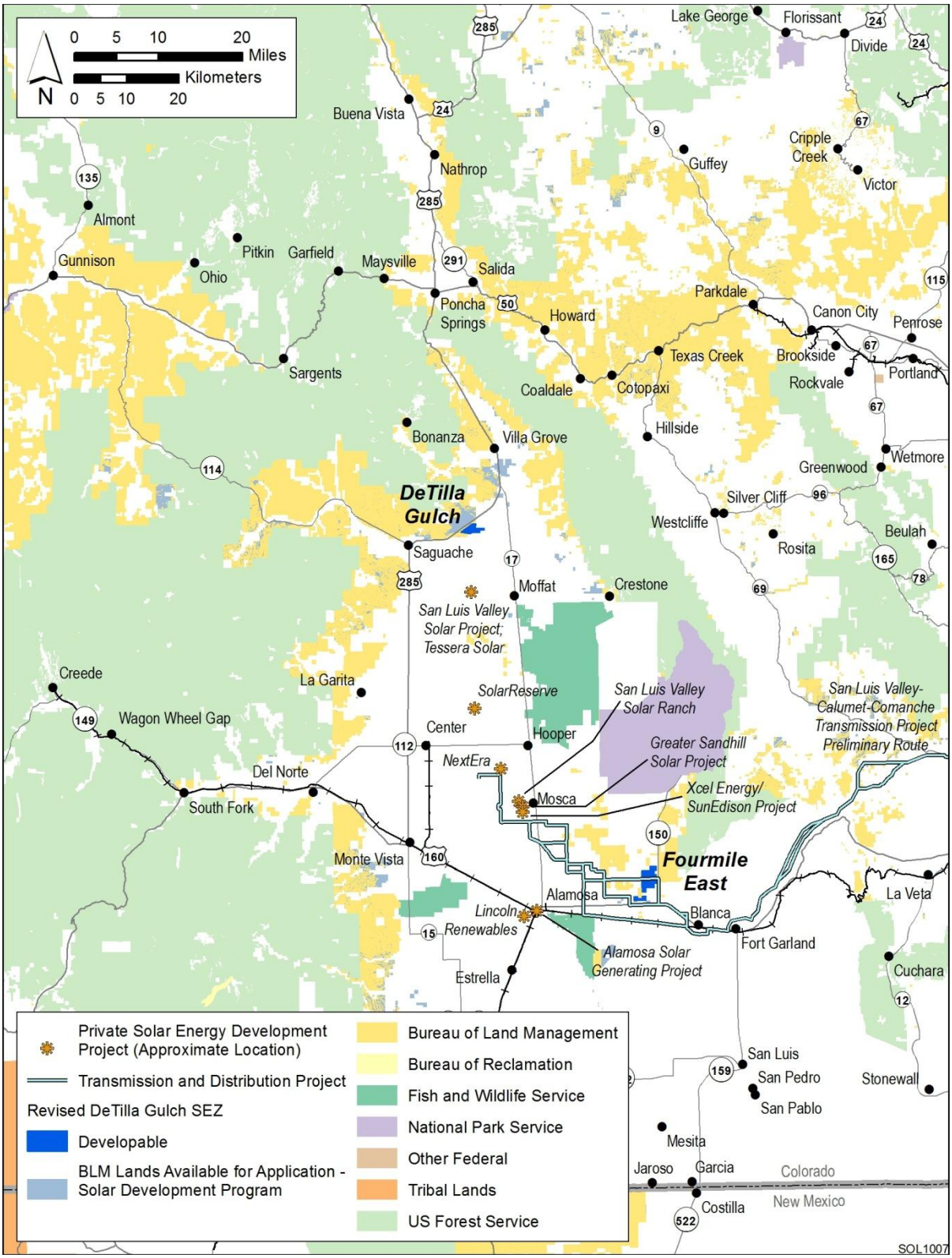

FIGURE 10.2.22.2-1 Locations of Existing and Reasonably Foreseeable Renewable Energy Projects on Public Land within a 50-mi (80-km) Radius of the Proposed De Tilla Gulch SEZ as Revised

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.

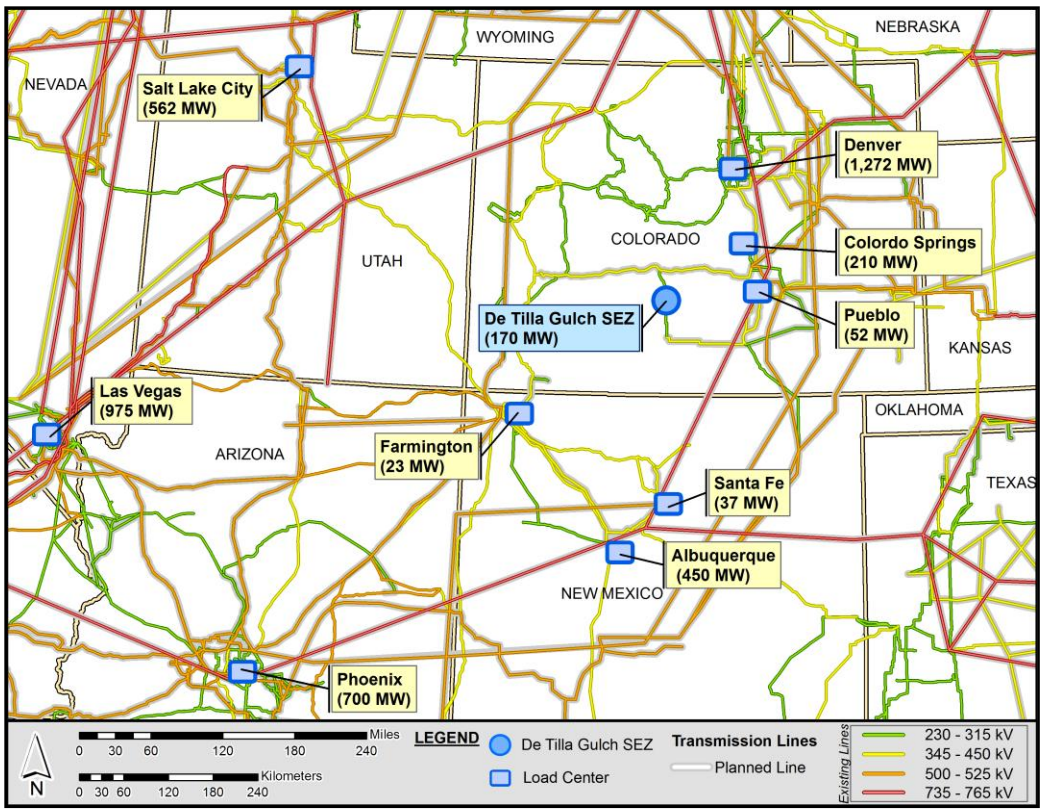

FIGURE 10.2.23.1-1 Location of the Proposed De Tilla Gulch SEZ and Possible Load Areas (Source for background map: Platts 2011)

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.

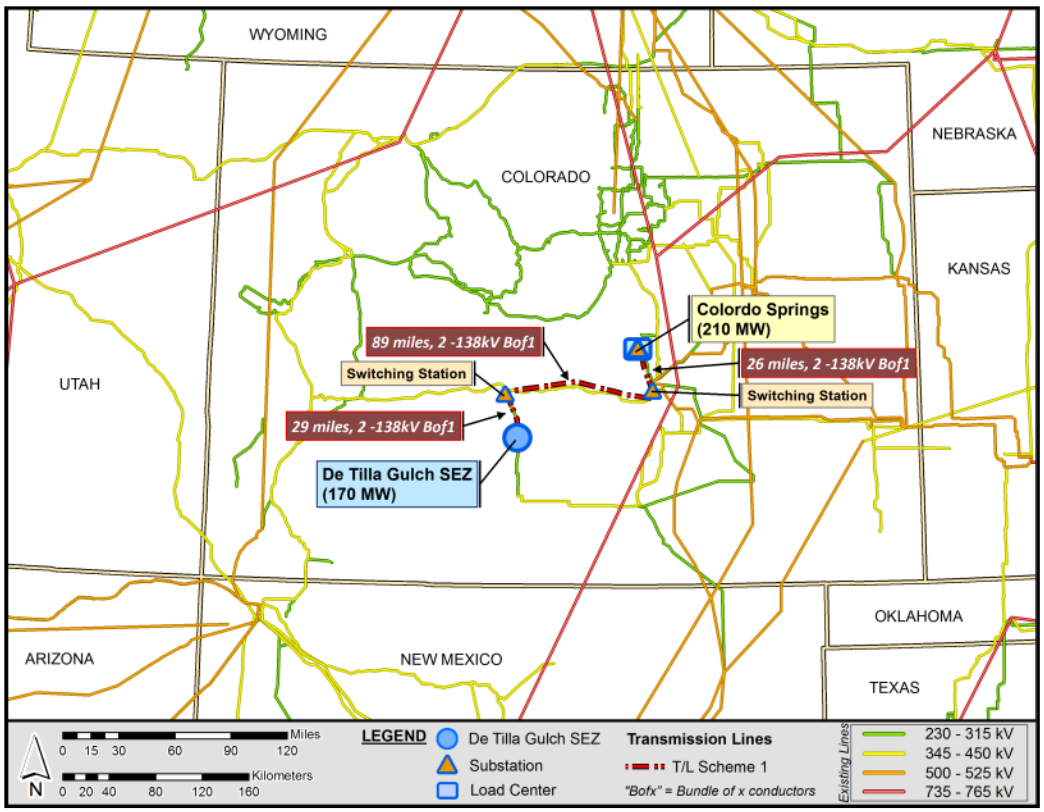

FIGURE 10.2.23.1-2 Transmission Scheme 1 for the Proposed De Tilla Gulch SEZ (Source for background map: Platts 2011)

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

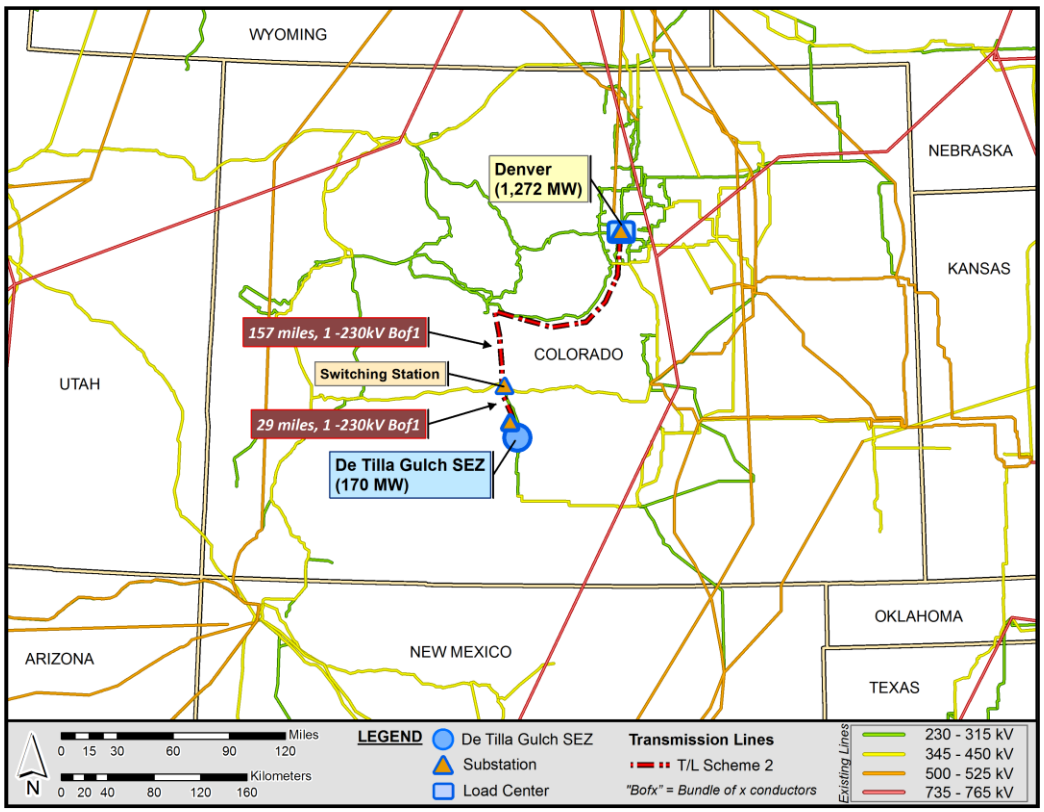

FIGURE 10.2.23.1-3 Transmission Scheme 2 for the Proposed De Tilla Gulch SEZ (Source for background map: Platts 2011)

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

Transmission Scheme	City/Load Area Name	Total Distance (mi)[c]	No. of Substations	Land Use (acres)[d]		
				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..."