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January 28, 2013

Ms. Diane Boyer-Vine  
Legislative Counsel  
State Capitol, Room 3021  
Sacramento, CA 95814

Mr. Gregory Schmidt  
Secretary of the Senate  
State Capitol, Room 3044  
Sacramento, CA 95814

Mr. E. Dotson Wilson  
Chief Clerk of the Assembly  
State Capitol, Room 3196  
Sacramento, CA 95814

Dear Ms. Boyer-Vine, and Messrs. Schmidt, and Wilson:

I am pleased to transmit the California Department of Transportation's (Department) "Eleventh Biennial Report," as required by Government Code section 14051.

Distribution to the California State Legislature has been made by the Department pursuant to Government Code section 9795.

Sincerely,

A handwritten signature in black ink, appearing to read "Malcolm Dougherty".

MALCOLM DOUGHERTY  
Director

Enclosure

California Department of Transportation

# Eleventh Biennial Report

January 2013



Biennial Report to the California State Legislature

Prepared Pursuant to Government Code Section 14051

*The*  
***California Department***  
*of*  
***Transportation***

***Eleventh Biennial Report***  
*to the*  
***California State Legislature***

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Government Code Section 14051

January 2013

## ***Cover***

The photographs making up the cover of this edition of the California Department of Transportation's (Department) Biennial Report display some of the elements detailed in the Report. The technical nature of the Report addresses the legislative requirements of disparate activities across eight divisions of the Department.

The inset photographs, clockwise from upper left, shows a Department's aircraft flying north at approximately 2,000 feet above the spectacular eastern view of the Golden Gate Bridge. The next photo is a street level view of a class two bicycle lane as an integral part of a divided urban roadway, representative of the many intelligent transportation systems to improve mobility. The lower right-hand photo shows a compressed 'balsi beam'. These beams have been created that, when extended, offer protection to roadway workers in a cone-zone construction area. Moving to the left, two fuel pumps are displayed that are in daily use for the Department's vehicles. These pumps are capable of delivering alternative fuels that help the State of California to lessen the dependence on fossil fuels. Each of these activities, and several others, is discussed in the Report.

The background photo is an eastbound Bay Area Rapid Transit (BART) train traveling through the lush, scenic area of State Route 24 at the Orinda Station. The train travels in the median of this designated *California Scenic Highway*.

## ***Credits***

This status report is a compilation of material from eight Department divisions. The contributors provided the technical details that fulfill the legislative requirements of the California Government Code. The contributing divisions are: Right of Way and Land Surveys, Environmental Analysis, Budgets, Local Assistance, Aeronautics, Research and Innovation, Business, Facilities and Security and Equipment. Since 1999, the Report has been compiled, edited and produced by W. Don Farrimond in the Division of Transportation Planning, Legislative Consultant Desk.

Appreciation is also extended to Steve Brooks in the Division of External Affairs/Public Affairs for the photography and the arrangement of the cover design.

## ***Finis***

The Biennial Report, initiated by the California State Legislature in 1965, has come to the end of its course with this eleventh edition. Status information required by Government Code in this report is presently covered in multiple media forms. In a streamlining effort, the passage of SB 71 has eliminated future editions of this report and it will pass into archival history at the close of business on December 31, 2012. Current and previous copies of this report are available through the Department Library and the 139 "*complete depository libraries*" throughout the state at this website: <http://dot.ca.gov/reports-legislature.htm>

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## *Preface*

Government Code section 14051 requires the California Department of Transportation (Department) to prepare and submit a report to the California State Legislature (Legislature) at the beginning of each regular session. Following publication of the Fourth Biennial Report in January 1991, the Legislature passed two bills suspending the report as a cost-cutting measure. In Fiscal Year (FY) 1999–00, the Assembly Transportation Committee introduced Assembly Bill (AB) 2908 which proposed the elimination of the Biennial Report; however, the bill failed passage and the requirement for the preparation of this report was reinstated with the publication of the 2001 Biennial Report.

Additionally, in 2004 AB 79 (Dutra) was enacted into law (Chapter 409 Statutes of 2004). This measure suspends certain reports to the Legislature until January 1, 2008. However, this measure specifically requires the continued preparation of the Biennial Report.

Accordingly, as required by law, this status report covers specific areas of the Department's program activities as follows:

- Excess real property disposal
- Freeway noise abatement in schools
- State assent to federal statutes, rules, and regulations
- Significant air transportation issues
- Alternative technologies in transportation
- Alternatives to fossil fuels

In addition, a brief summary on non-motorized transportation has also been included, although the requirement for this report was repealed several years ago. For more information on these and other activities, the reader is referred to the Department's publication entitled "The California Department of Transportation Journal." Available at <http://www.dot.ca.gov/ctjournal>.

## ***Government Code Section 14051***

- (a) At the commencement of each regular session of the Legislature, the Department shall submit to the Legislature a report summarizing information required under, and programs authorized by, Sections 118.6, 216, and 820 Article 3.5 (commencing with Section 156) of Chapter 1 of Division 1 of the Streets and Highways Code.
- (b) Information on other program activities may be included in the biennial report at the discretion of the department.
- (c) The report required by this section shall also include all of the following:
  - (1) An evaluation of significant air transportation issues anticipated to be of public concern during the five-year period commencing January 1 of the year preceding the date for submission of the report and beyond.
  - (2) Recommended modification to state and federal law, where appropriate.
  - (3) An overview of necessary future investments in the development and maintenance of the state's air transportation system.
  - (4) An analysis of the department's organizational and staff needs relative to its air transportation responsibilities.
  - (5) A review of state aeronautics policy.

In preparing the portion of the report required by this subdivision, the Department shall fully consider and incorporate air transportation needs as identified by local government and the private sector, as well as the need to fully integrate air transportation issues and concerns into the mission of the department.

- (d) The report required by this section shall also include all of the following:
  - (1) The status of alternative technologies in transportation, including, but not limited to, the efforts made in research development. The alternative technologies reported on shall seek to improve public safety, energy efficiency, and air quality.
  - (2) Alternatives to fossil fuels to power transportation devices, including alternative methods of propulsion of motor vehicles.



## *Executive Summary*

This is the Eleventh Biennial Report to the Legislature under the provisions of Government Code section 14051. The Government Code has very specific reporting requirements covering the Department's activities. This report is organized into seven sections summarizing the information required by statute. The required items, as well as the non-motorized transportation, listed in the same order as the language used in the Government Code, are summarized below:

### **Excess Real Property Disposal (Streets and Highways Code section 118.6)**

Streets and Highways Code section 118.6 requires the Department to sell or exchange real property determined to be excess. As of June 30, 2012, the Department's inventory of excess lands contained 1,459 parcels, with 325 available for sale. For the fiscal year ending June 30, 2012, excess lands sales, totaling 192 parcels, have produced \$5,897,660 in revenues. The value of these parcels at acquisition was \$2,432,397, thus netting \$ \$3,465,263.

### **Freeway Noise Abatement in Schools (Streets and Highways Code section 216)**

The Streets and Highways Code requires the Department to abate freeway traffic and construction noise that may affect school classroom learning environments. This program is limited to interior noise levels in classrooms only. Sound walls are for outdoor areas and comply with federal codes and use federal funds. In the Fourth Biennial Report (1991), the Department reported abatement measures had been completed for 116 schools. As reported in the Sixth Biennial Report (2003), this number has now risen to 122 schools and is substantially complete. However, this program is still active adding one additional school in the last two fiscal years bringing the total to 123 schools. Additional schools may qualify as traffic, and subsequently noise, increase.

### **State Assent to Federal Statutes, Rules and Regulations (Streets and Highways Code section 820)**

The State of California assents to federal statutes, rules, and regulations. Streets and Highways Code section 820 deals with the conflicts between State and federal law in cooperative highway work with funds apportioned by the federal government. The report explains how these conflicts have been resolved. Only one issue has been identified. California is not in compliance with federal law regarding driving under the influence. As a result, since the federal fiscal year (FFY) 2001, \$572 million of the federal highway funds have been transferred to the California Office of Traffic Safety (OTS). Of the \$572 million, approximately half has come to the Department for safety improvement projects.

### **Non-motorized Transportation (Streets and Highways Code section 156.7)**

The reader is directed to the "*Non-Motorized Transportation Facilities Report*," an annual report to the Legislature required by the Streets and Highways Code section 887.4. The report is available from the Bicycle Facilities Unit in the Department's Division of Local Assistance.

**Significant Air Transportation Issues (Aviation) (Government Code section 14051(c) (1)-(5))**

The California Department of Transportation's Division of Aeronautics (Aeronautics) is primarily involved with the General Aviation component of air transportation. The statutory goal for Aeronautics is to foster and promote the development of a safe, efficient, dependable, and environmentally compatible air transportation system. The State Aeronautics Act, Public Utilities Code, section 21001 et seq., is the foundation for the State's aviation policies. In February of 2012, Congress passed, and President Obama signed, the Federal Aviation Administration (FAA) Modernization and Reform Act of 2012, replacing the previous Vision 100-Century of Aviation Reauthorization Act of 2003. The Act provides a four-year, \$63 billion authorization package for the FAA and provides funding for the FAA's Airport Improvement Program (AIP). At \$3.35 billion per year, AIP funding will be slightly lower than recent years. During FY 2011-12, Aeronautics staff worked with the Transportation Research Board's Airport Cooperative Research Program and the Division of Research, Innovation and System Information (DRISI) on aviation safety issues. Another completed safety study was the FAA-sponsored \$600,000 Airport Pavement Management Survey of 85 GA airports in the State. Aeronautics secured over \$3.0 million in federal grants to promote aviation safety for California's air transportation system of public-use airports.

**Alternative Technologies (Government Code section 14051(d) (1))**

This section provides a status report on the development of alternative technologies in transportation. The Department's vision includes increased use of technology. Intelligent Transportation Systems (ITS) offer potential towards improving the efficiency of mobility. ITS can provide information that will enable better planning and operation of the transportation system and must be researched and deployed wherever possible. Not only will the use of technology improve mobility, but it can also lead to new and innovative partnerships with private industry and the academic community, leading to economic growth in the private sector while also creating economic gains through improvements in transportation. The technology improvements included in this report are for projects that seek to improve mobility, public safety, energy efficiency, and air quality.

**Alternatives to Fossil Fuels (Government Code section 14051(d) (2))**

The Department is active in innovative research and demonstration projects involving alternative fuels. Most departmental energy conservation goals should be attainable by 2015 as authorized by the issuance of Executive Orders S-12-04, S-03-05, S-06-06 and B-18-12, increasing the outreach of energy and environmental programs. The Department uses E85 (85 percent ethanol and 15 percent unleaded gasoline) capable vehicles and operates fueling sites at strategic locations in the state. The Department also operates Compressed Natural Gas (CNG) fueled sweepers and heavy duty trucks in areas where fuel is available. The results of a recent study of biodiesel with the University of California, Riverside have been utilized to implement biodiesel in its bulk fuel sites, albeit, a lower blend (B5: 5 percent biodiesel-95 percent diesel). Approximately 90 percent of the Department's bulk fuel sites are dispensing B5 biodiesel.

## EXCESS REAL PROPERTY DISPOSAL<sup>1</sup>

Section 118.6 of the Streets and Highways Code requires the Department, to the greatest extent possible, to sell or exchange real property within a year from the date the Department determines it to be excess. Excess land is property no longer needed for highway or other public purposes. It may be created by purchase, design change, route rescission, abandonment of maintenance or material sites, or decertification. Current Department policy requires the disposal of excess real property consistent with the intent of the law and good business practices.

As of June 30, 2012, the Department's inventory of excess land contained 1,459 parcels, with 325 available for sale. For the fiscal year ending June 30, 2012, excess land sales, totaling 192 parcels, have produced \$5,897,660 in revenue. The value of these parcels at acquisition was \$2,432,397, thus netting \$ 3,465,263. The following chart depicts excess land sales approved by the California Transportation Commission or by the Department and removed from inventory during FY 2011-12.

Excess Land Sales—FY 2011-12

District	Total Parcels	Value at Acquisition	Sale Price
1	1	\$0	\$250
2	2	\$1	\$64,701
3	51	\$0	\$739,886
4	47	\$381,198	\$2,280,187
5	21	\$47,500	\$268,136
6	10	\$0	\$1,500
7	16	\$1,239,418	\$1,297,100
8	10	\$1	\$188,700
9	0	\$0	\$0
10	4	\$0	\$13,600
11	28	\$764,279	\$1,043,600
12	2	\$0	\$0
	192	\$2,432,397	\$5,897,660

The column "Value at Acquisition" in the chart above represents the value of parcels when they are acquired by the Department as separate parcels, usually a remnant of a much larger piece of property. Some of those remnants are of such size or shape as to have little or no value at the time of acquisition. Also, some parcels of excess land may have been held for decades and the values may have appreciated significantly by the time the remaining portions are sold.

<sup>1</sup> For further information on this subject, please contact the Department's Division of Right of Way.

## **FREEWAY NOISE ABATEMENT IN SCHOOLS<sup>2</sup>**

Streets and Highways Code section 216 requires the Department to abate freeway traffic and construction noise within school classrooms under certain circumstances. This statute is intended to provide classroom-learning environments that are free of excessive freeway traffic noise or freeway construction noise. Classrooms at public or private elementary or secondary schools are generally eligible for noise abatement measures when freeway traffic or construction noise levels exceed a one-hour Leq (level equal) of 52 dBA (decibels over an A scale of measurement). Leq is the equivalent steady-state sound that represents an average of the sound energy occurring over a specified period. The abbreviation dBA is used to describe the method that measures sound similar to the way the human hearing system responds.

To be eligible for freeway noise abatement, classrooms, libraries, multipurpose rooms, or other spaces used for pupil personnel services, must be used for the purpose for which they were constructed and must have been built either:

- Prior to the award of the initial construction contract for the freeway route and prior to January 1, 1974.
- Subsequent to the construction of the freeway route but prior to any alteration or expansion of the freeway, this results in a significant and perceptible increase in ambient noise levels in the rooms or spaces.

If the construction of the freeway would cause hourly noise levels within the classroom to exceed 52 dBA Leq, then temporary or permanent noise abatement measures must be in-place prior to that construction, or as soon as practicable thereafter. The abatement must reduce the traffic or construction noise to below 52 dBA Leq hourly level. However, if pre-construction noise levels, including non-freeway noise sources, exceed 52 dBA Leq, then abated noise levels must be reduced only to the pre-construction level. Allowable abatement measures include, but are not limited to, installing acoustical material, replacing or eliminating windows, installing air conditioning, or constructing sound-baffling structures.

In the 2003 Biennial Report, the Department reported that noise abatement measures had been completed at 122 schools at a cost of \$23,548,000. Statewide, the program has been substantially complete since the late 1980s with only one additional project funded within the last two fiscal years. This brings the current total to 123 schools at a cost of \$24,548,000. As traffic increases on State freeways, resulting in higher noise levels in the future, additional schools might qualify for noise abatement under this program.

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<sup>2</sup> For further information on this subject, please contact the Department's Division of Environmental Analysis.

## STATE ASSENT TO FEDERAL STATUTES, RULES, AND REGULATIONS<sup>3</sup>

Section 164 of Title 23, United States Code (USC), requires a state to have, and enforce, a repeat intoxicated drivers law that: (1) suspends the driver's license for the second and future convictions, (2) impounds or disables all vehicles registered to the offender or places interlock devices on the vehicles, (3) requires mandatory jail time and/or community service, and (4) also requires evaluation for severity of alcohol abuse. Without compliance, beginning with the FFY 2000 1.5 percent of the Federal Interstate Maintenance, National Highway System and Surface Transportation Program funds are transferred to the OTS increasing to 3 percent per year in FFY 2003 and beyond.

The State of California does not conform to federal law. Federal law requires a mandatory one-year license suspension for the second offense, while California law allows discretion for the second offense such as allowing the driver to maintain a restricted license for employment purposes, and a mandatory three-year suspension for the third conviction. The federal law also requires either the impoundment of all vehicles registered to the offender or an ignition interlock system be placed on the vehicles. California law only impounds the vehicle used during the offense and provides discretion, under certain circumstances, to waive impoundment. The Federal Highway Administration (FHWA) has notified the State of California that it is not in compliance with Section 164 of Title 23, USC. As a result, since 2001, \$572.3 million in federal highway funds have been transferred from Caltrans to the Office of Traffic Safety to address specified safety goals. The majority of the funding is used by the OTS for programs intended to curb driving by intoxicated persons. However, a portion of these funds is allocated back to Caltrans for collision severity reduction projects, including upgrades of guardrails, median barriers, and crash cushions to current federal standards.

Currently, there are only two ways California can avoid being penalized for non-compliance. Either federal law has to be changed to allow states to meet the intent of the law, or state law needs to be changed to meet the letter of federal law. While Section 164 requires federal funds to be transferred to the OTS for activities meant to curb driving by intoxicated persons, it does allow these transferred funds to be used for the Department's Highway Safety Improvement Program projects under Section 148 of Title 23 USC.

The following amounts were transferred to the OTS in the FFY indicated; \$22.4 million was transferred in FFY 2001; \$27.3 million in FFY 2002; \$45.6 million in FFY 2003; \$60.0 million in FFY 2004; \$56.2 million in FFY 2005; \$51.1 million in FFY 2006; \$54.6 million in FFY 2007; \$57.8 million in FFY 2008; \$58.2 million in FFY 2009; \$8.2 million in FFY 2010; \$67.6 million in FFY2011 and \$63.3 million in FFY2012. These transfers total \$572.3 million.

<sup>3</sup> For further information on this subject, please contact the Department's Division of Budgets.

## NON-MOTORIZED TRANSPORTATION<sup>4</sup>

This section has been included in previous editions of the Biennial Report, although the law requiring this section was repealed in 1993. The reader is therefore directed to "*The Non-motorized Transportation Facilities Report*," an annual report to the legislature authorized by the Streets and Highways Code, section 887.4.

Since the preparation of the Tenth Biennial Report, the Department has been engaged in the implementation of and updates to the Strategic Highway Safety Plan (SHSP). The SHSP includes 17 specific challenge areas for improving transportation safety. Non-motorized transportation is addressed specifically in two challenge areas focused on improving the safety of walking and bicycling. The SHSP also includes other areas that affect these modes such as work-zone safety, improving intersection and interchange safety for roadway users, and making walking and street crossing safer. Each challenge area developed initial strategies and action items for improving safety in its area of emphasis. As of July, 2012, 149 separate action items had been completed.

The Department administers a number of funding programs that benefit non-motorized travelers, such as the Bicycle Transportation Account, State and federally funded programs for improving safety on routes to school, Transportation Enhancement activities, and the Environmental Enhancement and Mitigation program.

The Department coordinates and attends meetings of the California Bicycle Advisory Committee, the Active Transportation and Livable Communities Working Group, the California Blueprint for Bicycling and Walking Implementation Steering Committee, the California Pedestrian Advisory Committee, the Complete Streets Technical Advisory Committee, and the Main Streets-Flexibility in Planning, Design and Operations Committee.

The Department has also completed a revision to Deputy Directive 64 which addresses policy concerning non-motorized accommodations on State highways. The revision focused on incorporating Complete Streets concepts into the directive.

The Department also participates in the Million Mile Month and Bike to Work campaigns.

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<sup>4</sup> For further information on this subject, please contact the Department's Division of Local Assistance.

## **SIGNIFICANT AIR TRANSPORTATION ISSUES<sup>5</sup>**

The Department's mission in aviation is to foster and promote the development of a safe, efficient, dependable, and environmentally compatible air transportation system. The State Aeronautics Act, Public Utilities Code, section 21001, et seq., is the foundation for the Department's aviation policies and regulations.

The goal of the Division of Aeronautics (Aeronautics) is to annually inspect each of the 246 public-use airports and 156 hospital heliports. In addition, there are approximately 65 special-use airports and 345 special-use heliports and seaplane bases that have State operating permits. Aeronautics also makes recommendations regarding the safety of proposed school and State building sites within two miles of an airport runway and authorizes helicopter landings and departures on or near schools (K-12). Aviation system planning and environmental staff review proposed land uses at airports and their adjoining communities, and comment on their possible impacts to the public and airport operations. Aeronautics also administers the State Airport Noise Regulations for designated California airports and provides technical expertise for projects requiring compliance with the California Environmental Quality Act. Grants and loans are also provided to cities, counties, airport districts, and airport land use commissions for airport development, maintenance, and planning purposes.

The California Aviation System Plan serves as a resource guide and business plan for the Aeronautics. In developing this document, the following principles were used: continuously improving system safety at the airport level for users and workers, improving general aviation throughput, maintaining, expanding airport and system capabilities, improving delivery of products and services, promoting compatible land uses around airports, and preserving previous system investments. Aeronautics continues to participate in national-level research projects through the Transportation Research Board's Airport Cooperative Research Program and has worked with the Department's DRISI on various aviation related research projects.

### **Land Use and Planning Around Airports**

The aviation system in California is a vital economic resource and must be preserved, maintained, and developed for future generations. Many airports that were once located in fairly remote areas see encroachment due to incompatible land use as the greatest threat to enhancing airport capability and safety.

Regional Transportation Planning Agencies (RTPAs) work with airport owners and Aeronautics to develop a Regional Transportation Plan (RTP) that ensures aviation elements are included in the plan. The RTP is the mechanism that facilitates coordination of all transportation-related planning within a region. An RTP outlines regional goals and transportation improvements to be implemented in a region over the next 20 years. Some Metropolitan Planning Organizations (MPOs) develop a Regional Aviation System Plan within their RTPs. It is critical that airport land use decisions be based on health and safety concerns and realistic forecasts for airport growth.

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<sup>5</sup> For further information on this subject, please contact the Department's Division of Aeronautics.

The Division prepares the California Airport Land Use Planning Handbook. This Handbook provides critical land use planning guidance around airports. The Handbook is used by MPOs, RTPAs, and Airport Land Use Commissions statewide as they develop airport compatibility plans and RTPs. The Division released an updated version of the Handbook in October 2011. The Division also hosted the inaugural Aviation Planning Workshop in September 2012 that contained modules highlighting key elements within the State Aeronautics Act and airport land use compatibility planning. The Workshop was attended by the Department and Airport Land Use Commission staff and commissioners. The Workshop will be offered annually to help foster better land use decisions around airports and a better understanding of the State Aeronautics Act.

### **State Aeronautics Account Funding**

The State Aeronautics Account is the funding source for the Division of Aeronautics and the programs it administers. The Aeronautics Account revenue sources include a \$0.18 per gallon fuel excise tax on general aviation gasoline (Avgas) and a \$0.02 per gallon excise tax on general aviation jet fuel. Air carrier, military aircraft, and aviation manufacturing are exempt from the \$0.02 per gallon excise tax on jet fuel. In FY 2011–12, Avgas revenues of \$3.1 million and jet fuel revenues of \$2.5 million were transferred into the State Aeronautics Account.

Over the past ten years, the California Department of Finance has transferred aviation fuel tax revenues from the Aeronautics Account to the General Fund on three separate occasions: \$6.0 million in FY 2002–03, \$4.8 million in FY 2003–04, and \$4.0 million in FY 2010–11. There are no provisions in law to require repayment of these transfers. These mandated fund transfers from the Aeronautics Account, combined with decreased revenues, restrain the ability of the Department to accomplish its mission to foster and promote aviation safety and protect the public's interest.

Due to a decrease of approximately 25 percent from historic revenue amounts used to fund the Aeronautics Account and the recent \$4.0 million transfer to the General Fund in FY 2010–11, all three grant programs administered by Aeronautics will be affected in the future.

### **Federal Reauthorization for Aviation**

After more than four years and 23 continuing resolutions, Congress passed and the President signed the (FAA)-Modernization and Reform Act of 2012. The Act provides funding for the FAA's (AIP). These funding revenues are extremely important for the overall preservation and enhancement of California's Public Use Airport System. Nationwide, the annual authorized AIP funding levels average around \$3.55 billion. California typically receives around eight to ten percent of the funds appropriated. The Act provides a four year, \$63 billion authorization package for the FAA, which includes \$13.4 billion in AIP funding. At \$3.35 billion per year, AIP funding will be slightly lower than recent years. With a stable four year program, airports will be able to program and utilize AIP funding in a more effective manner than in recent years under repeated continuing resolutions. The Act did not include any new aviation user fees or tax increases.



The State, in cooperation with local, regional, and federal agencies, should provide and identify the leadership and resources needed to develop the aviation system essential to our economy in the 21st Century. California must continually assess its role in aviation to ensure that California remains competitive in the global economy. The Department's role in aviation includes planning and assisting with the development of infrastructure capacity improvements and the maintenance of the airport system.

Despite occasional economic slumps and past terrorist activities, all facets of aviation, including commercial airline enplanements, business and recreational aviation, charters, and air cargo continue to see slow, overall growth. However, aviation fuel sales subject to State excise taxes have decreased in California during the past few years. This affects the Department's ability to fund airport infrastructure and safety related projects in the State. Our nation's airports and air traffic control systems face traffic levels by both general aviation and commercial airlines that often challenge their capacities. Some major airports in California face capacity constraints. Without continued FAA and State funding of investments of airport infrastructure improvements the system will experience costly delays, cancellations, constraints, consumer complaints, and economic loss.

General aviation investments should also be protected. General aviation has proven to be a powerful economic engine for community development as it makes transportation connections on a global scale. The number of general aviation aircraft has increased over time along with their technical sophistication that enhances safety and energy efficiency. Public-use general aviation airports also play an indispensable role in separating their operations from those of the fast and heavy commercial service airport operations. Commercial service and general aviation airports support each other by separating their vastly different types of operations.

### **Federal Grants Support Aviation Safety**

Aeronautics obtained federal grants to foster and promote aviation safety throughout the State of California during FY 2011–12. During this period, aeronautics completed or received funds from the FAA for the following projects:

- \$600,000 to conduct Airport Pavement Management Surveys at 85 GA airports.
- \$880,000 to conduct obstruction surveys at 10 GA airports for the purpose of installing state-of-the-art GPS based instrument approach that will save taxpayers over \$2,000,000 in installation of traditional equipment and associated maintenance costs.
- \$1,300,000 to conduct Wildlife Hazard Assessments at 15 GA airports to identify and mitigate wildlife attractants on and adjacent to the most heavily used GA airports in southern and northern California.
- \$350,000 to update the California Airport Lane Use Planning Handbook (as described in Item A).

Together, these projects are valued at more than \$3,000,000 and will directly contribute to providing a safer operational flying environment to the public using the State's air transportation system.

## ALTERNATIVE TECHNOLOGIES IN TRANSPORTATION<sup>6</sup>

The Division of Traffic Operations (DOTO) and the DRISI, in partnership with academia, the private sector, local, regional, state, and federal governmental entities, works to research, develop, test, demonstrate, evaluate and support the deployment of innovative technologies and methodologies in transportation. These combined efforts are focused on advanced technologies that enhance mobility, public safety, air quality and energy efficiency.

### Technology Deployments

The technology improvements included in this report are recent examples of technology deployments led by the DOTO.

1. **Transit Shoulder Pilot Project:** The San Diego Association of Governments (SANDAG) and the Department conducted a pilot project to evaluate the effectiveness of using the freeway shoulder for transit lanes when regular freeway lanes are congested. The pilot, conducted on State Route 52/Interstate 805 between Kearny Mesa and Nobel Drive, has proven successful for transit time reliability, safety, bus driver and passenger perceptions, freeway level-of-service/maintenance, and shoulder lane pavement structural sufficiency. Lessons were documented and further project(s) are being pursued.
2. **Roundabout Intersections: A Policy Project:** The Department will implement a traffic engineering policy revision during the first half of 2013 to increase the utilization of yield-controlled roundabouts in order to reduce collisions, congestion, traffic speeds and air quality impacts associated with major state highway intersections across the State. The policy will facilitate a change in investment decision-making by focusing on the performance and other benefits expected for different intersection control options (i.e., Traffic Signal, Yield and Stop controls). The DOTO is leading this policy initiative. The Division of Transportation Planning recently published a Roundabout Inventory of existing and planned roundabouts on the state highway system.
3. **Dynamic Lane Management (DLM) System on Pasadena Freeway in Los Angeles:** In 2009, the Department implemented an intelligent traffic safety and management improvement along the northbound 110 freeway approach to the Interstate 5 (I-5) connector ramp in order to alleviate a long-term operational bottleneck and source of collisions. The DLM system allows a transportation management center operator to change the use of an interior freeway lane in order to add a second exit lane to the I-5 connector during peak periods. This relatively minor operational improvement has reduced congestion and queuing from the connector by 75 percent during peak periods. Collisions have been reduced by 20 percent.

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<sup>6</sup> For further information on this subject, please contact the Department's Divisions of Traffic Operations for pilots and deployed technologies and Research and Innovation for long-term research.

The project and performance benefits were produced by the installation of custom-designed changeable message signs and pavement lights, but without any pavement widening.

4. Freeway to Freeway Connector Metering: In September 2012, the Department's District 6 in Fresno completed a freeway to freeway connector metering project at the northbound lanes of Highway 41 from eastbound and westbound Highway 180. Early results show a 5 percent increase in traffic flow and a 40 percent increase in traffic speed since activating the meter.
5. Traveler Information Systems: Several innovative computer systems within the Department have been implemented to improve the quality of traveler information available to the public, media, and other agencies. Quickmap was publicly launched on August 2012 on the Department's home webpage. Quickmap provides a visual of current road conditions to motorists, giving them the information needed to make choices and improve mobility. Quickmap makes traffic flow, camera images, electronic sign messages, incident, work zone and chain control information easily available for travelers. The Transportation Management Center Activity Log evolved road condition situation tracking to a standard statewide. This increases internal processes as well as external traveler information. The Department implemented the Lane Closure System II, a new computer system to more reliably track work zone closure locations and times on April 2012.
6. Congestion-Pricing via High Occupancy Toll Lanes: In September the first High Occupancy Toll lane opened in the Bay Area, allowing solo drivers to utilize extra capacity in the carpool lane. On southbound Interstate 680 between Highway 84 and Highway 237, solo drivers can pay a toll to the Sunol Joint Powers Authority to enter the carpool lanes, relieving traffic congestion. More projects are planned statewide, in conjunction with local transportation agencies, to utilize this Congestion-Pricing method to provide options for motorists.
7. Accessible Pedestrian Signals (APS): The Department deployed APS at all of its new and modified signalized intersections and signalized pedestrian crossings to enhance safety and mobility for visually impaired pedestrians. APS provides information in non-visual formats, such as audible tones, speech messages, and/or vibrating surfaces. APS improves pedestrian orientation to their travel direction and provides guidance, when crossing the signalized location, to visually impaired pedestrians.
8. Integrated Roadway Information System (IRIS): The Department is expanding the use of IRIS, currently running in Stockton, to three other districts in Redding, Eureka, and San Luis Obispo. In addition to centrally managing cameras, changeable messages signs, vehicle detection, and roadway weather information, IRIS equipped the Stockton district with automated fog and speed warning messages to motorists via message signs. The system was developed in the open source domain with the Minnesota Department of Transportation, the original developer of IRIS.

9. Bicycle Detection: The Department is studying microwave and thermal imaging technologies that can distinguish a bicycle from a car. If this can be done accurately, traffic signals can be timed only to extend the GREEN indication when a bicycle is present and will improve traffic flow while improving the safety of bicyclists using the roadways. Currently, a longer GREEN time accommodates both vehicles and bicycles.
10. Coordinate Arterial Traffic Signals with Ramp Meters: The Department will research the coordination between freeway ramp metering and arterial traffic signal control to see if improved coordination between the two systems can reduce congestion. The study is expected to be completed by December 2012.

Connected Corridors: Vehicles, Infrastructure, and People: Vehicles, infrastructure and people are increasingly interconnected. Sustainability, safety, and economic necessity require improving the use of existing roadways. Building our way out of congestion is no longer an option; we must coordinate our way to improved performance. Enabling and facilitating communication between all users and stakeholders is essential.

The Department is part of a new collaborative effort called the Connected Corridors Consortium in coordination with Partners for Advanced Transportation Technology at the University of California Berkeley. As envisioned, the consortium will consist of the Department, academic institutions, the federal government, regional and local agencies, municipalities, transit operators, and all kinds of private sector vendors. The effort is to develop and pilot a framework for future corridor traffic operations to increase mobility, safety, and reliability for all travelers in the most congested corridors in the State. The vision is to fundamentally change the way California manages its transportation challenges for years to come. The goals of the program are to bring together all of the corridor stakeholders to create an environment for mutual cooperation to include knowledge sharing, developing working pilots, overcoming barriers, solving key issues, and formulating a road map for the cost-effective implementation of future innovations. The pilot effort proposes to employ active traffic management to plan for and improve travel time reliability in the most congested corridors to minimize the effect of incidents and events, improve air quality and energy efficiency. State of the art decision support frameworks will be employed for transportation management center managers and operators.

## Mobility

1. **Integrated Corridor Management (ICM)**: is the coordination of individual network operations between parallel facilities to create an interconnected system capable of cross network travel management. ICM will help manage the whole system, thus improving mobility and energy efficiency. ICM will enable independent systems and their cross-network linkages to operate in a more coordinated and integrated manner, resulting in significantly improved operations across the corridor.

ICM involves operational, institutional, and technical integration in order to achieve integrated management of multimodal transportation systems along corridors in metropolitan areas. Its goal is to provide institutional guidance, operational capabilities, and ITS technical methods needed for effective ICM Systems.

- Operational integration may be viewed as the implementation of multi-agency transportation management strategies, often in real-time, that promote information sharing and cross-network coordination and operations among the various transportation networks in the corridor, and facilitate management of the total capacity and demand of the corridor.
- Institutional integration involves the coordination and collaboration between various agencies and jurisdictions (network owners) in support of ICM, including the distribution of specific operational responsibilities and the sharing of control functions in a manner that transcends institutional boundaries.
- Technical integration provides the means (e.g., communication links between agencies, system interfaces, and the associated standards) by which information and system operations and control functions can be effectively shared and distributed among networks and their respective transportation management systems, and by which the impacts of operational decisions can be immediately viewed and evaluated by the affected agencies.

SANDAG was the lead agency for a federal corridor demonstration project, in partnership with the Department, the city of San Diego, the city of Escondido, the city of Poway, the Metropolitan Transit System, and the North County Transit District. The Interstate 15 corridor was chosen by FHWA as a site for the demonstration of ICM strategies. SANDAG and its partnering agencies contributed \$2.2 million for a total of a \$10.9 million project. For more information please visit: [http://www.its.dot.gov/icms/pioneer\\_sdiego.htm](http://www.its.dot.gov/icms/pioneer_sdiego.htm)



research team continues to make efforts for functional upgrade of the software and its practical implementations.

3. Interactive Transit Station Information System (ITSIS): This project aims to develop and test an innovative Interactive Transit Station Information System that uses the Vehicle Infrastructure Integration California Test Bed (on the US 101 corridor near Palo Alto) and Connected Vehicle technologies. The ITSIS provides an improved level of service to passengers and supports future enhanced transit operations by:

- Enabling travelers to interact with transit systems on their current trip needs and plans in real time, resulting in better passenger information service to passengers,
- Providing better origin-destination data collection to transportation providers, to facilitate high quality operations and planning decisions.

The project objectives are to:

- Identify issues and gaps in existing communication systems
- Develop issue-resolving concepts and approaches for a Connected Vehicle-supported ITSIS,
- Perform proof of concept testing of selected ITSIS applications

4. Smart Travel Choices (STC) Through Delivery of Real-Time Information: Studies have shown that mode shift by commuters can potentially help relieve traffic congestion, reduce fuel consumption, lower emissions, as well as enable travelers to make the trip less stressful and more productive or pleasurable. Real-time multimodal travel information, when integrated and timely, may influence commuters' travel decisions.

The goal of STC is to encourage and enable travelers to make more educated decisions that may result in selecting alternative modes, of transportation or changing their time of commute in order to avoid congestion. The project is developing and implementing a software application for the Los Angeles region which uses both a website and smartphone application to provide travelers with real-time, multimodal traveler information. The website trip planner allows the traveler to plan and compare trips using any combination of driving and/or transit. Travelers can compare trips using different modes of travel based on travel time, cost and carbon footprint. Once the traveler plans their trip, it can be sent to their smartphone application that will provide the traveler with real-time updates on traffic incidents and transit arrival times.

This research project field test is being conducted by California Partners for Advanced Transportation and Technology (PATH) at U.C. Berkeley in partnership with the Department and the Los Angeles County Metropolitan Transportation Authority.

5. Transit Vehicle Assist and Automation (VAA): Bus Rapid Transit (BRT) provides high quality public transportation that offers options to personal vehicles, reduces greenhouse gas emissions, and promotes transit-oriented development. One of the main features of a BRT system is having dedicated bus lanes which operate separately from all other traffic

modes, therefore allowing buses to run at a very high level of reliability. However, this is the most costly component in a BRT system. Narrowing bus lanes by two feet could reduce the right-of-way cost, but raises safety concerns, which as a result, slows down the transit speed. VAA develops a transit bus lane guidance system that enables buses to run in narrow lanes at high speed and dock precisely at bus stations which will increase bus travel speeds and reduce dwell times providing rail-like services.

The VAA project is being conducted by California PATH at U.C. Berkeley in partnership with Lane Transit District in Eugene, Oregon and Alameda-Contra Costa Transit District on California Highway 92 in the San Francisco Bay Area.

### **Public Safety**

The Department is conducting research projects on improving public safety. These projects range from preventing collisions at intersections and railroad/highway crossings to removing snow more effectively. Examples include:

1. **Connected Vehicle Research Program:** The Connected Vehicle Research Program is a national USDOT-sponsored initiative led by the ITS Joint Program Office and composed of representatives from American Association of State Highway and Transportation Officials and the Vehicle Infrastructure Integration Consortium, a private non-profit organization consisting of the nine major auto manufacturers working together in a pre-competitive manner. Its goal is to determine the feasibility of using emerging wireless communications technologies in ways that will improve the safety and operational efficiency of our nation's transportation network. The envisioned outcome from this cooperative effort will be a new approach to transportation, whereby vehicle manufacturers and transportation agencies build systems that communicate with one another to:
  - Implement safety features that prevent vehicle crashes
  - Provide unprecedented levels of reliable traveler information
  - Give transportation managers full knowledge of the real-time operating conditions on the nation's roadway network

**Cooperative Transportation Systems (CTS) Pooled Fund Project:** The Department is participating in the CTS pooled fund project led by Virginia DOT. This project developed a Connected Vehicle Strategic Plan and a Connected Vehicle Deployment Analysis. The project is preparing to fund a new effort to provide details to support the Connected Vehicle Program. This includes what type of infrastructure to deploy, at what locations and costs related to capital installation, operation and maintenance.

**California Connected Vehicle Test Bed:** In 2005, the Department and the Metropolitan Transportation Commission built a Connected Vehicle Test Bed on State Route 82 near Palo Alto, California to gain real-world experience with the safety and mobility benefits of Connected Vehicle technology. Auto industry research laboratories have used this test bed to develop and test the on-board components of the Connected Vehicle program. The standards and architecture for the national program have changed and the installed



infrastructure needs to be updated. This test bed has been designated as one of the nationally recognized test beds, so federal funds will be used to update the roadside equipment. The Department will use the updated test bed to perform safety and mobility research to benefit transit operations.

2. **Mobile Work Zone Protection System (Balsi Beam):** Maintenance and construction crews working on the highway are usually protected by a shadow truck positioned at the beginning of the work zone and plastic traffic cones along the lane line. Errant vehicles can enter the work zone by driving over the cones thus injuring highway workers.

Through the efforts of the Division of Research and Innovation and the Division of Equipment, the Department has developed and patented a mobile work zone protection device known as the Balsi Beam. This device is a truck-mounted, expandable beam that provides work zone protection comparable to working behind guardrail, K-rail or a concrete barrier. It functions in a tractor-trailer combination, where the trailer (Balsi Beam) extends and transforms into a 30-foot-long work zone protector. The work zones utilizing the Balsi Beam experience reduced travel delays and traffic congestion since they are less intrusive to the traveling public than traditional work zone protection methods.

3. **Augmented Speed Enforcement (ASE):** The Department proposed an innovative safety program consistent with the objectives of the FHWA sponsored Rural Safety Innovation Program (RSIP) to reduce speed-related crashes with coordinated speed management systems in work zones. This project is a joint effort between the Department, the Western Transportation Institute at Montana State University and the Partners for Advanced Transportation technology (PATH) at University of California Berkeley. U.S. DOT funds the project through an annual \$1.5 million award to the Department.
4. The vision for this project is to integrate three components: education, engineering, and enforcement: to actively counter high crash rates related to speeding on rural highways. The California Highway Patrol (CHP) differentiates this system from Automated Speed Enforcement (ASE) that uses real time information about speed violators to support road enforcement actions. The core issue of this project will be to investigate whether the deployment of an aSE system will change driver behavior and reduce vehicle speeds in work zones. The system developed and lessons learned in this project could then be used to prepare for implementation in a speed safety program that targets all forms of speeding along rural highways. Field data collection was completed in July 2012 with the final report due in early 2013.
5. **COZEEP/MAZEPP Evaluation:** The Department has embarked on an effort to evaluate the Construction Zone Enhanced Enforcement Program (COZEPP) and the Maintenance Zone Enhanced Enforcement Program (MAZEPP) on statewide basis. This study will assess the current practices in using CHP officers in construction and maintenance work zones along with evaluating the operational and cost effectiveness of deploying the CHP officers to reduce the speed of vehicles traveling through the work zone. The research will examine the correlation between the deployment of CHP officers and any improvement in safety for workers and the traveling public in the work zone. In addition,

the study will investigate any relationship between the deployment of the CHP officers and the risk of accidents in the work zone.

Initial work began in August 2011 in the San Diego area. Additional field data collection is being conducted in several areas throughout California in both urban and rural locations.

6. Pothole Patching Equipment to Reduce Worker Exposure to Traffic: Repair of damaged pavement, such as spalling concrete or potholes, is an ongoing activity and typically performed with traffic in adjacent lanes. This exposure to traffic increases the potential for collisions and injuries involving highway workers. Reduced worker exposure can be achieved by changing procedures or utilizing automated equipment. After an extensive search of available technologies, a unique pothole patching truck was discovered that uses normal pavement materials (hot or cold asphalt concrete) and a compacting roller. This truck performs the entire operation with the operator in the cab; no workers are required on foot. The truck was acquired in the summer of 2009, and has gone through an extensive evaluation process. Currently, the machine is being field-tested with District 4 Maintenance crews.
  
7. Real-Time Global Positioning Satellite (GPS) Signals for Winter Maintenance Vehicles: Real-time (GPS) information is being evaluated to help keep Interstate routes open during heavy winter snow events. Snowplow truck drivers are hampered by long periods of low visibility due to snow conditions. Providing accurate location information to the drivers during heavy snow events provides a level of confidence that is otherwise not available. For example, a real-time GPS system could indicate how far the plow blade is from a guardrail or in what lane the plow truck is driving. It would also help locate turnouts or other landmarks that may be difficult to observe and assist workers new to the area.

## **Air Quality**

The Department is conducting air quality research studies to understand the air quality impacts of maintenance and operations, improve the quality of project-specific air quality analysis, and to develop appropriate mitigation measures. Examples are:

1. The Department is currently involved in a multi-phased study with the University of California, Riverside that addresses emissions from heavy-duty equipment. This project, to be completed in FY 2013–14, will include the development of a software tool to quantify emissions of the Department's construction practices, which is especially significant in those regions of the state currently designated as non-attainment or maintenance areas.
2. The Department is partnering with other states and the federal government in a pooled fund effort to study near-road highway pollutants. The Mobile Source Air Toxics project, to be completed in FY 2012–13, will refine the guidance for air toxins analysis required for state transportation projects, thereby providing the additional level of emissions testing necessary for environmental regulatory compliance.

3. The Department is developing processes to address Climate Change/Greenhouse Gas (GHG) Emission reductions as required by AB 32 legislation. Through the development of internal/external expert groups, the Department is developing a policy framework for research and evaluation of connections between mobility and climate change impacts, including adaptation/mitigation strategies. Further, the Department has been working with UC Berkeley to develop tools for planners and decision makers to focus on the changes needed to minimize carbon emissions.
  - Creation of the Climate Change Advisory Group has assisted the Department in developing a roadmap of research projects addressing GHG reductions as well as developing policies that will lead the Department to more focused efforts regarding AB 32 and SB 375 mandates.
  - A partnership between the Department and Netherlands Climate Change Research Collaboration included the sharing of research “roadmaps” and discussions of internal and associated government partners necessary for climate change evaluations and actions.
  - A project is currently underway which addresses the dynamics of interregional travel and GHG emission impacts. This project, partnering with the U. C. Berkeley and the Department’s Division of Transportation Planning, will fill an important research gap in the analysis of GHG emissions and the incorporation of these factors in the Department’s transportation planning processes.

### **Energy Efficiency**

The Department recognizes the significance of energy-efficient transportation systems and operations. Making the transportation sector more energy efficient with diverse energy infrastructure is an important step toward a cleaner environment and lower dependency on fossil fuels. The Department, California Environmental Protection Agency (Cal/EPA), California Air Resources Board, and California Energy Commission, along with a number of other agencies support the research and development of alternative fuels and vehicles.

Additionally, the Department works with other state, regional and local agencies to promote environmental sustainability and implements policies conducive to smart growth, livable communities and enhanced transit services, including car sharing and ridesharing. The Department is a member of the Governor’s Climate Action Team (CAT) headed by Cal/EPA and is committed to transportation strategies outlined in the CAT report to reduce transportation fuel consumption and GHG.

The Department, through the Governor’s Strategic Growth Plan and Traffic Congestion Relief program, seeks to reduce emissions by minimizing travel demand and congestion through improved highway operations, such as application of ITS, like traveler information, traffic control, electronic toll collection on bridges and ramp metering. The Department’s “Greening the Fleet” initiative uses viable, emerging technologies to reduce mobile source emissions. Solar panels have replaced fossil fuel powered accessories, such as message signs and lighting. These efforts will continue under the Department’s stewardship goals to preserve and enhance

California's resource and assets and comply with numerous air quality mandates that affect the Department's fleet.

The Department is conducting research projects on improving energy efficiency for both private vehicle owners and the public sector in order to decrease the amount of fuel consumed and lowering transportation costs. An added benefit of increasing energy efficiency is an improvement in air quality.

## **ALTERNATIVES TO FOSSIL FUELS<sup>7</sup>**

Since the mid-1970s, the Department has been a leader in reducing its rate of consumption of fossil fuels, while at the same time increasing the size and complexity of the State's transportation infrastructure. Finding alternative energy sources is an element of this effort. Photovoltaic and wind power generation, hydrogen fuel cell and biomass power generation opportunities are being identified and developed into potential projects. Areas where these alternative energy sources can be applied include:

- Communication relay stations
- Roadside emergency call boxes
- Off-grid facility power
- "Park and Ride" parking lot lighting
- Remote-site flashing amber warning beacons
- Bridge-mounted wind generation prototype development
- Portable, trailer mounted, changeable message signs and arrow-boards
- On-site power generation
- On-site hydrogen generation or storage for use in fuel-cell technologies

These types of projects are best applied after the conservation opportunities within the Department are implemented. As an integrated solution, non-fossil fueled power production, coupled with conservation measures, will help to reduce the need for fossil fueled energy in California.

The areas that have been identified for modification under current conservation efforts include:

- Turn off energy-consuming equipment when not in use, automatically or manually.
- Deploy the Computer Energy Reduction and Documentation (CERD), which came online in July 2010. The software manages, measures, and reduces energy (and associated carbon dioxide emissions) consumption on personal computer networks. The CERD system tracks the Department's computer usage and average energy used by each district.
- Replace less efficient equipment with the most energy-efficient-products, such as, the Department's current adoption of new roadway lighting performance standards for light emitting diode lighting technologies. This technology allows for automated control of lighting for roadways and exterior lighting devices so the systems only operate when the need is present.
- Size equipment to meet loads, and where possible, install equipment that can vary output to meet variable loading situations.
- Install responsive automated control systems for facility environmental system.
- Develop conservation action plans that treat each facility's energy system elements as one integrated, interrelated system.
- Continue employee awareness programs that promote conservation at the work place and at home.

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<sup>7</sup> For further information on this subject, please contact the Department's Division of Business, Facilities and Security.

- Coordinate with the California Department of Finance and other government agencies to develop and implement a standardized method of total life cycle cost analysis in all energy-related state decision-making.
- Analyze energy-related programs, hydrogen-economy infrastructure development, and other energy-related projects.
- Coordinate with the other state departments to develop sustainable design elements for State facilities. The Department has adopted the United States Green Building Council's Leadership in Energy and Environmental Design (LEED) Silver certification or higher mandate for new construction and facility rehabilitation along with other currently enforced codes.
- Implement over 70 solar electric projects through the 2006 Federal Clean Renewable Energy Bond program. It is anticipated all 70 projects will be completed and generating electricity by the end of 2012. The goal is for the 70 sites to generate over 2.4 megawatts of energy.
- Implement a vehicle idling policy to reduce fuel consumption in vehicles during inactive operation.

In FY 2006–07, the Department joined the California Climate Action Registry, and became a certified member in 2009 by having its energy baseline certified by a third party engineering firm. This includes benchmarking of all departmental energy usage and conservation activities past, present, and future. This also includes usage in facilities, roadway electrical systems, fleet, and equipment. Re-certifying is required every other year.

With the issuance of Executive Orders S-12-04, S-03-05, S-06-06, and B-18-12, the Department continues to work towards reaching energy conservation goals and support the state's renewable power statutes, "green power" electric grid demand, energy conservation, LEED, and climate change mandates. Most departmental energy conservation goals should be attainable by 2015.

### **Alternative-Fueled Vehicles Research**

The Department, along with a number of other governmental agencies and academia, has experimented with the development of non-gasoline and diesel powered vehicles. For the most part, these alternative fuel vehicles still require fossil fuel in some form as their energy source. Research is continuing into a non-fossil fuel powered transportation system including zero-pollution and electric vehicles. To be truly non-fossil fuel reliant, electricity used to charge electric vehicles must come from non-fossil fueled electric power plants. While it is currently possible to power a vehicle from non-fossil fuel sources, the short- and long-term fueling, servicing and maintenance infrastructures do not exist. Without the support infrastructure in place, the impact and use of the technology will remain limited. Profit incentives must be in place to support the development of this market place in the long run. The public sector must be an active partner with the private sector to develop this new industry and the support infrastructure.

For additional information please link to the Department's Energy Conservation Program Web site at: <http://www.dot.ca.gov/hq/energy/>.

## **Alternative Fuels and Petroleum Displacement<sup>8</sup>**

The Department has invested in a variety of alternative-fueled vehicles in its vehicle fleet. It is expected that usage of alternative-fueled vehicles that run on E85 (85 percent ethanol and 15 percent unleaded gasoline), CNG, propane, or biodiesel result in a quantitative reduction in carbon emissions, better fuel economy, and general support for energy independence. However, it has been difficult to determine how much these vehicles are actually using alternative fuels, especially where they have bi-fuel capability. While a general understanding of fuel consumption can be gained through fuel sales data, those performance indicators are somewhat limited.

1. The Department's DRISI, in partnership with the Division of Equipment and the U. C. Riverside, College of Engineering—Center for Environmental Research and Technology, initiated a pilot project to monitor and track the use of Ethanol (E85) in the Department's Flexi Fuel fleet (vehicles that can alternatively run on different fuels). A prototype system was designed, developed, and deployed in ten instrumented vehicles. Five of these vehicles were deployed in the Department's District 3 and five in District 11. The system server is located at U. C. Riverside and can be accessed by authorized personnel 24 hours a day via the Internet. After developing the on-board hardware and system server, the hardware was placed in the vehicles and the pilot study was conducted over six months.

Based on the performance of the system, the study is being expanded to include enhancements to the overall system architecture, the development of universal protocols, and a larger scale deployment. The Department currently operates more than 650 flexible fuel (E85) vehicles. The system will collect data on fuel usage (percent of E85 being burned), along with information on the locations where the vehicle is refueled. The Department operates 12 E85 fueling sites located throughout the state, with six more sites being considered. Location of E85 vehicles are clustered around the fuel sites to maximize E85 fuel use.

This GPS-based system will allow supervisors and managers to monitor fuel usage in ensuring that the vehicles are operated on E85 to the extent feasible and available. This research is also expected to result in development of a plan to implement the system throughout the Department's flexible fuel vehicle fleet. It is anticipated that there will be sufficient refueling stations throughout California to maximize and enhance E85 usage during the time frame of the study.

The Department has also completed a biodiesel pilot program with the U. C. Riverside. Over 10,000 gallons of B20 biodiesel fuel (20 percent biodiesel-80 percent diesel fuel) were used during the study. The Department has utilized the experience from this study to implement biodiesel in its bulk fuel sites. Approximately 90 percent of the Department's bulk fuel sites are dispensing biodiesel fuel.

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<sup>8</sup> For further information on this subject, please contact the Department's Division of Equipment.

Also, the Department operates CNG fueled sweepers and heavy duty trucks primarily in the South Coast Air Quality Management District. These efforts will promote the state's emissions and petroleum reduction goals.

Alternative Fuel Fleet Monitoring System: DRISI, in partnership with the Division of Equipment, is working on a telemetry research project to measure fuel consumption rates for various vehicle types in order to develop a means to conserve the amount of fuel used by its maintenance fleet. Quantifying fuel used while engaged in a job versus traveling to the job site will provide opportunities for gaining tax credits for fuel consumed during off-road activities by licensed on-road vehicles. Also, quantifying fuel used while idling and while powering auxiliary work systems of stationary vehicles could result in the efficient use of idle shut down systems.

2. An additional partnership has been developed between U. C. Davis, a private industry equipment manufacturer, and the Department to install hardware in a pilot group of 30 vehicles that includes a microprocessor-based data collection device. The product provides real-time location information via GPS, as well as engine operating parameters, including real time fuel consumption, through an interface with the vehicle manufacturer's database. Activation and deactivation of auxiliary work systems are monitored through custom hardware interfaces. All information is sent to a database via integrated wireless cellular communications, making it available for analysis by the researchers and practitioners involved in the project. Pending a presentation of findings to Division of Equipment management, more units may be installed in fleet vehicles, and the information they provide could be used by fleet managers.

### **Alternative Fuels and Vehicle Technologies Market**

The extent of market penetration and marketing success of alternative fuels and vehicle technologies will, in large part, depend on a statewide service and maintenance infrastructure. There are approximately 400 public charging stations in California for electric vehicles and many private businesses are also providing charging facilities for their employees and customers. A systematic expansion of a support infrastructure for alternative vehicles is necessary for zero emission vehicles and partial zero emission vehicles to gain support.

The commercial market for alternative fuels and vehicle technologies (i.e., hybrid) is improving and will have a more sustainable and important role in California's transportation market. Changes in transportation energy markets will have a wide range of system implications and require continued research and evaluation. As an example, transportation financing is directly impacted by the transportation fuel tax structure. It may be necessary to modify the fuel tax structure to reflect institutional and market changes in the future.

In 2009, Green Technology, a nonprofit initiative designed to help government efforts toward sustainability, honored the Department with its 2009 Green California Leadership Award for developing an alternative fuel project to reduce greenhouse gas emissions in Department operations. The project maximizes the Department's use of alternative fuels, increases the number of flex-fuel and green vehicles in the fleet, and reduces overall fuel consumption through conservation practices.



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