

# AASHTO Innovation Initiative

[Proposed] Nomination of Innovation Ready for Implementation

## Sponsor

Nominations must be submitted by an AASHTO member DOT willing to help promote the innovation. If selected, the sponsoring DOT will be asked to promote the innovation to other states by participating on a Lead States Team supported by the AASHTO Innovation Initiative.

1. **Sponsoring DOT (State):** California DOT
2. **Name and Title:** Yinleng Vang, P.E., Transportation Engineer

**Organization:** California Department of Transportation (Caltrans)

**Street Address:** 1352 W Olive Ave

**City:** Fresno

**State:** CA

**Zip Code:** 93728

**Email:** Yinleng.Vang@dot.ca.gov

**Phone:** 559-284-0261

**Fax:** N/A

## Innovation Description (10 points)

The term “innovation” may include processes, products, techniques, procedures, and practices.

3. **Name of the innovation:**

ADA Data Collection System

4. **Please describe the innovation.**

Caltrans is developing an Americans with Disabilities Act (ADA) mobile data collector, review dashboard, and an inventory GIS Webmap. This is being done in order to address several challenges surrounding the

ADA inspection, inventory accuracy, and inventory mapping. The innovation has four primary components and objectives: (1) convert inspection from being paper-centric to a digital-centric workflow; (2) digitize the ADA review and certification workflow in real-time; (3) reconcile ADA data into a single relational database addressing the needs of all Caltrans divisions; and lastly (4), allow ADA data to be spatially available, accessible, and transparent. This is necessary to satisfy the business needs of construction, design and the ADA Transition Plan – plan to address non-compliant ADA assets. This solution received 2<sup>nd</sup> place in the 2021 Western Association State Highway Transportation Officials (WASHTO) for Innovation-Quality Awards and was presented at the 2020 California State Innovation Expo.

**5. What is the existing baseline practice that the innovation intends to replace/improve?**

ADA inspection and photo inventory was paper-centric for the entire state. When reporting performance measures at the end of Caltrans fiscal year, there will be significant data gaps in the performance resulting in funding constraints in project development. Caltrans is intending to streamline the data collection process by digitizing the inspection form to save time and resources by eliminating the need to transfer the information on paper inspection sheets onto the computer. This will also reduce human error through data transfer, which will lead to accurate data and will allow engineers to provide adequate work recommendations.

**6. What problems associated with the baseline practice does the innovation propose to solve?**

Most of the information prepared for ADA certification are archived and are not digitally accessible due to inspection primarily being paper-centric. The hand-written paper-centric inspection system often leaves higher degrees of error due to redundant data entries. As a result, many engineers will not only field-verify ADA elements, engineers will also conduct their own detailed field inspection to accurately scope work to retrofit, replace or add new ADA facilities. Inspectors on average record 40 field measurements and conduct qualitative assessment to ensure ADA compliance in accordance with the Design Information Bulletin 82-06 – a state document outlining multiple federal standards including Title II. Because of the granularity of the data required for ADA elements, there are multiple silos of how ADA information is stored, which stems from the varying business needs of different divisions.

**7. Briefly describe the history of its development.**

Due to a lawsuit filed in 2006 between Californians for Disability Rights and Caltrans (Case No. C-06-5125), Caltrans entered into a settlement agreement allocating funds annually to address non-compliant highway ADA facilities. For immediate needs, Caltrans hired consultants to prepare an inventory of non-compliant ADA elements across the State of California and to develop a Transition Plan for yearly planning of projects. The Transition Plan has succeeded in securing funding for ADA infrastructure improvement projects, but over the years, the Transition Plan was not able to help drive the project delivery process past the initial funding stage. To control and manage overhead cost of projects with ADA elements, engineering staff around the state outlined a workplan and scoped a solution in spring of 2020 to manage ADA information throughout a project lifecycle.

8. What resources—such as technical specifications, training materials, and user guides—have you developed to assist with the deployment effort? If appropriate, please attach or provide weblinks to reports, videos, photographs, diagrams, or other images illustrating the appearance or functionality of the innovation (if electronic, please provide a separate file). Please list your attachments or weblinks here.

YouTube – Inspection Process

[https://www.youtube.com/watch?v=t9LyQ0XLxKs&ab\\_channel=YinlengVang](https://www.youtube.com/watch?v=t9LyQ0XLxKs&ab_channel=YinlengVang)

ADA Innovation Presentation

<https://caltrans.maps.arcgis.com/apps/dashboards/cadbcb6a4a5847a8b80da792a5b97a9c>

GIS Database and Metadata Specification

<https://caltrans.maps.arcgis.com/apps/dashboards/afb7bb921f294845b01b19a34f6f6cf7>

Attach photographs, diagrams, or other images here. If images are of larger resolution size, please provide as separate files.

### ADA Mobile Data Collection

**Project Information**

70%  
Percent Complete

**In Progress**

04/13/20  
Start Date

06/16/23  
Finish Date

**Tasks by Status**

- Not Started
- In Progress
- Complete
- Cancelled

**Task Issues and Constraints**

Task Description	Status	Start Date	Comment	Task Des
Reconcile Inventory with Transition Plan	Cancelled	08/10/20	The old DB inventory and the transition plan has their own set of data quality issues making it problematic to even attempt reconciling the information.	Schema
Generate PDF DOCX Reports	Complete	06/28/21	Requires the use of Caltrans-approved automation tool. Intégrational is recommended from ESRI, but if it is not a Caltrans-approved automation tool, Microsoft Power Automate is a Caltrans-approved tool, but it is not available to Asset Management via Other option is to generate a custom reconciliation tool.	Schema Schema Schema Schema Custom Custom

**Schedule and Workplan**



### ADA Curb Ramp Inspection

**ADA Compliance Inspection Report (CEM-5773)**

If the curb ramp is not a part of the standard plans, select "N/A" for not applicable.

A, D, E   B   C   CH   CM   F, G   N/A

**Is the ramp perpendicular or parallel to the sidewalk?**

- Perpendicular
- Parallel

**Is this a conventional curb ramp? See examples below.**

- No
- Yes

**Examples of Conventional Non-Standard Ramp**

- Example 1
- Example 2
- Example 3

These "conventional" ramps are either modifications to current standards or are no longer a standard.

**Case B without the Right Flare**

### ADA Curb Ramp Inspection

**LEFT RAMP SLOPE (%)**

Federal: 8.3% or less   Caltrans: 7.5% or less

**Is there a ramp to the left?**

Yes

Bottom \*   Center \*   Top \*

8   8.2   8.1

Remarks

Federal: Compliant   Caltrans: Not Compliant

Ramp ID: ACR-00004

E Carlmill Ave, Tulare, Calif., 11 mi

**INFORMATION**

Case: Case CH  
County: TUL   City: Tulare  
Route: 99   PM: 31.84  
Position: Perpendicular  
Quadrant: Mid Block  
Date Built:  
Cross Street: N/A  
Passageway Type: Single  
Intersection Control: None  
Name of Inspector: Yinyang Wang  
Number of Photos Taken: 2  
Date of Inspection: 10/9/2020

**COMPLIANCE DETAIL REPORT**

Measure	Value	Federal State	Yes	No
Ramp Slope	7.2%	Yes	Yes	No

**Mobile Map**

**Surveyor Equipment and Spatial Network**

**Custom Database and Reporting Automation**

**ADA Assets in a Project Limit**

**Print Service**

Measure and verify the dimensions and slopes.					
Ramp Slope (x.x%)	Ramp Cross Slope (x.x%)	Ramp Width (inches)	Left Flare Slope at Back of Curb (x.x%)	Right Flare Slope at Back of Curb (x.x%)	Gutter Slope (x.x%)
A1 7.8	B1 1.3	C1 48.0	D1 16.6	E1 12.3	F1 1.4
A2 8.6	B2 3	C2 48.0			F2 1.2
A3 11.3	B3 8	C3 48.0			
7.7% or less?	1.7% or less?	48.75" or greater?	9.2% or less?	9.2% or less?	1.7% or less?
No	Yes	No	No	No	Yes

## State of Development (40 points)

Innovations must be successfully deployed in at least one State DOT. The All selection process will favor innovations that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use.

9. How ready is this innovation for implementation in an operational environment? Please select from the following options. Please describe.

- Prototype is fully functional and yet to be piloted
- Prototype has been piloted successfully in an operational environment
- Technology has been deployed multiple times in an operational environment
- Technology is ready for full-scale implementation

The innovation is 70 percent complete and is anticipated to address all known Caltrans business needs by June of 2023. The data collection and business processes have been fully developed for the highest priority ADA assets in Caltrans (e.g., curb ramps, passageways/pedestrian refuge island). As of this document, the most recently achieved milestone was establishing an equipment rental process from land surveying and to utilize their real-time network for high-accuracy coordinates. As of this document, over 50 ADA or Active Transportation projects across the state have utilized the innovation to scope and closeout projects.

10. What additional development is necessary to enable implementation of the innovation for routine use?

The needs of ADA project certification during closeout or post-construction will fully be addressed once the innovation is complete. Caltrans districts have already adopted the innovation for scoping ADA projects and for inventory management. In addition, the State Office of Civil Rights ADA Program have allocated additional resources to develop training material and policy development for statewide adoption. Student resources are also being allocated to conduct desktop data collection to archive past projects retrofitting or reconstruction ADA assets.

11. Are other organizations using, currently developing, or have they shown interest in this innovation or of similar technology??  Yes  No

If so, please list organization names and contacts. Please identify the source of this information.

Organization	Name	Phone	Email
County of Tulare	Carlos Gonzalez	559-624-7159	cgonzalez3@tularecounty.ca.gov

California Department of Transportation – North Region Construction	Kenneth Sutterfield	707-357-0365	kenneth.sutterfield@dot.ca.gov
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.

## Potential Payoff (30 points)

Payoff is defined as the combination of broad applicability and significant benefit or advantage over baseline practice .

12. How does the innovation meet customer or stakeholder needs in your State DOT or other organizations that have used it?

As a forementioned in question 6, different divisions across the state store their own repository of ADA information which stems from the varying business needs and reporting metrics for funding allocations. For example, deficient or non-compliant ADA elements are one of the performance measures Asset Management and the ADA Infrastructure Program is required to report in accordance to the State Highway System Management Plan (SHSMP) and the Transition Plan. Because of these diverse needs, ADA data has been comprehensive. Reconciliation, data housekeeping and management has been resource-intensive as well. With this innovation, there will now be a uniform, authoritative and more scalable format for how ADA information is stored and accessed.

13. Identify the top three benefit types your DOT has realized from using this innovation. Describe the type and scale of benefits of using this innovation over baseline practice. Provide additional information, if available, using quantitative metrics, to describe the benefits.

Benefit Types	Please describe:
Cost Savings	Based upon current evaluation of the ADA inventory, Asset Management estimates a one-time cost saving of \$2.1M in one Caltrans District alone. The cost savings are anticipated to be approximately 50% to 75% per element compliance inspection and reporting in perpetuity. The cost is based on an engineer’s hourly rate including overhead and the hours saved when utilizing the solution.
Organizational Efficiency	Project Development Teams and other Caltrans staff will now have reliable ADA information to accurately develop a project scope by determining the number of deficient ADA

	<p>elements and to close existing gaps in sidewalks. In addition, the construction engineering teams will now have the capability to digitally collect inspection data via mobile devices, submit, and view ADA inspection records online to streamline the ADA certification process. Through this effort, Caltrans is establishing a state data governance standard for asset-related data. Caltrans has also further enhanced the user experience by increasing transparency and data stewardship through documentation, training, communication, and leading by example. By providing a more efficient multimodal transportation network, including compliant ADA elements, this will help Caltrans become a more effective organization and be better stewards for the public.</p>
<p>Improved Customer Service</p>	<p>Caltrans has developed relationships with other Caltrans regions/districts and local agencies as a part of this effort. These relationships have resulted in a collaboration. These collaborations have also allowed Asset Management division to present at the 2020 Innovation Conference to various divisions across Caltrans and to external agencies. Asset Management has also pushed the boundaries for mobile inspection in Caltrans and have prepared articles assisting other staff in developing an offline-enabled mobile data collector.</p>

Provide any additional description, if necessary:

No additional description.

14 How broadly might this innovation be deployed for other applications. in the transportation industry (including other disciplines of a DOT, other transportation modes, and private industry)?

This innovation has already been discussed with local agencies and shared with professional organization including the American Public Works Association (APWA). The California Division of Local Assistance have also expressed interest in deploying this solution to local agencies to help with their ADA inventory. However, the internal resources required to provide technical support to local agencies have not been fully realized. Based on discussions with local agencies, it is likely funding will be allocated from regional measures and State Senate Bill 1 (SB1) as deferred maintenance (Section 36 Chapter 2 amended as of May 1, 2017) Road Maintenance and Rehabilitation Program. Caltrans will not be providing external access to ArcGIS Enterprise for security purposes, but the database documentation, source code, and form design can be made available as long as the intellectual property is reserved to Caltrans.

## Market Readiness (20 points)

The All selection process will favor innovations that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential.

15. What specific actions would another organization need to take along each of the following dimensions to adopt this innovation?

Check boxes that apply	Dimensions	Please describe:
<input checked="" type="checkbox"/>	Gaining executive leadership support	Provide a clear and concise business case. Convey how the existing allocation process and other related needs that can be improved on. Provide what resources are needed (workplan) and the anticipated timeline to complete the deployment.
<input checked="" type="checkbox"/>	Communicating benefits	Applications for federal and state funded projects are becoming more GIS data-driven. Mapping visuals with tabular data provide more transparent and effective communication.
<input checked="" type="checkbox"/>	Overcoming funding constraints	Cost savings has to be justified. As it stands, most local agencies may not have federal funds to support such development. Regional measures, local measures, and general funds will need to be allocated to deploy the solution.
<input checked="" type="checkbox"/>	Acquiring in-house capabilities	Staff must have expertise in GIS database architecture, web and mobile development as well as experience with project delivery and funding requirements. Communication, technical support and coordination across



		teams is essential for adoption. Knowledge in Real-Time Networks for high GPS accuracy is a plus.
<input checked="" type="checkbox"/>	Addressing legal issues (if applicable) (e.g., liability and intellectual property)	This solution works with existing Caltrans proprietary intellectual property as well as licenses procured through an enterprise agreement with ESRI. This solution is also an intellectual property of Caltrans. With local assistance, Caltrans can potentially provide the solution as a service.
<input checked="" type="checkbox"/>	Resolving conflicts with existing national/state regulations and standards	State ADA standard design and specifications for compliance are generally more conservative than the national standard (e.g., Title II). Although national standards govern compliance, the compliance logic for state or local agency standards may need updates depending on an agency's requirement.
<input type="checkbox"/>	Other challenges	Not applicable

16. Please provide details of cost, effort, and length of time expended to deploy the innovation in your organization.

**Cost:** Using a licensed engineer's hourly rate including overhead and other indirect charges, the total upfront cost of developing the innovation and system planning is approximately \$312,000. However, throughout the project lifecycle and using the Caltrans Transition Plan inventory, the estimated savings for one of twelve districts is approximately \$2.1M.

**Level of Effort:** The solution has been allocated two years worth of work hours at an engineer's hourly rate to address the ADA needs of multiple divisions. Since Spring of 2020, the first year of the innovation was dedicated to getting support from senior management. The first year was dedicated to getting the approval and support from internal stakeholders. This includes developing a workplan and conveying the benefits to get the necessary approval to procure the hardware and development resources. The workplan delineated the business processes of different divisions, and because multiple data systems

had separate repository of information, custom logic and user interfaces had to be developed to get all the systems to be synchronized. During development, the engineers also had to address constraints and develop contingencies for inspectors in case of overcast weather or if satellites are not available for high precision accuracy. Further coordination with the surveyors were required to help address unfavorable weather conditions and remote locations where signal is not available. With unfavorable weather conditions, remote locations, and GIS services that can only be accessed through IT-procured devices behind Caltrans firewall, offline configuration was crucial for the solution to be effective.

**Time:** Given 50% availability, the solution is anticipated to be complete by June 2023 (end of Caltrans fiscal year). This includes the time to improve documentation, scripting, training materials, and compiling reporting services.

**17. To what extent might implementation of this innovation require the involvement of third parties, including vendors, contractors, and consultants? If so, please describe. List the type of expertise required for implementation.**

No consultants or contactors are being utilized for the development of this solution. However, the companies ESRI (GIS), Microsoft (SQL Server), Apple (iPad), Verizon (Data) and Trimble (GNSS Receivers) are the main vendors providing the technology that is enabling Caltrans to innovate. The solution is being developed in-house by transportation engineers with coding, web development, ArcGIS Enterprise development, and database architecture experience in addition to the regular duties expected from engineers (e.g., utility coordination, construction inspection, cost estimation). The innovation is also being supported by other in-house staff providing their technical expertise regarding ADA needs and requirements.