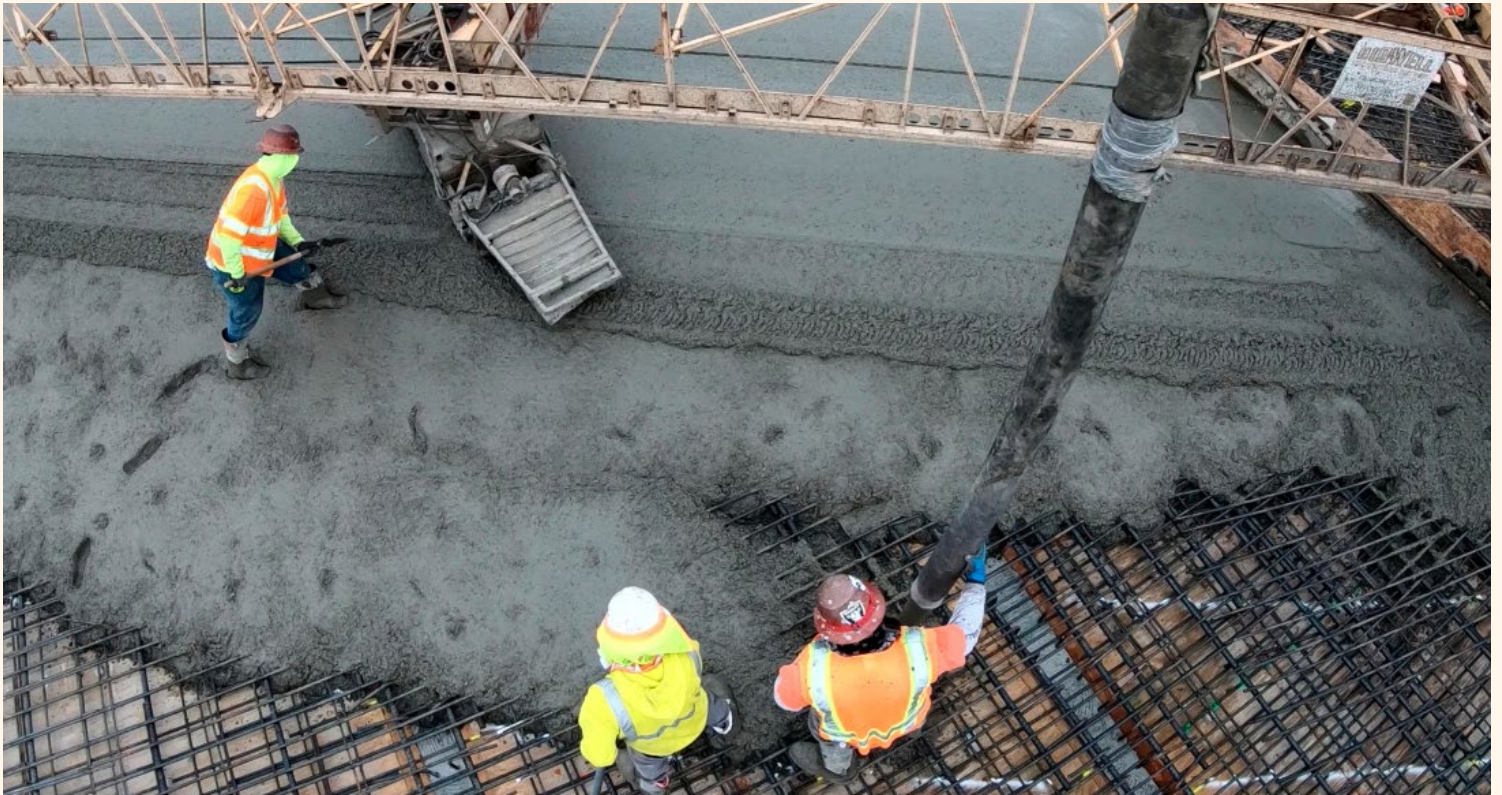




CALTRANS EFFICIENCIES REPORT 2020-21





EXECUTIVE SUMMARY

Senate Bill 1 (SB) 1 (Beall, Chapter 5, Statutes of 2017), also known as the Road Repair and Accountability Act of 2017, increases funding for California's transportation network by an average of \$5.4 billion annually, and specifies that the California Department of Transportation (Caltrans) implement efficiency measures with the goal of generating at least \$100 million in annual savings to be reinvested into the maintenance and rehabilitation of the state highway system. The legislation requires that Caltrans report efficiency savings to the California Transportation Commission annually.

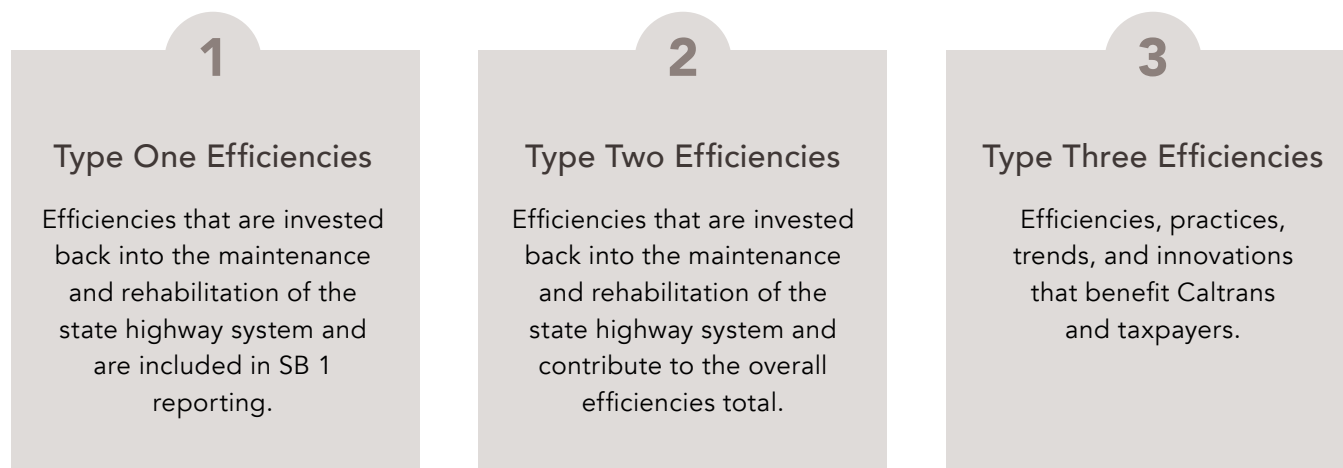
Efficiency Definition: Caltrans will consider efficiencies that result in cost avoidance or a reduction in support or capital costs.

The initial Caltrans Efficiencies Report for fiscal year 2017-18, focused only on efficiencies that met the criteria for the SB 1 goal, which requires reinvestment into the state highway system. The report identified \$133 million in efficiencies. The second annual report for fiscal year 2018-19 also focused solely on efficiencies that applied to the SB 1 goal and identified \$233 million in efficiencies.

Beginning with fiscal year 2019-20, Caltrans went beyond the SB 1 requirement to track and report on all efficiencies. In fiscal year 2019-20, Caltrans identified \$340 million in total efficiencies, of which \$195 million is included in SB 1 reporting.

For fiscal year 2020-21, Caltrans reports \$386.7 million in total efficiencies, of which \$177.3 million is included in SB 1 reporting.

Fiscal year 2020-21 efficiencies are categorized in three types:



TYPE ONE	COST SAVINGS OR AVOIDANCE	NUMBER OF EFFICIENCIES
New	\$51,302,000	4
Ongoing	\$126,039,000	12
Total	\$177,341,000	16

TYPE TWO	COST SAVINGS OR AVOIDANCE	NUMBER OF EFFICIENCIES
New	\$35,224,000	3
Ongoing	\$174,146,000	5
Total	\$209,370,000	8
Type One & Two Total	\$386,711,000	24

TYPE THREE	COST SAVINGS OR AVOIDANCE	NUMBER OF EFFICIENCIES
New	These efficiencies may be legacy practices, difficult to quantify, or are not invested in the rehabilitation of the state highway system.	4
Ongoing		6
Total		10

TYPE ONE EFFICIENCIES	COST SAVINGS OR AVOIDANCE
Municipal Coordination Grant Program  	\$50,864,000
Cost Avoidance through Open-Graded Friction Course (OGFC) 	\$50,160,000
High Reflective Materials for Striping   	\$34,000,000
Value Engineering Change Proposals 	\$18,514,000
Highway Lighting LED Retrofit  	\$6,800,000
Automated Machine Guidance  	\$6,000,000
Value Analysis 	\$3,140,000
Mobile Field Devices  	\$2,580,000
Independent Assurance Program 	\$1,802,000
Global Positioning Satellites  	\$1,763,000
Unmanned Aircraft Systems   	\$710,000
X-Ray Fluorescence Technology   	\$477,000
Repurposed Changeable Message Signs  	\$300,000
State Office of Historic Preservation Electronic Form Submittal  	\$116,000
Advance Mitigation Credits  	\$93,000
Cost Estimates Toolbar 	\$22,000
Total Type One Efficiencies	\$177,341,000

TYPE TWO EFFICIENCIES	COST SAVINGS OR AVOIDANCE
Construction Manager/General Contractor 	\$59,600,000
Value Analysis 	\$50,205,000
Streamlining Environmental Review – NEPA 	\$49,200,000
Partnering  	\$31,600,000
Reclaimed Asphalt Pavement 	\$8,296,000
Partial Depth Recycling (Cold in-place Recycling) 	\$6,845,000
Smart Water Controllers   	\$3,600,000
Electronic Plans & Quantities Submittal  	\$24,000
Total Type Two Efficiencies	\$209,370,000

Definitions:

-  New efficiency for FY 2020-21
-  Positively impacts the environment
-  Saves time or future delays
-  Positively impacts safety

While all efficiencies for fiscal year 2020-21 are listed in this report, Caltrans highlights two efficiencies below. These two efficiencies contribute more than \$84 million in cost savings or avoidance through partnerships and innovation.

Project Highlight 1: ★ 🌿 Municipal Coordination Grant Program



The Caltrans Statewide Stormwater Permit requires Caltrans to control, prevent, remove, or reduce pollution resulting from stormwater discharges to impaired waterbodies through construction of treatment devices. Caltrans' Stormwater Program receives one compliance unit credit for treatment of stormwater runoff from one acre of its right of way through treatment devices built on the state highway system (on-system), or investing \$88,000 of local grant funding provided to municipal partners

toward the successful delivery of off-system regional stormwater treatment projects. The off-system project investments are cost-effective when compared to on-system investments in treatment devices that are constrained by the limited right of way and the need to ensure safety for the users of the highway system. Since 2019, Caltrans has received 578 compliance units from the State Water Resources Control Board, resulting in more than \$50 million in cost avoidance.

Project Highlight 2: 🕒 🌿 ⚠️ High Reflective Materials for Striping



Caltrans has historically used 4-inch-wide painted stripes to delineate both edge and lane lines on the state highway system. More recently, Caltrans began deploying 6-inch-wide striping that uses more durable thermoplastic and tape.

Both thermoplastic and tape materials are embedded with glass beads to enhance reflectivity for better visibility at night and during inclement weather. The new materials are also more durable, lasting up to 6 years, compared to 1 year with painted stripes.

The more durable striping reduces the need for ongoing annual maintenance and frequent replacement, lowering both labor and material costs. Since fiscal year 2017-18, the new striping has saved more than \$113 million.

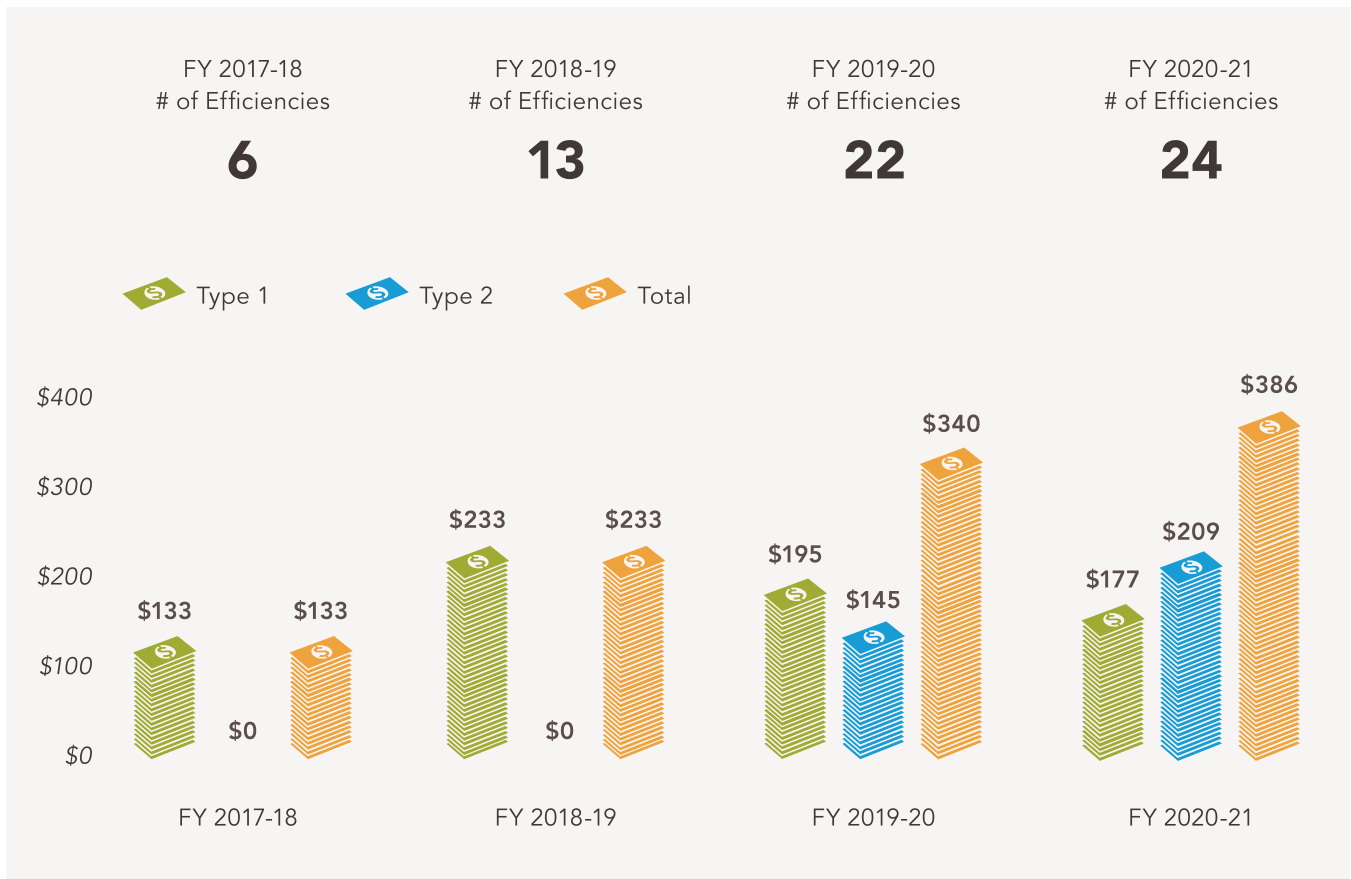
BACKGROUND

Caltrans manages more than 50,000 lane-miles of California's highway and freeway lanes, provides inter-city rail services, permits more than 400 public-use airports and special-use hospital heliports, and works closely with local agencies on a variety of projects. Caltrans accomplishes its mission to "provide a safe and reliable transportation network that serves all people and respects the environment," through 12 district offices geographically located throughout the state and support programs located at its headquarters in Sacramento.

Prior to the enactment of SB 1 in 2017, statewide taxes and fees dedicated to the maintenance of the system had not been increased in more than 20 years, with those revenues losing more than 55 percent of their purchasing power, while costs to maintain the system had steadily increased, and much of the underlying infrastructure had aged past its expected useful life.

Four-Year Summary

Caltrans has surpassed the \$100 million goal in each year since enactment of SB 1.



SB 1 adjusted fuel rates for past inflation and includes future inflation adjustments, solving the inflation issue and delaying any expected transportation funding shortfalls by a decade or more. SB 1 provides needed funding to address this gap and to fix California's aging infrastructure, including roads, bridges, culverts, and traffic management systems. SB 1 also plays a major role in reducing traffic delays and greenhouse gases, improving transportation options such as transit, rail, and active transportation, while improving safety, goods movement, accessibility, and equity throughout the system.

As written in the SB 1 legislation, "The department shall implement efficiency measures with the goal to generate at least one hundred million dollars (\$100,000,000) per year in savings to invest in maintenance and rehabilitation of the state highway system. These savings shall be reported to the commission."

Caltrans continually pursues new approaches to deliver transportation projects in a more efficient and effective way to reduce costs and accelerate project delivery. Caltrans continues to use many process improvements such as Value Analysis (VA) and Contract Manager/General Contractor (CM/GC) as more efficient ways to deliver projects. Tools like drones are assisting Caltrans with surveying and emergency response, and technologies like X-Ray Fluorescent Technology are helping to evaluate pavement more efficiently.

Caltrans also encourages its employees to be innovative and to utilize continuous improvements related to business practices and product development. The Division of Research, Innovation and System Information (DRISI) supports programs designed to encourage employees to drive innovative ideas and improve practices and processes, such as the Research Program, L6S and the Innovation Station.

The Innovation Station is a crowdsourcing platform which supports the submission of ideas and the management of those ideas through a defined process. The platform's goals are to encourage a culture of innovation and support statewide collaboration across organizational boundaries, breaking down silos in support of identified efficiencies.

The Research Program develops, tests, and evaluates transportation innovations. These innovations in methods, materials, and technologies enable Caltrans to improve many areas of the department and address goals in our Strategic Plan. Caltrans has also been participating in the Federal Highway Administration's (FHWA) Every Day Counts (EDC) Program and the State Transportation Innovation Council (STIC). EDC is a State-based model that identifies and rapidly deploys proven, but underutilized innovations to shorten the project delivery process, enhance roadway safety, reduce traffic congestion, and improve environmental sustainability. Proven innovations promoted through EDC facilitate greater efficiencies, including saving time, money and resources that can be used to deliver more projects.

The STIC is a multi-stakeholder leadership team that accelerates the rapid deployment of transportation innovations in California. STIC identifies, evaluates, and implements technologies, tactics, and techniques that have been demonstrated in "real world" applications and offer improved performance/effectiveness in California.

Caltrans is committed to exceeding the SB 1 efficiency goal as specified in the legislation. In the fall of 2020, Caltrans hosted a peer exchange with FHWA, other states, regional partners, and stakeholders to focus on efficiencies. This Peer Exchange provided a forum for Caltrans to share its vision, strategies, and best practices and receive feedback from other experts. Caltrans has been in contact with other states in 2021 as it continues its involvement in peer exchange practices to improve processes and increase efficiencies.



Report Organization

Fiscal year 2020-21 efficiencies are categorized in three groups:

- 1 Type 1 Efficiencies:** Efficiencies that are invested back into the maintenance and rehabilitation of the state highway system and are included in SB 1 reporting.
- 2 Type 2 Efficiencies:** Efficiencies that are invested back into the maintenance and rehabilitation of the state highway system and contribute to the overall efficiencies total.
- 3 Type 3 Efficiencies:** Efficiencies, practices, trends, and innovations that benefit Caltrans and taxpayers.

To keep the report concise, assumptions, detailed methodologies, project lists, and supporting documents are available in the appendix at rebuildingca.ca.gov/efficiencies.php

EFFICIENCIES: TYPE ONE

Total number of Type One Efficiencies **16**

Total Type One cost savings or avoidance **\$177,341,000**

Municipal Coordination Grant Program

Cost savings or avoidance

\$50,864,000

Submitted by

Division of Environmental Analysis



The Caltrans Statewide Stormwater Permit requires Caltrans to control, prevent, remove, or reduce pollution resulting from stormwater discharges to impaired waterbodies through construction of treatment devices. Caltrans' Stormwater Program receives one compliance unit credit for treatment of stormwater runoff from one acre of its right of way through treatment devices built on the State Highway System (on-system), or investing \$88,000 of local grant funding provided to municipal partners

toward the successful delivery of off-system regional stormwater treatment projects. The off-system project investments are cost-effective when compared to on-system investments in treatment devices that are constrained by the limited right of way and the need to ensure safety for the users of the highway system. Since 2019, Caltrans has received 578 compliance units, at a rate of \$88,000 per unit, from the State Water Resources Control Board, resulting in \$50 million in cost avoidance.

MUNICIPAL COORDINATION EXPENDITURES & EQUIVALENT COMPLIANCE UNITS

	<i>Invoiced Expenditures</i>	<i>Compliance Units Granted per each \$88K</i>
Fiscal Year 2018-19	\$20,240,000	230
Fiscal Year 2019-20	\$30,624,000	348
Total	\$ 50,864,000	578

Assumptions, detailed methodologies, project lists, and supporting documents are available in the appendix at rebuildingca.ca.gov/efficiencies.php

Cost Avoidance through Open-Graded Friction Course (OGFC)

Cost savings or avoidance	\$50,160,000
Submitted by	Division of Environmental Analysis

Caltrans has worked in partnership with regulatory agencies to explore innovative and cost-effective alternatives to capture stormwater pollutants prior to reaching water bodies.

In 2019, Caltrans secured 285 acres of stormwater treatment compliance credits utilizing open-graded friction course (OGFC) pavements constructed to address pavement preservation needs.

On average, Caltrans spends approximately \$176,000 in construction capital costs to treat stormwater runoff from one acre of Caltrans right of way through traditional treatment devices. Caltrans does not have to construct traditional stormwater treatment devices to address 285 acres of right of way where OGFC credits have been granted resulting in cost avoidance efficiency.



285 acres x \$176,000 per acre ¹	\$50,160,000
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¹ Average stormwater treatment device unit cost as noted in the 2012 NPDES Permit.

High Reflective Materials for Striping

Cost savings or avoidance

\$34,000,000

Submitted by

Division of Maintenance



Caltrans has historically used 4-inch-wide painted stripes to delineate both edge and lane lines on the state highway. In 2017, Caltrans began deploying 6-inch-wide striping that uses more durable materials such as high reflective thermoplastic and tape. Both high reflective thermoplastic and tape materials are embedded with glass beads to enhance reflectivity for better visibility at night and during inclement weather. The new materials are also more durable, lasting up to 6 years compared to 1 year with painted stripes.

The more durable pavement markings reduce the need for ongoing annual maintenance and frequent replacement, lowering both labor and material cost. The baseline used for the savings calculation was the bid cost of paint traffic stripes. The savings is the cost difference of maintaining and replacing lane miles.

The savings are realized by longer lasting material and decreased maintenance.

- » In 2017-18, a total of 16,602 lane miles were stripped with the reflective material achieving an average of \$16.50 million in savings per year for six years.
- » In 2018-19, a total of 9,026 lane miles were stripped with the reflective material achieving an average of \$12.40 million in savings per year for six years.
- » In 2019-20, only 3,209 lane miles were striped with the reflective material achieving \$5.1 million in savings per year for six years.

Additional benefits with the new reflective stripes include:

- » Longer preview distance for motorists
- » Improved guidance and safety for motorists
- » Less impact on motoring public and improved safety

	FY-2017-18 SAVINGS	FY-2018-19 SAVINGS	FY-2019-20* SAVINGS	FY-2020-21 SAVINGS
FY 2017-18 Striping Contracts	\$16.50	\$16.50	\$16.50	\$16.50
FY 2018-19 Striping Contracts		\$12.40	\$12.40	\$12.40
FY 2019-20 Striping Contracts			\$5.10	\$5.10
Total	\$16.50	\$28.90	\$34.00	\$34.00

* The fiscal year 2019-20 efficiencies report underreported savings, reporting only \$5.1 million of \$34 million in savings.

Value Engineering Change Proposals

Cost savings or avoidance	\$18,514,000
Submitted by	Division of Construction

Caltrans encourages contractors to develop and implement innovative approaches to construction of projects through Value Engineering Change Proposals (VECP). The VECP process encourages contractors to find innovative methods, materials, and technologies that are new and unique to reduce cost, save time, reduce congestion, and improve quality and safety. When these new approaches result in construction cost savings, Caltrans and contractors share the cost savings.

The VECP is a formal process whereby the innovation is proposed in writing to Caltrans and the merits of the approach are examined. If the innovation is accepted by Caltrans, a change order is prepared

to authorize the VECP so that the work can begin. Money saved through VECP enables Caltrans to reinvest construction dollars into additional transportation projects, and the new innovative construction solutions may be applied to future projects.

Efficiency savings were calculated based on the number of projects that had accepted VECPs for fiscal year 2020-21. There was a total of 38 accepted VECPs for the fiscal year, representing \$18.5 million in savings.

Highway Lighting LED Retrofit

Cost savings or avoidance

\$6,800,000

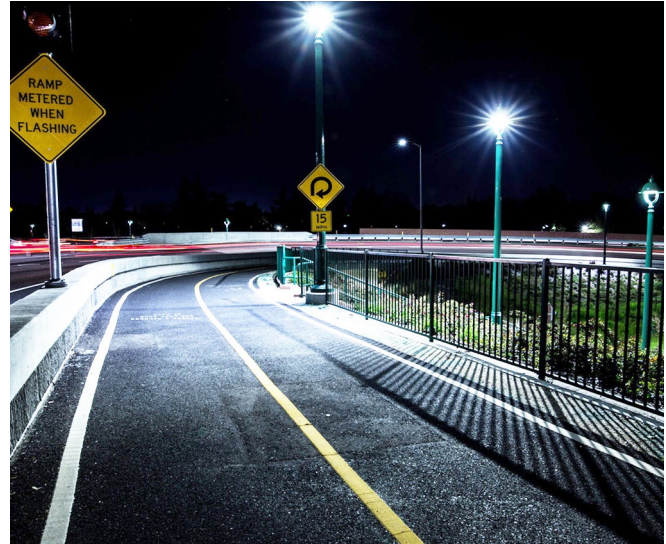
Submitted by

Division of Maintenance

In an ongoing statewide effort, Caltrans has been replacing existing high-pressure sodium (HPS) fixtures with light emitting diode (LED) lighting fixtures on highways statewide. HPS fixtures have been a mainstay on the highways for more than 30 years, however, LEDs are a superior alternative. LED fixtures are designed to operate for a minimum of 15 years with little to no maintenance, as compared to HPS lighting which require replacement every four years. LED fixtures are also far more energy efficient, reducing energy usage by 50 to 60 percent. Caltrans maintains approximately 80,000 pole-mounted streetlights statewide. A reduction in maintenance on LED fixtures also lessens the frequency of lane closures and reduces the exposure of maintenance workers to the hazards of working in live traffic. The production of electricity is a major contributor to greenhouse gas emissions. Therefore, lowering energy usage results in a positive impact to the environment.

The savings are captured on a per-year basis, based on 80,000 HPS fixtures replaced with LED fixtures.

FY 2020-21	FY 2020-21 SAVINGS
Energy Cost	5,623,560
Labor Cost	1,434,120
Vehicle Expense	188,700
Minus higher cost of LED	-426,667
Total Savings	\$6,819,713



- » **Energy Costs** — \$5.6 million reduction in yearly energy usage based on lab tested performance, industry data and current electrical energy rates. The savings is the difference between HPS and LED energy usage.
- » **Labor Costs** — \$1.4 million reduction in yearly labor costs associated with less frequent maintenance and relamping activities. Relamping HPS fixtures takes approximately 18 staff per year compared to 4 staff for maintaining LED lighting.
- » **Vehicle Usage** — \$188,700 additional yearly savings due to the reduction of vehicles used by maintenance crews in maintaining highway lighting.
- » **Materials** (light fixtures) — LED lighting is more expensive than HPS lighting. This cost is factored in and reduces the overall savings by \$426,667 per year.

Automated Machine Guidance (AMG)

Cost savings or avoidance

\$6,000,000

Submitted by

Division of Construction

In 2020-21, Caltrans completed 23 projects with over 5,000 cubic yards of earthwork using Automated Machine Guidance (AMG). AMG is a technology that uses positioning devices, singly or in combination, such as Global Positioning Systems, total stations, or rotating laser levels to determine and control the real time position of construction equipment such as bulldozers, blades, scrapers, and paving machines. This technology reduces the number of survey stakes needed during rough grading, minimizes the number of re-staking requests, and provides records for volume computations. AMG has been shown to reduce the number of construction working days as well as reducing survey and construction support.

Caltrans introduced AMG to its projects approximately 4 years ago and contractors have been using it for more than a decade for rough grading. The benefits for the department come as a result of the changes in the way Caltrans provides survey data on the project, how inspectors verify grades during rough grading and more efficiency quantity estimation methods.

AMG efficiencies and benefits:

- » Increased productivity and improved accuracies
- » Increased safety of field staff on construction projects
- » Survey and construction support savings
- » More efficient use of survey resources
- » Keeps accurate electronic records of material volumes



Support Savings	\$4,078,031
Working Days – 258 days ³ at \$7,500 per day	\$1,935,000
Total Savings	\$6,013,031

Assumptions, detailed methodologies, project lists, and supporting documents are available in the appendix at rebuildingca.ca.gov/efficiencies.php

Value Analysis

Cost savings or avoidance	\$3,140,000
Submitted by	Division of Design

Caltrans uses the Value Analysis (VA) study on individual projects to drive efficiency and add value or performance. VA is a systematic process of review and evaluation early in the project life cycle and it is one of the most important processes used in project delivery to achieve efficiencies. Conducted by a multidisciplinary team during the environmental and design phase, the goal is to identify innovative approaches that improve the overall value of the project. The team applies their knowledge in a systematic approach by utilizing function analyses tools to improve the value of a project. VA methodology is optimized through refining the design to increase performance and/or decrease costs, analyzing lifecycle costs, user benefits and overall return on investment. Value is added by improving functionality and/or reducing cost while maintaining the safety, necessary quality, and environmental attributes of the project. The team consists of independent subject-matter experts who are not directly involved in the project and will offer new perspectives.

Once the study is completed, a final report documents the process, results, decisions made, and implementation plans for moving the project forward. Recommendations, in most cases, reduce project cost but in some cases, the result is an increase to the overall cost of the project but improved overall performance. Federal regulations mandate that all projects on the National Highway System receiving federal funds, with an estimated total project cost exceeding \$50 million perform a VA.

To further generate efficiencies, Caltrans issued an internal policy in February 2019, where VA studies must be considered for all projects over \$25 million.

With the \$25 million threshold, Caltrans identified three VA projects that achieved savings in the amount of \$3,139,644 in fiscal year 2020-21.

Mobile Field Devices

Cost savings or avoidance

\$2,580,000

Submitted by

Division of Construction



As part of an ongoing effort to improve the project delivery process by effectively leveraging new technology, the Division of Construction deployed 1,300 mobile field devices (tablets) to construction staff as a device to help administer construction projects remotely. The mobile field devices enable field inspectors, resident engineers, and construction managers access to electronic documents and to administer construction contracts directly from the job site.

The ability to remotely access needed documentation significantly reduces frequent trips between field offices and job sites and allows construction staff to better utilize their time for high priority activities.

The mobile field devices also allow for elimination of printing millions of pages of documents. Caltrans plans to purchase additional devices which will increase the efficiency savings in future years.

Caltrans conducted a survey in 2018 and found that each mobile field device user saved 4.4 round trips weekly between the field office and the job site. Based on the data collected, each mobile field device user can save an average of \$2,000 per year over the expected life of the device which is 5 years. In total, the 1,300 devices are producing a net savings of \$12.9 million over their expected 5-year life span or approximately \$2.58 million per year.

Independent Assurance Program

Cost savings or avoidance

\$1,802,000

Submitted by

Division of Engineering Services

The Caltrans Materials Engineering and Testing Services (METS) is responsible for managing the statewide Independent Assurance Program (IAP) mandated by Title 23 Code of Federal Regulations, Part 637. The IAP provides guidance for independent quality assurance of testing functions on roadway construction projects. Originally, this program was administered within each district and then consolidated in the Division of Engineering Services at Headquarters. Consolidating this work improved efficiencies, created greater independence, and improved statewide consistency. By consolidating the Independent Assurance (IA) functions and the strategic placement of staff statewide, METS reduced the total number of IA staff from 33 to 22, achieving 11 personnel years (PYs) savings. The PY savings equates to an estimated annual efficiency savings of \$1.8 million.

Additional potential savings include reduction in project delays through allowance of certification and accreditation "off-project," as well as a potential reduction in claims and disputes associated with inconsistencies in performance of quality control and acceptance testing.



CLASSIFICATION	LOADED MONTHLY SALARY	PYS SAVED	MONTHLY SAVINGS	ANNUAL SAVINGS
Transportation Engineering Technician (TET) – Range C	\$9,190	2	\$18,380	\$220,560
Materials and Research Engineering Associate (MREA)	\$12,200	4	\$48,800	\$585,600
Transportation Engineer (Civil) – Range D	\$16,600	5	\$83,000	\$996,000
Total		11	\$150,180	\$1,802,160

Assumptions, detailed methodologies, project lists, and supporting documents are available in the appendix at rebuildingca.ca.gov/efficiencies.php

Global Positioning Satellites

Cost savings or avoidance	\$1,763,000
Submitted by	Division of Equipment

Caltrans utilizes telematics devices to improve fleet management practices. Telematics devices have effectively eliminated the need for manual reporting of vehicle usage, while providing far more accurate and timely data collection. Caltrans also reduced the cost of smog checks because vehicles equipped with a telematics device do not need to have a physical biennial smog inspection. Vehicles equipped with a telematics device send engine diagnostic information that is accepted in lieu of the physical inspection. Furthermore, telematics devices dramatically improve operator safety through automatic alerts of vehicle diagnostics and location.

It is estimated that Caltrans staff would have incurred close to 21,000 hours manually logging vehicle usage last year. Nearly \$2 million is saved annually by eliminating these manual logs and the elimination of smog inspections.

DESCRIPTION OF SAVINGS FOR 2020-21	SAVINGS
Elimination of Manual Usage Reporting (car tags)	\$1,245,110
Elimination of Annual Smog Inspections	\$517,912
Total Savings	\$1,763,022



Assumptions, detailed methodologies, project lists, and supporting documents are available in the appendix at rebuildingca.ca.gov/efficiencies.php

Unmanned Aircraft Systems

Cost savings or avoidance

\$710,000

Submitted by

Division of Aeronautics, Division of Right of Way
and Land Surveys, Division of Construction

Unmanned Aircraft Systems (UAS), also known as drones, have multiple applications for transportation and public works agencies including surveys, bridge inspections, construction monitoring, emergency response, and field investigations. Cameras and sensors mounted on UAS can capture imagery such as photogrammetry, photography, videography, LiDAR, and thermal imagery more effectively and rapidly than traditional ground-based methods. UAS may be used in different phases of project delivery including planning, environmental documentation, design, and construction. Incorporating UAS technology into Caltrans business activities improves safety, boosts efficiency, and decreases costs.

Because UAS applications vary, so do the savings derived from their use. UAS savings could range from 40 to 70 percent over traditional methods. In addition, UAS are reducing the need for field staff to travel as they are now able to view footage remotely. Additional benefits include capturing aerial photos and videos for public information. Caltrans has established working groups for the different types of applications (such as Bridge Inspections or Construction). These groups are responsible for documenting savings for their Divisions.

Savings for FY 2020-21 were provided by the Divisions of Construction and Right-of-Way and Land Surveys.

REPORTING DIVISION	REPORTED SAVINGS (FY 2020-21)
Construction ¹	\$212,280
Right of Way and Land Surveys ²	\$498,218
Total Savings	\$710,498

¹ 67 missions reported. Savings vary based on type of mission.

² 34 missions reported with savings of approximately \$14,600 per mission.

The following assumptions were made in calculating savings:

- » Applicable labor rates were used. Equipment depreciation was included where appropriate.
- » Construction UAS savings were generated for routine field duties (such as construction monitoring or quantity calculations).
- » Missions to provide imagery and videography (such as those used for public meetings) were not reflected in this analysis.

The use of UAS will increase statewide for surveys, bridge inspections, construction monitoring, and other field investigations. Additional methodologies are in development to capture savings from those types of missions.

X-Ray Fluorescence Technology

Cost savings or avoidance**\$477,000**

Submitted by

Division of Environmental Analysis



Caltrans is required to comply with the Department of Toxic Substances Control's (DTSC) Soil Management Agreement (Agreement) for Aerially Deposited Lead Contaminated Soils (ADL). The Agreement requires that Caltrans manage all ADL contaminated soils on the state highway system with elevated lead derived from leaded fuel tailpipe emissions. To fulfill this requirement, Caltrans has been using hazardous materials consultant task orders to collect field samples, analyze them in the laboratory, and develop the necessary reports. Hazardous materials consultant task orders for ADL studies are costly depending on the size and complexity of the project. The 2016 ADL Agreement lowered the hazardous waste threshold and imposed additional export restrictions for excess soil now considered "regulated", resulting in increased ADL testing requirements impacting all projects that disturb soil or generate excess soil.

To explore efficiencies and innovative technology, District 11 conducted a multi-year study to evaluate the use of X-Ray Fluorescence (XRF) technology as an additional screening tool for areas expected to have low levels of lead. The results of the study indicated relatively consistent correlation between the XRF analysis and the lab data. Caltrans submitted the results of the study to the DTSC and requested approval to use XRF technology for predetermined low risk projects. DTSC approved Caltrans District 11 staff to use XRF technology in place of previously required laboratory analytical methods.

XRF technology is a handheld tool that evaluates total lead concentrations in seconds, providing an economically viable alternative to costly and expensive laboratory analysis. The use of XRF technology by Caltrans trained personnel, has eliminated the need for consultant support on low-risk projects on a case by case basis using desktop criteria.

Additionally, the XRF technology provides real time data to screen projects that are considered non-hazardous, eliminating the need for a comprehensive field investigation supported by expensive and time-consuming laboratory analysis. The XRF technology can justify the unrestricted soil classification and can also be used to respond to emergency projects.

Caltrans determined a baseline by evaluating 918 boreholes from ADL task orders and calculated the cost to be an average of \$1,500 per borehole. Caltrans’ use of XRF technology to screen low-risk projects eliminated the need for hazardous consultant task orders.

Caltrans calculated savings by comparing the average borehole cost to the cost of Caltrans personnel using XRF technology on 17 projects in the 2020/2021 fiscal year. Using XRF technology eliminated the need to analyze data from 318 borehole locations during the 2020/2021 fiscal year.

	BOREHOLES ¹	SAVINGS
Fiscal Year 2020-21, 17 Projects	318	\$477,000

¹ Each borehole saves an average \$1,500

Repurposed Changeable Message Signs (CMS) ★ ⚠

Cost savings or avoidance

\$300,000

Submitted by

District 11 Maintenance



As part of the effort to upgrade Traffic Management Systems statewide to meet SB 1's goal of having 90 percent in good condition by 2027, Caltrans has been upgrading the existing Changeable Message Signs (CMS) to new technology full color Light Emitting Diode (LED) CMS 600 style signs. These CMS signs are able to display color pictures and graphics, and District 11 is installing the new technology while removing older technology CMS signs, most of which are still functional and have years of life remaining in them. These older signs, which were slated to be disposed of, still have value to other Districts whose CMS signs are older technology but may have failing lights or need a full replacement. Until other

districts receive the new technology color screen CMS signs, they can utilize the older signs from District 11 until the new technology is available. District 11 reached out to other districts and discovered there was a need for replacement CMS signs in three districts. Arrangements were made for the signs to be transported and installed, saving approximately \$65,000 per sign. Instead of disposal, the older signs have a use and purpose in other districts.

Each sign costs approximately \$65,000 and about \$15,000 to transport and reinstall, saving about \$50,000 for each repurposed sign. To date, six signs have been repurposed saving \$300,000.

State Office of Historic Preservation (SHPO) ★ ⌚

Electronic Form Submittal

Cost savings or avoidance

\$116,000

Submitted by

Division of Environmental Analysis

The Caltrans Cultural Studies Office has oversight of Section 106 of the National Historic Preservation Act and has developed an electronic submittal and review process for Caltrans and Local Agency documents to Caltrans and to the California Office of Historic Preservation (OHP). The new process provides cost savings associated with publishing, printing, mailing, revising, and approving hard copy compliance documentation by the Districts and Cultural Studies Office to and from OHP.

Based on the typical number of project reports and agreement documents that are required to be reviewed by CSO and OHP on an annual basis, the printing costs for fiscal year 2020-21 savings is \$115,560.

DOCUMENT TYPE	NUMBER OF DOCUMENTS	PRINTING SAVINGS	MAILING SAVINGS	TOTALS
Originals	144	\$72,000	\$5040	\$77,040
Revisions (avg. of 50% revision rate of Originals)	72	\$36,000	\$2520	\$38,520
Totals	216	\$108,000	\$7560	\$115,560

Based on 24 hours to prepare each document at \$20.83 per hour, which equates to \$500 in savings per document.

Advance Mitigation Credits

Cost savings or avoidance

\$93,000

Submitted by

Division of Environmental Analysis



The Caltrans Advance Mitigation Program (Program) was established by the Road Repair and Accountability Act of 2017 authorizing Caltrans to plan and implement advance mitigation solutions for its future transportation projects. This new business practice allows Caltrans to reduce delays by proactively obtaining environmental mitigation in advance of — rather than during — transportation projects. Caltrans Headquarters administers the Program and supports Caltrans Districts interested in planning and delivering advance mitigation projects.

The primary goal of the Program is to address longer-term future environmental mitigation needs resulting in improved environmental, economic and project delivery outcomes. By consolidating the forecasted mitigation needs of multiple future transportation projects, Caltrans can potentially provide strategically placed and environmentally sound replacement habitat and shorten project delivery timelines, resulting in both time and cost savings. Ultimately, the Program aims to help Caltrans meet conservation goals in addition to regulatory requirements.

In fiscal year 2020-21, Caltrans District 8 developed an advanced mitigation project funded to contribute endowment and acreage acquisition funds to the Coachella Valley Multiple Species Habitat Conservation Plan (HCP).

This project provided sediment stabilization and erosion control on State Route 111. Associated impacts of the off-pavement work would have necessitated compensatory mitigation for HCP resources. If not for the advance mitigation project's financial contribution, Caltrans would have been required to pay a fee of 5% of the project's construction capital cost of \$72,100, via cooperative agreement to the HCP for these impacts. Additionally, because of the advance mitigation financial contribution, the project avoided time and support costs of 6-9 months associated with drafting, negotiating, and executing the cooperative agreement that would otherwise have been required. This added \$21,000 to the savings for a total of \$93,100.

Cost Estimates Toolbar ★

Cost savings or avoidance		\$22,000
Submitted by		Division of Engineering Services

In an effort to improve structure cost estimating practices and better align engineers estimates with bid results, the Division of Engineering Services (DES), Structure Office Engineer, Cost Estimate Branch, adopted probabilistic cost estimate practices approximately 10 years ago. These practices were responsible for providing structure cost estimates in ranges with associated confidence levels. The branch chose to use the Oracle Crystal Ball software, which is the leading spreadsheet-based application for predictive modeling, forecasting, simulation, and optimization. It gives unparalleled insight into the critical factors affecting risk using Monte-Carlo simulation and providing structure cost estimates in ranges. At that time, the branch purchased the software, tested the software, and provided training to 25 DES cost estimators.

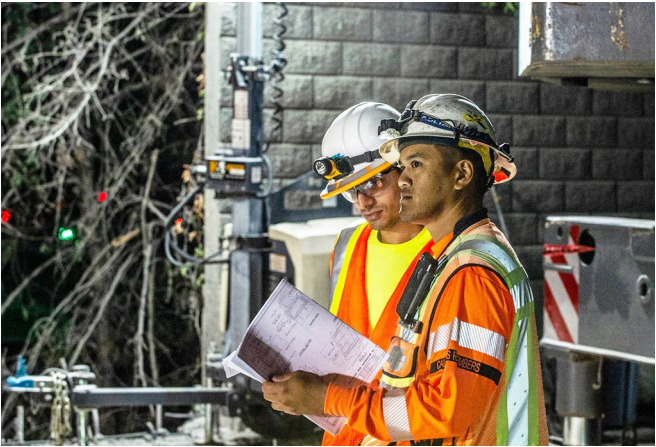
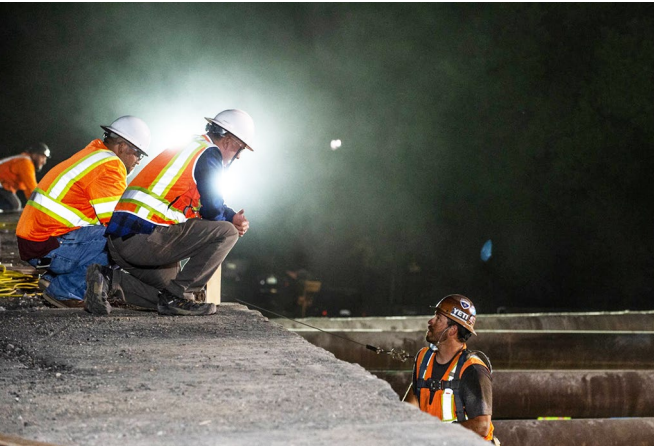
Division of Engineering Services staff developed an in-house software to replace the Oracle Crystal Ball software, hence saving the Department \$22,000 per year in software maintenance fees and future purchases of new licenses.

EFFICIENCIES: TYPE TWO

Total number of Type Two Efficiencies	8
Total Type Two cost savings or avoidance	\$209,370,000

Construction Manager/General Contractor (CMGC)

Cost savings or avoidance	\$59,600,000
Submitted by	Division of Design



An innovative method of project delivery known as Construction Manager/ General Contractor (CM/GC) enables Caltrans to engage the construction manager early to provide input during the design process. Under the traditional means of contracting for the construction of the highway improvement projects, construction of any portion of the project cannot begin until the implementing agency has developed complete plans and specifications for the entire project, placed the contract out for bid, and awarded the contract. Engaging the construction manager early allows the project team to work collaboratively to develop the project scope, optimize design, improve quality, manage costs, and share risks.

Savings are achieved due to the CM/GC contractor’s input during the design, resulting in a more constructible project, reduced costs, and a reduction in change orders. Caltrans hires an independent cost estimator to provide independent estimates and to advise Caltrans on cost related issues. The construction manager and independent cost estimator independently prepare a cost estimate and schedule based on the draft construction plans and specifications. The team meets to review pricing assumptions and attempt to reconcile price differences. The CM/GC contractor develops an innovation register which identifies proposed innovations, including the value of the idea and

identifies which innovations were incorporated into the final design and construction documents. The independent cost estimator reviews the innovation register to ensure that the estimated savings are reasonable and supported. When the design is approximately 90 to 95 percent complete, the CM/GC contractor will provide a price to build the project. If the proposed price is acceptable, the CM/GC contractor becomes the general contractor and delivers the project.

Savings are achieved and reported at two different stages — when the construction contract is awarded (e.g. innovations) and at the completion of construction (reduction in change orders and claims).

The CM/GC contractor develops and maintains an innovation register which identifies proposed innovations, including the value of the idea and identifies which innovations were incorporated into the final design and construction documents. The independent cost estimator reviews the innovation register to validate that the estimated savings are reasonable and supported. After award of the project, the district submits the final innovation log to the CM/GC Program. We reviewed the list of projects for which the CM/GC method was used and determined that six projects were awarded construction contracts during 2020-21 achieving a cost avoidance of \$59.6 million.

Value Analysis

Cost savings or avoidance	\$50,205,000
Submitted by	Division of Design

Caltrans uses the Value Analysis (VA) study on individual projects to drive efficiency and add value or performance. VA is a systematic process of review and evaluation early in the project life cycle and it is one of the most important processes used in project delivery to achieve efficiencies. Conducted by a multidisciplinary team during the environmental and design phase, the goal is to identify innovative approaches that improve the overall value of the project. The team applies their knowledge in a systematic approach by utilizing function analyses tools to improve the value of a project. VA methodology is optimized through refining the design to increase performance and/or decrease costs, analyzing lifecycle costs, user benefits and overall return on investment. Value is added by improving functionality and/or reducing cost while maintaining the safety, necessary quality and environmental attributes of the project. The team consists of independent subject-matter experts who are not directly involved in the project and will offer new perspectives.

Once the study is completed, a final report documents the process, results, decisions made, and implementation plans for moving the project forward. Recommendations, in most cases, reduce project cost but in some cases, the result is an increase to the overall cost of the project but improved overall performance. Federal regulations mandate that all projects on the National Highway System receiving federal funds, with an estimated total project cost exceeding \$50 million perform a VA.

Caltrans identified eight VA projects that achieved savings in the amount of \$50,205,180 in fiscal year 2020-21.

Environmental Review – NEPA Assignment

Cost savings or avoidance

\$49,200,000

Submitted by

Division of Environmental Analysis

Caltrans was the first state Department of Transportation in the nation to sign a Memorandum of Understanding with the Federal Highway Administration (FHWA) to assume responsibility for the National Environmental Policy Act (NEPA). This assumption of this federal responsibility is commonly referred to as "NEPA Assignment." NEPA Assignment streamlines the federal environmental review and approval process by eliminating FHWA project-specific review and approval. NEPA Assignment does not alter federal environmental protection standards. California assumes sole responsibility and liability for its NEPA decisions and is required to waive its right to sovereign immunity against NEPA related actions brought in federal court. Caltrans has established teams that are working on various strategies to further streamline NEPA Assignment. These strategies will be implemented in future fiscal years.

Caltrans has achieved significant time savings by completing environmental documents approximately 15.2 months earlier with NEPA Assignment. For projects that were determined to be exempt from preparing

a major environmental document, or "Categorically Excluded," the review processing time savings is estimated at one month. The time savings during the environmental review has allowed construction to begin sooner, avoiding cost escalation of capital construction costs. Processing projects utilizing NEPA Assignment saves money through cost avoidance.

Projects that utilized NEPA assignment and completed the Project Approval and Environmental Document phase during fiscal year 2020-21 were identified. Categorical exclusions are estimated to save one month in time savings and environmental assessments achieve 15.2 months in time savings. The time savings were multiplied by the approved capital cost escalation rate to determine cost savings. The Caltrans Legal Division provided the associated legal costs, which were subtracted from the savings. In addition, Caltrans subtracted the support costs for the program and the consultant costs associated with NEPA Assignment. As shown in the table below, there were 109 environmental documents completed utilizing NEPA Assignment achieving \$49.2 million in savings.

NEPA ASSIGNMENT CATEGORIES	NUMBER OF PROJECTS	SAVINGS	ASSOCIATED COSTS	TOTAL SAVINGS
Categorical Exclusions – 1 month	96	\$2,826,400		
Environmental Assessments – 15.2 months	13	\$47,250,031		
Legal Expenses			\$137,679	
Program Staff Support			\$325,540	
Consultant Costs			\$392,047	
Totals	109	\$50,076,431	\$855,266	\$49,221,165

Assumptions, detailed methodologies, project lists, and supporting documents are available in the appendix at rebuildingca.ca.gov/efficiencies.php

Partnering ★ ⌚

Cost savings or avoidance

\$31,600,000

Submitted by

Division of Construction

Owners of construction projects across the country pay tens of billions of dollars each year in interest and legal costs for claims that go unresolved for long periods of time. This is money that could be used to fund additional projects. Partnering is used to prevent this from happening or to help turn the situation around if it does occur.

Partnering is simply a way of conducting business in which two or more organizations make long term commitments to achieve mutual goals. This requires changing traditional adversarial relationships into team-based relationships. Partnering promotes open communication, trust, understanding, and teamwork among participants. Including partnering on construction contracts leads to less disputes on contracts and better cost and schedule certainty.

Professionally facilitated project partnering is mandatory on all projects with a total bid greater than \$10 million and 100 or more working days. Although optional, it is encouraged on all projects with a total bid greater than \$1 million and up to \$10 million. The Resident Engineer is required to extend a formal invitation to the contractor to partner on all projects with a total bid greater than \$1 million. Application of partnering concepts on projects with a total bid of \$1 million or less is also encouraged, even if a professional facilitator is not used.



The savings are cost avoidance through avoidance of change orders and claims on partnered projects. The savings are estimated by the project team (both Caltrans and the contractor) at the end of the project. The total cost of professionally facilitated partnering is subtracted from the estimated savings identified by the project team to find the savings due to partnering. The remaining project allocation is also used to validate the estimated savings.

Estimated savings from the projects receiving a 2020 Caltrans Excellence in Partnering Award is \$31.6 million.

Reclaimed Asphalt Pavement

Cost savings or avoidance

\$8,296,000

Submitted by

Division of Maintenance



Using recycled material in pavement projects reduces project capital costs. Reclaimed Asphalt Pavement (RAP) is old pavement that is removed and processed for immediate reuse or stockpiled for future construction projects. Current standard specifications allow contractors to use recycled material such as RAP. Contractors have been using RAP for many years, but the savings had not been quantified until now. Savings were calculated from industry practice and past studies.

Caltrans' Pavement Program's vision is to improve pavement quality across California. The Caltrans Standard Specifications allow contractors to use recycled materials in State Highway pavement projects which has shown to have yielded considerable savings. Since 2009 Caltrans allowed contractors to substitute RAP aggregate as part of the virgin aggregate in hot mix asphalt (HMA) in a quantity not exceeding 15 percent of the aggregate blend by weight. Starting in 2017, the allowable RAP aggregate in HMA has increased to 25 percent. Caltrans is

working with the asphalt industry to determine if it's possible to further increase the percentage of RAP without negatively affecting performance.

When properly crushed and screened, RAP consists of high-quality, well-graded aggregates coated by asphalt binder. With a good mix design, RAP will decrease project costs by replacing some virgin aggregate and virgin asphalt binder. The primary efficiency of recycled materials in pavement projects is reducing project capital costs. However, other benefits include diverting solid waste from landfills and reduced greenhouse gas emissions due to the reduced movement of removal and delivery of new material.

Caltrans used current industry practice, past studies, and correlations with available data to calculate savings.

Efficiency savings for the use of RAP in Caltrans paving projects for FY 2020-21 is approximately \$8.3 million.

Partial Depth Recycling (formerly Cold In-Place Recycling)

Cost savings or avoidance**\$6,845,000**

Submitted by

Division of Maintenance



Caltrans employs a variety of strategies and materials in maintaining and rehabilitating the State Highway Systems pavement. Partial Depth Recycling (PDR) is a strategy for pavement maintenance and/or rehabilitation and the process consists of grinding the existing pavement, processing material, mixing with stabilizing agents, spreading PDR mixture, and compacting in-place using a continuous train operation. The entire recycling operation is performed without heat. A thin hot mix asphalt overlay is then constructed on top of the recycled layer as a new wearing course.

In addition to PDR, Caltrans allows the use of several other in-place recycling strategies for pavement rehabilitation and maintenance such as Full Depth Recycling and Cold Central Plant Recycling. Additional benefits include diversion of material solid waste from landfills, reduced GHG emissions, faster construction schedules, and less impact to the traveling public.

The efficiency savings calculation compares the bid item cost for PDR versus the cost of a mill and fill with 20 percent digouts. A mill and fill is a pavement treatment that removes the existing surface layer and replaces it with a new asphalt layer. Partial Depth Recycling was used in nine projects in FY 2020-21. The use of Partial Depth Recycling saved Caltrans \$6.8 million in fiscal year 2020-21.

Smart Water Controllers ★ 🌿 ⚠️

Cost savings or avoidance

\$3,600,000

Submitted by

Division of Maintenance



In 2014, Caltrans responded to the January 17, 2014 Emergency Drought Declaration and Emergency Water Conservation mandates by investing in Smart Irrigation Controller technology to meet Caltrans' goal of reducing statewide potable irrigation water consumption by 50% (utilizing 2013 water use data as a baseline). Between 2015-2020 calendar years, Caltrans has met this goal by saving approximately 28.3 billion gallons of water and nearly \$34 million dollars in water use expenditures.

In an ongoing statewide effort, Caltrans has been replacing existing stand-alone irrigation controllers with smart controllers. Smart irrigation controllers have proven to be a valuable tool for maintenance personnel by providing real-time data regarding the

condition of the irrigation infrastructure. The smart controllers generate alerts that identify issues such as lateral line breaks, sprinkler flow issues such as broken heads, and power outages. In severe cases, such as a mainline break, the smart controller is capable of automatically shutting down the irrigation system to prevent major damage. This technology allows field personnel to safely and efficiently manage the irrigation system that exist throughout the highway roadside.

On average, Caltrans has saved approximately \$4.9 million dollars a year between calendar year 2015-2020 (vs. 2013). In 2020, the actual savings were \$3.6 million dollars due to decreased water usage.

Electronic Plans and Quantities Submittal Process ★ ⌚

Cost savings or avoidance

\$24,000

Submitted by

Division of Engineering Services

In 2016, the Structure Office Engineer implemented an electronic Plans & Quantities (P&Q) submittal process. Instead of Bridge Design staff submitting hard copies of the plans, quantities, foundation reports, hydraulic reports, etc., the Bridge Design branches were directed to submit all items required

at the P&Q milestone electronically. Not only did this save staff time but this also saved in the cost of paper, toner, and wear on the printers.

The fiscal year 2020-21 savings is \$24,000.

	OLD PROCESS	NEW PROCESS	SAVINGS
Labor Cost	22,500	0	22,500
Material Cost	1,000	0	1,000
Total	\$23,500	\$0	\$23,500

EFFICIENCIES: TYPE THREE

Efficiencies, practices, trends, and innovations that benefit Caltrans and taxpayers.



These efficiencies have helped Caltrans more efficiently clean our roadsides and strengthen partnerships through improved customer service.

These efficiencies can be difficult to tie directly to a cost savings or avoidance that gets invested back in the state highway system. However, these efficiencies are worthy of being highlighted to show Caltrans' commitment to being efficient in all budget areas and embracing the spirit of innovation.

Reduction in Local Project Agreement Processing

The Division of Local Assistance (DLA) initiated a Lean 6 Sigma project to reduce the processing time of Program Supplement Agreements (PSAs) from an average of 76 days down to 30 days or less. DLA processes approximately 1,200 PSAs annually. This improved customer service allows faster reimbursement to local agencies.

Non-Destructive Testing

Based on the 2020 AASHTO Interim Revisions to the Load and Resistance Factor Design, and Standard, Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, there was a change to the amount of Non-Destructive Testing

(NDT) requirements for the baseplate to pole welds. This allowed Caltrans to evaluate its inspection program and adjust the NDT testing program, saving time and money as a result.

High Performance Reflective Signs

Caltrans is using high-performance reflective materials that are more visible at night and do not require attached lighting. Removing the unnecessary light fixtures eliminates the utility, maintenance, and replacement costs associated with lighting. The brighter, more reflective signs allow for greater visibility from longer distances. The ability to see signs from a longer distance allows all drivers the additional time to react to unexpected conditions in a safe manner. Sign replacement is ongoing, and savings are still being evaluated.

Advertise Prior to Allocation

In a typical project award process, Caltrans would advertise projects after the California Transportation Commission (CTC) votes to allocate funds. The Headquarters Office Engineer (HQ OE) typically advertises these projects four to six Mondays after the date which CTC approves the funds. The Divisions of Design and HQ OE worked collaboratively to streamline this process to save time, resources, and capital costs. This process allows HQ OE to advertise projects prior to the CTC voting to allocate funds for the project, only if all the necessary documents have been provided to HQ OE. Advertising projects prior to CTC Allocation has shown to save an average of 40 days per project which results in projects beginning construction earlier. The time savings also translates to cost savings due to the escalation of construction costs with time.

Special Category Non-Competitive Bid for Mitigation Credit Purchases

The Special Category Non-Competitive Bid is a three-year standing exemption that allows Caltrans to make qualifying purchases for the acquisition of mitigation credits. This saves Caltrans time and money by reducing the Mitigation Credit Purchase timeline by two to five months, avoiding increased credit costs, project delay costs, and additional mitigation costs and liability for the mitigation in perpetuity when credits are no longer available due to market demand during the purchase approval process.

On-Call Culvert Lining Contract

Caltrans awarded a pilot on-call culvert cleaning and lining contract in 2019. The on-call contract is being monitored and evaluated for additional efficiency savings, improvements, and possible implementation statewide. It is anticipated that the efficiency savings will increase as the contract is fully utilized. The on-call culvert lining contract will achieve savings because Caltrans will no longer have to fund surveying and engineering support through the Highway Maintenance program. Additionally, the on-call contract will save approximately nine months in procurement time which is the typical procurement time for a Highway Maintenance project. This pilot project is ongoing and will be evaluated for future use.

Adopt A Highway

The Adopt-A-Highway Program allows volunteers to donate materials, equipment, and services for roadside maintenance or enhancement. Since 1989, Adopt-A-Highway groups have collected thousands of cubic yards of litter saving Caltrans millions of dollars.

dot.ca.gov/programs/maintenance/adopt-a-highway

Caltrans Tow Plow

The tow plow more effectively and efficiently helps Caltrans with snow removal operations.

www.youtube.com/watch?v=e5btFs-YFM8

Customized Snowplows

Caltrans builds and maintains its own snowplows, as opposed to using a vendor, which enhances quality, saves time and money.

www.youtube.com/watch?v=140ZI4r09Z8

New Tree Removal Technology

Advanced technology is now available to Caltrans to assist with the removal of dead, dying, and diseased trees throughout the state. The telescoping grappling saw allows contractors to take trees down at a faster pace than traditional tree removal processes, completing this task safely from the ground via remote control and outside the fall zone for the trees being removed.

www.youtube.com/watch?v=fH7dJ0hiMW0&list=PLexI970ijTguR-LqVqx5xi1nXZ3K3kL5q&index=6

On Deck for a More Efficient Future

Caltrans is looking at the trending innovations and efficiencies below for fiscal year 2021-22 and beyond. There are many more new and exciting efficiencies to be captured. Here are a few that have potential for implementation.

- » Accelerated Bridge Construction
- » Diverging Diamond Intersections
- » Steel Guardrail Posts
- » Steel Shot Blaster
- » Mechanics Tablets
- » Brine Solution
- » Lean Scheduling
- » ADA Data Collection System
- » Trimble SiteVision
- » Automated Radio Coverage Survey
- » Interactive Project Simulations

