

Contents

	Page
List of Appendices.....	vii
List of Tables.....	vii
List of Figures.....	xv
List of Acronyms and Abbreviations.....	xxi
Executive Summary.....	ES-1
ES.1 Project Background.....	ES-1
ES.2 Purpose and Need.....	ES-2
ES.2.1 Need for the ACE Extension.....	ES-2
ES.2.2 Purpose of the ACE Extension.....	ES-7
ES.3 Description of ACE Extension Improvements.....	ES-8
ES.3.1 Overview of Phase I Improvements.....	ES-9
ES.3.2 Overview of Phase II Improvements.....	ES-15
ES.3.3 Overview of Core Capacity Improvements.....	ES-17
ES.4 Costs and Revenues.....	ES-18
ES.4.1 Capital Costs.....	ES-18
ES.4.2 Operating and Maintenance Costs and Revenues.....	ES-19
ES.5 Summary of Environmental Impacts and Mitigation.....	ES-19
ES.6 Alternatives Screening Process and Other Alternatives Considered and Dismissed.....	ES-27
ES.7 Comparison of Alternatives and the Environmentally Superior Alternative.....	ES-28
ES.8 Issues of Controversy and Issues to be Resolved.....	ES-29
Chapter 1 Introduction.....	1-1
1.1 Overview.....	1-1
1.2 Project History.....	1-1
1.3 Need for the ACE Extension.....	1-2
1.3.1 Transportation Demand.....	1-2
1.3.2 Roadway Congestion.....	1-4
1.3.3 Air Quality and Greenhouse Gas Emissions.....	1-6
1.4 Purpose of the ACE Extension.....	1-8
1.5 Existing and Projected Ridership with the ACE Extension.....	1-9
1.6 Environmental Review Process.....	1-9
1.6.1 California Environmental Quality Act.....	1-9
1.6.2 Purpose of this Environmental Impact Report.....	1-10

1.6.3	Project-Level versus Program-Level Evaluation.....	1-10
1.7	Scope and Content of this Environmental Impact Report	1-12
1.7.1	Notice of Preparation and Scoping Meetings	1-12
1.7.2	Resource Topics	1-13
1.8	Environmental Impact Report Organization	1-14
Chapter 2 Description of Phase I Improvements.....		2-1
2.1	Phase I Improvement Location and Limits.....	2-2
2.2	Background	2-2
2.3	Phase I Improvements by Segment	2-3
2.3.1	Lathrop to Ceres	2-4
2.3.2	Ceres to Merced Interim Bus Bridge.....	2-20
2.3.3	Core Capacity Improvements	2-22
2.4	Operations and Maintenance	2-23
2.4.1	Conceptual Service Plan.....	2-23
2.4.2	Ridership	2-27
2.4.3	Energy Consumption.....	2-27
2.4.4	Maintenance Activities	2-27
2.5	Construction.....	2-29
2.5.1	Construction Methods	2-29
2.5.2	Construction Schedule and Durations	2-32
2.6	Right-of-Way and Easement Needs	2-32
2.7	Costs and Revenues	2-35
2.7.1	Capital Costs.....	2-35
2.7.2	Operations and Maintenance Costs and Revenues	2-36
2.8	Permits and Approvals	2-37
Chapter 3 Description of Phase II Improvements.....		3-1
3.1	Phase II Improvements Location and Limits	3-2
3.2	Background	3-2
3.3	Phase II Improvements by Segment	3-2
3.3.1	Ceres to Merced.....	3-3
3.3.2	Parking Demand at Stations Established in the Phase I.....	3-17
3.3.3	Core Capacity Improvements	3-18
3.4	Operations and Maintenance	3-18
3.4.1	Conceptual Service Plan.....	3-18
3.4.2	Ridership	3-19
3.4.3	Energy Consumption.....	3-20
3.4.4	Maintenance Activities	3-20

3.5	Construction.....	3-21
3.5.1	Construction Methods	3-21
3.5.2	Construction Schedule and Durations	3-24
3.6	Right-of-Way and Easement Needs	3-24
3.7	Costs and Revenues	3-24
3.7.1	Capital Costs.....	3-24
3.7.2	Operating and Maintenance Costs and Revenues.....	3-25
3.8	Permits and Approvals	3-26
Chapter 4 Environmental Impact Analysis		4-1
	Introduction.....	4-1
	Chapter Organization	4-1
	Approach to Impact Analysis	4-2
	Topics Considered but Dismissed from Further Analysis	4-4
4.1	Aesthetics.....	4.1-1
4.1.1	Introduction	4.1-1
4.1.2	Regulatory Setting.....	4.1-1
4.1.3	Methods of Analysis.....	4.1-4
4.1.4	Environmental Setting	4.1-5
4.1.5	Impact Analysis	4.1-17
4.2	Agricultural Resources	4.2-1
4.2.1	Introduction	4.2-1
4.2.2	Regulatory Setting.....	4.2-1
4.2.3	Environmental Setting	4.2-4
4.2.4	Impact Analysis	4.2-11
4.3	Air Quality	4.3-1
4.3.1	Introduction	4.3-1
4.3.2	Regulatory Setting.....	4.3-1
4.3.3	Environmental Setting	4.3-10
4.3.4	Impact Analysis	4.3-20
4.4	Biological Resources	4.4-1
4.4.1	Introduction	4.4-1
4.4.2	Regulatory Setting.....	4.4-1
4.4.3	Environmental Setting	4.4-7
4.4.4	Impact Analysis	4.4-21
4.5	Cultural Resources	4.5-1
4.5.1	Introduction	4.5-1
4.5.2	Regulatory Setting.....	4.5-1

4.5.3	Environmental Setting	4.5-5
4.5.4	Impact Analysis	4.5-20
4.6	Energy	4.6-1
4.6.1	Introduction	4.6-1
4.6.2	Regulatory Setting.....	4.6-1
4.6.3	Environmental Setting	4.6-3
4.6.4	Impact Analysis	4.6-8
4.7	Geology and Soils.....	4.7-1
4.7.1	Introduction	4.7-1
4.7.2	Regulatory Setting.....	4.7-1
4.7.3	Environmental Setting	4.7-6
4.7.4	Impact Analysis	4.7-14
4.8	Greenhouse Gas Emissions	4.8-1
4.8.1	Introduction	4.8-1
4.8.2	Regulatory Setting.....	4.8-1
4.8.3	Environmental Setting	4.8-5
4.8.4	Impact Analysis	4.8-8
4.9	Hazardous Materials	4.9-1
4.9.1	Introduction	4.9-1
4.9.2	Regulatory Setting.....	4.9-1
4.9.3	Environmental Setting	4.9-6
4.9.4	Impact Analysis	4.9-23
4.10	Hydrology and Water Quality	4.10-1
4.10.1	Introduction	4.10-1
4.10.2	Regulatory Setting.....	4.10-1
4.10.3	Environmental Setting	4.10-10
4.10.4	Impact Analysis	4.10-20
4.11	Land Use and Planning.....	4.11-1
4.11.1	Introduction	4.11-1
4.11.2	Regulatory Setting.....	4.11-2
4.11.3	Environmental Setting	4.11-4
4.11.4	Impact Analysis	4.11-12
4.12	Noise and Vibration	4.12-1
4.12.1	Introduction	4.12-1
4.12.2	Regulatory Setting.....	4.12-2
4.12.3	Environmental Setting	4.12-6
4.12.4	Impact Analysis	4.12-12

4.12.5	Noise Impact Assessment Tables.....	4.12-40
4.13	Population and Housing.....	4.13-1
4.13.1	Introduction	4.13-1
4.13.2	Regulatory Setting.....	4.13-1
4.13.3	Environmental Setting	4.13-2
4.13.4	Impact Analysis	4.13-8
4.14	Public Services.....	4.14-1
4.14.1	Introduction	4.14-1
4.14.2	Regulatory Setting.....	4.14-1
4.14.3	Environmental Setting	4.14-2
4.14.4	Impact Analysis	4.14-9
4.15	Recreation.....	4.15-1
4.15.1	Introduction	4.15-1
4.15.2	Regulatory Setting.....	4.15-1
4.15.3	Environmental Setting	4.15-3
4.15.4	Impact Analysis	4.15-9
4.16	Safety and Security	4.16-1
4.16.1	Introduction	4.16-1
4.16.2	Regulatory Setting.....	4.16-1
4.16.3	Environmental Setting	4.16-7
4.16.4	Impact Analysis	4.16-15
4.17	Transportation and Traffic.....	4.17-1
4.17.1	Introduction	4.17-1
4.17.2	Regulatory Setting.....	4.17-1
4.17.3	Environmental Setting	4.17-6
4.17.4	Impact Analysis	4.17-46
4.18	Utilities and Service Systems	4.18-1
4.18.1	Introduction	4.18-1
4.18.2	Regulatory Setting.....	4.18-1
4.18.3	Environmental Setting	4.18-3
4.18.4	Impact Analysis	4.18-16
Chapter 5	Other CEQA-Required Analysis	5-1
5.1	Cumulative Impacts	5-1
5.1.1	Approach and Methodology	5-2
5.1.2	Projections/Regional Growth Characteristics.....	5-4
5.1.3	Projects Considered	5-4
5.1.4	Cumulative Impact Analysis.....	5-23

5.2	Significant and Unavoidable Environmental Impacts	5-73
5.3	Significant and Irreversible Environmental Changes	5-74
5.4	Growth-Inducing Impacts	5-75
Chapter 6	Alternatives	6-1
6.1	Introduction	6-1
6.2	Alternatives Considered for Further Analysis	6-2
6.3	Analysis of Alternatives at a Lesser Level of Detail.....	6-2
6.3.1	No Project Alternative	6-3
6.3.2	Merced Layover East of State Route 99 Alternative.....	6-10
6.4	Comparison of Alternatives Analyzed.....	6-15
6.5	Environmentally Superior Alternative	6-18
6.6	Alternatives Screening Process	6-19
6.6.1	Alternatives Considered.....	6-19
6.6.2	Screening Criteria.....	6-26
6.6.3	Screening Results and Conclusions.....	6-27
Chapter 7	Public and Agency Involvement	7-1
7.1	Scoping Meetings and Noticing	7-1
7.2	Consultation and Coordination	7-1
7.2.1	Local Agency, Community, and Stakeholder Meetings	7-2
7.2.2	Working Group Meetings	7-3
7.2.3	Resource Agency Meetings.....	7-4
7.3	Notification and Circulation of Draft EIR.....	7-4
Chapter 8	List of Preparers.....	8-1
Chapter 9	References.....	9-1

Appendices

Apx A	ACE Extension Scoping Memorandum
Apx B	ACE Extension Environmental Footprint
Apx C	ACE Extension 15% Preliminary Engineering Plans
Apx D-1	ACE Extension Core Capacity Memorandum
Apx D-2	ACE Extension Ridership, Revenue, and Benefits Report
Apx E	ACE Extension Opinion of Probable Cost Report
Apx F	ACE Extension Operating and Maintenance Cost Technical Memorandum
Apx G	Regional Plans and Local General Plans
Apx H	Supporting Aesthetics Information
Apx I	Supporting Agricultural Resources Information
Apx J	Air Quality, Greenhouse Gas, and Health Risk Assessment Supporting Documentation
Apx K	Supporting Biological Resources Information
Apx L-1	ACE Extension Archaeological Inventory Report
Apx L-2	ACE Extension Historical Resources Inventory and Evaluation Report
Apx M	Geology, Soils, and Seismicity Maps
Apx N	Dam Inundation Maps
Apx O	Supporting Transportation and Traffic Information
Apx P	Public and Agency Coordination

Tables

	Page
ES-1	Projected Population and Employment Growth in the Existing ACE Service Areas..... ES-3
ES-2	Projected Population and Employment Growth in the Extended ACE Service Areas..... ES-4
ES-3	ACE Extension—System Ridership with Phase I Operations..... ES-12
ES-4	Construction Durations for Phase I Improvements ES-14
ES-5	Summary of Phase I Improvement Impacts and Required Mitigation Measures ES-31
ES-6	Summary of Phase II Improvement Impacts and Required Mitigation Measures ES-67
1-1	Projected Population and Employment Growth in the Existing ACE Service Areas.....1-3
1-2	Projected Population and Employment Growth in the Extended ACE Service Areas.....1-4
1-3	ACE Extension—System Ridership with Phase I Operations.....1-9
2-1	Ceres Extension Alignment—At-Grade Crossing Modifications2-11
2-2	Ceres Extension Alignment—Undercrossing Modifications2-14
2-3	Ceres Extension Alignment—New Bridge Structures over Waterways2-15
2-4	Phase I Operational Scenario A: Prototypical 2020 Schedule2-25
2-5	Phase I Operational Scenario B: Prototypical 2020 Schedule2-26
2-6	ACE Extension—System Ridership with Phase I Operations.....2-27
2-7	Construction Durations for Phase I Improvements2-32
2-8	Right-of-Way and Easement Needs for Phase I Improvements.....2-33
2-9	Construction Cost Estimates for Phase I Improvements.....2-35
2-10	Summary of Annual Projected Operations & Maintenance Cost (2017 \$-million)2-36
2-11	ACE System Revenue with Phase I Operations2-37
2-12	Permits, Funding, and Other Approvals Anticipated for Phase I Improvements.....2-37
3-1	Merced Extension Alignment—Undercrossing Modifications.....3-6
3-2	Merced Extension Alignment—At-Grade Crossing Modifications3-7
3-3	Merced Extension Alignment—New Culvert Structures.....3-11
3-4	Merced Extension Alignment—New Bridge Structures3-12
3-5	Construction Cost Estimates for Phase II Improvements.....3-25
3-6	Summary of Annual Projected Operations & Maintenance Cost (2017, \$ in millions).....3-25
3-7	Permits, Funding, and Other Approvals Anticipated for Phase II Improvements3-26
4.1-1	Designated Landscaped Freeways Potentially in View of the ACE Extension.....4.1-2
4.1-2	County- and City-Designated Scenic Routes within 3 Miles of the ACE Extension4.1-4
4.2-1	San Joaquin County—Important Farmland and Grazing Land (acres)4.2-6
4.2-2	San Joaquin County—Land under Williamson Act and Farmland Security Zone Contracts (acres)4.2-7
4.2-3	Stanislaus County—Important Farmland and Grazing Land (acres)4.2-8
4.2-4	Stanislaus County—Land under Williamson Act and Farmland Security Zone Contracts (acres)4.2-8
4.2-5	Merced County—Important Farmland and Grazing Land (acres).....4.2-9
4.2-6	Merced County—Land under Williamson Act and Farmland Security Zone Contracts (acres)4.2-10
4.2-7	Phase I Improvements—Important Farmland Temporary Impacts4.2-13

4.2-8	Phase I Improvements—Important Farmland Potentially Converted to Nonagricultural Use	4.2-14
4.2-9	Phase I Improvements—Williamson Act Lands Potentially Affected.....	4.2-17
4.2-10	Phase I Improvements—Confined Animal Facilities with Animal Holding Areas within 2,500 Feet.....	4.2-19
4.2-11	Phase I Improvements—Potential Important Farmland Parcel Severance (< 20 acres).....	4.2-20
4.2-12	Phase II Improvements—Important Farmland Temporary Impacts	4.2-24
4.2-13	Phase II Improvements—Important Farmland Potentially Converted to Nonagricultural Use	4.2-24
4.2-14	Phase II Improvements—Williamson Act Lands Potentially Affected.....	4.2-26
4.2-15	Phase II Improvements—Confined Animal Facilities with Animal Holding Areas within 2,500 Feet.....	4.2-28
4.2-16	Phase II Improvements—Potential Important Farmland Parcel Severance (< 20 acres).....	4.2-29
4.2-17	Phase II Improvements—Confined Animal Facilities Potentially Affected	4.2-31
4.3-1	Federal and State Ambient Air Quality Standards	4.3-3
4.3-2	List of Local Plans Regarding Air Quality	4.3-8
4.3-3	Ambient Criteria Pollutant Concentrations at Air Quality Monitoring Stations Closest to the Existing ACE Route (2014–2016)	4.3-15
4.3-4	Ambient Criteria Pollutant Concentrations at Air Quality Monitoring Stations Closest to ACE Extension Alignment (2014–2016).....	4.3-17
4.3-5	Federal and State Attainment Status	4.3-19
4.3-6	ACE Operating Hours and Locomotive Characteristics	4.3-22
4.3-7	Modeled Area, Track Orientation, and Representative Meteorology by Geographic Segment	4.3-26
4.3-8	Number of New ACE Train Visits per Day, Distance to Nearest Resident, and Representative Meteorology for Phase I Improvements.....	4.3-27
4.3-9	BAAQMD and SJVAPCD Mass Emission Thresholds	4.3-33
4.3-10	BAAQMD and SJVAPCD Cancer and Non-Cancer Health Risk Thresholds	4.3-35
4.3-11	Estimated Unmitigated Construction Criteria Pollutant Emissions from Phase I Construction in the San Joaquin Valley Air Pollution Control District	4.3-39
4.3-12	Estimated Mitigated Construction Criteria Pollutant Emissions from Phase I Construction in the San Joaquin Valley Air Pollution Control District	4.3-40
4.3-13	Modeled Carbon Monoxide Concentrations from Phase I Construction (µg/m ³).....	4.3-41
4.3-14	Estimated Operational Criteria Pollutant Emissions from Phase I Operation in the Bay Area Air Quality Management District	4.3-43
4.3-15	Estimated Operational Criteria Pollutant Emissions from Phase I Operation in the San Joaquin Valley Air Pollution Control District	4.3-44
4.3-16	Carbon Monoxide Modeling Concentration Results (parts per million)	4.3-47
4.3-17	Estimated Maximum Inhalation Cancer Risk and Chronic and Acute Hazard Index from Construction in the San Joaquin Valley Air Pollution Control District for Phase I	4.3-48
4.3-18	Estimated Maximum Inhalation Cancer Risk, Chronic Hazard Index, and PM _{2.5} Concentration from Operation of ACE Locomotives in the San Joaquin Valley Air Pollution Control District	4.3-50

4.3-19	Estimated Maximum Incremental Change in Inhalation Cancer Risk and Chronic Hazard Index from Operation of ACE Locomotives in the San Joaquin Valley Air Pollution Control District.....	4.3-51
4.3-20	Estimated Maximum Inhalation Cancer Risk and Chronic Hazard Index from Increased ACE Locomotive Idling for Phase I	4.3-52
4.3-21	Estimated Maximum Inhalation Cancer Risk, Chronic and Acute Hazard Index, and PM2.5 Concentration from Expanded Great America Shuttle Service	4.3-53
4.3-22	Estimated Maximum Inhalation Cancer Risk, and Chronic Hazard Index, and PM2.5 Concentration from Expanded Pleasanton Shuttle Service.....	4.3-54
4.3-23	Estimated Maximum Incremental Change in Inhalation Cancer Risk, Chronic Hazard Index, and PM2.5 Concentrations from Combined Project Emission Sources	4.3-55
4.4-1	Phase I Improvements - Land Cover Types in the Environmental Footprint (acres)	4.4-10
4.4-2	Phase II Improvements - Land Cover Types in the Environmental Footprint (acres)	4.4-11
4.4-3	Special-Status Species Potentially Occurring in the Study Area	4.4-25
4.4-4	Phase I Improvements—Impacts on Land Covers That May Contain Suitable Habitat for Special-Status Plant Species (acres).....	4.4-29
4.4-5	Phase I Improvements—Special-Status Wildlife Species Suitable Habitat Affected (acres).....	4.4-37
4.4-6	Phase I Improvements—Special-Status Fish Species Habitat Impacts.....	4.4-41
4.4-7	Phase I Improvements—Wetland and Other Aquatic Resource Impacts (acres)	4.4-43
4.4-8	Phase I Improvements Riparian Habitat Impacts.....	4.4-45
4.4-9	Phase II Improvements—Impacts on Land Covers that May Contain Suitable Habitat for Special-Status Plant Species (acres).....	4.4-59
4.4-10	Phase II Improvements—Special-Status Wildlife Species Suitable Habitat Affected (acres).....	4.4-64
4.4-11	Phase II Improvements—Special-Status Fish Species Habitat Impacts.....	4.4-69
4.4-12	Phase II Improvements—Wetland and Other Aquatic Resource Impacts (acres)	4.4-71
4.4-13	Phase II Improvements Riparian/Sensitive Natural Community Impacts	4.4-72
4.4-14	Applicability of Mitigation Measures for Phase I and Phase II Improvements	4.4-83
4.4-15	Regulated Trees, Relevant Activities, Replacement Requirements, and Recommended Tree Replacement Ratios	4.4-104
4.5-1	CEQA Historical Resources (Archaeology) and Unevaluated Resources in the ACE Extension Study Area	4.5-14
4.5-2	CEQA Historical Resources (Built Environment) in the ACE Extension Study Area	4.5-17
4.5-3	Summary of Phase I Improvement Impacts on CEQA Historical Resources (Built Environment).....	4.5-23
4.5-4	Summary of Phase II Improvement Impacts on CEQA Historical Resources (Built Environment).....	4.5-31
4.6-1	2014 U.S. Passenger Travel Mode and Energy Use.....	4.6-3
4.6-2	Electricity Providers by ACE Extension Improvement.....	4.6-5
4.6-3	2014 Electricity Consumption and Peak Demand by Electricity Providers	4.6-6
4.6-4	Phase I Improvements—Construction Fuel Consumption.....	4.6-12
4.6-5	Phase I Operations—Locomotive Fuel Consumption	4.6-13
4.6-6	Phase I Operations—Vehicle Shuttle/Bus Bridge Fuel Consumption	4.6-15
4.6-7	Phase I Operations—Electrical Use at New Stations and Facilities.....	4.6-16
4.6-8	Phase I Operations—Annual ACE Ridership and Total Automobile VMT Displaced	4.6-17
4.6-9	Phase I Operations—Summary of Energy Demand (Compared to No Project Alternative)	4.6-17
4.7-1	Geologic Units in the Paleontological Study Area	4.7-13

4.7-2	Phase I Improvements—Geologic Hazards	4.7-19
4.7-3	Phase I Improvements Involving Disturbance at or below Ground Surface	4.7-23
4.7-4	Phase II Improvements—Potential Geologic Hazards.....	4.7-29
4.7-5	Phase II Improvements Involving Disturbance at or below Ground Surface	4.7-33
4.8-1	Lifetimes and Global Warming Potentials of Key Greenhouse Gases.....	4.8-6
4.8-2	Global, National, State, and Local Greenhouse Gas Emissions Inventories.....	4.8-7
4.8-3	Estimated Phase I Construction Greenhouse Gas Emissions	4.8-14
4.8-4	Estimated Phase I Operational Greenhouse Gas Emissions in the Bay Area Air Quality Management District.....	4.8-14
4.8-5	Estimated Phase I Operational Greenhouse Gas Emissions in the San Joaquin Valley Air Pollution Control District	4.8-15
4.8-6	Total Estimated Phase I Operational Greenhouse Gas Emissions	4.8-16
4.9-1	Summary of Environmental Records Reviewed	4.9-9
4.9-2	North Lathrop Station—Hazardous Materials Release Sites of Concern.....	4.9-11
4.9-3	Ceres Extension Alignment—Hazardous Materials Release Sites of Concern	4.9-13
4.9-4	Downtown Manteca Station—Hazardous Materials Release Sites of Concern.....	4.9-14
4.9-5	Ripon Station—Hazardous Materials Release Sites of Concern	4.9-15
4.9-6	Modesto Station – Hazardous Materials Release Sites of Concern	4.9-16
4.9-7	Ceres Station—Hazardous Materials Release Sites of Concern.....	4.9-17
4.9-8	Merced Extension Alignment—Hazardous Materials Release Sites of Concern.....	4.9-18
4.9-9	Atwater Station—Hazardous Materials Release Sites of Concern.....	4.9-21
4.9-10	Merced Bus Stop—Hazardous Materials Release Sites of Concern.....	4.9-22
4.9-11	Merced Station—Hazardous Materials Release Sites of Concern	4.9-23
4.9-12	Potential Sources of Hazardous Materials and Primary Hazardous Materials of Concern within the Study Area.....	4.9-24
4.10-1	Overview of Watershed Basin Traits.....	4.10-12
4.10-2	Lathrop to Ceres—Subwatersheds and Surface Waters That May Receive Runoff	4.10-14
4.10-3	Lathrop to Ceres—Beneficial Uses of Surface Waters	4.10-15
4.10-4	Lathrop to Ceres—Impaired Waterbodies.....	4.10-16
4.10-5	Lathrop to Ceres—Types of Flood Hazard Zones Intersected by ACE Extension Improvements.....	4.10-17
4.10-6	Ceres to Merced—Subwatersheds and Surface Waters That May Receive Runoff.....	4.10-18
4.10-7	Ceres to Merced—Beneficial Uses of Surface Waters	4.10-19
4.10-8	Ceres to Merced—Impaired Waterbodies.....	4.10-19
4.10-9	Ceres to Merced—Types of Flooding Hazard Zones Intersected by ACE Extension Improvements.....	4.10-20
4.10-10	Design Storm Intervals	4.10-40
4.11-1	ACE Extension—Jurisdictions with Improvements	4.11-5
4.11-2	Phase I Improvements—Existing Zoning for Right-of-Way and Easement Needs.....	4.11-17
4.11-3	Phase I Improvements—Consistency with Local Land Use Plans and Policies	4.11-19
4.11-4	Phase II Improvements—Consistency with Local Land Use Plans and Policies	4.11-41
4.12-1	List of Local Plans Regarding Noise and Vibration	4.12-5
4.12-2	Phase I Improvements—Existing Noise Level Measurements in the Study Area	4.12-8
4.12-3	Federal Transit Administration Construction Noise Assessment Criteria	4.12-16
4.12-4	Federal Transit Administration Construction Vibration Damage Criteria.....	4.12-17
4.12-5	Federal Transit Administration Noise-Sensitive Land Use Categories	4.12-17

4.12-6	Federal Transit Administration Groundborne Vibration and Groundborne Noise Impact Criteria.....	4.12-19
4.12-7	Federal Transit Administration Groundborne Vibration and Groundborne Noise Impact Criteria for Special Buildings	4.12-20
4.12-8	Residential Noise Impact Assessment for Construction Activities.....	4.12-22
4.12-9	Overview of Operational Noise Impacts for Phase I Improvements.....	4.12-25
4.12-10	Approximate Screening Distances for Vibration Annoyance Effects from Pile Driving	4.12-32
4.12-11	Overview of Operational Noise Impacts for Phase II Improvements.....	4.12-37
4.12-12	Lathrop to Stockton—Residential and Institutional Noise Impact Assessment for Phase I Operations	4.12-40
4.12-13	Lathrop to Ceres—Residential and Institutional Noise Impact Assessment for Phase I Operations	4.12-42
4.12-14	Lathrop to Stockton—Residential and Institutional Noise Impact Assessment for Phase II Operations	4.12-47
4.12-15	Lathrop to Ceres—Residential and Institutional Noise Impact Assessment for Phase II Operations	4.12-48
4.13-1	ACE Extension—Existing and Projected Populations	4.13-3
4.13-2	Lathrop to Ceres—Population Projections	4.13-5
4.13-3	Lathrop to Ceres—Housing Unit Growth Projections	4.13-5
4.13-4	Ceres to Merced—Population Projections.....	4.13-7
4.13-5	Ceres to Merced—Housing Unit Growth Projections	4.13-7
4.13-6	Phase I Improvements—Residential Parcel Acquisitions or Easements	4.13-13
4.14-1	Fire Departments within the Study Area	4.14-3
4.14-2	Law Enforcement within the Study Area	4.14-5
4.14-3	2016 Crime Incidents and Rates in the Study Area.....	4.14-7
4.14-4	Emergency Medical Services Hospitals Most Proximate to ACE Extension Improvements.....	4.14-8
4.14-5	Schools within the Study Area	4.14-9
4.14-6	Phase I Improvements Affecting Streets and Roadways	4.14-11
4.15-1	Lathrop to Ceres—Recreation Facilities in the Study Area	4.15-4
4.15-2	Ceres to Merced—Recreation Facilities in the Study Area	4.15-8
4.16-1	Lathrop to Ceres—Airports in the Study Area	4.16-8
4.16-2	Ceres to Merced—Airports in the Study Area	4.16-9
4.16-3	List of Emergency Response Plans	4.16-11
4.16-4	Train Accidents and Incidents (2015).....	4.16-13
4.16-5	Train Accidents by Type (2015).....	4.16-13
4.16-6	Existing Altamont Corridor Express (ACE) Route—ACE and Union Pacific Railroad Accidents and Incidents (2015)	4.16-14
4.16-7	Existing Altamont Corridor Express (ACE) and ACE Extension Routes—Union Pacific Railroad Accidents and Incidents (2015).....	4.16-14
4.17-1	List of Regional and Local Transportation and Traffic Plans	4.17-2
4.17-2	ACE Daily Ridership—Existing (2015).....	4.17-8
4.17-3	Level of Service Criteria for Signalized Intersections	4.17-10
4.17-4	Level of Service Criteria for Unsignalized Intersections.....	4.17-10
4.17-5	Lathrop to Stockton—Existing Intersection Levels of Service.....	4.17-16
4.17-6	Lathrop to Ceres—Existing Intersection Levels of Service	4.17-18
4.17-7	Population and Employment by County, 2015–2020	4.17-22

4.17-8	ACE Daily Ridership—Year 2020 No Project Conditions	4.17-24
4.17-9	Lathrop to Stockton—Year 2020 No Project Conditions Intersection Levels of Service.....	4.17-26
4.17-10	Lathrop to Ceres—Year 2020 No Project Conditions Intersection Levels of Service	4.17-29
4.17-11	Population and Employment by County, 2015–2040	4.17-35
4.17-12	ACE Daily Ridership—Year 2040 No Project Conditions	4.17-36
4.17-13	Lathrop to Stockton—Year 2040 No Project Conditions Intersection Levels of Service.....	4.17-38
4.17-14	Lathrop to Ceres—Year 2040 No Project Conditions Intersection Levels of Service	4.17-41
4.17-15	Year 2020 No Project Conditions v. Year 2020 Plus Project Conditions— Daily ACE Train and Bus Service with ACE Extension Phase I Operations	4.17-48
4.17-16	Year 2040 No Project Conditions v. Year 2040 Plus Project Conditions— Daily ACE Train and Bus Service with ACE Extension Phase I Operations.....	4.17-49
4.17-17	Phase I Operations—Average Regional Annual Vehicle Miles Traveled Avoided	4.17-58
4.17-18	Year 2020 No Project Conditions and Year 2020 Plus Project Conditions— Intersection Delay and Levels of Service.....	4.17-61
4.17-19	Year 2020 Plus Project Conditions—Summary of Significant Intersection Impacts for Phase I Operations (Prior to Mitigation)	4.17-67
4.17-20	Year 2020 Plus Project Conditions—Intersection Impacts and Mitigation Measures Summary	4.17-68
4.17-21	Year 2040 Plus Project Conditions—Summary of Significant Intersection Impacts for Phase I Operations (Prior to Mitigation)	4.17-71
4.17-22	Year 2040 No Project Conditions and Year 2040 Plus Project Conditions — Intersection Delay and Levels of Service.....	4.17-72
4.17-23	Year 2040 Plus Project Conditions—Intersection Impacts and Mitigation Measures Summary	4.17-78
4.17-24	Year 2020 No Project Conditions and Year 2020 Plus Project Conditions— Daily Ridership Forecasts by Station	4.17-81
4.17-25	Year 2020 No Project Conditions and Year 2020 Plus Project Conditions— Daily Ridership on Shuttle Systems and Local Transit Serving ACE.....	4.17-83
4.17-26	Year 2040 No Project Conditions and Year 2040 Plus Project Conditions— Daily Ridership Forecasts by Station	4.17-85
4.17-27	Year 2040 No Project Conditions and Year 2040 Plus Project Conditions — Daily Ridership on Shuttle Systems and Local Transit Serving ACE.....	4.17-87
4.18-1	Utilities within the Environmental Footprints for ACE Extension Improvements	4.18-4
4.18-2	Utility Service Providers in the Study Area	4.18-7
4.18-3	Solid Waste Facilities in the Study Area	4.18-9
4.18-4	Lathrop to Stockton—Water Supply and Demand by Jurisdiction (in acre-feet/year)	4.18-11
4.18-5	Lathrop to Stockton—Wastewater Treatment Facilities	4.18-12
4.18-6	Lathrop to Ceres—Water Supply and Demand by Jurisdiction (in acre-feet/year)	4.18-13
4.18-7	Lathrop to Ceres—Wastewater Treatment Facilities by Jurisdiction	4.18-13
4.18-8	Ceres to Merced—Water Supply and Demand by Jurisdiction (in acre-feet/year)	4.18-15
4.18-9	Ceres to Merced—Wastewater Treatment Facilities by Jurisdiction.....	4.18-15
4.18-10	Phase I Improvements—Utilities Potentially Affected	4.18-20
4.18-11	Phase I Stations—Solid Waste Generation	4.18-26
4.18-12	Phase II Stations—Solid Waste Generation	4.18-31
5-1	Summary of Cumulative Impact Methodology	5-3

5-2	Existing and Projected Population and Housing Unit Growth in the Counties of the ACE Extension Corridor	5-4
5-3	Projects Considered In the Cumulative Analysis	5-7
5-4	Cumulative Existing (2016) and Future (2040) Daily Train Service in the ACE Extension Corridor	5-17
5-5	Land Development Projects Adjacent to the ACE Extension Corridor (within 0.15 mile).....	5-19
5-6	Summary of Cumulative Impacts Analysis	5-24
5-7	2040 Cumulative Noise Impacts.....	5-53
6-1	ACE Extension—System Ridership with and without Phase I Operations	6-4
6-2	Environmental Impact - Lathrop Station Alternatives Comparison	6-28
6-3	Environmental Impact - Ceres and Merced Layover Facility Alternatives Comparison	6-29
6-4	Capital Costs - Construction Cost Estimates for Phase I Improvements	6-30
6-5	Capital Costs - Construction Cost Estimates for Phase II Improvements	6-30
6-6	Identification of the Environmentally Superior Alternative.....	6-31
6-7	Alternatives Screening, Tier 1: Purpose and Need.....	6-32
6-8	Alternatives Screening, Tier 2: Feasibility	6-35
6-9	Alternatives Screening, Tier 3: Environmental Impact.....	6-40

List of Figures

	Follows Page
ES-1	Locations of Phase I and Phase II Improvements ES-96
ES-2	Phase I Operations—Conceptual Service Plans ES-96
ES-3	Phase II Operations—Conceptual Service Plans ES-96
1-1	Locations of Phase I and Phase II Improvements..... 1-16
2-1	Relocated Lathrop/Manteca Station..... 2-40
2-2	Existing Lathrop/Manteca Station..... 2-40
2-3	North Lathrop Station 2-40
2-4a	Ceres Extension Alignment 2-40
2-4b	Ceres Extension Alignment 2-40
2-4c	Ceres Extension Alignment 2-40
2-4d	Ceres Extension Alignment 2-40
2-4e	Ceres Extension Alignment 2-40
2-5	Downtown Manteca Station 2-40
2-6	Ripon Station..... 2-40
2-7	Modesto Station..... 2-40
2-8	Ceres Station 2-40
2-9	Ceres-Merced Interim Bus Bridge 2-40
2-10	Merced Bus Stop 2-40
2-11	Phase I Operations—Conceptual Service Plans 2-40
3-1a	Merced Extension Alignment..... 3-28
3-1b	Merced Extension Alignment..... 3-28
3-1c	Merced Extension Alignment..... 3-28
3-1d	Merced Extension Alignment..... 3-28
3-2	Turlock Station 3-28
3-3	Livingston Station..... 3-28
3-4	Atwater Station 3-28
3-5	Merced Station..... 3-28
3-6	Phase II Operations—Conceptual Service Plans 3-28
4.1-1	Key Observation Point Location Map for the North Lathrop and Ceres Stations 4.1-46
4.1-2	Existing View and North Lathrop Station Simulated Conditions..... 4.1-46
4.1-3	Existing View and North Lathrop Station Simulated Conditions..... 4.1-46
4.1-4	Existing View and North Lathrop Station Simulated Conditions..... 4.1-46
4.1-5	Existing View and Ceres Station Simulated Conditions..... 4.1-46
4.1-6	Existing View and Ceres Station Simulated Conditions..... 4.1-46
4.1-7	Existing View and Ceres Station Simulated Conditions..... 4.1-46
4.1-8	Existing View and Ceres Station Simulated Nighttime Conditions..... 4.1-46
4.2-1	Lathrop to Ceres - Important Farmlands, Sheet 1 4.2-32
4.2-2	Lathrop to Ceres - Important Farmlands, Sheet 2 4.2-32
4.2-3	Lathrop to Ceres -Important Farmlands, Sheet 3 4.2-32
4.2-4	Lathrop to Ceres - Important Farmlands, Sheet 4 4.2-32

4.2-5	Ceres to Merced - Important Farmlands, Sheet 1.....	4.2-32
4.2-6	Ceres to Merced - Important Farmlands, Sheet 2.....	4.2-32
4.2-7	Ceres to Merced - Important Farmlands, Sheet 3.....	4.2-32
4.2-8	Ceres to Merced - Important Farmlands, Sheet 4.....	4.2-32
4.2-9	Ceres to Merced - Important Farmlands, Sheet 5.....	4.2-32
4.2-10	Lathrop to Ceres - Williamson Act Land, Sheet 1.....	4.2-32
4.2-11	Lathrop to Ceres - Williamson Act Land, Sheet 2.....	4.2-32
4.2-12	Lathrop to Ceres - Williamson Act Land, Sheet 3.....	4.2-32
4.2-13	Lathrop to Ceres -Williamson Act Land, Sheet 4.....	4.2-32
4.2-14	Ceres to Merced - Williamson Act Land, Sheet 1.....	4.2-32
4.2-15	Ceres to Merced - Williamson Act, Sheet 2	4.2-32
4.2-16	Ceres to Merced - Williamson Act Land, Sheet 3.....	4.2-32
4.2-17	Ceres to Merced - Williamson Act Land, Sheet 4.....	4.2-32
4.2-18	Ceres to Merced - Williamson Act Land, Sheet 5.....	4.2-32
4.2-19	Ceres to Merced - Conservation Easement Lands	4.2-32
4.4-1	Biological Resources Study Area, Sheet 1	4.4-108
4.4-2	Lathrop to Ceres - Biological Resource Study Area, Sheet 2	4.4-108
4.4-3	Lathrop to Ceres - Biological Resource Study Area, Sheet 3	4.4-108
4.4-4	Lathrop to Ceres - Biological Resource Study Area, Sheet 4.....	4.4-108
4.4-5	Lathrop to Ceres - Biological Resource Study Area, Sheet 5	4.4-108
4.4-6	Lathrop to Ceres - Biological Resource Study Area, Sheet 6.....	4.4-108
4.4-7	Lathrop to Ceres - Biological Resource Study Area, Sheet 7.....	4.4-108
4.4-8	Lathrop to Ceres - Biological Resource Study Area, Sheet 8.....	4.4-108
4.4-9	Lathrop to Ceres - Biological Resource Study Area, Sheet 9.....	4.4-108
4.4-10	Lathrop to Ceres - Biological Resource Study Area, Sheet 10.....	4.4-108
4.4-11	Ceres to Merced - Biological Resource Study Area, Sheet 1	4.4-108
4.4-12	Ceres to Merced - Biological Resource Study Area, Sheet 2	4.4-108
4.4-13	Ceres to Merced - Biological Resource Study Area, Sheet 3.....	4.4-108
4.4-14	Ceres to Merced - Biological Resource Study Area, Sheet 4.....	4.4-108
4.4-15	Ceres to Merced - Biological Resource Study Area, Sheet 5	4.4-108
4.4-16	Ceres to Merced - Biological Resource Study Area, Sheet 6.....	4.4-108
4.4-17	Ceres to Merced - Biological Resource Study Area, Sheet 7	4.4-108
4.4-18	Ceres to Merced - Biological Resource Study Area, Sheet 8.....	4.4-108
4.4-19	Ceres to Merced - Biological Resource Study Area, Sheet 9	4.4-108
4.4-20	Ceres to Merced - Biological Resource Study Area, Sheet 10.....	4.4-108
4.4-21	Ceres to Merced - Biological Resource Study Area, Sheet 11.....	4.4-108
4.4-22	Ceres to Merced - Biological Resource Study Area, Sheet 12	4.4-108
4.4-23	Lathrop to Ceres - Land Cover, Sheet 1.....	4.4-108
4.4-24	Lathrop to Ceres - Land Cover, Sheet 2.....	4.4-108
4.4-25	Lathrop to Ceres - Land Cover, Sheet 3.....	4.4-108
4.4-26	Lathrop to Ceres - Land Cover, Sheet 4.....	4.4-108
4.4-27	Lathrop to Ceres - Land Cover, Sheet 5.....	4.4-108
4.4-28	Lathrop to Ceres - Land Cover, Sheet 6.....	4.4-108
4.4-29	Lathrop to Ceres - Land Cover, Sheet 7.....	4.4-108
4.4-30	Lathrop to Ceres - Land Cover, Sheet 8.....	4.4-108
4.4-31	Lathrop to Ceres - Land Cover, Sheet 9.....	4.4-108

4.4-32	Lathrop to Ceres - Land Cover, Sheet 10.....	4.4-108
4.4-33	Ceres to Merced - Land Cover, Sheet 1.....	4.4-108
4.4-34	Ceres to Merced - Land Cover, Sheet 2.....	4.4-108
4.4-35	Ceres to Merced - Land Cover, Sheet 3.....	4.4-108
4.4-36	Ceres to Merced - Land Cover, Sheet 4.....	4.4-108
4.4-37	Ceres to Merced - Land Cover, Sheet 5.....	4.4-108
4.4-38	Ceres to Merced - Land Cover, Sheet 6.....	4.4-108
4.4-39	Ceres to Merced - Land Cover, Sheet 7.....	4.4-108
4.4-40	Ceres to Merced - Land Cover, Sheet 8.....	4.4-108
4.4-41	Ceres to Merced - Land Cover, Sheet 9.....	4.4-108
4.4-42	Ceres to Merced - Land Cover, Sheet 10.....	4.4-108
4.4-43	Ceres to Merced - Land Cover, Sheet 11.....	4.4-108
4.4-44	Ceres to Merced - Land Cover, Sheet 12.....	4.4-108
4.4-45	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 1.....	4.4-108
4.4-46	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 2.....	4.4-108
4.4-47	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 3.....	4.4-108
4.4-48	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 4.....	4.4-108
4.4-49	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 5.....	4.4-108
4.4-50	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 6.....	4.4-108
4.4-51	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 7.....	4.4-108
4.4-52	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 8.....	4.4-108
4.4-53	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 9.....	4.4-108
4.4-54	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 10.....	4.4-108
4.4-55	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 11.....	4.4-108
4.4-56	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 12.....	4.4-108
4.4-57	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 13.....	4.4-108
4.4-58	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 14.....	4.4-108
4.4-59	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 15.....	4.4-108
4.4-60	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 16.....	4.4-108
4.4-61	Tracy to Lathrop – Special Status Wildlife Species Habitat, Sheet 17.....	4.4-108
4.4-62	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 1.....	4.4-108
4.4-63	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 2.....	4.4-108
4.4-64	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 3.....	4.4-108
4.4-65	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 4.....	4.4-108
4.4-66	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 5.....	4.4-108
4.4-67	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 6.....	4.4-108
4.4-68	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 7.....	4.4-108
4.4-69	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 8.....	4.4-108
4.4-70	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 9.....	4.4-108
4.4-71	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 10.....	4.4-108
4.4-72	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 11.....	4.4-108
4.4-73	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 12.....	4.4-108
4.4-74	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 13.....	4.4-108
4.4-75	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 14.....	4.4-108
4.4-76	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 15.....	4.4-108
4.4-77	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 16.....	4.4-108

4.4-78	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 17.....	4.4-108
4.4-79	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 18.....	4.4-108
4.4-80	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 19.....	4.4-108
4.4-81	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 20.....	4.4-108
4.4-82	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 21.....	4.4-108
4.4-83	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 22.....	4.4-108
4.4-84	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 23.....	4.4-108
4.4-85	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 24.....	4.4-108
4.4-86	Ceres to Merced – Special Status Wildlife Species Habitat, Sheet 25.....	4.4-108
4.5-1	Lathrop to Ceres – CEQA Study Area for Archaeological Resources, Sheet 1.....	4.5-56
4.5-2	Lathrop to Ceres – CEQA Study Area for Archaeological Resources, Sheet 2.....	4.5-56
4.5-3	Lathrop to Ceres – CEQA Study Area for Archaeological Resources, Sheet 3.....	4.5-56
4.5-4	Lathrop to Ceres – CEQA Study Area for Archaeological Resources, Sheet 4.....	4.5-56
4.5-5	Ceres to Merced – CEQA Study Area for Archaeological Resources, Sheet 1.....	4.5-56
4.5-6	Ceres to Merced – CEQA Study Area for Archaeological Resources, Sheet 2.....	4.5-56
4.5-7	Ceres to Merced – CEQA Study Area for Archaeological Resources, Sheet 3.....	4.5-56
4.5-8	Ceres to Merced – CEQA Study Area for Archaeological Resources, Sheet 4.....	4.5-56
4.5-9	Lathrop to Ceres – CEQA Study Area for Built Resources, Sheet 1.....	4.5-56
4.5-10	Lathrop to Ceres – CEQA Study Area for Built Resources, Sheet 2.....	4.5-56
4.5-11	Lathrop to Ceres – CEQA Study Area for Built Resources, Sheet 3.....	4.5-56
4.5-12	Lathrop to Ceres – CEQA Study Area for Built Resources, Sheet 4.....	4.5-56
4.5-13	Ceres to Merced – CEQA Study Area for Built Resources, Sheet 1.....	4.5-56
4.5-14	Ceres to Merced – CEQA Study Area for Built Resources, Sheet 2.....	4.5-56
4.5-15	Ceres to Merced – CEQA Study Area for Built Resources, Sheet 3.....	4.5-56
4.5-16	Ceres to Merced – CEQA Study Area for Built Resources, Sheet 4.....	4.5-56
4.9-1	Lathrop to Ceres Hazardous Materials Concerns, Sheet 1.....	4.9-44
4.9-2	Lathrop to Ceres Hazardous Materials Concerns, Sheet 2.....	4.9-44
4.9-3	Lathrop to Ceres Hazardous Materials Concerns, Sheet 3.....	4.9-44
4.9-4	Ceres to Merced Hazardous Materials Concerns, Sheet 1.....	4.9-44
4.9-5	Ceres to Merced Hazardous Materials Concerns, Sheet 2.....	4.9-44
4.9-6	Ceres to Merced Hazardous Materials Concerns, Sheet 3.....	4.9-44
4.10-1	Hydrologic Basins and Large Watersheds of the Study Area.....	4.10-66
4.10-2	Groundwater Basins and Subbasins of the Study Area.....	4.10-66
4.10-3	Lathrop to Ceres Subwatersheds and Surface Waters, Sheet 1.....	4.10-66
4.10-4	Lathrop to Ceres Subwatersheds and Surface Waters, Sheet 2.....	4.10-66
4.10-5	Lathrop to Ceres Flooding Hazard Zones, Sheet 1.....	4.10-66
4.10-6	Lathrop to Ceres Flooding Hazard Zones, Sheet 2.....	4.10-66
4.10-7	Ceres to Merced Subwatersheds and Surface Waters, Sheet 1.....	4.10-66
4.10-8	Ceres to Merced Subwatersheds and Surface Waters, Sheet 2.....	4.10-66
4.10-9	Ceres to Merced Flooding Hazard Zones, Sheet 1.....	4.10-66
4.10-10	Ceres to Merced Flooding Hazard Zones, Sheet 2.....	4.10-66
4.11-1	Lathrop to Ceres Land Use Designations Sheet 1.....	4.11-50
4.11-2	Lathrop to Ceres Land Use Designations Sheet 2.....	4.11-50
4.11-3	Lathrop to Ceres Land Use Designations Sheet 3.....	4.11-50
4.11-4	Lathrop to Ceres Land Use Designations Sheet 4.....	4.11-50
4.11-5	Lathrop to Ceres Land Use Designations Sheet 5.....	4.11-50

4.11-6	Ceres to Merced Land Use Designations Sheet 1	4.11-50
4.11-7	Ceres to Merced Land Use Designations Sheet 2	4.11-50
4.11-8	Ceres to Merced Land Use Designations Sheet 3	4.11-50
4.11-9	Ceres to Merced Land Use Designations Sheet 4	4.11-50
4.12-1	Typical A-Weighted Sound Levels	4.12-52
4.12-2	Typical L _{dn} Noise Exposure Levels	4.12-52
4.12-3	Typical Levels of Ground-borne Vibration	4.12-52
4.12-4	Lathrop to Stockton Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-5	Lathrop to Stockton Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-6	Lathrop to Stockton Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-7	Lathrop to Ceres Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-8	Lathrop to Ceres Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-9	Lathrop to Ceres Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-10	Lathrop to Ceres Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-11	Lathrop to Ceres Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-12	Lathrop to Ceres Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-13	Lathrop to Ceres Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-14	Lathrop to Ceres Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-15	Lathrop to Ceres Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-16	Lathrop to Ceres Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-17	Ceres to Merced Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-18	Ceres to Merced Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-19	Ceres to Merced Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-20	Ceres to Merced Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-21	Ceres to Merced Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-22	Ceres to Merced Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-23	Ceres to Merced Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-24	Ceres to Merced Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-25	Ceres to Merced Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-26	Ceres to Merced Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-27	Ceres to Merced Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-28	Ceres to Merced Noise and Vibration Study Area and Noise Measurement Sites	4.12-52
4.12-29	FTA Noise Impact Criteria.....	4.12-52
4.12-30	FTA Cumulative Noise Impact Criteria	4.12-52
4.12-31	Lathrop to Ceres – Phase I Noise Impacts in Manteca.....	4.12-52
4.12-32	Lathrop to Ceres – Phase I Noise Impacts in Manteca.....	4.12-52
4.12-33	Lathrop to Ceres – Phase I Noise Impacts in Ceres	4.12-52
4.12-34	Lathrop to Ceres – Phase II Noise Impacts in Manteca.....	4.12-52
4.12-35	Lathrop to Ceres – Phase II Noise Impacts in Manteca.....	4.12-52
4.14-1	Lathrop to Ceres Public Services	4.14-22
4.14-2	Lathrop to Ceres Public Services	4.14-22
4.14-3	Lathrop to Ceres Public Services	4.14-22
4.14-4	Lathrop to Ceres Public Services	4.14-22
4.14-5	Lathrop to Ceres Public Services	4.14-22
4.14-6	Ceres to Merced Public Services	4.14-22
4.14-7	Ceres to Merced Public Services	4.14-22

4.14-8	Ceres to Merced Public Services	4.14-22
4.14-9	Ceres to Merced Public Services	4.14-22
4.14-10	Ceres to Merced Public Services	4.14-22
4.15-1	Lathrop to Ceres - Parks and Recreation Facilities, Sheet 1.....	4.15-22
4.15-2	Lathrop to Ceres - Parks and Recreation Facilities, Sheet 2.....	4.15-22
4.15-3	Lathrop to Ceres - Parks and Recreation Facilities, Sheet 3.....	4.15-22
4.15-4	Lathrop to Ceres - Parks and Recreation Facilities, Sheet 4.....	4.15-22
4.15-5	Lathrop to Ceres - Parks and Recreation Facilities, Sheet 5.....	4.15-22
4.15-6	Lathrop to Ceres - Parks and Recreation Facilities, Sheet 6.....	4.15-22
4.15-7	Lathrop to Ceres - Parks and Recreation Facilities, Sheet 7.....	4.15-22
4.15-8	Lathrop to Ceres - Parks and Recreation Facilities, Sheet 8.....	4.15-22
4.15-9	Lathrop to Ceres - Parks and Recreation Facilities, Sheet 9.....	4.15-22
4.15-10	Lathrop to Ceres - Parks and Recreation Facilities, Sheet 10.....	4.15-22
4.15-11	Ceres to Merced - Parks and Recreation Facilities, Sheet 1.....	4.15-22
4.15-12	Ceres to Merced - Parks and Recreation Facilities, Sheet 2.....	4.15-22
4.15-13	Ceres to Merced - Parks and Recreation Facilities, Sheet 3.....	4.15-22
4.15-14	Ceres to Merced - Parks and Recreation Facilities, Sheet 4.....	4.15-22
4.15-15	Ceres to Merced - Parks and Recreation Facilities, Sheet 5.....	4.15-22
4.15-16	Ceres to Merced - Parks and Recreation Facilities, Sheet 6.....	4.15-22
4.15-17	Ceres to Merced - Parks and Recreation Facilities, Sheet 7.....	4.15-22
4.15-18	Ceres to Merced - Parks and Recreation Facilities, Sheet 8.....	4.15-22
4.15-19	Ceres to Merced - Parks and Recreation Facilities, Sheet 9.....	4.15-22
4.15-20	Ceres to Merced - Parks and Recreation Facilities, Sheet 10.....	4.15-22
4.15-21	Ceres to Merced - Parks and Recreation Facilities, Sheet 11.....	4.15-22
4.15-22	Ceres to Merced - Parks and Recreation Facilities, Sheet 12.....	4.15-22
4.16-1	Lathrop to Ceres - Airports and Fire Hazard Severity Zones in Study Area.....	4.16-26
4.16-2	Ceres to Merced - Airports and Fire Hazard Severity Zones in Study Area.....	4.16-26
4.17-1	Lathrop to Stockton - Study Intersection and Grade Crossing Locations	4-100
4.17-2	Lathrop to Ceres - Study Intersection and Grade Crossing Locations.....	4-100
4.17-3	Ceres to Merced - Study Intersection and Grade Crossing Locations.....	4-100
5-1	Lathrop to Stockton-Projects Considered in the Cumulative Analysis.....	5-76
5-2	Lathrop to Ceres—Projects Considered in the Cumulative Analysis	5-76
5-3	Ceres to Merced—Projects Considered in the Cumulative Analysis.....	5-76
6-1	Mered Layover Facility East of SR 99 Alternative	6-54

Acronyms and Abbreviations

DBCP	1,2-dibromo-3-chloropropane
ALS	advanced life support
ALUP	Airport Land Use Plans
ACTC	Alameda County Transportation Commission
ACE	Altamont Corridor Express
AAQA	ambient air quality analysis
ADA	Americans with Disabilities Act
AVE	area of visual effect
ACM	asbestos-containing materials
AB	Assembly Bill
ABAG	Association of Bay Area Governments
dBA	A-weighting decibel
BLS	basic life support
BAAQMD	Bay Area Air Quality Management District
BART	Bay Area Rapid Transit
bgs	below ground surface
BAT	best available technology economically achievable
BCT	best conventional pollutant control technology
BMP	best management practices
BCF	billion cubic feet
BA	biological assessment
BO	biological opinion
BRWL	blue-rich white light lamps
BZP	border zone property
Btu	British thermal units
BM	building material
BLM	Bureau of Land Management
ARB	California Air Resources Board
CAAQS	California ambient air quality standards
CBIA v. BAAQMD	California Building Industry Association vs. Bay Area Air Quality Management District
California CAA	California Clean Air Act
Cal. Code Regs.	California Code of Regulations
	California Code of Regulations, or CALGreen
CCED	California Conservation Easement Database
CDFW	California Department of Fish and Wildlife
CALFIRE	California Department of Forestry and Fire Protection
Cal/OSHA	California Department of Occupational Safety and Health
DPR	California Department of Pesticide Regulation
DTSC	California Department of Toxic Substances
Caltrans	California Department of Transportation

DWR	California Department of Water Resources
Cal/OSHA	California Division of Occupational Safety and Health
CESA	California Endangered Species Act
CEC	California Energy Commission
Cal/EPA	California Environmental Protection Agency
CEQA	California Environmental Quality Act
Fish & G. Code	California Fish and Game Code
Cal. Gov. Code	California Government Code
Health & Saf. Code	California Health and Safety Code
CAISO	California Independent System Operator
CA MUTCD	California Manual on Uniform Traffic Control Devices
CNPS	California Native Plant Society
CNDDDB	California Natural Diversity Database
CalOES	California Office of Emergency Services
Public Res. Code	California Public Resources Code
CPUC	California Public Utilities Commission
CRHR	California Register of Historical Resources
SEMS	California Standardized Emergency Management System
SLC	California State Lands Commission
CalSTA	California State Transportation Authority
CASQA	California Stormwater Quality Association
Wat. Code	California Water Code
Cal/OSHA	California's Division of Occupational Safety and Health
EFs	California's Emergency Function Annexes
CO ₂	carbon dioxide
CO _{2e}	carbon dioxide equivalent
CO	carbon monoxide
Carl Moyer Program	Carl Moyer Memorial Air Quality Standards Attainment Program
CCIC	Central Coast Information Center
CVFPB	Central Valley Flood Protection Board
CVFPP	Central Valley Flood Protection Plan
Central Valley Water Board	Central Valley Regional Water Quality Control Board
CUPA	Certified Unified Program Agencies
CAA	Clean Air Act
CWA	Clean Water Act
CWA	Clean Water Act
Scoping Plan	Climate Change Scoping Plan
C.F.R.	Code of Federal Regulations
CNG	compressed natural gas
CMP	congestion management program
C&D	construction and demolition
CRMP	construction risk management plan

CCTA	Contra Costa Transportation Authority
COGs	councils of governments
Downtown Area Shuttle in San Jose	DASH
dB	decibels
DHS	Department of Homeland Security
DTSC	Department of Toxic Substances Control
DPM	diesel particulate matter
DP	distributive power
ECP	electronically controlled pneumatic
EMS	emergency medical services
EMT	emergency medical technician
ESFs	Emergency Support Functions
ESA	Endangered Species Act
EIR	environmental impact report
Leq	equivalent sound level
EFH	essential fish habitat
EO	Executive Order
°F	Fahrenheit
F	Fahrenheit
FMMP	Farmland Mapping and Monitoring Program
FSZ Act	Farmland Security Zone
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
ESFs	Federal Emergency Support Function Annexes
ESA	federal Endangered Species Act
Federal EO	Federal Executive Order
FRSIA	Federal Rail Safety Improvement Act 2008
FRA	Federal Railroad Administration
FR	Federal Register
FTA	Federal Transit Administration
First Update	First Update to the Climate Change Scoping Plan
FAST	Fixing America's Surface Transportation
FIRM	Flood Insurance Rate Maps
FUDS	formerly used defense sites
FIP	freight investment plan
GO	General Order
GIS	geographic information system
GWh	gigawatt hours
GPS	global positioning system
GWP	global warming potential
GHG	greenhouse gas
GW	groundwater
GAMAQI	Guide for Assessing and Mitigating Air Quality Impacts

HCP	habitat conservation plan
HI	hazard index
HWP	hazardous waste property
HREA	Health Risk and Exposure Assessment
HRA	health risk assessment
HHFT	High-Hazard Flammable Trains
HCM 2000	Highway Capacity Manual 2000
HNT	Hostage Negotiation Team
HARP 2	Hotspots Analysis and Reporting Program Version 2
ICS	Incident Command System
ITP	incidental take permit
FIFRA	Insecticide, Fungicide, and Rodenticide Act
IPCC	Intergovernmental Panel on Climate Change
I-	Interstate
ICCTA	Interstate Commerce Commission Termination Act
KVP	key viewpoints
kWh	kilowatt hours
Pb	lead
LBP	lead-based paint
LOS	level of service
LRT	light rail transit
LDT	light-duty truck
LAVTA, or Wheels	Livermore-Amador Valley Transportation Authority
LID	low-impact development
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MOW	Maintenance of way
MAA	Management Agency Agreement
Lmax	maximum A-weighted sound pressure levels
MEI	maximum exposed individual
MW	megawatts
MOU	memorandum of understanding
MCAG	Merced County Association of Governments
CH ₄	methane
MPO	metropolitan planning organizations
MTC	Metropolitan Transportation Commission
µg/m ³	micrograms per cubic meter
MBTA	Migratory Bird Treaty Act
mph	miles per hour
mg/m ³	milligrams per cubic meter
MGD	million gallons per day
SJC	Mineta Airport San Jose
MWLO	model water efficient landscape ordinance
MAX	Modesto Area Express

MID	Modesto Irrigation District
MSR	Modesto-Santa Clara-Redding Public Power Agency
MS4	Municipal Separate Storm Sewer System
NAAQS	national ambient air quality standards
NFHL	National Flood Hazard Layer
NHFP	National Highway Freight Program
NHPA	National Historic Preservation Act
NHD	National Hydrography Dataset
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission
NCCP	natural community conservation plan
NOA	naturally occurring asbestos
NSR	New Source Review
NO	nitric oxide
NO ₂	nitrogen dioxide
NO _x	nitrogen oxide
N ₂ O	nitrous oxide
NGOs	nongovernmental organizations
NSWD	non-stormwater discharge
N/A	not applicable
NOA	Notice of Availability
NOP	notice of preparation
MS4 Permit	NPDES General Permit for Municipal Separate Storm Sewer Systems
OSHA	Occupational Safety and Health Administration
OEHHA	Office of Environmental Health Hazard Assessment
OHP	Office of Historic Preservation
OHWM	ordinary high water mark
OCP	organochlorine pesticides
PG&E	Pacific Gas and Electric Company
PM	particulate matter
ppb	parts per billion
ppm	parts per million
PPV	peak particle velocity
PHMSA	Pipeline and Hazardous Materials Safety Administration
PCB	polychlorinated biphenyls
PAH	polycyclic aromatic hydrocarbons
Porter-Cologne Act	Porter-Cologne Water Quality Control Act of 1969
PTC	Positive Train Control
PM	post miles
PPDG	Project Planning and Design Guide

RFGS	Rail Fixed Guideway Systems
RTA	Rail Transit Agency
ROG	reactive organic gases
RTP	Regional Transportation Plan
RWQCB	Regional Water Quality Control Boards
RC	reinforced concrete
RWD	Report of Waste Discharge
RCRA	Resources Conservation Recovery Act
ROW	right-of-way
RMP	risk management plan
RMS	root-mean-square
Delta	Sacramento–San Joaquin Delta
SLF	Sacred Lands File
SED	Safety and Enforcement Division
Bay Area	San Francisco Bay Area
SFBAAB	San Francisco Bay Area Air Basin
SJCOG	San Joaquin Council of Governments
SJMSCP	San Joaquin County Multi-Species Habitat Conservation and Open Space Plan
SJRRC	San Joaquin Regional Rail Commission
San Joaquin RTD	San Joaquin Regional Transit District
SJVAB	San Joaquin Valley Air Basin
SJVAPCD	San Joaquin Valley Air Pollution Control District
Santa Clara VTA	Santa Clara Valley Transportation Authority
SLR	sea level rise
SOI	Secretary of the Interior's
SB	Senate Bill
SRA	shaded riverine aquatic cover
SEL	sound exposure level
SPRR	Southern Pacific Railroad
SERT	Special Emergency Response Team
SFHA	special flood hazard areas
SLIC	Spills, Leaks, Investigation, and Cleanup
StanCOG	Stanislaus Council of Governments
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SR	State Route
State Water Board	State Water Resources Control Board
SEWD	Stockton East Water District
SWPPP	Stormwater Pollution Prevention Plan
SO ₂	sulfur dioxide
SO _x	sulfur oxide
SSMs	supplemental safety measures
STB	Surface Transportation Board
SCS	Sustainable Communities Strategy

SSPP	System Safety Program Plan
TCE	temporary construction easement
Ldn	the day-night sound level
FEMA	The Federal Emergency Management Agency
NFIP	The National Flood Insurance Program
TDS	total dissolved solids
TMDL	total maximum daily load
Tanner Act	Toxic Air Contaminant Identification and Control Act
TAC	toxic air contaminants
TSCA	Toxic Substances Control Act
TOD	transit-oriented development
TSA	Transportation Security Administration
TID	Turlock Irrigation District
USACE	U.S. Army Corps of Engineers
USDOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
USDA NRCS	U.S. Department of Agriculture Natural Resource Conservation Service
USA North	Underground Service Alert North
UST	underground storage tank
UPRR	Union Pacific Railroad
U.S.C.	United States Code
USAR	urban search and rescue
USBR	US Bureau of Reclamation
VegCAMP	Vegetation Classification and Mapping Program
VMT	vehicle miles traveled
VdB	vibration velocity
VERA	Voluntary Emission Reduction Agreement
WDR	waste discharge requirements