Transit Asset Management System

Chicago Transit Authority (CTA)

July 2012

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Overview

- History of Asset Management at Chicago Transit Authority

- Transit Asset Management Initiative

    – Project Approach

    – Long Term Inspection Approach

    – Project Status

    – Project Schedule

- Future Goals

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History of TAM

- 1992 - Initial asset inventory and engineering condition assessment completed

- 2007 - Vehicle maintenance management system implemented

- 2008 - Facilities management system upgraded (EAM – Infor)

- 2010 - Regional capital asset inventory completed

- 2011 - Regional capital decision tool upgraded

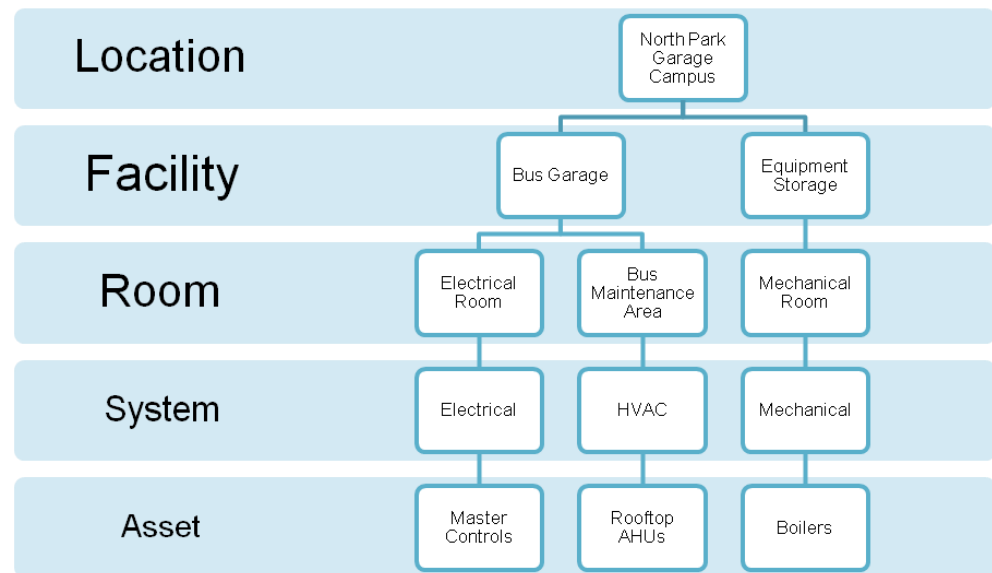- 2011 - CTA Transit Asset Management System Completed
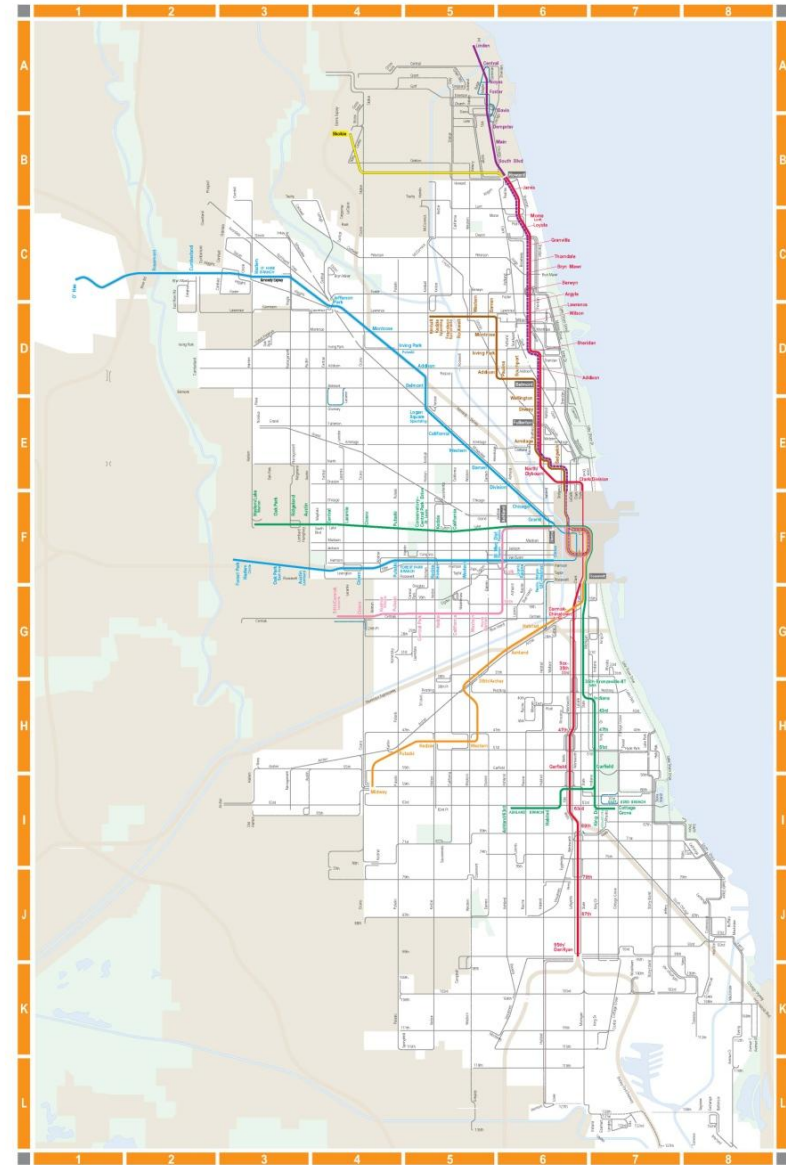
Transit Asset Management Initiative

- CTA received $5.4 million grant through the US Dept. of Transportation State of Good Repair Initiative (SGR) 2010

- Focus on Bus Maintenance Facility Assets:
  - Goal is to establish baseline structure for future expansion into other asset categories
  - Project Efficiencies lead to scope expansion to include some rail maintenance facilities

- Four phases of work:
  1. Phase A: Software Enhancement and Data Migration
  2. Phase B: Facility Asset Inventory and Assessment
  3. Phase C: Reporting and Prioritization
  4. Phase D: Process Evaluation and Training

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Asset Class Definition

- Classify and standardize assets within CTA's portfolio
- Maintenance perspective used to create classification

  - Establish baseline considering expected level of problem reporting
  - Ensure reasonable level for data maintenance

  - Develop flexible framework for future expansion
- Multiple Tiers of Detail and Roll-up Reporting Capability

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Asset Attribute Inventory

Critical asset information collection including the following attributes:

- Type
- Size
- Replacement Value
- Condition
- Expected Life
- Vulnerability to climate
- Install Year
- Location
- Deficiency Type(s)
- Total Quantity
- Deficiency Quantity

Condition Assessment Criteria

- Established continuity with Regional (RTA) and National (FTA) Nomenclature and Criteria

- Expanded descriptions associated with Transit Economic Requirements Model (TERM)

- Expanded criteria to address unique assets within CTA's portfolio

- Highlighted importance of institutional knowledge and available work order history

Description	Rating				
	New (5)	Good (4)	Fair (3)	Poor (2)	Unsat. (1)
NEW	X				
ROUTINE MAINTENANCE		X			
MINOR REPAIR			X		
MAJOR REPAIR				X	
REPLACEMENT					X

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Data Collection Methodology

- Two multi-disciplinary teams of engineers perform the survey: 7 garages, 3 maintenance shops and 10 rail maintenance facilities

- Collect key inventory and perform condition assessments on over 3 million square feet of facilities

- Develop cost estimates for identified deficiencies

- Involvement of organization personnel to observe contractor assessment to promote learning with the ultimate goal of self-performance

Data Modeling

Project prioritization based on asset criticality, condition, and criteria including nearness of asset failure, safety risks, and funding availability.

Building Summary

System Type	Cost to Correct	Repl. Cost New	SCI
Conveying Systems	$68,310.00	$68,310.00	1.00
Electrical	$1,178,347.50	$1,571,130.00	0.75
Exterior Finish	$976,833.00	$1,502,820.00	0.65
HVAC	$2,869,020.00	$2,869,020.00	1.00
Interior Finish	$2,042,469.00	$3,142,260.00	0.65
Plumbing	$696,762.00	$1,161,270.00	0.60
Roof	$655,776.00	$819,720.00	0.80
Structure	$491,832.00	$1,639,440.00	0.30
Technology	$256,162.50	$341,550.00	0.75
Total	$9,781,992.00	$13,662,000.00	0.72 (FCI)

System Deficiency Summary

ADA Compliance	5.6%
Conveying Systems	0.7%
Electrical	12.0%
Exterior Finish	10.0%
HVAC	29.3%
Interior Finish	20.9%
Plumbing	7.1%
Roof	6.7%
Structure	5.0%
Technology	2.6%
Total:	100.0%

Name of Facility	FCI	Facility Condition	Conveying Systems	Electrical	Exterior Finish	Structure	HVAC	Interior Finish	Plumbing	Roof	ADA Compliance	Technology
Building #1	0.47	Fair	1.00	0.40	0.50	0.20	0.50	0.50	0.50	0.40	1.00	0.40
Building #2	0.51	Poor	1.00	0.40	0.35	0.10	0.49	0.60	0.80	1.00	0.83	0.30
Building #3	0.80	Poor	1.00	0.75	0.90	0.85	0.90	0.60	0.80	0.85	1.00	0.90
Building #	0.72	Poor	1.00	0.75	0.65	0.30	1.00	0.65	0.60	0.80	1.00	0.75
Building #	0.46	Fair	0.85	0.80	0.40	0.26	0.45	0.35	0.52	0.41	0.83	0.43
Building #	0.02	Good	0.00	0.05	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00
Building #	0.81	Poor	1.00	1.00	0.45	0.50	1.00	0.80	1.00	0.85	0.85	0.85
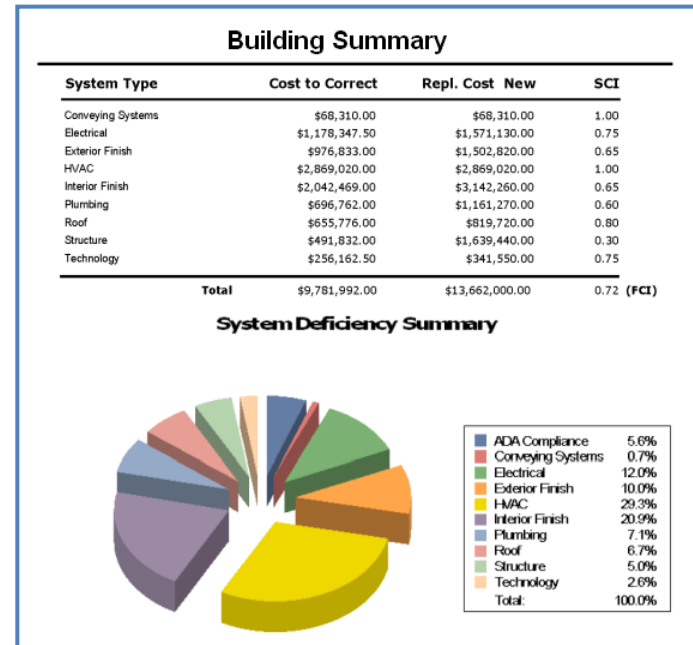
Comparative analysis of facilities at the building and system level.

Long Term Inspection Approach

- Routine assessments completed by trained in-house staff
- Prioritized inspections based on asset criticality and condition
- Inspections treated as required work orders within EAM
- Utilize available technology to streamline deficiency tracking and reporting
- LTI approach allows for continued migration to proactive versus reactive maintenance utilizing updated inventory and assessment data

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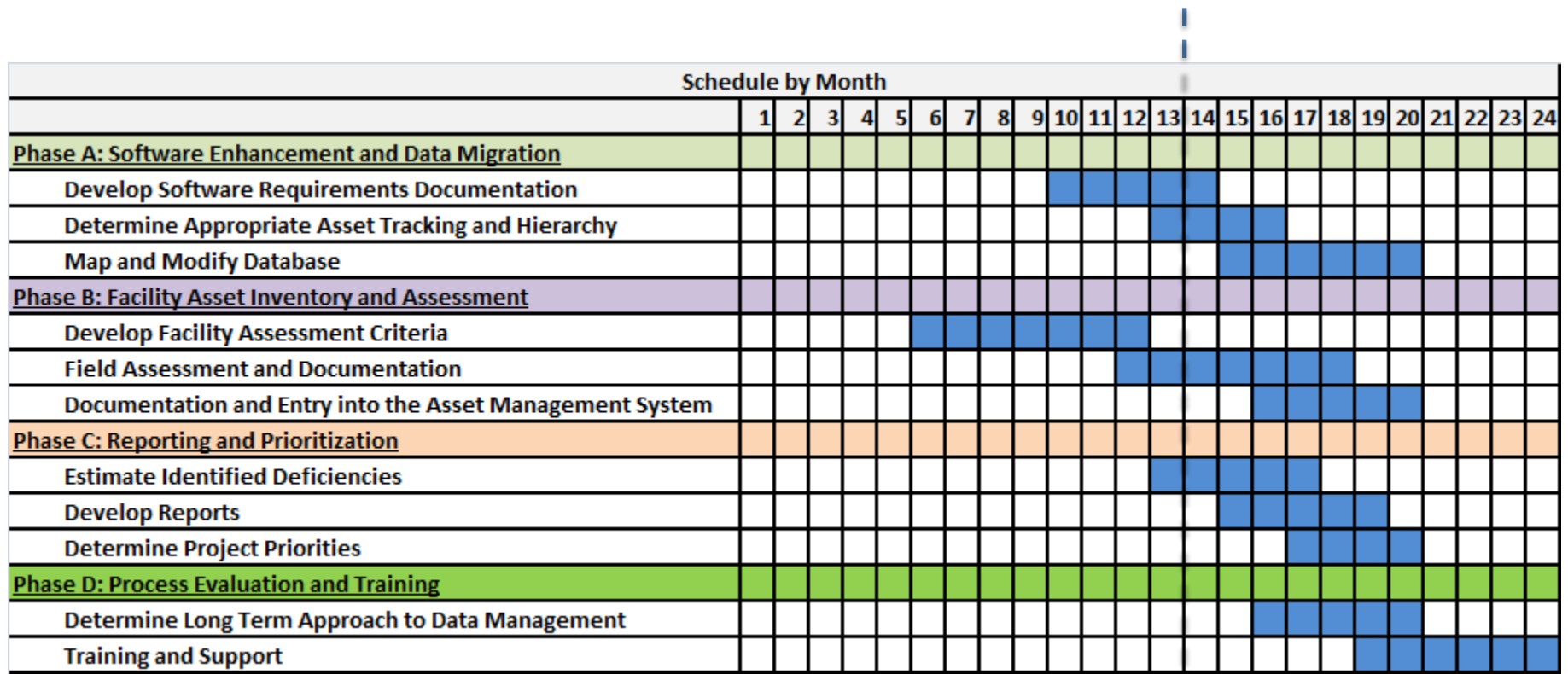Federal Transit Administration
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Inspection Technology

- Goal for inspections is to maximize available technology to streamline inspection process for all asset types
- Pilot program used hand held devices for a subset of assets
  - Difficult to read data based on screen size
  - Speed and coverage of network affected certain CTA locations
- Currently exploring the use of tablets for future data collection
  - Intent to minimize manually tedious data entry

Project Schedule

Schedule by Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Phase A: Software Enhancement and Data Migration																								
Develop Software Requirements Documentation										■	■	■	■	■										
Determine Appropriate Asset Tracking and Hierarchy														■	■	■								
Map and Modify Database															■	■	■	■	■	■				
Phase B: Facility Asset Inventory and Assessment																								
Develop Facility Assessment Criteria						■	■	■	■															
Field Assessment and Documentation														■	■	■	■	■						
Documentation and Entry into the Asset Management System																	■	■	■					
Phase C: Reporting and Prioritization																								
Estimate Identified Deficiencies														■	■	■	■							
Develop Reports																■	■	■						
Determine Project Priorities																■	■	■	■	■				
Phase D: Process Evaluation and Training																								
Determine Long Term Approach to Data Management																■	■	■						
Training and Support																				■	■	■	■	■

Current Progress

Future Goals

1. Development of an overarching asset management plan that creates a cohesive link between business processes and EAM technology

2. Further expansion of the transit asset management system to include:

   a) Preventive maintenance schedules,

   b) Updated staffing information, and

   c) Work order prioritization functionality for the facilities management group;

3. Incorporate rail infrastructure assets in EAM System

4. Include better tracking and managing of warranty information

5. Develop methods to automate asset updates when capital projects completed

Thank You

APPENDIX

1992 Engineering Condition Assessment

- CTA Consultant teams:
  - Inventory existing assets
  - Perform engineering condition rating (1-5 scale)
- Inputs for "20 Year Needs" and capital project list
  - $6.8B unfunded capital need
  - $800m annual need to stay in good repair, once attained
- Updates performed via desk audits (consultant staff)
  - Capital projects performed
  - Assets replaced in maintenance cycle
- Provided baseline data for RTA Capital Asset Condition Assessment
  - Condition rating data omitted

Vehicle Maintenance Management System

- Vehicle Fleet Maintenance Management Information System (MMIS) fully implemented by 2007
- Work order based approach
  - Labor, materials utilization and costing for all maintenance activities
  - Scheduling of preventive maintenance activities
  - Automated identification/analysis of vehicle/component failure trends
- MMIS process
  - Work orders created, stored and maintained in MMIS
  - Online processing of Work Orders
  - Annual updates based on user input
- Vehicle PM work well-defined
  - Regular maintenance cycles
  - Capital overhaul programs

Asset Management Challenges

- Fragmented existing information
  - Legacy systems, excel spreadsheets
- Stale condition assessments
  - How to keep updated over time?
- Coordination with maintenance activites
  - Leverage field resources efficiently
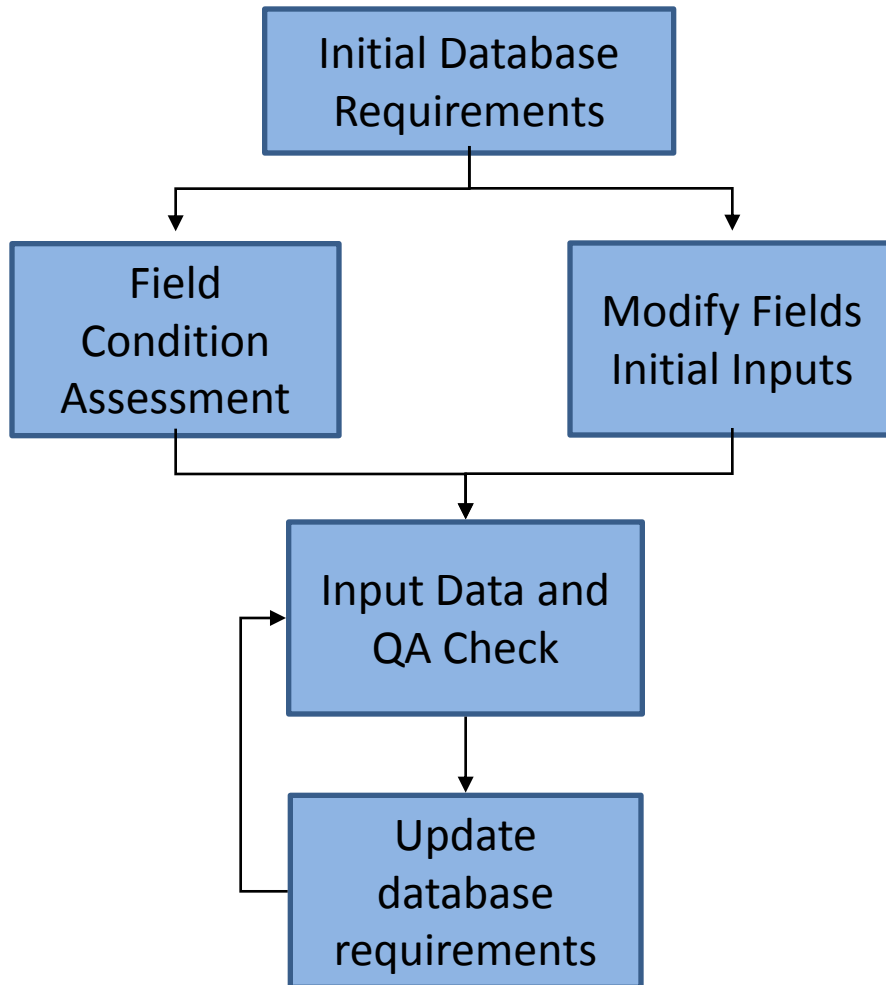 - Informed capital decisions

CTA Bus Garages

Name	Address	Fueling System Condition	Underground Storage Tanks	Lube Oil/Fluid System	Engine Wash Equipment	Roof - Condition	Architectural	Transportation Office	Admin. Offices	Male Locker Room	Female Locker Room	Lunch Room	Battery Charging Room	Waste Water Systems	Quantity	Condition	Trash Collection	Bus Washer	Quantity - Portable Lifts	Condition - Portable Lifts	Fire Protection	Boiler	Air Curtain	Electrical	Outdoor Lighting	Indoor Lighting	HVAC	Aprons	Sewers	Parking Lots
Archer	2600 W. Pershing Rd	2	4	2	1	3	1	1	1	1	1	1	1	1	2	2	2	2	4	4	1	3	1	2	1	1	1	3	3	1
Forest Glen	5419 W. Armstrong Ave	1	4	2	2	3	1	1	1	1	1	1	3	3	12	2	1	1	1	4	1	2	4	1	1	2	1	2	1	2
Kedzie	358 S. Kedzie Ave	3	3	3	3	1	3	3	3	3	3	3	3	3	14	2	3	3	0	4	3	3	3	3	3	3	2	4	2	3
North Park	3112 W. Foster Ave	1	4	2	2	2	1	1	2	2	2	2	2	1	2	2	1	2	3	2	2	2	4	2	1	1	2	3	2	2
77th	210 W. 79th Street	1	2	2	1	1	1	2	2	2	1	2	2	1	17	2	1	1	3	2	1	2	4	2	2	1	2	1	1	1
103rd and Stony Island	10201 S. Stony Island Ave	2	4	3	1	3	3	2	3	3	3	3	3	2	14	2	3	2	2	2	2	3	1	2	3	3	2	3	3	3
Chicago and Pulaski	4301 W. Chicago Ave	2	4	3	1	2	4	3	3	3	3	3	3	1	12	3	4	2	2	3	3	3	4	3	3	3	2	4	2	3
74th and Wood	1715-1907 W. 74th Street	4	4	4	3	2	3	4	4	4	4	4	4	2	12	4	4	4	1	4	3	4	4	2	4	4	2	3	4	3

Enterprise Asset Management System

- Facilities Maintenance replaced legacy work order management system in 2008 (Infor EAM)
  - New work order based approach
  - Preventive maintenance activities scheduled
- EAM Process
  - Work orders created, stored and tracked
  - Configuration changes done in-house or by consultants
- On-Going Rollout to Agency
  - Signal, Track, Structure, Power & Way Maintenance implementation ongoing
  - Other areas: Safety, GPS Equipment, Revenue Technology

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Phase A: Incorporate Assets into EAM System

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┌─────────────────────┐
│  Initial Database   │
│    Requirements     │
└─────────────────────┘
     │          │
     ▼          ▼
┌──────────┐  ┌──────────────┐
│  Field   │  │Modify Fields │
│Condition │  │Initial Inputs│
│Assessment│  │              │
└──────────┘  └──────────────┘
     │              │
     └──────┬───────┘
            ▼
   ┌──────────────┐
   │Input Data and│
   │  QA Check    │
   └──────────────┘
            │
            ▼
   ┌──────────────┐
   │   Update     │
   │  database    │
   │ requirements │
   └──────────────┘
```

- Initial information from existing EAM asset data and 1992 Inventory

- Validate database structure

- Add required fields: age, quantity, location, cost

- Create placeholder fields for condition data

- Add data from condition assessment

- 2012 condition assessments may create new requirements for database

Phase B: Engineering Condition Assessment

- Multi-disciplinary teams of engineers survey CTA facilities

- Produce condition ratings to be incorporated in EAM system

- Engineers also develop:
    - Recommendations on future data collection: methods and timeframe
    - Work processes to be incorporated into preventive maintenance SOPs
    - Checklists to guide PM and identify elements to trigger future reviews
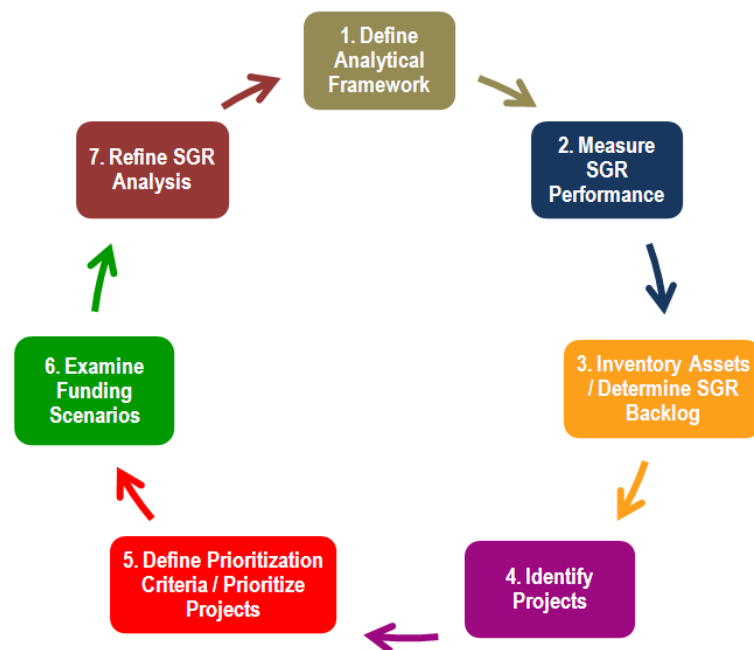
- Develop cost estimate data to be incorporated into database

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Phase C: Develop Reporting & Modeling Tools

- Develop ad hoc reporting for CTA use in policy/planning
  - Initial phase for immediate functionality
  - Incorporate vehicle and facilities information

- Model Development
  - Coordinate with regional project: provide better inputs
  - Consider development of "higher resolution" modeling tool

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Phase D: Develop Plan to Maintain Data

- Incorporate recommendations of multidisciplinary engineering teams:
  - Where possible leverage maintenance efforts
  - Adopt recommendations for frequency of inspections
  - Identify "triggers" for additional engineering review
- Establish data owners to manage subsections of data
  - Engineering owners responsible for updating based on capital investment
  - Maintenance updates based on repair/replace work orders
  - Visibility into system allows discrepancies to be reconciled
- Longer Term: Develop methods to automate updates of assets associated with capital project completion

Project Budget

- Total Project Budget = $5.4 million
  - Developed for grant based on man-hours calculation

- Current Working Budget Breakdown
  - Phase A: Software Enhancement and Data Migration $1,000,000
  - Phase B: Facility Asset Inventory and Assessment $3,000,000
  - Phase C: Reporting and Prioritization $900,000
  - Phase D: Process Evaluation and Training $500,000

Project Status Timeline

Completion 24 months from grant award (May 2011)

Activity	Status
Project Work Plan	Completed November, 2011
Facility Assessment Criteria	Completed April, 2012
Software Requirement Document	In progress (August 2012)
Software Enhancements	September 2012 through January 2013
Field Assessments	June through October 2012
Capital Planning & Data Migration	Commence in November 2012 with completion by end of January 2013
Training & Implementation	Commence in February 2013 with completion by end of May 2013