State of California
DEPARTMENT OF TRANSPORTATION

California State Transportation Agency

M e m o r a n d u m

TAB 16

To: CHAIR AND COMMISSIONERS
CALIFORNIA TRANSPORTATION COMMISSION

CTC Meeting: March 16-17, 2016

Reference No.: 4.17
Action Item

From: NORMA ORTEGA
Chief Financial Officer

Prepared by: Mike Johnson
State Transportation
Asset Manager

Subject: **2016 TRANSPORTATION ASSET MANAGEMENT PERFORMANCE REPORT**

SUMMARY:

The California Department of Transportation's (Department) 2016 Asset Management Performance Report provides performance information related to Caltrans ongoing asset management implementation effort and performance information for the four core asset classes; pavement, bridges, intelligent transportation systems, and culverts that were approved by the California Transportation Commission (Commission) at its March 2015 meeting.

The Department's Asset Management Performance Report provides an overview of activities accomplished in 2015 related to the implementation of asset management and key activities planned for 2016.

The Asset Management Performance Report also provides the first State Highway Operation and Protection Program (SHOPP) Performance Report addressing the expected performance of the four core asset classes; pavement, bridges, culverts and ITS elements resulting from the 2016 SHOPP project portfolio and as well as how each of the core assets are represented as they relate to the adoption of the proposed 2016 SHOPP.

In accordance with Government Code Section 14526, as modified by Senate Bill 486, the Department must submit Phase 1 of the Transportation Asset Management Plan (TAMP) in conjunction with the 2016 SHOPP. This report is provided to meet the Phase 1 requirement of the TAMP.

BACKGROUND:

Federal regulations (MAP-21) and California Government Code Section 14526 both require the implementation of a TAMP to guide transportation infrastructure investments. Asset Management is a strategic and systematic process of operating, maintaining, and improving physical assets. Its focus is on engineering and economic analysis, based on quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired and sustainable state of good repair of the lifecycle of the assets at minimum practicable cost.

Attachment

2016

Asset Management Performance Report

(Asset Management Plan – Phase 1)

Prepared by the California

Department of Transportation

In Accordance with Government Code

Section 14526.5

Table of Contents

Executive Summary 3

Introduction 5

Background 6

Asset Management Implementation 7

- Implementation Status of Major Asset Management Milestones 7
- Inventory 7
- Condition Assessment 8
- Performance Measurement 9
- Performance Gap Analysis 10
- Project Prioritization 10
- Planning Business Process Review Activities 11
- External Stakeholder Awareness and Involvement 12
- Deterioration Modelling 13
- Risk Management 13
- Life Cycle Cost Analysis 14
- Enterprise Asset Management Software 14

2016 Asset Performance Report 16

- Pavement Assets 17
  - Inventory 17
  - Condition Trends 17
  - 2016 SHOPP Investment 18
- Bridge Assets 19
  - Inventory 19
  - Condition Trends 19
  - 2016 SHOPP Investment 20
- Intelligent Transportation System Assets 21
  - Inventory 21
  - Condition Trends 21
  - 2016 SHOPP Investment 22

Culvert Assets 23
Inventory 23
Condition Trends 23
2016 SHOPP Investment 24
Looking Forward 25

Executive Summary

2015 was a year marked with many activities related to the implementation of asset management in California. These activities include:

- Completion of an updated automated pavement condition survey of state highway pavement.
- Rollout of new condition assessment methods for pavement and bridges
- Refinement of State Highway Operation and Protection Program(SHOPP) project prioritization methodology through an asset management pilot program
- CTC adoption of the four core asset classes: pavement, bridges, culverts and Intelligent Transportation System (ITS) Elements
- Adoption of performance measures for all four asset classes (Pavement and bridges pending final federal rulemaking).
- Collection of risk management information required by the Moving Ahead for Progress in the 21st Century (MAP-21) and continued in the Fix America's Surface Transportation (FAST) Act.
- Implementation of the SHOPP Management Tool
- Evaluation of several commercially available asset management software programs
- External outreach to our transportation partners through workshops and the formation of the Transportation Asset Management Advisory Committee (TAMAC)
- Initiation of contracts to provide consultant assistance with our Transportation Asset Management Plan (TAMP) development and project prioritization efforts

The 2016 Asset Management Report provides performance information for the four core asset classes; pavement, bridges, intelligent transportation systems, and culverts. Performance charts and discussion of each of the four asset classes are presented reflective of the proposed 2016 SHOPP project portfolio.

At current investment levels in the SHOPP, the condition of the pavements are expected to remain fairly flat for the coming five year period at approximately 8,300 distressed lane miles of pavement. Distressed bridge counts are expected to increase near term and then level out at to an estimated 555 distressed bridges by 2020. The culvert inventory is expected to continue to expand as the program continues their initial inspection efforts. Culverts conditions are expected to continue to grow as the inventory expands with approximately 13% of the known inventory in poor condition. The condition of ITS elements (changeable message signs, ramp meters and traffic loop detectors) are expected to lag desired performance levels due to a lack of projects to specifically address the lagging loop detector health.

In recognition of the growing culvert inventory needs and lagging ITS element condition, 2016 SHOPP reservations of $100 and $150 million respectively are proposed to reserve

funding until planning documents can be completed in these two areas. Once planning studies are completed, these projects would be proposed for amendment into the 2016 SHOPP against these reservations.

With the noted strategic changes in our investments within the 2016 SHOPP, Caltrans expects to be able to hold the major assets at current conditions or better while simultaneously increasing the culvert and ITS investment to improve future conditions in these two asset classes.

Many significant activities are planned for 2016 related to the implementation of asset management as the program marches toward full implementation in 2020. Planned activities include:

- Completion of locally owned NHS pavement condition survey
- Scheduled final rule making of performance measures for pavement and bridges
- Development of the asset management system requirements
- Beginning a shift to performance management in the 2017 SHOPP Ten Year Plan

The asset management implementation will require the development of an asset management software system. The development of this application is dependent on Information Technology approval and funding package. This is a substantial critical path activity in the overall implementation effort. In 2016, Caltrans will begin the process of defining business requirements and gaining necessary approvals to move forward with this aspect of the asset management implementation.

Introduction

This California Department of Transportation (Caltrans) Asset Management Performance Report provides an overview of activities accomplished in 2015 related to the implementation of asset management and key activities planned for 2016.

The Asset Management Performance Report also provides the first State Highway Operation and Protection Program (SHOPP) Performance Report addressing the expected performance of the four core asset classes; pavement, bridges, culverts and ITS elements resulting from the 2016 SHOPP project portfolio.

The California Government Code section (14526) modified by Senate Bill 486 requires Caltrans to submit Phase 1 of the asset management plan in conjunction with the 2016 SHOPP. This report is provided to meet the Phase 1 requirement of the TAMP.

Background

Federal regulations (MAP-21) and California Government Code (14526) both require the implementation of a TAMP to guide transportation infrastructure investments. Asset Management is defined by the American Association of State Highway and Transportation Officials (AASHTO) as "a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle. It focuses on business and engineering practices for resource allocation and utilization, with the objective of better decision making based upon quality information and well defined objectives".

California Government Code (CGC) requirements call for a "robust asset management plan" to guide the investments in the SHOPP. The CGC requires full implementation by 2020 with Phase 1 to be delivered in 2016. The scope of the TAMP under the CGC is not specifically defined, however subsequent action by the California Transportation Commission (CTC) has focused the initial implementation on pavement, bridges, culverts and intelligent transportation system elements. The CGC requirement is directed to the State Highway System assets and the SHOPP investment program.

The federal regulation governing asset management was introduced in the Moving Ahead for Progress in the 21st Century (MAP-21) regulations and carried forward in the Fixing Americas Surface Transportation (FAST) Act. Compulsory items under federal regulations include the following:

- Summary listing of the pavement and bridge assets
- Description of the condition of those assets
- Asset management objectives and measures
- Performance gap identification
- Lifecycle cost and risk management analysis
- Financial plan
- Investment strategies

Federal regulations require that the California TAMP address both state and local agency owned pavements and bridges on the National Highway System (NHS). Federal regulations also standardize the condition assessment methods and performance measures for pavement and bridges. The federal implementation timeline is contingent on the date of the finalization of rule making efforts. Caltrans timeline for implementation could be accelerated through the federal rule making process.

The implementation of asset management in California must "thread the needle" and satisfy both sets of regulations with a single strategic plan.

Asset Management Implementation

The implementation of Transportation Asset Management (TAM) in California will involve a number of significant changes to Caltrans business processes, software systems and culture of transportation managers at both state and local levels. In 2015 with the enactment of Senate Bill 486, Caltrans began the steps necessary to meet the 2020 implementation date set forth in statutes. Key implementation areas defined in CGC and Federal Regulation (MAP-21) are defined below with accomplishments in 2015 summarized in the following pages.

Implementation Status of Major Asset Management Milestones

Activity	Status	Target Date
Establishment of the Asset Classes	**Adopted by CTC March 2015**	**Complete**
Establishment of the performance measures for the four asset classes	**Adopted by CTC March 2015**	**Complete**
Internal/External Stakeholder Engagement	Ongoing	NA
Define inventory for the four asset classes	80% Complete	2016*
Performance Goal Setting (Targets for four asset classes)	**Not Started**	**2017**
Performance Gap Analysis	Not Started	2017
Assess the condition of the asset classes	60% Complete	2018*
Risk Management	80% Complete	2018
Performance Management	20% Complete	2019
SHOPP Project Prioritization (MODA)	60% Complete	2020
Deterioration Modelling	25% Complete	2020
Life Cycle Cost Analysis	Not Started	2020
Publish Transportation Asset Management Plan	**Not Started**	**2020**
Enterprise Asset Management Software Development	Not Started	2022

* - Culvert inventory will not be fully defined or assessed until 2024, Bolded items require CTC approval

In 2015 we devoted a large part of our effort to the foundational building blocks of asset management. The foundation of asset management involves having an accurate inventory and condition assessment of assets in their current state. The bolded headings indicate the combined compulsory requirements of these two regulations governing the implementation of asset management. Some reporting requirements for the SHOPP required under CGC requirements have been omitted from this document if they do not directly apply to the asset management implementation.

Inventory

In 2015, Caltrans continued and expanded efforts already underway to strengthen the inventory definition of the four core asset classes; pavement, bridges, culvert, and ITS elements.

Significant accomplishments include initiating a contract for the collection of pavement condition on the locally owned portions of the National Highway System (NHS) in California. The definition of the NHS was expanded by the Moving Ahead for Progress in the 21st Century (MAP-21) regulations to include pavement and bridges owned by cities and counties in California on designated routes. This contract will result in a comprehensive pavement inventory for the entire NHS in California in 2016.

California's inventory of bridges on both the state and local systems is complete under provisions of federal requirements that have been in place for many years.

Efforts continued to build the initial inventory of culvert and drainage structures in California. Caltrans has been building this inventory over time and currently has over 105,000 culverts documented. While substantial progress has been made, we estimate that there are another 100,000 culverts not in our asset inventory at this time. Locating and inventorying of these culverts is a challenge due to heavy overgrowth, difficult access, and limited staffing and equipment allocated for this work. In 2016, Caltrans will continue to expand the culvert inventory. The full culvert inventory is expected to be completed by 2024.

The ITS inventory was established prior to the enactment of Senate Bill 486, however in some cases this inventory lacked complete data that is necessary for asset management. In 2015, efforts were undertaken to bolster the ITS inventory to facilitate asset management of these system operation elements.

In addition to looking at the current state of the inventory for each of the four core asset classes, Caltrans began conceptual planning for how to integrate this information into a single asset management system database. A preliminary format for this combined information was developed and will be used for development of the asset management system requirements.

Condition Assessment

Asset management relies on having a good baseline of existing asset conditions. The enactment of MAP-21 resulted in changes in the way that pavement and bridge conditions are assessed.

Federal requirements for pavement condition assessment were expanded to include new attributes not previously captured by pavement condition surveys. The condition assessment of the State Highway pavement will be improved with the completion of the 2015 automated pavement condition survey. The new pavement condition information will provide the most comprehensive and objective status of pavement conditions. The improved condition assessment and new local NHS inventory represent fundamental steps in our progress toward a fully implemented asset management plan.

MAP-21 also required all states to implement a new bridge condition assessment method. Caltrans began conducting inspections using the new assessment protocol in July 2014 and continues to increase the number of bridges inspected utilizing the newest standard. By July 2016, approximately 65 percent of bridges will have been inspected using the new assessment method.

Culvert condition assessment utilizes specialized robotic crawlers that enter smaller pipe culverts to capture video information of the culvert condition. This video information is converted to numerical scores used to determine the overall condition of the culvert. This inspection method produces good results but is time consuming and limits the number of culverts that can be assessed with the available robotic equipment inventory.

ITS element condition reporting in the past has focused on whether the equipment was operational or not. In order to make the performance connection to the SHOPP it was necessary to refine the condition assessment to include the cause of the non-operation. In some cases, ITS elements were reported accurately as non-operational when being relocated during an active construction project. This non-operational status would not require any additional SHOPP action and therefore needed to be excluded from the reporting. Data collection changes put into place in 2015 allow SHOPP ITS needs to be isolated from maintenance needs and construction activities.

Performance Measurement

Under provisions of MAP-21, all states are required to utilize nationally defined performance measures for pavement and bridges. These measures were called out in regulation as good, fair and poor condition based on the surface area of the asset. The specific details of what constitutes good, fair and poor was left to the federal rule making process. In 2015, a Notice of Proposed Rule Making (NPRM) was issued to begin the process of defining the specifics of these performance measures. Caltrans provided comments and suggested changes to these proposed rules based upon internal and external discussions. The final performance measure rule is currently scheduled to be released in the summer of 2016. In March of 2015, the CTC adopted the proposed performance measures for pavement and bridges. The CTC further granted Caltrans the authority to continue to use existing performance measures until the federal measures become regulation. Therefore, the 2016 Asset Management Performance Report will utilize distressed lane miles and distressed bridges as measures.

Caltrans developed state specific measures for culverts and ITS elements because they do not have a national performance measure requirement. For culvert assets, Caltrans opted to model the measure after the good, fair and poor condition assessment measures used for pavement and bridge. Similarly, the ITS performance measure was able to be finalized

using a good and poor assessment related to operational status. These measures were adopted by the CTC in March of 2015.

Caltrans has been awaiting the final rule making for the pavement and bridge performance measures. The Federal Highway Administration has a scheduled final rule date of July 2016. The date for the final rule is beyond the control of the department. If the schedule for the final rule is further delayed beyond July 2016, Caltrans plans to develop our own technical criteria for the missing technical parameters in these proposed performance measures. This would allow Caltrans to develop the 2017 SHOPP Ten Year Plan utilizing Good, Fair and Poor measures for pavement and bridges, however it would carry the risk of potential future changes once the federal rule becomes final.

Performance Gap Analysis

Caltrans has performed performance gap analysis in our SHOPP Ten Year Plans for over a decade. These plans establish an unconstrained fiscal need necessary to achieve a desired condition or performance goal and a fiscally constrained performance level. The difference between these two plans represent the gap analysis required under provisions of MAP-21.

Historically, SHOPP Ten Year Plans have focused on fiscal need first and performance second. For the 2017 SHOPP Ten Year Plan, Caltrans intention is to move to a performance based plan as the primary measure, with funding required to achieve the plan as an outcome of desired performance. This will mark a fundamental shift in thinking within Caltrans. This new approach is consistent with the multi-objective approach of project planning and delivery.

Project Prioritization

Improvement and documentation of the SHOPP project prioritization methodology continued in 2015. Caltrans began implementing a Multi-Objective Decision Analysis (MODA) approach for project prioritization. The MODA framework for project prioritization was first piloted in parallel with the 2014 SHOPP. In the initial pilot effort, the focus was on evaluating if the MODA framework could be effectively applied to SHOPP project evaluation.

The MODA approach is the state of the art practice for multi-criteria decision analysis applied to transportation asset management. The MODA approach allows agencies to evaluate project benefits across multiple assets and competing investment decisions. As applied to the SHOPP, MODA will allow project benefits ranging from condition improvement to safety improvement and sustainability efforts to be evaluated in a common framework. When fully implemented, the MODA project evaluation will provide the following benefits:

- The benefits in each of the five Department Strategic Goal areas will be determined at a project level. This will effectively tie SHOPP project prioritization to the broader goals of the Department.
- Allow the department to prioritize projects from highest to lowest benefit cost ratio across the entire SHOPP regardless of asset composition and will incorporate condition improvement, safety, operations, and sustainability objectives among others.
- Ability to measure the benefits of projects that involve multiple objectives and shift our project development culture from one of a largely silo based funding centered on a single objective to more comprehensive transportation solutions. This change in approach will provide the opportunity for greater economies of scale, better local partner coordination and less disruption to traffic.
- A byproduct of the MODA implementation is a comprehensive documentation of how projects are prioritized and selected in the SHOPP. This documentation will provide a level of transparency that has been desired by external partners and oversight agencies.
- Provide Caltrans with the ability to maximize the impact of investment of each transportation dollar.
- Provide the CTC with information necessary to implement the Commission's responsibilities for the SHOPP.

Planning Business Process Review Activities

The implementation of asset management will inevitably require business process changes in Caltrans system and project planning to support the new requirements. In 2015, a number of efforts were initiated to begin the process of defining necessary changes and to develop plans for the implementation of these changes. The Caltrans' Division of Planning initiated "Planning Forward" and "Planning to Programming" reviews. These consultant assisted reviews take a fresh look at the products of system planning and how these products meet the current needs of Caltrans and external partners. The Planning to Programming effort is looking at how system planning efforts can better support asset management and project level programming of projects.

Asset management implementation requires information for project prioritization and performance management that is not currently available in project initiation documents. In 2015, an asset management pilot program was developed to engage our districts in the process of developing multiple objectives project nominations prior to the initiation of formal project planning. The asset management pilot required our districts to produce projects that achieved at least three Departmental objectives in a single project. The specific objectives were left to the districts to define. The criteria for the pilot projects required the districts to develop multi-disciplinary teams that brought together various

project perspectives at the concept phase of project development. Feedback from Caltrans districts indicated that in many cases, this requirement demanded a more global approach to project scoping that was seen as beneficial. The multi-objective requirement also led to several districts consolidating highway system needs and deficiencies in a spatial format to better "see" needed comprehensive system improvements.

These asset management pilot projects were "nominated" using an abbreviated process that provided the information necessary for project prioritization prior to formal planning efforts. The asset management pilot program will inform the development of a standardized "project nomination" process that will allow projects to be prioritized prior to being resourced for formal project planning. This project nomination process is proposed to be moved into a web based software wizard format that will allow projects to dynamically compete statewide for project planning resources.

The asset management pilot program engaged five internal teams of subject matter experts to develop criteria for evaluation of 37 pilot program nominations. These teams worked for over six months developing objective data driven prioritization criteria necessary to rank the pilot program nominations. Selected projects in this pilot program will begin formal planning efforts and will become 2018 SHOPP candidates. This process facilitated the selection of the "winners" of the pilot program and also resulted in identification of evaluation information needs that will inform future project initiation document changes. The evaluation criteria also resulted in the first comprehensive documentation of a project selection criterion that covers all SHOPP objectives.

External Stakeholder Awareness and Involvement

Caltrans took a number of steps to increase external stakeholder awareness of the requirements of asset management and engage partners in key decisions. Caltrans held two workshops with external partners during 2015.

One workshop focused on the performance management requirements included in MAP-21. This workshop included city, county, Metropolitan Planning Organizations (MPO), Regional Transportation Planning Agencies (RTPA), the Federal Government and Caltrans staff. Keynote speakers included an invited guest from the Office of Performance Management in Washington D.C. During this session, Caltrans presented information on the current inventory, condition and performance of the four defined asset classes. The Department also received significant feedback on the collection of locally owned NHS pavement inventory and condition information.

Caltrans also co-sponsored an Asset Management and SHOPP workshop with the CTC. This workshop was held in conjunction with the California Council of Governments (CalCOG) Executive Board meeting and featured presentations by Caltrans and CTC staff on asset management and the SHOPP development process. A discussion session followed the

presentations that provided the Department with a number of partner suggestions for improvement.

Caltrans also established a Transportation Asset Management Advisory Committee (TAMAC) comprised of MPO, RTPA and advocacy groups. The TAMAC is a standing committee that will be providing input on numerous aspects of the asset management implementation effort. This committee was asked to develop an independent project prioritization methodology as part of the asset management pilot program. The TAMAC was further asked to rank the 37 pilot project nominations independently of Caltrans. The goal was to provide external partners an opportunity to propose a project prioritization methodology that could be evaluated along with the internally developed criteria to arrive at the best possible approach.

Deterioration Modelling

An assessment of the viability of existing deterioration models for the four asset classes was completed in 2015. Deterioration models are necessary for the Department to evaluate expected future performance and perform programmatic life cycle cost analysis. The pavement and bridge management systems used by the Department both have existing deterioration models.

The culvert and ITS assets do not have defined deterioration models. The ITS element deterioration is largely a service life based model that the Caltrans Division of Traffic Operations began developing in 2015. This deterioration model relies on acquiring the extended data set discussed in the condition assessment section of this report. Preliminary discussion of methods to develop a culvert deterioration model took place in 2015. The culvert program continues to perform the initial inventorying of culverts statewide. With the focus on identifying where all the culverts are located and establishing current condition, repeated inspections of the same culverts have not been possible on a programmatic scale. Without a history of performance of the culverts, alternative methods were explored to establish a reasonable deterioration model. Work on the ITS and culvert deterioration models will continue in 2016.

Risk Management

MAP-21 required and the FAST Act confirms the requirement that the asset management plan be "risk based". This requirement is interpreted to mean two distinct activities: the identification of risks that could impact the delivery of agreed upon performance targets and the incorporation of transportation risks in the project prioritization methodology. The MODA approach satisfies the latter requirement.

The risks that could impact or prevent state and local agencies from delivering agreed upon performance include such things as changes in transportation funding levels, general

economic pressures, construction cost increases, political changes in transportation focus, local agency priorities, climatic deterioration and more. In 2015, the Caltrans Enterprise Risk Management Office conducted workshops with all twelve Caltrans Districts and local agencies in order to develop a risk register of items that may influence the ability of California transportation agencies to deliver agreed upon performance. It is worth noting that the agreed upon performance will include agreements with both the Federal Highway Administration (FHWA) and the CTC. In early January 2016, it is not yet possible to establish TAM performance targets that satisfy the requirements of MAP-21 due to the incomplete inventory data, condition assessments, and the absence of final performance measures coming out of the federal rule making process.

The risk information from the workshops conducted in 2015 is being analyzed and documented and will form the basis for the risk management portion of the TAMP.

Life Cycle Cost Analysis

MAP-21 requires that all states implement life cycle cost analysis in their TAMP's. This life cycle cost analysis occurs at the network level and should not be confused with project level alternative evaluations. Network level life cycle cost analysis is independent of project limits or location with the exception of environmental and operational deterioration influence. None of the individual asset systems are capable of performing this level of analysis currently. The State Asset Management Engineer is evaluating options for how to satisfy this requirement. It is likely that a custom software application will be necessary to perform this level of analysis for all four core asset classes.

It is worth noting that the Department does utilize a project level life cycle cost analysis tool called RealCost when warranted. The RealCost tool is a sophisticated Excel spreadsheet that was developed by the FHWA and distributed for free.

Enterprise Asset Management Software

Asset management implementation in California will require the development of an enterprise asset management software system. This software will integrate a number of existing Departmental systems that house inventory and condition information, manage projects, fiscal system, and geographical information systems. During 2015, the Department met with a number of commercial asset management software vendors to assess what capabilities these tools have relative to our business requirements. The development of the transportation asset management system will represent a significant investment in the management of infrastructure and the projects selected for funding in the SHOPP.

In 2016, Caltrans will begin formalizing the business and data requirements of this software system in order to develop a funding plan and feasibility study for the

development. The development of the asset management software solution is currently a critical path item for the overall implementation. It is expected that the development of the underlying linear referencing system backbone to support the spatial requirements of asset management and the asset management software itself will likely take 2-3 years to implement once contracts are executed. The development of the feasibility study report is expected to take approximately 12 months to develop and secure necessary approvals internally, from the Department of Technology Services, and from the Department of General Services. Caltrans is evaluating options to utilize consultant or retired annuitant resources in order to expedite the completion of the feasibility study and requirements document.

2016 Asset Performance Report

The ultimate goal of TAM is to develop a strategic approach to managing investments in order to achieve a desired condition or performance level for the transportation network. California Government Code requires that TAM apply to the SHOPP.

The SHOPP is the primary program available to the Department to execute the asset management plan. The Maintenance Program also provides critical maintenance and preservation efforts during the early stages of asset deterioration that collectively reduce the demand for SHOPP funding. The SHOPP and Maintenance Program efforts are related through the SHOPP Ten year Plan and Five Year Maintenance Plans. Ultimately these two plans, required under separate state laws, could be combined into a single asset management document if this would satisfy the separate requirements.

In 2015, the provisions of Senate Bill 486 were signed into law by Governor Brown, requiring the department to implement "a robust asset management plan" by the end of the 2020. The CGC requires that "Phase 1" of the asset management plan be produced in conjunction with the 2016 SHOPP.

The following performance information for the 2016 SHOPP reflects the asset management accomplishments achieved in 2015. This is the first ever performance reporting of this nature for the SHOPP covering the four core asset classes adopted by the CTC in 2015.

This reporting shows the progress made by the department in implementing a formal transportation asset management program. Though meaningful progress was made in 2015, it is important to remember that this is only 20 percent into the implementation time period provided in law.

Recognizing the current asset management implementation stage, this report relies on information available at the time of writing and asset management tools already in place. The expectation is that this performance report will be a building block that can be improved through implementation efforts and feedback as we move closer to full implementation in 2020.

Pavement Assets

Inventory

The State Highway System consists of 49,645 lane miles of pavement. To provide a visual, the area of pavement being managed by Caltrans could cover every inch of San Francisco County almost twice over. The reported pavement area does not reflect shoulders and on and off ramp pavement that would add additional area that the Department is responsible for maintaining.

Condition Trends

The most recent five years of performance and projected condition performance for the coming five years is presented in Chart 1 below. The existing "distressed lane mile" performance measure is used for reporting. A distressed lane mile is defined as a pavement section that has more than one defined threshold of cracking or has measured pavement roughness beyond established levels or combinations thereof. The historic goal for pavement is 5,000 distressed lane miles or 10% of the total inventory.

The projections of future performance assumes that the funding level available to rehabilitate pavement remains at current funding levels, deterioration rates follow historical patterns and construction buying power remains flat over the five year period. It also assumes the adoption of the 2016 SHOPP projects as proposed and a stable funding picture for pavement maintenance through the Caltrans' Maintenance Program.

Chart 1 - Pavement Performance Trend and Forecast Performance

Pavement condition beyond 2016 is projected to remain fairly flat as current funding levels are just sufficient to treat the natural deterioration of pavements across the network.

Additional funding would be required to further reduce the number of distressed lane miles. Chart 1 shows significant drops of distressed lane miles in 2011 and 2012. These two significant drops reflect the one time change in the sampling selection method used for pavement condition assessment and additional funds from ARRA (American Recovery and Reinvestment Act) funding of 2009.

2016 SHOPP Investment

The 2016 SHOPP project portfolio includes 143 pavement preservation or rehabilitation projects that will work on a combined 4,876 lanes miles of pavement throughout California. Collectively these projects will provide thin overlays on 3,198 lane miles (750 distressed lane miles) of pavement and rehabilitate or replace 1,678 lane miles (312 distressed lane miles). The total 2016 SHOPP investment in the pavement condition statewide is $2.8 billion over the four year period from July 2016 – June 2020.

Notable pavement projects include the following:

- District 3 – Interstate 5 in Sacramento $175 M 53 Project Lane Miles
- District 4 – Interstate 680 in Alameda $142 M 63 Project Lane Miles
- District 7 – Interstate 210 in Los Angeles $125 M 52 Project Lane Miles
- District 8 - Interstate 15 in San Bernardino $173 M 95 Project Lane Miles

Note: The projects noted above include pavement work in addition to other improvements.

Bridge Assets

Inventory

The State Highway System relies on almost 13,000 bridges to carry the highway over waterways, canyons and intersecting roadways. The total bridge deck surface area is more than 251 million square feet. If one were to place all the bridges end to end, bridges would span from Mexico to the Oregon border.

Condition Trends

The most recent five years of bridge condition performance and projected performance for the coming five years is presented in Chart 2 below. The performance chart is based on the existing performance measure of "distressed bridges". A distressed bridge is defined as any bridge that has a rehabilitation, replacement, scour or seismic retrofit need that has been identified by an engineer either through inspection or analysis. The historic goal is three percent of the inventory or 400 distressed bridges.

The projections of future performance assume that the funding level available to rehabilitate bridges remains at current funding levels, deterioration rates follow historical patterns and construction buying power remains flat over the five year period. Chart 2 also assumes the adoption of the 2016 SHOPP projects as proposed and a stable funding picture for the Bridge Maintenance Program.

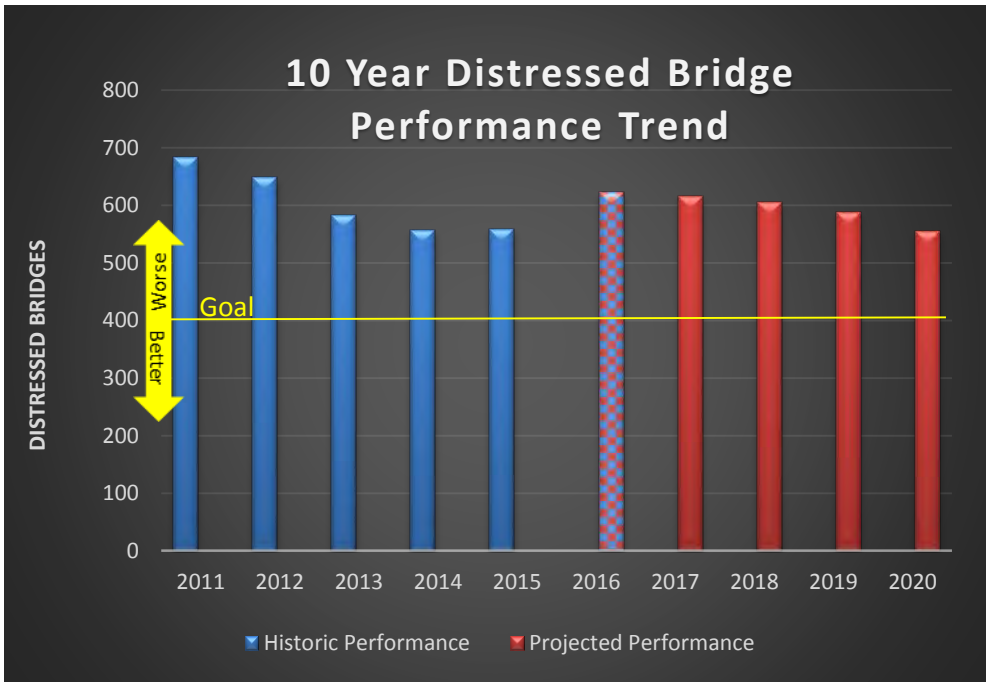


Chart 2 – Bridge Performance Trend and Forecast Performance

2016 SHOPP Investment

The 2016 SHOPP project portfolio includes 163 bridge preservation, rehabilitation or vulnerability mitigation projects that will work on 178 distressed bridges throughout California. The total 2016 SHOPP investment in the bridges statewide is $1.4 billion over the four year period from July 2016 – June 2020.

Collectively these projects will replace 40 bridges, rehabilitate 138 bridges, upgrade 83,000 feet of deficient bridge rail, increase vertical clearance on 12 bridges, strengthen 7 bridges and apply preservation treatments on 209 bridges.

Notable bridge projects include the following:

***Albion River* bridge replacement** – The project is located in Mendocino County on State Route 1 approximately 7 miles south of the community of Mendocino. This 969 foot long bridge was built in 1944 and features 34 spans constructed of timber and steel. Upon completion of this project will replace a functionally obsolete bridge, improve seismic safety and provide pedestrian and bicycle access across the river.

I-80 Mobility Project – The project is located in Solano County on Interstate 80 in the city of Vallejo. This project will increase the vertical clearance of 6 structures on Interstate 80 to a minimum standard height of 16'-5". This project is the final phase to improve vertical clearance restrictions along the I-80 corridor from San Francisco to the Nevada State line. This project is part of the Interstate 80 freight improvement corridor work.

Sacramento River Bridge and Overhead – Sacramento River BOH (Bryte Bend) are a pair of parallel 4,050 foot long bridges which carry Interstate 80 over the Sacramento River in West Sacramento. These 4,050 foot long steel box girder bridges were built in 1971 have a long history of fatigue related cracking. The load carrying capacity of these structures has been reduced to a level that restricts heavy permit vehicles. This project will restore capacity and improve freight use. This project is also being done to facilitate clearing freight restrictions along the I-80 corridor.

Santa Monica Viaduct – This project is located in the City of Los Angeles on Interstate 10. The structure is over 4 miles long and was built in 1959 with a total of 271 mainline spans constructed of reinforced concrete and steel. This project will provide preventive maintenance measures to the structure to extend the service life of the bridge.

Stanislaus River Bridge– The bridge carries southbound State Route 99 near Ripon and spans the Stanislaus River which separates San Joaquin and Stanislaus counties. The 1,220 foot long structure was originally built in 1903 and consisted of two reinforced concrete

arch spans over the channel and 24 steel approach spans. This project proposes to replace the original two reinforced concrete arch spans.

Intelligent Transportation System Assets

Inventory

ITS elements increase the efficiency of the existing highway system by maximizing throughput of the system and through the facilitation of rapid response to clear non-recurrent delays caused primarily by accidents or disabled vehicles impeding efficient traffic flows. ITS assets are represented by the three most significant elements; ramp meters, changeable message signs and highway loop detectors. Other lesser cost or lesser count items such as closed circuit television cameras, weigh in motion systems, highway advisory radio systems are excluded from this reporting.

The State Highway System relies on 2,802 ramp meters, 834 changeable message signs, and over 43,200 highway traffic loop detectors to improve system operation. In total there are over 46,800 individual ITS elements represented by these three major types.

Condition Trends

The most recent five years of ITS element performance and projected performance for the coming five years is presented in Chart 3. The performance chart is based on the adopted performance measure of Good (operational) or Poor (non-operational or obsolete). The performance measure is a count of elements in these two categories. The lagging condition is dominated by non-functioning highway loop detectors. These loop detectors are cut into the pavement and wired to controllers on the side of the highway. The controllers work with ramp meters to control the signal timing of traffic entering the highway. Loop detectors can become non-operational for a number of reason including damage from traffic loads, construction and copper wire theft or because of controller failure.

The projections of future performance assumes that the funding level available to replace poor condition ITS elements remains at current funding levels, service lives follow historical patterns and our construction buying power remains flat over the five year projection period. Chart 3 also assumes the adoption of the 2016 SHOPP projects as proposed, the execution of the proposed SHOPP reservation and a stable funding picture for the Maintenance Program.

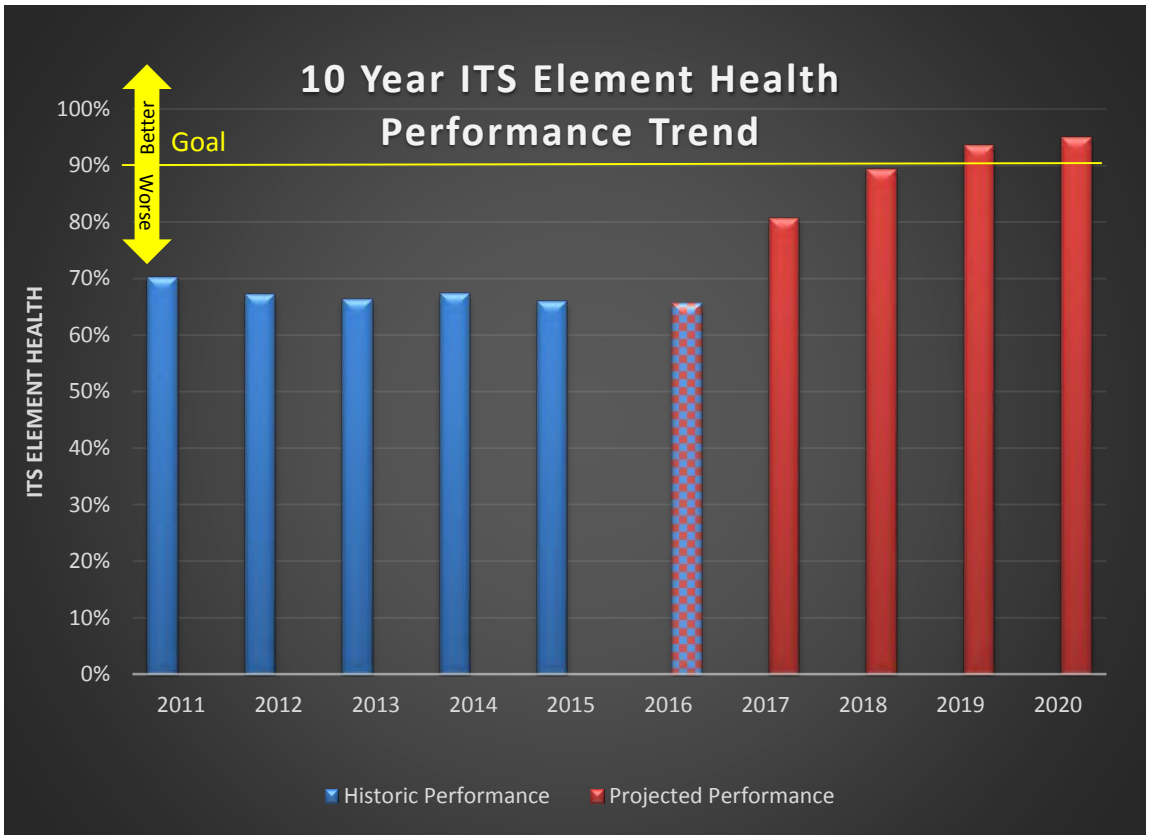


Chart 3 – Intelligent Transportation System Performance Trend and Forecast Performance*

* Chart is inclusive of expected performance from the proposed SHOPP reservation

2016 SHOPP Investment

The 2016 SHOPP project portfolio includes thirty ITS projects. These projects include a mix of element replacement and system build out projects. In total the 2016 SHOPP includes 1,600 rehabilitation or replacement of existing ITS elements and 1,100 ITS element additions to continue the system build out. The total 2016 SHOPP investment in the ITS elements statewide is $260 million over the four year period from July 2016 – June 2020 including proposed reservation.

In recognition of the lagging projected performance of the ITS elements shown in Chart 3, the Department is proposing a SHOPP reservation of $150 million to allow additional ITS projects to be planned and included in the later years of the 2016 SHOPP(fiscal years 2018/19 and 2019/20). This reaction to lagging performance reflects an adjustment of our investment strategy to achieve a desired performance goal. This is asset management. The department will also be evaluating improved technology and alternative means to capture the necessary information in addition to conventional loop detection approaches.

Culvert Assets

Inventory

Culverts are unique among the four core asset classes as they are the only asset where we are rapidly building the known inventory. At the time of the writing of this report, more than 105,000 individual culverts had been added to the inventory. The inventory is comprised of small box culverts not meeting the requirements to be defined as bridges and pipe culverts. Caltrans estimates that the total number of highway culverts is approximately 205,000. Ongoing culvert inspections are adding approximately 12,000 culverts to the inventory each year.

Failure to address deteriorating culvert conditions increases the risk of potential mobility disruptions associated with highway fill collapse or severing of the highway during period of high flows. The total length of currently inventoried culverts is 10.2 million feet. If one were to line these culverts end to end on Interstate 80 the length would reach from San Francisco to the state of Illinois.

Condition Trends

The most recent five years of culvert performance and projected performance for the coming five years is presented in Chart 4. The performance chart is based on the adopted performance measures of Good, Fair and Poor. The presented performance measure is a count of culverts that have varying degrees of deterioration when inspected.

The projections of future performance assumes that the funding level available to replace poor culverts remains at current levels with proposed reservation, deterioration follows historical patterns, newly inventoried culverts have a similar statistical condition distribution to those already in the inventory and construction buying power remains flat over the five year projection period. Chart 4 also assumes the adoption of the 2016 SHOPP projects as proposed and a stable funding picture for the maintenance program.

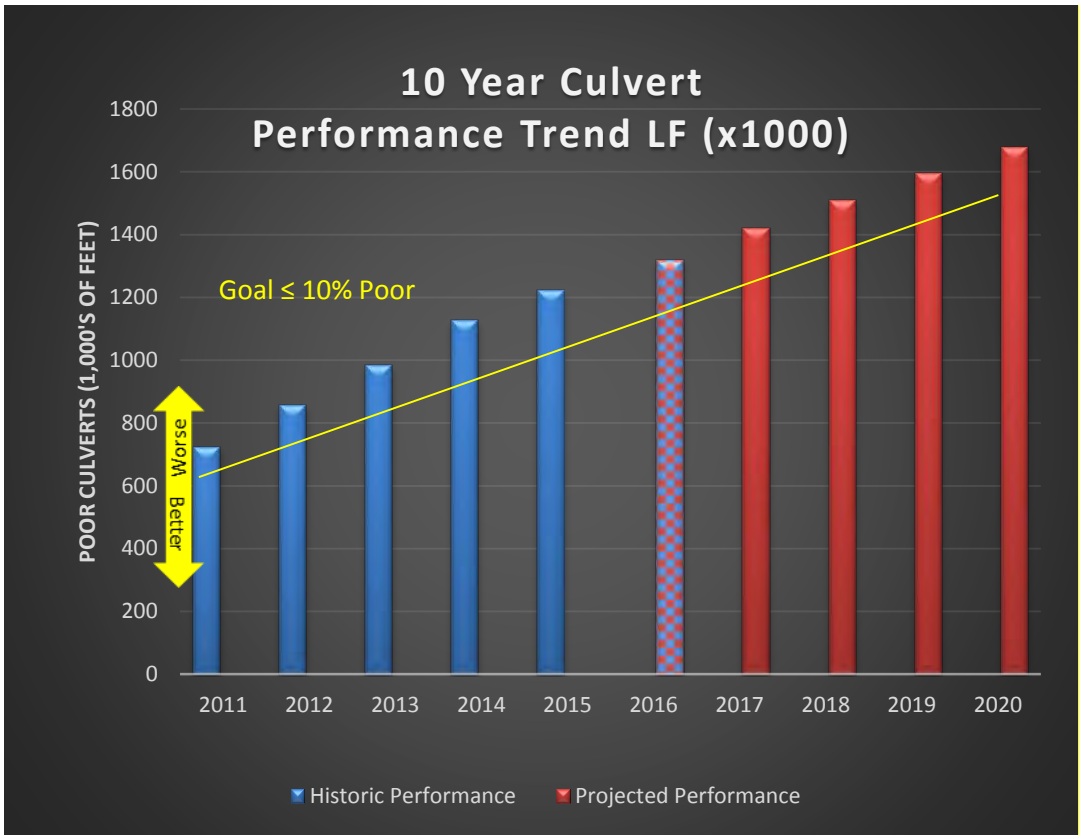


Chart 4 – Culvert Performance Trend and Forecast Performance

(Includes proposed reservation in projection)

2016 SHOPP Investment

The 2016 SHOPP project portfolio includes 37 culvert rehabilitation or replacement projects valued at $150 million which will address approximately 64,000 feet of poor condition culverts. The total 2016 SHOPP investment in the culverts statewide is approximately $250 million (including proposed reservation) over the four year period from July 2016 – June 2020.

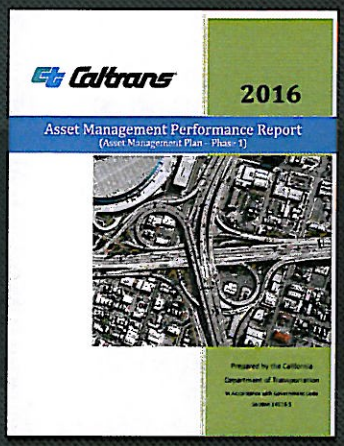
In recognition of the lagging projected performance of the culverts shown in Chart 4 being driven by the increasing inventory, the Department is proposing a SHOPP reservation of $100 million to allow additional culvert projects to be planned and included in the 2016 SHOPP over the next two years. This reaction to the growing inventory and lack of planning studies in this asset area reflects adjustment of our investment strategy to achieve a desired performance goal.

Looking Forward

Substantial work is still needed to fully implement the asset management requirements contained in federal and state regulation. This initial Asset Management Performance Report serves to document our progress to date in implementing asset management in California and the performance relationship to the SHOPP. The Department invites feedback on this report and suggestions for improvement in future reports.

2016 will mark another year of considerable activities associated with our asset management implementation efforts. Looking ahead in 2016, the Department is anticipating the scheduled release of the final rulemaking on the federal performance measures, completion of the local NHS pavement condition survey, the development of our asset management system requirements and beginning a fundamental shift to performance management in our approach to the 2017 Ten Year SHOPP Plan.

TAB 16



Asset Management Performance Report

Michael B. Johnson
State Asset Management Engineer
March 2016

Implementation Progress

- Inventory And Condition Assessment
  - Commission adopted the four core asset classes (Pavement, Bridges, Culverts and ITS elements)
  - Completion of an automated pavement condition survey of state highway pavement.
  - Continued new condition assessment of bridges
  - Continued to build the culvert inventory
- CTC Adoption of performance measures for all four asset classes
- External outreach to our transportation partners through workshops and the formation of the Transportation Asset Management Advisory Committee (TAMAC)

2

Implementation Progress

- Implementation of the SHOPP Management Tool
- Evaluation of several commercially available asset management software programs
- Refinement of SHOPP project prioritization methodology
- Risk management data compilation

3

Progress and Schedule -20%

Activity	Status	Target Date
Establishment of the Asset Classes	Adopted by CTC March 2015	Complete
Establishment of the performance measures for the four asset classes	Adopted by CTC March 2015	Complete
Internal/External Stakeholder Engagement	Ongoing	NA
Define inventory for the four asset classes	80% Complete	2016*
Performance Goal Setting (New targets for four asset classes using new measures)	Not Started	2017
Performance Gap Analysis	Not Started	2017
Assess the condition of the four asset classes	60% Complete	2018*
Risk Management	80% Complete	2018
Performance Management	20% Complete	2019
SHOPP Project Prioritization (Multi Objective Decision Analysis)	60% Complete	2020
Deterioration Modelling	25% Complete	2020
Life Cycle Cost Analysis	Not Started	2020
Publish Transportation Asset Management Plan	Not Started	2020
Enterprise Asset Management Software Development	Not Started	2022

*- With the exception of the culvert assets

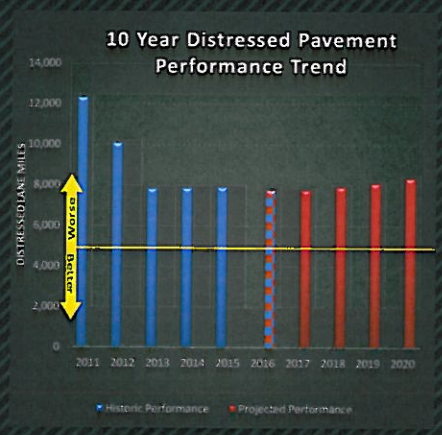
Current Conditions of Four Asset Classes

Asset Class	Inventory	Distressed Quantity	% Distressed
Pavement	49,720 lane miles of pavement	7,800 Lane Miles	16%
Bridges	12,662 Bridges	620 Bridges	5%

Asset Class	Inventory	% Poor
Culverts	105,000 Culverts (Partial Inventory) [1]	14%
Intelligent Transportation System Elements	833 – Changeable Message Signs 42,201 – Freeway Detectors 2,802 - Ramp Meters	13% 36% 21%

1 – Culvert inventory is a partial inventory based on inspected culverts. Total inventory is estimated to be 205,000 culverts.

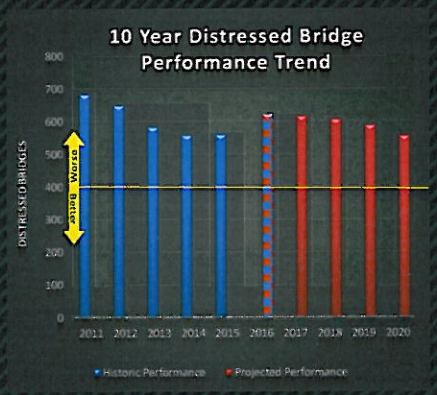
Pavement Assets



2016 SHOPP Projects

- 142 projects treating a total of 4,876 Lane Miles (LM)
- Rehabilitation of 1,678 LM
- Capital Preventive Maintenance of 3,198 LM

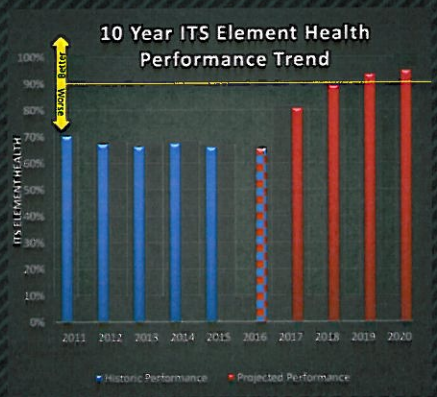
Bridge Assets



2016 SHOPP Projects

- 40 bridge replacements
- 138 bridge rehabilitations
- 83,832 feet of bridge rail upgrades
- 19 bridge mobility upgrades (raise/strengthen)
- 26 Preventive Maintenance on 208 bridges

Traffic Management System Assets

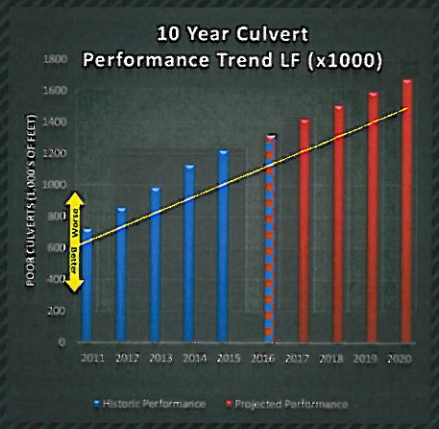


* Performance of CMS, Ramp Meter, and Detection only

2016 SHOPP Projects

- 30 Intelligent Transportation System (ITS) Projects
- Almost 1600 ITS elements replaced
- Over 1100 new ITS elements added

Culvert Assets



2016 SHOPP Projects

- 37 projects
- 669 Culverts rehabilitated or replaced
- A total length of over 64,000 linear feet

Summary

- The TAMP work is progressing on schedule for a 2020 implementation
- Phase 1 of the TAMP includes a performance analysis of the four asset classes
- The 2016 SHOPP was influenced by the Asset Management Performance Analysis
- Future SHOPP's will be increasingly influenced by the asset management implementation