VTrans Transportation Asset Management Implementation Plan

Implementation Plan

Final

Vermont Agency of Transportation Transportation Asset Management Implementation Plan

Table of Contents

List of Tables

List of Figures

1.0 Introduction

1.1 BACKGROUND

The mission, vision, and goals of the Vermont Agency of Transportation (VTrans) are as follow:

- **Mission**: Provide for the safe and efficient movement of people and goods.

- **Vision**: A safe, reliable, and multimodal transportation system that promotes Vermont's quality of life and economic well being.

- **Goals**:

  1. Provide a safe and resilient transportation system in an environmentally responsible manner.

  2. Preserve, maintain, and operate the transportation system in the most cost effective and efficient manner.

  3. Provide Vermonters energy efficient travel choices/options.

  4. Provide quality customer service.

  5. Develop a workforce to meet the strategic needs of the Agency.

Transportation infrastructure managers nationwide are facing many challenges, including aging assets and tighter budgets. The complexity is increased due to limited infrastructure information, the need to satisfy multiple stakeholders' expectations and the demand for more sustainable transportation solutions. VTrans is committed to responding proactively to these needs and is responsible for ensuring that Vermont's transportation system remains in good working order regardless of its age. Therefore, the challenge to manage transportation infrastructure assets has led VTrans to emphasize an asset management policy as a business process that drives quality decisions based on accurate data and analysis. The primary purpose of asset management is to use available funding strategically and efficiently.

The Agency seeks to continue progressing in both performance and asset management, managing for the whole life including implementation of infrastructure preservation programs, risk management, and longer term financial management, particularly in terms of addressing the long-term sustainability of transportation assets.

The VTrans Asset Management Policy Statement was endorsed by the VTrans' Executive Team in April 2014 (Vermont Agency of Transportation, 2014). As indicated in the policy statement, VTrans is developing an asset management framework. Also, as of February 2014, VTrans has begun developing a Transportation Asset Management Plan (TAMP) to comply with both State and Federal (MAP-21) legislation. VTrans is developing the TAMP through an intra-Agency work group (TAMP-WG) committed to improving how the Agency conducts its business.

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 VTrans has developed this Transportation Asset Management Implementation Plan, customized to the business processes and needs of the Agency which specifically focuses on selected transportation infrastructure.

VTrans 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. VTrans is developing an asset management framework to support its asset management efforts and to comply with the requirements of MAP-21 and Vermont State Statute 19 V.S.A §10k. 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 VTrans' 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 implementation plan was developed in four steps. The first step was performance of a strategic self-assessment. As part of this process, eighty-four Agency staff participated in an online Gap Analysis survey (AMEC, 2014) 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 VTrans' 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 adoption of this implementation plan is a first step. This plan should be revisited on a periodic basis (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 VTrans 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 AASHTO 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 VTrans using the state-of-the-practice asset management framework in the AASHTO TAM Guide as a benchmark.

- Section 4 establishes a mission 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."*

The Vermont Legislature ([19 V.S.A. § 10k](#)) has codified asset management policy as:

(a) The agency shall develop an asset management plan which is a systematic goal and performance-driven management and decision-making process of operating, maintaining, and upgrading transportation assets cost-effectively. At a minimum, the asset management system shall:

  (1) identify transportation system indicators by which the different components of the transportation system may be evaluated;

  (2) list all of the infrastructure assets and their condition, including, but not limited to, pavements, structures, and facilities;

  (3) include deterioration rates for infrastructure assets; and

  (4) determine, long-term, the annual funds necessary to fund infrastructure maintenance at the recommended performance level.

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 VTrans 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 VTrans 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 quality data and 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 VTrans' 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.
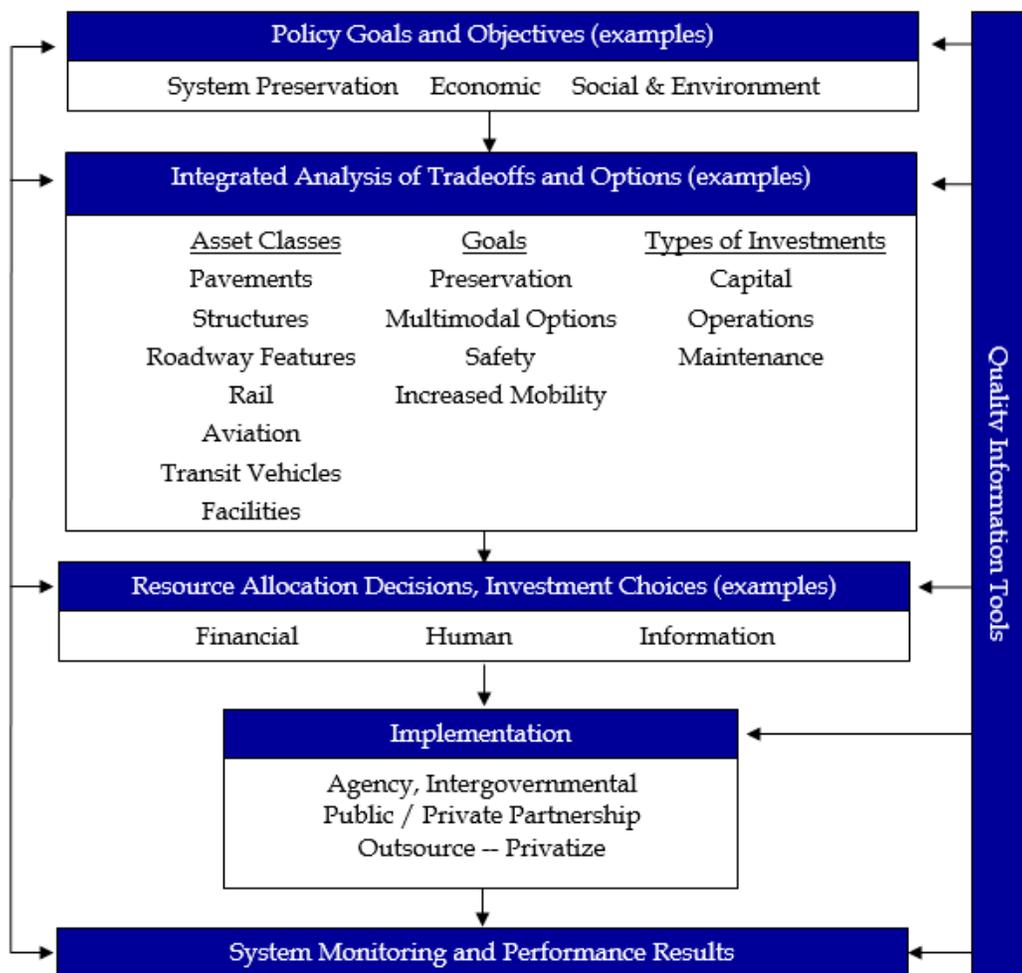
Figure 2.1 illustrates a strategic, integrated, systematic, and interdisciplinary approach to asset management for physical transportation infrastructure. The approach is cast as a resource allocation and utilization process. The entries in Figure 2.1 are examples, defined broadly and comprehensively to provide a "benchmark" as to how the process could work in a general case. VTrans 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 in the Vermont legislation and VTrans Asset Management Policy Statement. "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.

- 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 VTrans

This section summarizes current (2014) TAM practice in VTrans. These practices are summarized by topic area congruent with the AASHTO TAM Guide, Volume 1. As briefly described in section 2, the TAM Guide, Volume 1 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 VTrans, and a focused and structured face-to-face workshop with key personnel, including Executive Staff.

3.1 CURRENT VTRANS ASSET MANAGEMENT PRACTICES

Tables located in appendix A (A.1 through A.4) present VTrans' state of the practice as compared to the state-of-the-art in asset management as documented in the AASHTO TAM Guide, Volume 1. 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 VTrans 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 VTrans in each of the key areas of asset management.

3.2 TAM STRENGTHS

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

- The Vermont Legislature has set asset management policy for VTrans.

- VTrans 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 State has a very strong tie with political leaders for formulation of policy and budgets.

- VTrans has a strong framework for project delivery and program management and this characteristic is valued as one of the top factors in having good asset management practice.

- Project delivery and program management is seen as a strength especially with respect to keeping agency Executives and program managers informed on program delivery status and soliciting input from all affected parties to ensure that project scope is consistent with objectives of the project.

- VTrans is very close to its desired maturity level in maintaining and using information on the full unit costs of construction activities. This can serve as a foundation for tracking maintenance costs.

- Pavement inventory and condition information (Pavement Management System - dTIMS) is considered high quality and robust. There exists a good foundation for the pavement and bridge assets.

- Ranking candidates for capital projects and identifying system deficiencies and needs are strengths. Lessons learned from the Agency's current prioritization system may be able to be utilized to increase the Agency's ability to monitor overall system performance and compare its performance to system targets.

- Good software tools and systems are in place. Integration is the key.

3.3 TAM OPPORTUNITIES FOR IMPROVEMENT

The current practice review identified several opportunities to strengthen VTrans' 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. The Agency Strategic Plan should be tied more closely to performance of the entire system. Currently the plan only considers measures that are readily reportable, not necessarily key to drive the Agency forward and manage the entire network. The measures are still stove-piped.

- 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 external and internal 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. Most staff don't consider themselves experts in asset management and would benefit from formal training.

- 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. To this effect, VTrans has set up a working group that began developing the TAMP in February 2014.

- The most apparent opportunity for improvement is in the area of information management. The most evident opportunity for improvement exists in information integration and access. This includes improving the ease of access to asset information, establishing data standards to promote consistent treatment of existing asset-related data and development of future applications, having standard geographic referencing and ability to generate maps showing needs/deficiencies for different asset classes and planned/programmed projects.

- The highest tactical priority that resulted from the interview process was to increase access to the data the State already has along with information on how to use (and how not to use the data). The second highest tactical priority was data integration. Data is presently stored in over 250 databases so a strategy for data storage and integration will need to be the first key step in moving towards asset management.

- Integration of systems so location, type, and history of all assets can be viewed and used for decision making is a high priority item in supporting the State's asset management efforts.

- The following factors are considered important for TAM: establishing data governance standards, data-driven project selection, developing policy and procedures for analytical trade-off analysis, and considering risk in managing assets.

- 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. The majority of the staff are unclear on how Agency budget is developed and how funding is

allocated by asset class. Documenting this process will provide a more transparent budget structure to more directly link work plans and programs to authorized funding.

- TAM should show a series of incremental small wins.

- Transparency should be a driver for TAM – both for the TAM development process and for goal setting and goal achievement.

- There is inconsistency throughout the department at varying levels on whether a preservation-first strategy is currently being applied to VTrans' assets.

- The State has a very strong tie with political leaders for formulation of policy and budgets. This link is not as strong in relation to the general public.

- There seems to be indecision about whether customer opinion should drive, or significantly influence, the program. While there is general consensus that establishing customer based service levels (CSLs) is a step in the right direction, it doesn't appear to be considered a key factor at this point in time.

- Opportunities for improvement exist with respect to inventory data collection for all assets. Interestingly, condition and performance information is viewed as more advanced. The agency is proactive in efforts to improve data collection efficiency and effectiveness.

- Creation and alignment of strategies with specific performance measures is a significant opportunity for improvement. Specifically this relates to strategies that take into account the impact to asset conditions and remaining life resulting from maintenance and operations, not simply upfront construction costs. Development of performance targets is a first step. Building systems (process and technology) to support the collection, analysis, and reporting of current performance with respect to the performance targets is the next step.

- Pavement project level decision making is seen as being data driven. While bridge project level decision making is seen as being data driven, there is room for improvement.

- Improvements can be made to make pavement and bridge investment decisions more transparent. Improvements are also needed to make investment decisions between asset classes (roads, rail, airports, and transit) more transparent. Many staff believe that in the current situation, the Agency has not determined what the "right" (data driven) allocation is. While the Agency seems to be doing relatively better on being able to determine the "right" balance between preservation and reconstruction, there is room for improvement.

- Engineering judgment is the primary method of project selection for the Agency.

- Policies supporting preservation of existing infrastructure assets and those that encourage resource allocation and project selection based on cost-effectiveness or cost/benefit analysis are considered an important step towards VTrans' future in asset management.

- Forecasting future system performance and system monitoring and feedback is a need for the agency. A positive feedback loop should be developed internally that allows for external (customer) and internal stakeholders to provide feedback in a variety of performance related areas.

- There exists an opportunity to have policy guidance that supports a long-term, life-cycle approach to evaluating investment benefits and costs.

- The Districts need better tools to manage their assets and make maintenance decisions. Implementing a maintenance quality assurance program to drive system performance is a key step.

- The current decision support tools are good for identifying needs, but not so good at being able to evaluate priorities. The ability to use decision support tools in support of effective asset management is another opportunity for improvement.

- Refinement of deterioration prediction models is another area of improvement.

- The Agency seems undecided on whether the Managing Assets for Transportation Systems (MATS) is, or could be, important to the State's asset management efforts.

- While the majority of the staff have access to geographic information system (GIS), a small percentage of the staff have the experience to be able to extract the information needed.

- 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.

- There is room for improvement for managing projects that change their scope thus impacting the treatment of assets within the project.

- Consistent definitions need to be established.

4.0 TAM Mission and Goals

This section presents the mission for risk based TAM at VTrans, a set of goals to guide its implementation, and a discussion of the outcome and benefits of TAM. The mission and goals are the synthesis of (1) VTrans' development of several different concepts and methods as described in Appendix A, (2) the principles of asset management described in section 2, (3) the results of the Gap Analysis exercise, (4) VTrans Asset Management Policy Statement, and (5) the results of an executive meeting to formalize the goals, objectives, and strategies to carry out the policy statement.

4.1 TAM MISSION

Asset management is an Agency-wide commitment to excellence and applies to all departments and divisions within VTrans; Finance and Administration, Motor Vehicles, Operations, Policy, Planning and Intermodal Development and Program Development.

The primary mission of the VTrans asset management process builds on the department's vision of a safe, reliable, and multimodal transportation system that promotes Vermont's quality of life and economic well being. The TAM mission is in alignment with the 2006 New Zealand Asset Management Support (NAMS) International Infrastructure Management Manual definition of asset management. It is:

> *"Meet the required customer service level, in the most cost effective manner through the management of assets for both present and future customers."*

The overall mission is to program projects at strategic points in a particular asset's life to extend its expected useful life, prolong performance, and reduce the cost to manage assets over the entire useful life.

4.2 TAM GOALS

VTrans is developing an asset management framework to support its asset management efforts and to comply with the requirements of MAP-21 and Vermont State Statute 19 V.S.A §10k. The components of this framework reflect the recommendations of the Federal Highway Administration (FHWA), MAP-21, and best practices of the international community.

The primary objective of VTrans asset management is to achieve better decision-making based on quality information and well-defined objectives. VTrans asset management practices will focus on a "preservation first" principle rather than "worst first" and we will implement this practice through regular preventative maintenance activities and planned rehabilitation and replacement projects.

VTrans will utilize asset management principles to effectively manage both the physical and financial condition of its assets.

The VTrans' asset management framework is designed to support the Agency's policies and goals related to accountability, environmental stewardship, mobility, resiliency, safety, sustainability, and transparency. The proposed framework is envisioned to include a continuous cycle of asset condition and inventory, performance, risk, and cost assessments. These activities will provide data and information that asset managers can use to develop, implement, and support the TAMP. The TAMP is the tactical plan for managing the Agency's assets and one of its primary objectives is to support the Agency's strategic plan. It is envisioned that the Agency's TAMP will consider three time frames (long, mid, and short) synchronizing with the Agency's 25 year Long Range Plan (including, but not limited to, asset lifecycle costs and strategies as well as the performance of the bridge management program), 3 to 5 year Statewide Transportation Improvement Plan (STIP), and an annual plan to support fiscal year program delivery, respectively.

VTrans, in its commitment to transparency and government accountability, will provide annual reports on the status and condition of each asset group to demonstrate long-term stewardship of the public infrastructure. VTrans' customers will develop a better understanding of costs and benefits of individual functions (asset maintenance, resurfacing, rehabilitation and replacement) and how these costs impact overall programs and budgets. The public can then use this information to communicate more clearly to the decision-makers the level of infrastructure investment, maintenance and condition they expect, and the decision-makers can then use this information to make the decisions they believe reflect the best stewardship of public resources.

This implementation plan is intended to address the goals of the TAM program over a five year time frame (2015-2020) in order to accommodate and adapt to the fluidity of the various components of the TAM program especially with regard to data or IT related items. As the TAM program matures, it is expected that VTrans will likely revisit this plan sooner than five years. Frequent check-in and alignment of the Transportation Asset Management Plan (TAMP) and associated actions is necessary. Implementation of the TAM approach will allow VTrans to:

- Make the right amount of investment in the right asset at the right time.

- Monitor asset status and condition, determine customer service level, measure performance and determine any unmet needs.

- Plan how to maintain, rehabilitate, and replace assets through timely, cost-effective management, program development, and resource allocation.

- Maximize the value of VTrans' capital, operations and maintenance expenditures within current revenues, while continuously delivering levels of service that the public expects and decision makers require.

- Strategically time treatment interventions to helps extend the asset's useful life and maximize the Agency's financial resources by following a preservation first policy.

The goals of the TAM program over the period 2015-2020 will be as follows:

Goal 1. Meet the minimum Federal (MAP-21) and State legislative requirements regarding asset management implementation.

Goal 2. Develop factual, risk based, and data driven asset management processes.

Goal 3. Use asset management to manage the Agency's physical infrastructure, drive the budget development process and support the Agency's Strategic Plan.

Goal 4. Integrate asset management into VTrans' culture.

4.3   BENEFITS OF TAM

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

- *Enhanced planning, programming, and budgeting guidelines that will align investment decisions throughout VTrans 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 data 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 Implementation Plan

This section presents the asset management implementation plan for VTrans. 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, and internal TAMP working group meetings. It identifies practical implementation steps that support the mission 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.

Implementing the work plan will require a mixture of indirect and direct costs. Indirect costs cover the resources required for current VTrans 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 VTrans. Determining the mix of in-house and contracted work will be the responsibility of the Asset Management & Performance Bureau. 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 VTrans 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 VTrans. Rather, the plan presents activities, timeframes, and budgets as if the implementation of asset management at VTrans 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. <u>TAM at its core is an ever evolving continuous improvement process.</u>

After completion of this work plan it will need to be revisited often (a minimum frequency of every 2 years) and re-aligned with the Agency's Strategic Plan.

5.1 TAM IMPLEMENTATION PLAN (2015-2020)

As indicated in the VTrans Asset Management Policy Statement, the development of an asset management framework and a TAMP are underway and therefore they are not explicitly covered in the goals listed below.

Goal 1. Meet the minimum Federal (MAP-21) and State legislative requirements

Objective 1A. Develop an Asset Registry that provides a GIS based summary of asset information including location and condition data for municipally managed pavement and bridge assets on the

NHS and State owned and maintained critical assets, including pavement and bridges, on and off the NHS.

Objective Leader: TAMP Working Group

Key Strategies:

1.A.1: Develop a one to two page summary for each asset that identifies the location and condition of assets that are to be included in the Agency's TAMP and which assets should be addressed in future asset management planning cycles.

1.A.2: Determine a uniform condition scale for VTrans assets.

1.A.3: Develop a GIS data layer for each asset.

1.A.4: Develop management profiles for each asset including, but not limited to age, remaining service life, condition, and replacement cost.

Timing: This activity can begin immediately and the implementation will be complete by September 30, 2015.

Preliminary Cost Estimate: Indirect

Objective 1B. Define recommended performance or customer service levels for pavements and bridges.

Objective Leader: TAMP Work Group in coordination with Planning Bureau

Key Strategies:

1.B.1: Develop customer service levels (CSLs) utilizing uniform asset condition descriptions to communicate technical condition data to non-technical audiences. For example, VTrans will correlate the NBI system ratings (0 to 9) to VTrans' universal condition system, i.e., very good/good/fair/poor/very poor.

Timing: This activity can begin immediately and implementation will be complete by September 30, 2015.

Preliminary Cost Estimate: Indirect

Objective 1C. Develop a Financial Plan that details the implementation of a framework to assess, manage, and communicate the financial sustainability of the transportation system maintained by VTrans.

Initiative Leader: Financial Plan Task Force

Key Strategies:

1.C.1: Compile historic funding levels for NHS pavements and bridges consistent with the timeframes used to present historic condition levels.

1.C.2: Prioritize the determination of the replacement value for critical assets beginning with pavements and bridges on and off the NHS. Perform a comparison of condition data and corresponding need to actual funding levels. Assist development of the Asset Registry with identification of replacement costs.

1.C.3: Determine acceptable processes to determine the asset valuation of the transportation system to identify and quantify the necessary level of expenditures to maintain the overall value or "net worth" of the Agency's existing transportation network.

1.C.4: Identify best practices for WIP to CAP estimates and depreciation methods for pavements and bridges. Establish an "asset depreciation" pilot project for pavements and bridges on the Agency's transportation network; develop an implementation plan to assimilate this methodology to other assets.

1.C.5: Review, develop and incorporate financial metrics such as asset sustainability ratio, asset renewal ratio and asset consumption ratio.

1.C.6: Compile existing information on future revenue projections. Summarize revenue projections over a 10-year asset management planning horizon, including identification of revenue sources. These projections will be developed as part of the budgeting process description provided in the TAMP with input from several other TAMP development activities.

1.C.7: Summarize the program funding levels resulting from the ongoing budgeting process. The TAMP will present program-level funding levels for the 10 year planning horizon.

1.C.8: Document the processes used to develop the financial plan.

Timing: This activity can begin immediately and the implementation will be complete by September 30, 2015.

Preliminary Cost Estimate: Indirect and Direct (medium)

Goal 2. Life-Cycle Cost Considerations; develop factual, risk based, and data driven asset management processes to manage assets through their whole life.

Objective 2A. Identify, develop and document AM processes and incorporate lifecycle costs into VTrans' decision-making process.

Initiative Leader: Task workgroup leader – to be determined

Key Strategies:

2.A.1: Identify efficient cost strategies for managing critical assets through their life cycle.

2.A.2: Develop an effective management system to include, but not limited to, cost tracking (using an Asset ID number to track capital investments on assets listed in the TAMP asset registry) and updating asset condition immediately after work has been performed with regards to VTrans maintenance and construction activities. By 2020, strive to include municipal maintenance and construction activities and Section 1111 permits into this management system.

2.A.3: Include in the Agency's initial TAMP a summary of the importance of considering life cycle costs, and describe how VTrans critical assets such as bridges and pavement are managed throughout their whole life. The summary is

to include an overview of the life cycle cost strategies and management methods for all activities relating to these two assets, including operations, maintenance, asset renewals, and new asset development work activities, condition, and performance monitoring, risk management practices, procurement and how the program will be delivered.

2.A.4: Develop an approach (documentation of key steps and processes) for incorporating lifecycle cost information when evaluating and prioritizing highway expansion projects.

2.A.5: Establish viable and user-friendly procedures for the development of economic analyses for projects such as cost-benefit analyses (CBA) and/or return-on-investments (ROI).

2.A.6: Connect asset financial data (valuations, replacement value, depreciation, remaining life, maintenance and capital investment costs) with data documenting its physical condition.

Timing: This activity can begin immediately and the implementation will be complete by September 30, 2015.

Preliminary Cost Estimate: Indirect and Direct (medium)

Objective 2B. Establish a comprehensive and integrated data management framework that will ensure that the data and analytical needs of the Agency are met effectively and efficiently.

Initiative Leader: Data Management Task Force

Key Strategies:

2.B.1: Institutionalize data as a key Agency asset; develop an Agency Data Registry; to include definitions, systems and condition information, data quality, and reporting.

2.B.2: Develop a process to produce credible and quality information for stakeholder consumption through efficient data transformation and to integrate data efficiently and effectively to assure data quality; ensuring that data is consumed, analyzed, and reported in a consistent manner with the end result of enhancing the Agency's ability to produce standardized or ad-hoc map enabled reports.

2.B.3: Identify existing and future Agency data management needs. Develop data management initiatives for the time period of 2015–2020 including corresponding system integration strategies that will ensure that the data and analytical needs of the Agency are met effectively and efficiently.

Timing: This activity can begin immediately and the implementation will be complete by September 30, 2015.

Preliminary Cost Estimate: Indirect

Objective 2C. Develop a risk integration plan that formally considers and identifies risk and performance criteria in investment decisions. Ensure that any initiatives are effectively communicated to those responsible for implementation. In the immediate future, ensure that any risks

relative to the Agency's budgeting process are incorporated into the Agency's TAMP chapter relating to Investment Strategies.

Initiative Leader: TAM Coordinator

Key Strategies:

2.C.1: Develop an Agency Risk Registry to be included in the Agency's TAMP and reviewed annually by Agency Division and Bureau management leaders. Conduct and document the process used for the Agency level risk analysis; VTrans will document its process for developing the initial risk register and incorporating the results into the budgeting and strategy development processes.

Actions: VTrans will convene a workshop with key staff. Participants will be asked to identify key risks associated with the transportation system. The following types of risks may be addressed at this workshop: 1) risks associated with implementation of the TAMP (e.g., cost escalations, budget cuts, stakeholder opinion, environmental delays, etc.); 2) risks associated with providing continuity of the service in relation to physical assets and system resiliency such as hazard risks, extreme events, and physical failures; and 3) risks associated with program and project delivery. Participants also will be asked to assess the relative likelihood and consequences of each risk, and recommend mitigation strategies.

2.C.2: Annually prioritize Agency risks which threaten asset management processes.

2.C.3: Develop and implement risk mitigation strategies based on the Agency's risk prioritization process.

Actions: Ensure that any initiatives are effectively communicated to those responsible for implementation. In the immediate future, ensure that any risk relative to the Agency's budgeting process be incorporated into the Agency's TAMP chapter relating to Investment Strategies.

Timing: This activity can begin immediately and the implementation will be complete by September 30, 2015.

Preliminary Cost Estimate: Indirect and Direct (medium)

Goal 3. Use asset management to manage the Agency's physical infrastructure, drive the budget development process and support the Agency's Strategic Plan

Objective 3A. Define processes and develop Agency capabilities to conduct risk-based tradeoff analysis within and among pavement and bridge asset types.

Initiative Leader: Asset Management & Performance Bureau

Key Strategies:

3.A.1: Develop reliable bridge and pavement deterioration models.

3.A.2: Identify tools and methods across all assets (cross-asset optimization) that can be utilized to determine reliable and credible project prioritization; ensuring that the

Agency is allocating its resources timely, efficiently, and in a cost effective manner.

3.A.3: Advance other asset classes to the point where they can be incorporated into the funding customer service level trade-off process.

Timing: This activity can begin immediately and the implementation will be completed for FY 2016.

Preliminary Cost Estimate: Indirect and Direct (medium)

Objective 3B. Define the framework for how asset management will inform the budget process (i.e., project selection, programming, planning, budgeting, etc.).

Initiative Leader: Asset Management & Performance Bureau

Key Strategies:

3.B.1: Coordinate with the ongoing budgeting process, identifying key points in the process at which asset information can be used and provided to inform budgetary discussions.

3.B.2: Identify strategies and initiatives available to the Agency to bridge more completely the gap between capital investment decisions and budgeting activities for operations and maintenance.

Timing: This activity can begin immediately and the implementation will be complete by September 30, 2015.

Preliminary Cost Estimate: Indirect

Objective 3C. Establish the framework for initial Agency investment policies and procedures with the intent of determining reliable future investment scenarios for both capital needs and operations and maintenance budgets for each "critical" asset type.

Initiative Leader: TAM Coordinator and TAM Executive Committee

Key Steps:

3.C.1: Document VTrans' policies and processes for allocating funds to preserve and maintain the existing highway system.

3.C.2: Develop long term investment, 10 to 20 year, strategies for pavements and bridges.

3.C.3: Define Agency short term, 5 to 10 year, strategies based on current and future asset management activities including, but not limited to, performance gap analysis, risk assessment, and financial planning. Use the derived information to inform the budgeting process.

Timing: This activity can begin immediately and the framework will be complete by September 30, 2015. Determination of reliable future investment scenarios for both capital needs and operations and maintenance budgets for each "critical" asset type will be complete by 2020.

Preliminary Cost Estimate: Indirect

Goal 4. Integrate asset management into VTrans' culture

Objective 4A. Further develop, refine, shape, and strengthen the Agency's organizational structure by December 31, 2020 to support an AM culture within VTrans.

Initiative Leader: TAM Coordinator and TAM Executive Committee

Key Strategies:

4.A.1: Utilize the recently established Corridor Management and Programming Bureau to support asset management planning, implementation, and management and to ensure that asset management is incorporated into planning and project development activities.

4.A.2: Develop an Asset Management Communication Plan.

Actions: Identify key customers and stakeholders; i.e., target audience. Develop over-arching strategies and communication initiatives. Identify the messages to be delivered via these initiatives; developing the Agency's "story" relative to asset management. Identify communication elements and strategies to effectively implement TAM goals and objectives. Institutionalize a communicative feedback loop with Agency stakeholders and customers.

4.A.3: Develop an Asset Management Training and Education Plan.

Actions: Identify training needs for the Agency to effectively execute the TAMP objectives. Identify key customers and stakeholders; i.e., target audience. Develop an understanding of how the Agency will be conducting business in the future. Work with the vision of the future organization structure and VTrans Human Resources to identify special or different areas of technical expertise. Perform an employee needs assessment and develop resulting training initiatives. Provide consumable training for adult learners in close conformity with the four elements of adult learning - motivation, reinforcement, retention, and transference.

4.A.4: Identify key or core asset management processes; ensure that they are well defined and "mapped" to ensure repeatability and reliability to build stakeholder credibility.

Timing: This activity can begin immediately and the implementation continues through December 31, 2020.

Preliminary Cost Estimate: Indirect and Direct (high)

Objective 4B. Institutionalize asset management across the entire Agency; combining operations and maintenance activities with capital planning and programming activities.

Initiative Leader: TAM Coordinator and TAM Executive Committee

Key Strategies:

4.B.1: Establish clear, consistent, and open lines of communication amongst VTrans bridge professionals. Develop an understanding of the roles of key operations, bridge inspection, and project development personnel. Coordinate bridge management strategies into a single Agency-wide plan to ensure that the physical condition of VTrans structures is maintained in a cost-efficient and timely manner.

4.B.2: Identify and implement applicable corridor management opportunities; ensuring that community impacts are consolidated and minimized.

4.B.3: Ensure that the Agency's Strategic Plan and TAMP are aligned with each other prior to their issuance.

Timing: This activity can begin immediately and the implementation continues through December 31, 2020.

Preliminary Cost Estimate: Indirect

Objective 4C. Document and prioritize asset management process enhancements or improvements

Initiative Leader: TAM Coordinator

Key Steps:

4.C.1: Identify which assets should be addressed in future versions of the Agency's TAMP.

4.C.2: Develop and document a TAMP governance process to define who owns the TAMP, how it will be used throughout the Agency, how it relates to other documents, and how and when it will be updated.

4.C.3: VTrans will develop an asset management enhancement plan which will include a gap analysis (per AASHTO Asset Management Guide, A Focus on Implementation), prioritize opportunities for improvement (OFIs), and develop a phased approach for implementing them. Document the processes and activities used to develop the asset management enhancement plan; incorporating future activities as the basis for a Continuous Improvement Plan (CIP).

4.C.4: Identify opportunities for process, system, and data enhancements throughout the TAMP development process. VTrans will keep a running list of OFIs identified as it completes its initial TAMP. These items will be combined with the opportunities identified during the self-assessment exercise and gap analysis process.

4.C.5: Identify opportunities for "small wins" to build and maintain momentum.

Timing: This activity can begin immediately and the 1st iteration can be completed by September 30, 2015 and on an annual basis thereafter.

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.

Table 5.1 Implementation Plan Summary

Initiative	Leader	Timeframe	Prelim. Cost Estimate
Approval of Work Plan	Chief Engineer	N/A	N/A
Goal 1. Meet the minimum Federal (MAP-21) and State legislative requirements regarding Asset Management implementation			
Objective 1A. Develop GIS-based Asset Registry	TAMP Working Group	2014 – September 30, 2015	Indirect
Objective 1B. Develop Customer Service Levels (CSLs)	TAMP Working Group in coordination with the Planning Bureau	2014 – September 30, 2015	Indirect
Objective 1C. Develop a Financial Plan	Financial Plan Task Force	2014 – September 30, 2015	Indirect and Direct (medium)
Goal 2. Develop factual, risk based, and data driven Asset Management processes			
Objective 2A. Develop and Document Life Cycle Costs Processes	Task workgroup leader – to be determined	2014 – September 30, 2015	Indirect and Direct (medium)
Objective 2B. Develop Data Management Framework	Data Management Task Force	2014 – September 30, 2015	Indirect
Objective 2C. Develop Risk Integration Plan	TAM Coordinator	2014 – September 30, 2015	Indirect and Direct (medium)
Goal 3. Use asset management to manage the Agency's physical infrastructure, drive the budget development process, and support the Agency's Strategic Plan			
Objective 3A. Develop Risk-based Tradeoff Analysis Processes	Asset Management & Performance Bureau	2014 – Financial Year 2016	Indirect and Direct (medium)
Objective 3B. Define Asset Management Budget Process Framework	Asset Management & Performance Bureau	2014 – September 30, 2015	Indirect
Objective 3C. Develop Investment Policies and Procedures Framework	TAM Coordinator and TAM Executive Committee	Ongoing through 2020	Indirect
Goal 4. Integrate asset management into VTrans' culture			
Objective 4A. Strengthen asset management-focused Organizational Structure	TAM Coordinator and TAM Executive Committee	Ongoing through 2020	Indirect and Direct (high)
Objective 4B. Institutionalize asset management across the entire Agency	TAM Coordinator and TAM Executive Committee	Ongoing through 2020	Indirect
Objective 4C. Document and prioritize asset management process enhancements or improvements	TAM Coordinator	1st iteration by September 30, 2015; Ongoing through 2020	Indirect

Appendix A. VTrans 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	VTrans 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.	VTrans has taken important initial steps to define goals, objectives, and performance measures. These steps reflect recognition of the importance of a performance-driven, outcome-based approach to planning and resource allocation. A refined set of 33 performance measures has been established to reflect key outcome areas. Because work on development of a performance framework has been evolving, existing long-range plans, policy plans budget documents and procedures manuals do not always reflect a consistent view of policies and desired outcomes.

There is general agreement that a preservation-first strategy is currently being applied to VTrans' assets. The 2007 Road to Affordability Act realigns VTrans' priorities to focus on a "back-to-basics" approach that limits project amenities, emphasizes safety and preservation, employs an asset and performance management approach and puts limited transportation funds where they can do the most good. |
| | 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 policy statement was endorsed recently (June 2014) by the VTrans Executive Team. It sets the stage for communicating the principles of good asset management. The development of the TAMP was initiated in February 2014. |
| | 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. | Current performance measures are based on condition distributions and don't explicitly encourage least life-cycle cost strategies. |

Characteristics	Criteria	Benchmark – State-of-the-Practice	VTrans State-of-the-Practice
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.	VTrans has developed a mission statement and a set of emphasis areas that reflect the public's priority issues, based on extensive customer surveys. Public input is sought during the long range budgeting process. While there is general consensus that establishing customer based service levels (CSLs) is a step in the right direction, it doesn't appear to be considered a key factor at this point in time. The Agency plans on monthly focus groups to tie performance with customer service feedback.
	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.	VTrans is moving towards a more outcome-based presentation of the annual budget document.
	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.	Budget process is handled by a committee under the Finance and Administration division of VTrans. Transportation program is developed annually and is a multi-year (4-year) plan. The funding levels are decided by program and are not related to performance measures. There are multiple rounds of appropriations with flexibility during each appropriation. However, the budget process is not well documented. The STIP process, on the other hand, is documented and is connected to asset management tools. STIP is developed around the budget and is adjusted as needed. The long-range plan is based on the minimum budget to preserve current conditions and estimate the gap in budget to meet performance targets. Current planning is based on engineering judgment. Attempts are underway to connect the customer service level to budget and changing the budget structure to have a more programmatic focus.

Characteristics	Criteria	Benchmark – State-of-the-Practice	VTrans 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.	VTrans has a very strong tie with political leaders for formulation of policy and budgets. VTrans works with policy-makers during the budget process, sharing information on specific transportation problems and projects. A system wide view of needs and performance under different budget scenarios is not currently presented to policy-makers. VTrans' asset management systems are used to identify projects. The pavement and bridge management systems have the capabilities to assess the performance impacts of different budget levels, but are not used extensively for this purpose. 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	VTrans 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 long-range plan is consistent with policy goals and contains a thorough analysis of revenue trends and projections. Programming procedures that support policy goals and objectives have been developed for selection of projects within the rail, aviation, pavement and bridge program categories. The pavement management system is used to produce a list of candidate projects based on a benefit/cost analysis. The PMS software allows presentation of network needs and helps target treatments to areas of need and maximization of investments.

VTrans' long-range plan is updated every five years. The Project Development Division is responsible for coordinating the programming process. There is no formal revision schedule for updating the programming process.

Budget process is handled by a committee under the Finance and Administration division of VTrans. Transportation program is developed annually and is a multi-year (4-year) plan. The funding levels are decided by program and are not related to performance measures. There are multiple rounds of appropriations with flexibility during each appropriation. However, the budget process is not well documented.

The STIP process, on the other hand, is documented and is connected to asset management tools. STIP is developed around the budget and is adjusted as needed. |
| | 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). | |

Characteristics	Criteria	Benchmark – State-of-the-Practice	VTrans State-of-the-Practice
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.	VTrans has a strong framework for project delivery and program management. Alternate delivery is one of VTrans' strong suites. Its long-range plan evaluates multi-modal program alternatives. VTrans' project development process for Federal-aid projects calls for consideration of alternatives including maintenance, rehabilitation, and a "no-build" option as part of the scoping process.

However, design-bid-build is still the dominant project delivery method used at VTrans. The programs are divided into classes based on population records from 1930s. |
| | 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 customer service level to budget and changing the budget structure to have a more programmatic focus.

The budget documents program objectives, outputs, and current and projected performance and policy objectives. Target performance levels are presented for each program category and compared to current year performance. The amount of funding allocated to each program category is not explicitly linked to specific performance targets.

Historical data indicates a high degree of instability in funding levels to specific program categories from year to year. The relationship between cost and performance is not currently available to decision-makers during the budgeting process.

33 performance measures have been established and are tracked. Information on the resources required to maintain existing assets at target performance levels and at least life-cycle cost is |
	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.	
	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.	
	Reporting	Progress toward stated programmatic system performance targets is measured and reported regularly.	

Characteristics	Criteria	Benchmark – State-of-the-Practice	VTrans State-of-the-Practice
			available for pavement and for railroads, but this information does not appear to have a strong influence on programming decisions. Bridge deterioration models are being revised.
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.	Objective criteria (both quantitative and qualitative) generally consistent with policy guidance are used to select projects within each program area. Program tradeoffs are based on informed judgment and negotiation. Formal, quantitative tradeoff analysis across program categories is not currently done.

Performance measures are available for decision-makers, but information on the implications of more or less resources available to different categories is not generally estimated or communicated.

Pavement and rail asset classes can produce resource based programs. But overall this process is still 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	VTrans 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).	Cost data is in various systems - Maintenance Activity Tracking System (MATS) and State Transportation Accounting and Reporting System (STARS). Detailed cost information does not easily lend itself to the derivation of unit cost factors required by pavement and bridge management systems, or for aggregate level analysis of program output versus cost relationships. The drainage structures and culverts group is transitioning from an activity tracking to an asset tracking model. MATS is considered a key tool and good tracking system in the group and its financial arm (STARS) can be used for tracking whole life costs. VTrans is trying to use MATS as a management system. VTrans is very close to its desired maturity level in maintaining and using information on the full unit costs of construction activities. Costs can be easily captured for capital projects. Preservation and maintenance costs are much harder to determine by asset type. A process should be developed to link financial and activity data to asset systems for preservation and maintenance activities in order to manage whole life costs more effectively.
	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.	VTrans either self-performs or subcontracts a certain function/task based on cost-effectiveness, resource availability, and established procedures.

Characteristics	Criteria	Benchmark – State-of-the-Practice	VTrans State-of-the-Practice
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.	VTrans 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.	The Budget office produces a monthly status report that shows how projects within a program are performing. Appropriation reports (rolled up financial reports) are produced for executives that show at a gross level if the agency is on track for spending money. Meetings between the Budget office and program delivery units occur regularly/as needed to monitor progress. Project status reports are available on the VTrans web page.
	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.	Program managers provide quarterly project reviews and update program status information. There does not appear to be any established process or mechanism for review and revision of delivery approaches.
	Change management	The Agency has a process to review and revise delivery approaches if improvement is needed.	VTrans 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	VTrans 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 VTrans' major infrastructure asset classes, as described below.

Pavement - The pavement group at VTrans collects inventory/condition data for NHS roadways every year. A composite index comprising of ride quality, rutting, structural condition, and transverse cracking is used as the primary performance measure. The performance goal is 70% travel-weighted roadway in good condition. dTIMS is used for budget analysis and optimization. The Agency has very high confidence on network wide measurement but not a good handle on the information about the pavement structure. |
| | 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. | Bridges – VTrans uses PONTIS and dTIMS as its bridge management system. While inventory/condition is maintained in an Access database, it has been idle for the past few years. Bridge inspection data was collected up to last year by in-house inspectors. PONTIS and dTIMS are in place but there is no data governance or forward looking modeling. PONTIS is not currently being used to develop the program. Primary inventory element collected on the bridges is the number of bridges. Rail height is not being collected. There is limited information on maintenance activities and there is no link between actions performed on bridges and a tie between performance and actions needs to be established. The Site Manager can be used as the link. Currently, it is difficult to access the data. Decision making currently follows the worst first policy using 10 to 12 factors such as deterioration, condition, traffic, load capacity/use, functionality, etc. |

Characteristics	Criteria	Benchmark – State-of-the-Practice	VTrans State-of-the-Practice
			Other assets - They are in different levels of inventory collection and maintenance.
	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.	Public input is sought during the long range budgeting process. While there is general consensus that establishing customer based service levels (CSLs) is a step in the right direction, it doesn't appear to be considered a key factor at this point in time. The Agency plans on utilizing focus groups to tie performance with customer service feedback.
	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.	Actual costs and accomplishments are tracked at the program category level (e.g., paving, structures). In addition, an agency-wide average unit price list is available which reflects actual bid information, providing price ranges by bid item, and graphs of quantities versus price that support project level cost estimation. Current cost and accomplishment tracking systems do not provide significant support for planning-level cost estimation. This varies by asset class. In general, this area, especially with regard to tracking maintenance costs, is an 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.	VTrans uses an efficient combination of methods to collect asset inventory and condition data for the major assets (e.g., manual inspections, video logging, Automatic Road Analyzer (ARAN). Data collection is performed in accordance with federal guidelines (e.g., Federal Aviation Administration (FAA), Highway Performance Monitoring System (HPMS), National Bridge Inventory (NBI), etc.). Other asset class data collection is an emerging process.

Characteristics	Criteria	Benchmark – State-of-the-Practice	VTrans State-of-the-Practice
	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 are still underway. Sampling methodologies and quality management processes for other asset classes are emerging.
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.	VTrans management systems are partially integrated. Output from the management systems is not available to decision-makers throughout the agency on an immediate basis for ad-hoc queries and reports. IT requirements for future systems and system updates are determined on a case by case basis to reflect specific tactical needs. No standards are available. Although VTrans maintains two linear referencing systems, integrating the data from existing management systems is performed on an as-needed basis and is very labor intensive. A current initiative to develop a geographic information system (GIS)-based route log system will enhance and extend VTrans' GIS capabilities. 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.	The current decision support tools at VTrans are good for identifying needs, but not so good at being able to evaluate priorities. The ability to use decision support tools in support of effective asset management is another opportunity for improvement. 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 not for other assets.

Characteristics	Criteria	Benchmark – State-of-the-Practice	VTrans 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.	There is no formal tradeoff process currently in place. 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.	Financial plan is developed yearly and project cost based value is used to develop these and it is in conformance to the GASB-34.
	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 and bridges.

Appendix B. References

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