Transit Asset Management
MBTA Initiatives

Standing Committee on Audit and Finance
March 3, 2015
Agenda

- TAM overview
- MAP 21 requirements
- MBTA TAM initiatives:
  - Asset Management Plan
  - Decision Support Tool
  - SGR Database
  - Maintenance management systems
The importance of TAM

- Insufficient funding (federal, state, MBTA) available to address all capital needs
- As a result, maintenance of the existing system needs to be a top priority
- Limited resources must be directed to where they can most cost-effectively provide continued safe and reliable service
- Transit asset management (TAM) strategies and practices are more important than ever in helping to make this happen:
  - Extending the useful life of existing assets
  - Optimizing investment in new assets
  - Proving to the public that every dollar is well-spent
MAP-21 requirements

MAP-21 (49 U.S.C. Section 5326) requires all transit agencies receiving federal funds to develop an asset management plan (AMP), which is to address, at a minimum:

- Capital asset inventory
- Condition assessments ("SGR")
- Investment prioritization
- Performance measures (for system condition)

MBTA proactively applied for and received FTA “TAM Pilot Program” grant funding in 2012 to develop a comprehensive TAM program that would address these forthcoming requirements.
The MBTA’s TAM program

Made up of four key projects – which work together to support better decision making relative to maintaining, upgrading and replacing transit capital assets.

Four separate initiatives, but being melded together to form the MBTA’s overall TAM program:

**Asset Management Plan** – The MBTA’s overall roadmap to achieve its TAM goals over the next 5 years. Was published in February 2014.

**Decision Support Tool** – Project prioritization tool used in developing the annual capital plan. Used for the past 2 CIP cycles (FY15-19, FY16-20).

**SGR Database** – Asset inventory and long-term capital planning tool; calculates “SGR backlog,” shows impact of various funding scenarios on system condition and performance. Next report due in June 2015.

**Maintenance Management Systems** – Supports day-to-day asset maintenance and life-cycle management. In place for fleet and commuter rail; development underway for Engineering & Maintenance (E&M) assets.
Asset management plan

Per the FTA Asset Management Guide (October 2012):

- The AMP “outlines how people, processes, and tools come together to address the asset management policy and goals” of the transit agency. It also “outlines the activities that will be implemented and resources applied” to meeting those goals.

In order to address these guidelines, our AMP is a high-level planning document (covering the next 5 years) that focuses on:

3 key questions:

- **Goals** – where do we hope to be in the future?
- **Activities** – what needs to be done to get there?
- **Resources** – what will it take to accomplish this?

4 success factors:

- **People** – our employees
- **Processes** -- business practices
- **Tools** – databases, systems
- **Policy** – plans. procedures

*Completed in February 2014, the FTA has concluded that the Authority’s AMP “is comprehensive and practical, and complies with the requirements of MAP-21 Legislation.”*
AMP – how did we prepare it?

Throughout 2013, about 40 MBTA employees (the “TAM Team”) participated in the development of the AMP. There were 3 major steps:

1. **Perform baseline assessment** — Where does the MBTA stand today in terms of industry “best practice” in asset management?

2. **Develop goals and objectives** — In what areas do we hope to improve over the next 2-5 years? What do we expect to accomplish from this?

3. **Identify implementing actions and “roadmap”** — What steps are needed to get there?
# AMP – roadmap (years 1-2)

19 action items over 5 years (with schedule, resource requirements, work plan)

<table>
<thead>
<tr>
<th>0-6 Months</th>
<th>6-12 Months</th>
<th>12-24 Months (Year 2)</th>
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<tbody>
<tr>
<td>Policy: Provide agency-wide direction and leadership to increase the MBTA’s asset management maturity</td>
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<tr>
<td>1.1: Develop asset management plan</td>
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<td>1.2: Establish governance structure</td>
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<td>1.3: Establish AM working group</td>
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<td>1.4: Establish communication strategy</td>
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<tr>
<td>People: Establish asset management culture and support through talent management practices</td>
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<tr>
<td>2.1: Specify staff roles, responsibilities, and accountabilities</td>
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<td>Conduct skills assessment (2.2) and implement training updates (2.3) and succession planning (2.4)</td>
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<tr>
<td>Tools: Provide infrastructure and tools to support data-driven decision-making for asset management</td>
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<td>3.1: Prepare planned final business and technology architecture for all assets and departments</td>
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<td>3.2: Implement MMS for E&amp;M, including inventories of record, preventive maintenance requirements, etc.</td>
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<td>3.2: Enhance functionality of MMS for Commuter Rail to facilitate LCM practices, as part of new operating agreement</td>
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<td>3.3: Deploy capital planning tool (State of Good Repair Database) and integrate with MMS</td>
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<td>3.4: Deploy decision support tool for CIP capital project prioritization</td>
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<tr>
<td>Business Practices: Manage whole lifecycle costs, risks, and performance to achieve cost savings, improve service reliability, and contribute to customer safety</td>
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<td>4.1: Pilot improved lifecycle management process, including reliability-centered maintenance (RCM) for Blue Line Fleet</td>
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<td>4.4: Ongoing update of design standard to address whole lifecycle management</td>
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<td>4.7: Use a risk-based approach to help identify and prioritize capital investments</td>
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<td>4.6: Pilot incorporation of management principles into capital projects/maintenance contracts</td>
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Decision support tool

**Goal:** To optimize the allocation of limited resources and the prioritization of proposed capital investment projects to best achieve the Authority’s objectives and customer expectations

- A more collaborative, consensus-based approach to identifying and weighting evaluation criteria – so everyone feels part of the process
- A more structured, systematic approach to project prioritization – so stakeholders will believe in the results
- An ability to support decision making at different levels of the organization – both for the entire agency and for individual departments (e.g., operations, accessibility)
Decision support tool

A 5-step process:

1. Identify project evaluation criteria
2. Determine criteria weights
3. Establish rating scales
4. Score capital funding requests
5. Prioritize projects within fiscally constrained scenarios

A collaborative approach:

- By MBTA managers representing various divisions/asset classes
- By subject matter experts (e.g., operations, environ., budget)
- By the General Manager and senior management team

The result:
A prioritized list of capital projects generated through inter-departmental collaboration and consensus
Decision support tool

Capital project evaluation criteria include the following:

- System preservation (SGR Database rating, lifecycle management, environmental vulnerability)

- Impact on the environment/alignment to GreenDOT objectives (reduce pollution and consumption of natural resources, promote mode shift)

- Financial considerations (impact on operating costs, revenues)

- Operations impact (customer experience, operational “criticality,” number of riders affected, operational sustainability)
For the MBTA, a state of good repair (SGR) standard is where all capital assets are functioning at their ideal capacity within their design life.

- The “SGR backlog” is the total cost to renew or replace all assets that are not currently in a state of good repair (e.g., operating beyond their design life).

- SGR is not a measurement of safety; nor is it a measure of operational efficiency or maintenance costs.

- As part of MAP-21, FTA will be defining “SGR” for the transit industry.

- MBTA is working toward FTA’s “comprehensive approach” where SGR is a function of an asset’s age, condition and performance (using 1-5 scale with 2.5 = SGR threshold, based on FTA and industry standards).
### Calculating SGR

#### SGR Score

<table>
<thead>
<tr>
<th>Rating</th>
<th>Scoring Range</th>
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<tbody>
<tr>
<td>Excellent</td>
<td>4.4 to 5.0</td>
</tr>
<tr>
<td>Good</td>
<td>3.8 to 4.3</td>
</tr>
<tr>
<td>Fair</td>
<td>3.2 to 3.7</td>
</tr>
<tr>
<td>Marginal</td>
<td>2.6 to 3.1</td>
</tr>
<tr>
<td>Substandard</td>
<td>1.8 to 2.5</td>
</tr>
<tr>
<td>Poor</td>
<td>1.0 to 1.7</td>
</tr>
<tr>
<td>Non-Operable</td>
<td>0</td>
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#### Age / Usage

<table>
<thead>
<tr>
<th>Condition</th>
<th>Life-Cycle Rating</th>
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<tbody>
<tr>
<td>Excellent</td>
<td>Asset new or nearly new (0% - 25% of useful life)</td>
</tr>
<tr>
<td>Good</td>
<td>Asset nearing or at its midlife point (26% - 50% of useful life)</td>
</tr>
<tr>
<td>Fair</td>
<td>Asset has passed its midlife point (51% - 75% of useful life)</td>
</tr>
<tr>
<td>Marginal</td>
<td>Asset is nearing the end of its useful life (76% - 100% of useful life)</td>
</tr>
<tr>
<td>Substandard</td>
<td>Asset is just beyond its useful life (101% - 125% of useful life)</td>
</tr>
<tr>
<td>Poor</td>
<td>Asset is considerably beyond its useful life (125% + of useful life)</td>
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#### Condition

<table>
<thead>
<tr>
<th>Condition</th>
<th>Physical Condition Rating</th>
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<tbody>
<tr>
<td>Excellent</td>
<td>Asset new or like new; no visible defects or deterioration</td>
</tr>
<tr>
<td>Good</td>
<td>Asset showing minimal signs of wear; some slight defects or deterioration</td>
</tr>
<tr>
<td>Fair</td>
<td>Some moderately defective or deteriorated components; expected maintenance needs</td>
</tr>
<tr>
<td>Marginal</td>
<td>Increasing number of defects, deteriorating components; growing maintenance needs</td>
</tr>
<tr>
<td>Substandard</td>
<td>Significant defects and component deterioration; excessive maintenance needs</td>
</tr>
<tr>
<td>Poor</td>
<td>Asset in need of replacement or restoration; may have critically damaged components</td>
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</tbody>
</table>

#### Performance

<table>
<thead>
<tr>
<th>Condition</th>
<th>Functional Rating</th>
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<tbody>
<tr>
<td>Excellent</td>
<td>Asset meets or exceeds all performance and reliability metrics, industry standards</td>
</tr>
<tr>
<td>Good</td>
<td>Asset generally meets performance and reliability metrics, industry standards</td>
</tr>
<tr>
<td>Fair</td>
<td>Occasional performance and reliability issues; may be sub-standard in some areas</td>
</tr>
<tr>
<td>Marginal</td>
<td>More frequent performance and reliability issues; sub-standard in some areas</td>
</tr>
<tr>
<td>Substandard</td>
<td>Performance and reliability problems becoming more serious; sub-standard elements</td>
</tr>
<tr>
<td>Poor</td>
<td>Frequent performance and reliability problems; does not meet industry standards</td>
</tr>
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#### SGR Score

Under this comprehensive approach to defining state of good repair, the SGR score can be calculated as a function of an asset’s age (weighted 50%), its condition (weighted 25%) and its performance (weighted 25%).

(Sample approach – weightings configurable)
SGR database – what is it?

- It provides a comprehensive inventory of the MBTA’s transit capital assets
- It calculates the current state of the MBTA’s capital assets (e.g., What’s the “SGR backlog” amount? What percentage of assets, by class, are not in SGR?)
- It identifies measures/funding levels required to bring system to a “State of Good Repair” over time (as well as annual capital cash flow needs)
- It analyzes the SGR impacts of various funding and policy scenarios (“What if…”)
- It provides quantitative analysis for prioritizing assets/programs for the capital plan
- It Helps the MBTA to articulate the case for additional capital funding (State and Federal)
Initially developed around 1999, the SGR Database was used to produce an SGR Report in 2003 and 2006, with a backlog of $2.7 billion at the time.

Data was updated in 2009 (with the backlog now estimated to exceed $3 billion).

In January 2011 the MBTA applied for an FTA grant to enhance the functionality of the database.

In June 2012 the MBTA was awarded the FTA grant (under the TAM Pilot Program) and contracted with a consultant team to help design and implement the upgrades (a 2-year effort).

SGR Database software upgrades now substantially complete and updated data being inputted (a continuous process to refine existing data).
SGR database

Recent enhancements:

- **Convert from PC-based to web-based version** - to provide direct access for field and maintenance personnel, and to facilitate the updating of asset data on a continuous basis

- **Revisit asset structure and detail** – to facilitate future NTD and MAP-21 reporting, to better integrate with the Capital Investment Program, and to identify the optimal level of asset line item granularity

- **Incorporate condition and performance ratings** – to comply with MAP-21 and to better analyze the relationships between asset age, condition and performance

- **Incorporate decay curves** - to recognize that asset condition deteriorates at different rates over the useful life, and to forecast future SGR

- **Revise asset prioritization methodology** – to support future capital and maintenance decisions

Ongoing efforts include continuous collection and refinement of data, as well as integration with MMS systems
SGR database

Preliminary results - systemwide

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
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<tbody>
<tr>
<td>SGR Score (Overall)</td>
<td>3.05</td>
</tr>
<tr>
<td>Replacement/Renewal Value</td>
<td>$21,562,873,703</td>
</tr>
<tr>
<td>SGR Backlog</td>
<td>$6,691,885,429</td>
</tr>
<tr>
<td>Funded in CIP (FY15-20)</td>
<td>$4,491,703,120</td>
</tr>
</tbody>
</table>

![Backlog Graph]
MMS & Asset Management


- Asset Management - “the coordinated activity of an organization to realize value from assets”
- Asset - “item, thing, or entity that has potential or actual value to an organization”

Maintenance Management System:

- A database that maintains information about an organization’s assets and maintenance operations; it is intended to help maintenance workers do their jobs more effectively
- It supports day-to-day operations and maintenance throughout the asset’s life cycle (e.g., preventative maintenance schedules, work orders, inventory management, warranties)
- It generally monitors and reports at the asset component and sub-component level
MMS & Asset Management

Some benefits:

- Helps to understand the trade off between the cost of undertaking maintenance and the increasing risks associated with a deteriorating asset
- Supports departmental investment strategy
- Helps to reduce the total life cycle cost of an asset, while improving system reliability
- Feeds data into SGR Database (e.g., asset condition, operating costs) to support long-term capital planning
MMS implementation

Existing MMS – in place for:

- Fleet
- Commuter Rail

New MMS - procurement underway for E&M infrastructure assets:

- Hardware:
  - All IT infrastructure procured, installed and tested
  - Phase 1 mobile devices procured; asset tag equipment /materials in testing
- Software:
  - Vendor selected; contract pending
- Professional Services:
  - 2015 competitive bid for professional services

Long Term Plan:

- MMS for all major asset classes
- Asset management “IAM” training for personnel – Formal Certification
- Improved integration of the Authority’s various MMS’s
- Direct data feeds between MMS and SGR Database
Thank you.

Any Questions?