Chapter 7
Energy

7.1 Introduction

This chapter provides an analysis of energy impacts resulting from the proposed project. It describes the existing energy setting in the project area and summarizes the overall regulatory framework in California and the region. Environmental impacts related to usage, as well as mitigation measures to reduce or eliminate potential impacts, are also discussed.

7.2 Environmental Setting

The study area for the analysis of energy consists of the traffic analysis study area, shown in Figure 16-1 from Chapter 16, Traffic, which covers portions of five jurisdictions: Sacramento County; El Dorado County; the cities of Elk Grove, Rancho Cordova and Folsom. It covers the general area where the travel demand model shows "significant" changes in traffic volumes would result from the Connector alternatives, although the percentage of roadways that would be affected by the Connector decreases on the fringes of that area. This analysis considers the direct energy consumption and indirect energy consumption related to the proposed project (Sections 7.4.2.1 and 7.4.2.2).

Section 15125(a) of the State CEQA Guidelines provides that the environmental setting "will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant." The environmental setting consists of existing physical conditions at the time the NOP is released or CEQA analysis is begun.

In 2010, the California Supreme Court clarified that "[n]either CEQA nor the CEQA Guidelines mandates a uniform, inflexible rule for determination of the existing conditions baseline. Rather, an agency enjoys the discretion to decide, in the first instance, exactly how the existing physical conditions without the project can most realistically be measured, subject to review, as with all CEQA factual determinations, for support by substantial evidence. (citation)" (*Communities for a Better Environment v. South Coast Air Quality Management District* (2010) 48 Cal.4th 310) The Court limited this flexibility by further stating that "[a]n approach using hypothetical allowable conditions as the baseline results in 'illusory' comparisons that 'can only mislead the public as to the reality of the impacts and subvert full consideration of the actual environmental impacts,' a result at direct odds with CEQA's intent. (citation)"]

Past practice in traffic impact analysis undertaken to help determine the significance of a project's energy impact has often relied upon a "future no-project" scenario as its CEQA baseline. The project's impact is derived from the difference between "future with-project" and "future no-project" scenarios. This approach has been used in the past because it offers a means of comparing with- and without-project scenarios that share common assumptions for future growth and improvements. It may not, however, conform to the *Communities for a Better Environment* decision. In fact, that very approach was invalidated late last year in the Sixth District Court of Appeal's decision in *Sunnyvale West Neighborhood Assn. v. City of Sunnyvale* (2010) __ Cal.App.4th __.

In recognition of the *Communities for a Better Environment* and Sunnyvale West decisions, the program EIR for the Connector has not followed this past practice. For purposes of determining the impact on energy in this EIR, the baseline is physical conditions along the Southeast Connector alignment as they existed in 2008. This is the most recent year for which comprehensive traffic data is available. The data on existing traffic levels has been used to estimate existing energy conditions based on standard modeling techniques. The estimated conditions are compared to the conditions with the project to determine the significance of the project's energy impact. This approach complies with the intent of the *Communities for a Better Environment*, by providing a significance determination based on the change from existing conditions and avoiding the use of a hypothetical baseline condition.

Determining the significance of an impact by comparing anticipated project conditions to existing conditions in the area affected by the project is a relatively straightforward analysis for most impacts. However, the energy impact of a project that will not be operational for years is not easily compared to existing conditions. By the time the Project is operational in 2025 there will be new infrastructure and background growth in the region unrelated to the project that will impact area roads. The 2025 traffic conditions modeled for the proposed project and used as the basis for the energy analysis do not include reasonable assumptions about new infrastructure and background growth within the region. As a result, although this provides a comparison between existing conditions and conditions with the Project in place, the resultant significance determination will likely overstate the extent of change in energy conditions that is a direct result of the Project.

This program EIR also analyzes the potential impacts that would occur under the "future with-project" scenario. The significance of the impacts of the "future with-project" scenario in comparison to the "future without-project" scenario is analyzed and disclosed in the cumulative impact discussion in Chapter 18, Cumulative and Growth Inducing Impacts.

7.2.1 Energy Terminology

- **Biomass.** Plant materials and animal waste used especially as a source of fuel.
- **Cubic Foot.** A unit of measurement used to represent volume. It represents an area one foot long, by one foot wide, by one foot deep.
- **Direct energy.** The energy used in the actual propulsion of a vehicle using the facility. It can be measured in terms of the thermal value of the fuel (usually measured in British thermal units [BTUs]), the cost of the fuel, or the quantity of electricity used in the engine or motor.
- **Fossil Fuel.** A fuel (as coal, oil, or natural gas) formed in the earth from plant or animal remains.
- **Fuel Cell.** A device that continuously changes the chemical energy of a fuel (as hydrogen) and an oxidant directly into electrical energy.
- **Geothermal.** Of, relating to, or utilizing the heat of the earth's interior.
- **Gigawatt.** A unit of power equal to one billion watts.
- **Hydroelectric.** Of, or relating to, production of electricity by water power.
- **Indirect energy.** The remaining energy used to run a transportation system, including construction energy, maintenance energy, and any substantial impacts on energy expenditures related to project-induced land use changes and mode shifts, and any substantial changes in

energy associated with vehicle operation, manufacturing, or maintenance due to increased automobile use.

- **Kilowatt.** A unit of power equal to 1,000 watts.
- **Megawatt.** A unit of power equal to 1,000 watts.
- **Photovoltaic.** Of, relating to, or utilizing the generation of a voltage when radiant energy falls on the boundary between dissimilar substances (as two different semiconductors).
- **Renewable Energy.** Energy derived from sources capable of being replaced by natural ecological cycles (i.e., solar, wind, biomass, geothermal, tidal) or sound management practices.
- **Solar Energy.** Produced or operated by the action of the sun's light or heat.
- **Watt.** The absolute meter-kilogram-second unit of power equal to the work done at the rate of one joule per second.
- **Watt-hour.** A unit of work or energy equivalent to the power of one watt operating for one hour.

7.3 Regulatory Setting

7.3.1 Federal Regulations

7.3.1.1 The National Energy Policy

The National Energy Policy, established in 2001 by the National Energy Policy Development Group (NEPDG), is designed to help the private sector and state and local governments promote dependable, affordable, and environmentally sound production and distribution of energy for the future (National Energy Policy Development Group 2001). Key issues addressed by the energy policy are energy conservation, repair and expansion of energy infrastructure, and ways of increasing energy supplies while protecting the environment. The National Energy Policy report includes a recommendation to establish Corporate Average Fuel Economy (CAFE) standards for new motor vehicles.

7.3.1.2 Corporate Average Fuel Economy Standards

The CAFE Standards were enacted into law by Congress in 1975 under the "Energy Policy Conservation Act. The CAFE is the sales weighted average fuel economy of a manufacturer's fleet of passenger cars or light trucks manufactured for sale in the United States, for any given model year, and the CAFE Standards are intended to improve the average fuel economy of cars and light trucks (trucks, vans and sport utility vehicles) sold in the U.S. In May 2010, a new national fuel economy program adopting uniform federal standards to regulate both fuel economy and greenhouse gas emissions was adopted. Covering the model years 2012 to 2016, the program would ultimately require an average fuel economy standard of 35.5 miles per gallon (mpg) which is an increase from the current average of 25 mpg for all vehicles. In September 2010, the U.S. Department of Transportation and EPA announced intent to propose new CAFE and GHG emission standards for passenger cars and trucks built in model years 2017 through 2025.

7.3.2 State Regulations

7.3.2.1 California Assembly Bill 32—Global Warming Solutions Act of 2006

Assembly Bill 32 (AB 32) requires California to reduce its total GHG emissions to 1990 levels by 2020, which represents about a 30% decrease from current levels. In September 2007, ARB approved a list of nine Discrete Early Actions to reduce GHG emissions and is currently in the process of developing regulations and programs, based on these actions, that must be adopted and in effect by January 1, 2010 (HSC §38560.5 [b]).

ARB's Discrete Early Actions include maximizing energy efficient building and appliance standards, pursuing additional efficiency efforts, including new technologies and new policy and implementation mechanisms, and pursuing comparable investment in energy efficiency by all retail providers of electricity in California (including both investor-owned and publicly-owned utilities). Current Approved Discrete Early Action Items which have regulatory effect include the

- **Low Carbon Fuel Standard Program.** The purpose of the Low Carbon Fuel Standard Program is to reduce the carbon intensity in transportation fuels as compared to conventional petroleum fuels
- **Heavy-Duty (Tractor-Trailer) Greenhouse Gas Regulation.** The purpose of the Heavy-Duty (Tractor-Trailer) Greenhouse Gas Regulation is to reduce greenhouse gas emissions by improving the fuel efficiency of heavy-duty tractors that pull 53-foot or longer box-type trailers. Fuel efficiency is improved through improvements in tractor and trailer aerodynamics and the use of low rolling resistance tires
- **HFC Emission Reduction Measures for Mobile Air Conditioning measure**. The purpose of the HFC Emission Reduction Measures for Mobile Air Conditioning measure is to reduce hydrofluorocarbon (HFC) emissions associated with mobile air conditioning (MAC) through use of low global warming potential refrigerants in MAC and through efficiency measures applied to MAC systems.
- **Tire Inflation Regulation.** The purpose of the Tire Inflation Regulation is to reduce greenhouse gas emissions from vehicles operating with under inflated tires by inflating them to the recommended tire pressure rating.

7.3.2.2 Assembly Bill 1493 Pavley Standards

Known as "Pavley I," Assembly Bill (AB) 1493 standards are the nation's first GHG standards for automobiles. AB 1493 requires ARB to adopt vehicle standards that will lower GHG emissions from new light-duty autos to the maximum extent feasible beginning in 2009, although court action delayed its implementation. Additional strengthening of the Pavley standards (Pavley II) has been proposed for vehicle model years 2017–2020. Together, the two standards are expected to increase average fuel economy to roughly 43 mpg by 2020 and reduce GHG emissions from the transportation sector in California by approximately 14%. In June 2009, EPA granted California's waiver request enabling the state to enforce its GHG emissions standards for new motor vehicles beginning with model year 2009 and later new motor vehicles.

7.3.2.3 Executive Order S-01-07—Low Carbon Fuel Standard

EO S-01-07 essentially mandates: (1) that a statewide goal be established to reduce the carbon intensity of California's transportation fuels by at least 10% by 2020, and (2) that a Low Carbon Fuel Standard (LCFS) for transportation fuels be established in California. A reduction of 10% in the carbon intensity of all transportation fuels is expected to yield a reduction of 16.5 million MT CO2e by 2020 (California Air Resources Board 2008).

7.3.2.4 Senate Bill 375—Sustainable Communities Strategy, Chapter 728, Statutes of 2008

SB 375 provides for a new planning process that coordinates land use planning, regional transportation plans, and funding priorities in order to help California meet the GHG reduction goals established in AB 32. SB 375 requires that regional transportation plans (RTPs), developed by metropolitan planning organizations (MPOs) relevant to the project area (the Sacramento Area Council of Governments [SACOG] in the case of the proposed action) incorporate a sustainable communities strategy (SCS). The goal of the SCS is to reduce regional GHG emissions through land use and transportation planning such that development patterns would lead to reduced vehicle trips and associated emissions. SB 375 also includes provisions for streamlined CEQA review for some infill projects, such as transit-oriented development. Those provisions will not become effective until an SCS is adopted. Once ARB approves the regional target, SACOG will work with the local jurisdictions to develop the SCS for the region. Each SCS will be developed as part of the RTP update, performed regularly by the 18 MPOs in California. SACOG is currently underway with their RTP update.

7.4 Impact and Mitigation Discussion

A qualitative comparison of the proposed project and project options was employed in this analysis. Direct energy consumption was relatively assessed through a comparison of peak vehicle miles traveled (VMT) (a.m. and p.m.), total VMT, and delay hours. Indirect energy consumption was based on the assumed construction parameters of the proposed project (see Appendix B for the construction assumptions).

The assessment of direct energy use consider various factors, including vehicle fleet mix, annual VMT, fuel economy, and variation of fuel consumption rates over time and by vehicle type.

The proposed project cannot influence the vehicle fleet, future fuel economy, or development patterns that steer regional driving patterns. However, at the writing of this document, both the regulatory environment and the market are responding to climate change concerns, and a transformation of American driving patterns and technologies seems likely within a generation. The practice of assuming present-day fuel economy and fleet conditions is commonly implemented as a worst-case scenario for energy analyses, but at this time the likelihood of large-scale changes in this sector would render that assumption grossly incorrect. This analysis has therefore relied on a comparison of the raw traffic numbers.

In addition, numerous contributors to the energy balance within a project area require complicated and rigorous economic analysis. The decision of where people buy homes, how far they regularly commute, their choice of personal vehicle, and the fuel price at which consumers begin to alter their transportation patterns are just a few examples of large-scale patterns that ultimately affect the number of vehicles in the project area. Traditional energy analyses for roadway projects have ignored these components and consequently attributed changes in VMT and roadway speed/congestion uniquely to the implementation of the projects—a gross oversimplification of the regional energy budget.

With so many unknowns and a multitude of future energy scenarios, a quantitative analysis has a high risk of being inaccurate and meaningless and therefore a qualitative approach was employed (described in detail in Section 7.4.2, Approach and Methodology).

7.4.1 Thresholds of Significance

The JPA has not formally adopted a threshold of significance for impacts related to energy and natural resources. For purposes of this analysis, consistent with prevailing practice, a significant impact related to energy would occur through the encouragement of activities or practices, or construction of facilities that result in the inefficient, wasteful, and unnecessary consumption of energy.

7.4.2 Approach and Methodology

The energy analysis addresses both direct and indirect energy consumption. The analysis of direct energy consumption discusses the potential for increased energy consumed by fossil-fuel–powered vehicles. A discussion of motor vehicle traffic (VMT and average travel speeds) is a component of the direct energy analysis because VMT and speeds can infer direct energy consumption. These VMT values were not converted to direct energy expenditures, avoiding the need to make assumptions about the future vehicle fleet or fuel economy. This approach essentially assumes that all future developments in fuel carbon content, fuel economy, fuel technology, and regulation affect the projected VMT.

The analysis of indirect energy consumption addresses the energy associated with construction and maintenance of the proposed project. Construction-related energy consumption and energy consumption embodied in materials production is assumed to be directly proportional to the size of the proposed project.

7.4.2.1 Direct Energy Consumption

This analysis compares the estimated VMT, vehicle hours traveled (VHT), and average network speed in the traffic analysis study area (see Chapter 16, Traffic). The analysis uses VMT (fuel consumption through VMT), VHT (congestion), and expected air pollutant emission as surrogates for direct energy expenditures associated with anticipated changes in energy consumption associated with changes in estimated roadway vehicle speeds, as indicated in the traffic study. A comparison of traffic metrics in the project area for 2035 conditions is shown in Tables 7-1 through 7-3. It is assumed that societal, economic, or regulatory changes affecting fuel economy are equally reflected in the traffic data (i.e., would not change between alternatives and scenarios). Thus assumed fuel economy is not required to convert traffic data to energy consumption, such as BTUs.

Direct energy expenditures associated with the Kammerer Road Bypass and Off-Corridor Multi-Use Path options were not estimated because the traffic analysis (Chapter 16) found that they would have no discernable impacts on the transportation network, and did not identify any differences in the operational data.

Tables 7-1 and 7-2 summarize peak period delay for the project area and indicate that overall delay is anticipated to improve during peak periods when the highest levels of congestion are expected to occur. Improvements in overall delay indicate that network improvements would occur in which congestion would be lessened and vehicles would flow through the network more efficiently, thereby reducing energy consumption.

Although the data in Tables 7-1 and 7-2 indicate that the proposed project would substantially reduce delay along the project alignment and reduce overall delay on the entire roadway system serving the traffic study area, Table 7-3 indicates that the proposed project with the Sheldon Reduced Access Roadway option would result in increases in total VMT by 1.4%, total VHT by 0.1%, and average speed by 0%. Vehicle energy usage is a function of overall VMT and how efficient this VMT is operating through the roadway network. Within this analysis, average speed is used as a surrogate to determine network efficiency, as average speed takes into account the number of hours (i.e., congestion and vehicle delay) it takes for vehicles to travel through the roadway network.

Increases in VMT generally are associated with increases in direct energy consumption. While VMT increases by approximately 1.7%, average speed remains unchanged, indicating that increased energy consumption may occur associated with the VMT increases.

Because variables such as vehicle age, vehicle type, and fuel type also factor into vehicle efficiency, the description of vehicle efficiency presented here is a generalization. However generalized, the description is pertinent to this analysis and helps to demonstrate that VMT would increase (i.e., energy usage increase). To further evaluate the effects of the project and options on congestion and emissions, an additional analysis at link level was undertaken to estimate changes in VMT and associated fuel consumption in the project alignment area. The Synchro traffic simulation model was used to evaluate traffic operations along the proposed project alignment. The simulation model tracks individual vehicles on the proposed project alignment and their acceleration/deceleration and delay at signals, allowing fuel consumption to be estimated. As emissions are directly related to fuel consumption, one can infer effects to air quality emissions based on changes in fuel consumption associated with the proposed project and options. The additional Synchro analysis found that change in regional fuel consumption would be less than 0.06 percent for any of the project options along the proposed project alignment. Consequently, while Table 7-3 shows increases in VMT, the results of the Synchro analysis, which provides a more complete analysis of the effects of congestion on network operation, indicates that the project and options may result in a smaller increase in VMT than those identified in Table 7-3. While the results of the Synchro model and Table 7-3 cannot be directly compared due to limitations inherent in the Synchro modeling analysis, it does provide a more complete snapshot of the congestion-relief benefits of the project and it's affect on fuel consumption and air quality emissions, and it is likely that the actual effects of the project to VMT lie in the middle of the Synchro results and those presented in Table 7-3.

Table 7-1. Peak Period Vehicle Delay in Traffic Analysis Study Area

			2035 with Project			
			Sheldon Reduced Access Roadway	Deer Creek Causeway		Sheldon High Access Roadway
Measure	Facility	2008		Option 1	Option 2	
> Level of Service (LOS) C Delay[a]	Connector	40,862	26,920	27,430	27,351	27,600
	Non-Connector	1,089,698	1,357,521	1,352,409	1,365,969	1,360,102
	Total traffic study area	1,130,560	1,384,441	1,379,838	1,393,320	1,387,702
Change from Baseline	Connector		(8,870)	(8,791)	(9,301)	(8,621)
	Non-Connector		(27,007)	(40,568)	(35,455)	(32,874)
	Total traffic study area		(35,877)	(49,359)	(44,756)	(41,495)
Percent Change from Baseline	Connector		-24.5%	-24.3%	-25.7%	-23.8%
	Non-Connector		-1.9%	-2.9%	-2.5%	-2.4%
	Total traffic study area		-2.5%	-3.5%	-3.1%	-2.9%
> LOS E Delay[b]	Connector	26,545	6,358	7,886	7,583	6,381
	Non-Connector	770,636	807,018	804,030	817,538	810,755
	Total traffic study area	797,181	813,376	811,916	825,121	817,136
Change from Baseline	Connector		(5,561)	(5,258)	(6,785)	(6,763)
	Non-Connector		(9,893)	(23,401)	(20,413)	(16,676)
	Total traffic study area		(15,454)	(28,659)	(27,199)	(23,439)
Percent Change from Baseline	Connector		-42.3%	-40.0%	-51.6%	-51.5%
	Non-Connector		-1.2%	-2.8%	-2.5%	-2.0%
	Total traffic study area		-1.8%	-3.4%	-3.2%	-2.8%

Source: DKS Associates 2010.

Note: See Figure 16-1 for boundary of traffic study area. The peak period covers 6 hours: the 3-hour morning commute period (6 to 9 a.m.) and the 3-hour evening commute period (3 to 6 p.m.).

[a] > LOS C is the added travel time for vehicles faced with LOS D, E, and F conditions in the traffic study area during the 6-hour peak period.

[b] > LOS E is the added travel time for vehicles faced with LOS F conditions in the traffic study area during the 6-hour peak period.

Table 7-2. Peak Period Vehicle Delay in Traffic Analysis Study Area

		2035 PM Peak Hour Travel Time (minutes)									
		Baseline		Proposed Project with Sheldon Reduced Access Roadway		Proposed Project with Deer Creek Causeway				Proposed Project with High Access Roadway	
						Option 1		Option 2			
Segment	Distance (miles)	North/ East Bound	South/ West Bound	North/ East Bound	South/ West Bound	North/ East Bound	South/ West Bound	North/ East Bound	South/ West Bound	North/ East Bound	South/ West Bound
1 - US 50/Silva Valley to Sacramento Co Line	2.3	6.3	5.4	6.9	6.6	7.2	6.5	7.0	6.6	7.8	6.8
2 - El Dorado Co Line to Grant Line Rd	6.3	9.1	16.4	6.1	8.1	7.8	8.1	7.9	8.1	7.8	8.1
3 - Grant Line Rd to Calvine Road	11.6	22.7	23.5	17.5	17.8	17.0	17.3	17.6	17.3	17.5	17.9
4 - Calvine Rd to Bond Rd	2.7	6.7	6.9	4.5	4.6	5.2	5.0	5.2	5.0	7.3	7.2
5 - Bond Rd to SR 99	4.3	8.5	9.1	7.7	8.1	9.3	10.7	9.3	10.7	8.3	9.7
6 - SR 99 to I-5	6.5	9.6	9.8	8.9	8.7	7.9	8.2	8.8	9.1	8.8	9.0
Total Corridor	**33.7**	**62.9**	**71.0**	**51.6**	**53.8**	**54.2**	**55.8**	**55.8**	**56.9**	**57.5**	**58.6**
Difference from Baseline				-8.7	-15.2	-11.3	-17.2	-7.1	-14.2	-5.4	-12.5
Percent Difference				-14%	-21%	-18%	-24%	-11%	-20%	-9%	-18%
2 & 3 - Expressway Segments	17.9	31.8	39.9	24.7	25.3	23.6	25.9	25.6	25.5	25.2	26.0
Difference from Baseline				-7.1	-14.6	-8.1	-14.0	7.0	6.6	-6.5	-13.9
Percent Difference				-22%	-37%	-26%	-35%	7.9	8.1	-21%	-35%

Source: DKS Associates 2010.

Table 7-3. Summary of Vehicle Miles Traveled, Vehicle Hours Traveled, and Average Speed

			2035 with Project			
			Sheldon Reduced Access Roadway	Deer Creek Causeway		Sheldon High Access Roadway
Measure	Facility	2008		Option 1	Option 2	
Vehicle Miles Traveled (VMT)						
VMT	Connector	168,865	685,464	755,317	749,855	677,672
	Non-Connector	3,993,135	6,656,969	6,605,387	6,613,760	6,660,363
	Total traffic study area	4,162,000	7,342,433	7,360,704	7,363,615	7,338,035
Change from Baseline	Connector		211,994	217,456	147,603	139,811
	Non Connector		(89,470)	(97,843)	(46,260)	(42,866)
	Total traffic study area		122,524	119,613	101,343	96,945
Percent Change from Baseline	Connector		39.4%	40.4%	27.4%	26.0%
	Non Connector		-1.3%	-1.5%	-0.7%	-0.6%
	Total traffic study area		1.7%	1.7%	1.4%	1.3%
Vehicle Hours Traveled (VHT)						
VHT	Connector	4,623	14,724	13,796	13,680	14,694
	Non-Connector	121,650	208,595	209,220	209,750	208,625
	Total traffic study area	126,274	223,318	223,015	223,429	223,318
Change from Baseline	Connector		754	870	1,798	1,768
	Non Connector		(476)	(1,007)	(1,631)	(1,601)
	Total traffic study area		278	(136)	167	167
Percent Change from Baseline	Connector		5.8%	6.7%	13.9%	13.7%
	Non Connector		-0.2%	-0.5%	-0.8%	-0.8%
	Total traffic study area		0.1%	-0.1%	0.1%	0.1%
Average Speed						
Average Speed	Connector	37	47	55	55	46
	Non-Connector	33	32	32	32	32
	Total traffic study area	33	33	33	33	33
Change from Baseline	Connector		10	18	18	9
	Non Connector		(1)	(1)	(1)	(1)
	Total traffic study area		0	0	0	0
Percent Change from Baseline	Connector		27.5%	49.9%	50.1%	26.3%
	Non Connector		-2.8%	-3.8%	-3.9%	-2.7%
	Total traffic study area		0.0%	0.0%	0.0%	0.0%

Source: DKS Associates 2010.

7.4.2.2 Indirect Energy Consumption

This analysis discusses the potential quantities of material for construction of structures and quantity of structures. An additional metric discussed is miles of roadway requiring maintenance after construction is complete. The total amount of energy required is inferred from these metrics and no assumptions regarding cost are made in this analysis. Because detailed construction information, such as required equipment, quantity of materials, and number of labor hours is not available, it is not possible to provide a detailed quantitative assessment of materials-specific energy factors and equipment-specific fuel economy to calculate construction-related energy consumption.

The qualitative comparison analysis presented here assumes that, in general, construction activities and construction materials could be inferred from total project length and area disturbed (see Appendix B for the construction assumptions). This assumption is based on the fact that longer roadways and roadways encompassing a larger disturbed area would require more construction activities and materials than a smaller roadway would require. For example, a roadway with a length of 100 miles and an area of disturbance of 60 acres would require more construction activities and materials than a roadway with a length of 1 mile and an area of disturbance of 6 acres. Larger amounts of materials equates with more energy use resulting from increased labor hours, increased hauling of materials, and increased embodied energy consumption in materials manufacture.

In addition to indirect energy consumption associated with construction activities, electricity required to power traffic lights and signals would result in indirect energy expenditures. As indicated in the Traffic and Transportation analysis (Chapter 16), the project is anticipated to reduce the number of traffic signals from 49 to between 34 and 36 with implementation of the project and options.

Table 7-4. Roadway Length and Assumptions on Area of Disturbance

	Project Length (miles)	Acreage Disturbed[a]
Proposed Project	36.0	1,434
Proposed Project with Off-Corridor Trail[b]	63.5	1,554
Proposed Project with Kammerer Bypass	34.3	1,476
Proposed Project with Deer Creek Causeway Option 1	35.8	1,403
Proposed Project with Deer Creek Causeway Option 2	35.8	1,427
Proposed Project with Reduced Access Roadway	33.5	1,471
Proposed Project with Sheldon High Access Roadway	33.5	1,477

[a] Assumes alignment footprint plus 50 feet on either side for construction staging. Calculated using ArcGIS.
[b] Off-corridor trail assumed to be 30 miles long and disturbed at total of 84.8 acres.

7.4.3 Impacts of the Proposed Project and Project Options

The available traffic data consists of traffic volumes only for the proposed project with the various options. Thus, the impacts discussed here are for the proposed project only in the context of the project options.

Impact EN-1: Increased Consumption of Direct Energy

Direct energy consumption would result from motor vehicle travel through the project area. This analysis compares data summarized in the traffic and air quality analyses for the proposed project and inferred future energy consumption from the relationship between traffic conditions and fuel consumption.

The proposed project would result in increased total VMT on the alignment and decreased total VMT on the remainder of the roadway system in the traffic study area, while the percentage of VMT and VHT that would occur on congested roadways would be decreased, substantially reducing delay along the project alignment and reducing overall delay on the entire roadway system serving the traffic study area. Increased VMT would result from increased motor vehicle trips traveling a greater distance in the project area. Increased vehicle speeds would increase travel flow and reduce congestion, which may result in reduced fuel consumption. The optimal fuel efficiency varies by vehicle, but generally the lowest fuel economy is in the 0–25 mph range, and the optimal range is 45–55 mph, with a steady decline in efficiency occurring as speeds exceeding 45 to 55 mph.

Because vehicle energy usage is a function of overall VMT and average speed, and because efficiency tends to follow the same trend as air pollutant emissions, the analysis of air pollutant emissions can be used to help identify whether the VMT increases are offset by the improvements in network function. The analysis of air pollutant emissions presented in Chapter 4, Air Quality, is calculated using VMT and roadway network speed data. As indicated in Tables 4-13 and 4-14, the proposed project is expected to result in an overall increase in air pollutant emissions. Consequently, it can be inferred that energy consumption will increase as well.

Under existing conditions, the proposed project would not result in speed increases over the traffic study area, while corridor speed increases would increase vehicle speeds to the optimal range for fuel efficiency (from 37 mph to the 46–55 mph range), a condition that would increase fuel efficiency when compared to future no-project conditions. Improved traffic flow would reduce the vehicle hours of delay, a condition that might reduce fuel use because lower traffic speeds (0–25 mph) result in poor fuel economy. As indicated in the additional Synchro analysis, fuel consumption would be less than 0.06 percent for any of the project options along the proposed project alignment, which indicates that the project and options may result in a smaller increase in VMT and fuel than those identified in Table 7-3.

However, as previously indicated, the proposed project is expected to result in an overall increase in air pollutant emissions. Consequently, it can be inferred that energy consumption will increase as well. However, it is not anticipated that this energy consumption would result in wasteful, inefficient, or excessive use of direct energy because operation of the proposed project would lead to improvements in congestion and roadway network efficiency. Because congestion and network inefficiency can be associated with the wasteful and inefficient use of energy, (i.e., increased congestion and network inefficiency would “waste” energy as a result of more cars idling and traffic taking longer to travel through the roadway network), improvements to congestion and roadway network efficiency associated with the proposed project are anticipated to result in more efficient use of energy resources. The impact would be less than significant. No mitigation is required.

Impact EN-2: Increased Consumption of Indirect Energy

Indirect energy consumption would result from project construction as well as the operation of traffic lights and signals. Construction of the proposed project would result in the consumption of energy to prepare the project site, manufacture and deliver construction materials to the project site, and to construct the roadway interchange and associated structures (see the roadway length and total area of disturbance data for the project in Table 7-4). This increased fossil fuel consumption from project construction is not expected to have an appreciable impact on energy resources.

Without a more rigorous assessment of the energy associated with each of the unique construction activities and energy requirements for the project components in Table 7-4, it is impossible to quantify the total energy consumed for the aggregate of construction tasks and roadway lighting. Some construction activities may be inherently more energy intensive than others, and thus apparent energy benefits in one metric could be negated in another.

Based on the qualitative comparison, the proposed project with the Sheldon Reduced Access Roadway option or the Sheldon High Access Roadway option will have the shortest project length and smallest area of disturbance, resulting in the lowest overall amount of construction activities and number of traffic lights and signals (and lowest anticipated energy expenditures), compared to the other options. Consequently, it is anticipated that energy expenditures would be lowest with the Sheldon Reduced Roadway option or the Sheldon High Access Roadway option. Construction of any of the options would be a one-time expenditure of energy. This one-time expenditure of energy would provide energy benefits in the long run because reduced congestion and improved traffic flow through the interchange might result in more efficient direct energy consumption.

As previously indicated, the number of traffic signals is anticipated to be reduced from 49 to between 34 and 36 with implementation of the project and options. Consequently, it is anticipated that implementation of the proposed project and options would result in a decrease in indirect energy consumption relative to the baseline condition from operation of lighting and traffic signals. Lighting will also be limited in order to minimize aesthetic impacts. Traffic signals will utilize standard fixtures. Therefore, the associated energy use is not expected to result in an inefficient, wasteful, or unnecessary consumption of energy. The impact would be less than significant. No mitigation is required.