PDQ

Project Delivery Quarterly

Spring 2016

Caltrans

Construction • Design • Engineering Services • Environmental • Project Management • Right of Way and Land Surveys

INNOVATION & Project Delivery

Caltrans Vision

A performance-driven, transparent, and accountable organization that values its people, resources and partners, and meets new challenges through leadership, innovation, and teamwork.

Cover photo: A georeferenced document from the North Region. See the first article for more information about how Right of Way and Land Surveys is using innovative technology to improve Project Delivery products and services across the state.

Innovation & Project Delivery

I am pleased to present the Spring 2016 edition of the PROJECT DELIVERY QUARTERLY (PDQ). This edition focuses on "Innovation" as a central focus of the Caltrans Vision and as a driving force that generates Project Delivery's products and services. Project Delivery has a long history of implementing innovative practices and documenting those improvements. The Project Delivery Innovation Toolbox (formerly the Project Delivery Acceleration Toolbox) documents current and previous innovation efforts. We are also pleased to be participating in the Caltrans crowd-sourcing Innovation effort. The Division of Design – Landscape Architecture Program is leading the water conservation Innovation team that is evaluating ideas submitted through the Innovate@Caltrans website: https://innovate.dot.ca.gov.

This edition highlights Right of Way and Land Survey's impressive achievements in using cutting edge technology to provide georeferenced right of way information to enhance Project Delivery's effectiveness; and Project Delivery's recent successes with implementing the Lean Six Sigma methodology to eliminate errors and inefficiencies.

I look forward to highlighting more of our innovative practices in future editions and encourage all of Project Delivery to approach our work with the goal of continuing to keep Caltrans on the leading edge of transportation innovation. For now, please join me in congratulating all of those who deserve credit for the living examples of "innovation" within Project Delivery that are featured in these articles. My thanks go out to all of you pursuing creative and judicious new strategies that help us meet "new challenges through leadership, innovation, and teamwork."

-Karla B. Sutliff
Project Delivery Deputy Director
(Chief Engineer)

Right of Way and Land Surveys

Innovating with Plans on Demand

"[I]nnovation initiated within Caltrans Districts, has produced increasingly streamlined techniques for georeferencing right of way maps, making them available for viewing in easily accessed web applications."

Can finding and viewing vital Caltrans records, such as Right of Way (R/W) Record Maps or Monumentation Maps, become as easy as searching online maps for the location of a local restaurant or dry cleaner? 21st Century innovation makes the answer a definite - Yes!

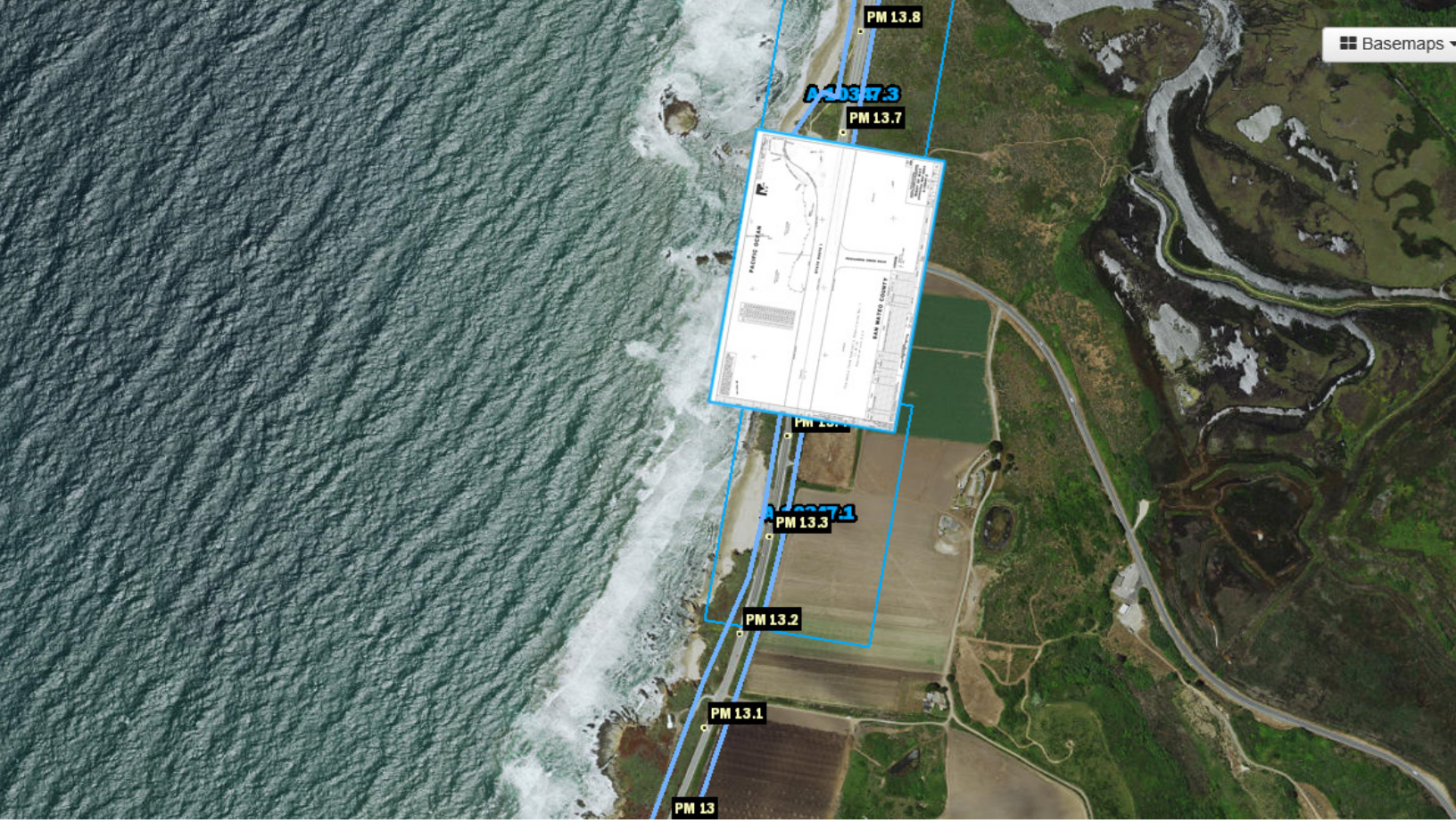
Clearly, Caltrans right of way is one of the state's most valuable non-human assets. Innovations that improve the maintenance and effective sharing of Caltrans right of way information benefit Project Delivery, and our allied Caltrans Programs. Caltrans Division of Right of Way and Land Surveys is developing a plan to innovate processes and deploy new tools to make right of way maps and documents searchable and viewable from a web based map, also known as a Geographic Information System (GIS).

This effort is called Plans on Demand (PoD). Plans on Demand is also the name of the American Association of State Highway and Transportation Officials (AASHTO) Innovation Initiative that encouraged Caltrans to pursue this effort. PoD supports Caltrans goals identified in the Right of Way and Land Surveys Strategic Direction related to future geospatial enabled right of way management systems.

What past Caltrans efforts laid the foundation for Plans on Demand?

Caltrans maintains hardcopy files of right of way documents for staff and the public at district Right of Way Engineering record counters. The Streets and Highways Code requires each district to provide public access to hardcopy mapping records. This was the only means to view these documents for decades.

In the late 1990's and early 2000's, Caltrans began automating the process to allow internal staff access to surveying field notes, right of way maps, and "As-Built" plans through a web interface. Investments were made in time and money to scan these documents, sheet by sheet, into the



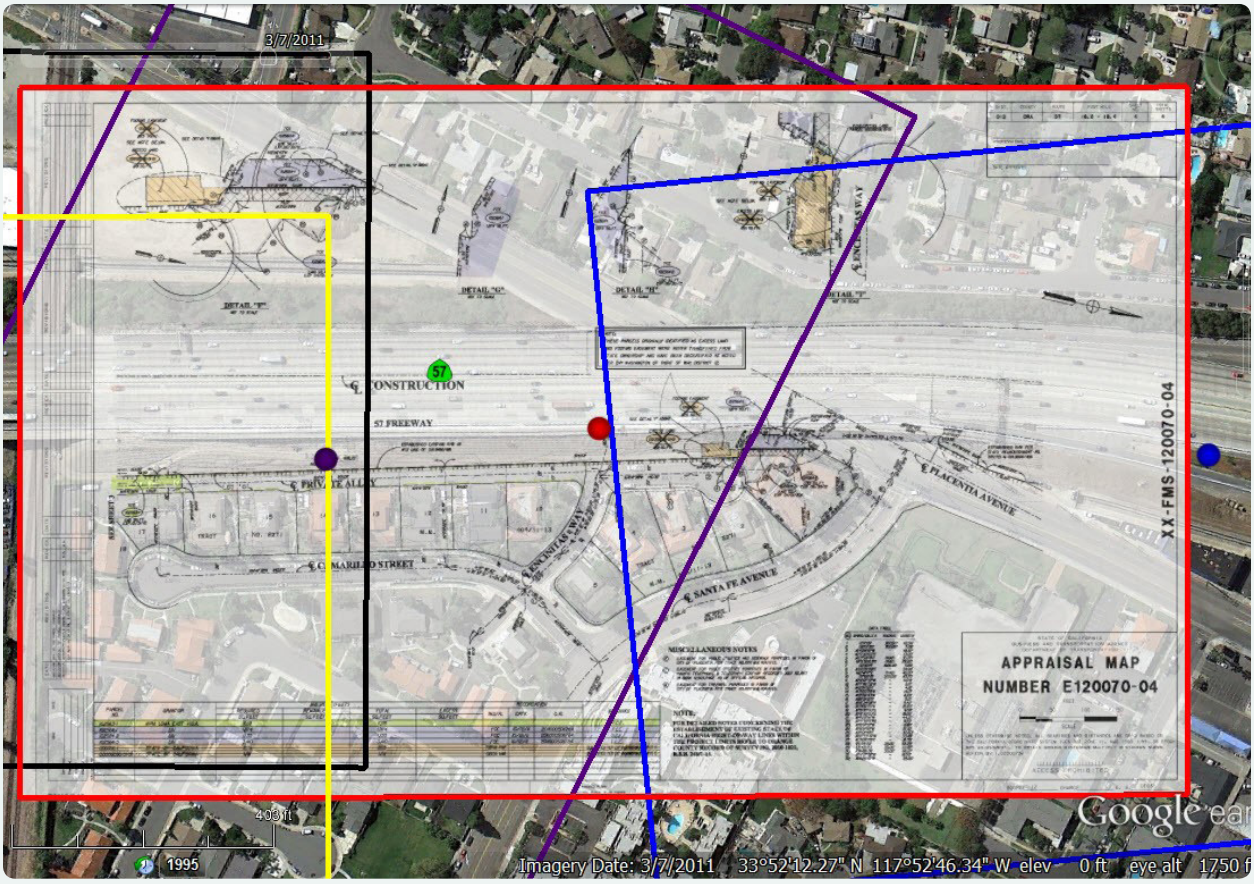
District 4 R/W & Surveys pioneered the use of computer-aided design and drafting (CADD)-GIS interoperability and program scripting to automate the georeferencing of over 17,000 maps. Maps are provided to Caltrans users via a web page built on ESRI's ArcGIS server Java API. When viewed over aerial imagery, the georeferenced maps make it easy to determine Caltrans' right of way at any location. Additionally, successive geo data creation efforts are built upon this base set. Today District 4 R/W provides a complete right of way layer and several parcel classes (Excess, Utilities, etc.) to users through a web map application called "CTrip." (Photo above.)

Caltrans Document Retrieval System (DRS). Documents in DRS could then be searched using criteria that includes County, Route, Post mile, and Project Identification number, and viewed or downloaded through the Caltrans intranet. Although DRS digital storage was an improvement, it was not designed to meet modern demands for georeferenced materials.

Over the last few years, further innovation initiated within Caltrans Districts, has produced increasingly streamlined techniques for georeferencing right of way maps, making them available for viewing in easily accessed web applications.

What is georeferencing?

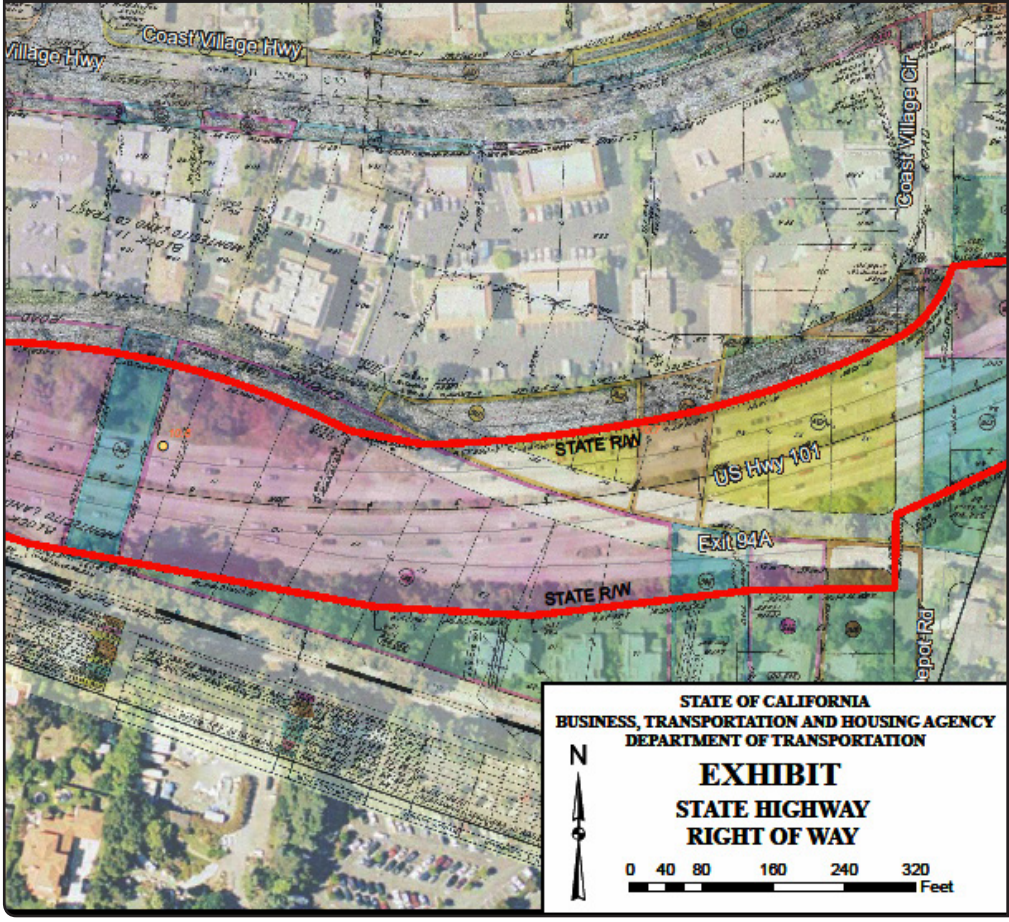
Georeferencing is a process of aligning digital images, such as maps or plan sheets, with their real world coordinate location on the earth. Georeferencing a map or plan sheet requires that the coordinates, scale factor, and rotation are stored with each scanned image. Once georeferenced, the scanned maps align with base maps and imagery, providing a visual overlay superimposing map information relative to Caltrans facilities, and the world in general.



District 12 has R/W Map files linked and the images georeferenced within Google Earth. Related textual and photographic data has been added in an informational placemark balloon. Research websites, as well as Geodetic and Public Land Survey System tools can be accessed via provided links. R/W Engineering Branch employs this powerful tool to enhance communication with local agencies, private surveyors/engineers, and the public. (Photo above.)

North Region Survey Data Center began the georeferencing effort by first converting tens of thousands of paper land survey monument records, including surveyed right of way monuments, private property corners, and geodetic control, to electronic format. These monument records cover 22 of California's 58 counties, and date back to nearly the turn of the 20th century. Once converted, monument records were mapped based on their associated grid coordinates. The Survey Data Center also developed a web GIS application called SMILE (Survey Monument Information Locator and Exporter), providing valuable monument data to Surveys field, office, and R/W Engineering staff.

Mapped monument locations became the foundation for georeferencing not only Right of Way Record Maps, but Monumentation Maps, Vacation and Relinquishment Maps, Control Line Maps, and historic Railroad Maps. Once georeferenced, these maps are published through ArcGIS Server services for use in web based (intranet) GIS applications, desktop GIS, Civil 3D and Microstation, where users can overlay various other thematic data for visual analysis, planning and project development. Additionally, accessing the maps through the web GIS application allows users to download the scanned image and associated file to their project directory for direct use. (Photo front cover.)



District 5 uses georeferenced right of way maps for quick planning and analysis along state routes. This photo illustrates how this technology can help create legal exhibits that assist Caltrans in being dismissed from claims arising from accidents outside of the State right of way. (Photo right)

The success and benefits of these local Caltrans efforts, and those demonstrated by other states associated with the AASHTO PoD initiative, prompted the Division of Right of Way and Land Surveys to expand this innovation to all districts. Benefits from PoD will be significant. Districts will not have to maintain independent electronic indexing systems for right of way maps. Standardized statewide support and training for PoD management will become available. Searching maps through the PoD web map will quickly support identifying Caltrans property ownership. Georeferenced documents in PoD should interface with Caltrans CADD and GIS software improving staff access to data.

What is next for Plans on Demand?

PoD will stimulate other innovations. The system established for PoD will also be able to store and visualize As-Built drawings and other types of engineering documents. When Caltrans ultimately establishes a public facing GIS, PoD will be able to share selected data. This data sharing should decrease traffic at Caltrans public counters and improve customer service.

As more maps are georeferenced, a statewide right of way dataset will be possible. Districts that were early users of georeferenced right of way map systems have gone on to develop vector land parcel data layers. Likewise, PoD should facilitate the creation of such right of way data sets statewide. Such GIS feature services are the key to future transportation asset management systems, which will rely on these tools for data-based decision making.

Past innovations laid the foundation for PoD. Innovation builds on innovation! The innovation favorable culture at Caltrans continues to provide new and improved tools for accomplishing our mission.

Meeting new challenges through leadership, innovation and teamwork.

Lean Six Sigma and Project Delivery

To ensure organizational excellence, most large organizations, including Caltrans are concerned with reducing backlog, errors, multiple quality checks, delays, and significant customer and employee dissatisfaction. Lean Six Sigma (LSS), a quality management methodology, is designed to attack the source of the inefficiencies and eliminate defects and re-work to increase customer and employee satisfaction. LSS is a data-driven process used by experts to improve the delivery of a product or process. By using cross functional teams, and an arsenal of analytical, quality, and efficiency tools, the teams can reduce variation and waste, build "mistake-proofing" directly into the process, and deliver a quality product at a faster rate.

LSS originated in the manufacturing industry over thirty years ago. The LSS methodology produces substantial results using a data-driven, focused approach to Caltrans delivery practices. LSS accomplishes these process transformations by integrating a set of powerful improvement tools with a five phase "DMAIC" methodology. This methodology provides a road map to not only transform processes, but also to become part of an organization's culture. These five phases are Define, Measure, Analyze, Improve, and Control, and when applied correctly, form a circle of cultural improvements to institutionalize the process improvements.

One of the benefits of LSS is the implementation of key performance metrics and corresponding control plans to monitor process performance and make further adjustments, when needed, to ensure process stability. Another unique benefit of LSS is that the identified process improvements are not just "recommendations." In order to institutionalize the improvements, the project Champion and Executive Sponsor must commit to the changes and support the necessary policy and manual revisions to implement the improvements statewide where appropriate.

Project Delivery is implementing LSS by: training staff in the DMAIC process to become certified Green Belts, piloting process improvement projects, adding LSS to its collection of process improvement tools, and continuing to look for opportunities to streamline the delivery of projects and services. In the last session of LSS training, Caltrans studied several aspects of inefficiencies. These included the Staff Central Time Sheet Reporting Process, and the Architectural and Engineering Services (A&E) contracting process.

Staff Central Time Sheet Reporting Process

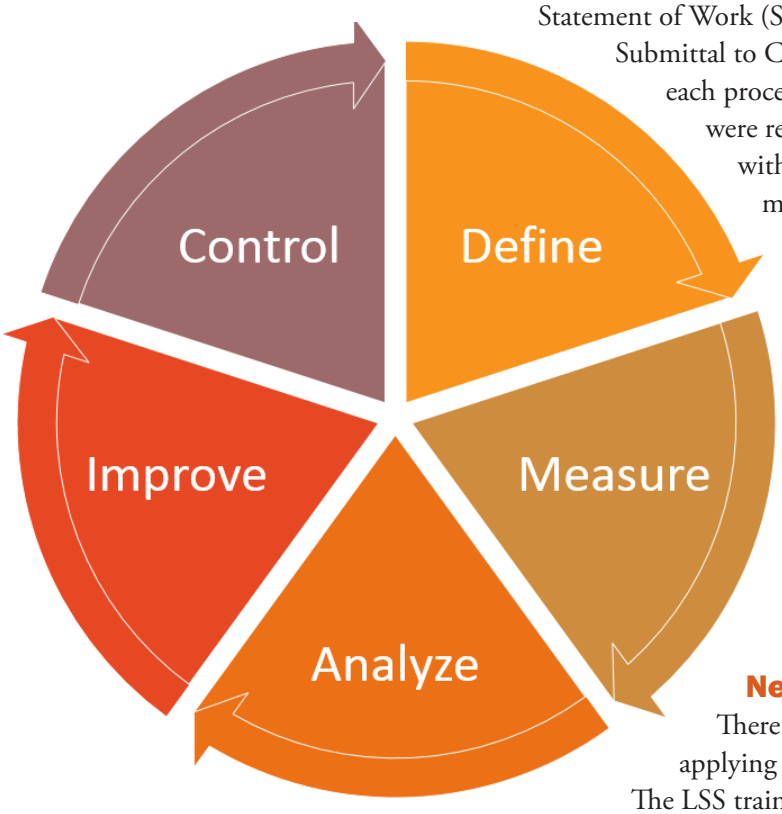
Division of Accounting initiated a Staff Central LSS project that will help improve Project Delivery. To tackle the project, Troy Tusup, the Value Analysis (VA) Program Manager, utilized his knowledge of VA and LSS to lead a team to address unsubmitted and unapproved time sheets. Typically, over 4000 incomplete timesheets were reported each week. This unreported labor resulted in missing reimbursed federal dollars, incorrect overhead charging, inaccurate leave balances, paycheck problems, and daunting timesheet corrections. Utilizing the LSS process, the team initiated "one-click" access, and an email reminder system to the Weekly Time Reporting page in Staff Central.

Accurately tracking weekly activities is an essential business practice. Accurately reporting project related reimbursed activities translates into accurate workload balancing and staff resourcing. To become a performance-driven and transparent organization, time sheet reporting will play a crucial part in

becoming the "consultant of choice." These LSS process improvements have already helped project delivery eliminate 80% of the unreported labor expense report.

Architectural and Engineering Services (A&E) Contracting Process

Division of Procurement and Contracts (DPAC) initiated two LSS projects that will help improve Project Delivery. To tackle the A&E process, Christine Inouye and John Neri developed two LSS projects: Statement of Work (SOW) approval and SOW Package Submittal to Contract Execution. Prior to the studies, each process averaged over 100 days. These processes were re-engineered by running parallel activities with the introduction of cross-functional meetings; new templates and checklists to eliminate errors and missing data; and replacing the vendor financial document review with a seven-day audit review of financial documents. By eliminating non-value added activities and simplifying the "draft-review-rework" cycles, once fully implemented, the A&E SOW approval process will be streamlined to 30 days and the A&E contract award process will be reduced to 45 days.



Lean Six Sigma Projects employ a five step DMAIC methodology: Define, Measure, Analyze, Improve, Control.

Next Steps

There are many further opportunities for applying LSS methodologies throughout Caltrans. The LSS training program provides an opportunity for individuals to learn a new process, lead a team, sharpen their leadership skills, interact with executive management and make innovative improvements that make Caltrans a more responsive and performance based organization. In the next round of LSS training, new Green Belts are improving the contract award process (Ready to List to Award) and the Environmental Permit Acquisition process. Further implementation of the LSS methodology will enable Project Delivery to better meet Caltrans' vision of being a performance-driven, transparent and accountable organization that values its people, resources and partner, and meets new challenges through leadership, innovation and teamwork.