APPENDIX C

Addendum/Errata to Final Program EIR/EIS for the Bay Area to Central Valley Portion of the California HST System

ADDENDUM/ERRATA

to

Final Program EIR/EIS for the Bay Area to Central Valley Portion of the California HST System

June 2008

Attached are replacement pages for the Final Program EIR/EIS that revise the discussion of air quality and energy benefits associated with the HST alternative as represented in the Final Program EIR/EIS. These corrections do not create new or increase anticipated adverse environmental impacts of the HST system and are being provided as an Addendum/Errata because they are more substantial than simple typographical errors.

Authority staff review of certain calculations used to estimate reductions in air pollutant emissions and energy consumption projected to result with operation of the HST system resulted in the discovery of an error in stated air quality and energy benefits and the need for the corrections shown on the attached pages (highlighted and underscored). The pages should be inserted in the Final Program EIR/EIS to replace previously issued corresponding pages with the same numbers.

Basis for the changes: Automobile vehicle-miles traveled (VMT) that may be affected by implementation of the HST system were estimated and the estimate was used to develop projected air quality and energy benefits from future HST system operations, as reported in the Bay Area to Central Valley Program-level EIR/EIS. The Authority discovered that the total auto VMT for trips within the Bay Area was incorrectly reported because one of the trip purposes was inadvertently omitted in the auto vehicle assignment step for some scenarios that overstated reductions in VMT. This omission occurred outside of the main model forecasting functions. This has been corrected, and revised VMT totals have been derived for trips within the Bay Area and used to correct the estimated air quality and energy benefits on the attached pages of the Final Program EIR/EIS. The correction does not affect HST ridership, revenue forecasts, or the trip diversions reported for highway segments, but it would reduce the air quality and energy benefit associated with the HST alternative as represented in the Final Program EIR/EIS.

These minor technical corrections are appropriately addressed in the attached Addendum/Errata included as part of the Final Program EIR/EIS. The corrections do not constitute changes in the proposed HST system, and therefore do not result in new or increased adverse environmental impacts, or any changes to the discussion of environmental impacts from the HST system. Additionally, the corrections do not result in any changes in the circumstances under which the HST system will be pursued that would require changes in the proposed HST system, and do not make feasible any alternatives or mitigation strategies that were considered infeasible. The minor technical changes contained in the Addendum/Errata do not meet the criteria for preparation of a supplement to or for recirculation of the Final Program EIR/EIS. Finally, the changes are equivalent for the representative Network Alternatives and therefore have no bearing on the identification or selection of a Preferred Alternative.

Revisions

Executive Summary

Chapter 3 includes in each topic area a discussion of mitigation strategies. In addition, design and construction practices have been identified that would be employed as the HST system is developed further in the project-level environmental review, final design, and construction stages. Key aspects of the design practices include (i.e., are not limited to) the following.

- Minimize impact footprint and associated direct impacts on farmland, parkland, biological, and water resources through maximum use of existing transportation corridors.
- Minimize impact associated with growth effects through the selection of multi-modal transportation hubs for potential HST station locations that would maximize access and connectivity as well as provide efficient (transit-oriented) growth centered on these station locations.
- Minimize impact on farmlands and associated growth through the selection of multi-modal transportation hubs for potential HST station locations that would maximize access and connectivity as well as provide for efficient (transit-oriented) growth centered on these station locations.
- Increase safety and circulation and potentially reduce air pollution and noise impacts, through use of grade separation at road crossings, of considerable portions of adjacent existing services with construction of the planned HST system.
- Pursue agreements with owners/rail operators to place the HST alignment within existing rail rights-of-way, to reduce the need for additional right-of-way and minimize potential impacts on agricultural resources and other natural resources.
- Cooperate with regulatory agencies to develop acceptable specific design and construction standards for stream crossings, including (i.e., not limited to) maintaining open surface (bridged versus closed culvert) crossings, infrastructure setbacks, erosion control measures, sediment-controlling excavation/fill practices, and other best management practices.
- Fully line tunnels with impermeable material to prevent infiltration of groundwater or surface waters to the extent possible based on available geologic information and previous tunneling projects in proximity to proposed tunnels.
- Where there is potential for significant barrier effects that could divide wildlife populations or habitat areas or impede wildlife migration corridors, underpasses or overpasses or appropriate passageways will be designed during project-level environmental review for implementation at reasonable intervals during construction to avoid, minimize, or mitigate potential impacts on wildlife movement.
- The potential impacts associated with construction access roads would be greatly limited, and avoided altogether through sensitive areas (as defined at the project level), by using in-line construction (i.e., by using the new rail infrastructure as it is built to transport equipment to and from the construction site and transporting excavated materials away from the construction area to appropriate reuse [e.g., as fill material, aggregate for new concrete] or disposal sites). To avoid creating access roads in sensitive areas (as defined at the project level), necessary geologic exploration would be conducted using helicopter transport for drilling equipment to minimize surface disruption, followed by site restoration on the completion of work.

In addition, the network alternatives have the potential to reduce overall air pollution, total energy consumption, and traffic congestion as compared to the No Project Alternative. Comparing the energy required by each mode to carry a passenger 1 mile (1.6 km), an HST needs only about one-third that required by an airplane and one-fifth that required by a commuter automobile trip. Comparing the pollutant burden generated by each mode to carry a passenger 1 mile (1.6 km), an HST generates approximately less than one-tenth of the pollutants (excluding CO_2) that would be generated by an airplane or by a commuter automobile trip. The representative base HST forecast would result in a reduction of 5.8 million barrels of oil and 6.8 billion pounds of CO_2 emissions annually by 2030, as compared to the No Project Alternative. Diversions from the automobile to HST could lead to a projected

2.3% statewide reduction in vehicle miles traveled (VMT) on the highway system, with VMT reductions of between 1.75% and 8.0% in Bay Area and Central Valley counties.

S.6 HST Station Area Development

There would be great benefits from enhancing development patterns and increasing development densities near proposed HST stations. To further this objective the Authority has outlined the station area development objectives described in Chapter 6. These include:

- The preferred HST station locations would be multi-modal transportation hubs and would typically be in traditional city centers to provide maximum opportunity for station area development in accordance with the purpose, need, and objectives for the HST system.
- To be considered for a station, the proposed site must have the potential to promote higher density, mixed-use, pedestrian-oriented development around the station.
- As the HST project proceeds to more detailed study, and before a final station location decision is made, the responsible local governments(s) are expected to provide (through planning and zoning) for transit-oriented development around HST stations.
- As the project proceeds to more detailed study, local governments are expected to finance (e.g., through value-capture or other financing techniques) the public spaces needed to support the pedestrian traffic generated by hub stations, as well as identify long-term maintenance of the spaces.
- Parking for the HST services at HST stations would be provided at market rates, with a strong preference that parking be placed in structures.
- Provide incentives for local governments in which potential HST stations would be located to prepare and adopt station area plans, amend city and county general plans, and encourage transit-oriented development in the vicinity of HST stations.

S.7 Public and Agency Involvement

Public and agency involvement was conducted as part of this program environmental process. Involvement was accomplished through a variety of means, including the scoping process, which included a series of public and agency scoping meetings, consultation meetings with federal and state resource agency staff representatives throughout the environmental process, informational meetings with interested groups and agencies, presentations and briefings to a broad spectrum of interest groups, information materials (such as a series of fact sheets), the Authority's web site presenting information about the proposed project and study evaluations, noticed public meetings of the Authority's governing board at which key policy issues and decisions were raised and discussed and opportunities for public comment were provided, public circulation and posting of the Draft Program EIR/EIS on the Authority's web site, and eight public hearings on the Draft Program EIR/EIS.

S.7-1 Summary of Comments on the Identification of the Preferred Alternative

The identification of a preferred HST alignment between the Bay Area and Central Valley is controversial, and this Program EIR/EIS process has received a considerable amount of comment from agencies (federal, state, regional, and local), organizations, and the general public. There is a wide divergence of opinion, with many favoring the Pacheco Pass, many favoring the Altamont Pass, and many favoring a combination of both passes (with the Pacheco serving as the north/south HST connection and Altamont primarily serving interregional commuter service between Sacramento/northern San Joaquin Valley and the Bay Area).

Section 3.3 Revisions

Air Quality and Global Climate Change

uncontrolled engine emissions. Newer regulations, including California's low fuel standards, which will require a 10% reduction of carbon intensity by 2020, and AB1493, which is predicted to result in a 27% reduction in grams of CO_2 per vehicle mile by 2030, are not yet reflected in the current emission burden estimates developed by CARB and are thus not reflected in this analysis.

According to CARB pollutant burden projections, emissions of PM10 are expected to increase statewide for the No Project Alternative compared to existing conditions. The upward trend in PM10 emissions is primarily the result of increased emissions from areawide sources, including dust from increased VMT on unpaved and paved roads. PM10 emissions from stationary sources are also expected to increase slightly in the future because of industrial growth.

CO_2 levels for 2005 were projected from data in the December 2006 report Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004, by the California Energy Commission. Year 2005 CO_2 emissions were estimated at 1.280 million tons/day.

The percentage of each pollutant source that may be affected by the HST Alignment Alternatives is shown in Figure 3.3-2. Of the four sources of concern (on-road mobile, trains, planes, electric) shown in the figure, on-road mobile is the largest single contributor for all the pollutants. For CO, on-road mobile sources would contribute 74%; for NO_X, on-road mobile sources would contribute 50%. These percentages are only based on the four sources affected by the project and do not reflect total statewide percentages. By detailing the potential overall contribution to statewide pollution levels of each of these sources, the relationship between changes in sources and overall pollution concentrations becomes clearer.

The following analysis of the Pacheco and Altamont Alternatives is based on the "low" ridership projections found in Chapter 2, Table 2.3-3. As discussed in Chapter 2, only the low ridership forecasts are used for air quality analysis for both the Pacheco and Altamont alternatives.

B. PACHECO ALTERNATIVE

No Project Base Alternative Compared to Pacheco Alignment Alternative

The highway component is based on potential daily VMT reductions of 26.682 million miles. The air travel component is based on potential reductions of 43,865 daily trips.

Roadways: The proposed Pacheco Alignment Alternative could potentially result in a daily reduction of 26.682 million VMT as compared to the No Project Alternative. Changes in VMT and estimated on-road mobile source emission reductions resulting from the use of the proposed HST have been calculated statewide and for each of the air basins (Table 3.3-4). The highest reductions in on-road mobile source emissions are predicted for the San Joaquin Air Basin. The Pacheco Alignment Alternative is predicted to reduce the 2030 predicted CO mobile source emission budget for San Joaquin Air Basin by 11.42 tons per day (10.4 metric tons per day).

Air Travel: The air-travel component is based on 43,865 daily trips (1 trip = 1 takeoff and 1 landing), or 433 flights statewide, being shifted from the airplane component of No Project future conditions to the proposed Pacheco Alignment Alternative. The emission burden reductions projected from the reduced number of flights, shown in Table 3.3-5, were calculated by determining the number of flights that could be accommodated by the proposed HST and multiplying that number by the emission estimates of an average flight, as described above in the discussion of methods of evaluating impacts. The emission changes by air basin resulting from the reduced number of flights range from an estimated 3.4% reduction in PM2.5 in the San Francisco Bay Air Basin to a 0.1% reduction in CO in the San Joaquin Air Basin. Statewide emission reductions range from 0.7% for PM10 and PM2.5 to 3.4% for NO_X. CO_2 plane emissions, generated based on BTUs, are predicted to decrease by approximately 44% on a statewide level under the Pacheco Alignment Alternative.

Train Travel: Conventional rail service is not predicted to increase under the proposed Pacheco Alignment Alternative; therefore, no change in pollutant burdens is predicted as a result of conventional train travel.

Electrical Power: Additional electrical power would be required to operate the HST system. Because of the nature of electrical power generation and the use of a grid system to distribute electrical power, it is not yet clear which facilities would be supplying power to the HST system. Emission changes from power generation can therefore be predicted only on a statewide level for the full HST system. As shown in Table 3.3-6, CO, PM10, PM2.5, NO_X, and TOG burden levels would be predicted to increase because of the power requirements of the Pacheco Alignment Alternative. A 1.2% increase in CO, PM10, PM2.5, TOG, and NO_X is predicted in the electric utilities portion of these CARB pollutant emission burden projections. A 1.8% increase in CO_2 electrical power emission burden projections is predicted due to increased electrical requirements of the project. If it is decided that the project would be run on 100% clean, zero-carbon emissions electricity, there would be no predicted increase in CO_2 levels due to the project's increased electrical requirements.

Summary of Pollutants: Table 3.3-7 summarizes the combined source categories for existing conditions and the No Project Alternative and the Pacheco Alignment Alternative. Compared to the No Project Alternative, the proposed Pacheco Alignment Alternative is projected to result in a decrease in the amount of pollutants statewide and in all air basins analyzed. Potential medium rated air quality benefits are predicted under this alternative. CO_2 levels are also detailed in Table 3.3-7. CO_2 project impacts were estimated based on energy projections developed for each alignment alternative. CO_2 calculations for the alignment alternatives reflect only emissions from electrical power stations, planes, and on-road VMT. More detailed tables illustrating the analysis of the pollutant burdens predicted, can be found in the appendix to this report.

Table 3.3-4
On-Road Mobile Source Regional Emissions Analysis—No Project Alternative and Pacheco Alignment Alternative

Air Basin	2030 No Project VMT	2030 Pacheco Base VMT	2030 No Project Emission Burden (Tons/Day)						2030 Pacheco Base Emission Burden (Tons/Day)						Incremental Change from No Project					
			CO	PM10	PM2.5	NO_X	TOG	CO_2	CO	PM10	PM2.5	NO_X	TOG	CO_2	CO	PM10	PM2.5	NO_X	TOG	CO_2
Miles and Tons per Day*																				
San Francisco Bay	112,280,333	110,319,202	259.8	11.6	7.5	51.0	36.0	NA	255.2	11.4	7.3	50.1	35.3	NA	-4.54	-0.2	-0.13	-0.89	-0.63	NA
San Joaquin Valley	126,463,316	116,352,966	142.8	7.1	4.2	33.8	19.3	NA	131.4	6.5	3.9	31.1	17.8	NA	-11.4	-0.6	-0.3	-2.7	-1.5	NA
State Total	1,141,592,762	1,114,910,694	1,310.5	56.9	35.1	263.5	186.2	486,613	1,279.8	55.6	32.5	257.3	181.9	475,240	-30.63	-1.33	-2.57	-6.16	-4.35	-11,373
Kilometers and Metric Tons per Day*																				
San Francisco Bay	180,697,680	177,541,546	235.7	10.5	6.8	46.2	32.6	NA	231.6	10.3	6.7	45.4	32.1	NA	-4.1	-0.2	-0.1	-0.8	-0.6	NA
San Joaquin Valley	203,522,979	187,251,948	129.6	6.4	3.8	30.6	17.5	NA	119.2	5.9	3.5	28.2	16.1	NA	-10.4	-0.5	-0.3	-2.4	-1.4	NA
State Total	1,837,215,462	1,794,274,836	1,188.8	51.6	31.8	239.0	168.9	441,457	1,161.1	504.4	29.5	233.4	165.0	431,139	-27.8	-1.2	-2.3	-5.6	-3.9	-10,318

* Area emission increments are based on area specific emission factors derived from area specific VMT and emission burdens. Statewide emission increments are based on statewide average emissions rather than area specific emissions, thus the statewide totals do not represent a simple sum of all air basins but rather an average of emission increments statewide. CO_2 emissions are only calculated on a statewide level.

Air Basin	% Change from No Project					
	CO	PM10	PM2.5	NO_X	TOG	CO_2
San Francisco Bay	-1.7	-1.7	-1.7	-1.7	-1.7	NA
San Joaquin Valley	-8.0	-8.0	-8.0	-8.0	-8.0	NA
State Total	-2.3	-2.3	-7.3	-2.3	-2.3	-2.3

Table 3.3-5
Airplane Emission Burdens—No Project Alternative and Pacheco Alignment Alternative

Air Basin	2030 Projected No Project Airplane Emission Inventory (Tons/Day)						Flights removed due to project	2030 Emission Reductions due to Flights removed under Build Alternative (Tons/Day)						2030 Total Plane Emission Burden under Build Alternative (Tons/Day)					
	CO	PM10	PM 2.5	NO_X	TOG	CO_2		CO	PM10	PM 2.5	NO_X	TOG	CO_2	CO	PM10	PM2.5	NO_X	TOG	CO_2
Tons per Day*																			
San Francisco Bay	74.75	0.67	0.64	41.45	12.72	NA	167	-1.74	-0.02	-0.02	-1.20	-0.41	NA	73.00	0.65	0.62	40.24	12.31	NA
San Joaquin Valley	81.50	0.46	0.45	4.75	10.03	NA	10	-0.10	0.00	0.00	-0.07	-0.02	NA	81.40	0.46	0.45	4.68	10.00	NA
State Total	346.74	7.76	7.67	92.44	51.05	11,528	433	-4.53	-0.06	-0.06	-3.13	-1.08	-5,108.32	342.21	7.70	7.62	89.32	49.97	6,420.11
Metric Tons per Day*																			
San Francisco Bay	67.81	0.61	0.58	37.60	11.54	NA	167	-1.58	-0.02	-0.02	-1.09	-0.38	NA	66.23	0.59	0.56	36.51	11.17	NA
San Joaquin Valley	73.93	0.42	0.41	4.31	9.10	NA	10	-0.09	0.00	0.00	-0.06	-0.02	NA	73.84	0.42	0.41	4.24	9.07	NA
State Total	314.56	7.04	6.96	83.87	46.31	10,458.63	433	-4.11	-0.05	-0.05	-2.84	-0.98	-4,634.29	310.45	6.99	6.91	81.03	45.33	5,824.34

*CO_2 emissions are only calculated on a statewide level.

Air Basin	% Change from No Project					
	CO	PM10	PM2.5	NO_X	TOG	CO_2
San Francisco Bay	-2.3	-3.2	-3.4	-2.9	-3.3	NA
San Joaquin Valley	-0.1	-0.3	-0.3	-1.4	-0.2	NA
State Total	-1.3	-0.7	-0.7	-3.4	-2.1	-44.3

Table 3.3-7
Potential Impacts on Air Quality Statewide—Existing, No Project, and Pacheco Alignment Alternative

Air Basin	2005 Existing Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO_2 all sources) (Tons/Day)						2030 Projected No Project Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO_2 all sources) (Tons/Day)						2030 Projected Build Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO_2 all sources) (Tons/Day)					
	CO	PM10	PM2.5	NO_X	TOG	CO_2	CO	PM10	PM2.5	NO_X	TOG	CO_2	CO	PM10	PM2.5	NO_X	TOG	CO_2
Tons per Day																		
San Francisco Bay	1536	10	7	318	174	NA	398	22	17	144	94	NA	393	22	17	143	94	NA
San Joaquin Valley	948	7	6	224	102	NA	231	8	5	58	31	NA	220	7	5	55	30	NA
State Total	7,979	69	52	1759	932	1,280,217	1,715	69	47	478	253	1,763,118	1,680	67	44	468	247	1,753,871
Metric Tons per Day																		
San Francisco Bay	1,393	9	7	288	157	NA	361	20	16	131	86	NA	356	20	16	130	85	NA
San Joaquin Valley	860	7	5	203	93	NA	210	7	5	53	28	NA	199	7	4	50	27	NA
State Total	7,239	63	48	1,596	846	1,161,416	1,556	62	42	433	229	1,599,505	1,524	61	40	425	224	1,591,116

Air Basin	% Change from No Project					
	CO	PM10	PM2.5	NO_X	TOG	CO_2
San Francisco Bay	-1.4	-0.5	-0.3	-1.1	-0.6	NA
San Joaquin Valley	-5.0	-7.0	-6.6	-4.8	-5.0	NA
State Total	-2.0	-2.0	-5.6	-1.9	-2.2	-0.5
Air Basin	**Benefit Rating**					
	CO	**PM10**	**PM2.5**	**NO_X**	**TOG**	**CO_2**
San Francisco Bay	Medium	Medium	Medium	Medium	Medium	NA
San Joaquin Valley	Medium	Medium	Medium	Medium	Medium	NA
State Total	Medium	Medium	Medium	Medium	Medium	NA

Local Impacts: A total of 18 intercity freeway segments were analyzed. The general trend in screenline data shows that the LOS on these freeway segments would largely remain the same under the Pacheco Alignment Alternative compared to the No Project Alternative. Most of the freeway segments would experience less than a 5% change in V/C ratio and no change in LOS. This is with the exception of I-5 (between I-580 and SR 140), which would experience a better level of service under the Pacheco Alignment Alternative, with an approximately 20% reduction in V/C ratio. V/C ratio is the comparison of the roadway volume to roadway capacity, and a reduction in the V/C ratio signifies a better level of service and, therefore, less congestion and lower potential for air quality impacts.

As the alignment alternatives are refined, segments where V/C ratios increase (degrade) should be screened to determine whether more detailed local analyses need to be conducted. Roadways and intersections around proposed station location options should also be screened and undergo detailed modeling if necessary to ensure that the project would not cause or exacerbate a violation of applicable air quality standards.

GHGs: The air quality analysis identified a reduction of about 0.5% of CO_2 emissions statewide attributed to the Pacheco Alignment Alternative. This would be a beneficial impact due to the reduction in automobile vehicle miles traveled (mobile sources) and reduction in the number of airplane trips.

C. ALTAMONT ALTERNATIVE

No Project Base Alternative Compared to Altamont Alignment Alternative

The highway component is based on potential daily VMT reductions of 24.163 million miles. The air travel component is based on potential reductions of 41,573 daily trips.

Roadways: The proposed Altamont Alignment Alternative could potentially result in a daily reduction of 24.163 million VMT as compared to the No Project Alternative. Changes in VMT and estimated on-road mobile source emission reductions resulting from the use of the proposed HST have been calculated statewide and for each of the air basins (Table 3.3-8). The highest reductions in on-road mobile source emissions are predicted for the San Joaquin Air Basin. The Altamont Alignment Alternative is predicted to reduce the 2030 predicted CO mobile source emission budget for San Joaquin Air Basin by 11.16 tons per day (10.12 metric tons per day).

Air Travel: The air-travel component is based on 41,573 daily trips (1 trip = 1 takeoff and 1 landing), or 411 flights statewide, being shifted from the airplane component of No Project future conditions to the proposed Altamont Alignment Alternative. The emission burden reductions projected from the reduced number of flights, shown in Table 3.3-9, were calculated by determining the number of flights that could be accommodated by the proposed HST and multiplying that number by the emission estimates of an average flight, as described above in the discussion of methods of evaluating impacts. The emission changes by air basin resulting from the reduced number of flights range from an estimated 3.2% reduction in PM2.5 in the San Francisco Bay Air Basin to a 0.1% reduction in CO in the San Joaquin Air Basin. Statewide emission reductions range from 0.7% for PM10 and PM2.5 to 3.2% for NO_X. CO_2 plane emissions, generated based on BTUs, are predicted to decrease by approximately 42% on a statewide level under the Altamont Alignment Alternative.

Train Travel: Conventional rail service is not predicted to increase under the proposed Pacheco Alignment Alternative; therefore, no change in pollutant burdens is predicted as a result of conventional train travel.

Table 3.3-8
On-Road Mobile Source Regional Emissions Analysis—No Project Alternative and Altamont Alignment Alternative

Air Basin	2030 No Project VMT	2030 Altamont Base VMT	2030 No Project Emission Burden (Tons/Day)						2030 Altamont Base Emission Burden (Tons/Day)						Incremental Change from No Project					
			CO	PM 10	PM 2.5	NO_X	TOG	CO_2	CO	PM 10	PM 2.5	NO_X	TOG	CO_2	CO	PM 10	PM 2.5	NO_X	TOG	CO_2
Miles and Tons per Day*																				
San Francisco Bay	112,280,333	110,469,583	259.8	11.6	7.5	51.0	36.0	NA	255.6	11.4	7.4	50.2	35.4	NA	-4.19	-0.19	-0.12	-0.82	-0.58	NA
San Joaquin Valley	126,463,316	116,584,184	142.8	7.1	4.2	33.8	19.3	NA	131.7	6.5	3.9	31.1	17.8	NA	-11.2	-0.6	-0.3	-2.6	-1.5	NA
State Total	1,141,592,762	1,117,429,041	1,310.5	56.9	35.1	263.5	186.2	486,613	1,282.7	55.7	34.3	257.9	182.3	476.313	-27.74	-1.2	-0.74	-5.58	-3.94	-10,300
Kilometers and Metric Tons per Day*																				
San Francisco Bay	180,697,681	177,783,560	235.7	10.5	6.8	46.2	32.6	NA	231.9	10.4	6.7	45.5	32.1	NA	-3.80	-0.17	-0.11	-0.75	-0.53	NA
San Joaquin Valley	203,522,980	187,624,056	129.6	6.4	3.8	30.6	17.5	NA	119.5	5.9	3.5	28.2	16.2	NA	-10.12	-0.50	-0.30	-2.39	-1.37	NA
State Total	1,837,215,462	1,798,327,722	1,188.8	51.6	31.8	239.0	168.9	441,457	1,163.7	50.5	31.2	234.0	165.4	432,133	-25.16	-1.09	-0.67	-5.06	-3.58	-9,344

* Area emission increments are based on area specific emission factors derived from area specific VMT and emission burdens. Statewide emission increments are based on statewide average emissions rather than area specific emissions, thus the statewide totals do not represent a simple sum of all air basins but rather an average of emission increments statewide. CO_2 emissions are only calculated on a statewide level.

Air Basin	% Change from No Project					
	CO	PM10	PM2.5	NO_X	TOG	CO_2
San Francisco Bay	-1.6	-1.6	-1.6	-1.6	-1.6	NA
San Joaquin Valley	-7.8	-7.8	-7.8	-7.8	-7.8	NA
State Total	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1

Table 3.3-9
Airplane Emission Burdens—No Project Alternative and Altamont Alignment Alternative

Air Basin	2030 Projected No Project Airplane Emission Inventory (Tons/Day)						Flights removed due to project	2030 Emission Reductions due to Flights removed under Build Alternative (Tons/Day)						2030 Total Plane Emission Burden under Build Alternative (Tons/Day)					
	CO	PM 10	PM 2.5	NO_X	TOG	CO_2		CO	PM 10	PM 2.5	NO_X	TOG	CO_2	CO	PM 10	PM 2.5	NO_X	TOG	CO_2
Tons per Day*																			
San Francisco Bay	74.75	0.67	0.64	41.45	12.72	NA	-158	-1.65	-0.02	-0.02	-1.14	-0.39	NA	73.10	0.65	0.62	40.31	12.33	NA
San Joaquin Valley	81.50	0.46	0.45	4.75	10.03	NA	-9	-0.09	0.00	0.00	-0.07	-0.02	NA	81.40	0.46	0.45	4.68	10.00	NA
State Total	346.74	7.76	7.67	92.44	51.05	11,528	-411	-4.29	-0.05	-0.05	-2.96	-1.02	-4,848.6	342.44	7.70	7.62	89.48	50.03	6,685.8
Metric Tons per Day*																			
San Francisco Bay	67.81	0.61	0.58	37.60	11.54	NA	-158	-1.50	-0.02	-0.02	-1.03	-0.36	NA	66.31	0.59	0.56	36.57	11.19	NA
San Joaquin Valley	73.93	0.42	0.41	4.31	9.10	NA	-9	-0.09	0.00	0.00	-0.06	-0.02	NA	73.85	0.42	0.41	4.25	9.07	NA
State Total	314.56	7.04	6.96	83.87	46.31	10,458.6	-411	-3.90	-0.05	-0.05	-2.69	-0.93	-4,393.3	310.67	6.99	6.91	81.18	45.38	6,065.4

*CO_2 emissions are only calculated on a statewide level.

Air Basin	% Change from No Project					
	CO	PM10	PM2.5	NO_X	TOG	CO_2
San Francisco Bay	-2.2	-3.1	-3.2	-2.8	-3.1	NA
San Joaquin Valley	-0.1	-0.3	-0.3	-1.4	-0.2	NA
State Total	-1.2	-0.7	-0.7	-3.2	-2.0	-42.0

Table 3.3-11
Potential Impacts on Air Quality Statewide—Existing, No Project, and Altamont Alignment Alternative

Air Basin	2005 Existing Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO_2 all sources) (Tons/Day)						2030 Projected No Project Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO_2 all sources) (Tons/Day)						2030 Projected Build Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO_2 all sources) (Tons/Day)					
	CO	PM10	PM2.5	NO_X	TOG	CO_2	CO	PM 10	PM 2.5	NO_X	TOG	CO_2	CO	PM 10	PM 2.5	NO_X	TOG	CO_2
Tons per Day																		
San Francisco Bay	1,536	10	7	318	174	NA	398	22	17	144	94	NA	393	22	17	143	94	NA
San Joaquin Valley	948	7	6	224	102	NA	231	8	5	58	31	NA	220	8	5	55	30	NA
State Total	7,979	69	52	1,759	932	1,280,217	1,715	69	47	478	253	1,763,118	1,683	68	46	469	248	1,755,210
Metric Tons per Day																		
San Francisco Bay	1,393	9	7	288	157	NA	361	20	16	131	86	NA	357	20	16	130	85	NA
San Joaquin Valley	860	7	5	203	93	NA	210	7	5	53	28	NA	200	7	4	50	27	NA
State Total	7,239	63	48	1,596	846	1,161,416	1,556	62	42	433	229	1,599,505	1,527	61	42	425	225	1,592,331

Air Basin	% Change from No Project					
	CO	PM10	PM2.5	NO_X	TOG	CO_2
San Francisco Bay	-1.3	-0.4	-0.2	-1.0	-0.5	NA
San Joaquin Valley	-4.9	-6.9	-6.4	-4.7	-4.9	NA
State Total	-1.9	-1.8	-1.7	-1.8	-2.0	-0.4
Air Basin	**Benefit Rating**					
	CO	**PM10**	**PM2.5**	**NO_X**	**TOG**	**CO_2**
San Francisco Bay	Medium	Medium	Medium	Medium	Medium	NA
San Joaquin Valley	Medium	Medium	Medium	Medium	Medium	NA
State Total	Medium	Medium	Medium	Medium	Medium	NA

Electrical Power: Additional electrical power would be required to operate the HST system. Because of the nature of electrical power generation and the use of a grid system to distribute electrical power, it is not yet clear which facilities would be supplying power to the HST system. Emission changes from power generation can therefore be predicted only on a statewide level for the full HST system. As shown in Table 3.3-10, CO, PM10, PM2.5, NO_X, and TOG burden levels would be predicted to increase because of the power requirements of the Altamont Alignment Alternative. A 1.2% increase in CO, PM10, PM2.5, TOG, and NO_X is predicted in the electric utilities portion of these CARB pollutant emission burden projections. A 1.8% increase in CO_2 electrical power emission burden projections is predicted due to increased electrical requirements of the project. If it is decided that the project would be run on 100% clean, zero-carbon emissions electricity, there would be no predicted increase in CO_2 levels due to the project's increased electrical requirements.

Summary of Pollutants: Table 3.3-11 summarizes the combined source categories for existing conditions and the No Project Alternative and the Altamont Alignment Alternative. Compared to the No Project Alternative, the proposed Altamont Alignment Alternative is projected to result in a decrease in the amount of pollutants statewide and in all air basins analyzed. Potential medium rated air quality benefits are predicted under this alternative. CO_2 levels are also detailed in Table 3.3-11. CO_2 project impacts were estimated based on energy projections developed for each alignment alternative. CO_2 calculations for the alignment alternatives reflect only emissions from electrical power stations, planes, and on-road VMT. More detailed tables illustrating the analysis of the pollutant burdens predicted can be found in the appendix to this section.

Local Impacts: A total of 18 intercity freeway segments were analyzed. The general trend in screenline data shows that the LOS on these freeway segments would largely remain the same under the Altamont Alignment Alternative compared to the No Project Alternative. Most of the freeway segments would experience less than a 5% change in V/C ratio and no change in LOS. This is with the exception of I-5 (between I-580 and SR 140), which would experience a better level of service under the Altamont Alignment Alternative, with an approximately 20% reduction in V/C ratio. V/C ratio is the comparison of the roadway volume to roadway capacity, and a reduction in the V/C ratio signifies a better level of service and, therefore, less congestion and lower potential for air quality impacts.

As the alignment alternatives are refined, segments where V/C ratios increase (degrade) should be screened to determine whether more detailed local analyses need to be conducted. Roadways and intersections around proposed station location options should also be screened and undergo detailed modeling if necessary to ensure that the project would not cause or exacerbate a violation of applicable air quality standards.

GHGs: The air quality analysis identified a reduction of about 0.4% of CO_2 emissions statewide attributed to the Altamont Alignment Alternative. This would be a beneficial impact due to the reduction in automobile vehicle miles traveled (mobile sources) and reduction in the number of airplane trips.

3.3.4 Design Practices

The HST system would use electrical propulsion to serve the forecast ridership, which is primarily diverted from highway or air travel. The HST Alignment Alternatives are estimated to have a beneficial effect on the emissions levels throughout the air basins involved. In addition, the Authority will pursue the identification and utilization of energy produced from clean/efficient sources to the extent possible, as per the California Renewables Portfolio Standard Program, which was enacted in SB 1078, ch. 516, Statutes of 2002, which added California Public Utility codes sections 387, 399.11 et seq., and 399.25.

Section 3.5 Revisions

Energy

Transportation Energy Consumption

Transportation accounts for a large portion of the California energy budget, with approximately 46% of the state's energy consumption resulting from the transport of goods and people. The population in California is projected to increase 28% by the year 2030. That growth equates to almost 10 million people (Cambridge Systematics 2007). Because of trends in travel demand, congestion, and other adverse travel conditions, the market for intercity travel in California that the proposed HST system could serve is projected to grow by up to 46% over the next 30 years.

Although travelers in, or who are visiting or leaving, the study area have several options for intercity travel—automobiles on interstate and state highways, commercial airlines, conventional passenger trains (Amtrak) on freight and/or commuter rail tracks, and long-distance commercial bus transit—the automobile is the predominant mode for intercity trips.

Transportation Energy Outlook

The recent fuel price increases have generated renewed interest in more fuel-efficient cars and in living closer to the workplace. Although it is a slow process to transform an automobile fleet, drivers are increasingly making automobile purchasing decisions based on fuel consumption concerns. Automobiles powered by diesel engines and engines that are hybrids composed of both electrical and gasoline components offer substantial fuel-efficiency upgrades over traditional gasoline engines.

Automobiles are most efficient when operating at steady speeds of 35–45 mph (56–72 kph) with no stops (U.S. Department of Energy 2006). Fuel consumption increases by about 30% when average speeds drop from 30 to 20 mph (48 to 32 kph), while a drop from 30 to 10 mph (48 to 16 kph) results in a 100% increase in fuel use with conventional automobile engines. Studies estimate that approximately 10% of all on-road fuel consumed is a result of congestion (California Energy Commission 1990).

As of 2005, 26 million automobiles were registered to drivers in California, which equated to the state being the second largest consumer of petroleum fuel in the world; only the United States consumes more. Because of this dependence on petroleum fuels, world geopolitical events can immediately and adversely affect the price and adequacy of California's fuel supply (California Energy Commission 2006e).

3.5.3 Environmental Consequences

A. NO PROJECT ALTERNATIVE

In 2000, passenger trips taken in California resulted in 273.2 billion automobile VMT (442.9 billion automobile VKT) and 75.8 million airplane VMT (122.8 million airplane VKT). By 2030, under the No Project Alternative, the total number of passenger trips estimated to be taken in California would result in about 416.7 billion automobile VMT (670.6 billion automobile VKT) and 131.9 million airplane VMT (213.9 million airplane VKT). The increase in passenger trips is reflective of population growth expected over the same period.

Operational (Direct) Energy

As indicated in Table 3.5-3, the existing (Year 2000) energy used to power intrastate transportation was 1,547,264,050 million Btus (MMBtus), or 267 million barrels of oil. The 3.49 billion passenger trips estimated under the No Project Alternative would consume the equivalent of about 408 million barrels of oil. This is an increase of 141 million barrels of oil over existing conditions. On the one hand, this is a conservative estimate because, as noted in Section 3.5.3, automobile fuel efficiency decreases considerably as travel speed decreases below 30 mph (48 kph) and stop-and-go traffic increases. Because congestion levels under the No Project Alternative would likely be higher than they are under existing conditions, the increase in direct energy used in 2030 would have congestion-related cause to be higher than the estimated 408 million barrels. To illustrate this point, if the direct energy consumption factor for automobiles under a more congested No Project condition increased by 5%, from 5,572 Btus/VMT to 5,851 Btus/VMT, and all other factors remained the same, the total direct energy consumption under the No Project Alternative would increase by 20 million barrels of oil to 428 million barrels of oil.

Key Findings
The No Project Alternative conditions would potentially place additional demand on statewide energy supplies compared to existing conditions as a result of increased passenger trips, higher levels of congestion, and slower speeds on intercity highways. There is some level of uncertainty because it is not clear how the energy intensity of the state's automobile fleet would change in the next 20 years.

Table 3.5-3
Annual Intercity Operational Energy Consumption in the Study Area

	2000 Existing[f]	**2030 No Project Alternative[f]**
Annual VMT (VKT) (millions)		
Auto[b]	273,241 (442,924)	416,681 (670,585)
Airplane[c]	76 (123)	132 (214)
HST[d]	0	0
Annual Energy Consumption (MMBtus)		
Auto	1,522,500,948	2,321,748,527
Airplane	24,763,102	43,128,553
HST	0	0
Total Energy Consumption (MMBtus[a])	1,547,264,050	2,364,877,081
Change in Total Energy from Existing (MMBtus[a])	—	362,736,373
Total Energy Consumption (Barrels of Oil[e]) (millions)	267	408
Change in Total Energy from Existing (Barrels of Oil[e]) (millions)	—	141

Notes:
[a] One Btu is the quantity of energy necessary to raise 1 pound of water 1° F.
[b] Based on 6/18/08 VMT data (Cambridge Systematics 2008).
[c] Based on airplane passengers flights (Cambridge Systematics 2007). Airplane VMT based on average number of passengers per flight: 101.25 (using 70% load factor per Business Plan).
[d] No HST is included in the existing conditions (2000) or No Project Alternative.
[e] One barrel of crude oil is equal to 5.8 MMBtus.
[f] Rounded.

Peak-Period Electricity Demand

The No Project Alternative electricity consumption would increase slightly over existing conditions resulting from programmed and funded projects and growth anticipated under the No Project Alternative. The possible future electrification of Caltrain, commuter rail systems, and/or Amtrak would also increase electricity use. While these projects would be regionally significant, they are small in scale compared to overall electricity usage and would be captured by routine electricity consumption forecasts by CEC, allowing electricity generation and transmission planning to account for and accommodate their additions.

Key Findings
CEC electricity supply capacity and demand projections account for the projected routine expansion increases of in the state's electricity requirements. Potential electricity demand under the No Project Alternative would be satisfied by expected expansion in generating capacity. No significant potential impacts on electricity generating capacity have been identified. (Less than significant.)

B. HIGH-SPEED TRAIN ALTERNATIVE

The HST Alternative would increase the transportation energy use in California with respect to existing conditions. However, compared to the No Project Alternative the HST Alternative would use less energy. As indicated in Table 3.5-4, energy use would decline by the equivalent of about 5.8 million barrels of oil when compared to the No Project Alternative. Additional energy savings over the No Project Alternative would be realized with implementation of the HST system because it would also ease congestion. The magnitude of the expected annual operational energy savings resulting from the HST system could also be lower than shown in Table 3.5-4 given the possibility of automobile fuel efficiency improvements.

Table 3.5-4
Annual Operational Energy Consumption in Study Area

	2000	2030 Alternatives	
	Existing	No Project Alternative[e]	HST Alternative
Annual VMT[b, c, g] (VKT) (millions)			
Auto[f]	273,241 (442,924)	416,681 (675,440)	406,942 (659,654)
Airplane[c]	76 (123)	132 (214)	73 (119)
HST	0	0	43 (70)
Annual Energy Consumption (MMBtus[a])			
Auto	1,522,500,948	2,321,748,527	2,267,483,071
Airplane	24,763,102	43,128,553	24,008,005
HST	0	0	39,707,950
Total Energy Consumption (MMBtus)	1,547,264,050	2,364,877,081	2,331,209,026
Change in Total Energy from Existing (MMBtus)		362,736,373	24,763,102
Change in Total Energy from No Project (MMBtus)	—	—	-33,668,055
Total Energy Consumption (Barrels of Oil[d]) (millions)	267	408	402
Change in Total Energy from Existing (Barrels of Oil[d]) (millions)	—	141	135
Change in Total Energy from No Project (Barrels of Oil[d]) (millions)	—	—	-5.8

	2000	2030 Alternatives	
	Existing	No Project Alternative[e]	HST Alternative

Notes:

[a] One Btu is the quantity of energy necessary to raise 1 pound of water 1°F.
[b] Based on airplane passengers flights (Cambridge Systematics 2007). Airplane VMT based on average number of passengers per flight: 101.25 (using 70% load factor per business plan HST VMT (California High-Speed Rail Authority 2000)
[c] Does not include airplane VMT resulting from passengers making connections to other flights to continue or complete their journey because these are a minor portion of the HST-served market.
[d] One barrel of crude oil is equal to 5.8 MMBtus.
[e] Fuel consumption for No Project would increase beyond the figures presented here as speeds drop below 30 mph on congested highways.
[f] Based on 6/18/08 VMT data (Cambridge Systematics 2008).

Energy intensities were calculated using passenger miles traveled (PMT)/passenger kilometers traveled (PKT) for each of the modes. Table 3.5-5 lists the energy intensity consumption factors of each of the modes. HST service would offer a sharp reduction in energy consumption per passenger mile (kilometer), compared to other modes, if actual ridership were to fall within the range of current projections and the planned operating plan were implemented. Specifically, whereas intercity trips taken in automobiles would average about 2,320 Btus/PMT (1,438 Btus/PKT) and those trips taken in airplanes would require 3,230 Btus/PMT (2,003 Btus/PKT), the HST system would require 975 Btus/PMT (605 Btus/PKT).

Table 3.5-5
Energy Consumption per Passenger Mile Traveled by Mode (PMT)

Mode	Energy Consumption[d]
Intercity Passenger Vehicles (auto, van, light truck)[a]	2,320 Btus/PMT (1,438 Btus/PKT)
Airplanes[b]	3,230 Btus/PMT (2,003 Btus/PKT)
High-Speed Train[c]	975 Btus/PMT (605 Btus/PKT)

Notes:
[a] Based on 2.4 passengers per vehicle.
[b] Based on 101.25 passengers per vehicle (70% load factor).
[c] Based on 994 passengers per 16-car trainset.
[d] Rounded.

Regional
In addition to the statewide direct automobile VMT savings that would result from travelers choosing HST travel, the proposed HST system would potentially provide additional regional VMT reductions, compared to the No Project Alternative conditions. Proposed HST station location options would be more numerous than airports, which would result in a lessening of the average distance required for passengers to travel from their points of origin to the mode transfer point (and vice versa) because of the likelihood that one or more of the stations would be closer to their point of origin than would their respective regional airport.

Key Findings
The comparison of the HST Alternative to the No Project Alternative shows that the proposed project would decrease energy use statewide by 5.8 million barrels of oil per year. (Beneficial impact.)

operations would make the load additions less abrupt than would be the case if the start of the full planned operations were to occur simultaneously.

C. HST CONSTRUCTION (INDIRECT) ENERGY

Construction of the programmed and funded transportation improvements under the No Project Alternative would require less energy than construction of the HST system.

Project Construction

The HST system construction-related energy consumption would result in a one-time, non-recoverable energy cost, which would occur during construction of on-the-ground, underground, and aerial facilities such as trackwork, guideways, structures, maintenance yards, stations, and support facilities. Details regarding energy conservation practices have not been specified for the HST system, which has not been designed in detail, nor have construction methods and staging been planned at this time. Given the scope and scale of the improvements proposed as part of the HST system, however, it is anticipated that the construction-related energy requirement would be substantial. Table 3.5-6 shows estimates of potential construction-related indirect energy consumption for the statewide HST system.

Table 3.5-6
Non-Recoverable Construction-Related Energy Consumption

Structure	Rural vs. Urban[a]	Facility Quantity[b]	Energy Consumption[c] (MMBtus)
HST guideway (at grade)	Rural	2,074 guideway mi (3,361 km)	25,485,000
	Urban	619 (1,003 km)	11,829,000
HST guideway (elevated)	Rural	271 guideway mi (439 km)	15,026,000
	Urban	153 (249 km)	8,529,000
HST guideway (below grade, cut)	Rural	30 guideway mi (497 km)	3,557,000
	Urban	70 (114 km)	11,469,000
HST guideway (below grade, tunnel)	Rural	128 guideway mi (208 km)	15,034,000
	Urban	110 (178 km)	35,966,000
HST station	N/A	23 stations	1,794,000
HST Total			128,688,000

a Assumes the HST would be constructed in rural and urban areas at the following proportions:
- Bay Area to Central Valley: Rural (40%), Urban (60%)
- Sacramento to Bakersfield: Rural (95%), Urban (5%)
- Bakersfield to Los Angeles: Rural (70%), Urban (30%)
- LOSSAN: Rural (30%), Urban (70%)
- Los Angeles to San Diego via Inland Empire: Rural (60%), Urban (40%)

b Measured in guideway miles for non-discrete structures (e.g., highways and HST guideways), and in structure quantities for discrete structures (e.g., HST stations).

c Rounded.

As shown in the table, the construction of the proposed HST Alternative (statewide) would consume 128,688,000 Btus, or about 22 million barrels of oil. Energy savings resulting from operation of the HST Alternative would repay the construction energy consumption in about 3.8 years.

Section 3.17 Revisions

Cumulative Analysis

HST Network Alternatives

Compared to the No Project Alternative in 2030, the proposed statewide HST system would result in a reduction of automobile travel from 12 to 23 billion miles (19 to 37 billion km) annually, depending on network alternative as discussed in Section 3.2, "Travel Conditions." This outcome would benefit intercity highways within the study region and reduce travel delays on the affected highways and on surface streets leading to and from intercity highways. Therefore, implementation of the HST Network Alternatives would not lead to a considerable contribution to the cumulative impact related to highway and airport use but could be a considerable contribution to the cumulative impact related to surface streets leading to and from proposed stations.

Program mitigation strategies, as discussed in Section 3.1, could be developed in consultation with state, federal, regional, and local governments and affected transit agencies to improve the flow of intercity travel on the primary routes and access to the proposed stations. Regional strategies would include coordination with regional transportation planning and intelligent transportation system strategies. Local improvements could employ TSM/signal optimization; local spot widening of curves; and major intersection improvements.

B. AIR QUALITY

As stated in Section 3.3, "Air Quality," pollution sources in the two air basins directly affected by the proposed project account for about 30% of the total statewide criteria pollutant emissions. Overall, emissions in the San Francisco Bay Area Air Basin and San Joaquin Valley Air Basin have been declining for the past 20 years despite population growth and increases in vehicular travel. This decline is a result of new controls, rules, and more stringent emissions standards. The one exception to improvement has been PM10. PM10 emissions are predicted to increase through 2010 as a result of growth in emissions from areawide sources, primarily fugitive dust sources. An additional growing environmental concern is global climate change, and the transportation sector is responsible for about 40% of California's greenhouse gas emissions, and up to 50% in the Bay Area.

The study area for the cumulative analysis of air quality was identified to be the San Francisco Bay Area Air Basin and San Joaquin Valley Air Basin, as well as the state as a whole. CO_2 emissions are only calculated on a statewide level.

No Project Alternative

The program-level impact analysis of air quality described in Section 3.3, "Air Quality," focused on the potential statewide, regional, and localized impacts related to pollutant burdens occurring from highway vehicle miles traveled, number of plane operations, number of train movements, and power requirements. The analysis of air quality considers emissions of projected regional growth by the CARB for eight criteria pollutants (CO, SO_x, HC, NO_x, O_3, PM10, PM2.5, and Pb) in the two air basins potentially affected, and therefore includes past, present, and reasonably foreseeable projects/actions and population growth as part of the No Project Alternative. CO_2, the primary greenhouse gas, is projected to increase 38% statewide from existing conditions. As noted above, the analysis is structured to estimate the potential impacts on air quality on the local and regional levels in two air basins directly affected by the project alternatives as well as statewide. Under the No Project Alternative, the cumulative impact related to air quality would be significant when considering past, present, and reasonably foreseeable future projects in the study area (See Section 3.3).

HST Network Alternatives

It is estimated that the proposed HST Network Alternatives would be able to accommodate between 88 and 117 million people annually for intercity trips, as discussed in Section 3.2, "Travel Conditions." Intercity passengers using the HST system otherwise would use the roadways and airports, and the result is a potential reduction of automobile travel from 8.82 to 9.74 billion miles (14.3 to 15.8 billion km) annually, and a reduction in emissions because of the reduced number of flights (19.3 to 20.1 million air trips would shift to HST annually, as discussed in Section 3.3). Overall, pollutants would decrease statewide compared to the No Project Alternative: CO 1.9% to 2.0%, PM10 1.8% to 2.0%, PM2.5 1.7% to 5.6%, NO_X 1.8% to 1.9%, and total organic gases 2.0% to 2.2%. Therefore, the HST Network Alternatives would result in an air quality benefit. The benefit could increase if the HST ridership increased beyond the levels assumed in this document. However, as described in Section 3.3, there may be localized air quality impacts from the HST Network Alternatives.

The HST Network Alternatives would also reduce greenhouse gas emissions (CO_2) statewide by 0.5%. The proposed HST system would result in beneficial impacts related to greenhouse gases and global climate change. Any additional carbon entering the atmosphere, whether by emissions from the project itself or removal of carbon sequestering plants (included agricultural crops), would be more than offset by the beneficial reduction of carbon resulting from the project due to a reduction in automobile vehicle miles traveled (mobile sources) and reduction in the number of airplane trips.

The potential local air quality impacts of the HST Network Alternatives, in combination with the air quality impacts of other projects identified for this cumulative impact analysis (Appendix 3.17-A) and those projects considered in the state implementation plan for air quality, could contribute considerably to cumulative air quality impacts in the two air basins in the study area. Local adverse air quality impacts related to traffic could occur near HST stations. Program-level analysis reviews the potential statewide air quality impacts that would support determination of conformity, as discussed in Section 3.3. At the project level, mitigation strategies to address localized impacts could consider increasing emission controls from power plants supplying power for the HST Network Alternatives; designing the system to use energy efficient, state-of-the-art equipment; promoting increased use of public transit, alternative fueled vehicles, and parking for carpools, bicycles, and other alternative transportation methods; alleviating traffic congestion around passenger station areas; and minimizing construction air emissions.

C. NOISE AND VIBRATION

As noted in Section 3.4, "Noise and Vibration," the noise environment in the study area along the proposed HST alignments and stations generally is dominated by transportation-related sources. The ambient noise in the northern portion of the Bay Area to Central Valley region is dominated by motor vehicle traffic in densely populated areas and along freeways. Other major contributors include Caltrain, Amtrak, and freight rail as well as international airports at San Francisco, Oakland, and San Jose. In the more rural areas of the region, the ambient noise is lower because it is more removed from transportation noise sources.

The study area for the cumulative analysis of noise and vibration was identified to be within 1,000 ft (305 m) of the HST Network Alternatives.

No Project Alternative

Noise and vibration impacts, particularly in growing urban areas and along highway corridors, will continue to increase as population grows and use of highways and airports increases. Therefore, under the No Project Alternative the cumulative impact related to noise and vibration would be significant when considering past, present, and reasonably foreseeable future projects in the study area (See Section 3.4).

HST Network Alternatives

Implementation of the proposed HST Network Alternatives potentially could result in high noise impacts for up to approximately 20 mi (32.4 km) of alignment, depending on network alternative. These potential impacts, when combined with the potential noise impacts of other highway, roadway, and transit expansion projects in the Bay Area to Central Valley region, could locally contribute potential cumulative noise impacts during construction and operation. The same is true for vibration impacts where the network alternatives would potentially result in high vibration impacts for up to approximately 52 mi (84.3 km) of alignment.

The potential impacts of the HST Network Alternatives could be a considerable contribution to cumulative noise and vibration impacts. Program-level mitigation of noise and vibration impacts, as discussed in Section 3.4, "Noise and Vibration," relates to design practices emphasizing the use of tunnels or trenches; use of electric-powered trains, higher quality track interface, and smaller lighter and more aerodynamic trainsets; and grade separations from roadways. At the project level, mitigation strategies to address localized noise and vibration impacts should include treatments for insulation of buildings affected by noise and vibration; sound barrier walls within the right-of-way; track treatments to minimize train vibrations; and construction mitigation (See Section 3.4).

D. ENERGY

As noted in Section 3.5, "Energy," California is the tenth-largest worldwide energy consumer and is ranked second in consumption in the United States, behind Texas. The study area for the cumulative analysis of energy was identified to be the state of California. Of the overall energy consumed in the state, the transportation sector represents the largest portion at 46%. Between 2005 and 2030, the statewide vehicle miles of travel on all roadways are projected to increase by more than 68%, with fuel consumption increasing by more than 61% (California Department of Transportation 2006).

According to the CEC, total statewide electricity consumption grew from 228,038 GWh in 1990 to 272,000 GWh in 2005, approximately 19%. The upward electricity consumption trend throughout the state is anticipated to continue because of growth (California Energy Commission 2006a).

No Project Alternative

As discussed in Section 3.5, the No Project Alternative assumes continued dependence on automobiles and air travel for intercity trips in the state. Compared to 2000, this increase in travel would result in an increase in annual energy consumption by an estimated 141 million barrels of oil per year. Therefore, under the No Project Alternative, the cumulative impact related to energy consumption would be significant when considering past, present, and reasonably foreseeable future projects in the study area (See Section 3.5).

HST Network Alternatives

The statewide HST system would reduce energy consumption in 2030 by an estimated 5.8 million barrels of oil annually, depending on HST Network Alterative (a 1.5% savings compared to the No Project Alternative). This conservative estimate is based on use of average size trains that could be expanded to carry more passengers; the potential energy benefits could be substantially higher if train capacity and ridership were increased. The proposed statewide HST system, regardless of network alternative, would have a beneficial effect on energy consumption in the state and, therefore, would not contribute to cumulative energy impacts.

The statewide HST system would represent a small percentage of generating and transmission capacity required to satisfy projected overall demand in 2030. The electricity requirement of the HST system would be about 794 MW, depending on overall ridership, during peak electricity demand periods in 2030. This represents approximately 0.96% of the projected statewide electricity demand in 2030. The proposed HST system is anticipated to reduce energy consumption overall. Any localized electricity impacts would be avoided through proper planning and design of power distribution systems and their relationship with the overall power grid. Therefore, the statewide HST system's contribution to cumulative electricity demand would be less than significant when considering past, present, and reasonably foreseeable future projects.

Construction-related energy consumption of the statewide HST system would result in a one-time, nonrecoverable energy cost of 22 million barrels of oil spaced over a number of years. Because of the more energy-efficient mode of travel provided by the HST, the energy consumed for construction would be recovered by the energy savings within about 3.8 years as noted in Section 3.5, "Energy." Construction of the HST system potentially would represent a significant use of nonrenewable resources. Mitigation strategies to address construction energy use include implementation of a construction energy conservation plan. Therefore, the statewide HST system would result in a considerable contribution to a significant cumulative energy impact when considering past, present, and reasonably foreseeable future projects in the study area (See Section 3.5).

E. ELECTROMAGNETIC FIELDS AND ELECTROMAGNETIC INTERFERENCE

As described in Section 3.6, EMFs exist in the environment both naturally and as a result of human activities. The study area for the cumulative analysis of EMF and EMI was identified to be within 1,000 ft (305 m) of the right-of-way of the HST Network Alternatives.

No Project Alternative

By Year 2030, EMFs along existing roadways and railroad rights-of-way probably would be affected by technological developments and by increases in total energy consumption. For example, general EMF levels along highways may be cumulatively increased by advanced automotive technologies such as collision avoidance systems and automatic vehicle guidance systems, if such technologies are implemented by 2030, and increased reliance on electrically powered automobiles. Improvements to airports may also increase environmental EMFs because of increased use of radar, radio communications, and instrument landing systems. Based on available information, these changes are not likely to cause significant changes in EMF levels, increased human exposures to EMFs, or EMI in the environment. Therefore, under the No Project Alternative there would be no cumulative impact related to EMFs or EMIs when considering past, present, and reasonably foreseeable future projects in the study area.

HST Network Alternatives

The HST Network Alternatives would traverse a range of geographic and land use typologies and could result in potential EMF exposure in urban, suburban, rural, agricultural, and industrial areas. The various components of the HST infrastructure and the trains themselves would be sources of EMFs at both ELF and RF. It is likely that some additional potential for human exposure to EMFs and EMI would occur with the HST Network Alternatives in combination with other proposed projects (potential activities include transmission lines and other electric rail systems); however, although the HST Network Alternatives could cause direct and indirect EMF and EMI impacts, there would not be a considerable contribution to EMF and EMI levels because mitigation included in project-level analysis would include design choices (tunnel, elevated track, physical barriers between track and receptor, or facility site selection) and through shielding to avoid or minimize potential EMF and EMI impacts.

F. LAND USE AND PLANNING, COMMUNITIES AND NEIGHBORHOODS, PROPERTY, AND ENVIRONMENTAL JUSTICE

Even though the population in the San Joaquin Valley grew from 200,000 to 3 million in the 20th century, it underwent much less of a transformation than did the Bay Area. Population growth in the northern San Joaquin Valley was 63% between 1980 and 2000. In this same period the urban to rural share went from 78% urban and 22% rural to 89% urban and 11% rural (Teitz et al. 2005). Since 1990 the rate of land conversion has increased by 21% in the northern San Joaquin Valley (Great Valley Center 2006).

Chapter 5 Revisions

Economic Growth and Related Impacts

As an overall conclusion, the potential transportation impacts of induced growth under the HST Network Alternatives are likely to concentrate around proposed HST station sites. Because the Altamont network alternative is projected to experience higher population and employment growth than the Pacheco network alternative for nearly all counties north of Fresno County, the secondary transportation impacts could be expected to be proportionately larger for the Altamont network alternative. Project-level environmental studies would be expected to provide the appropriate opportunity to investigate more localized impacts.

5.4.2 Air Quality

Section 3.3, "Air Quality," describes the potential impact of induced growth on air pollution. Under high-end assumptions, the HST Network Alternatives annually would accommodate an estimated 95 million travelers that would otherwise use the roadways and airports. This diversion to HST could lead to a projected 2.3% statewide VMT reduction on the highway system, with VMT reductions of between 1.75% and 8.0% in Bay Area and Central Valley Counties. Thus, the HST Network Alternatives are projected to decrease the amount of mobile-source air quality pollutants in the study area and the state as compared to the No Project Alternative. The additional increase in population and employment in each county from induced growth generally would be expected to increase traffic and mobile-source air pollutants by an amount proportional to that growth. Even with induced growth, mobile-source air emissions under all HST Network Alternatives would be lower than No Project emissions in all counties because the projected VMT reduction is larger than the projected population and employment growth.

At the local level, the HST Network Alternatives have somewhat more potential to affect air quality because of expected increases in local traffic near HST station locations. It is expected that the induced growth could concentrate near HST stations, and thus the direct and indirect air quality effects could be larger around the station areas. The severity of these local impacts, however, cannot be reliably quantified without local and detailed traffic modeling and impact analysis, which is outside the scope of analysis for this Program EIR/EIS. Project-level environmental studies would be expected to provide the appropriate opportunity to investigate more localized impacts.

5.4.3 Noise and Vibration

Increased population and employment related to induced growth would not increase the likelihood or levels of potential noise and vibration impacts. Therefore, no indirect impacts from induced growth are expected in the areas of noise and vibration.

5.4.4 Energy

There would not be any significant differences in potential energy use among the alignment alternatives resulting from general population and employment growth projections because the magnitude of the incremental statewide population and employment growth is expected to be similar, regardless of which alternative is chosen. However, the expected propensity of the proposed HST Network Alternatives to concentrate employment and population near HST stations, and the resulting incremental development density benefit, would tend to reduce the number and length of vehicle trips for work, leisure, and commerce compared to the No Project Alternative. Such an effect would decrease the amount of energy directly used for transportation. The potential increased density in the vicinity of proposed HST station sites also would limit the amount of energy required for construction of and access to future infrastructure projects by reducing the distance between structures and reducing the number of structures that would be required to serve new population and employment growth. In addition, higher density would reduce demand for the large-volume transportation-related infrastructure projects required for a highly automobile-oriented transportation network. Finally, if growth around HST stations occurs at higher densities than would occur with more dispersed growth under the No Project Alternative, savings in building-related energy use also could be realized because multi-unit and multi-story structures tend to require less energy per square foot for heating and cooling needs.

Chapter 7 Revisions

High-Speed Train Network and Alignment Alternatives Comparisons

- Human environment (land use and community impacts, farmlands and agriculture, aesthetics and visual resources, and socioeconomics).
- Cultural resources (archaeological resources, historical properties) and paleontological resources.
- Natural environment (geology and seismic hazards, hydrology and water resources, and biological resources and wetlands).
- Section 4(f) and 6(f) resources (certain types of publicly owned parklands, recreation areas, wildlife/waterfowl refuges, and historical sites).

The environmental topics for traffic, energy and air quality are not included in this chapter. The network alternatives have the potential to reduce overall air pollution, total energy consumption, and traffic congestion as compared to the No Project Alternative. The representative base HST forecast would result in a reduction of 5.8 million barrels of oil and 6.8 billion pounds of CO_2 emissions annually by 2030, as compared to the No Project Alternative. Diversions from the automobile to HST could lead to a projected 2.3% statewide reduction in vehicle miles traveled (VMT) on the highway system, with VMT reductions of between 1.75% and 8.0% in Bay Area and Central Valley counties.

The network alternatives with the highest ridership levels show the greatest reductions in VMT on the roadways in the region. The reduction in VMTs results in a corresponding reduction in vehicular emissions, energy consumption, and traffic. Therefore, in this chapter ridership is a proxy for traffic, energy and air quality benefits since the network alternatives with the highest ridership would have the greatest traffic, energy and air quality benefits.

Chapter 9 Revisions

Unavoidable Adverse Environmental Impacts

9 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

This chapter of the Program EIR/EIS describes any potentially significant adverse environmental effects, identifiable at the program level of environmental review, that cannot be avoided should the proposed HST system or a network alternative be implemented and any unavoidable adverse impacts of the alternatives, as required by CEQA and NEPA, respectively. This chapter also describes any significant irreversible or irretrievable commitments of resources or foreclosures of future options, identifiable at the program level of environmental review, that would be involved in the proposed HST system or network alternatives should one be implemented.

This Program EIR/EIS represents the second part of the first conceptual planning stage of a tiered environmental evaluation that analyzes a broad range of HST Alignment Alternatives and a number of Network Alternatives. Most potentially significant impacts that have been described in previous chapters of this document can be avoided or minimized by selecting an alignment alternative that avoids or minimizes impacts on environmental resources through refinement to the design or specific location of the alignment or station, or through incorporation of mitigation measures. For example, some potentially significant impacts on sensitive habitat or wetlands would occur in areas where alignment alternatives are available that would avoid or minimize the impact, such as tunneling or designing the alignment to avoid the sensitive area. In addition, potential noise impacts would occur in residential areas along the alignment alternatives where significant noise levels could be reduced to less than significant with implementation of mitigation measures such as noise walls between the train track or highway and the residential receptors. However, there are some unavoidable potentially significant impacts that could occur as a result of implementation of the HST Network Alternatives under consideration. Those impacts are discussed below.

9.1 Potentially Adverse Unavoidable Significant Impacts

9.1.1 Fuel Consumption and Energy Use

Potentially significant impacts of the No Project Alternative that cannot be mitigated or reduced to less than significant include consumption of an estimated 408 million barrels of oil per year under the No Project Alternative in 2030, over 141 million barrels of oil per year more than existing conditions.[1] The No Project Alternative would continue California's dependency on automobiles and airplanes for intercity travel. The statewide HST system would annually consume approximately 402 million barrels of oil. The proposed HST system would result in a savings of about 5.8 million barrels of oil (a 1.5% difference) over the 2030 No Project Alternative.

Operation of the proposed HST system would potentially increase the load on the statewide electric power system by an estimated 794 MW during the peak period in 2030. Overall, the HST electricity demand would represent about a 0.96% increase in 2030. During construction, energy consumption for the HST system is estimated to be approximately 128 MMBTUs, or 22 million barrels of oil.

9.1.2 Biological Resources and Wetlands, Agricultural Land, Section 4(f) and 6(f) Resources, Cultural and Paleontological Resources, and Visual Resources

The HST Network Alternatives would each commit the use of land and natural resources to a transportation right-of-way, even though much of the system would be constructed along existing transportation facilities. Some potentially significant unavoidable impacts on biological resources (wetlands and habitat for threatened and endangered species) might occur where the land required for

1 Energy consumption based on June 11, 2007 and June 18, 2008, forecasts provided by Cambridge Systematics. See Chapter 2, "Alternatives."

Table 9.3-1
Summary of Key Environmental Impact/Benefits of Alternatives

Key Environmental Issues	Alternative		Mitigation Strategy for HST	Potential Significance for HST	
	No Project	HST Network Alternatives		Before Mitigation	After Mitigation
Traffic and Circulation	Capacity is insufficient to accommodate projected growth. 13 of the 18 intercity highway segments considered would operate at unacceptable levels of service with increased congestion, travel delays, and accidents compared to existing conditions. Congestion would increase.	Congestion reduction on intercity highways compared to the No Project Alternative. 15 of the 18 intercity highway segments would experience diversion of trips from vehicles to the HST system yielding improved V/C ratios. Reduce automobile travel in the state 9.7 billion miles annually. Localized traffic conditions around some stations would be adversely affected.	Encourage use of transit to stations. Work with transit providers to improve station connections.	Potentially significant	Potentially less than significant/ potentially significant/ unavoidable
Travel Conditions (travel time, reliability, safety, connectivity, sustainable capacity, passenger cost)	Longer travel times, more delay. Lower reliability due to dependence on the automobile. Increase in injuries and fatalities due to increase in highway travel. No net improvement to connectivity options. No significant increase in capacity for highway or air infrastructure, and significant worsening of congestion due to increased demand.	Travel time reduction compared to the No Project Alternative. Greatest improvement in reliability due to high reliability of HST mode; significant levels of diversion to HST from auto and air result in reduced congestion; and additional modal option improves reliability for overall transportation system. Decrease in injuries and fatalities due to diversion of trips from highways. Highest level of connectivity. New mode would add a variety of connections to existing modes, additional frequencies, and greater flexibility. HST system would provide sufficient capacity to meet representative demand and would provide substantial additional capacity with minimal additional infrastructure.	N/A	Beneficial	N/A

Key Environmental Issues	Alternative		Mitigation Strategy for HST	Potential Significance for HST	
	No Project	HST Network Alternatives		Before Mitigation	After Mitigation
		HST system would provide a release valve for the existing intercity modes. Overall savings in passenger costs of 22% to 87% on the HST compared to No Project, depending on city pair. HST passenger costs are competitive with the automobile travel and less expensive than air travel.			
Air Quality (Conformity Rule; Statewide tons of pollutants/year)	Statewide emissions predicted to decrease in 2030 due to low emission vehicles; CO_2 to increase statewide. Estimated CO 625,975 tons/year (79% decrease); PM10 25,185 tons/year (same as existing); PM2.5 17,155 tons/year (10% decrease); NO_x 174,470 tons/year (73% decrease); TOG 92,345 tons/year (73% decrease); CO_2 644 million tons/year (38% increase).	Air quality benefit. Pacheco Alternative - Annual decrease in pollutants compared to No Project: CO 12,775 tons/year; PM10 730 tons/year, PM2.5 1,095 tons/year, NO_x 3,650 tons/year; TOG 2,190 tons/year; CO_2 3.4 million tons/year (0.5% less than No Project). Altamont Alternative - Annual decrease in pollutants compared to No Project: CO 11,680 tons/year; PM10 365 tons/year, PM2.5 365 tons/year, NO_x 3,285 tons/year; TOG 1,825 tons/year; CO_2 2.8 million tons/year (0.4% less than No Project). Overall reduction of Greenhouse Gas Emissions compared to No Project.	Control of construction-related emissions.	Beneficial	N/A
Energy Use (Statewide)	Energy consumption of 408 million barrels of oil annually in California in 2030; 141 million over existing conditions.	Energy benefit. Lower statewide energy consumption compared to No Project. Operation of the statewide HST system would result in a savings of 5.8 million barrels (1.5%)	Develop and implement energy conservation plan for construction.	Beneficial	N/A

Chapter 23 Revisions

Organization Comments

with the other environmental methodologies in the EIR/EIS, which were developed with input from the appropriate regulatory agencies. The potential effects are compared between the existing conditions and the no-build alternative, and then the no-build alternative is compared to the HST alternatives.

O007-87

Executive Order S-3-05, signed by Governor Arnold Schwarzenegger on June 1, 2005, calls for a reduction in GHG emissions to 1990 levels by 2020 (equivalent to a 25% reduction) and for an 80% reduction in GHG emissions to below 1990 levels by 2050. Assembly Bill 32, enacted in 2006, calls for the California Air Resources Board to adopt regulations to help achieve these emission-reduction goals. See discussion of GHG issues in Section 3.3, Air Quality, of this Final Program EIR/EIS.

The effect of the HST system on emissions of CO_2 was calculated and presented in the Draft Program EIR/EIS. 2005 statewide CO_2 levels have been quantified and were estimated at 1.280 million tons per day (California Energy Commission). The air quality analysis identified a reduction of about 6.8 billion pounds of CO_2 emissions annually by 2030 attributed to the proposed HST project. The proposed HST project is shown to have net beneficial impacts related to climate change. Any additional carbon entering the atmosphere, whether by emissions from the project itself or removal of carbon sequestering plants (including agricultural crops), would be more than offset by the beneficial reduction of carbon resulting from the project due to a reduction in automobile VMT (mobile sources) and reduction in the number of airplane trips.

O007-88

Please see Standard Response 5 and mitigation strategies listed in Chapter 3.3 of the Final EIR/EIS. CEQA requires that feasible mitigation be identified where significant adverse impacts have been identified. Mitigation measures are not required for effects which are not found to be significant (CEQA §15126.4 [a]). As noted previously, the proposed HST project is shown to have net beneficial impacts related to climate change. Where beneficial impacts have been identified, mitigation measures are not required. Benefits of the proposed HST system would include reduced vehicle trips, reduced VMT and multi-modal HST stations. Increased energy efficiency for HST facilities, increased recycling, and use of green building technology are all measures that can appropriately be considered in the future during project-level environmental reviews, when more detailed system design and location information will be available.

O007-89

As noted in Response to Comments O007-87 and O007-88, the proposed HST project is shown to have net beneficial impacts related to climate change. Where beneficial impacts have been identified, mitigation measures are not required.

O007-90

Please see Response to Comments O007-87 and O007-88. The Final EIR/EIS includes an expanded discussion of global climate change, including a revised setting discussion, and emissions inventories for the 2005 existing condition, the 2030 No Project Alternative, and proposed HST project alternative. In addition, the Authority is investigating the feasibility of having the HST system be powered by energy sources with zero emissions, but this is not required as a mitigation measure.

O007-91

The Authority agrees that, while not required, creating a carbon neutral HST system is an appropriate goal for the HST. The Authority will examine its feasibility at the project-level analysis. Also see Response to Comment O007-90.

O007-92

See Standard Response 5.

although there was more decrease from the Pacheco Pass alternative.

O015-7

Table 3.3-7 highlights the air quality benefits of the project. Using the benefit rating system established for the project, the Build Alternative is predicted to have medium benefits on regional air quality levels. This table has been expanded to include both base alternatives (Pacheco Base, and, Altamont Base).

O015-8

Considering that California condors can range up to 150 miles in a day, it is possible that one of the 16 condors currently at Pinnacles National Monument (as of Dec. 2007) (source: http://www.nps.gov/pinn/naturescience/upload/Condor_Status-Dec07.pdf), it is possible that a condor may occasionally fly over Pacheco Pass, similar to the way that condors from the Mt. Pinos area may occasionally fly over cities like Ventura and Bakersfield. However, because no part of the alignment is located within the critical habitat for the species, impacts on this species would be minimal to none.

O015-9

The Authority and FRA respectfully disagree with the assertion that the Program EIR/EIS gives inadequate attention to "land use sprawl and attendant traffic congestion." Chapter 5, and the accompanying technical report, Economic Growth Effects Analysis of the Bay Area to Central Valley Program-Level EIR and Tier 1 EIS, provide a detailed analysis of potential economic growth and related impacts (including traffic congestion). Please refer to Standard Response 4 and Chapter 6 (Station Area Development).

O015-10

Consistent with NEPA and CEQA, the Preferred Alternative is identified in this Final Program EIR/EIS, following public comment on the Draft Program EIR/EIS.

O015-11

The specific mitigation measures as suggested in the letter will be considered in Tier 2 project-level environmental analysis.

Appendix 3-3A Revisions

2030 No Build Scenario VMT and VHT

CALIFORNIA HIGH SPEED RAIL
PACHECO SCENARIO VMT AND VHT

	VMT - daily	VHT - daily	VkT - daily
SF Air Basin	110,319,202	1,680,135	177,541,545.88
SJ Air Basin	116,352,966	1,649,721	187,251,947.97
Statewide	1,114,910,694	28,315,177	1,794,274,836.07
	MILES		

This data revised on 6/19/08 to reflect CS revisions to VMT.

CALIFORNIA HIGH SPEED RAIL
ALTAMONT SCENARIO VMT AND VHT

	VMT - daily	VHT - daily	VkT - daily
SF Air Basin	110,469,582	1,603,257	177,783,559.74
SJ Air Basin	116,584,184	1,653,235	187,624,056.42
Statewide	1,117,429,041	28,238,654	1,798,327,722.33

This data revised on 6/19/08 to reflect CS revisions to VMT.

CALIFORNIA HIGH SPEED RAIL
SAN JOAQUIN COUNTY SUMMARY

Year	Category	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5
2005	Stationary	389.97	91.35	54.02	128.06	20.41	33.84	22.99	16.16
2005	Area	993.45	190.09	826.93	23.97	4.33	571.51	322.99	138.01
2005	Mobile On Road	91.79	83.93	874.42	195.68	1.74	6.29	6.21	4.44
2005	Aircraft	9.09	8.10	68.76	3.72	0.37	0.44	0.43	0.42
2005	Train	1.97	1.54	4.50	23.64	0.71	0.66	0.66	0.60
2005	Mobile Off Road	42.38	38.10	275.85	105.68	0.87	7.89	7.76	6.93
2005	**Total**	**1,528.65**	**413.11**	**2,104.48**	**480.75**	**28.43**	**620.63**	**361.04**	**166.56**

Year	Category	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5
2010	Stationary	416.71	94.53	54.95	123.74	21.51	34.70	23.61	16.79
2010	Area	1,061.84	195.55	824.51	23.49	4.31	539.40	306.86	133.03
2010	Mobile On Road	64.98	59.01	606.00	145.31	0.59	6.35	6.26	4.29
2010	Aircraft	9.30	8.29	71.52	3.94	0.40	0.45	0.44	0.43
2010	Train	1.85	1.54	4.87	20.04	0.07	0.59	0.59	0.54
2010	Mobile Off Road	34.12	30.85	255.17	84.64	0.62	6.81	6.67	5.90
2010	**Total**	**1,588.80**	**389.77**	**1,817.02**	**401.16**	**27.50**	**588.30**	**344.43**	**160.98**

Year	Category	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5
2015	Stationary	441.81	97.25	55.78	126.42	23.01	36.23	24.51	17.42
2015	Area	1,120.21	174.02	822.04	23.21	4.31	551.29	311.93	132.96
2015	Mobile On Road	47.13	42.54	415.80	97.52	0.70	6.49	6.38	4.21
2015	Aircraft	9.48	8.45	74.00	4.14	0.43	0.45	0.44	0.43
2015	Train	1.87	1.56	5.30	20.78	0.02	0.58	0.58	0.53
2015	Mobile Off Road	29.15	26.54	246.99	64.73	0.78	5.77	5.59	4.89
2015	**Total**	**1,649.65**	**350.36**	**1,619.91**	**336.80**	**29.25**	**600.81**	**349.43**	**160.44**

Year	Category	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5
2020	Stationary	467.51	100.24	57.93	127.31	24.09	38.18	25.81	18.43
2020	Area	1,212.65	181.18	818.99	23.06	4.31	568.11	320.01	134.39
2020	Mobile On Road	36.67	32.91	297.28	68.28	0.77	6.88	6.78	4.36
2020	Aircraft	9.63	8.58	75.98	4.29	0.44	0.46	0.45	0.44
2020	Train	1.90	1.58	5.83	21.46	0.02	0.59	0.59	0.54
2020	Mobile Off Road	26.46	24.21	249.43	52.82	0.98	4.95	4.76	4.13
2020	**Total**	**1,754.82**	**348.70**	**1,505.44**	**297.22**	**30.61**	**619.17**	**358.40**	**162.29**

CALIFORNIA HIGH SPEED RAIL
SAN FRANCISCO COUNTY SUMMARY

Year	Category	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5
2005	Stationary	512.40	78.42	52.72	55.23	44.00	22.10	16.60	12.88
2005	Area	180.47	92.48	177.69	19.53	0.64	328.23	175.27	60.27
2005	Mobile On Road	165.88	151.73	1,495.79	285.82	2.33	9.68	9.57	6.51
2005	Aircraft	7.14	6.36	37.86	20.71	0.63	0.53	0.51	0.50
2005	Train	1.13	0.91	2.33	13.03	0.23	0.33	0.31	0.27
2005	Mobile Off Road	63.83	56.96	446.47	154.33	5.25	11.52	11.23	10.05
2005	**Total**	**930.85**	**386.86**	**2,212.86**	**548.65**	**53.08**	**372.39**	**213.49**	**90.48**

Year	Category	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5
2010	Stationary	530.62	78.62	54.41	56.74	46.91	23.29	17.59	13.66
2010	Area	187.59	94.92	181.81	20.27	0.64	350.37	186.70	63.58
2010	Mobile On Road	124.43	112.54	1,105.26	217.12	1.07	10.50	10.34	6.94
2010	Aircraft	8.01	7.14	45.65	25.85	0.68	0.55	0.54	0.53
2010	Train	1.07	0.87	2.51	10.68	0.03	0.30	0.28	0.24
2010	Mobile Off Road	48.67	43.68	402.30	135.07	6.71	10.72	10.41	9.27
2010	**Total**	**900.39**	**337.77**	**1,791.94**	**465.73**	**56.04**	**395.73**	**225.86**	**94.22**

Year	Category	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5
2015	Stationary	550.14	81.83	56.86	58.85	50.03	24.36	18.38	14.30
2015	Area	195.90	98.07	188.15	20.84	0.64	373.04	198.61	67.42
2015	Mobile On Road	88.76	79.83	751.99	146.00	1.13	10.62	10.45	6.93
2015	Aircraft	9.09	8.10	50.82	28.36	0.72	0.58	0.57	0.55
2015	Train	1.09	0.88	2.78	12.35	0.01	0.30	0.28	0.24
2015	Mobile Off Road	43.24	38.97	405.46	125.45	8.61	10.47	10.13	9.00
2015	**Total**	**888.22**	**307.68**	**1,456.06**	**391.85**	**61.14**	**419.37**	**238.42**	**98.44**

Year	Category	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5
2020	Stationary	566.39	84.91	59.47	61.20	53.36	25.30	19.13	14.87
2020	Area	204.01	101.05	194.10	21.38	0.64	395.34	210.29	71.14
2020	Mobile On Road	66.81	59.92	522.14	101.30	1.20	10.91	10.72	7.07
2020	Aircraft	10.05	8.96	56.58	31.07	0.79	0.62	0.60	0.58
2020	Train	1.11	0.90	3.10	13.01	0.01	0.30	0.29	0.25
2020	Mobile Off Road	41.03	36.92	421.87	127.95	11.01	10.55	10.15	9.04
2020	**Total**	**889.40**	**292.66**	**1,257.26**	**355.91**	**67.01**	**443.02**	**251.18**	**102.95**

CALIFORNIA HIGH SPEED RAIL
STATE SUMMARY

Year	Category	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5
2005	Stationary	2,193.92	472.88	372.32	420.31	112.28	234.25	135.67	90.63
2005	Area	2,334.58	750.47	2,719.14	111.66	11.05	3,506.72	1,938.04	658.52
2005	Mobile On Road	838.90	770.01	7,629.14	1,518.31	12.38	50.65	49.94	34.31
2005	Aircraft	41.92	37.44	267.06	54.63	2.87	7.74	7.56	7.46
2005	Train	14.61	12.15	33.05	157.56	7.53	4.76	4.74	4.33
2005	Mobile Off Road	432.43	390.42	2,744.89	952.81	146.31	78.32	75.75	68.34
2005	**Total**	**5,856.36**	**2,433.37**	**13,765.60**	**3,215.28**	**292.42**	**3,882.44**	**2,211.70**	**863.59**

Year	Category	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5
2010	Stationary	2,329.75	499.44	389.72	426.67	118.93	249.01	144.13	96.59
2010	Area	2,370.79	749.13	2,759.08	107.55	10.95	3,566.53	1,971.16	668.75
2010	Mobile On Road	607.65	554.02	5,397.14	1,126.69	5.23	51.73	50.94	34.09
2010	Aircraft	43.10	38.49	283.93	63.21	3.08	7.67	7.48	7.39
2010	Train	14.10	11.73	36.97	116.36	0.85	4.30	4.26	3.88
2010	Mobile Off Road	350.34	317.76	2,542.02	886.77	179.42	78.43	75.52	68.21
2010	**Total**	**5,715.73**	**2,170.57**	**11,408.86**	**2,727.25**	**318.46**	**3,957.67**	**2,253.49**	**878.91**

Year	Category	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5
2015	Stationary	2,472.09	530.03	402.36	437.19	125.74	265.72	152.83	102.11
2015	Area	2,490.80	776.70	2,772.80	106.52	10.90	3,682.12	2,030.90	684.10
2015	Mobile On Road	445.36	403.70	3,743.82	757.44	5.69	53.13	52.25	34.23
2015	Aircraft	45.25	40.40	298.07	68.88	3.28	7.78	7.59	7.50
2015	Train	14.54	12.10	41.29	128.32	0.12	4.35	4.30	3.93
2015	Mobile Off Road	315.05	286.72	2,526.21	855.93	224.12	80.97	77.60	70.19
2015	**Total**	**5,783.09**	**2,049.65**	**9,784.55**	**2,354.28**	**369.85**	**4,094.07**	**2,325.47**	**902.06**

Year	Category	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5
2020	Stationary	2,609.63	561.48	416.64	447.46	132.22	282.50	162.00	108.01
2020	Area	2,614.86	806.70	2,791.36	107.92	10.89	3,809.14	2,097.88	702.44
2020	Mobile On Road	344.36	310.63	2,661.34	531.74	6.08	55.07	54.14	34.93
2020	Aircraft	47.19	42.14	311.79	74.40	3.49	7.88	7.69	7.60
2020	Train	15.09	12.56	46.53	138.64	0.13	4.48	4.44	4.06
2020	Mobile Off Road	302.12	274.80	2,603.62	904.83	288.70	87.07	83.20	75.73
2020	**Total**	**5,933.25**	**2,008.31**	**8,831.28**	**2,204.99**	**441.51**	**4,246.14**	**2,409.35**	**932.77**

CALIFORNIA HIGH SPEED RAIL
TOG EMISSION BURDEN 2030

Air Basin	TOG - On-Road Mobile (tons/day)		On-Road TOG Increment	TOG - Planes (tons/day)		Plane TOG Increment	TOG - Trains (tons/day)		Train - TOG Increment	TOG - Electric (tons/day)		Electric - TOG Increment	TOTAL TOG (On-Road, Planes, Trains, Electric) (Tons/day)		Total - TOG Increment	Total % Change from No Build
	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	HSR Pacheco
San Francisco Bay	35.97	35.34	(0.63)	12.72	12.31	(0.41)	12.85	12.85	0.00	0.00	0.00	0.00	61.54	60.49	(1.04)	-1.70%
San Joaquin Valley	19.32	17.78	(1.54)	10.03	10.00	(0.02)	19.62	19.62	0.00	0.00	0.00	0.00	48.97	47.40	(1.57)	-3.20%
State Total	186.21	181.86	(4.35)	51.05	49.97	(1.08)	121.58	121.58	0.00	44.48	45.01	0.52	403.33	398.42	(4.91)	-1.22%

Air Basin	TOG - On-Road Mobile (tons/day)		On-Road TOG Increment	TOG - Planes (tons/day)		Plane TOG Increment	TOG - Trains (tons/day)		Train - TOG Increment	TOG - Electric (tons/day)		Electric - TOG Increment	TOTAL TOG (On-Road, Planes, Trains, Electric) (Tons/day)		Total - TOG Increment	Total % Change from No Build
	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	HSR Altamont
San Francisco Bay	35.97	35.39	(0.58)	12.72	12.33	(0.39)	12.85	12.85	0.00	0.00	0.00	0.00	61.54	60.56	(0.97)	-1.58%
San Joaquin Valley	19.32	17.81	(1.51)	10.03	10.00	(0.02)	19.62	19.62	0.00	0.00	0.00	0.00	48.97	47.43	(1.53)	-3.13%
State Total	186.21	182.27	(3.94)	51.05	50.03	(1.02)	121.58	121.58	0.00	44.48	45.01	0.52	403.33	398.89	(4.44)	-1.10%

CALIFORNIA HIGH SPEED RAIL
TOG ON-ROAD MOBILE CALCULATIONS

Air Basin	No Build		Pacheco			TOG (tons/day)		TOG Increment	
	VMT	VHT	VMT	VHT	% of NB VMT	No Build	Build	Pacheco	%
San Francisco Bay	112,280,333	2,967,721	110,319,202	1,680,135	98.3%	35.97	35.34	(0.63)	-1.75%
San Joaquin Valley	126,463,316	1,836,428	116,352,966	1,649,721	92.0%	19.32	17.78	(1.54)	-7.99%
State Total	1,141,592,762	30,536,249	1,114,910,694	28,315,177	97.7%	186.21	181.86	(4.35)	-2.34%

TOG (metric tons/day)		TOG Increment
No Build	Build	Pacheco
32.63	32.06	(0.57)
17.53	16.13	(1.40)
168.93	164.98	(3.95)

Air Basin	No Build		Altamonte			TOG (tons/day)		TOG Increment	
	VMT	VHT	VMT	VHT	% of NB VMT	No Build	Build	Altamonte	
San Francisco Bay	112,280,333	2,967,721	110,469,582	1,603,257	98.4%	35.97	35.39	(0.58)	-1.61%
San Joaquin Valley	126,463,316	1,836,428	116,584,184	1,653,235	92.2%	19.32	17.81	(1.51)	-7.81%
State Total	1,141,592,762	30,536,249	1,117,429,041	28,238,654	97.9%	186.21	182.27	(3.94)	-2.12%

TOG (metric tons/day)		TOG Increment
No Build	Build	Altamonte
32.63	32.10	(0.53)
17.53	16.16	(1.37)
168.93	165.36	(3.58)

CALIFORNIA HIGH SPEED RAIL
PM10 EMISSION BURDEN 2030

Air Basin	PM10 - On-Road Mobile (tons/day)		On-Road PM10 Increment	PM10 - Planes (tons/day)		Plane PM10 Increment	PM10 - Trains (tons/day)		Train - PM10 Increment	PM10 - Electric (tons/day)		Electric - PM10 Increment	TOTAL PM10 (On-Road, Planes, Trains, Electric) (Tons/day)		Total - PM10 Increment	Total % Change from No Build
	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	HSR Pacheco
San Francisco Bay	11.60	11.40	(0.20)	0.67	0.65	(0.02)	0.27	0.27	0.00	0.00	0.00	0.00	12.54	12.31	(0.22)	-1.79%
San Joaquin Valley	7.07	6.50	(0.57)	0.46	0.46	(0.00)	0.53	0.53	0.00	0.00	0.00	0.00	8.06	7.50	(0.57)	-7.02%
State Total	56.88	55.55	(1.33)	7.76	7.70	(0.06)	4.15	4.15	0.00	9.34	9.45	0.11	78.13	76.85	(1.28)	-1.63%

TOTAL PM10 (On-Road, Planes, Trains, Electric) (Tons/day)		Total - PM10 Increment	Total % Change from No Build
No Build	HSR Pacheco Low	HSR Pacheco Low	HSR Pacheco Low
11.37	11.17	(0.20)	-1.03%
7.32	6.80	(0.51)	-4.87%
70.88	69.72	(1.16)	-1.33%

Altamont Low

Air Basin	PM10 - On-Road Mobile (tons/day)		On-Road PM10 Increment	PM10 - Planes (tons/day)		Plane PM10 Increment	PM10 - Trains (tons/day)		Train - PM10 Increment	PM10 - Electric (tons/day)		Electric - PM10 Increment	TOTAL PM10 (On-Road, Planes, Trains, Electric) (Tons/day)		Total - PM10 Increment	Total % Change from No Build
	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	HSR Altamont
San Francisco Bay	11.60	11.42	(0.19)	0.67	0.65	(0.02)	0.27	0.27	0.00	0.00	0.00	0.00	12.54	12.33	(0.21)	-1.66%
San Joaquin Valley	7.07	6.52	(0.55)	0.46	0.46	(0.00)	0.53	0.53	0.00	0.00	0.00	0.00	8.06	7.51	(0.55)	-6.86%
State Total	56.88	55.68	(1.20)	7.76	7.70	(0.05)	4.15	4.15	0.00	9.34	9.45	0.11	78.13	76.98	(1.15)	-1.47%

TOTAL PM10 (On-Road, Planes, Trains, Electric) (Metric Tons/day)		Total - PM10 Increment	Total % Change from No Build
No Build	HSR Altamont Low	HSR Altamont Low	HSR Altamont Low
11.37	11.19	(0.19)	-1.03%
7.32	6.81	(0.50)	-4.87%
70.88	69.84	(1.04)	-1.33%

CALIFORNIA HIGH SPEED RAIL
PM10 ON-ROAD MOBILE CALCULATIONS

Air Basin	No Build		Pacheco			PM10 (tons/day)		PM10 Increment		PM10 (metric tons/day)		PM10 Increment
	VMT	VHT	VMT	VHT	% of NB VMT	No Build	Build	Pacheco	%	No Build	Build	Pacheco
San Francisco Bay	112,280,333	2,967,721	110,319,202	1,680,135	98.3%	11.60	11.40	(0.20)	-1.75%	10.53	10.34	(0.18)
San Joaquin Valley	126,463,316	1,836,428	116,352,966	1,649,721	92.0%	7.07	6.50	(0.57)	-7.99%	6.41	5.90	(0.51)
State Total	1,141,592,762	30,536,249	1,114,910,694	28,315,177	97.7%	56.88	55.55	(1.33)	-2.34%	51.60	50.40	(1.21)

Air Basin	No Build		Altamont			PM10 (tons/day)		PM10 Increment		PM10 (metric tons/day)		PM10 Increment
	VMT	VHT	VMT	VHT	% of NB VMT	No Build	Build	Altamont		No Build	Build	Altamont
San Francisco Bay	112,280,333	2,967,721	110,469,582	1,603,257	98.4%	11.60	11.42	(0.19)	-1.61%	10.53	10.36	(0.17)
San Joaquin Valley	126,463,316	1,836,428	116,584,184	1,653,235	92.2%	7.07	6.52	(0.55)	-7.81%	6.41	5.91	(0.50)
State Total	1,141,592,762	30,536,249	1,117,429,041	28,238,654	97.9%	56.88	55.68	(1.20)	-2.12%	51.60	50.51	(1.09)

CALIFORNIA HIGH SPEED RAIL
PM2.5 EMISSION BURDEN 2030

Air Basin	PM2.5 - On-Road Mobile (tons/day)		On-Road PM2.5 Increment	PM2.5 - Planes (tons/day)		Plane PM2.5 Increment	PM2.5 - Trains (tons/day)		Train - PM2.5 Increment	PM2.5 - Electric (tons/day)		Electric - PM2.5 Increment	TOTAL PM2.5 (On-Road, Planes, Trains, Electric) (Tons/day)		Total - PM2.5 Increment	Total % Change from No Build
	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	HSR Pacheco
San Francisco Bay	7.48	7.35	(0.13)	0.64	0.62	(0.02)	0.23	0.23	0.00	0.00	0.00	0.00	8.35	8.20	(0.15)	-1.82%
San Joaquin Valley	4.21	3.88	(0.34)	0.45	0.45	(0.00)	0.49	0.49	0.00	0.00	0.00	0.00	5.16	4.82	(0.34)	-6.56%
State Total	35.09	34.27	(0.82)	7.67	7.62	(0.06)	3.79	3.79	0.00	9.00	9.11	0.11	55.56	54.79	(0.77)	-1.39%

TOTAL PM25 (On-Road, Planes, Trains, Electric) (Tons/day)		Total - PM2.5 Increment	Total % Change from No Build
No Build	HSR Pacheco Low	HSR Pacheco Low	HSR Pacheco Low
7.57	7.44	(0.14)	-1.03%
4.68	4.37	(0.31)	-4.87%
50.41	49.71	(0.70)	-1.33%

Air Basin	PM2.5 - On-Road Mobile (tons/day)		On-Road PM2.5 Increment	PM2.5 - Planes (tons/day)		Plane PM2.5 Increment	PM2.5 - Trains (tons/day)		Train - PM2.5 Increment	PM2.5 - Electric (tons/day)		Electric - PM2.5 Increment	TOTAL PM2.5 (On-Road, Planes, Trains, Electric) (Tons/day)		Total - PM2.5 Increment	Total % Change from No Build
	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	HSR Altamont
San Francisco Bay	7.48	7.36	(0.12)	0.64	0.62	(0.02)	0.23	0.23	0.00	0.00	0.00	0.00	8.35	8.21	(0.14)	-1.69%
San Joaquin Valley	4.21	3.89	(0.33)	0.45	0.45	(0.00)	0.49	0.49	0.00	0.00	0.00	0.00	5.16	4.83	(0.33)	-6.41%
State Total	35.09	34.35	(0.74)	7.67	7.62	(0.05)	3.79	3.79	0.00	9.00	9.11	0.11	55.56	54.87	(0.69)	-1.24%

TOTAL PM2.5 (On-Road, Planes, Trains, Electric) (Metric Tons/day)		Total - PM2.5 Increment	Total % Change from No Build
No Build	HSR Altamont Low	HSR Altamont Low	HSR Altamont Low
7.57	7.45	(0.13)	-1.03%
4.68	4.38	(0.30)	-4.87%
50.41	49.78	(0.63)	-1.33%

CALIFORNIA HIGH SPEED RAIL
NOX EMISSION BURDEN 2030

Air Basin	NOx - On-Road Mobile (tons/day)		On-Road NOx Increment	NOx - Planes (tons/day)		Plane NOx Increment	NOx - Trains (tons/day)		Train - NOx Increment	NOx - Electric (tons/day)		Electric - NOx Increment	TOTAL NOx (On-Road, Planes, Trains, Electric) (Tons/day)		Total - NOx Increment	Total % Change from No Build
	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	HSR Pacheco
San Francisco Bay	50.98	50.08	(0.89)	41.45	40.24	(1.20)	12.85	12.85	0.00	0.00	0.00	0.00	105.27	103.17	(2.09)	-1.99%
San Joaquin Valley	33.77	31.07	(2.70)	4.75	4.68	(0.07)	19.62	19.62	0.00	0.00	0.00	0.00	58.14	55.37	(2.77)	-4.76%
State Total	263.48	257.32	(6.16)	92.44	89.32	(3.13)	121.58	121.58	0.00	39.16	39.62	0.46	516.67	507.84	(8.83)	-1.71%

TOTAL PM25 (On-Road, Planes, Trains, Electric) (Tons/day)		Total - PM2.5 Increment	Total % Change from No Build
No Build	HSR Pacheco Low	HSR Pacheco Low	HSR Pacheco Low
95.50	93.60	(1.90)	-1.03%
52.74	50.23	(2.51)	-4.87%
468.72	460.72	(8.01)	-1.33%

Air Basin	NOx - On-Road Mobile (tons/day)		On-Road NOx Increment	NOx - Planes (tons/day)		Plane NOx Increment	NOx - Trains (tons/day)		Train - NOx Increment	NOx - Electric (tons/day)		Electric - NOx Increment	TOTAL NOx (On-Road, Planes, Trains, Electric) (Tons/day)		Total - NOx Increment	Total % Change from No Build
	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	HSR Altamont
San Francisco Bay	50.98	50.15	(0.82)	41.45	40.31	(1.14)	12.85	12.85	0.00	0.00	0.00	0.00	105.27	103.30	(1.96)	-1.86%
San Joaquin Valley	33.77	31.13	(2.64)	4.75	4.68	(0.07)	19.62	19.62	0.00	0.00	0.00	0.00	58.14	55.43	(2.70)	-4.65%
State Total	263.48	257.90	(5.58)	92.44	89.32	(3.13)	121.58	121.58	0.00	39.16	39.62	0.46	516.67	508.43	(8.24)	-1.60%

TOTAL PM2.5 (On-Road, Planes, Trains, Electric) (Metric Tons/day)		Total - PM2.5 Increment	Total % Change from No Build
No Build	HSR Altamont Low	HSR Altamont Low	HSR Altamont Low
95.50	93.72	(1.78)	-1.03%
52.74	50.29	(2.45)	-4.87%
468.72	461.25	(7.48)	-1.33%

CALIFORNIA HIGH SPEED RAIL
NOX ON-ROAD MOBILE CALCULATIONS

Air Basin	No Build		Pacheco			NOx (tons/day)		NOx Increment	
	VMT	VHT	VMT	VHT	% of NB VMT	No Build	Build	Pacheco	%
San Francisco Bay	112,280,333	2,967,721	110,319,202	1,680,135	98.3%	50.98	50.08	(0.89)	-1.75%
San Joaquin Valley	126,463,316	1,836,428	116,352,966	1,649,721	92.0%	33.77	31.07	(2.70)	-7.99%
State Total	1,141,592,762	30,536,249	1,114,910,694	28,315,177	97.7%	263.48	257.32	(6.16)	-2.34%

NOx (metric tons/day)		NOx Increment
No Build	Build	Pacheco
46.24	45.44	(0.81)
30.64	28.19	(2.45)
239.03	233.44	(5.59)

Air Basin	No Build		Altamont			NOx (tons/day)		NOx Increment	
	VMT	VHT	VMT	VHT	% of NB VMT	No Build	Build	Altamont	
San Francisco Bay	112,280,333	2,967,721	110,469,582	1,603,257	98.4%	50.98	50.15	(0.82)	-1.61%
San Joaquin Valley	126,463,316	1,836,428	116,584,184	1,653,235	92.2%	33.77	31.13	(2.64)	-7.81%
State Total	1,141,592,762	30,536,249	1,117,429,041	28,238,654	97.9%	263.48	257.90	(5.58)	-2.12%

NOx (metric tons/day)		NOx Increment
No Build	Build	Altamont
46.24	45.50	(0.75)
30.64	28.25	(2.39)
239.03	233.97	(5.06)

CALIFORNIA HIGH SPEED RAIL
CO EMISSION BURDEN 2030

Pacheco

Air Basin	CO - On-Road Mobile (tons/day)		On-Road CO Increment	CO - Planes (tons/day)		Plane CO Increment	CO - Trains (tons/day)		Train - CO Increment	CO - Electric (tons/day)		Electric - CO Increment	TOTAL CO (On-Road, Planes, Trains, Electric) (Tons/day)		Total - CO Increment	Total % Change from No Build
	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	No Build	HSR Pacheco	HSR Pacheco	HSR Pacheco
San Francisco Bay	259.78	255.24	(4.54)	74.75	73.00	(1.74)	3.73	3.73	0.00	0.00	0.00	0.00	338.26	331.98	(6.28)	-1.86%
San Joaquin Valley	142.83	131.41	(11.42)	81.50	81.40	(0.10)	6.90	6.90	0.00	0.00	0.00	0.00	231.22	219.70	(11.52)	-4.98%
State Total	1,310.46	1,279.83	(30.63)	346.74	342.21	(4.53)	58.28	58.28	0.00	60.08	60.78	0.71	1,775.55	1,741.10	(34.45)	-1.94%

Altamont

Air Basin	CO - On-Road Mobile (tons/day)		On-Road CO Increment	CO - Planes (tons/day)		Plane CO Increment	CO - Trains (tons/day)		Train - CO Increment	CO - Electric (tons/day)		Electric - CO Increment	TOTAL CO (On-Road, Planes, Trains, Electric) (Tons/day)		Total - CO Increment	Total % Change from No Build
	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	No Build	HSR Altamont	HSR Altamont	HSR Altamont
San Francisco Bay	259.78	255.59	(4.19)	74.75	73.10	(1.65)	3.73	3.73	0.00	0.00	0.00	0.00	338.26	332.42	(5.84)	-1.73%
San Joaquin Valley	142.83	131.67	(11.16)	81.50	81.40	(0.09)	6.90	6.90	0.00	0.00	0.00	0.00	231.22	219.97	(11.25)	-4.87%
State Total	1,310.46	1,282.72	(27.74)	346.74	342.44	(4.29)	58.28	58.28	0.00	60.08	60.78	0.71	1,775.55	1,744.23	(31.33)	-1.76%

CALIFORNIA HIGH SPEED RAIL
CO ON-ROAD MOBILE CALCULATIONS

Air Basin	No Build		Pacheco			CO (tons/day)		CO Increment	
	VMT	VHT	VMT	VHT	% of NB VMT	No Build	Build	Pacheco	%
San Francisco Bay	112,280,333	2,967,721	110,319,202	1,680,135	98.3%	259.78	255.24	(4.54)	-1.75%
San Joaquin Valley	126,463,316	1,836,428	116,352,966	1,649,721	92.0%	142.83	131.41	(11.42)	-7.99%
State Total	1,141,592,762	30,536,249	1,114,910,694	28,315,177	97.7%	1,310.46	1,279.83	(30.63)	-2.34%
	26,682,068								0.00000115

CO (metric tons/day)		CO Increment
No Build	Build	Pacheco
235.67	231.56	(4.12)
129.58	119.22	(10.36)
1,188.85	1,161.06	(27.79)

Air Basin	No Build		Altamont			CO (tons/day)		CO Increment	
	VMT	VHT	VMT	VHT	% of NB VMT	No Build	Build	Altamont	
San Francisco Bay	112,280,333	2,967,721	110,469,582	1,603,257	98.4%	259.78	255.59	(4.19)	-1.61%
San Joaquin Valley	126,463,316	1,836,428	116,584,184	1,653,235	92.2%	142.83	131.67	(11.16)	-7.81%
State Total	1,141,592,762	30,536,249	1,117,429,041	28,238,654	97.9%	1,310.46	1,282.72	(27.74)	-2.12%
	24,163,721								

CO (tons/day)		CO Increment
No Build	Build	Altamont
235.67	231.87	(3.80)
129.58	119.45	(10.12)
1,188.85	1,163.69	(25.16)

CALIFORNIA HIGH SPEED RAIL
CO2 EMISSION BURDEN

Air Basin	CO2 - On-Road Mobile (tons/day)			On-Road - CO2 Increment		CO2 - Planes (tons/day)			Plane - CO2 Increment		CO2 - Trains (tons/day)	CO2 - Electric (tons/day)			Electric - CO2 Increment		TOTAL CO2 (On-Road, Planes, Trains, Electric) (Tons/day)			Total - CO2 Increment		Total % Change from No Build	
	No Build	Pacheco	Altamont	Pacheco	Altamont	No Build	Pacheco	Altamont	Pacheco	Altamont	No Build	No Build	Pacheco	Altamont	Pacheco	Altamont	No Build	Pacheco	Altamont	Pacheco	Altamont	Pacheco	Altamont
State Total	486,613.05	475,239.60	476,313.07	11,373.44	-10,299.98	113.86	63.41	66.03	-50.45	-47.83	uk	0.00	7,234.46	7,234.46	7,234.46	7,234.46	486,726.91	482,537.47	483,613.56	-4,189.44	-3,113.35	-1%	-1%

CALIFORNIA HIGH SPEED RAIL
ELECTRIC ANALYSIS

Air Basin	2030 electric - No build (tons/day)					2030 additional burden - Pacheco Base					Total					% change from No Build				
	CO	PM10	pm2.5	NOx	TOG	CO	PM10	PM2.5	NOx	TOG	CO	PM10	PM2.5	NOx	TOG	CO	PM10	PM2.5	NOx	TOG
Statewide	60.08	9.34	9.00	39.16	44.48	0.706	0.110	0.106	0.460	0.523	60.8	9.4	9.1	39.6	45.0	1.18%	1.18%	1.18%	1.18%	1.18%

Air Basin	2030 electric - No build (tons/day)					2030 additional burden - Altamont Base					Total					% change from No Build				
	CO	PM10	pm2.5	NOx	TOG	CO	PM10	PM2.5	NOx	TOG	CO	PM10	PM2.5	NOx	TOG	CO	PM10	PM2.5	NOx	TOG
Statewide	60.08	9.34	9.00	39.16	44.48	0.706	0.110	0.106	0.460	0.523	60.8	9.4	9.1	39.6	45.0	1.2%	1.2%	1.2%	1.2%	1.2%

High Speed Train (San Francisco to Central Valley Analysis)

ANNUAL DIRECT ENERGY CONSUMPTION

	2000		2030	CS VMT DATA 6/18/08 (with VMT Updates, Existing and Pacheco)	
ALTERNATIVE	**Existing (absolute)**	No-Build (absolute, 5% elevated auto consumption	**No-Build (Base)**	**Pacheco Base**	**Altamont Base**
Annual Auto VMT	273,241,376,219	437,515,426,040	416,681,358,134	406,942,403,342	407,861,599,913
Annual Airline VMT	75,752,623	131,934,237	131,934,237	73,473,300	76,513,845
Annual HST VMT	0	0	0	42,956,120	42,956,120
AUTOS					
Annual Auto BTU	1,522,500,948,294,220	2,437,835,953,896,730	2,321,748,527,520,700	2,267,483,071,421,260	2,272,604,834,715,150
Airline					
Annual Airline BTU	24,763,102,458,624	43,128,553,470,392	43,128,553,470,392	24,018,004,652,952	25,011,941,731,450
High Speed Train					
Annual High Speed Train BTU	0	0	0	39,707,950,030,080	39,707,950,030,080
SUMMARY					
Annual Autos BTU	1,522,500,948,294,220	2,437,835,953,896,730	2,321,748,527,520,700	2,267,483,071,421,260	2,272,604,834,715,150
Annual Airline BTU	24,763,102,458,624	43,128,553,470,392	43,128,553,470,392	24,018,004,652,952	25,011,941,731,450
Annual High Speed BTU	0	0	0	39,707,950,030,080	39,707,950,030,080
TOTAL DIRECT ENERGY (BTUs)	**1,547,264,050,752,840**	**2,480,964,507,367,120**	**2,364,877,080,991,090**	**2,331,209,026,104,290**	**2,337,324,726,476,680**
Change from Existing direct energy (BTU)		**933,700,456,614,282**	**817,613,030,238,247**	**783,944,975,351,452**	**790,060,675,723,839**
% Change in Existing direct energy (BTU)		**0.60**	**0.53**	**0.51**	**0.51**
Change from No-Build direct energy (BTU)				**-33,668,054,886,795**	**-27,552,354,514,408**
% Change in No-Build direct energy (BTU)				**-0.01**	**-0.01**
Change from No-Build direct energy 5 % inc. (BTU)				**-149,755,481,262,830**	**-143,639,780,890,442**
% Change in No-Build direct energy 5 % inc. (BTU)				**-0.0604**	**-0.0579**
TOTAL DIRECT ENERGY (BARRELS OF OIL)	**266,769,664**	**427,752,501**	**407,737,428**	**401,932,591**	**402,987,022**
Change from Existing direct energy (Barrels of Oil)		**160,982,837**	**140,967,764**	**135,162,927**	**136,217,358**
% Change in existing direct energy (Barrels of Oil)		**0.60**	**0.53**	**0.51**	**0.51**
Change from No-Build direct energy (Barrels of Oil)				**-5,804,837**	**-4,750,406**
% Change in No-Build direct energy (Barrels of Oil)				**-0.01**	**-1.2%**
Change from No-Build direct energy 5 % inc. (BTU)				**-25,819,911**	**-24,765,479**
% Change in No-Build direct energy 5 % inc. (BTU)				**-0.0604**	**-0.0579**

CALIFORNIA HIGH SPEED RAIL
CO2 ENERGY ANALYSIS

HSR CO2 Only

	Annual BTUs (from energy report)	Million BTUs	CO2 (Tons CO2/Million Btu)*	CO2 Burden (tons/year)	CO2 Burden (Tons/day)	Difference from NB	% Dif. From NB
No Build	0	0	0.0665	0	0.00	-	-
Pacheco	39,707,950,030,080	39707950.03	0.0665	2,640,578.68	7,234.46	7,234.46	
Altamont Base	39,707,950,030,080	39707950.03	0.0665	2,640,578.68	7,234.46	7,234.46	

CO2 state wide burden

Year	MMT	Metric tons/day	Tons/Day
2010	467.80	1,281,643.84	1,412,742.33
2001	429.6	1,176,986.30	1,297,379.45
2002	422.6	1,157,808.22	1,276,239.65
2005	423.92	1,161,416.37	1,280,216.88

AUTOS

	Annual BTUs (from energy report)	Million BTUs	CO2 (Tons CO2/Million Btu)*	CO2 Burden (tons/year)	CO2 Burden (Tons/day)	Difference from NB	% Dif. From NB
No Build	2,321,748,527,520,700	2,321,748,527.52	0.0765	177,613,762.36	486,613.05	-	-
Pacheco	2,267,483,071,421,260	2,267,483,071.42	0.0765	173,462,454.96	475,239.60	-11,373.44	-2%
Altamont Base	2,272,604,834,715,150	2,272,604,834.72	0.0765	173,854,269.86	476,313.07	-10,299.98	-2%

PLANES

	Annual Airline BTUs (from energy report)	Annual Airline VMT (from energy report)	CO2 (Tons/Mile)**	CO2 Burden (tons/year)	CO2 Burden (Tons/day)	Difference from NB	% Dif. From NB
No Build - Planes	43,128,553,470,392	131,934,237	0.03189375	4,207,877.59	11,528.43	-	-
Pachecc - Planes	24,018,004,652,952	73,473,300	0.03189375	2,343,339.05	6,420.11	-5,108.32	-44%
Altamont - Planes	25,011,941,731,450	76,513,845	0.03189375	2,440,313.45	6,685.79	-4,842.64	-42%

320,547.95 people a day

HSR

				grams/kilowatt-hours					Burden (grams/day)					Burden (tons/day)				
	Annual BTUs (from energy report)	Conversion Factor KW to BTU (from Energy data source edition 22, table B.3)	Kwhr	CO	PM10	PM2.5	NOx	TOG	CO	PM10	PM2.5	NOx	TOG	CO	PM10	PM2.5	NOx	TOG
No Build - HSR	0	11765	0	0.07	0.01	0.01	0.05	0.05	-	-	-	-	-	-	-	-	-	-
Pachecc - HSR	39,707,950,030,080	11765	3,375,091,375.27	0.07	0.01	0.01	0.05	0.05	640,800.00	99,621.44	96,049.02	417,699.82	474,483.98	0.71	0.11	0.11	0.46	0.52
Altamont - HSR	39,707,950,030,080	11765	3,375,091,375.27	0.07	0.01	0.01	0.05	0.05	640,800.00	99,621.44	96,049.02	417,699.82	474,483.98	0.71	0.11	0.11	0.46	0.52
													lbs/mile	0.012001	0.00186566	0.001799	0.007822	0.008886

Note - for electric burden calculations, only the HSR contributes. There is no no build because HSR does not exist in No Build

CALIFORNIA HIGH SPEED RAIL
TRAINS

Air Basin	2030 trains - No build & build (tons/day)				
	CO	PM10	PM2.5	NOx	TOG
San Francisco	3.73	0.27	0.23	12.85	1.09
San Joaquin	6.90	0.53	0.49	19.62	1.83
Statewide	58.28	4.15	3.79	121.58	15.25

Air Basin	2005 trains - Existing (tons/day)				
	CO	PM10	PM2.5	NOx	TOG
San Francisco	2.33	0.31	0.27	13.03	1.13
San Joaquin	4.50	0.66	0.60	23.64	1.97
Statewide	33.05	4.74	4.33	157.56	14.61

CALIFORNIA HIGH SPEED RAIL
PLANES

Pacheco

Air Basin	2030 planes - No build (tons/day)					2030 burden per flight (tons/day) - as per EDMS Model*					# of flights not needed due to HSR (from Table 2.3-4 & 3.3-3)	2030 removed plane burden - HSR Alternative (tons/day)					2030 - plane burden HSR Alternative (tons/day)					2030 - HSR Alternative % plane burden decrease from No Build (tons/day)				
	CO	PM10	PM2.5	NOx	TOG	CO	PM10	PM2.5	NOx	TOG		CO	PM10	PM2.5	NOx	TOG	CO	PM10	PM2.5	NOx	TOG	CO	PM10	PM2.5	NOx	TOG
San Francisco	74.75	0.67	0.64	41.45	12.72	0.010	0.0001	0.0001	0.007	0.002	-167	-1.743	-0.022	-0.022	-1.203	-0.415	73.004	0.648	0.617	40.242	12.309	-2.3%	-3.2%	-3.4%	-2.9%	-3.3%
San Joaquin	81.50	0.46	0.45	4.75	10.03	0.010	0.0001	0.0001	0.007	0.002	-10	-0.100	-0.001	-0.001	-0.069	-0.024	81.396	0.460	0.450	4.678	10.002	-0.1%	-0.3%	-0.3%	-1.4%	-0.2%
Statewide	346.74	7.76	7.67	92.44	51.05	0.010	0.0001	0.0001	0.007	0.002	-433	-4.532	-0.056	-0.056	-3.128	-1.079	342.208	7.700	7.618	89.316	49.971	-1.3%	-0.7%	-0.7%	-3.4%	-2.1%

** Flight emission information is for default 737 and associated ground support*

Altamont

Air Basin	2030 planes - No build (tons/day)					2030 burden per flight (tons/day) - as per EDMS Model*					# of flights not needed due to HSR (from Table 2.3-4 & 3.3-3)	2030 removed plane burden - HSR Alternative (tons/day)					2030 - plane burden HSR Alternative (tons/day)					2030 - HSR Alternative % plane burden decrease from No Build (tons/day)				
	CO	PM10	PM2.5	NOx	TOG	CO	PM10	PM2.5	NOx	TOG		CO	PM10	PM2.5	NOx	TOG	CO	PM10	PM2.5	NOx	TOG	CO	PM10	PM2.5	NOx	TOG
San Francisco	74.75	0.67	0.64	41.45	12.72	0.010	0.0001	0.0001	0.007	0.002	-158	-1.652	-0.021	-0.021	-1.140	-0.393	73.095	0.649	0.618	40.305	12.331	-2.2%	-3.1%	-3.2%	-2.8%	-3.1%
San Joaquin	81.50	0.46	0.45	4.75	10.03	0.010	0.0001	0.0001	0.007	0.002	-9	-0.094	-0.001	-0.001	-0.065	-0.022	81.402	0.460	0.450	4.682	10.003	-0.1%	-0.3%	-0.3%	-1.4%	-0.2%
Statewide	346.74	7.76	7.67	92.44	51.05	0.010	0.0001	0.0001	0.007	0.002	-411	-4.295	-0.053	-0.053	-2.965	-1.022	342.445	7.703	7.621	89.479	50.027	-1.2%	-0.7%	-0.7%	-3.2%	-2.0%

** Flight emission information is for default 737 and associated ground support*

CALIFORNIA HIGH SPEED RAIL
PACHECO SUMMARY

ON ROAD MOBILE

MILES and TONS per DAY

Air Basin	2030 No Project VMT	2030 Pacheco VMT	2030 No Project Emission Burden Tons/Day						2030 Pacheco Low Emission Burden Tons/Day						Incremental Change from No Project					
			CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	112,280,333.2	110,319,202	259.8	11.6	7.5	51.0	36.0	NA	255.2	11.4	7.3	50.1	35.3	NA	-4.54	-0.20	-0.13	-0.89	-0.63	NA
San Joaquin Valley	126,463,316.4	116,352,966	142.8	7.1	4.2	33.8	19.3	NA	131.4	6.5	3.9	31.1	17.8	NA	-11.42	-0.57	-0.34	-2.70	-1.54	NA
State Total	1,141,592,762.0	1,114,910,694	1,310.5	56.9	35.1	263.5	186.2	486,613	1,279.8	55.6	32.5	257.3	181.9	475,240	-30.63	-1.33	-2.57	-6.16	-4.35	-11,373
	0.003244803		0.002296	1E-04	6E-05	0.000461602	0.0003262	0.852516												

KILOMETERS and METRIC TONS per DAY

Air Basin	2030 No Project VKT	2030 Pacheco VKT	2030 No Project Emission Burden Metric Tons/Day						2030 Pacheco Low Emission Burden Metric Tons/Day						Incremental Change from No Project					
			CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	#NAME?	#NAME?	235.7	10.5	6.8	46.2	32.6	NA	231.6	10.3	6.7	45.4	32.1	NA	-4.1	-0.2	-0.1	-0.8	-0.6	NA
San Joaquin Valley	#NAME?	#NAME?	129.6	6.4	3.8	30.6	17.5	NA	119.2	5.9	3.5	28.2	16.1	NA	-10.4	-0.5	-0.3	-2.4	-1.4	NA
State Total	#NAME?	#NAME?	1,188.8	51.6	31.8	239.0	168.9	441,457	1,161.1	50.4	29.5	233.4	165.0	431,139	-27.8	-1.2	-2.3	-5.6	-3.9	-10,318

26,682,067.9

Air Basin	% Change from No Project					
	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	-1.7%	-1.7%	-1.7%	-1.7%	-1.7%	NA
San Joaquin Valley	-8.0%	-8.0%	-8.0%	-8.0%	-8.0%	NA
State Total	-2.3%	-2.3%	-7.3%	-2.3%	-2.3%	-2.3%

PLANES

TONS per DAY

Air Basin	2030 Projected No Project Airplane Emission Inventory (Tons/Day)						Flights removed due to project	2030 Emission Reductions due to Flights removed under Build Alternative (Tons/Day)						2030 Total Plane Emission Burden under Build Alternative (Tons/Day)					
	CO	PM10	PM2.5	NOx	TOG	CO_2		CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	74.75	0.67	0.64	41.45	12.72	NA	-167	-1.74	-0.02	-0.02	-1.20	-0.41	NA	73.00	0.65	0.62	40.24	12.31	NA
San Joaquin Valley	81.50	0.46	0.45	4.75	10.03	NA	-10	-0.10	0.00	0.00	-0.07	-0.02	NA	81.40	0.46	0.45	4.68	10.00	NA
State Total	346.74	7.76	7.67	92.44	51.05	11528	-433	-4.53	-0.06	-0.06	-3.13	-1.08	-5108.32	342.21	7.70	7.62	89.32	49.97	6420.11

METRIC TONS per DAY

Air Basin	2030 Projected No Project Airplane Emission Inventory (Metric Tons/Day)						Flights removed due to project	2030 Emission Reductions due to Flights removed under Build Alternative (Metric Tons/Day)						2030 Total Plane Emission Burden under Build Alternative (Tons/Day)					
	CO	PM10	PM2.5	NOx	TOG	CO_2		CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	67.81	0.61	0.58	37.60	11.54	NA	-167	-1.58	-0.02	-0.02	-1.09	-0.38	NA	66.23	0.59	0.56	36.51	11.17	NA
San Joaquin Valley	73.93	0.42	0.41	4.31	9.10	NA	-10	-0.09	0.00	0.00	-0.06	-0.02	NA	73.84	0.42	0.41	4.24	9.07	NA
State Total	314.56	7.04	6.96	83.87	46.31	10458.63	-433	-4.11	-0.05	-0.05	-2.84	-0.98	-4634.29	310.45	6.99	6.91	81.03	45.33	5824.34

-1691515

Air Basin	% Change from No Project					
	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	-2.3%	-3.2%	-3.4%	-2.9%	-3.3%	NA
San Joaquin Valley	-0.1%	-0.3%	-0.3%	-1.4%	-0.2%	NA
State Total	-1.3%	-0.7%	-0.7%	-3.4%	-2.1%	-44.3%

CALIFORNIA HIGH SPEED RAIL
PACHECO SUMMARY

ENERGY

TONS per DAY

Air Basin	2030 Projected No Project Energy Emission Inventory (Tons/Day)						2030 Emission changes due to HSR power demands under the Build Alternative (Tons/Day)						2030 Total Energy Emission Burden under Build Alternative (Tons/Day)					
	CO	PM10	PM2.5	NOx	TOG	CO_2*	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2
Statewide	60.08	9.34	9.00	39.16	44.48	391,412	0.71	0.11	0.11	0.46	0.52	7,234	60.78	9.45	9.11	39.62	45.01	398,647
117688							0.0120006	0.0018657	0.001799	0.007822	0.00889	122.943072						

METRIC TONS per DAY

Air Basin	2030 Projected No Project Energy Emission Inventory (Metric Tons/Day)						2030 Emission changes due to HSR power demands under the Build Alternative (Metric Tons/Day)						2030 Total Energy Emission Burden under Build Alternative (Metric Tons/Day)					
	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2
Statewide	54.50	8.47	8.17	35.53	40.36	355,090	0.64	0.10	0.10	0.42	0.47	6,563	55.14	8.57	8.27	35.94	40.83	361,653

** Assumes 22.2% of CO2 inventory is a result of electical production, as per Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004,*

Air Basin	% Change from No Project					
	CO	PM10	PM2.5	NOx	TOG	CO_2
Statewide	1.2%	1.2%	1.2%	1.2%	1.2%	1.8%

SUMMARY

TONS per DAY

Air Basin	2005 Existing Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO2 all sources) (Tons/Day)						2030 Projected No Project Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO2 all sources) (Tons/Day)						2030 Projected Build Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO2 all sources) (Tons/Day)					
	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	1536	10	7	318	174	NA	398	22	17	144	94	NA	393	22	17	143	94	NA
San Joaquin Valley	948	7	6	224	102	NA	231	8	5	58	31	NA	220	7	5	55	30	NA
State Total	7979	69	52	1759	932	1,280,217	1715	69	47	478	253	1,763,118	1680	67	44	468	247	1753871
						0.73						1.01						-0.52%

3,507,741,013.96

1,280,325,470,094.21

METRIC TONS per DAY

Air Basin	2005 Existing Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO2 all sources) (Metric Tons/Day)						2030 Projected No Project Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO2 all sources) (Metric Tons/Day)						2030 Projected Build Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO2 all sources) (Metric Tons/Day)					
	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	1,393	9	7	288	157	NA	361	20	16	131	86	NA	356	20	16	130	85	NA
San Joaquin Valley	860	7	5	203	93	NA	210	7	5	53	28	NA	199	7	4	50	27	NA
State Total	7,239	63	48	1,596	846	1,161,416	1,556	62	42	433	229	1,599,505	1,524	61	40	425	224	1,591,116

Air Basin	% Change from No Project					
	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	-1.4%	-0.5%	-0.3%	-1.1%	-0.6%	NA
San Joaquin Valley	-5.0%	-7.0%	-6.6%	-4.8%	-5.0%	NA
State Total	-2.0%	-2.0%	-5.6%	-1.9%	-2.2%	-0.5%

Air Basin	Change from No Project (tons/day)					
	CO	PM10	PM2.5	NOx	TOG	CO_2
San Franc	-5.57	-0.11	-0.05	-1.63	-0.52	na
San Joaqu	-11.52	-0.57	-0.34	-2.77	-1.57	na
State Total	-35.16	-1.39	-2.62	-9.29	-5.43	-9247.31

-18494615.08

(6,750,534,504)

Air Basin	Impact Rating					
	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	medium	medium	medium	medium	medium	NA
San Joaquin Valley	medium	medium	medium	medium	medium	NA
State Total	medium	medium	medium	medium	medium	NA

Air Basin	Change from No Project (tons/year)					
	CO	PM10	PM2.5	NOx	TOG	CO_2
San Franc	-2035	-42	-17	-596	-190	NA
San Joaqu	-4204	-207	-123	-1011	-573	NA
State Total	-12834	-506	-957	-3389	-1982	-3375267

(6,750,534,504)

CALIFORNIA HIGH SPEED RAIL
ALTAMONT
SUMMARY

ON ROAD MOBILE

MILES and TONS per DAY

Air Basin	2030 No Project VMT	2030 Altamont VMT	2030 No Project Emission Burden Tons/Day						2030 Altamont Low Emission Burden Tons/Day						Incremental Change from No Project					
			CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	112,280,333.2	110,469,582.5	259.8	11.6	7.5	51.0	36.0	NA	255.6	11.4	7.4	50.2	35.4	NA	-4.19	-0.19	-0.12	-0.82	-0.58	NA
San Joaquin Valley	126,463,316.4	116,584,183.6	142.8	7.1	4.2	33.8	19.3	NA	131.7	6.5	3.9	31.1	17.8	NA	-11.16	-0.55	-0.33	-2.64	-1.51	NA
State Total	1,141,592,762.0	1,117,429,040.9	1,310.5	56.9	35.1	263.5	186.2	486,613	1,282.7	55.7	34.3	257.9	182.3	476,313	-27.74	-1.20	-0.74	-5.58	-3.94	-10,300

KILOMETERS and METRIC TONS per DAY

Air Basin	2030 No Project VKT	2030 Altamont VKT	2030 No Project Emission Burden Metric Tons/Day						2030 Altamont Low Emission Burden Metric Tons/Day						Incremental Change from No Project					
			CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	#NAME?	#NAME?	235.7	10.5	6.8	46.2	32.6	NA	231.9	10.4	6.7	45.5	32.1	NA	-3.80	-0.17	-0.11	-0.75	-0.53	NA
San Joaquin Valley	#NAME?	#NAME?	129.6	6.4	3.8	30.6	17.5	NA	119.5	5.9	3.5	28.2	16.2	NA	-10.12	-0.50	-0.30	-2.39	-1.37	NA
State Total	#NAME?	#NAME?	1,188.8	51.6	31.8	239.0	168.9	441,457	1,163.7	50.5	31.2	234.0	165.4	432,113	-25.16	-1.09	-0.67	-5.06	-3.58	-9,344

Air Basin	% Change from No Project					
	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	-1.6%	-1.6%	-1.6%	-1.6%	-1.6%	NA
San Joaquin Valley	-7.8%	-7.8%	-7.8%	-7.8%	-7.8%	NA
State Total	-2.1%	-2.1%	-2.1%	-2.1%	-2.1%	-2.1%

PLANES

TONS per DAY

Air Basin	2030 Projected No Project Airplane Emission Inventory (Tons/Day)						Flights removed due to project	2030 Emission Reductions due to Flights removed under Build Alternative (Tons/Day)						2030 Total Plane Emission Burden under Build Alternative (Tons/Day)					
	CO	PM10	PM2.5	NOx	TOG	CO_2		CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	74.75	0.67	0.64	41.45	12.72	NA	-158	-1.65	-0.02	-0.02	-1.14	-0.39	NA	73.10	0.65	0.62	40.31	12.33	NA
San Joaquin Valley	81.50	0.46	0.45	4.75	10.03	NA	-9	-0.09	0.00	0.00	-0.07	-0.02	NA	81.40	0.46	0.45	4.68	10.00	NA
State Total	346.74	7.76	7.67	92.44	51.05	11528	-411	-4.29	-0.05	-0.05	-2.96	-1.02	-4842.64	342.44	7.70	7.62	89.48	50.03	6685.79

METRIC TONS per DAY

Air Basin	2030 Projected No Project Airplane Emission Inventory (Metric Tons/Day)						Flights removed due to project	2030 Emission Reductions due to Flights removed under Build Alternative (Metric Tons/Day)						2030 Total Plane Emission Burden under Build Alternative (Tons/Day)					
	CO	PM10	PM2.5	NOx	TOG	CO_2		CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	67.81	0.61	0.58	37.60	11.54	NA	-158	-1.50	-0.02	-0.02	-1.03	-0.36	NA	66.31	0.59	0.56	36.57	11.19	NA
San Joaquin Valley	73.93	0.42	0.41	4.31	9.10	NA	-9	-0.09	0.00	0.00	-0.06	-0.02	NA	73.85	0.42	0.41	4.25	9.07	NA
State Total	314.56	7.04	6.96	83.87	46.31	10458.63	-411	-3.90	-0.05	-0.05	-2.69	-0.93	-4393.26	310.67	6.99	6.91	81.18	45.38	6065.37

Air Basin	% Change from No Project					
	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	-2.2%	-3.1%	-3.2%	-2.8%	-3.1%	NA
San Joaquin Valley	-0.1%	-0.3%	-0.3%	-1.4%	-0.2%	NA
State Total	-1.2%	-0.7%	-0.7%	-3.2%	-2.0%	-42.0%

CALIFORNIA HIGH SPEED RAIL
ALTAMONT
SUMMARY

ENERGY

TONS per DAY

Air Basin	2030 Projected No Project Energy Emission Inventory (Tons/Day)						2030 Emission changes due to HSR power demands under the Build Alternative (Tons/Day)						2030 Total Energy Emission Burden under Build Alternative (Tons/Day)					
	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2
Statewide	60.08	9.34	9.00	39.16	44.48	391,412	0.71	0.11	0.11	0.46	0.52	7,234	60.78	9.45	9.11	39.62	45.01	398,647

** Assumes 22.2% of CO2 inventory is a result of electical production, as per Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004,*

METRIC TONS per DAY

Air Basin	2030 Projected No Project Energy Emission Inventory (Metric Tons/Day)						2030 Emission changes due to HSR power demands under the Build Alternative (Metric Tons/Day)						2030 Total Energy Emission Burden under Build Alternative (Metric Tons/Day)					
	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2
Statewide	54.50	8.47	8.17	35.53	40.36	355,090	0.64	0.10	0.10	0.42	0.47	6,563	55.14	8.57	8.27	35.94	40.83	361,653

Air Basin	% Change from No Project					
	CO	PM10	PM2.5	NOx	TOG	CO_2
Statewide	1.2%	1.2%	1.2%	1.2%	1.2%	1.8%

SUMMARY

TONS per DAY

Air Basin	2005 Existing Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO2 all sources) (Tons/Day)						2030 Projected No Project Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO2 all sources) (Tons/Day)						2030 Projected Build Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO2 all sources) (Tons/Day)					
	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	1536	10	7	318	174	NA	398	22	17	144	94	NA	393	22	17	143	94	NA
San Joaquin Valley	948	7	6	224	102	NA	231	8	5	58	31	NA	220	8	5	55	30	NA
State Total	7979	69	52	1759	932	1,280,217	1715	69	47	478	253	1,763,118	1683	68	46	469	248	1755210

METRIC TONS per DAY

Air Basin	2005 Existing Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO2 all sources) (Metric Tons/Day)						2030 Projected No Project Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO2 all sources) (Metric Tons/Day)						2030 Projected Build Emission Inventory (Planes, Trains, On-Road Mobile, and Energy, CO2 all sources) (Metric Tons/Day)					
	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	1393	9	7	288	157	NA	361	20	16	131	86	NA	357	20	16	130	85	NA
San Joaquin Valley	860	7	5	203	93	NA	210	7	5	53	28	NA	200	7	4	50	27	NA
State Total	7239	63	48	1596	846	1161416	1556	62	42	433	229	1,599,505	1527	61	42	425	225	1592331

Air Basin	% Change from No Project					
	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	-1.3%	-0.4%	-0.2%	-1.0%	-0.5%	NA
San Joaquin Valley	-4.9%	-6.9%	-6.4%	-4.7%	-4.9%	NA
State Total	-1.9%	-1.8%	-1.7%	-1.8%	-2.0%	-0.4%

Air Basin	Change from No Project (tons/day)					
	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francis	-5.14	-0.10	-0.04	-1.50	-0.45	na
San Joaqui	-11.25	-0.55	-0.33	-2.70	-1.53	na
State Total	-32.03	-1.26	-0.80	-8.54	-4.96	-7908.16

Air Basin	Impact Rating					
	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francisco Bay	medium	medium	medium	medium	medium	NA
San Joaquin Valley	medium	medium	medium	medium	medium	NA
State Total	medium	medium	medium	medium	medium	NA

Air Basin	Change from No Project (tons/year)					
	CO	PM10	PM2.5	NOx	TOG	CO_2
San Francis	-1874	-36	-13	-548	-164	NA
San Joaqui	-4107	-202	-121	-987	-559	NA
State Total	-11692	-459	-291	-3118	-1812	(2,886,478)

(5,772,955,922.00)