New Hampshire DOT
Transportation Asset Management

Implementation Plan

Final

June 16, 2014

New Hampshire DOT Transportation Asset Management Implementation Plan

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New Hampshire Department of Transportation

Transportation Asset Management Implementation Plan

The Department of Transportation is committed to using our resources in the most effective and efficient way possible to meet our Strategic Direction to: *Maintain, Preserve, and Improve Asset Condition, Optimize Mobility, Enhance Safety and Security,* and *Strengthen the Economy*.

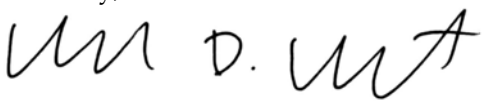
Managing New Hampshire's Transportation System is complex. Every dollar invested constructing a new lane mile of roadway to improve mobility and reduce delay, adds a future expense in maintaining, operating, preserving and eventually reconstructing that lane mile. However, preservation strategies can extend the life of an asset and postpone reconstruction at a cost benefit of more than 10 to 1. Transportation funding invested to improve safety leads to reduced fatalities and severe injuries on the roadway system. Because of limited resources, investment of the public's transportation dollars requires careful consideration and balance of these competing interests to insure the infrastructure meets the needs and expectations of the public. The Department needs to consider data from many sources to make the choices of how best to distribute the resources most efficiently considering these competing interests. Asset Management is a process that compiles and analyzes data that assist in weighing alternative options that result in getting the best return on investments.

The development of a Transportation Asset Management Plan (TAMP) makes good business sense and provides a strategic and systematic process of operating, maintaining, upgrading, and expanding transportation physical assets effectively throughout their life cycle. 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. Operating through a TAMP strengthens the partnership between the Federal Highway Administration (FHWA) and NH Department of Transportation (NHDOT) in MAP-21 development and implementation and promotes transportation excellence enhancing the quality of life in New Hampshire.

This Transportation Asset Management Implementation Plan report is the outcome of partnering with the FHWA in a project facilitated by the FHWA consultant project team from AMEC Environment & Infrastructure, Inc. (AMEC). The Department contributed the time, and energy of NHDOT subject matter experts who participated in surveys, interviews and workshops. I appreciate everyone's contributions to create this implementation plan.

It is through this spirit of cooperation and participation that the Transportation Asset Management (TAM) concept will be integrated into NHDOT's business model to be advanced for years to come providing enhanced transportation services for the travelers of New Hampshire's transportation system.

Sincerely,



Christopher D. Clement, Sr.
Commissioner

1.0 Introduction

1.1 BACKGROUND

The mission and purpose of the New Hampshire Department of Transportation (NHDOT) are as follow:

- **Mission**: Transportation excellence enhancing the quality of life in New Hampshire.
- **Purpose**: Transportation excellence in New Hampshire is fundamental to the state's sustainable economic development and land use, enhancing the environment, and preserving the unique character and quality of life. The Department will provide safe and secure mobility and travel options for all of the state's residents, visitors, and goods movement, through a transportation system and services that are well maintained, efficient, reliable, and provide seamless interstate and intrastate connectivity.

To further the mission and purpose of the Agency, NHDOT has made a commitment to advance the concept of Transportation Asset Management (TAM) within the Agency to integrate asset management systems and philosophies into its business model. The Agency seeks to continue progressing in both performance and asset management. Managing for the system's whole life includes implementation of infrastructure preservation programs, risk management, and longer term financial management, particularly in terms of addressing the long-term sustainability of transportation assets.

As an enabling step in this evolution, the Agency has conducted a Gap Analysis to benchmark current asset management practices versus good practice. Through this exercise NHDOT has developed this Transportation Asset Management Implementation Plan, customized to the business processes and needs of the Agency.

NHDOT manages a wide range of assets to meet public, Agency, and legislative expectations. Physical transportation infrastructure is one type of asset. Others include an Agency's human resources, financial capacity, equipment and vehicle fleets, materials stocks, real estate, and corporate data and information. The overall TAM framework needs to be flexible enough to be adapted and refined for use with, respectively, each type of asset above. However, this implementation plan focuses on the particular set of assets that constitutes NHDOT's physical transportation infrastructure. Other assets can be viewed in this context as resources that are allocated and utilized in managing the physical transportation infrastructure.

This plan was developed in four steps. The first step was performance of a strategic self-assessment. As part of this process, forty-four Agency staff participated in an online Gap Analysis survey (AMEC, 2013) based on the American Society of Highway and Transportation Officials (AASHTO) Transportation Asset Management Guide, Volume 1 (AASHTO, 2002). The second step included in-depth face-to-face interviews with internal stakeholders to drill down into the results of the online survey and inform the Gap Analysis process (AMEC, 2014). The third step was an asset management workshop with Major Staff

and Executive Staff that served as a forum to formulate and discuss NHDOT's asset management vision and goals resulting in development of specific prioritized initiatives for TAM implementation (AMEC, 2014). Finally, the draft implementation plan was developed, reviewed, and presented to Executive Staff. The input received during this step was incorporated into this final TAM Implementation Plan.

It should be noted that development and implementation of this plan is a first step. This plan should be revisited every year and revised to reflect accomplishments, emerging challenges, unexpected opportunities, and revised Agency policies.

1.2 WORK PLAN ORGANIZATION

The following sections of this plan contain the building blocks NHDOT will use to implement the TAM method of doing business within the Agency. The report is organized into 5 sections (inclusive of this section):

- Section 2 introduces the topic of TAM. This material is adopted from the TAM Guide that was developed through National Cooperative Highway Research Program (NCHRP) Project 20-24(11), *Asset Management Guidance for Transportation Agencies*. (AASHTO, 2002)
- Section 3 summarizes current asset management practice at NHDOT using the state-of-the-practice asset management framework in the AASHTO TAM Guide as a benchmark.
- Section 4 establishes a vision and goals for integrating TAM in the Agency business model.
- Section 5 recommends an asset management work plan with practical implementation steps that support the vision and goals.

2.0 TAM State-of-the-Practice

This section provides an overview of TAM and provides a brief discussion of key good practices. This section sets the context for recommendations made later in this plan.

According to The Moving Ahead for Progress in the 21st Century Act (MAP-21) (United States Congress, 2012), the term asset management is defined as:

> ***"…a strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on both engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair over the lifecycle of the assets at minimum practicable cost."***

Elements of good practice elaborate upon the definition of asset management. These elements reflect the concept that transportation asset management should not be considered as a separate new program or initiative, overlaid upon existing procedures, and in competition with other items on the department's agenda. Rather, it represents a way of doing business – a perspective that NHDOT will further adopt in looking at its current procedures and seeing how better decisions on physical infrastructure management can be made with better information. In this view, the principles of good asset management can be visualized as affecting, simultaneously, the philosophy, processes, and technical tools that underlie NHDOT's decisions and use of information and serve as a framework for doing business.

The following statements describe good TAM:

- TAM is a Philosophy
- TAM is a Process to Fuel Decision Making and Business Improvement
- TAM is a Set of Management Tools
- TAM is a Resource Allocation and Utilization Process

2.1 TAM IS A PHILOSOPHY

Asset management represents an approach to managing infrastructure that is strategic and proactive, and places a premium on good information in all aspects and in all Agency units.

Asset management is holistic. It entails a comprehensive view across a range of assets. It encourages consideration of a full range of options to solve problems or meet needs. Tradeoffs are explicitly considered among programs, modes, or strategies.

- Asset management is driven by policy goals and objectives based upon performance. Strategies are analyzed in terms of objective assessments of costs, benefits, long-term performance, risks to both agency and system performance, and other impacts on the transportation system and levels of service provided to transportation users.

- Asset management takes a long-term view of infrastructure performance and cost. The benefits of different actions are assessed throughout the infrastructure service life, applying economic as well as technical criteria.
- Asset management is proactive. An agency has the latitude to make decisions based on merit and consider factors such as cost effectiveness, risks, and practical considerations, among others.
- Asset management policy is influenced and informed by good information. This information describes current and projected system condition and performance that would result from different policies or strategies. It also encompasses user perceptions of system condition and performance, as obtained through surveys or focus groups.
- Asset management is explicit and visible, and serves to clarify and communicate the process and outcomes of resource allocation and program delivery. Asset management, by virtue of its rational and objective qualities, demystifies and fosters confidence in those decision processes that influence the allocation and utilization of scarce resources. In doing so, asset management fosters increased stakeholder participation, buy-in, and adherence to adopted strategies and decisions.
- Viewed as "a way of doing business," asset management is pervasive, affecting the business practices of every organizational element involved in the functions to which it is applied.

2.2 TAM IS A PROCESS TO FUEL DECISION MAKING AND BUSINESS IMPROVEMENT

Principles of good asset management can suggest ways in which NHDOT's decision making and business processes as well as its organizational roles and responsibilities can be strengthened. These process improvements can occur in those activities prior to budget approval – i.e., planning and program development – and in the program delivery and system performance monitoring phases subsequent to budget approval. Major principles governing process improvements are listed below.

- Investment choices and decisions on allocating and applying resources are policy and performance-driven. Procedures to reach these decisions are consistent with objective information and criteria based on merit. Performance measures consistent with policy goals and objectives are established for management review of both system performance and program delivery. TAM takes a long-term view of performance and manages assets over the whole life.
- Investment choices and decisions on allocating resources are based upon explicit tradeoffs among modes, programs, or strategies. Tradeoffs assess the impacts of more or less investment in a mode, program, or strategy, and help to craft final recommendations on how resources will be allocated across competing needs. Managers also understand the implicit tradeoffs in their programs and budgets, and the consequences thereof.

- Asset management entails the translation of policies and plans into optimized investment strategies, and the translation of investment strategies into optimized program delivery. The essence of asset management involves a combination of resource allocation decisions and program delivery strategies that are optimized in relation to specific policy-driven criteria and these decisions/strategies consider risk over the entire life-cycle of an asset and over the entire network.
- Organizational roles and responsibilities regarding asset management are developed to encourage more strategic and integrated approaches. While strong vertical organizational units may exist to maintain core expertise, managed business processes and decisions involve wider participation.
- Asset management is interdisciplinary. Decisions on investment choices and resource allocation are based upon expertise and judgment from several quarters of an Agency. Assets are managed for delivery of the desired level-of-service for the least practical cost.
- Asset management requires effective communication within and outside the Agency. Within the Agency, strong communication channels are needed both across divisions and disciplines as well as within divisions.
- External communications need to inform policy-makers and other stakeholders of the status of transportation assets and recommended policies and their benefits.
- The Agency strives for more effective program delivery. The Agency explores innovative methods to deliver the range of projects and services required. All available methods are considered, including use of departmental employees, intergovernmental agreements, outsourcing or managed competition, and privatization.

2.3 TAM IS A SET OF MANAGEMENT TOOLS

Effective management systems and complete, current, and accurate information on transportation infrastructure are practical necessities in meeting the policy and process requirements of asset management. Good asset management implies a systematic, integrated approach to project selection, analysis of tradeoffs, and program and budget decisions. It also implies that the right information be available to the right levels of management at the right times. The principles below support the availability and application of better information to make better decisions in asset management.

- Complete, current, and accurate information on transportation infrastructure assets, including descriptions, location, usage, unique or specialized characteristics, functional and other classification, and data needed for management systems.

An appropriate suite of management systems and databases informs the Agency of the status, trends, and needs regarding its infrastructure assets. Typical capabilities of these systems include the following:

- Organization of information within databases describing infrastructure inventory, condition, and performance;
- Information ownership identifying the business group responsible for updating asset information including condition ratings, frequency of data updates, detailed condition rating methodology, and the method of data collection.
- Metadata containing a dictionary of the data fields collected for each asset, data values, data validation rules, linear referencing system used, and data flow/integration with other information systems.
- Analytic models that predict the rate of future change in condition or performance, enabling the agency to forecast future infrastructure needs;
- Decision rules or procedures for applying treatments or actions to maintain, preserve, rehabilitate, replace, or expand transportation infrastructure, with analytic models of resulting costs, benefits, and other impacts including an emphasis on a preservation based approach to strategy implementation
- Reports tailored to different organizational levels of management, including senior and executive levels, as well as for public distribution.
- Information on system performance in terms of both proposed targets and values actually achieved in the field. These data may be obtained in a number of ways:
  - Periodic surveys and assessments of system condition or levels of service;
  - Customer surveys of satisfaction with system condition and agency performance;
  - Performance based upon different policies, strategies, and investment levels; and
  - Incorporation of performance measures and associated backup information within management systems.
- Specialized technical applications that support an Agency's asset management procedures. These will vary by Agency, but may include advances such as use of geographic information systems (GIS) as a system/data integration platform, economic analysis applications (e.g., generalized life-cycle benefit-cost procedure), trade-off analysis between assets, and other decision-support tools.
- Applications that assist in program and service delivery, including financial applications (e.g., to compute "total" or "true" cost of Agency and contracted services), and management systems for construction project pipeline and construction delivery.

2.4 TAM IS A RESOURCE ALLOCATION AND UTILIZATION PROCESS

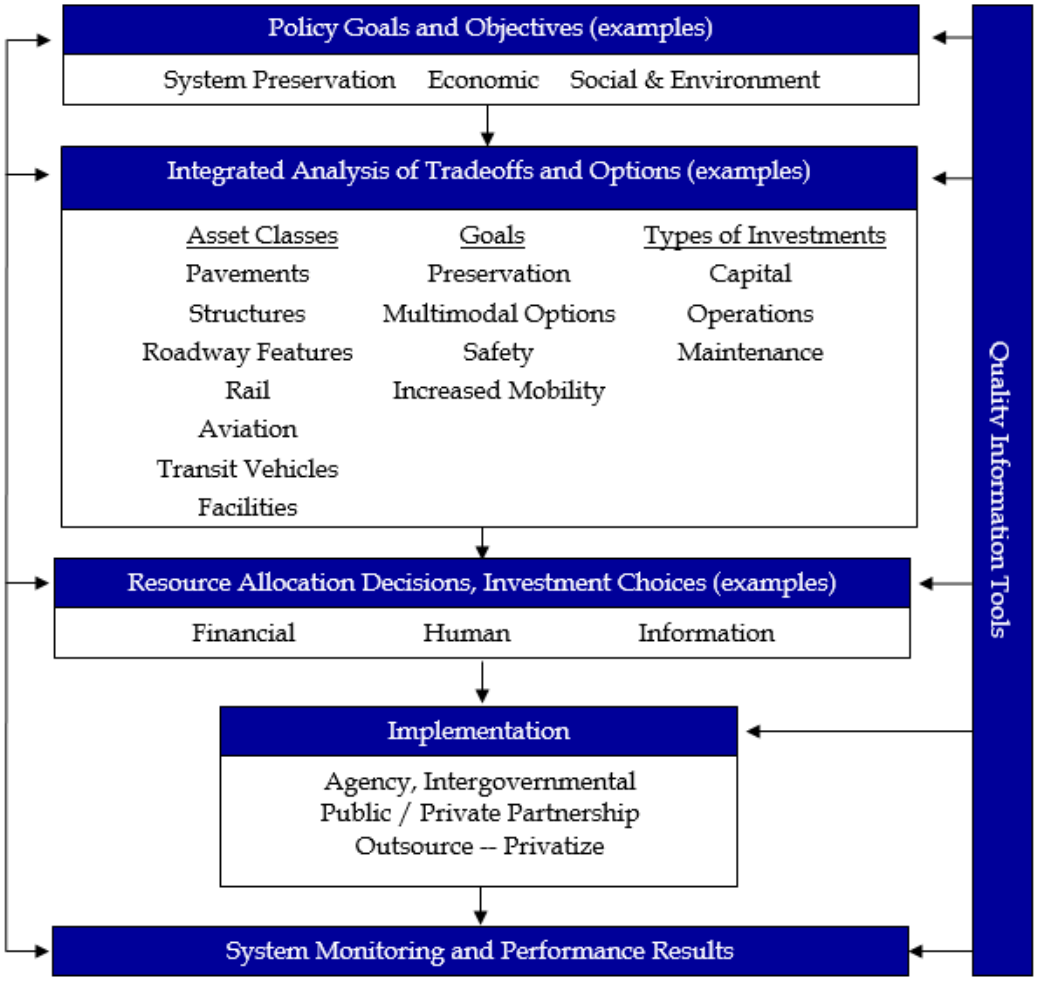
Asset management is, at its core, a process of resource allocation and utilization.

Resources in this context are interpreted broadly, encompassing financial, human, information, material, and equipment inputs to the management of the physical transportation infrastructure. The process of assigning or distributing these resources and applying them to the Agency's mission is likewise interpreted broadly, encompassing not only the traditionally understood functions in planning, program development, and budget approval, but also program delivery, system monitoring, data analysis, and input to policy formulation.

Figure 2.1 illustrates a strategic, integrated, systematic, and interdisciplinary approach to asset management for physical transportation infrastructure. The approach is cast as a resource allocation and utilization process. The entries in Figure 2.1 are examples, defined broadly and comprehensively to provide a "benchmark" as to how the process could work in a general case. NHDOT will tailor and adjust this benchmark example to its specific situations and perspectives on asset management. Note that the blocks in Figure 2.1 are general stages in the process; each block may comprise a number of individual processes and specific procedures, involving several organizational units, and the sequence in which they are performed may be more complicated than that implied in Figure 2.1. With this qualification, a discussion of each stage in the example follows.

- Policy Goals and Objectives. The process is driven by stated policy goals and objectives as documented in the NHDOT Balanced Scorecard. "Goals" are general statements that define priority areas. "Objectives" are defined by performance measures quantifiable by targets that can be used when analyzing alternatives and performing tradeoffs. For example, enhanced safety is an objective and decreasing fatalities by 50 percent over the next twenty years is a target to support that objective. An additional set of policy, goals and objectives that are in alignment with the BSC but TAM specific is presented in the Agency's TAM Strategic Plan. The TAM Strategic Plan identifies the importance of setting both initial and changing asset policy goals and objectives that will initiate defined asset performance measures. The TAM Strategic Plan also has value in communicating asset management changes to DOT staff, DOT partners, and the public.
- Integrated Analysis of Options and Tradeoffs. Several processes and procedures associated with an Agency's planning and programming functions may be conducted at this stage. Among these are the following examples: identify problems and needs within the context of policy objectives, assess available resources and set realistic targets, explore alternatives to address problems and needs within financial constraints, develop information on the practicality, costs, and impacts of proposed approaches, define candidate projects or service levels, analyze their benefits, costs and other impacts, rank or prioritize candidates, and evaluate tradeoffs between asset classes.

Figure 2.1. Transportation Asset Management Framework



- These analyses are performed with a wide vision of available alternatives and potential tradeoffs in long-term investment across, for example, modes, classes of physical infrastructure assets, and types of investments (e.g., capital improvements, operations, and maintenance).
- Decisions on Applying Resources, Investment Choices. Based upon the analyses above, decisions can be made on recommended capital projects and levels of service for maintenance and operations activities. Program approval finalizes these resource allocations. Financial, human, and information resources are shown as examples in Figure 2.1; other resources (e.g., real estate, equipment, and materials) are also included as appropriate.

- Implementation. With an approved allocation of resources, asset management programs can be implemented. All available options to deliver program projects and services are considered (e.g., in-house, outsourcing, intergovernmental agreements, etc.).
- System Monitoring and Performance Results. Since program implementation is a continual process, monitoring of system performance must be done periodically. The resulting information is used to inform and update other stages of the overall process, as illustrated in Figure 2.1. For example, trends in the condition or performance of the physical infrastructure may influence future policy formulation, or the priorities given to particular programs, projects, or services in resource allocation. Observed impacts of work zones may influence future decisions on methods and timing of program delivery.
- Quality Information. Systems of physical transportation infrastructure are extensive, and the information to describe their inventory, condition, characteristics, performance, costs, and impacts is voluminous. Developing, maintaining, and updating the management systems and data that are needed to describe the asset classes and to support the functions and decisions illustrated in Figure 2.1 is a continuing task. Ensuring that quality information can be provided to all organizational levels in a timely, accurate, and meaningful way to assist them in fulfilling their asset management responsibilities is likewise important to the process.

3.0 TAM in NHDOT

This section summarizes current (2014) TAM practice in NHDOT for highway assets. These practices are summarized by topic area congruent with the AASHTO TAM Guide. As briefly described in section 2, the TAM Guide provides a convenient benchmark with which to measure progress against TAM good practice. The information contained in this section was derived from an online survey, in-depth interviews across NHDOT, and a focused and structured face-to-face workshop with Major and Executive Staff.

3.1 CURRENT NHDOT ASSET MANAGEMENT PRACTICES

Tables located in appendix A (A.1 through A.4) present NHDOT's state of the practice as compared to the state-of-the-art in asset management as documented in the AASHTO TAM Guide. The tables represent four "matrices" that organize key concepts, principles, and state-of-the-practice techniques. These matrices lay out a range of options in improved asset management and identify "ideal" practices to which NHDOT will strive. They address the full range of DOT infrastructure management activities and are described by the following questions:

- ***Policy Goals and Objectives*** – Does policy guidance encourage and provide incentives for good asset management?
- ***Planning and Programming*** – Do resource allocation decisions reflect good practice in asset management?
- ***Program Delivery*** – Do oversight techniques and follow-through reflect good industry practice?
- ***Information and Analysis*** – Do information resources effectively support asset management policies and decisions?

The information in each matrix has been organized in four columns:

- The first column identifies the most important basic characteristics of good asset management practice applicable to US transportation agencies. These have been kept to a small number in each matrix to focus on the most important.
- The second column lists specific evaluation criteria by which these characteristics can be evaluated. They identify the likely places to look in determining whether the policy guidance, management procedures, and decision culture that drive investment choices and program delivery conform to the characteristics of good asset management.
- The third column describes the current state-of-the-practice for each criterion.

- The fourth column describes the current state of practice at NHDOT in each of the key areas of asset management.

3.2 TAM STRENGTHS

In summary, the strengths of NHDOT TAM efforts to date include:

- NHDOT is well positioned to implement asset management. There is strong Executive level support.
- Broad employee support is present and staff are eager to begin formal adoption of TAM practices.
- There exists a strong professional desire and pride in the Agency to take the best possible care of assets. Most employees understand the importance of asset management and therefore implementing a new work flow that would improve the data, system performance, and decision making would be welcomed.
- The Balanced Scorecard (BSC) is a good first step in coalescing Agency strategic priorities for TAM. It is supported by Staff.
- The Agency has a documented process for developing the Capital program supported by Decision Lens software (NHDOT, 2013).
- Staff are increasingly making use of the data available to them to make decisions.
- The Agency has reached out to partners to determine their level of satisfaction with Agency programs and policies.
- A coordinated and complete linear referencing system exists. The geographic information system is robust and mature.
- Pavement inventory and condition information (Pavement Management System - dTIMS) is considered high quality and robust. Modeling of condition under various scenarios can be performed and this capability is constantly evolving. There exists a good foundation for this asset class.
- Bridge inventory and condition information (Bridge Management System - PONTIS) is also considered high quality and complete.
- The video logging van is state-of-the-art and can be used for TAM inventory data collection for other assets besides pavements.
- The Intelligent Transportation Systems asset class has a good inventory system and preventative maintenance plan.
- The Managing Assets for Transportation Systems (MATS) program is mature and can be leveraged now as a key TAM tool.
- The recent guardrail inventory project can serve as a model for other asset inventory initiatives.

- The Agency has a history of being able to deliver information technology projects successfully.

3.3 TAM OPPORTUNITIES FOR IMPROVEMENT

The current practice review identified several opportunities to strengthen NHDOT's asset management capabilities and processes. These findings, based extensively on the interviews and structured feedback exercise provide the foundation for the asset management work plan presented in the next section.

- A strategic direction (scope, polices, definitions, direction, and goals, etc.) is needed for transportation asset management.
- There appears to be widespread consensus that development of an asset management training and communications plan within the Agency to bridge the gap in asset management knowledge is a vital step in moving towards asset management. It is deemed important to inform outside stakeholders on the process and goals of asset management.
- TAM needs a focal point and structure. Dedicated staff should be devoted to the effort (not a collateral duty) and be given clear strategic direction. Personnel are ready to move forward with TAM in a structured manner.
- There was agreement that the Balanced Scorecard is the primary vehicle to communicate overall strategy within the organization and that the BSC is important to TAM efforts. Strengthening the link between the BSC and tactical decisions (i.e. program funding levels and project selection) is considered important to asset management.
- There is general agreement that development of a Transportation Asset Management Plan (TAMP) may be a near-term coalescing tactical initiative to provide focus for the TAM effort.
- The following factors are considered important for TAM: establishing data governance standards, data-driven project selection, considering risk in managing assets, and developing policy and procedures for analytical trade-off analysis.
- The Districts need better analytical tools to manage their assets.
- Management of assets outside of DOT control (i.e. Urban Compacts) does not seem to be a priority at this time.
- Most staff are of the opinion that budgets that are currently used for asset improvement are not clearly linked to the performance of that asset.
- Asset Management will assist in providing the most effective means to operate and manage assets from funding provided in the department budget. It will provide a more transparent budget structure to more directly link workplans and programs to authorized funding.

- There is inconsistency throughout the department at varying levels on whether a preservation-first strategy is currently being applied to NHDOT's assets.
- While there is general consensus that establishing customer based level of service (LOS) is a step in the right direction, it doesn't appear to be considered a key factor at this point in time.
- Pavement and bridge project level decision making should be more data driven.
- Improvements can be made to make pavement investment decisions more transparent. Also, the PMS currently only considers IRI as the performance measure. This should be expanded to include other currently available indicators such as cracking and rutting (a process that is currently underway).
- Although transparency in investment decisions for bridges is more transparent as compared to pavements, there is opportunity for improvement in this area.
- A majority of staff believe that engineering judgment or "tribal knowledge" is the primary method of project selection for the Agency, and Asset Management institutionalizes this knowledge.
- Many staff believe that in the current situation, the Agency has not determined what the "right" (data driven) allocation is between assets or the "right" balance between preservation and reconstruction.
- Budgets for asset improvement are not clearly linked to performance.
- There is no system or process in place to manage assets to the lowest life-cycle cost.
- The majority believes that MATS is, or could be, important to the State's asset management efforts.
- Staff opinion seems to favor using the geographic information system (GIS) as the future primary warehouse for asset data.
- Assuming that an asset information system is developed, there is a strong preference that the Agency uses a combination of in-house and off-the-shelf components for its asset management information system, as appropriate.
- Agency personnel feel strongly that the TAM process should be completed fully for an asset, not piecemeal.

The priority of asset classes for implementation (based on impact to performance of the network) are: 1. bridges, 2. pavement, 3. roadside, and 4. facilities. Assets within roadside were ranked in priority as follows: 1. culverts, 2. guardrails, 3.signals, 4. overhead signs, 5. ground-mounted signs, 6. ITS devices, and 7. sidewalks.

4.0 TAM Vision and Goals

This section presents a vision for risk based TAM at NHDOT, a set of goals to guide its implementation, and a discussion of the outcome and benefits of TAM. The vision and goals build upon (1) NHDOT's development of several different concepts and methods as described in Appendix A, (2) the principles of asset management described in section 2, and (3) the results of the Gap Analysis exercise.

4.1 TAM VISION STATEMENT

The TAM Vision statement builds on the Department's Mission of transportation excellence and is in alignment with the MAP-21 definition of asset management. It is:

> ***"Transportation Asset Management at NHDOT is a strategic and systematic process of maintaining, preserving, and improving physical assets based on economic analysis, engineering, age/use of asset, and customer focused feedback considerations."***

4.2 TAM GOALS

The TAM program will provide the strategic basis for the State's Ten Year Transportation Improvement Plan (TYP) and the Department's operations budget. The TYP process in turn links with public outreach and planning efforts with the Regional Planning Commissions and the bridging between long range transportation plans, regional transportation improvement plans (TIP), and Statewide Transportation Improvement Plan (STIP). The structured evaluation of system condition and performance, and establishment of realistic performance targets and scenarios, will inform the selection and prioritization of projects and programs in the TYP and operations budget to meet established performance goals.

The top ten goals of the TAM program over the period 2014-2019 will be as follows:

- Develop a TAM process that supports NHDOT's strategic direction to maintain, preserve, and improve asset condition, optimize mobility, enhance safety and security, and strengthen the economy.
- Create a culture through training and communication where TAM is viewed as the way of doing business.
- Create a TAM process that can be used to justify budget requests based on resultant level of service.
- Develop a centralized asset management framework from which personnel can extract high quality complete asset data sets and information.
- Develop a TAM process that yields the ability to perform a robust funding/level of service trade-off analysis between pavement and bridge asset classes.

- Advance other asset classes to the point where they can be incorporated into the funding/level of service trade-off process.
- Incorporate risk into the TAM process.
- Maintain, preserve, and improve infrastructure assets with targeted performance results and quantifiable cost effectiveness measures.
- Deliver to NHDOT customers the best value for the dollar spent.
- Enhance NHDOT transparency and accountability.

4.3 BENEFITS OF TAM

Developing a comprehensive TAM focused business process in NHDOT will result in the following sustainable benefits to the Agency:

- *Enhanced planning, programming, and budgeting guidelines that will align investment decisions throughout NHDOT with Agency policies and focus areas* – increased quality of services;
- *Reports identifying 1) current and accurate asset inventory information in terms of effective performance measures, 2) target levels for asset condition compared to actual condition, and 3) estimated funds to maintain the target condition compared to actual costs* – improved accountability, transparency, and communication;
- *Standardized and ad hoc (on-demand) management system reports and GIS integration supporting planning, programming, and budgeting decisions* – defensible decisions and increased credibility;
- *Analytical methodologies and tools required to analyze the life-cycle costs and benefits of capital and maintenance projects, and to evaluate projects across modes and programs and minimize the cost of managing the system over the long-term* – increased cost-effectiveness and service life;
- *Suite of IT tools that generates consistent strategic information across asset types that is consistent with tactical information* – enhanced top-to-bottom agency integration;
- *A set of department-wide organizing principles for existing and planned initiatives* – improved alignment between divisions; and
- *Reduction of risk to the Agency* – improved governance of system.

5.0 TAM Work Plan

This section presents the asset management work plan for NHDOT. The plan is based on the findings of the state-of-the-practice review, the results of the Gap Analysis process explained previously including a workshop with Executive staff to refine the plan. It identifies practical implementation steps that support the vision and goals defined above. The plan also includes a timetable, a discussion of implementation issues, an evaluation of associated risks, and a preliminary cost estimate for each activity. This work plan fits within the Agency as conceptually illustrated in Figure 5.1.

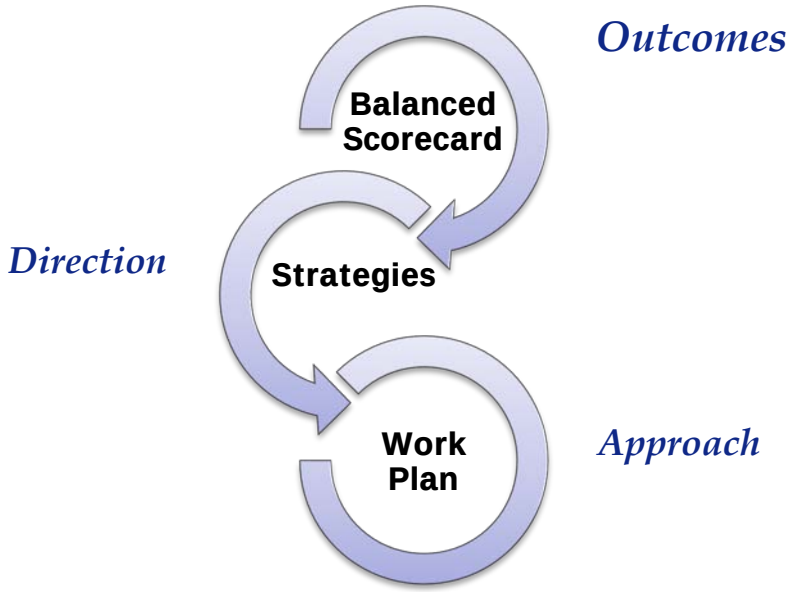


Figure 5.1. Role of BSC, Strategic Plan, and Work Plan

Implementing the work plan will require a mixture of indirect and direct costs. Indirect costs cover the resources required for current NHDOT staff to perform work and to bring their current processes and mindsets into alignment with the asset management principles presented earlier. Direct costs cover the resources required to engage consultants. Consultants may be brought in to add expertise or to address workload constraints within NHDOT. Determining the mix of in-house and contracted work will be the responsibility of the asset management Executive Committee. This work plan represents one implementation scenario, which combines both internal and outsourced work. For the majority of the initiatives, the plan provides a preliminary cost estimate (low =<$25k, medium = $25 – $75k, and high => $75k) associated with engaging a consultant. Indirect costs have not been estimated. The final cost of implementing the work plan will decrease if NHDOT performs more work in-house and increase if consultants are relied upon more heavily.

The work plan makes no presumption of the relative priority of this initiative with respect to other projects at NHDOT. Rather, the plan presents activities, timeframes, and budgets as if the implementation of asset management at NHDOT has full financial backing.

Implementing TAM in the Agency will take patience. The concept is a fundamental shift in the way the Agency will do business going forward. For example, the Utah DOT is regularly used as an example of being highly TAM focused but after 15 years of investment, they still do not consider the process complete and are constantly improving the process (Parsons, 2012). TAM at its core is an ever evolving continuous improvement process.

The following Asset Management Initiatives are discussed below in detail:

Initiative 1. Establish TAM Governance Structure

Initiative 1.1. Establish TAM Coordination Leadership

Initiative 1.2. Establish Governance Structure

Initiative 2. Develop TAM Strategy

Initiative 2.1. Develop TAM Strategic Plan

Initiative 2.2. Develop TAM Communications Plan

Initiative 2.3. Develop TAM Training Plan

Initiative 3. Develop the Transportation Asset Management Plan

Initiative 4. Develop Framework for Centralized TAM Warehouse and Data Analytics Capability

Initiative 5. Enhance Performance Based Planning and Programming

Initiative 6. Develop Trade-off Capabilities for Pavement and Bridges

Initiative 7. Develop Asset Class Specific TAM Procedures

Initiative 8. Develop Maintenance Quality Assurance Program

This work plan will necessarily need to be revisited and aligned with the TAM Strategic Plan, once complete.

5.1 ASSET MANAGEMENT INITIATIVES

Initiative 1. Establish TAM Governance Structure

The first priority for reinforcing TAM in the Agency is development of a structure to support the effort. This structure is commonly referred to as the "Governance" structure and is the method to drive progress for the Agency. The TAM implementation process will reside under the new Asset Management, Performance, and Strategies office, or AMPS.

Initiative 1.1. Establish TAM Coordination Leadership

Description: The lead role at NHDOT for asset management coordination will be assigned to the Chief Engineer and the Executive Committee. The TAM Coordinator will reside in the Office of Asset Management, Performance, and Strategies (AMPS). An individual with identified support resources will be given the charge to lead this assignment, henceforth referred to as TAM Coordinator. This person will be the focal point for all TAM efforts during this phase of the process. They will be the "TAM Champion" for the Agency. Establishing "ownership" will provide clear accountability for asset management and ensure that efforts throughout NHDOT are coordinated and performed in a logical sequence. The TAM Coordinator will not be performing all of the work needed to implement TAM, rather they will guide the effort and ensure progress is being made in a structured manner. Specifically, they will be charged with responsibility for:

- Lead for Office of Asset Management, Performance, and Strategies.
- Development and update of the NHDOT Transportation Asset Management Strategic Plan and Work Plan.
- Conveying the asset management initiative to all NHDOT employees and partners.
- Implementing the asset management work plan. This will include assisting each of the divisions charged with mobilizing the resources necessary to carry out the initiatives as well as monitoring and providing assistance as necessary throughout the implementation process.
- Developing the MAP-21 required Transportation Asset Management Plan.
- Forming and coordinating asset management steering and technical committees made up of representatives from various sections and bureaus. These committees will coordinate asset management initiatives throughout NHDOT.
- Reporting progress to the Executive Staff.
- Providing material for ongoing communication regarding asset management implementation at NHDOT to all employees.

Initiative Leader: NHDOT Chief Engineer and Executive Committee and TAM Coordinator.

Key Steps:

- Assign coordination "ownership" to an individual and identify the resources available for this effort.
- Form asset management executive and steering committees (see below).
- Provide ongoing communication regarding asset management implementation.

Timing: "Ownership" will be assigned before work begins on any of the other initiatives.

Preliminary Cost Estimate: Indirect

Initiative 1.2. Establish Governance Structure[1]

Description: Establish a structure of representative members of NHDOT staff to coordinate the TAM effort. This will consist of a three-tier system of (1) TAM Executive Committee (Executive Staff), (2) TAM Steering Committee and Project Management staff, and (3) TAM Work Groups. The first two groups' membership remains fairly constant over time. The third group's membership will be determined by the primary thrust, or leading initiatives being worked on during a given time period and will change in scope and membership over time.

Initiative Leader: TAM Coordinator

Key Steps:

- Develop a mission and responsibilities for each group.
- Determine the typical Agency membership of each group.
- Document the Governance structure.
- Receive approval from Executive Committee on structure.

Timing: One month after establishing the TAM Coordinator.

Preliminary Cost Estimate: Indirect

Initiative 2. Develop TAM Strategy

The Agency will develop a TAM Strategic Plan. This plan will provide the Agency with a clear set of TAM policy and strategies and will serve as the focal point for implementation across the Agency. A companion Communication Plan and Training Plan will also be developed to support the Strategic Plan and educate the Agency on TAM practices.

Initiative 2.1. Develop TAM Strategic Plan

Description: Develop the TAM Strategic Plan for the Agency. This 10-15 page plan should include, as a minimum, the following: scope of TAM (assets to be managed), measurable goals and objectives, policies, definitions, financial links to the department's budget structure and direction.

Initiative Leader: TAM Coordinator

Key Steps:

- Work with the TAM Project Management team, develop the outline for the Strategic Plan.
- Review and approval of outline from Executive Committee.

[1] Example TAM Governance structures will be available in early summer of 2014 from the FHWA Asset Management website.

- Develop the first draft of the Strategic Plan.
- Review by Executive Committee.
- Develop final draft.
- Approval by Executive Committee.
- Update at one year intervals.

Timing: Six months after completion of initiative 1.2.

Preliminary Cost Estimate: Indirect/Consultant (medium)

Initiative 2.2. Develop TAM Communications Plan

Description: Develop the TAM Communications Plan for the Agency. This 5-10 page plan should include, as a minimum, the following: an analysis of who requires TAM communication (Legislature, within the Agency, partners including MPOs and municipal agencies), the type of communication each stakeholder requires, the frequency, communications channels, and the message.

Initiative Leader: TAM Coordinator (with significant input from the Division of Policy and Administration, Public Information Officer, or their designee).

Key Steps:

- Brainstorm communication needs with the Steering Committee and Director of Public Information, or their designee (if not a member of the Steering Committee).
- Develop the outline for the Communications Plan.
- Review and approval of outline from Executive Committee.
- Develop the first draft of the Communications Plan.
- Review by Executive Committee.
- Develop final draft.
- Approval by Executive Committee.
- Implement Communications Plan.
- Update every two years.

Timing: Three months after completion of initiative 2.1.

Preliminary Cost Estimate: Indirect/Consultant (low)

Initiative 2.3. Develop TAM Training Plan

Description: Develop the TAM Training Plan for the Agency in conjunction with the Communication Plan listed under Initiative 2.2 This 5-10 page plan should include, as a

minimum, the following: an analysis of who requires TAM training, the type of training each stakeholder requires, the frequency, training channels, and the message.[2] This plan should be developed in close coordination with the Division of Policy and Administration, Human Resources Bureau.

Initiative Leader: TAM Coordinator (with significant input from the Division of Policy and Administration, Administrator of Human Resources or their designee).

Key Steps:

- Brainstorm training needs for all levels of the Agency with the Project Management Team and Administrator of Human Resources, or their designee (if not a member of the Project Management Team).
- Develop the outline for the Training Plan.
- Review and approval of outline from Executive Committee.
- Develop the first draft of the Training Plan.
- Review by Executive Committee.
- Develop final draft.
- Approval by Executive Committee.
- Implement training plan.
- Update every two years.

Timing: Three months after completion of initiative 2.1.

Preliminary Cost Estimate: Indirect/Consultant (low)

Initiative 3. Develop the Transportation Asset Management Plan

Description: MAP-21 requires development of a Transportation Asset Management Plan (TAMP). Each State is required to develop a risk-based asset management plan for the National Highway System (NHS) to improve or preserve the condition of the assets and the performance of the system. Specifically the law requires that the plan include the following (as a minimum) for State-owned pavement and bridge assets:

- A summary listing of the pavement and bridge assets on the NHS in the State, including a description of the condition of those assets.
- Asset management objectives and measures.
- Performance gap identification.
- Lifecycle cost and risk management analysis.

[2] Asset Management training materials may be purchased from the National Highway Institute to serve as a starting point.

- A financial plan.
- Investment strategies.

In addition to what the law requires the TAMP will include a summary listing of intermodal assets including rail, transit, and aeronautics as a long-term goal.

States are required to have developed and implemented a NHS asset management plan by the second fiscal year beginning after the Secretary of Transportation establishes by regulation the process for asset management plan development. Depending on timing of the date of final rulemaking at the national level, the TAMP is expected to be due either in September 2015 or September 2016. From experience with three States involved in a FHWA Pilot Study, this process will take NHDOT about one year. A generic work plan and examples from the three FHWA Pilot States are available on FHWA's Asset Management website. The TAMP from the three pilot States are expected to be available in May 2014. The Georgia DOT TAMP is also available on this site. While not MAP-21 compliant, it is a good example and will assist the Agency in scoping the TAMP.

The FHWA Pilot Study generic work plan should be used as the basis for this task, tailored to meet NHDOT needs. Some States have decided to use outside consultants for development of the TAMP (Minnesota, Nevada, Rhode Island are examples). Even with outside help, this process requires a great deal of time and energy by NHDOT staff. Some of the tasks involved in developing a TAMP overlap many of the tasks in this work plan.

Initiative Leader: TAM Coordinator with significant assistance from TAM Project Management Team and TAM Work Groups

Key Steps:

- Decide on in-house, consultant, or blended effort.
- Review FHWA Pilot Study TAMP work plans and tailor to NHDOT needs.
- Review and approval of TAMP outline from Executive Committee.
- Develop the first draft of the TAMP.
- Review by Executive Committee.
- Develop final draft.
- Approval by Executive Committee.
- Update every two years, or as designated by Executive Committee.

Timing: Twelve months, beginning in August 2014.

Preliminary Cost Estimate: Indirect/Consultant (high, $200-250k)

Initiative 4. Develop Framework for Centralized TAM Warehouse and Data Analytics Capability

Description: NHDOT will define the data and analytical capabilities required at all levels of the Agency to support asset management practices. There is legacy work that has been done

that can serve as the springboard for this effort. As examples, the present Deighton Pavement Management system is being utilized and continues to be developed and refined. Also a draft TAM data model exists for other roadside assets in the guardrail inventory project that has been successfully implemented; and GIS is a mature system in the Agency. The challenge will be a data governance structure that integrates these existing systems and information.

The final product of this initiative will be an IT plan that will ensure that these needs are met in the most efficient and effective manner. The plan will focus on four key themes:

1. Development of data governance policy. How will data, models, outputs, software be managed and maintained in the Agency? What are the risks and how can they be mitigated?
2. Maximizing the use of NHDOT's current data and analytical capabilities. Perform an inventory of current data and analytics used to extract information from this data.
3. Decide on an IT strategy.
4. Implement the strategy.

Initiative Leader: A workgroup should be formed for this purpose. This workgroup should be small enough to be efficient but representative of the Agency. A leader of the working group shall be named to manage this effort.

Key Steps:

- Document the current overall planning, programming, and budget processes at NHDOT, and the types of information and analysis used in these processes.
- Develop a set of "use case" scenarios for how these processes would be assisted by additional data or computerized tools.
- Review current and planned databases to identify gaps, areas of improvement, and opportunities for integration.
- Compile a list of data and analysis requirements and identify which requirements are not currently addressed by current or planned systems.
- Establish a consistent set of requirements for all management systems so that their results can be consolidated (e.g., inventory listings, condition summaries, comparison of conditions to targets, listing of proposed projects by location, type and status, estimates of funds required to meet condition targets, mix of preventive maintenance versus major rehabilitation/replacements, linear referencing system (LRS) requirement).
- Reinforce existing GIS and data warehouse efforts by documenting their criticality for asset management implementation as platforms for data integration.
- Build a formal logical data model and system architecture to support asset management needs in a comprehensive fashion.
- Compile metadata for each asset data set - define data owner, create dictionary of the data fields collected for each asset, data values, data validation rules, linear

referencing system used, frequency of data updates, detailed condition rating methodology, method of data collection, and data flow/integration with other information systems.

Timing: Twenty four months, beginning in October 2014. This activity may be implemented in phases (e.g., Phase I – data, system, and processes inventory, Phase II – needs identification, and Phase III – gap analysis and plan).

Preliminary Cost Estimate: Indirect/Consultant (high, $200-250k)

Initiative 5. Enhance Performance Based Planning and Programming

Description: The objective of this initiative is to encourage a more performance and risk-based approach to the overall planning and programming functions at NHDOT. In this context, "planning and programming" refers to an Agency-wide process rather than a project specific process and the results of this process should feed into the State Transportation Improvement Program. To meet this objective, NHDOT will complete the following activities.

- Establish network level performance criteria that are consistent with NHDOT's policies and goals and are based on life-cycle benefit/cost and consider political realities and constraints.
- Determine risk management strategies (i.e. identification of risks, ranking, and mitigation) at the agency and program levels.
- Develop guidelines that assist NHDOT with making decisions on when a facility should be considered for replacement, rehabilitation, and preventive maintenance. For example, when should a particular section of roadway be replaced rather than maintained? Currently, NHDOT answers these questions based on pavement deterioration models from the PMS, safety concerns, congestion issues, etc. However, NHDOT will develop a method to consider multiple factors simultaneously.
- Communicate the need for stability in funding levels for specific program categories to policy-makers. Funding stability would enable NHDOT to have a longer-term outlook in its planning and programming processes by developing accurate projections of future resources.
- Develop processes and procedures that support coordinated project programming and development across functional areas.
- Develop processes and procedures for improving cross-program resource allocation decisions, including prioritization methods.

Initiative Leader: A workgroup should be formed for this purpose. This workgroup should be small enough to be efficient but representative of the Agency. A leader of the work group shall be named to manage this effort. This effort will require the participation of high level Agency staff.

Key Steps:

- Develop a detailed scope for this initiative. Scope items will include:
    - Workshops for brainstorming, consensus building, and determining priorities
    - Case studies of model DOT's
    - Prioritization methods and tools
    - Guidelines and/or manual for performance-based planning and programming
- Pilot the process in year 2.
- Implement for pavement and bridges in year 3.

Timing: These activities will begin in March 2015 and take thirty six months to complete. The first draft of the plan will be completed in one year, piloted in year 2, and implemented in year 3.

Preliminary Cost Estimate: Indirect/Consultant (high, $150-200k)

Initiative 6. Develop Trade-off Capabilities for Pavement and Bridges

Description: This initiative is a key goal of this work plan. The Agency will develop a method to perform risk-based trade-offs between investments in pavement and bridges in order to optimize budget allocations. This will include being able to equate a pavement investment and a bridge investment according to a common investment benefit framework that considers risk and lowest life-cycle cost. In this work plan, this initiative is viewed as perhaps the most difficult undertaking as this is an emerging field in the US and there is little prior work to build on.

Initiative Leader: A workgroup should be formed for this purpose. The work group should consist of pavement and bridge subject matter experts, members of the finance and planning groups, and a District representative, as a minimum.

Key Steps:

- Research the current state-of-the-practice of trade-off analysis in the US (literature review). There are national (FHWA, NCHRP, AASHTO) research projects in the pipeline that may assist with this effort.
- Select a model for the trade-off analysis. If no suitable model exists that meets NHDOT needs, then consultant assistance may be needed to develop the trade-off model.
- Develop a manual to be used for trade-off analysis.
- Develop an IT system to perform the trade-off analysis.
- Pilot the system.
- Revise based on results.

- Implement the system on a pilot basis for one year.
- Revise based on results.
- Implement the system.
- Refine the system as lessons are learned.
- Incorporate other assets into the analysis as they mature.

Timing: This activity should start in March 2017 and will last through the term of the work plan. Using a later start than other initiatives will allow the Agency to leverage the national research being conducted currently. The initiative can start earlier if desired but the Agency will need to perform more fundamental research than if this initiative is undertaken at a later date.

Preliminary Cost Estimate: Indirect/Consultant (high, $150-200k)

Initiative 7. Develop Asset Class Specific TAM Procedures

Description: The primary thrust of this initiative is to advance each asset class into a mature state so that eventually all Agency assets can be incorporated into the performance based planning framework and decisions can be made using complete data sets of known quality.

Characteristics of a mature asset class TAM system are as follow:

- An IT system exists to store information for each asset that contains a data analytics engine.
- An asset owner(s) (responsible party for managing an asset) is identified.
- A complete and accurate inventory system is available for an asset that is tied to the Agency's linear referencing system. The granularity of the inventory is dependent on the asset (for example, a complete inventory is required for pavements but a sampling approach may be used for ground-mounted signs). This inventory is shown in an Agency asset register.
- Protocols are established to collect condition information. These protocols include the inspection procedure, frequency, responsible party for inspections, quality management procedures, data storage and archival procedures.
- Risks are identified, ranked, and a mitigation strategy developed.
- Analytical engines exist to project condition given various preservation and funding scenarios. Scenarios can be run to determine the optimal investment scenario that take into account risk and whole life costs to build, maintain, and dispose of an asset. This includes a process to determine the funding needed to maintain a newly installed asset at a specific level of service.
- A feedback process is in place to improve the management of an asset class.
- The complete process for managing an asset is documented.

The priority of this implementation for highways will focus on the following assets:

1. Bridges
2. Pavements
3. Culverts, Roadside Maintenance
4. Guardrails
5. Signals
6. Overhead signs
7. Ground-mounted signs
8. ITS Devices
9. Sidewalks
10. Facilities

Each asset will be advanced as per the priorities established by the NHDOT TAM Coordinator with approval by the Executive Committee. It is desired that assets from other modes be incorporated as well. The assets from other modes will be advanced as per direction of the TAM Coordinator with approval by the Executive Committee. For other modes, the following assets will be advanced.

Rail

- State owned rail lines
- Cars and equipment
- Rail facilities

Transit

- Rolling Stock (buses, trucks, and loaders)
- Facilities
- Equipment (IT and maintenance)

Aeronautics

- Airport pavement
- Airport infrastructure
- Navigational Aids

Bike & Pedestrian

- Trail facilities

Initiative Leader: The TAM Project Management Team will have overall oversight for development of the asset class template. A workgroup will be formed for each asset class for this purpose. The work groups should consist of subject matter experts for each asset under consideration. A representative from the Districts should also be present on each workgroup.

Key Steps:

The first key step is development of an asset class template that describes specifically the desired characteristics for an "optimal" asset class level TAM program. This template will be used by the individual asset class specific workgroups as a "go-by" for their implementation efforts. This should include a template set of documentation.

For each asset class the Agency will conduct the following:

- Determine the current state of an asset class against the "ideal characteristics" developed above.
- Determine a timeframe for development of the asset class (detailed asset specific work plan).
- Develop (or revise existing) manuals that document all aspects of TAM processes for an asset class.
- Implement the work plan.
- Implement the system on a pilot basis for one year.
- Revise based on results.
- Implement the system.
- Refine the system as lessons are learned.

Timing: This activity should start immediately and will last through the term of this work plan. It is desired that the pavement and bridge asset classes will be advanced first and are of high priority. The remaining asset classes will be advanced as per the direction of the NHDOT TAM Coordinator.

Preliminary Cost Estimate: Indirect

Initiative 8. Develop Maintenance Quality Assurance Program

Description: This initiative is designed to begin a performance based process for the assets that are managed by the Districts (other than pavements and bridges). Development of a Maintenance Quality Assurance (MQA) Program will allow performance of Maintenance Operations to begin to be captured and compared against budget outlays.

This type of system is mature within the United States. There are many good examples in existence for the Agency to draw from to establish this program.

Initiative Leader: A workgroup should be formed for this purpose. A District Engineer should be the leader of the working group. This workgroup should include members of the district who actually perform maintenance of the assets.

Key Steps:

- Research the current state-of-the-practice of MQA in the United States. The following website is a good resource to use for this purpose http://www.wistrans.org/mrutc/training-libraries/mqa/. The Federal Highway Administration also has expert MQA resources. The Ohio DOT is known as a leader in this field.
- Select a model for the MQA program.
- Develop a manual of data collection and quality assurance processes to be used for MQA in New Hampshire.
- Develop an IT system to store the data. This should include a "Dashboard" reporting mechanism that is visible throughout the Agency.
- Pilot the system in one District.
- Revise based on results.
- Implement the system on a pilot basis for one year.
- Hold a de-briefing with all Districts to share lessons learned.
- Revise based on results.
- Develop performance targets based on result of the pilot study. Provide incentives for Districts to meet the performance targets.
- Implement the system.
- Implement a yearly "best practices" summit to provide the Districts the opportunity to share experiences and lessons learned.

Timing: This activity can begin immediately and the implementation will last for the duration of this work plan (five years).

Preliminary Cost Estimate: Indirect

5.2 IMPLEMENTATION PLAN SUMMARY

Table 5.1 presents a summary of the implementation plan. It illustrates the initiatives, responsible party, and an initial estimate of funding needs.

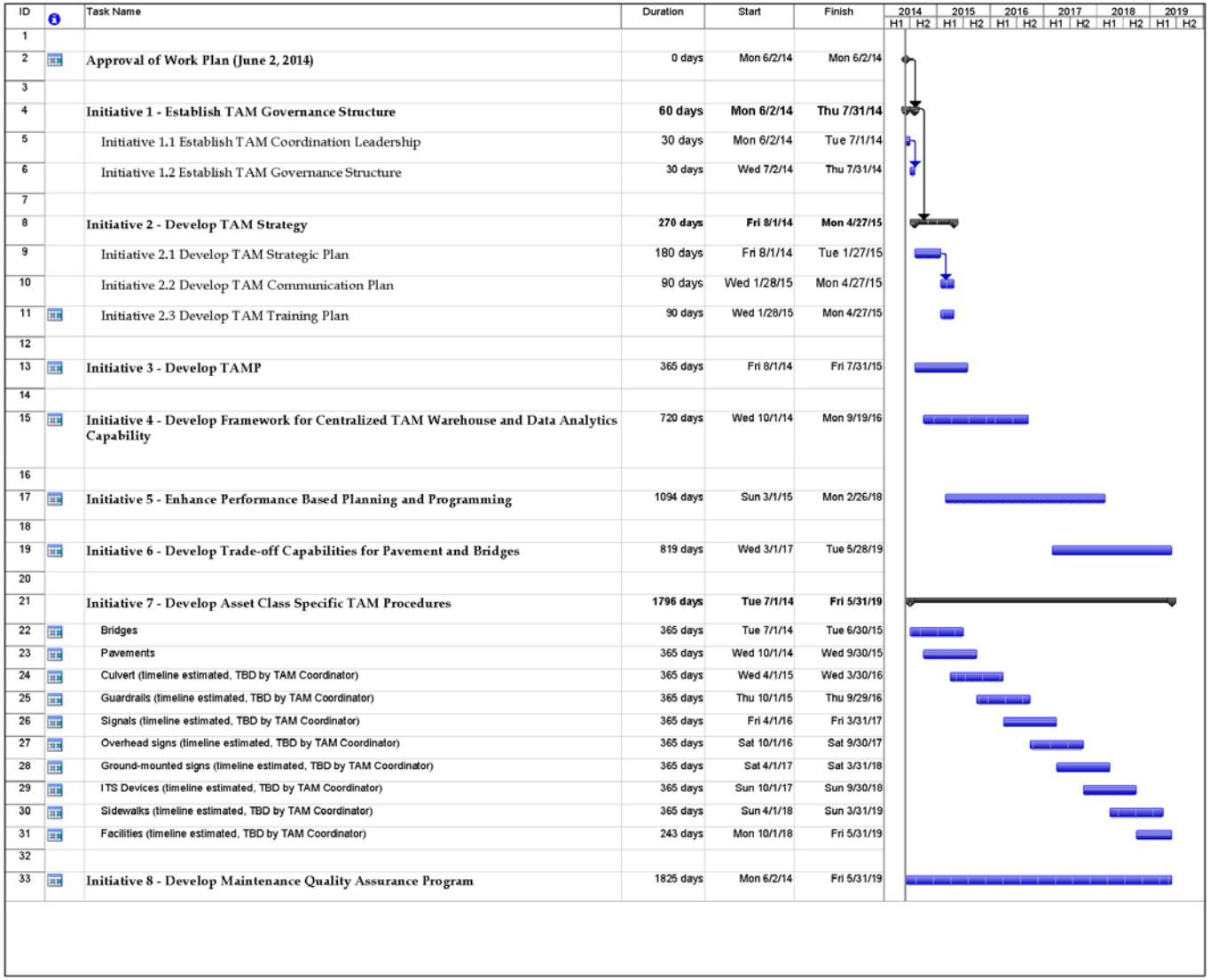
5.3 IMPLEMENTATION TIMEFRAME

This work plan covers a period of five years. Figure 5.2 provides a schematic of the overall implementation timeframe for each initiative.

Table 5.1 Implementation Plan Summary

Initiative	Leader	Timeframe	Prelim. Cost Estimate
Approval of Work Plan	Commissioner	N/A	N/A
Initiative 1 - Establish TAM Governance Structure			
Initiative 1.1 Establish TAM Coordination Leadership	Chief Engineer/Executive Committee	One month after work plan approval	Indirect
Initiative 1.2 Establish TAM Governance Structure	TAM Coordinator	One month after TAM Coordinator appointed	Indirect
Initiative 2 - Develop TAM Strategy			
Initiative 2.1 Develop TAM Strategic Plan	TAM Coordinator	Six months after completion of initiative 1.2	Indirect/Consultant (medium)
Initiative 2.2 Develop TAM Communications Plan	TAM Coordinator	Three months after completion of initiative 2.1	Indirect/Consultant (low)
Initiative 2.3 Develop TAM Training Plan	TAM Coordinator	Three months after completion of initiative 2.1	Indirect/Consultant (low)
Initiative 3 - Develop the TAMP	TAM Coordinator	Twelve months beginning in August 2014	Indirect/Consultant (high, $200-250k)
Initiative 4 - Develop Framework for Centralized TAM Warehouse and Data Analytics Capability	Task Workgroup Leader	Twenty-four months beginning in October 2014	Indirect/Consultant (high, $200-250k)
Initiative 5 - Enhance Performance Based Planning and Programming	Task Workgroup Leader	Thirty-six months beginning in March 2015	Indirect/Consultant (high, $150-200k)
Initiative 6 - Develop Trade-off Capabilities for Pavement and Bridges	Task Workgroup Leader	Begin in March 2017, continue through 2019	Indirect/Consultant (high, $150-200k)
Initiative 7 - Develop Asset Class Specific TAM Procedures			
Bridges	TAM Project Management Team/Asset Specific Workgroup Leader	2014-2019	Indirect
Pavements			
Other Assets as Designated by TAM Coordinator			
Initiative 8 - Develop Maintenance Quality Assurance Program	Task Workgroup Leader	2014-2019	Indirect

Figure 5.2. Implementation Schedule



ID	Task Name	Duration	Start	Finish
1				
2	**Approval of Work Plan (June 2, 2014)**	0 days	Mon 6/2/14	Mon 6/2/14
3				
4	**Initiative 1 - Establish TAM Governance Structure**	**60 days**	**Mon 6/2/14**	**Thu 7/31/14**
5	Initiative 1.1 Establish TAM Coordination Leadership	30 days	Mon 6/2/14	Tue 7/1/14
6	Initiative 1.2 Establish TAM Governance Structure	30 days	Wed 7/2/14	Thu 7/31/14
7				
8	**Initiative 2 - Develop TAM Strategy**	**270 days**	**Fri 8/1/14**	**Mon 4/27/15**
9	Initiative 2.1 Develop TAM Strategic Plan	180 days	Fri 8/1/14	Tue 1/27/15
10	Initiative 2.2 Develop TAM Communication Plan	90 days	Wed 1/28/15	Mon 4/27/15
11	Initiative 2.3 Develop TAM Training Plan	90 days	Wed 1/28/15	Mon 4/27/15
12				
13	**Initiative 3 - Develop TAMP**	365 days	Fri 8/1/14	Fri 7/31/15
14				
15	**Initiative 4 - Develop Framework for Centralized TAM Warehouse and Data Analytics Capability**	720 days	Wed 10/1/14	Mon 9/19/16
16				
17	**Initiative 5 - Enhance Performance Based Planning and Programming**	1094 days	Sun 3/1/15	Mon 2/26/18
18				
19	**Initiative 6 - Develop Trade-off Capabilities for Pavement and Bridges**	819 days	Wed 3/1/17	Tue 5/28/19
20				
21	**Initiative 7 - Develop Asset Class Specific TAM Procedures**	**1796 days**	**Tue 7/1/14**	**Fri 5/31/19**
22	Bridges	365 days	Tue 7/1/14	Tue 6/30/15
23	Pavements	365 days	Wed 10/1/14	Wed 9/30/15
24	Culvert (timeline estimated, TBD by TAM Coordinator)	365 days	Wed 4/1/15	Wed 3/30/16
25	Guardrails (timeline estimated, TBD by TAM Coordinator)	365 days	Thu 10/1/15	Thu 9/29/16
26	Signals (timeline estimated, TBD by TAM Coordinator)	365 days	Fri 4/1/16	Fri 3/31/17
27	Overhead signs (timeline estimated, TBD by TAM Coordinator)	365 days	Sat 10/1/16	Sat 9/30/17
28	Ground-mounted signs (timeline estimated, TBD by TAM Coordinator)	365 days	Sat 4/1/17	Sat 3/31/18
29	ITS Devices (timeline estimated, TBD by TAM Coordinator)	365 days	Sun 10/1/17	Sun 9/30/18
30	Sidewalks (timeline estimated, TBD by TAM Coordinator)	365 days	Sun 4/1/18	Sun 3/31/19
31	Facilities (timeline estimated, TBD by TAM Coordinator)	243 days	Mon 10/1/18	Fri 5/31/19
32				
33	**Initiative 8 - Develop Maintenance Quality Assurance Program**	1825 days	Mon 6/2/14	Fri 5/31/19

Appendix A. State of the Practice

Table A.1 Policy Goals and Objectives

Does Policy Guidance Encourage Good Asset Management?

Characteristics	Criteria	Benchmark – State-of-the-Practice	NHDOT State-of-the-Practice
1. Policy goals and objectives reflect a holistic, long-term view of asset performance and cost.	Defined goals and objectives	Goals and objectives are comprehensive, integrated with other statewide policy objectives, and supported by quantitative and measurable performance measures or criteria.	The Balanced Scorecard (BSC) provides a focus on goals and objectives of the Agency. This engenders a shared mission and purpose within the Agency. The BSC is an evolving tool within the Agency. Agency staff expressed strong support.
	Asset Management is a key catalyst for decision and action	Principles of good asset management are articulated in an Agency business plan and clearly recognized throughout the Agency as the driving force for resource allocation and utilization.	Asset management platform, policies, and practices are not currently in place but there is a general consensus within the NHDOT staff on the need and importance of transportation asset management (TAM) going forward.
	Life-cycle perspective	Goals and objectives embody the perspective of life-cycle economic analyses of asset performance and cost, and encourage strategies with long-term benefits.	Life cycle analysis is not the primary driver for decision-making.
2. Goals and objectives embody the public interest in good stewardship of transportation assets.	Recognition of asset condition, performance, and public acceptance in policy formulation	Policy goals and objectives encourage a business-model, customer-oriented approach to asset management. Reliable information on asset condition and public perceptions thereof is accounted for in updating policy objectives.	The BSC contains input from planning organization customers (i.e. Regional and Metropolitan Planning Organizations) but not citizens. System performance for pavements and bridges are measured and publicly reported against BSC goals.
	Public reporting and accountability	Reported system performance is measured against policy goals and objectives.	
3. Policy formulation allows the Agency latitude in arriving at performance-driven decisions on resource allocation.	Political process	Political decisions on resource allocation among modes or programs are strongly influenced by objective information on expected performance.	Resource allocation among programs is not based on formal analysis of budget level versus expected performance. Performance models are not established and goals, budget, and actions are not explicitly connected. Districts - minimal guidelines on how budgets are allocated, thus, most of the districts' funding decisions are based on historic funding levels.
	Agency decision-making	The Agency makes resource allocation decisions among programs and across geographic regions based on expected performance rather than by historical splits or formulas that do not correlate with an objective indication of system condition.	

Characteristics	Criteria	Benchmark – State-of-the-Practice	NHDOT State-of-the-Practice
4. The Agency proactively helps to formulate effective asset management policy.	Engagement with policy-makers	The Agency actively engages with political leaders and other policy-makers to define expectations of system performance, frame alternative approaches, and outline the consequences of decisions and courses of action relative to these expectations.	NHDOT works with policy-makers during the 10-year budgeting process, sharing information on specific transportation problems, projects, and potential solutions. A system wide view of needs and performance under different budget scenarios is not currently presented to policy-makers. Pavement and bridge assets can provide some information on policy choices (preservation advantages for pavements for example), but improvements are needed for both asset classes. All other asset classes do not have systems available to provide meaningful information on policy choices.
	Provision of information	The Agency's asset management systems are designed and applied to yield meaningful information on policy choices and consequences.	

Table A.2 Planning and Programming

Do Resource Allocation Decisions Reflect Good Practice in Asset Management?

Characteristics	Criteria	Benchmark – State-of-the-Practice	NHDOT State-of-the-Practice
1. Planning and programming procedures and criteria are consistent and reinforce policy goals and objectives.	Fiscally responsible planning	Development of statewide long-range plans can be demonstrated to be consistent with policy goals and objectives and with realistic projections of future revenue.	The budget is prepared biannually in accordance with the 10-year plan. In the future, NHDOT wants to connect infrastructure needs to budget more explicitly. There is a need to link the BSC to budgets more explicitly. Attempts are underway to connect the level of service to budget and changing the budget structure to have a more programmatic focus. BSC is used to drive decisions at a strategic level. The ideal goal is to base decisions on the 10-year plan and move the focus away from worst-first and work towards improving the health of the overall system which would mean focusing on preservation over capital improvements. Currently, planning and program development and risk management process are not formally documented.
	Program prioritization	Funding allocation and project prioritization criteria are consistent with and support the State's and the Agency's policy goals and objectives.	
	Updates and revisions	Updates and revisions to the planning and program development process are performed regularly to reflect changes affecting asset management priorities in the areas of: - Policy (e.g., preserving existing investments, economic development), - Technology (e.g., new design procedures or materials), or -Emerging issues (e.g., updated environmental regulations; identification of potentially catastrophic risks to asset condition or performance).	
2. Planning and program development consider a range of alternatives in addressing system deficiencies.	Planning alternatives	Long-range planning identifies and evaluates a range of program alternatives and, as appropriate, modal alternatives to meet present and future deficiencies.	There are currently no specific targets for project programming. Engineering judgment is used to create plans. There is no formal trade-off process within or between assets. The program is developed primarily for capital projects, not as much for maintenance and preservation. MPOs have a say in project programming. There is a great deal of discretion in how programs and projects are funded.
	Project scope, cost, benefits, impact on performance	Program development, guided by adopted plans, formulates projects of appropriate scope and develops realistic estimates of their costs, benefits, and impacts on system performance.	
3. Performance-based concepts guide planning, program development, and system monitoring.	Performance-based budgeting	Recommended programs and budgets are tied to performance budgeting concepts entailing: -Structuring of costs by activity -Relationships of costs to levels of service or performance measures	Resource allocation among programs is not based on formal analysis of budget level versus expected performance. Attempts are underway to connect the level of service to budget and changing the budget structure to have a more programmatic focus. Currently the BSC only considers measures that are easily reportable, not necessarily key to drive overall performance.
	Benchmark achievement	The planning and programming process indicates (or "defines") the resources required to maintain existing assets at target performance levels and at least lifecycle cost.	

Characteristics	Criteria	Benchmark – State-of-the-Practice	NHDOT State-of-the-Practice
	System monitoring	Performance measures or levels of service are defined and regularly applied to quantify the impacts of program decisions and actions and to provide feedback for future planning and program priorities.	Information on resources needed to maintain existing assets at target performance level is not easily available. NHDOT's system monitoring and reporting approach is being updated using BSC and system is monitored using different indices based on the asset type. NHDOT wants to move towards a "health index."
	Reporting	Progress toward stated programmatic system performance targets is measured and reported regularly.	
4. Resource allocations and program tradeoffs are based on relative merit and an understanding of comparative costs and consequences.	Program building	Organization of projects within programs (program building) results from statewide competition among projects based on objective criteria.	Currently, the planning group of NHDOT uses a lot of data to drive its decisions and the Agency is good at interpreting the data. There is transparency in decision making which is important to the Agency and the legislature. However, there are currently no specific targets for project programming. Engineering judgment is used to create plans. There is no formal trade-off process within or between assets. The program is developed primarily for capital projects, not as much for maintenance and preservation. Most of the districts' funding decisions are based on historic funding. Pavement and bridge asset classes can produce resource based programs. But overall this process is very much focused on engineering judgment.
	Consistency	Projects being designed and built respond to, and are consistent with, overall policy guidance for system performance.	
	Program tradeoffs	Tradeoffs between programs (e.g., preservation versus improvement) are based upon analyses of life-cycle benefits and costs, rather than arbitrary formulas or historical splits.	
	Communication	The implications of more or less resources allocated to each program are clearly communicated in terms of selected performance measures.	

Table A.3 Program Delivery

Do Oversight Techniques and Follow-Through Reflect Good Industry Practices?

Characteristics	Criteria	Benchmark – State-of-the-Practice	NHDOT State-of-the-Practice
1. The Agency considers all available methods of program delivery.	Cost tracking	The Agency knows its costs for delivering its programs and services (e.g., by activity, bid item, or resource class).	NHDOT uses the Managing Assets for Transportation Systems (MATS) as a project accounting system. It can be used as a project accounting system, tool to coordinate activities, and a tool to track work performed on all assets. It can record people, time, and assets touched. The current version of MATS does not capture the cost of work performed by contractors. The data is sometimes hard to retrieve. Costs can be easily captured for capital projects. Preservation and maintenance costs are much harder to determine by asset type.
	Options for delivery	The Agency periodically evaluates its options for delivering programs and services: e.g., Agency employees, intergovernmental agreements, partnering, outsourcing, and managed competition.	NHDOT either self-performs or subcontracts a certain function/task based on cost-effectiveness, resource availability, and established procedures.
2. The Agency tracks program outputs and outcomes.	Feedback mechanism	The Agency has the ability to easily track actual project and service delivery against the program plan so that adjustments can be made.	NHDOT does not have an established feedback mechanism or a formal change process.
	Change process	A formal program change process exists to make needed adjustments in cost, schedule, and scope; document causes; and reallocate funds.	
3. Reports on program delivery accomplishments are communicated and applied.	Internal	Department executives and program managers are regularly informed of progress; a well-understood mechanism exists to make needed adjustments.	BSC provides insight into some programs. Good process for large capital projects.
	External	Policy-makers and key stakeholders are kept informed of program status and adjustments.	Generally the legislature is kept well informed of progress against goals.
4. The approved program is delivered efficiently and effectively.	Delivery measures	Measures are defined and tracked to gauge successful program delivery in terms of schedule, cost, and scope.	Performance models are not established and goals, budget, and actions are not connected.
	Change management	The Agency has a process to review and revise delivery approaches if improvement is needed.	NHDOT does not have any specific systems in place for change management.

Table A.4 Information and Analysis

Do Information Resources Effectively Support Asset Management Policies and Decisions?

Characteristics	Criteria	Benchmark – State-of-the-Practice	NHDOT State-of-the-Practice
1. The Agency maintains high-quality information needed to support asset management	Asset Inventory	The Agency maintains an inventory of assets that is a complete, accurate, and current description of infrastructure for which the Agency is responsible or in which it has a statewide transportation interest.	Inventory and condition data is available for NHDOT's major infrastructure asset classes, as described below. Pavement - NHDOT has been using Deighton as its pavement management system for over 15 years. The IRI, crack detection, rutting, and right-of-way images are collected every year for interstates, Turnpike, and the National Highway System (NHS). The non-NHS numbered routes are collected on the odd year, and the unnumbered system and off-network HPMS sections collected on the even year. Bridges – NHDOT uses PONTIS as its bridge management system to record inventory and condition. The pavement and bridge inventory and condition information are considered of high quality. The Agency is good at collection of pavement maintenance/rehabilitation information and most of this data is collected through an interactive process with personnel. Custom reports are developed and delivered to the districts. Other assets - There is a MS Excel based inventory of overhead sign structures. Annual inspections are conducted on overhead signs. A detailed inventory of ITS field assets is in place and routine preventative maintenance is performed every six months on ITS field assets. A good database of signals including latitude, longitude, type of controllers, and phasing is stored in a MS Access database.
	Asset Condition	Asset condition data are updated on a periodic schedule sufficient to meet regulatory requirements (e.g., bridge inspection data) and to provide timely and accurate information on status and performance.	

Characteristics	Criteria	Benchmark – State-of-the-Practice	NHDOT State-of-the-Practice
	Customer Perceptions	Information on customer perceptions is updated regularly through surveys, focus groups, complaint tracking, or other means, to gauge public perception of asset condition and Agency performance, and to respond thereto.	There is no citizen input process in place.
	Program Outputs	Information on actual costs and accomplishments by project, asset category, work type, and location are maintained in a form that can be utilized to track actual cost versus performance and improve cost estimation techniques.	This varies by asset class. In general, this area is a significant opportunity for improvement.
2. Agency collects and updates asset management data in a cost effective manner	Data Collection Technology	The Agency applies the appropriate mix of data collection technology (e.g., visual, automated, remote sensing) to provide cost-effective coverage needed to maintain the quality information base discussed above.	NHDOT uses an efficient combination of methods to collect asset inventory and condition data for pavement and bridges. NHDOT uses a state-of-the-art Pathways videologging vehicle for pavement data collection. All collected data goes through a quality assurance process. Bridge information is collected using national standards. The process is documented. ITS has a good inventory base. Other asset class data collection is an emerging process.
	Sampling Methodology	The sampling methodology is demonstrated to be appropriate in terms of network coverage, sample size, and frequency, and in the training and team assignments needed to ensure objectivity, consistency, and repeatability.	Data collection is performed in accordance with federal guidelines (e.g. Highway Performance Monitoring System (HPMS), National Bridge Inventory (NBI), etc.). Written data collection procedures for pavements are being developed (anticipated to be released in May 2014). Sampling methodologies and quality management processes for other asset classes are emerging.

Characteristics	Criteria	Benchmark – State-of-the-Practice	NHDOT State-of-the-Practice
3. Information is automated and on platforms accessible to those needing it – relates to both databases and systems	System Technology and Integration	The Agency's single-asset management systems and databases have been updated and integrated to enable consistent information on all asset categories to be accessible to multiple applications, and to provide managers at various organizational levels the information and tools needed for effective asset management.	NHDOT's systems are partially integrated. IT group of NHDOT can "see" across all systems and GIS provides a means to integrate data access across the DOT including Districts and could (is not currently) be used as the central data repository for asset data and information. The GIS has the ability to link into other systems fairly easily. Currently GIS data is pushed to the Districts every quarter (bandwidth issues prevent "live" access to GIS data). Primary data in the pavement management system (Deighton) is stored and backed up on servers controlled by the IT department. However, some data and information is currently being stored informally resulting in potential redundancy of data and raising the possibility for loss of data or the inability to use current data if a critical staff member leaves. Summary Pavement Management System (PMS), bridge and guard rail location data is present in the GIS but inventory data of other assets are stored in other formats. Orthos are available for the entire State through GIS. The Pathways van videolog is not currently linked to GIS. There is a common geographic referencing system. A consolidated asset management platform, policies, and practices are not currently in place.
	Data Administration	Information requirements and/or standards for asset management are in place to ensure that future system and database development efforts within the Agency will integrate with existing systems and meet asset management information and analysis improvement needs.	
	Geosystems	Systems and information are based upon a common geographic referencing system and a common map-based interface for analysis, display, and reporting.	
4. Effective Decision-Support Tools are available for Asset Management	Strategy Analysis	The Agency has decision-support tools that facilitate exploration of capital versus maintenance tradeoffs for different asset classes.	There is lot of data to assist with decision-making, however, it is very scattered and engineering judgment plays a big role in decision making. There is no formal tradeoff process currently in place. Capital versus maintenance tradeoffs can be analyzed for pavements but no other assets.

Characteristics	Criteria	Benchmark – State-of-the-Practice	NHDOT State-of-the-Practice
	Project Analysis	The Agency has tools that support consistent analysis of project costs and impacts, using a life-cycle cost perspective.	This is an emerging need.
	Program Analysis	The Agency has tools, which provide an understanding of the system performance implications of a proposed program of projects.	This is an emerging need.
	Program Tradeoff Analysis	The Agency has tools to help explore the system performance implications of different levels or mixes of investments across program categories or subcategories.	This is an emerging need.
5. Financial value of assets	Conformity with Government Accounting Standards Board (GASB) Statement 34	The Agency reports the value and condition of its transportation capital assets in a manner that conforms to the modified approach specified in GASB standards.	This is an emerging need.
	Information support for condition and financial reporting	Information on asset condition and the level of expenditure needed to meet target condition is available from the Agency's asset management systems.	This is an emerging need for all assets besides pavements.

Appendix B. References

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