

<b>DOCKETED</b>	
<b>Docket Number:</b>	21-AFC-02
<b>Project Title:</b>	Gem Energy Storage Center
<b>TN #:</b>	240768-2
<b>Document Title:</b>	Table of Contents_Gem Energy Storage Center
<b>Description:</b>	N/A
<b>Filer:</b>	Kari Miller
<b>Organization:</b>	Golder Associates USA Inc.
<b>Submitter Role:</b>	Applicant Representative
<b>Submission Date:</b>	12/1/2021 5:37:30 PM
<b>Docketed Date:</b>	12/1/2021

# Table of Contents

<b>1.0 INTRODUCTION .....</b>	<b>1-1</b>
1.1    Project Objectives .....	1-1
1.2    Project Location .....	1-5
1.3    Project Elements .....	1-5
1.4    Project Benefits .....	1-9
1.5    Project Operation .....	1-10
1.6    Project Ownership .....	1-10
1.7    Project Schedule .....	1-10
1.8    Persons Who Prepared the AFC .....	1-10
<b>2.0 PROJECT DESCRIPTION.....</b>	<b>2-1</b>
2.1    Generating Facility Description, Design, and Operation .....	2-2
2.1.1    General Site Arrangement and Layout .....	2-2
2.1.2    Process Description .....	2-3
2.1.3    Facility Operating Philosophy .....	2-11
2.1.4    Energy Storage Facility Charge Mode Cycle.....	2-11
2.1.5    Energy Storage Facility Generation/Discharge Mode.....	2-12
2.1.6    Energy Storage Facility Standby / Idle Mode.....	2-12
2.1.7    Energy Storage Air Compression Equipment Drivetrain .....	2-13
2.1.8    Energy Storage Air-Expansion Turbine Generators .....	2-14
2.1.9    Thermal Management System.....	2-14
2.1.10    Cavern Air and Water Conduits .....	2-15
2.1.11    Hydrostatically Compensating Surface Reservoir .....	2-15
2.1.12    Underground Storage Caverns .....	2-15
2.1.13    Black Start Generator .....	2-16
2.1.14    Major Electrical Equipment and Systems .....	2-16
2.1.14.1    Generators and Motors .....	2-17
2.1.14.2    Alternating Current Power—Transmission .....	2-17
2.1.14.3    Alternating Current Power—Distribution to Auxiliaries .....	2-17

2.1.14.4	DC Power Supply System.....	2-17
2.1.14.5	Uninterruptible Power Supply System .....	2-18
2.1.14.6	Emergency Power.....	2-18
2.1.15	Water Supply and Use .....	2-18
2.1.15.1	Construction Water .....	2-19
2.1.15.1.1	Cavern Works .....	2-19
2.1.15.1.2	Surface Works .....	2-19
2.1.15.1.3	Compensation Reservoir Fill.....	2-20
2.1.15.2	Water and Wastewater Requirements.....	2-20
2.1.15.3	Water Quality .....	2-20
2.1.15.4	Water Treatment .....	2-20
2.1.15.5	Water Availability.....	2-21
2.1.16	Waste Management.....	2-22
2.1.16.1	Wastewater Collection, Treatment, and Disposal.....	2-22
2.1.16.2	Excavation Waste .....	2-22
2.1.16.3	Solid Nonhazardous Waste .....	2-22
2.1.16.4	Hazardous Wastes.....	2-23
2.1.17	Management of Hazardous Materials .....	2-23
2.1.18	Fire Protection.....	2-23
2.1.19	Plant Auxiliaries.....	2-24
2.1.19.1	Process Systems .....	2-24
2.1.19.2	Heating, Ventilation and Air Conditioning (HVAC) Systems .....	2-24
2.1.19.3	Lighting.....	2-25
2.1.19.4	Grounding .....	2-25
2.1.19.5	Control System.....	2-25
2.1.19.6	Cathodic Protection.....	2-27
2.1.19.7	Freeze Protection System.....	2-27
2.1.19.8	Service Air.....	2-27
2.1.19.9	Instrument Air.....	2-27
2.1.20	Interconnect to Electrical Grid.....	2-27
2.1.21	Project Construction.....	2-28

Table of Contents	Application for Certification (AFC) Gem Energy Storage Center
2.1.21.1 Construction Schedule .....	2-28
2.1.21.2 Construction Workforce .....	2-28
2.1.21.3 Construction Laydown and Traffic .....	2-28
2.1.22 Gem Facility Operation .....	2-29
2.2 Engineering .....	2-29
2.2.1 Facility Design.....	2-29
2.2.1.1 Facility Safety Design .....	2-30
2.2.2 Facility Reliability.....	2-30
2.2.2.1 Facility Availability.....	2-30
2.2.3 Redundancy of Critical Components .....	2-30
2.2.3.1 Turbomachinery .....	2-30
2.2.3.2 Pumps.....	2-31
2.2.3.3 Heat Exchangers .....	2-31
2.2.3.4 Storage Tanks.....	2-31
2.2.4 Fuel Availability .....	2-31
2.2.5 Water Availability.....	2-31
2.2.6 Project Quality Control .....	2-31
2.2.7 Project Stages.....	2-31
2.2.8 Quality Control Records.....	2-32
2.2.9 Facility Closure.....	2-32
2.2.10 Temporary Closure .....	2-32
2.2.11 Permanent Closure .....	2-33
<b>3.0 ELECTRIC TRANSMISSION.....</b>	<b>3-1</b>
3.1 Introduction.....	3-1
3.2 Transmission Lines Description, Design, and Operation.....	3-1
3.2.1 Overhead Transmission Line Characteristics .....	3-1
3.2.2 Gem Switchyard Characteristics.....	3-3
3.2.3 230 kV Whirlwind Substation Interconnection .....	3-7
3.3 Transmission Interconnection Studies .....	3-7
3.3.1 New Equipment Installation .....	3-8

3.3.2	System Impact Studies .....	3-8
3.3.2.1	Power Flow Reliability Assessment .....	3-9
3.3.2.1.1	Discharging Analysis.....	3-9
3.3.2.1.2	Charging Analysis.....	3-10
3.3.2.2	Short Circuit Duty.....	3-10
3.3.2.2.1	Short circuit Study Results.....	3-10
3.3.2.2.2	Substation Ground Grid Duty.....	3-11
3.3.2.3	Transient Stability Evaluation.....	3-11
3.3.2.4	Power Factor Requirements .....	3-11
3.3.2.5	Deliverability Assessments .....	3-11
3.4	Transmission Line Safety and Nuisances.....	3-12
3.4.1	Electrical Clearances .....	3-12
3.4.2	Electrical Effects.....	3-13
3.4.2.1	Electric and Magnetic Fields .....	3-13
3.4.2.2	Audible Noise and Radio and Television Interference.....	3-15
3.4.2.3	EMFs, Audible Noise, and Radio and Television Interference Assumptions .....	3-15
3.4.2.4	Induced Current and Voltages .....	3-15
3.4.3	Fire Hazards.....	3-16
3.5	Laws, Ordinances, Regulations, and Standards.....	3-16
3.5.1	Design and Construction.....	3-16
3.5.2	Electric and Magnetic Fields .....	3-17
3.5.3	Hazardous Shock.....	3-17
3.5.4	Communications Interference .....	3-17
3.5.5	Aviation Safety .....	3-18
3.5.6	Fire Hazards.....	3-18
3.5.7	Jurisdiction .....	3-18
<b>4.0</b>	<b>NATURAL GAS SUPPLY .....</b>	<b>4-1</b>
<b>5.0</b>	<b>ENVIRONMENTAL ANALYSIS .....</b>	<b>5-1</b>
5.1	Air Quality.....	5.1-1
5.1.1	Introduction.....	5.1-1

5.1.2 Regulatory Items Affecting New Source Review .....	5.1-1
5.1.3 Project Description .....	5.1-3
5.1.3.1 Gem Site Location.....	5.1-3
5.1.3.2 Project Equipment Specifications .....	5.1-5
5.1.3.2.1 Fuels .....	5.1-8
5.1.4 Emissions Evaluation .....	5.1-8
5.1.4.1 Facility Emissions and Permit Limitations.....	5.1-8
5.1.4.2 Facility Emissions.....	5.1-8
5.1.4.3 Normal Operations .....	5.1-8
5.1.4.4 Criteria Pollutant Emissions .....	5.1-9
5.1.4.4.1 Greenhouse Gas Emissions .....	5.1-10
5.1.4.5 Hazardous Air Pollutants.....	5.1-10
5.1.4.6 Construction .....	5.1-10
5.1.5 Best Available Control Technology Evaluation .....	5.1-12
5.1.5.1 Current Control Technologies .....	5.1-12
5.1.5.2 Proposed Best Available Control Technology.....	5.1-12
5.1.6 Air Quality Impact Analysis .....	5.1-13
5.1.6.1 Climate and Meteorology .....	5.1-13
5.1.6.2 Dispersion Modeling.....	5.1-13
5.1.6.2.1 NO <sub>2</sub> Modeling Procedures .....	5.1-14
5.1.6.3 Additional Model Selection.....	5.1-14
5.1.6.4 Good Engineering Practice Stack Height Analysis .....	5.1-14
5.1.6.5 Receptor Grid Selection and Coverage .....	5.1-14
5.1.7 Meteorological Data Selection .....	5.1-18
5.1.7.1 Background Air Quality .....	5.1-18
5.1.7.1.1 Air Quality Analyses.....	5.1-22
5.1.7.1.2 Screening Analysis .....	5.1-22
5.1.7.2 Operations Impact Analysis .....	5.1-23
5.1.7.3 Gem Commissioning Impact Analysis .....	5.1-24
5.1.7.3.1 Fumigation Analysis.....	5.1-25
5.1.8 Laws, Ordinances, Regulations, and Statutes .....	5.1-25

5.1.8.1 Specific LORS Discussion .....	5.1-25
5.1.8.1.1 Federal LORS .....	5.1-25
5.1.8.1.2 State LORS.....	5.1-26
5.1.8.1.3 APCD LORS .....	5.1-27
5.1.8.2 Agency Jurisdiction and Contacts.....	5.1-28
5.1.8.3 Permit Requirements and Schedules .....	5.1-29
5.1.9 References.....	5.1-29
5.2 Biological Resources.....	5.2-1
5.2.1 Affected Environment.....	5.2-1
5.2.1.1 Regional Overview.....	5.2-2
5.2.1.2 Significant Regional Wetlands and Protected Areas .....	5.2-2
5.2.1.2.1 Hydrologic Features.....	5.2-2
5.2.1.2.2 Protected Areas .....	5.2-5
5.2.1.3 Sensitive Habitat Types and Critical Habitat.....	5.2-7
5.2.1.3.1 Sensitive Habitat Types .....	5.2-7
5.2.1.3.2 Critical Habitat.....	5.2-8
5.2.1.4 Regional Sensitive or Special-status Species .....	5.2-9
5.2.1.5 Biological Surveys.....	5.2-9
5.2.1.6 Land Cover Types and Vegetation Communities .....	5.2-16
5.2.1.6.1 Creosote-White Bursage Series .....	5.2-16
5.2.1.6.2 Saltbush Scrub.....	5.2-16
5.2.1.6.3 Developed/Disturbed .....	5.2-16
5.2.1.6.4 Cresote-Saltbush Series.....	5.2-17
5.2.1.6.5 California Matchweed-Rubber Rabbitbrush Series .....	5.2-17
5.2.1.6.6 Agriculture Land.....	5.2-17
5.2.1.6.7 Annual Buckwheat/Grasses.....	5.2-17
5.2.1.6.8 Creosote-White Bursage Series – Disturbed.....	5.2-17
5.2.1.6.9 Developed Areas .....	5.2-18
5.2.1.6.10 Rubber Rabbitbrush Series.....	5.2-18
5.2.1.6.11 Saltbush Scrub – Disturbed .....	5.2-18

5.2.1.6.12	Disturbed Areas .....	5.2-18
5.2.1.6.13	Ornamental Habitat.....	5.2-18
5.2.1.7	Generator Tie-Line.....	5.2-18
5.2.1.8	Sensitive and Special-Status Species .....	5.2-19
5.2.1.8.1	Sensitive and Special-status Plant Species .....	5.2-19
5.2.1.8.2	Sensitive or Special-status Wildlife Species.....	5.2-20
5.2.1.8.3	Migratory Bird Treaty Act.....	5.2-23
5.2.1.8.4	Bald and Golden Eagle Protection Act .....	5.2-23
5.2.1.8.5	Federal Endangered Species Act.....	5.2-23
5.2.1.8.6	California Endangered Species Act.....	5.2-23
5.2.1.8.7	State Fully Protected Species.....	5.2-24
5.2.1.8.8	State Species of Special Concern .....	5.2-24
5.2.1.8.9	State Special Species .....	5.2-24
5.2.2	Environmental Analysis.....	5.2-24
5.2.2.1	Significance Criteria .....	5.2-25
5.2.2.2	Potential Impacts of Construction .....	5.2-26
5.2.2.2.1	GESC Facility.....	5.2-26
5.2.2.2.2	Construction Laydown Area.....	5.2-26
5.2.2.2.3	Generator Tie-Line .....	5.2-26
5.2.2.2.4	Construction Impacts to Special-status Plant Species .....	5.2-27
5.2.2.2.5	Construction Impacts to Special-status Wildlife Species.....	5.2-27
5.2.2.2.6	Impacts to Wildlife Corridors.....	5.2-27
5.2.2.2.7	Wetlands and Waters of the United States.....	5.2-28
5.2.2.3	Potential Impacts of Operation .....	5.2-28
5.2.2.3.1	Combustion Turbine Emissions .....	5.2-28
5.2.2.3.2	Stormwater and Process Water Discharge .....	5.2-28
5.2.2.3.3	Noise and Light from Plant Operations.....	5.2-29
5.2.2.3.4	Potential for Collision and Electrocution Hazard to Wildlife.....	5.2-29
5.2.2.3.5	Effects of Operation on Special-status Species .....	5.2-30
5.2.2.3.6	Operation Phase Impacts to Wetlands and Waters of the United States.....	5.2-30

5.2.3	Cumulative Effects .....	5.2-30
5.2.4	Avoidance and Minimization Measures .....	5.2-30
5.2.4.1	Minimization Measures for Construction.....	5.2-31
5.2.4.2	Minimization Measure for Special-Status Species .....	5.2-32
5.2.4.3	Minimization Measure for Site Restoration .....	5.2-34
5.2.5	Laws, Ordinances, Regulations, and Standards.....	5.2-34
5.2.5.1	Federal LORS .....	5.2-36
5.2.5.1.1	Federal ESA (16 United States Code [USC] 153 et seq.) .....	5.2-36
5.2.5.1.2	MBTA (16 USC 703 to 711).....	5.2-36
5.2.5.1.3	Bald and Golden Eagle Protection Act (16 USC 668) .....	5.2-36
5.2.5.2	State LORS.....	5.2-36
5.2.5.2.1	CESA .....	5.2-36
5.2.5.2.2	Fish and Game Code Sections 3500, 3503.5, and 3800.....	5.2-37
5.2.5.2.3	Fish and Game Code Section 3511.....	5.2-37
5.2.5.2.4	Fish and Game Code Section 3513.....	5.2-37
5.2.5.2.5	Plants and Animals of California Declared to be Endangered or Threatened (Title 14, CCR, Sections 670.2 and 670.5) .....	5.2-37
5.2.5.2.6	CEQA (PRC Section 15380).....	5.2-37
5.2.5.2.7	Warren Alquist Act (PRC Section 25000, et seq.) .....	5.2-37
5.2.5.3	Local LORS.....	5.2-38
5.2.5.3.1	Kern County General Plan.....	5.2-38
5.2.5.3.2	Kern County Valley Floor Habitat Conservation Plan.....	5.2-39
5.2.6	Permits and Permit Schedule .....	5.2-39
5.2.7	Agency Contacts .....	5.2-39
5.2.8	References.....	5.2-41
5.3	Cultural Resources.....	5.3-1
5.3.1	Affected Environment.....	5.3-4
5.3.1.1	Cultural Chronology .....	5.3-5
5.3.1.2	Pleistocene (ca. 10,000 to 8,000 cal. B.P.).....	5.3-5
5.3.1.3	Early Holocene (9,600 BC to 6,000 BCE).....	5.3-5
5.3.1.4	Middle Holocene (6,000 BCE to 500 BCE).....	5.3-6

5.3.1.5 Late Holocene (500 CE to Historic Contact) .....	5.3-6
5.3.1.6 Ethnographic Setting.....	5.3-7
5.3.1.6.1    Historic Setting.....	5.3-9
5.3.1.6.2    Antelope Valley .....	5.3-10
5.3.1.6.3    Willow Springs .....	5.3-10
5.3.1.6.4    Post-World War II Development .....	5.3-11
5.3.1.6.5    Wind and Solar Energy in Antelope Valley.....	5.3-11
5.3.2    Research Design for the Cultural Resources Inventory.....	5.3-11
5.3.2.1    Resources Inventory .....	5.3-15
5.3.2.1.1    Archival Research.....	5.3-15
5.3.2.1.2    Archaeological Field Survey .....	5.3-23
5.3.2.1.3    Architectural Survey.....	5.3-24
5.3.2.1.4    Native American Consultation .....	5.3-24
5.3.3    Environmental Analysis.....	5.3-24
5.3.3.1    Significance Criteria .....	5.3-24
5.3.3.2    Construction Impacts .....	5.3-24
5.3.3.3    Operations Impacts .....	5.3-25
5.3.4    Cumulative Effects .....	5.3-25
5.3.5    Mitigation Measures .....	5.3-25
5.3.5.1    Undiscovered Archaeological Sites .....	5.3-25
5.3.5.1.1    Designated Cultural Resources Specialist .....	5.3-25
5.3.5.1.2    Construction Worker Training .....	5.3-26
5.3.5.1.3    Emergency Discovery .....	5.3-26
5.3.5.1.4    Site Recording and Evaluation .....	5.3-26
5.3.5.1.5    Mitigation Planning.....	5.3-26
5.3.5.1.6    Curation .....	5.3-26
5.3.5.1.7    Report of Findings.....	5.3-27
5.3.5.2    Inadvertent Discovery of Human Burials.....	5.3-27
5.3.6    Law, Ordinances, Regulations, and Standards.....	5.3-27
5.3.6.1    Federal LORS .....	5.3-29

5.3.6.2 State LORS .....	5.3-29
5.3.6.3 Local LORS .....	5.3-30
5.3.7 Agencies and Agency Contacts .....	5.3-30
5.3.8 Permits and Permit Schedule.....	5.3-31
5.3.9 References .....	5.3-32
5.4 Geological Hazards and Resources .....	5.4-1
5.4.1 Affected Environment.....	5.4-1
5.4.1.1 Regional Geology.....	5.4-1
5.4.1.1.1 Faulting and Seismicity .....	5.4-1
5.4.1.1.2 Local Geology and Stratigraphy.....	5.4-3
5.4.1.1.3 Seismic Setting .....	5.4-3
5.4.1.1.4 Potential Geologic Hazards.....	5.4-3
5.4.1.4.1 Ground Rupture .....	5.4-3
5.4.1.4.2 Seismic Shaking .....	5.4-3
5.4.1.4.3 Liquefaction.....	5.4-5
5.4.1.4.4 Mass Wasting .....	5.4-5
5.4.1.4.5 Subsidence .....	5.4-8
5.4.1.4.6 Expansive Soils.....	5.4-8
5.4.1.4.7 Tsunamis and Seiches .....	5.4-8
5.4.1.4.8 Permanent Slopes and Embankments .....	5.4-9
5.4.1.4.9 Collapse of Below Grade Features.....	5.4-9
5.4.1.4.10 Anthropologically Induced Seismicity .....	5.4-9
5.4.1.4.10.1 Reservoir Induced Seismicity .....	5.4-9
5.4.1.4.10.2 Compressed Air Induced Seismicity .....	5.4-10
5.4.1.5 Geologic Resources of Recreational, Commercial, or Scientific Value .....	5.4-10
5.4.2 Environmental Analysis.....	5.4-13
5.4.2.1 Significance Criteria .....	5.4-13
5.4.2.2 Geological Hazards.....	5.4-13
5.4.2.3 Geological Resources .....	5.4-14
5.4.3 Cumulative Effects .....	5.4-14

5.4.4	Mitigation Measures .....	5.4-14
5.4.5	Laws, Ordinances, Regulations, and Standards.....	5.4-15
5.4.6	Agencies and Agency Contacts.....	5.4-16
5.4.7	Permits and Permit Schedule.....	5.4-16
5.4.8	References.....	5.4-17
5.5	Hazardous Materials Handling .....	5.5-1
5.5.1	Affected Environment.....	5.5-1
5.5.1.1	Land Use .....	5.5-1
5.5.1.2	Hazardous Materials Use.....	5.5-1
5.5.1.2.1	Construction and Commissioning Phase.....	5.5-1
5.5.1.2.2	Operations Phase .....	5.5-1
5.5.2	Environmental Analysis.....	5.5-10
5.5.2.1	Significance Criteria .....	5.5-10
5.5.2.2	Transportation of Hazardous Materials.....	5.5-10
5.5.2.3	Hazardous Materials Use.....	5.5-11
5.5.2.3.1	Construction Phase.....	5.5-11
5.5.2.3.2	Project Operation .....	5.5-11
5.5.2.4	Accidental Release Hazards .....	5.5-12
5.5.2.4.1	Fire and Explosion Hazards.....	5.5-12
5.5.2.4.1.1	Construction.....	5.5-12
5.5.2.4.1.2	Operations .....	5.5-12
5.5.2.5	Schools and Sensitive Receptors .....	5.5-13
5.5.2.6	Cortese List .....	5.5-15
5.5.2.7	Effects on Emergency Response Plan .....	5.5-15
5.5.2.8	Summary of Significant Criteria.....	5.5-15
5.5.3	Cumulative Effects .....	5.5-15
5.5.4	Mitigation Measures .....	5.5-16
5.5.4.1	Construction Phase.....	5.5-16
5.5.4.1.1	Hazardous Material Use .....	5.5-16
5.5.4.1.2	Explosive Use .....	5.5-17

5.5.4.2 Operation Phase .....	5.5-17
5.5.4.2.1 Hazardous Materials.....	5.5-17
5.5.4.2.1.1 Sulfuric Acid.....	5.5-18
5.5.4.2.2 Petroleum Products .....	5.5-19
5.5.4.2.3 Transportation/Delivery of Hazardous Materials and Regulated Substances .....	5.5-19
5.5.4.2.4 Security Plan.....	5.5-19
5.5.4.3 Monitoring.....	5.5-19
5.5.4.4 Facility Closure.....	5.5-20
5.5.5 Laws, Ordinances, Regulations, and Standards.....	5.5-20
5.5.5.1 Federal LORS .....	5.5-25
5.5.5.1.1 29 CFR 1910 et seq. and 1926 et seq.....	5.5-25
5.5.5.1.2 49 CFR Parts 172, 173, and 179 .....	5.5-25
5.5.5.1.3 CERCLA .....	5.5-25
5.5.5.1.4 Clean Air Act .....	5.5-25
5.5.5.1.5 Clean Water Act.....	5.5-26
5.5.5.1.6 Commerce of Explosives and MSHA.....	5.5-26
5.5.5.2 State LORS .....	5.5-26
5.5.5.2.1 Title 8, CCR, Section 339; Section 3200 et seq., Section 5139 et seq., and Section 5160 et seq.....	5.5-26
5.5.5.2.2 Health and Safety Code Section 25500 .....	5.5-26
5.5.5.2.3 Health and Safety Code Section 25531 (CalARP) .....	5.5-27
5.5.5.2.4 Aboveground Petroleum Storage Act .....	5.5-27
5.5.5.2.5 Proposition 65 .....	5.5-27
5.5.5.2.6 Cal/OSHA Title 8.....	5.5-27
5.5.5.3 Local LORS.....	5.5-27
5.5.5.3.1 Kern County General Plan.....	5.5-27
5.5.5.3.2 Kern County and Incorporated Cities Hazardous Waste Management Plan .....	5.5-28
5.5.5.3.3 Kern County Public Health Services Department.....	5.5-28
5.5.5.4 Codes .....	5.5-28
5.5.6 Agencies and Agency Contacts .....	5.5-28

5.5.7	Permits and Permit Schedule.....	5.5-29
5.5.8	References.....	5.5-30
5.6	Land Use .....	5.6-1
5.6.1	Affected Environment.....	5.6-5
5.6.1.1	Existing Land Uses within the Study Area .....	5.6-5
5.6.1.2	Specific Land Uses within the Gem Study Area .....	5.6-9
5.6.1.2.1	Industrial .....	5.6-9
5.6.1.2.2	Commercial/General Office .....	5.6-9
5.6.1.2.3	Residential .....	5.6-9
5.6.1.2.4	Agricultural Use.....	5.6-10
5.6.1.2.5	Recreation.....	5.6-10
5.6.1.2.6	Open Space .....	5.6-13
5.6.1.2.7	Scenic Areas.....	5.6-13
5.6.1.2.8	Natural Resource Protection.....	5.6-13
5.6.1.2.9	Educational/Child Care/Nursing Home .....	5.6-14
5.6.1.2.10	Religious .....	5.6-14
5.6.1.2.11	Cultural and Historic.....	5.6-14
5.6.1.2.12	Unique Land Uses .....	5.6-14
5.6.1.3	General Plan Land Use Designations.....	5.6-14
5.6.1.3.1	General Plan Land Use Designations within the Study Area .....	5.6-14
5.6.1.3.2	General Plan Land Use Designations, GESC .....	5.6-18
5.6.1.4	Study Area Zoning .....	5.6-18
5.6.1.5	Project Site and Linear Zoning.....	5.6-18
5.6.1.6	Other Applicable Planning Documents .....	5.6-21
5.6.1.7	Recent Proposed Zone Changes and General Plan Amendments .....	5.6-21
5.6.1.8	Recent Discretionary Review by Public Agencies .....	5.6-21
5.6.1.9	Population and Growth Trends .....	5.6-21
5.6.2	Environmental Analysis.....	5.6-22
5.6.2.1	Significance Criteria .....	5.6-22
5.6.2.2	Potential Effects on Land Use during GESC Construction and Operation .....	5.6-22

5.6.2.2.1	Divide an Established Community .....	5.6-22
5.6.2.2.2	Conflict with an Applicable Land Use Plan, Policy, or Regulation.....	5.6-23
5.6.2.2.3	Conflict with an Applicable Habitat Conservation Plan.....	5.6-32
5.6.2.2.4	Convert Farmland to Nonagricultural Uses .....	5.6-32
5.6.2.2.5	Cause Changes that will Result in the Conversion of Farmland .....	5.6-32
5.6.2.3	Compatibility with Existing and Designated Land Uses and Applicable Planning Policies .....	5.6-32
5.6.3	Cumulative Effects .....	5.6-32
5.6.4	Mitigation Measures .....	5.6-33
5.6.5	Laws, Ordinances, Regulations, and Standards.....	5.6-33
5.6.5.1	Federal LORS .....	5.6-33
5.6.5.2	State LORS .....	5.6-33
5.6.5.2.1	Warren Alquist Act .....	5.6-33
5.6.5.2.2	California Land Conservation Act (Williamson Act) .....	5.6-33
5.6.5.3	Local LORS .....	5.6-33
5.6.6	Agencies and Agency Contacts .....	5.6-34
5.6.7	Permits and Permit Schedule.....	5.6-35
5.6.8	References .....	5.6-36
5.7	Noise .....	5.7-1
5.7.1	Fundamentals of Acoustics .....	5.7-1
5.7.2	Affected Environment.....	5.7-4
5.7.2.1	Local Land Use and Noise Sources.....	5.7-4
5.7.2.2	Ambient Noise Survey.....	5.7-5
5.7.3	Environmental Analysis.....	5.7-13
5.7.3.1	Significance Criteria .....	5.7-13
5.7.3.2	Construction Impacts .....	5.7-13
5.7.3.2.1	Center Construction Noise.....	5.7-13
5.7.3.2.2	Construction Vibration .....	5.7-17
5.7.3.2.3	Worker Exposure to Noise .....	5.7-17
5.7.3.3	Operational Impacts .....	5.7-17
5.7.3.3.1	Worker Exposure .....	5.7-17

5.7.3.3.2	Transmission Line and Switchyard Noise Levels .....	5.7-20
5.7.3.3.3	Plant Operational Noise Modeling .....	5.7-20
5.7.3.3.4	Ground and Airborne Vibration .....	5.7-25
5.7.4	Cumulative Effects .....	5.7-25
5.7.5	Mitigation Measures .....	5.7-27
5.7.5.1	Noise Hot Line.....	5.7-27
5.7.5.2	Noise Complaint Resolution.....	5.7-28
5.7.5.3	Construction Hours .....	5.7-28
5.7.5.4	Noise Barriers for Pump Sets.....	5.7-28
5.7.6	Laws, Ordinances, Regulations, and Standards.....	5.7-28
5.7.6.1	Federal LORS .....	5.7-30
5.7.6.1.1	EPA.....	5.7-30
5.7.6.1.2	Occupational Safety and Health Administration .....	5.7-30
5.7.6.2	State LORS .....	5.7-31
5.7.6.2.1	Cal/OSHA .....	5.7-31
5.7.6.2.2	California Vehicle Code .....	5.7-31
5.7.6.3	Local LORS.....	5.7-31
5.7.7	Agencies and Agency Contacts .....	5.7-31
5.7.8	References .....	5.7-32
5.8	Paleontological Resources.....	5.8-1
5.8.1	Affected Environment.....	5.8-1
5.8.1.1	Physiographic and Geologic Setting .....	5.8-4
5.8.1.2	Physiographic and Geologic Setting .....	5.8-4
5.8.1.2.1	Resource Inventory Methods.....	5.8-4
5.8.1.2.2	Resource Inventory Results.....	5.8-5
5.8.1.2.3	Geological Units in the Mojave Desert.....	5.8-5
5.8.1.2.4	Results of the Records Search and Literature Review.....	5.8-6
5.8.1.2.5	Results of the Field Survey.....	5.8-8
5.8.1.2.6	Paleontological Sensitivity of the GESC Right-of-Way.....	5.8-8
5.8.2	Environmental Analysis.....	5.8-9

5.8.2.1 Paleontological Resource Significance Criteria .....	5.8-9
5.8.2.2 Paleontological Resource Impact Assessment.....	5.8-10
5.8.2.2.1 Quaternary alluvium.....	5.8-10
5.8.2.2.2 Quaternary alluvial gravel and sand .....	5.8-10
5.8.2.2.3 Miocene-Pliocene Gem Hill Formation .....	5.8-10
5.8.3 Cumulative Effects .....	5.8-10
5.8.4 Mitigation Measures .....	5.8-11
5.8.4.1 Project Paleontological Resources Specialist.....	5.8-11
5.8.4.2 Construction Personnel Education.....	5.8-11
5.8.4.3 Develop and Implement a Paleontological Resources Monitoring and Mitigation Plan.....	5.8-11
5.8.4.4 Develop a Final Paleontological Resources Report .....	5.8-11
5.8.5 Laws, Ordinances, Regulations, and Standards.....	5.8-12
5.8.5.1 Federal LORS .....	5.8-12
5.8.5.2 State LORS .....	5.8-13
5.8.5.3 Local LORS .....	5.8-13
5.8.5.4 Professional Standards .....	5.8-13
5.8.6 Agencies and Agency Contacts .....	5.8-14
5.8.7 Permits and Permit Schedule.....	5.8-14
5.8.8 References .....	5.8-15
5.9 Public Health .....	5.9-1
5.9.1 Affected Environment.....	5.9-1
5.9.2 Environmental Analysis.....	5.9-5
5.9.2.1 Significant Criteria .....	5.9-5
5.9.2.1.1 Cancer Risk .....	5.9-5
5.9.2.1.2 Non-Cancer Risk.....	5.9-5
5.9.2.2 Construction and Commissioning Phase Effects .....	5.9-6
5.9.2.3 Operational Phase Effects .....	5.9-6
5.9.2.4 Public Health Effect Study Methods.....	5.9-10
5.9.2.5 Characterization of Risks from Toxic Air Pollutants .....	5.9-12
5.9.2.6 Hazardous Materials .....	5.9-20
5.9.2.7 Odors.....	5.9-20

5.9.2.8 Electromagnetic Field Exposure .....	5.9-20
5.9.2.9 Legionella.....	5.9-21
5.9.2.10 Summary of Effects.....	5.9-21
5.9.3 Cumulative Effects .....	5.9-21
5.9.4 Mitigation Measures .....	5.9-21
5.9.4.1 Criteria Pollutants.....	5.9-21
5.9.4.1.1 Toxic Pollutants.....	5.9-21
5.9.4.1.2 Legionella Mitigation Measure .....	5.9-21
5.9.4.2 Hazardous Materials .....	5.9-22
5.9.5 Laws, Ordinances, Regulations, and Standards.....	5.9-22
5.9.5.1 Federal LORS .....	5.9-22
5.9.5.2 State LORS .....	5.9-23
5.9.5.3 EKAPCD LORS.....	5.9-23
5.9.5.4 Permits Required and Schedule .....	5.9-23
5.9.5.5 Agencies Involved and Agency Contacts.....	5.9-23
5.9.6 References.....	5.9-25
5.10 Socioeconomics .....	5.10-1
5.10.1 Affected Environment.....	5.10-1
5.10.1.1 Population .....	5.10-1
5.10.1.2 Housing .....	5.10-5
5.10.1.3 Economy and Employment.....	5.10-5
5.10.1.4 Fiscal Resources.....	5.10-6
5.10.1.5 Education .....	5.10-7
5.10.1.6 Public Services and Facilities .....	5.10-8
5.10.1.6.1 Law Enforcement.....	5.10-8
5.10.1.6.2 Fire Protection.....	5.10-9
5.10.1.6.3 Emergency Response.....	5.10-9
5.10.1.6.4 Hospitals .....	5.10-9
5.10.1.7 Utilities.....	5.10-9
5.10.1.7.1 Electricity and Gas .....	5.10-9
5.10.1.7.2 Water.....	5.10-10

5.10.1.7.3 Wastewater Discharge.....	5.10-10
5.10.2 Environmental Analysis.....	5.10-10
5.10.2.1 Potential Environmental Impacts .....	5.10-10
5.10.2.2 Significance Criteria .....	5.10-10
5.10.2.3 Construction Impacts .....	5.10-11
5.10.2.3.1 Construction Workforce .....	5.10-11
5.10.2.3.2 Induce Substantial Growth or Concentration of Population.....	5.10-17
5.10.2.3.3 Displace a Large Number of People or Impact Existing Housing.....	5.10-17
5.10.2.3.4 Result in Substantial Adverse Impacts on the Local Economy and Employment .....	5.10-18
5.10.2.3.5 Create Adverse Fiscal Impacts in the Community.....	5.10-19
5.10.2.3.6 Result in Substantial Adverse Impacts on Educational Facilities .....	5.10-19
5.10.2.3.7 Result in Substantial Adverse Impacts on Provision of Utility Services .....	5.10-20
5.10.2.3.8 Result in Substantial Adverse Impact on the Provision of Public Services .....	5.10-20
5.10.2.4 Operational Impacts.....	5.10-20
5.10.2.4.1 Operational Workforce .....	5.10-20
5.10.2.4.2 Induce Substantial Growth or Concentration of Population.....	5.10-20
5.10.2.4.3 Displace a Large Number of People or Impact Existing Housing.....	5.10-21
5.10.2.4.4 Result in Substantial Adverse Impacts on the Local Economy and Employment .....	5.10-21
5.10.2.4.5 Create Adverse Fiscal Impacts on the Community .....	5.10-22
5.10.2.4.6 Result in Substantial Adverse Impacts on Educational Facilities .....	5.10-22
5.10.2.4.7 Result in Substantial Adverse Impacts on Provision of Utility Services .....	5.10-22
5.10.2.4.8 Result in Substantial Adverse Impacts on the Provision of Public Services .....	5.10-22
5.10.2.4.9 Environmental Justice.....	5.10-22
5.10.3 Cumulative Effects .....	5.10-23
5.10.4 Mitigation Measures .....	5.10-23
5.10.5 Laws, Ordinances, Regulations, and Standards.....	5.10-23
5.10.5.1 Federal LORS .....	5.10-24
5.10.5.2 State LORS .....	5.10-25
5.10.5.3 Local LORS.....	5.10-25
5.10.5.3.1 Kern County .....	5.10-25

5.10.6 Agencies and Agency Contacts .....	5.10-25
5.10.7 Permits and Permit Schedule.....	5.10-26
5.10.8 References .....	5.10-27
5.11 Soils.....	5.11-1
5.11.1 Affected Environment.....	5.11-1
5.11.1.1 Agricultural Use.....	5.11-4
5.11.1.2 Wetlands .....	5.11-4
5.11.1.3 NRCS Soil Map Units.....	5.11-4
5.11.1.4 Potential for Soil Loss and Erosion .....	5.11-4
5.11.1.5 Other Significant Soil Characteristics.....	5.11-5
5.11.1.5.1 Expansive Soils.....	5.11-5
5.11.1.5.2 Liquefaction Risk.....	5.11-5
5.11.1.5.3 Potential for Shallow Groundwater .....	5.11-6
5.11.1.5.4 Potential for Organic Soils .....	5.11-6
5.11.1.5.5 Potential for Soil Contamination .....	5.11-6
5.11.2 Environmental Analysis.....	5.11-6
5.11.2.1 Significance Criteria .....	5.11-6
5.11.2.2 Farmland Conversion.....	5.11-7
5.11.2.3 Jurisdictional Wetlands .....	5.11-7
5.11.2.4 Soil Erosion during Construction.....	5.11-7
5.11.2.4.1 Water Erosion .....	5.11-7
5.11.2.4.2 Wind Erosion.....	5.11-7
5.11.2.5 Other Significant Soil Properties .....	5.11-8
5.11.2.6 Compaction during Construction and Operation.....	5.11-8
5.11.2.7 Effects of Emissions on Soil-Vegetation Systems .....	5.11-8
5.11.3 Cumulative Effects .....	5.11-8
5.11.4 Mitigation Measures .....	5.11-9
5.11.5 Laws, Ordinances, Regulations, and Standards.....	5.11-10
5.11.5.1 Federal LORS .....	5.11-10
5.11.5.1.1 Federal Clean Water Act.....	5.11-10
5.11.5.1.2 U.S. Department of Agriculture Engineering Standards .....	5.11-10

5.11.5.2 State LORS .....	5.11-11
5.11.5.2.1 California Porter-Cologne Water Quality Control Act .....	5.11-11
5.11.5.2.2 Uniform Building Code .....	5.11-11
5.11.5.3 Local LORS.....	5.11-11
5.11.6 Agencies and Agency Contacts .....	5.11-12
5.11.7 Permits and Permit Schedule.....	5.11-12
5.11.8 References.....	5.11-13
5.12 Traffic and Transportation .....	5.12-1
5.12.1 Affected Environment.....	5.12-1
5.12.1.1 Existing Regional and Local Transportation Facilities .....	5.12-4
5.12.1.1.1 Pedestrian .....	5.12-4
5.12.1.1.2 Bicycle Facilities .....	5.12-4
5.12.1.1.3 Public Transportation.....	5.12-5
5.12.1.1.4 Rail Traffic .....	5.12-5
5.12.1.1.5 Air Traffic .....	5.12-5
5.12.1.2 Existing Traffic Conditions and Level of Service.....	5.12-6
5.12.1.2.1 Existing Roadway Conditions .....	5.12-8
5.12.1.2.2 Existing Roadway Conditions .....	5.12-10
5.12.1.2.3 Truck Routes – Weight and Load Limitations.....	5.12-13
5.12.1.3 Other Projects .....	5.12-17
5.12.1.3.1 Future Plans and Projects .....	5.12-17
5.12.1.4 Pedestrian/Bicycle Facilities .....	5.12-17
5.12.1.5 Public Transportation .....	5.12-19
5.12.1.6 Rail Traffic .....	5.12-19
5.12.1.7 Air Traffic .....	5.12-19
5.12.2 Environmental Analysis.....	5.12-21
5.12.2.1 Significance Criteria.....	5.12-21
5.12.2.1.1 Project Specific Impacts .....	5.12-22
5.12.2.1.2 Construction Traffic Generation.....	5.12-22
5.12.2.1.3 Construction Traffic Distribution.....	5.12-24

5.12.2.1.4	Roadway LOS with Construction Traffic.....	5.12-26
5.12.2.1.5	Intersection LOS with Construction Traffic .....	5.12-26
5.12.2.2	Linear Facility Construction Impacts.....	5.12-28
5.12.2.3	Transport of Hazardous Materials .....	5.12-28
5.12.2.4	Public Safety .....	5.12-29
5.12.2.5	Air Traffic .....	5.12-29
5.12.2.6	Emergency Vehicle Access .....	5.12-29
5.12.2.7	Parking .....	5.12-29
5.12.2.8	VMT Impacts.....	5.12-29
5.12.3	Cumulative Effects .....	5.12-31
5.12.4	Mitigation Measures .....	5.12-31
5.12.5	Laws, Ordinances, Regulations, and Standards.....	5.12-31
5.12.5.1	Federal LORS .....	5.12-31
5.12.5.2	State LORS .....	5.12-32
5.12.5.3	Local LORS.....	5.12-32
5.12.6	Agencies and Agency Contacts .....	5.12-35
5.12.7	Permits and Permit Schedule .....	5.12-36
5.12.8	References.....	5.12-38
5.13	Visual Resources .....	5.13-1
5.13.1	Introduction.....	5.13-1
5.13.2	Affected Environment.....	5.13-4
5.13.2.1	Regional Setting.....	5.13-4
5.13.2.2	Project Site.....	5.13-5
5.13.2.3	Construction Laydown Area.....	5.13-5
5.13.2.4	Project Assessment Area.....	5.13-5
5.13.2.4.1	Project Viewshed and Visibility .....	5.13-5
5.13.3	Environmental Analysis.....	5.13-8
5.13.3.1	Analysis Procedure and Methodology .....	5.13-8
5.13.3.1.1	Regulatory Setting .....	5.13-8
5.13.3.1.2	Photographic Survey.....	5.13-8
5.13.3.1.3	Key Observation Points .....	5.13-8

5.13.3.1.4 Viewers and Exposure .....	5.13-10
5.13.3.1.5 Visual Impact Analysis .....	5.13-11
5.13.3.1.5.1 Visual Resources Inventory .....	5.13-11
5.13.3.1.5.2 Landscape Modelling .....	5.13-12
5.13.3.1.5.3 Visual Contrast Rating .....	5.13-12
5.13.3.1.5.4 Visual Impact Assessment .....	5.13-12
5.13.3.1.6 Lighting Assessment .....	5.13-13
5.13.3.2 Impact Evaluation Criteria .....	5.13-14
5.13.3.3 Project Appearance .....	5.13-14
5.13.3.3.1 Project Structures, Dimensions, and Materials .....	5.13-14
5.13.3.3.2 Construction Laydown Area .....	5.13-16
5.13.3.3.3 Lighting .....	5.13-16
5.13.3.3.4 Water Vapor Plumes .....	5.13-16
5.13.3.4 Assessment of Visual Effects .....	5.13-16
5.13.3.4.1 Key Observation Points .....	5.13-16
5.13.3.4.2 Lighting Effects .....	5.13-19
5.13.3.5 Impact Significance .....	5.13-21
5.13.4 Cumulative Effects .....	5.13-21
5.13.5 Mitigation Measures .....	5.13-22
5.13.6 Laws, Ordinances, Regulations, and Standards .....	5.13-22
5.13.7 Agencies and Agency Contacts .....	5.13-23
5.13.8 Permits and Permit Schedule .....	5.13-24
5.13.9 References .....	5.13-25
5.14 Waste Management .....	5.14-1
5.14.1 Affected Environment .....	5.14-1
5.14.1.1 Site Investigations .....	5.14-1
5.14.1.2 Project Waste Generation .....	5.14-1
5.14.1.2.1 Pre-Construction and Construction Waste Streams .....	5.14-1
5.14.1.2.2 Operation Waste Streams .....	5.14-6
5.14.2 Environmental Analysis .....	5.14-9

5.14.2.1	Significance Criteria .....	5.14-9
5.14.2.2	Cortese List .....	5.14-9
5.14.2.3	Solid Waste Disposal .....	5.14-10
5.14.2.3.1	Nonhazardous Waste Disposal .....	5.14-10
5.14.2.3.2	Hazardous Waste Disposal.....	5.14-13
5.14.2.4	Waste Disposal Summary.....	5.14-14
5.14.3	Cumulative Effects .....	5.14-14
5.14.4	Mitigation and Waste Management Methods.....	5.14-14
5.14.4.1	Construction Phase Mitigation Measures .....	5.14-15
5.14.4.1.1	Nonhazardous Wastes Mitigation Measures .....	5.14-15
5.14.4.1.2	Hazardous Wastes Mitigation Measures .....	5.14-16
5.14.4.2	Operation Phase Mitigation Measures.....	5.14-16
5.14.4.2.1	Nonhazardous Waste Mitigation Measures .....	5.14-16
5.14.4.2.2	Hazardous Waste Mitigation Measures .....	5.14-17
5.14.4.3	Facility Closure.....	5.14-18
5.14.4.3.1	Temporary Closure .....	5.14-18
5.14.4.3.2	Permanent Closure .....	5.14-19
5.14.4.3.3	Monitoring .....	5.14-19
5.14.5	Laws, Ordinances, Regulations, and Standards.....	5.14-19
5.14.5.1	Federal LORS .....	5.14-21
5.14.5.2	State LORS .....	5.14-22
5.14.5.3	Local LORS.....	5.14-22
5.14.5.3.1	Kern County General Plan .....	5.14-22
5.14.5.3.2	The Willow Springs Site-Specific Plan.....	5.14-23
5.14.5.4	Codes.....	5.14-23
5.14.6	Agencies and Agency Contacts .....	5.14-23
5.14.7	Permits and Permit Schedule.....	5.14-24
5.14.8	References Cited or Consulted.....	5.14-25
5.15	Water Resources .....	5.15-3
5.15.1	Affected Environment.....	5.15-4

5.15.1.1	Water Features, Climate, and Drainage .....	5.15-4
5.15.1.2	Groundwater .....	5.15-4
5.15.1.2.1	Groundwater Use.....	5.15-7
5.15.1.2.2	Groundwater Level and Flow.....	5.15-8
5.15.1.3	Water Quality .....	5.15-8
5.15.1.4	Flooding Potential .....	5.15-9
5.15.1.5	Water Supply.....	5.15-10
5.15.1.5.1	Process Water .....	5.15-11
5.15.1.5.2	Construction Phase.....	5.15-11
5.15.1.5.3	Process Water Quality .....	5.15-15
5.15.1.5.4	Domestic Water Supply .....	5.15-16
5.15.1.6	Wastewater Collection, Treatment, Discharge, and Disposal .....	5.15-16
5.15.1.6.1	Construction Phase.....	5.15-16
5.15.1.6.2	Operations Phase .....	5.15-17
5.15.1.7	Stormwater.....	5.15-19
5.15.2	Environmental Analysis.....	5.15-19
5.15.2.1	Water Supply.....	5.15-20
5.15.2.2	Wastewater Collection, Treatment, Discharge, and Disposal .....	5.15-20
5.15.2.3	Stormwater Runoff and Drainage .....	5.15-20
5.15.2.4	Compensation Reservoir .....	5.15-21
5.15.3	Cumulative Effects .....	5.15-21
5.15.4	Mitigation Measures .....	5.15-21
5.15.5	Laws, Ordinances, Regulations, and Standards.....	5.15-22
5.15.5.1	Federal LORS .....	5.15-23
5.15.5.2	State LORS .....	5.15-24
5.15.5.2.1	California Porter-Cologne Water Quality Control Act .....	5.15-24
5.15.5.2.2	NPDES Permit for Wastewater and Municipal Discharges .....	5.15-24
5.15.5.2.3	NPDES Construction Stormwater Permit .....	5.15-24
5.15.5.2.4	NPDES Stormwater Industrial General Permit .....	5.15-24
5.15.5.2.5	DSOD Permit .....	5.15-24
5.15.5.3	Local LORS.....	5.15-24

5.15.6 Agency Contacts, Permits, and Permit Schedule .....	5.15-26
5.15.7 References.....	5.15-27
5.16 Worker Health and Safety .....	5.16-1
5.16.1 Setting .....	5.16-1
5.16.2 Health and Safety Program.....	5.16-1
5.16.2.1 Environmental Checklist .....	5.16-1
5.16.2.2 Hazard Analysis .....	5.16-1
5.16.2.3 Training and Safety Programs .....	5.16-7
5.16.2.3.1 Construction Health and Safety Program .....	5.16-7
5.16.2.3.2 Operation Health and Safety Program.....	5.16-15
5.16.2.3.3 Safety Training.....	5.16-21
5.16.2.4 Fire Protection.....	5.16-24
5.16.3 Laws, Ordinances, Regulations, and Standards.....	5.16-25
5.16.4 Agencies and Agency Contacts .....	5.16-33
5.16.5 Permits and Permit Schedule.....	5.16-34
5.16.6 References .....	5.16-35
<b>6.0 ALTERNATIVES .....</b>	<b>6-1</b>
6.1 Project Objectives .....	6-1
6.2 The “No Project” Alternative.....	6-3
6.3 Power Plant Site Alternatives.....	6-4
6.3.1 Proposed Project Site .....	6-6
6.3.2 Alternative 1 – BLM Site .....	6-6
6.3.3 Alternative 2 – Little Buttes Site .....	6-7
6.3.4 Alternate Site 3 - Rosamond Hills Site.....	6-8
6.3.5 Alternative Site Summary .....	6-8
6.4 Alternative Project Design Features .....	6-10
6.4.1 Electrical Transmission Line Route Alternatives.....	6-10
6.4.2 Water Supply Source Alternatives .....	6-12
6.4.2.1 Ocean Water.....	6-12
6.4.2.2 Reclaimed Water .....	6-12

Table of Contents	Application for Certification (AFC) Gem Energy Storage Center	
6.4.2.3	Water from State Water Project.....	6-12
6.4.3	Excavated Rock Recycle or Disposal Alternative .....	6-13
6.4.3.1	Recycle for Additional Onsite Beneficial Use.....	6-13
6.4.3.2	Disposal at Offsite Landfill .....	6-13
6.5	Technology Alternatives.....	6-13
6.5.1	Conventional and Renewable Generation Technology Alternatives .....	6-13
6.5.2	Energy Storage Alternatives .....	6-14
6.5.2.1	Battery Storage Systems .....	6-14
6.5.2.2	Pumped Hydro Storage .....	6-14
6.5.2.3	Traditional Compressed Air Energy Storage .....	6-14
6.6	References.....	6-16

## TABLES

Table 2-1: Preliminary Building Square Footage.....	2-2
Table 2-2: Energy Storage Process Steps .....	2-10
Table 2-3: Heat Exchangers <sup>1</sup> .....	2-15
Table 2-4: Cavern Design.....	2-16
Table 2-5: Reverse Osmosis and Boiler Feedwater Purity Requirements.....	2-21
Table 2-6: Major Project Milestones .....	2-28
 Table 3-1: Design and Construction LORS for the Proposed Transmission Line and Switchyard .....	3-16
Table 3-2: Electric and Magnetic Fields LORS .....	3-17
Table 3-3: Hazardous Shock LORS .....	3-17
Table 3-4: Communications Interference .....	3-17
Table 3-5: Aviation Safety LORS.....	3-18
Table 3-6: Fire Hazard LORS .....	3-18
Table 3-7: National, State and Local Jurisdiction over Applicable LORS .....	3-19
 Table 5.1-1: Facility PTE Summary and Major Source/Attainment Status for Operation .....	5.1-3
Table 5.1-2: Equipment Specification.....	5.1-5
Table 5.1-3: Emission Unit Specification .....	5.1-6
Table 5.1-4: Chemical Substances Potentially Emitted to the Air from the GESC.....	5.1-9
Table 5.1-5: Facility Maximum Emission Rate and PTE Summary for Operation of One Generator .....	5.1-9

<u>Table of Contents</u>	<u>Application for Certification (AFC) Gem Energy Storage Center</u>
Table 5.1-6: Air Dispersion Modeling Receptors.....	5.1-15
Table 5.1-7: California and National Ambient Air Quality Standards .....	5.1-18
Table 5.1-8: Measured Ambient Air Quality (Background).....	5.1-21
Table 5.1-9: Stack Parameters and Emission Rates for Each Generator.....	5.1-23
Table 5.1-10: Air Quality Impact Results - Significant Impact Levels.....	5.1-23
Table 5.1-11: Air Quality Impact Results - Ambient Air Quality Standards .....	5.1-24
Table 5.1-12: Agency, Contacts, Jurisdictional Involvement, Required Permits for Air Quality.....	5.1-28
 Table 5.2-1: Jurisdictional Waters Within the Project Site.....	5.2-4
Table 5.2-2: Biological Surveys Conducted.....	5.2-10
Table 5.2-3: Swainson's Hawk Survey Dates and Personnel for GESC Site .....	5.2-11
Table 5.2-4: Focused Swainson's Hawk Survey Results .....	5.2-12
Table 5.2-5: Burrowing Owl Survey Dates and Personnel for GESC Site .....	5.2-13
Table 5.2-6: Rare Plant Survey Dates and Personnel for GESC Site.....	5.2-15
Table 5.2-7: Acreage of Land Use and Vegetation Communities .....	5.2-16
Table 5.2-8 - Laws, Ordinances, Regulations, and Standards for Biological Resources.....	5.2-34
Table 5.2-9: Regulatory Agency Contacts for Biological Resources.....	5.2-40
 Table 5.3-1: Previous Cultural Studies within One-Half-Mile of the Project Area .....	5.3-16
Table 5.3-2: Historic Built-Environment Resources in the Project area .....	5.3-21
Table 5.3-3: Laws, Ordinances, Regulations, and Standards for Cultural Resources .....	5.3-27
Table 5.3-4: Agency Contacts for Cultural Resources .....	5.3-30
 Table 5.4-1: Laws, Ordinances, Regulations, and Standards for Geological Hazards and Resources.....	16
 Table 5.6-1: Parcel numbers and land uses descriptions adjacent to GESC. ....	5.6-7
Table 5.6-2: General land use designations within the Study Area .....	5.6-16
Table 5.6-3: Zoning districts within the Study Area .....	5.6-18
Table 5.6-4: Project conformity with Local Land Use Plans and Policies .....	5.6-24
Table 5.6-5: LORS for Land Use .....	5.6-34
Table 5.6-6: Agency Contacts for Land Use.....	5.6-34

Table of Contents	Application for Certification (AFC) Gem Energy Storage Center
Table 5.7-1: Sound Pressure Levels of Typical Sounds Sources .....	5.7-3
Table 5.7-2: Sound Pressure Levels of Typical Environments.....	5.7-4
Table 5.7-3: Monitoring Locations Included in the Baseline Noise Study .....	5.7-5
Table 5.7-4: Noise Summary Table Baseline Ambient Sound Pressure Levels .....	5.7-8
Table 5.7-5: Summary of Long-term Sound Pressure Levels (dBA) .....	5.7-9
Table 5.7-6: Noise Model Configuration Parameters .....	5.7-14
Table 5.7-7: Construction Noise Source Data.....	5.7-16
Table 5.7-8: Modeled Construction Noise Levels at Residential Receptors .....	5.7-18
Table 5.7-9: Noise Model Configuration Parameters .....	5.7-20
Table 5.7-10: Operations Noise Source and Reduction Indices Data.....	5.7-22
Table 5.7-11: Modeled Operational Noise Levels at Residential Receptors.....	5.7-23
Table 5.7-12: Modeled and Predicted Noise Levels at Boundary and Residential Receptors.....	5.7-26
Table 5.7-13: Summary of LORS for Noise.....	5.7-29
 Table 5.8-1: Records Search Results from Natural History Museum of Los Angeles County .....	5.8-6
Table 5.8-2: Paleontological Resource Sensitivity .....	5.8-9
Table 5.8-3: LORS Applicable to Paleontological Resources .....	5.8-12
Table 5.8-4: Agency Contacts for Paleontological Resources .....	5.8-14
 Table 5.9-1: HRA Receptors .....	5.9-3
Table 5.9-2: Gem Emission Sources for Operation Phase .....	5.9-7
Table 5.9-3: Chemical Substances Potentially Emitted to the Air from the Gem .....	5.9-9
Table 5.9-4: Toxic Pollutant Emissions Estimates for Operation Phase .....	5.9-9
Table 5.9-5: Toxicity Values Used to Characterize Health Risks (Inhalation).....	5.9-11
Table 5.9-6: Health Effects Significant Threshold Levels for EKAPCD.....	5.9-12
Table 5.9-7: Health Risk Assessment Summary.....	5.9-13
Table 5.9-8: Agency Contacts for Public Health.....	5.9-24
 Table 5.10-1: Historical and Project Populations .....	5.10-2
Table 5.10-2: Historical and Projected Annual Population Growth .....	5.10-2
Table 5.10-3: Housing Estimates by County and State as of January 1, 2021.....	5.10-5
Table 5.10-4: Employment Distribution in Kern County, 2015-2019. ....	5.10-5
Table 5.10-5: Employment Data, Annual Average 2019 & 2020. ....	5.10-6

Table of Contents	Application for Certification (AFC) Gem Energy Storage Center
Table 5.10-6: Kern County Fund Revenues and Expenditures.....	5.10-6
Table 5.10-7: Historic and Current Enrollment by Grade .....	5.10-8
Table 5.10-8: Construction Workforce Personnel for Months 1-24 .....	5.10-12
Table 5.10-9: Construction Workforce Personnel for Months 25-60 .....	5.10-14
Table 5.10-10: Available Labor Skill in Bakersfield Metropolitan Area, Kern County, 2018-2028 .....	5.10-17
Table 5.10-11: Labor Union Contacts in Kern County.....	5.10-17
Table 5.10-12: Summary of Estimated Construction Expenditures over 60 Month Period (2021 \$s) .....	5.10-18
Table 5.10-13: Total Multipliers – Industry Aggregations RIMSII Multipliers Used in Analysis.....	5.10-19
Table 5.10-14: Annual Final Demand Multipliers Impacts from Project Operations Payroll (2021\$) .....	5.10-21
Table 5.10-15: Annual Direct Multipliers Impacts from Project Operations Payroll (2021\$) .....	5.10-21
Table 5.10-16: LORS for Socioeconomics .....	5.10-24
Table 5.10-17: Agency Contacts for Socioeconomics.....	5.10-25
 Table 5.11-1: NRCS Soil Map Unit Descriptions.....	 5.11-2
Table 5.11-2: Laws, Ordinances, Regulations, and Standards for Soils.....	5.11-10
Table 5.11-3: Permits and Agency Contacts for Soils.....	5.11-12
 Table 5.12-1: Level of Service Definitions for Local Roadway Segments.....	 5.12-9
Table 5.12-2: Existing Conditions on Study Roadway Segments .....	5.12-9
Table 5.12-3: Level of Service Definitions for Signalized Intersections .....	5.12-10
Table 5.12-4: Level of Service Definitions for Stop Controlled Intersections .....	5.12-11
Table 5.12-5: Intersection Level of Service – Existing Conditions .....	5.12-13
Table 5.12-6: Bicycle Facilities Planned for the Rosamond Area .....	5.12-18
Table 5.12-7: Trip Generation .....	5.12-22
Table 5.12-8: Top 10 Residential Locations for Workers .....	5.12-24
Table 5.12-9: Roadway Capacity Analysis .....	5.12-27
Table 5.12-10: Intersection Level of Service - Construction Phase Conditions .....	5.12-29
Table 5.12-11: Computation of Average VMT for People Employed in Rosamond.....	5.12-31
Table 5.12-12: Computation of VMT/Employee for GESC Workers Residing in Hotels .....	5.12-31
Table 5.12-13: Computation of VMT/Employee for Workers Residing in Hotels after Mitigation.....	5.12-32
Table 5.12-14: Agency Contacts for Traffic and Transportation .....	5.12-36
Table 5.12-15: Permits and Permit Schedule for Traffic and Transportation .....	5.12-38

Table of Contents	Application for Certification (AFC) Gem Energy Storage Center
Table 5.13-1: Key Observation Points .....	5.13-9
Table 5.13-2: Environmental Lighting Zone Classification for Sky Glow.....	5.13-13
Table 5.13-3: Project Site Components Approximate Dimension, Materials, and Finishes .....	5.13-14
Table 5.13-4: Transmission Line Components Approximate Dimension, Materials, and Finishes .....	5.13-15
Table 5.13-5: Visual Contrast and Visual Impact for Key Observation Points .....	5.13-17
Table 5.13-6: Environmental Light Classification for Light Receptors.....	5.13-20
Table 5.13-7: Agency Contacts for Visual Resources.....	5.13-23
Table 5.14-1: Potential Wastes Generated during Construction.....	5.14-3
Table 5.14-2: Potential Wastes Generated during Operations.....	5.14-6
Table 5.14-3 Solid Waste Disposal Facilities in the Vicinity of GESC.....	5.14-10
Table 5.14-4 Viable Excavated Soil and Bedrock Disposal Locations in the Vicinity of GESC .....	5.14-11
Table 5.14-5: LORs for Waste Management.....	5.14-20
Table 5.14-6: Agency Contacts for Waste Management.....	5.14-23
Table 5.15-1: Yearly Water Balance.....	5.15-13
Table 5.15-2: Expected Source Water Quality .....	5.15-17
Table 5.15-3: Blowdown Water Quality (Expected Maximum Concentrations).....	5.15-19
Table 5.15-4: Potential Wastewater Generated during Operations .....	5.15-20
Table 5.15-5: LORS of Water Resources.....	5.15-23
Table 5.15-6: Agency Contacts, Permits, and Permit Schedule .....	5.15-27
Table 5.16-1: Construction Hazard Analysis for the Gem Energy Storage Facility.....	5.16-2
Table 5.16-2: Operation Hazard Analysis for the Gem Energy Storage Facility .....	5.16-5
Table 5.16-3: Construction Training Program .....	5.16-22
Table 5.16-4: Operations Training Program .....	5.16-23
Table 5.16-5: Estimation of Demand for Fire Area .....	5.16-25
Table 5.16-6: Estimation of Available Water for Fire Demand .....	5.16-25
Table 5.16-7: Laws, Ordinances, Regulations, and Standards for Worker Health and Safety .....	5.16-26
Table 5.16-8: Agency Contacts for Worker Health and Safety .....	5.16-34
Table 5.16-9: Applicable Permits for Worker Health and Safety.....	5.16-34
Table 6-1: Alternative Site Summary .....	6-9

**FIGURES**

Figure 1-1: Existing Site Conditions .....	1-3
Figure 1-2: Architectural Rending of Gem Energy Storage Center.....	1-4
Figure 1-3: Project Location Map .....	1-7
Figure 1-4: Project Site and Facilities Map.....	1-8
Figure 2-1: Site Plan .....	2-4
Figure 2-2: General Arrangement.....	2-5
Figure 2-3: Facility Elevation Views.....	2-6
Figure 2-4: Elevation View 1 - Turbine Hall, Electrical Gallery & Control Room.....	2-7
Figure 2-5: Elevation View 2 - East Looking and West Looking.....	2-8
Figure 2-6: Elevation View 3 - North Looking and South Looking.....	2-9
Figure 3-1: Representative Transmission Pole .....	3-2
Figure 3-2: Gem Electrical One-Line Diagram .....	3-4
Figure 3-3: Gem 69 kV Protection SLD Sheet 1 .....	3-5
Figure 3-4: Gem 69 kV Protection SLD Sheet 2 .....	3-6
Figure 5.1-1: Location of Gem Site.....	5.1-4
Figure 5.1-2: Location of Gem Emission Sources during Operation Phase.....	5.1-7
Figure 5.1-3: Location of Ambient Boundary and Closest Receptors for Air Dispersion Modeling.....	5.1-16
Figure 5.1-4: Location of Grid Receptors for Air Dispersion Modeling.....	5.1-17
Figure 5.2-1a: National Wetlands Inventory - 10 mile buffer .....	5.2-46
Figure 5.2-1b: Jurisdictional Survey Literature Review.....	5.2-47
Figure 5.2-1c: Jurisdictional Survey Literature Review .....	5.2-48
Figure 5.2-2: Protected AreasFigure 5.2-3a: Sensitive Habitat.....	5.2-49
Figure 5.2-3b: Critical Habitat.....	5.2-51
Figure 5.2-4: Potentially Occurring Special-Status Species.....	5.2-52
Figure 5.2-5: Vegetation (1 of 7).....	5.2-53
Figure 5.2-5: Vegetation (2 of 7).....	5.2-54
Figure 5.2-5: Vegetation (3 of 7).....	5.2-55

Table of Contents	Application for Certification (AFC) Gem Energy Storage Center
Figure 5.2-5: Vegetation (4 of 7).....	5.2-56
Figure 5.2-5: Vegetation (5 of 7).....	5.2-57
Figure 5.2-5: Vegetation (6 of 7).....	5.2-58
Figure 5.2-5: Vegetation (7 of 7).....	5.2-59
 Figure 5.3-1: Location Map (Western Portion of the Project Area) .....	5.3-2
Figure 5.3-2: Location Map (Eastern Portion of the Project Area) .....	5.3-3
 Figure 5.5-1: Sensitive Receptor Survey.....	5.5-14
 Figure5.6-1: Site Vicinity Map with Transmission Preferred Alternative .....	5.6-2
Figure5.6-2: Site Vicinity Map for the Preferred Alternative. ....	5.6-3
Figure5.6-3: Site Vicinity Map for Transmission Line Alternative.....	5.6-4
Figure 5.6-4: Parcel Boundary Map.....	5.6-6
Figure 5.6-5: Agriculture and Prime Farmland Map. ....	5.6-12
Figure 5.6-6: Existing Land Use Designation Map.....	5.6-15
 Figure 5.7-1: Noise Monitoring Locations .....	5.7-6
Figure 5.7-2: Long-Term Baseline Sound Pressure Levels, One Minute Intervals.....	5.7-10
Figure 5.7- 3: Construction Noise Modeling Impacts .....	5.7-19
Figure 5.7-4: Operational Noise Modeling Impacts Tonal Noise.....	5.7-24
 Figure 5.8-1: Project Location (Western Portion) .....	5.8-2
Figure 5.8-2: Project Location (Eastern Portion) .....	5.8-3
Figure 5.8-3: Geologic Units of Willow Springs .....	5.8-7
 Figure 5.9-1: Location of Receptors for Health Risk Assessment: Location of Receptors for Health Risk Assessment .....	5.9-4
Figure 5.9-2: Location of Gem Emission Sources during Operation Phase.....	5.9-8
Figure 5.9-3: 30-Year Cancer Isopleths and Locations for PMI, MEIR, and Maximum Sensitive Receptor....	5.9-15
Figure 5.9-4: 25-Year Cancer Location of MEIW .....	5.9-16
Figure 5.9-5: Annual Chronic Hazard Locations for PMI, MEIR, MEIW and Maximum Sensitive Receptor....	5.9-17
Figure 5.9-6: Acute Hazard Index Locations of PMI, MEIR, MEIW, and Maximum Sensitive Receptor.....	5.9-18

Figure 5.10-1 Low Income Community Map.....	5.10-3
Figure 5.11-1:NRCS Soil Map: NRCS Soil Map.....	5.11-3
Figure 5.12-1: Project Location .....	5.12-2
Figure 5.12-2: Study Roadway Segments and Intersection .....	5.12-3
Figure 5.12-3: Existing Volumes at Study Intersections .....	5.12-7
Figure 5.12-4: Truck Route from Ports of Los Angeles and Long Beach.....	5.12-12
Figure 5.12-5: Truck Route from Port of Oakland .....	5.12-15
Figure 5.12-6: High-Speed Rail Alignment in Relation to GESC .....	5.12-16
Figure 5.12-7: Construction Traffic by Month .....	5.12-20
Figure 5.12-8: Distribution of Project Workers' Place of Residence .....	5.12-23
Figure 5.12-9: Project Trip Distribution During Construction.....	5.12-25
Figure 5.12-10: Volumes at Study Intersections (Construction Phase Conditions) .....	5.12-27
Figure 5.13-1: Project Location .....	5.13-2
Figure 5.13-2: Viewshed and Viewing Distance.....	5.13-3
Figure 5.13-3: Key Observation Point and Light Receptor Locations .....	5.13-7
Figure 5.15-1: Antelope Valley Watershed.....	5.15-4
Figure 5.15-2: Antelope Valley Adjudication Area and Management Subareas .....	5.15-5
Figure 5.13-3: Groundwater Wells.....	5.15-6
Figure 5.15-4: Flood Zone Potential .....	5.15-9
Figure 5.15-5: Water Balance.....	5.15-12
Figure 5.15-6: Plant Capacity vs Excess Water Production.....	5.15-13
Figure 5.15-7: Seasonal Water Inventory for Various Capacity Factors .....	5.15-14
Figure 6-1: Alternative Project Site Locations .....	6-5

## APPENDICES

### Appendix 1 Introduction

#### APPENDIX 1A

Assessor's Parcel Map

#### APPENDIX 1B

Property Owners List

#### APPENDIX 1C

Persons who Prepared the AFC

## APPENDIX 2 PROJECT DESCRIPTION

#### APPENDIX 2A

Engineering Design Criteria

#### APPENDIX 2B

Construction Schedule

#### APPENDIX 2C

Heat and Mass Balance Diagrams

#### APPENDIX 2D

Water Balance Diagrams and Construction Water Use

#### APPENDIX 2E

Construction Truck Traffic Estimates

## APPENDIX 3 ELECTRIC TRANSMISSION

#### APPENDIX 3A

Phase I Interconnection Study Documents

## APPENDIX 5.1 AIR QUALITY

#### APPENDIX 5.1A

Emission Calculations for Operation Phase

#### APPENDIX 5.1B

Emission Calculations for Construction Phase

#### APPENDIX 5.1C

Construction Impact Analysis

#### APPENDIX 5.1D

Air Dispersion Modeling and Model Options and Parameters

#### APPENDIX 5.1E

Electronic Modeling Files (submitted electronically)

#### APPENDIX 5.1F

List of Receptors used in Air Dispersion Modeling

**APPENDIX 5.1G**

Ambient Air Quality Concentrations by Year

**APPENDIX 5.2 BIOLOGICAL RESOURCES****APPENDIX 5.2A**

Summary of Special Status-Species within the Study Area

**APPENDIX 5.2B**

Observed Species List

**APPENDIX 5.2C**

Resumes of the Applicant's Biologists

**APPENDIX 5.2D**

CNDDB Forms

**APPENDIX 5.3A CULTURAL RESOURCES**

Copies of Agency Consultation Letters

**APPENDIX 5.3B**

Cultural Resource Technical Report (Confidential)

**APPENDIX 5.3C**

Resumes of Personnel Who Contributed to the Cultural Resources Study

**APPENDIX 5.7 NOISE****APPENDIX 5.7A**

Solid Solutions Noise Reports

**APPENDIX 5.7B**

Gem Construction Noise Model Inputs/Noise Model Receptors

**APPENDIX 5.7C**

Gem Operational Noise Model Inputs

**APPENDIX 5.7D**

Hourly Weather Data – 25 Hour Noise Monitoring

**APPENDIX 5.9 PUBLIC HEALTH****APPENDIX 5.9A**

List of Receptors

**APPENDIX 5.9B**

Emission Inventory and Screening HRA for Construction Phase

**APPENDIX 5.9C**

Detailed Emission Calculations of Air Toxic Pollutants for Operation Phase

**APPENDIX 5.9D**

HRA Methodology and Model Options and Parameters

**APPENDIX 5.9E**

Detailed HRA Results for Operation Phase

**APPENDIX 5.9F**

Electronic Modeling Files (submitted electronically)

**APPENDIX 5.10 SOCIOECONOMICS****APPENDIX 5.10A**

Environmental Justice

**APPENDIX 5.12 TRAFFIC AND TRANSPORTATION****APPENDIX 5.12A**

Turning Movement Counts

**APPENDIX 5.12B**

Existing Conditions – Synchro 10 Summary

**APPENDIX 5.12C**

Existing plus Construction Phase conditions – Synchro 10 Summary

**APPENDIX 5.13 VISUAL RESOURCES****APPENDIX 5.13A**

Visual Resources Landscape Photographs and Simulations

**APPENDIX 5.13B**

Psychrometric Analysis

**APPENDIX 5.14 WASTE MANAGEMENT****APPENDIX 5.14A**

Modeling Tables for Construction (On-Site) for Annual Dispersion Modeling

**APPENDIX 5.15 WATER RESOURCES****APPENDIX 15.5A**

Grading and Drainage Plan, Stormwater Basin Design Drawings and Supporting Calculations

**APPENDIX 15.5B**

AV WM Water Source Forms/ AV Water Production Rights List/ Kern County Well Permit Application Forms