Florida's Turnpike Enterprise

Operational and Institutional Impacts of the Integration of a Computerized Maintenance Management System and Asset Management System

FLORIDA'S TURNPIKE ENTERPRISE

STATE OF FLORIDA • DEPARTMENT OF TRANSPORTATION

Evolution from Authority to Enterprise

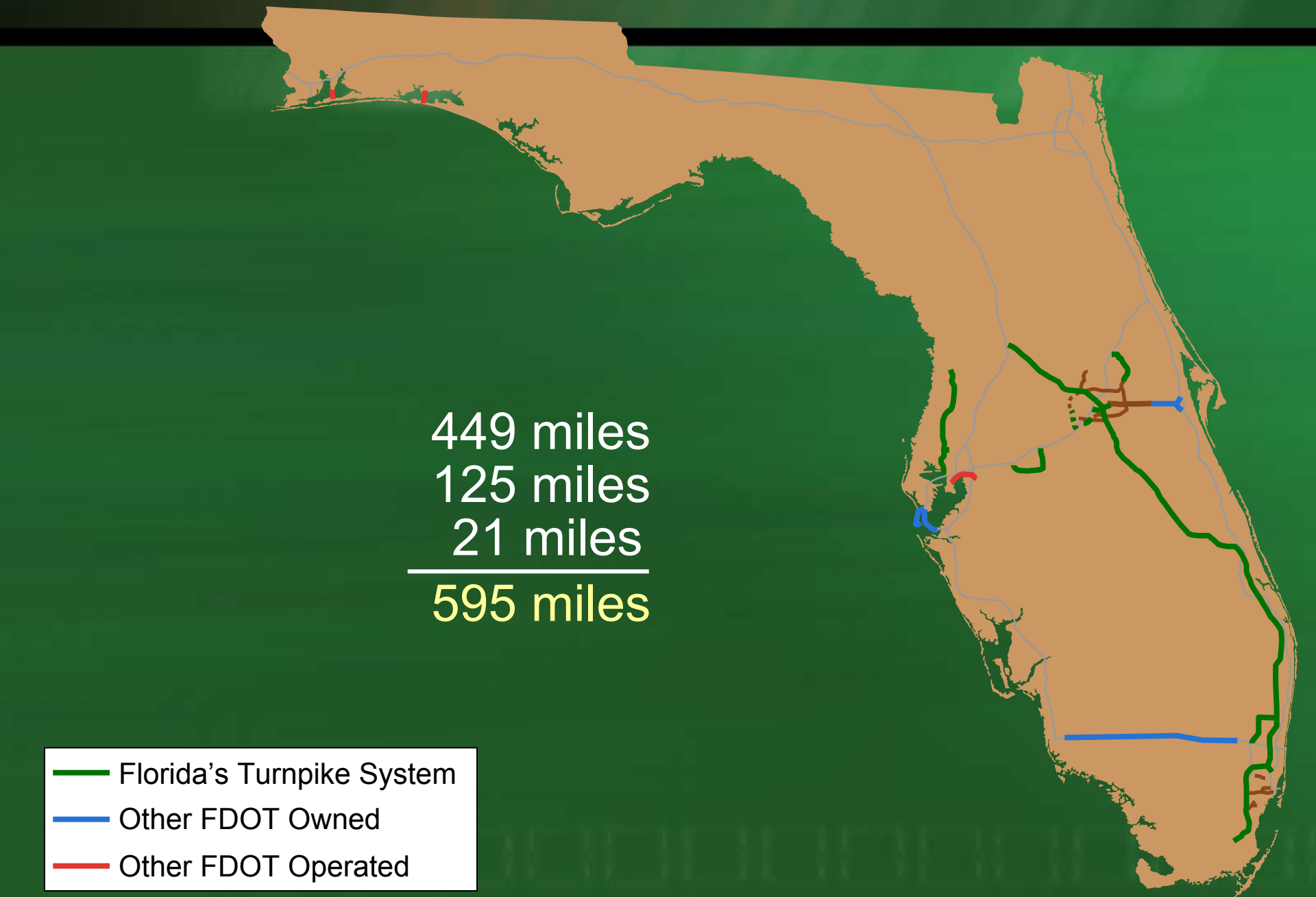
Sunshine State Parkway Authority

Florida's Turnpike Office

Florida's Turnpike District (FDOT)

Florida's Turnpike Enterprise

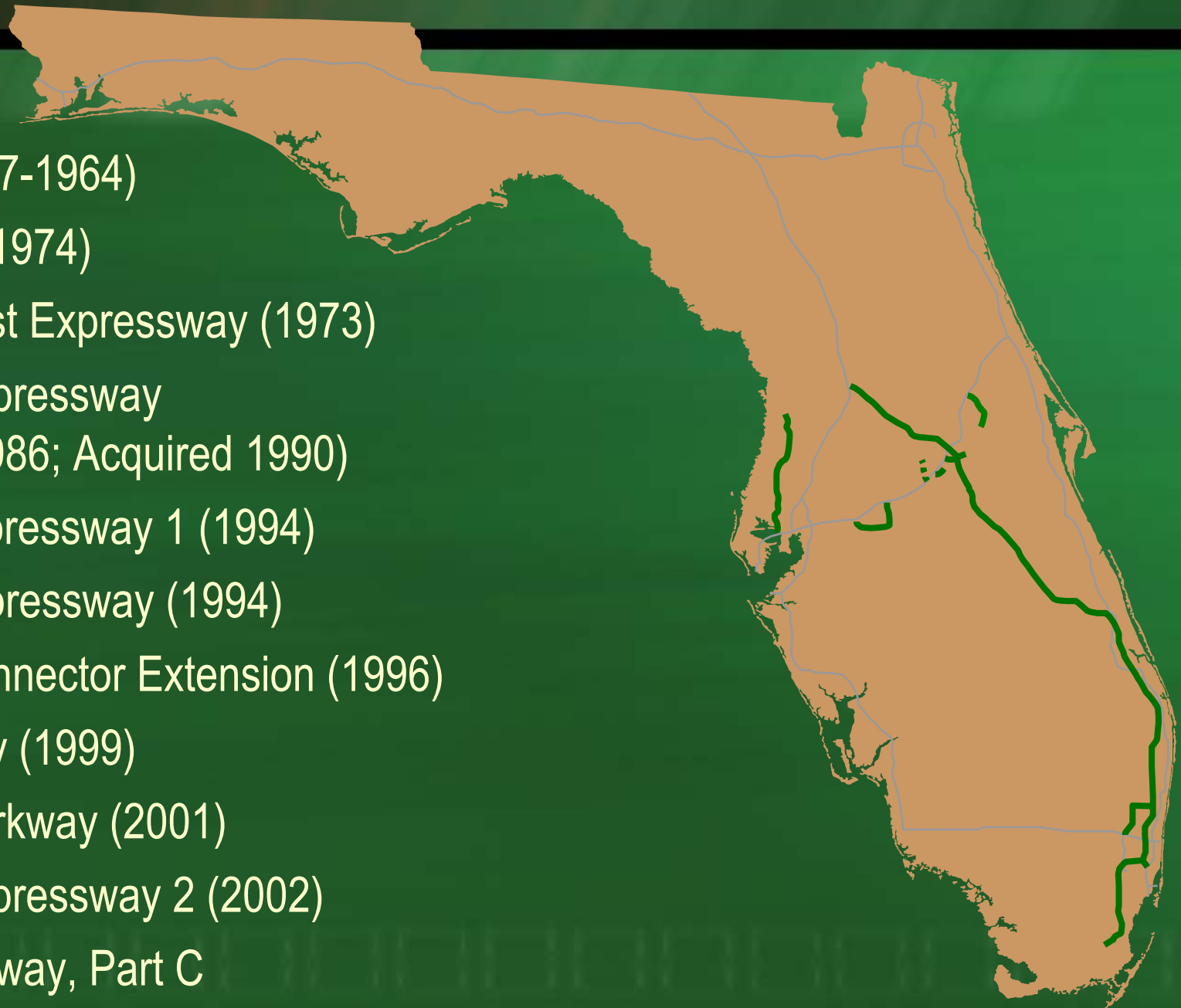
Turnpike Enterprise System



What Is Florida's Turnpike?

- The largest toll road system in Florida
- The 4th largest toll road in the USA
- An "Enterprise" within the Florida Department of Transportation
- Not an independent authority

Florida's Turnpike System



Mainline (1957-1964)

HEFT (1973-1974)

Bee Line West Expressway (1973)

Sawgrass Expressway
(Opened 1986; Acquired 1990)

Seminole Expressway 1 (1994)

Veterans Expressway (1994)

Southern Connector Extension (1996)

Polk Parkway (1999)

Suncoast Parkway (2001)

Seminole Expressway 2 (2002)

Western Beltway, Part C

Florida's Turnpike System
Investment in Transportation

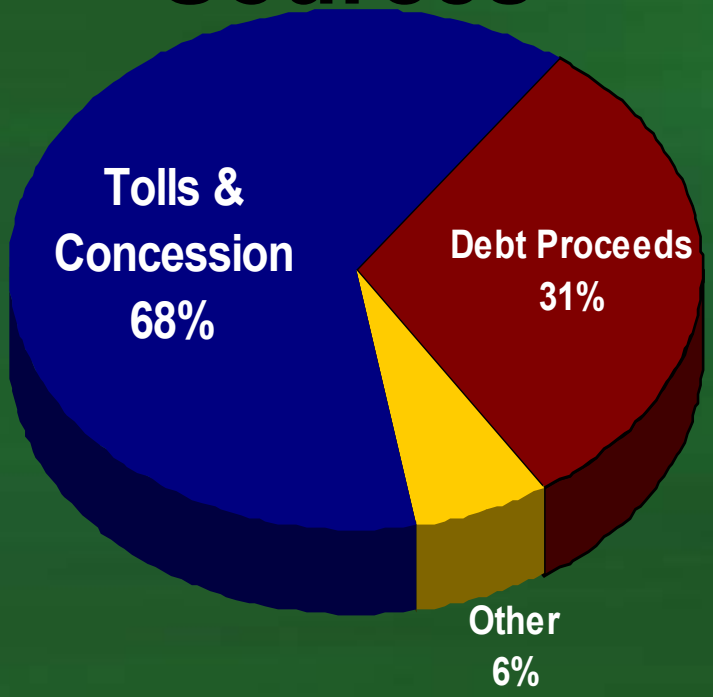
Project	Length (miles)	Cost (millions)
Sawgrass Expressway	23	$215.2
Seminole Expressway -Project 1	12	203.5
Veterans Expressway	15	351.7
Southern Connector Extension	6	153.3
Polk Parkway	25	465.5
Suncoast Parkway	42	507.0
Seminole Expressway -Project 2	6	265.2
Western Beltway-Part C (u.d)	11	313.9
	140	$2,475.3

u.d. = under development

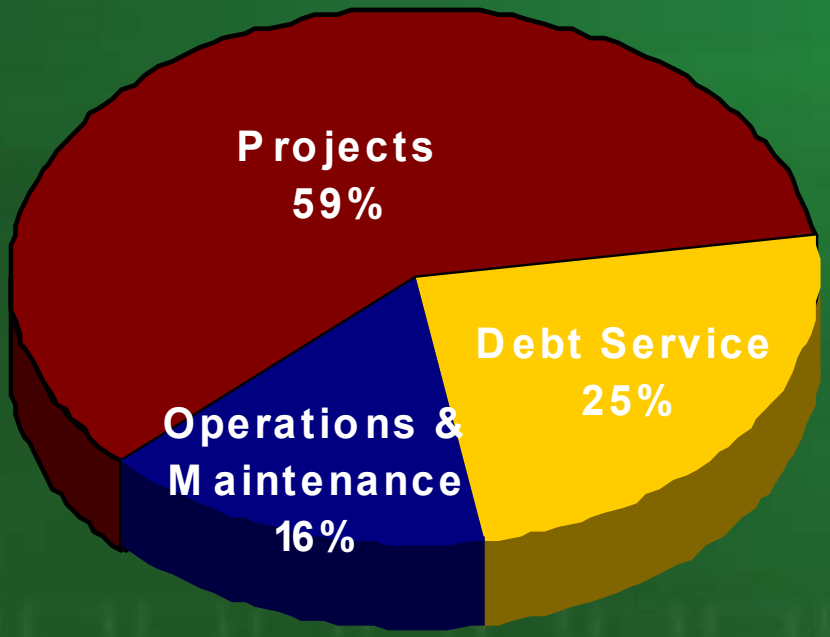
10-Year Finance Plan

FY 2005 – FY 2014

Sources



Uses

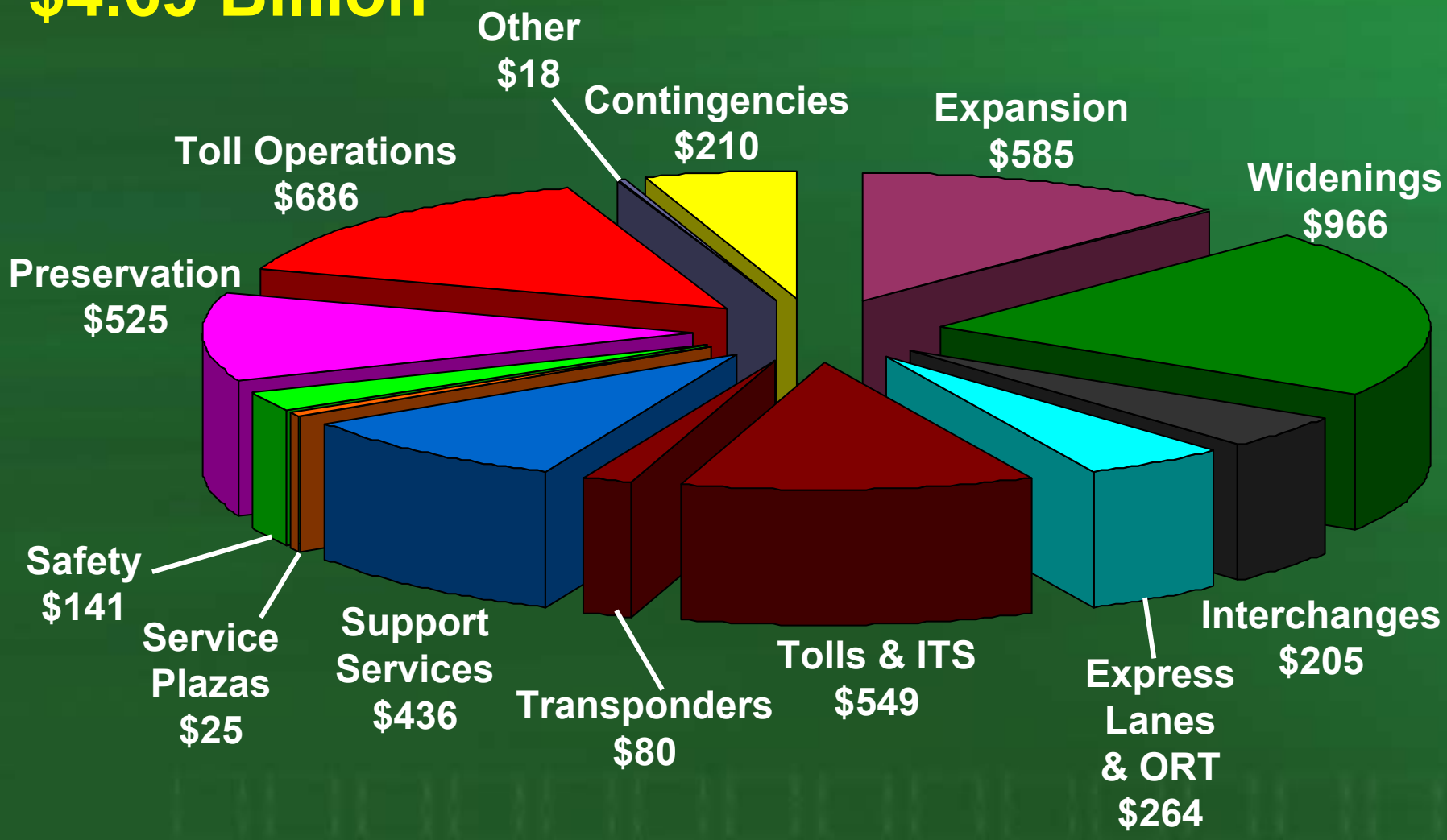


$11.1 Billion Total

Tentative Five-Year Work Program

2006-2010

$4.69 Billion



Bonded Indebtedness

	(Millions) Issued	Outstanding
Exempt from Statutory Bond Cap:		
Series 1984, 1984A (Sawgrass)	$200.0	$0.0
Series 1986A (Sawgrass Refunding)	134.1	0.0
Series 1993A (Turnpike Refunding)	522.1	0.0
Series 1997A (Turnpike Refunding)	199.7	173.2
Series 2003A (Turnpike Refunding)	446.0	436.3
Series 2003B (Turnpike Refunding)	303.9	301.7
	$1,805.8	$911.2
Included in Statutory Bond Cap:		
Series 1989 (Turnpike Improvements)	$220.0	$0.0
Series 1991A (Seminole)	336.9	0.0
Series 1992A (Veterans)	193.3	0.0
Series 1995A (Polk)	347.7	8.0
Series 1998A (Polk, Suncoast)	233.6	218.0
Series 1998B (Suncoast)	200.5	188.0
Series 1999A (Widenings, Interchanges)	109.8	99.5
Series 2000A (Widenings and Reimbursements)	112.4	103.5
Series 2000B (Widenings, Interchanges)	101.1	66.1
Series 2003C (Wid's, Intrchng's, Western BW)	200.9	199.0
Series 2004A (Wid's, Intrchng's, Western BW)	279.2	279.2
Planned through FY 2010	1,960.9	0.0
Remaining	$203.7	$1,161.3
Total	$4,500.0	$2,072.5

Bond Ratings

Moody's Investors Service

~~Aa2~~

Indicates excellent financial security, high quality with very low credit risk

STANDARD &POOR'S

AA-

Indicates high quality and ability to pay interest and principal

FITCH

FITCH IBCA, DUFF & PHELPS

AA-

Indicates high credit quality and strong capacity for payment of financial commitments

Moody's Investors Service

According to Moody's Investors Service, Florida's Turnpike Enterprise is the highest rated turnpike in America

"Proven ability to manage large and growing capital program."

"Turnpike plays key role in State's rapidly growing economy."

"Turnpike's timely toll increases and continued traffic growth have allowed it to manage equally rapid growth in operating expenses and achieve strong coverage of debt service."

Moody's Investors Service

According to Moody's Investors Service, Florida's Turnpike Enterprise is the highest rated turnpike in America

"System is increasingly diversified geographically; faces limited competition."

"Organizational structure ensures political access but reduced autonomy."

"New State law encourages a more business-like environment, increased focus on customer service."

Why Choose Asset Management

- Fiscal responsibility
  - "Fix it before it's broken" principle
  - Facilities maintained at a higher level of service
  - Lower cost to maintain over time
- Directly related to bond rating
- Higher customer service ratings
- A tool used to meet performance measures and meet the mission statement goals

Why Choose Asset Management

Mission Statement

To [illegible] growing transportation needs, ensuring value to customers, protecting investors and managing the Turnpike System in a business-like manner

Balanced Work Program & Finance Plan

Performance measures

AA bond ratings

}

FLORIDA'S TURNPIKE ENTERPRISE

Why Choose Asset Management

- 1997 AASHTO created an Asset Management Task Force
- 1998 AASHTO Board of Directors approved an Asset Management Strategic Plan
- 1999 FHWA created an Office of Asset Management

U.S. Department of Transportation
Federal Highway Administration

TEAMS 101

TEAMS

Turnpike Enterprise Asset Management System

STATE OF FLORIDA • DEPARTMENT OF TRANSPORTATION

FLORIDA'S TURNPIKE ENTERPRISE

Florida's Turnpike "Futures" Study

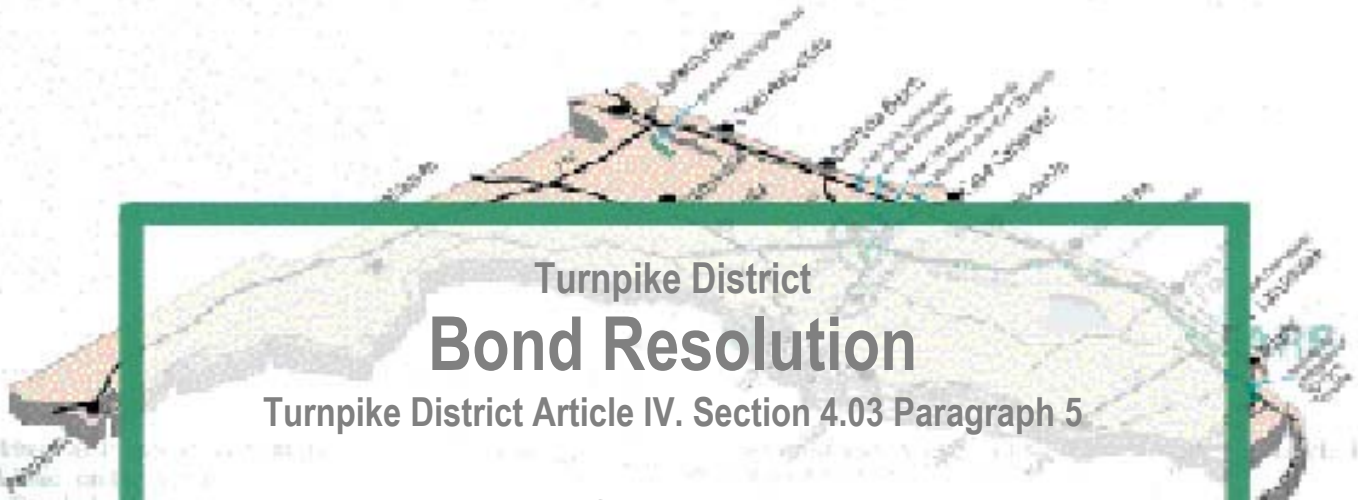
- In February 1996, the Florida Transportation Commission requested the Florida Department of Transportation to "conduct a thorough review of the Turnpike Program's future after the year 2000…"

Florida's Turnpike "Futures" Report

- "Futures Report" provided 22 strategies to guide the Turnpike into the 21st century
- Resulted in legislation which increased the Turnpike District bonding authority to $3 Billion
- Identified projects throughout the state for further in-depth examination

Florida's Turnpike System Plan "TSP"

- Prepare detailed analysis of the potential projects identified in the "Futures Report"
- Prioritize newly identified expansion projects and necessary improvements over the next 20 years
- While reserving sufficient funds for periodic system renewal and replacement



Turnpike District

Bond Resolution

Turnpike District Article IV. Section 4.03 Paragraph 5

". . . the amount certified by the consulting Engineer for such Fiscal Year as necessary for the purposes of the Renewal and Replacement Fund . . . the monies in the Renewal and Replacement Fund shall be used, when necessary, for the purpose of paying the cost of replacement or renewal of capital assets or facilities . . . "

Florida Department of Transportation

Historical Method of Managing Assets

- Development of R&R Budget
  - Rule of Thumb
  - Historical Expenditures
  - Short Term Horizon
  - Reactive Rather than Proactive

TEAMS & 7i Integration
TEAMS Development

- TEAMS Concept Report completed early 1999
- Pilot completed late 1999
- Full TEAMS development approved 2000
- TEAMS version 1.0 went live April 2001

TEAMS & 7i Integration
7i Implementation

- Initial software purchased mid 1999
- 1st generation CMMS utilized DataStream MP2
- Development of CMMS required because of mandated reductions in staff – unable to maintain paper MMS
- Initial user requirements focused on work order processing and contract management.
- System did not support individual asset inventory reporting or history analysis

TEAMS & 7i Integration
7i Implementation

- 2001 DataStream introduced 7i – web enabled MP2
- 2001 DataStream announced it was going to de-support MP2 - offered incentives to migrate from MP2 to 7i
- Migration to 7i began in 2003
- Contracted with DataStream to assist in development user requirements and conversion.
- Asset inventory imported from TEAMS

TEAMS & 7i Integration
7i Implementation

Asset Management System (AMS)
vs
Computerized Maintenance Management System (CMMS)

- **AMS is a generic term**
  - **Vehicle maintenance**
  - **Building maintenance**
  - **Computer Systems**
- **Enterprise Asset Management Systems**
- **CMMS is a type of asset management Systems - CMMS vendors market themselves as AMS**
- **CMMS Systems offer work order management**

Asset Management Software Alternatives

- Totally customized program
  - TEAMS
  - Based on clients requirements
  - Not “plug and play”
- Commercially off-the-shelf (COTS) software programs
  - Hansen
  - Archibus
  - DataStream
  - Others
- Combination

Asset Management Implementation Approach

- Needs Assessment
  - Existing computing infrastructure
  - Existing databases and legacy systems
  - Business Processes
- Prioritization of needs
  - User requirements
  - Budget
- Determine system needs
  - Present development & implementation plan
    - Customized vs. COTS
- Development & implementation
  - Data collection/organization
  - Legacy system integration
  - Software development
- System operation & maintenance

TEAMS Concept Study Data Analysis Process

- Decision Tree Process
- Identify and Integrate Existing Data
- Database Integration Inclusion based on Users needs through Focus Groups
- Review “Canned Off The Shelf” (COTS) Software Packages

Asset Type by Vendor

Software	Buildings/Plants & Grounds	Pavement & Bridges	Roadway & Traffic	Fleets	Water & Waste Water Utilities	Other Utilities
VFA						
Asset Works	✔	✔				
FIS, Inc	✔					
ARCHIBUS/FM	✔					
CHS Software	✔	✔			vertical	
Hanson IT	✔	✔	✔		✔	
CarteGraph		✔	✔		✔	
Stantec	grounds	✔	✔		✔	
City Works		✔	✔		✔	✔
Infrastructure 2000			✔		✔	
MAXIMO MRO	✔			✔		
FAMIS	✔			✔		
Mainstar CMMS	✔			✔		
RECAPP	✔			✔		
Micromain				✔		✔
DataStream MP5						
TEAMS	☆	☆	☆		☆	☆

Industries Where Software is Installed

Software	Federal Gov't	State & Local Gov't	Public Utilities	Financial & Insurance	Comm.	Retail/Manufacturing/Real Estate	Education/ Healthcare
VFA							✖
Asset Works					✖		✖
FIS, Inc	✖					✖	✖
ARCHIBUS/FM	✖	✖	✖	✖	✖	✖	✖
CHS Software		✖	✖				
Hanson IT	✖	✖					
CarteGraph	✖	✖	✖				
Stantec	✖	✖					
City Works		✖	✖				✖
Infrastructure 2000							
MAXIMO MRO	✖	✖		✖		✖	
FAMIS					✖	✖	
Mainstar CMMS	✖	✖					
RECAPP	✖	✖	✖			✖	✖
Micromain			✖				✖
DataStream MP5							
TEAMS		★					

Customized vs. COTS

CUSTOMIZED

- More expensive
+ Will meet 100% of user requirements
- Requires development of in-house support / or ongoing relationship with developer.

COTS

+ Lower cost
- May need to modify operations to match application business model
- May not meet all user requirements
+ Quicker start up

What is TEAMS?

- TEAMS is a desktop method to:
  - Show an accurate inventory of infrastructure assets (and certain other capital assets)
  - Provide the current condition of assets
  - A method to forecast and prioritize capital expenditures required for periodic renewal & replacement

TEAMS Goals

- Reduce/Eliminate System Duplication
- Identify a Better Way to . . .
  - Collect
  - Store
  - Process
  - Analyze
  - Present

  . . . Assets

TEAMS Concept Study

- Identify Existing Systems and Processes
- Preliminary Hardware/Software Requirements
- Data Collection Process
- Detailed Schedule
- Led To…Pilot Program

Assets Managed In TEAMS

- Turnpike Assets Managed in TEAMS
  - PAVEMENT
  - ROADWAY
  - FACILITIES
  - BRIDGES

TEAMS Concept Study
"Needs Assessment"

- User Focus Group
  - Turnpike District Staff Participation
  - Questionnaires
  - Interviews
  - Meetings

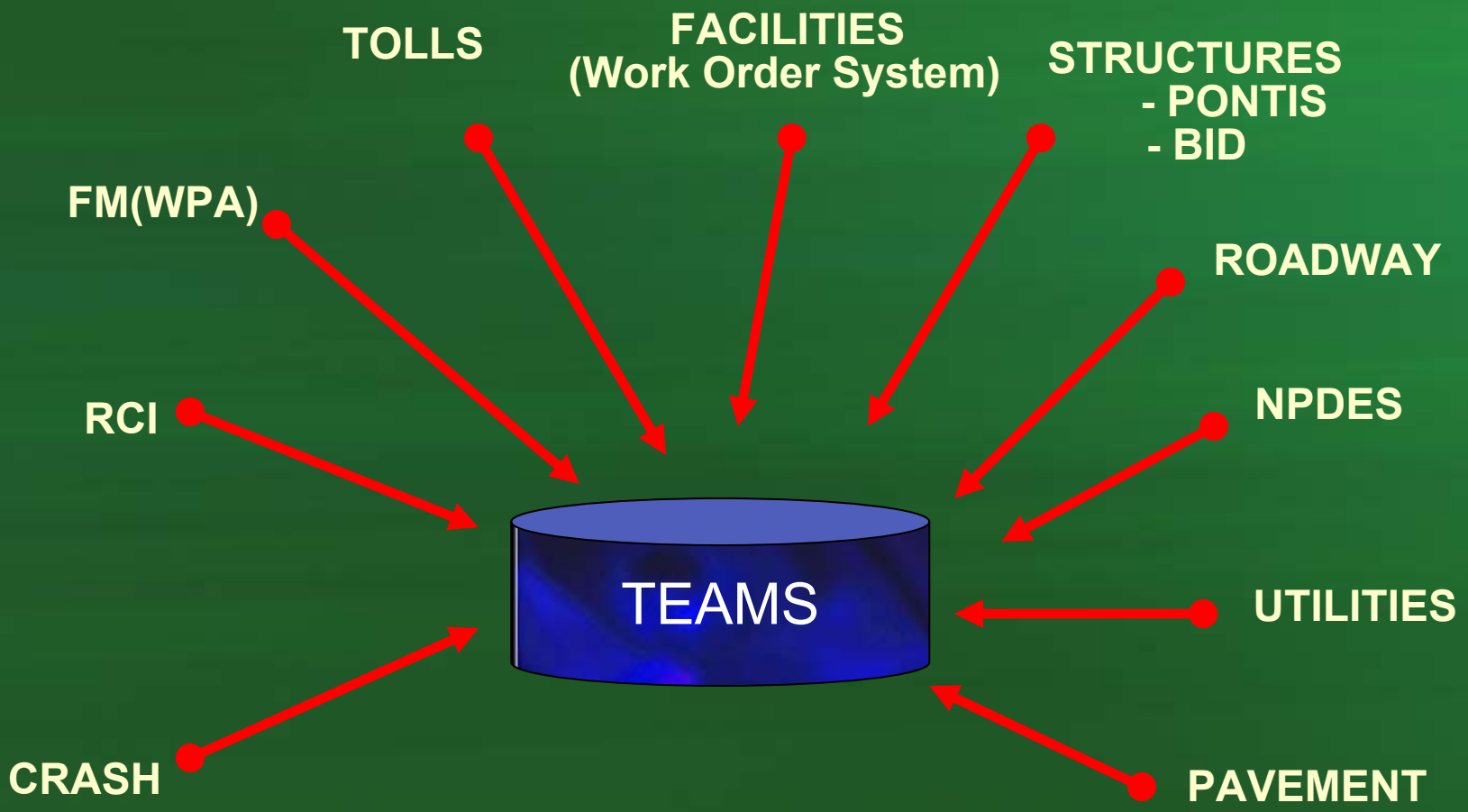
TEAMS Concept Study
Focus Group

- Focus Group Needs:
  - What Assets Do We Have?
  - What is the Current Condition?
  - How Long Will it Last?
  - What is the Cost to Repair?
    To Replace? Are There Alternatives?
  - What Monies Should be Programmed?

TEAMS Concept Study Focus Group

- Existing Diverse Systems
  - Spreadsheets
  - Microsoft Access Databases
  - State Mandated Databases
  - Federal Databases

TEAMS Concept Study Data Integration



TEAMS Concept Study Application Goals

- Ease of Use - Graphically Driven
- Fully Integrated with all Existing Databases
- Asset Management System Using Maps and Pull Down Menus
- Accessible via the Turnpike Intranet
- Web Enabled Program

TEAMS “Pilot”

- Eight (8) Mile Section of the Homestead Extension of Florida’s Turnpike (HEFT)
- Included all Major Assets
- Proof of Concept…
  - Collect Data
  - Store Data
  - Basic Functionality
    - Inventory
    - Condition
    - Forecast

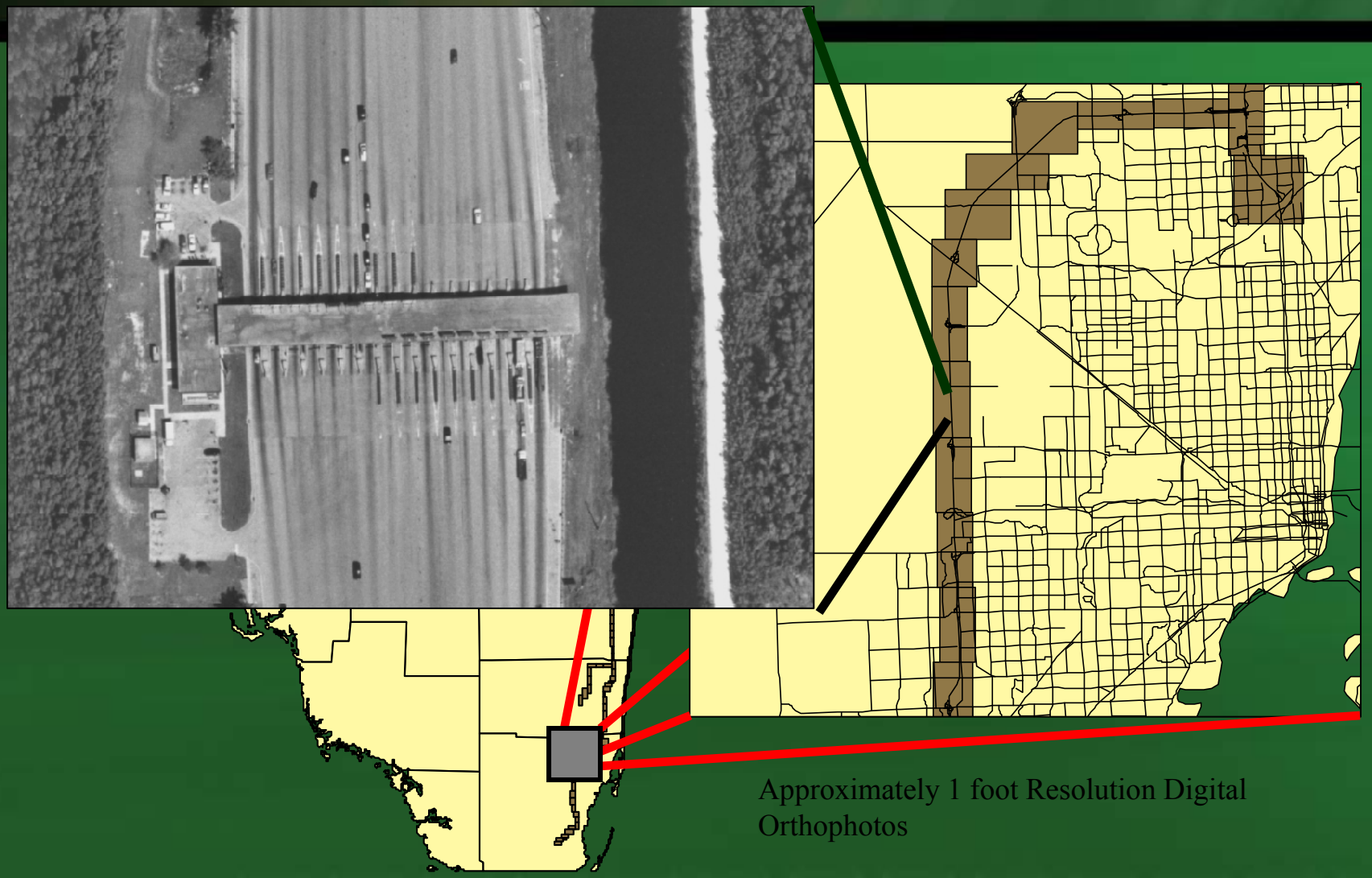
TEAMS Development Process

- White Papers
  - Data Collection Process
    - Existing Data
    - Photogrammetry
    - VISAT
    - Field (Vocarta)
  - Evaluation of Latest Hardware
    - Application Server
    - Data (Oracle) Server
    - Network Set-up
  - Evaluation of Latest Software
    - Map Software
    - Application Software
    - Database Software
    - Reporting Software

Initial Data Collection Process

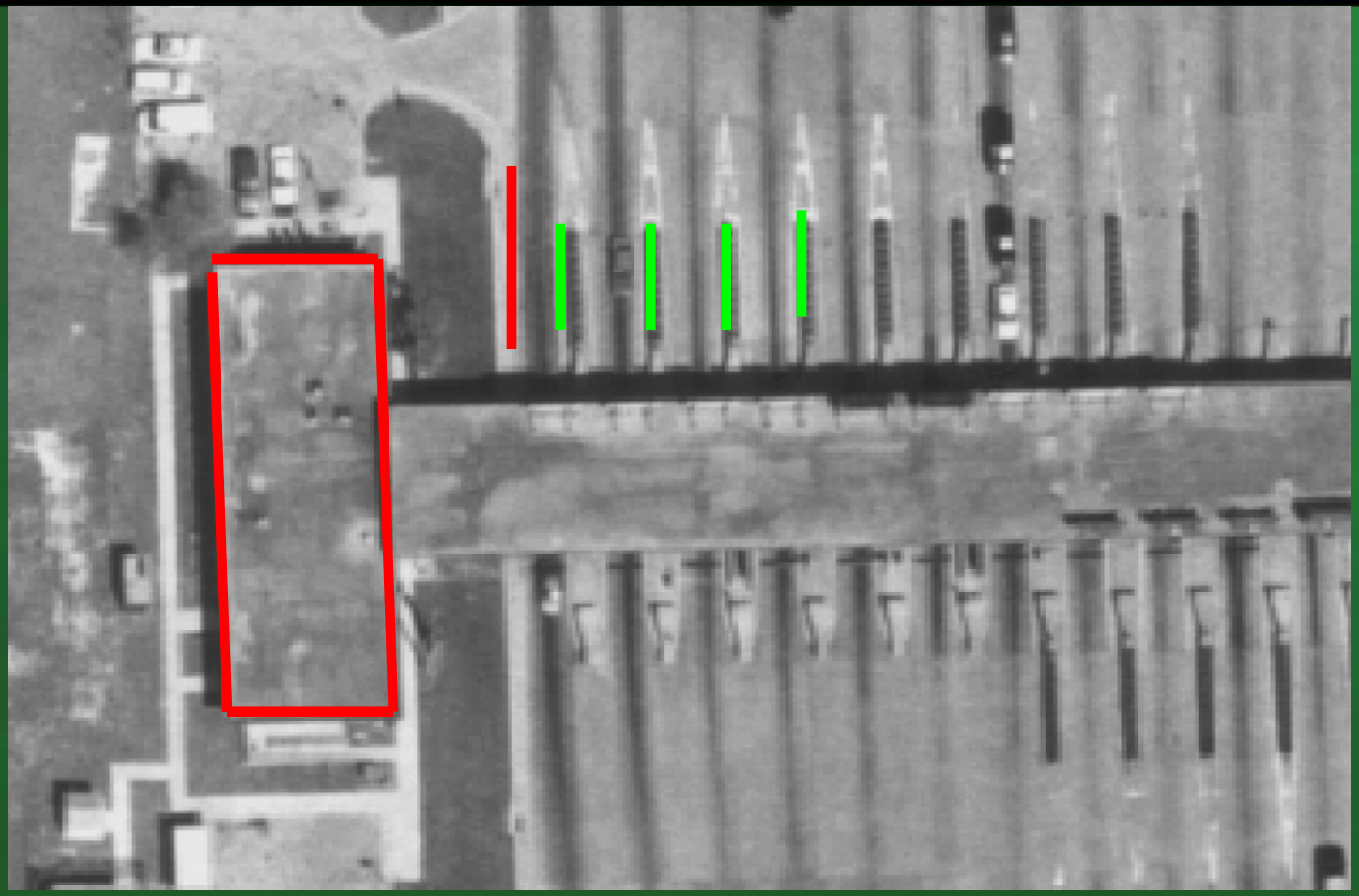
- Multi Source Approach
  - **Photogrammetry**
  - VISAT VAN
  - GPS Field Data Collections Units
  - Pavement

Photogrammetry



Approximately 1 foot Resolution Digital Orthophotos

Photogrammetry



Initial Data Collection Process

- Multi Source Approach
  - Photogrammetry
  - **VISAT VAN**
  - GPS Field Data Collections Units
  - Pavement

VISAT VAN

VISAT

(Video + Inertial + SATellite)

A mobile georeferenced digital image surveying system

VISAT VAN

FEATURES

- Can travel at up to 75 km/h
- Takes 360^{o} images (traveling in both directions)
- Camera configurability
- Images taken in sets of five
- Recorded with each image, are the positions and geodetic orientations of the camera's focal point
- Data are stored on a RAID (Redundant Array of Independent Disks)

VISAT VAN

PRECISION

- 3-D geodetic coordinates NAD 83
  - (latitude, longitude, altitude, pitch, roll, azimuth)
- Absolute precision 11.81 in/30 cm
- Relative precision 3.94 in/10 cm

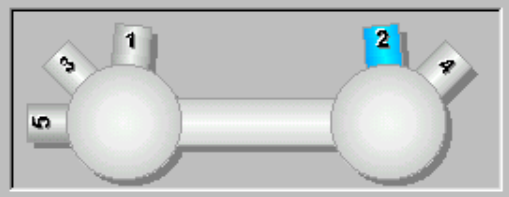
VISAT Station Demo v1.05

File Edit View Project Image Filter Windows Help

IMG01 - VA000815, Set 381, Cam 2

IMG02 - VA000815, Set 381, Cam 2

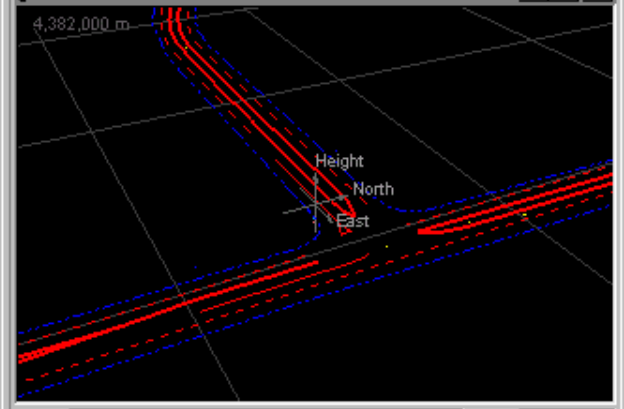
Image Selector



IMG02 - VA000815, Set 381, Cam 2

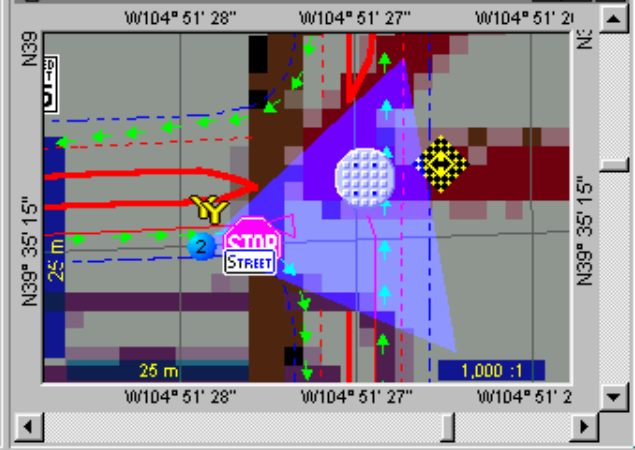
Latitude	N39° 35' 15.00"	North	4,381,984.98 m
Longitude	W104° 51' 27.87"	East	512,215.93 m
Ellips. Height	1,727.31 m	Ortho. Height	1,744.47 m

3D Viewer



N:4,381,984.98 m, E:512,215.93 m H:1,727.

Navigation



Demo Data | METRIC | New Object | Area

Start | Office | Find: Files named *.apr | VISAT Station Demo ... | 9:50 AM

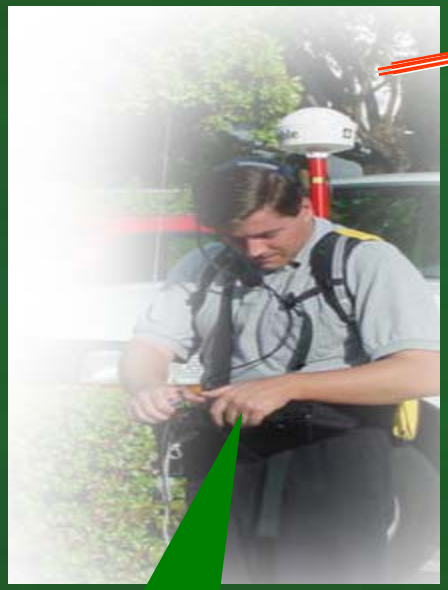
Initial Data Collection Process

- Multi Source Approach
  - Photogrammetry
  - VISAT VAN
  - GPS Field Data Collections Units
  - Pavement

Field Data Collection

- Data collection software based on integrated, proven technologies for rapid and real-time data capture.
- VoCarta Voice Activated Data Collection Software
- Digital Camera
- Electronic Notepad
- GPS Unit

Field Data Collection - VoCarta



GPS

Inspection QA

Alameda

Mississippi

Ely

× – Cracked pavement

C – Pothole

collected field data

Office

Alameda

Mississippi

Ely

Repair schedule for Friday April 2nd

Design

GPS receiver

Lockheed

Portable unit

Microphone headset

Alameda

Mississippi

Ely

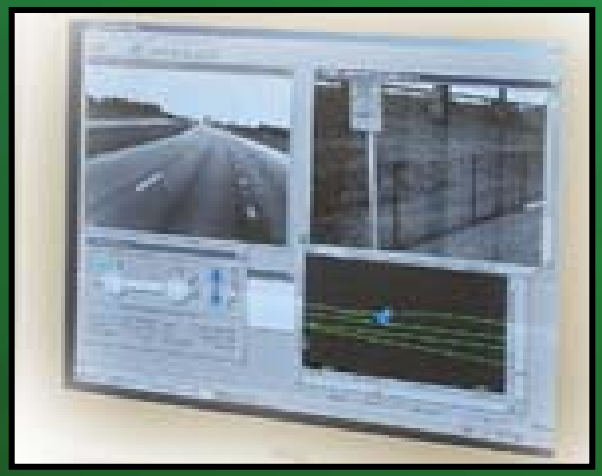
Query: Show condition of inspected streets

Good Fair Repair

Planning

Field Data Collection - VoCarta

- VoCarta turns speech (data) into information
- Mobile computing
- Hands free/eyes up environment
- Efficient and effective collection
- Quick and easy configurability
- Association of spatial and relational data
- Correlation of all data types



Initial Data Collection Process

- Multi Source Approach
  - Photogrammetry
  - VISAT VAN
  - GPS Field Data Collections Units
  - Pavement

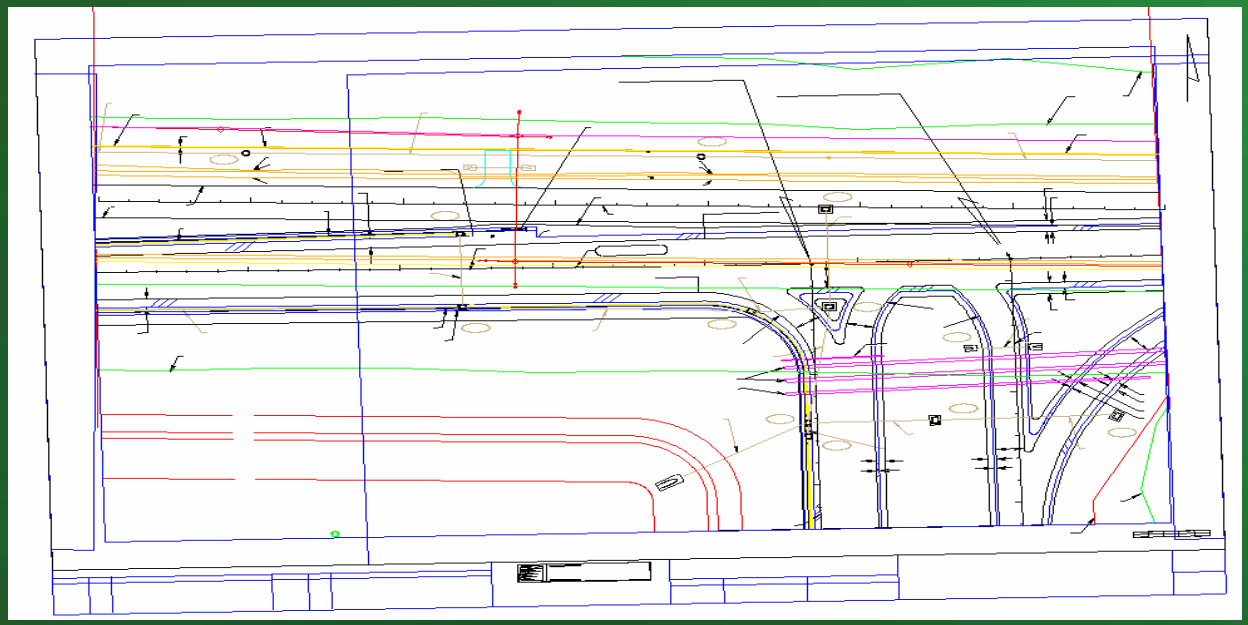
Pavement Data Collection

- Data Collection Process
  - Pavement Data Collection
    - FWD
    - In-house Pavement Data collection
    - GPR/Plans Review – Layer Data

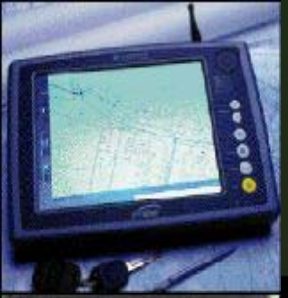
Data Maintenance Process

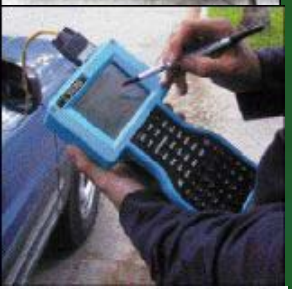
- Facilities – farmed from 7i (CMMS)
- Legacy Systems – Pavement, Work Program, PONTIS, RCI, Safety
- Roadway – design plans, TEAMS FIELD - verification/collection

Data Extraction From Design Plans



- Design accuracy asset position
- Reduced field work (safety consideration)
- Improved data delivery schedule
  - Data ready to integrate at project completion
- Facilitates integration of CADD and GIS





Field TEAMS

- Currently Developing Functional Specifications
- Vision
  - Full TEAMS Functionality in the Field
  - Capability to collect, update or validate asset data in the field
  - Auto location (analogous in-car navigation systems)
  - Real-time data updates from field locations

Data Maintenance Process

- Facilities – farmed from 7i (CMMS)
- Roadway – design plans, TEAMS FIELD - verification/collection
- Legacy Systems – Pavement, Work Program, PONTIS, RCI, Safety

TEAMS Status

- Asset Facts
  - Over ***300,000*** Data Elements collected via Photogrammetry
  - Over ***500,000*** Data Elements collected via VISAT
  - Over ***600,000*** Data Elements Collected via Manual Method
  - Over ***600,000*** Pavement Data Elements collected
  - Total - Over ***2,000,000*** data elements collected
  - Over ***1,000,000*** data elements compiled from existing databases
  - Total over ***3,000,000*** data elements collected/QC'ed/compiled and loaded in TEAMS!

Asset Facts

- Roadway/Facilities Approximate Inventory

– Centerline (Miles) – 443

– Lane (Miles) – 1900

– Guardrail (Miles) – 270

– Barrier Wall (Miles) - 140

– Attenuators (Each) – 790

– Fencing (Miles) - 770

– Highway Lights (Each) – 10,350

– Signs (Each) – 21,000

– Buildings (Each) - 300

– Generators (Each) – 130

– AC Systems (Each) – 500

– Fuel Storage Tanks (Each) – 215

TEAMS Concept Study
Focus Group

- Focus Group Needs:
  - What Assets Do We Have?
  - What is the Current Condition?
  - How Long Will it Last?
  - What is the Cost to Repair?
    To Replace? Are There Alternatives?
  - What Monies Should be Programmed?

TEAMS & 7i Integration
7i Implementation

1.0 Definition Phase
- 1.1 Site Assessment
- 1.4 Create Implementation Services Document (ISD)

2.0 Design Phase
- 2.2 Product Installation
- 2.3 Initial Business Process Review
- 2.4 Kick-Off and Core Team Training
- 2.5 Business Process & System Planning
- 2.6 Configuration/System Review

3.0 Development Phase
- 3.1 Configuration
- 3.2 DataStream Extended Setup
- 3.4 Final Data Preparation and QA

TEAMS & 7i Integration
7i Implementation

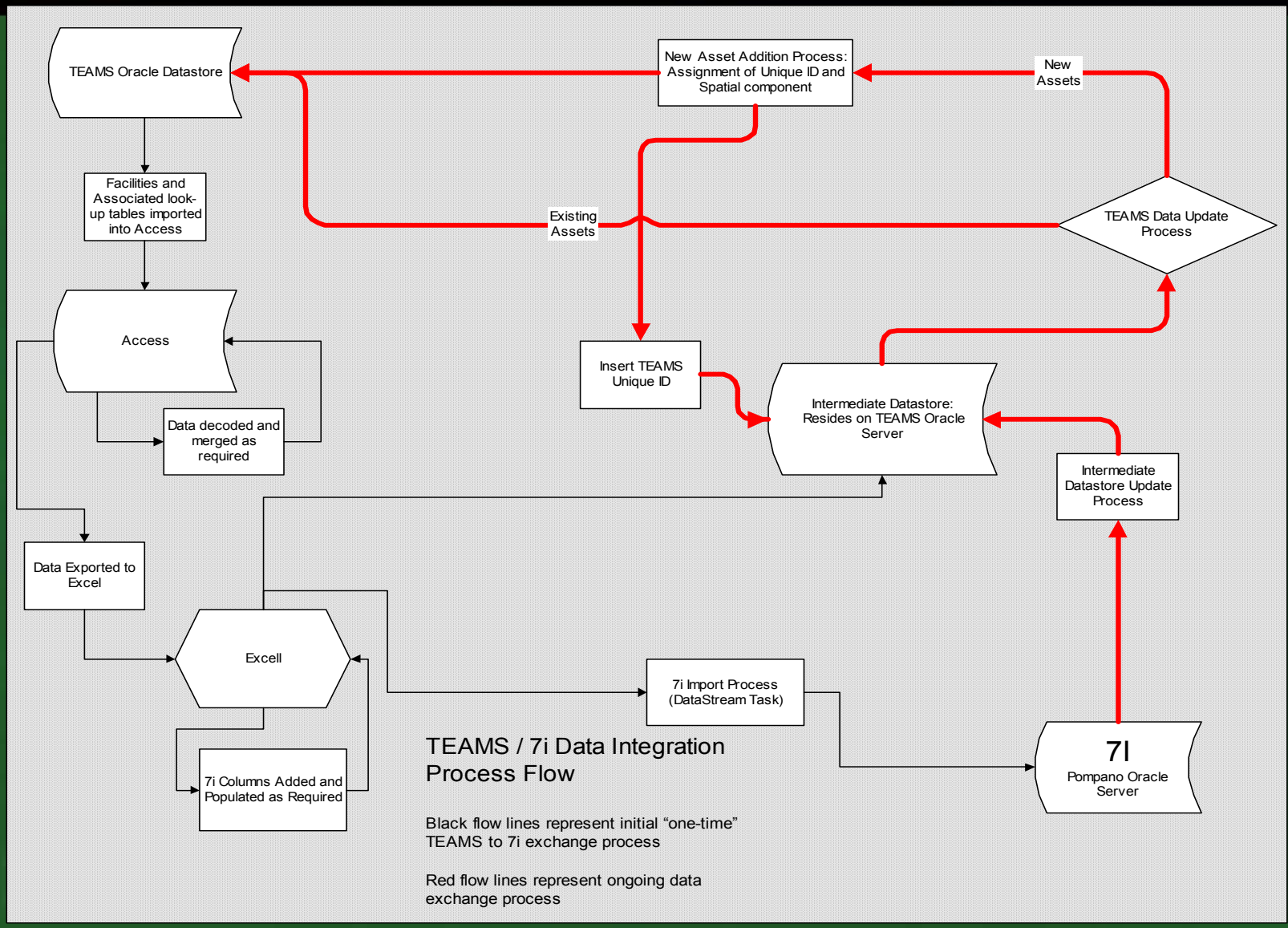
3.0 Development Phase (cont.)

- 3.5 Data Mapping
- 3.6 Evaluation Conversion
- 3.8 KPI Configuration
- 3.9 Mapping for Integration to TEAMS
- 3.10 System Testing
- 3.11 Final Configuration
- 3.13 System Acceptance and Sign Off

4.0 Implementation Phase

- 4.1 End User Training
- 4.2 Production Conversion
- 4.3 Cut Over to Production
- 4.4 Go-Live Support
- 4.5 Project Close Out

TEAMS & 7i Integration
7i Implementation



TEAMS & 7i Integration
7i Implementation

TEAMS Asset/Table Name	7i Object Class	TEAMS Field Name	Datastream 7i Field Name	Custom Fields	Comments
Backflow Preventers / TAMS_ENV_BF_PREVENTERS	BKFLPREV	BF_PREV_ID	Not Maintained in 7i		
		Account Number	BF-ACNUM	Custom Fields	Custom Field based on BKFLPREV class
		Backflow Preventer ID	OBJ_CODE	Field in 7i	Concatenate with Class as Prefix
		Backflow Type ID	BF-TYPE	Custom Fields	Custom Field based on BKFLPREV class
		Building ID		Convert in Hierarchy Table	Equipment Hierarchy
		Comments	ADD_TEXT	Field in 7i	ADD_ENTITY = OBJ
		Cost Replacement Type		To be DELETED	

TEAMS & 7i Integration
7i Implementation

Institutional Issues

Selling Your System

- User Involvement – start-to-finish
- Training – top down
- Form user groups

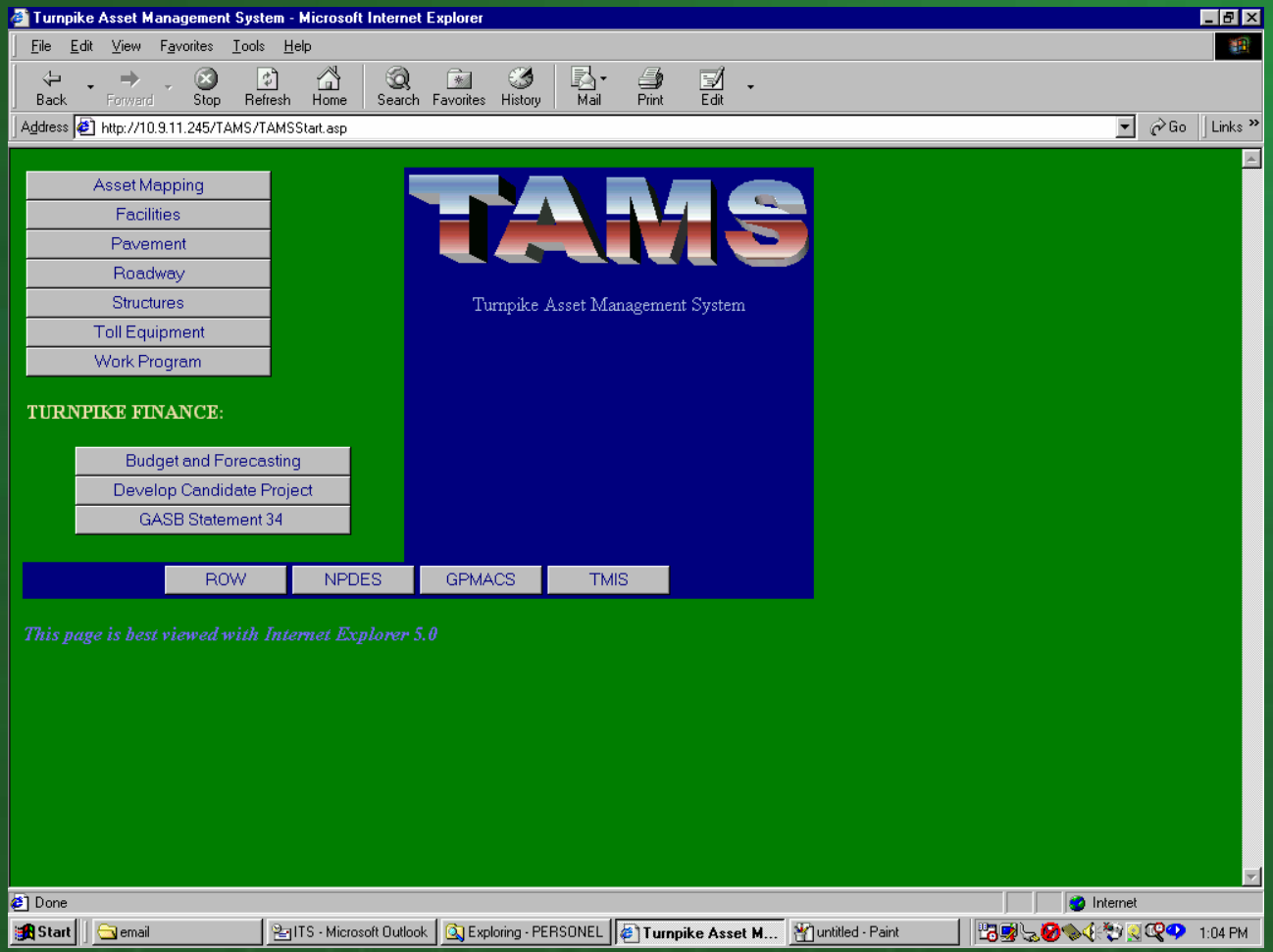
Expect Resistance

- Computer fear
- “Always done this way”
- Data hording

Standard Operational Procedures

- Key requirement for data consistency

TEAMS Demo


Turnpike Asset Management System - Microsoft Internet Explorer
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Asset Mapping
Facilities
Pavement
Roadway
Structures
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Turnpike Asset Management System
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Budget and Forecasting
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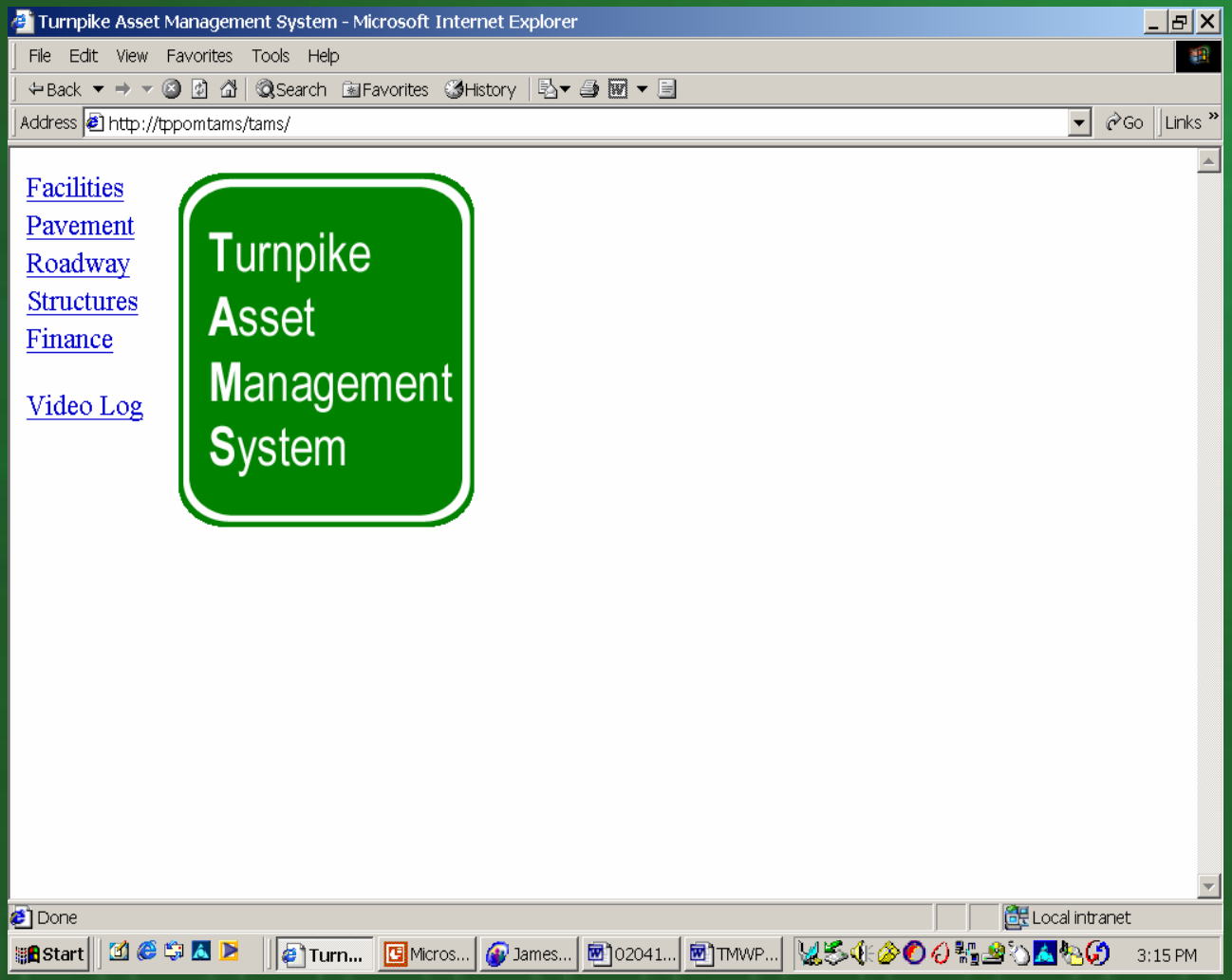
TEAMS Demo


Turnpike Asset Management System - Microsoft Internet Explorer
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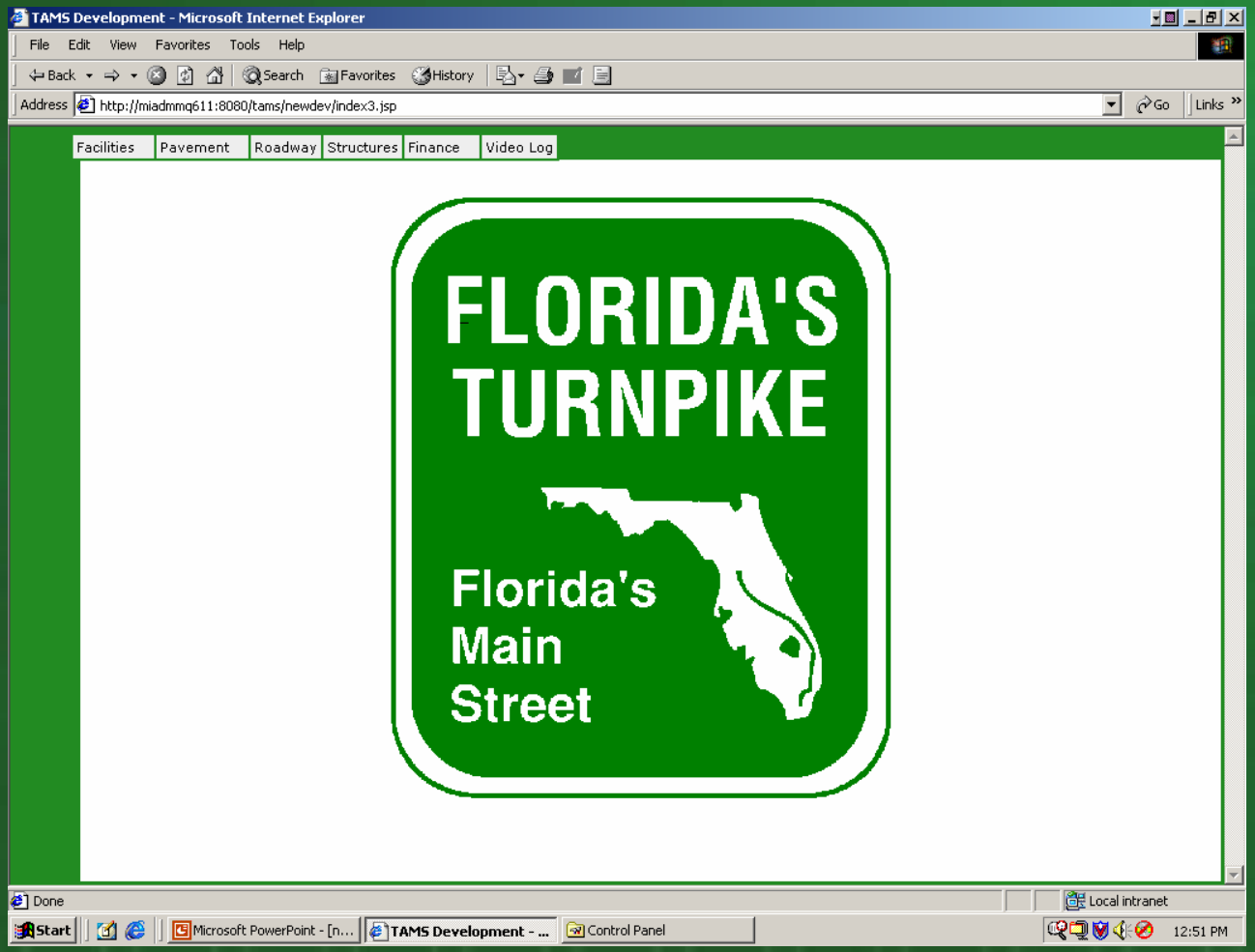
TEAMS Demo


TAMS Development - Microsoft Internet Explorer
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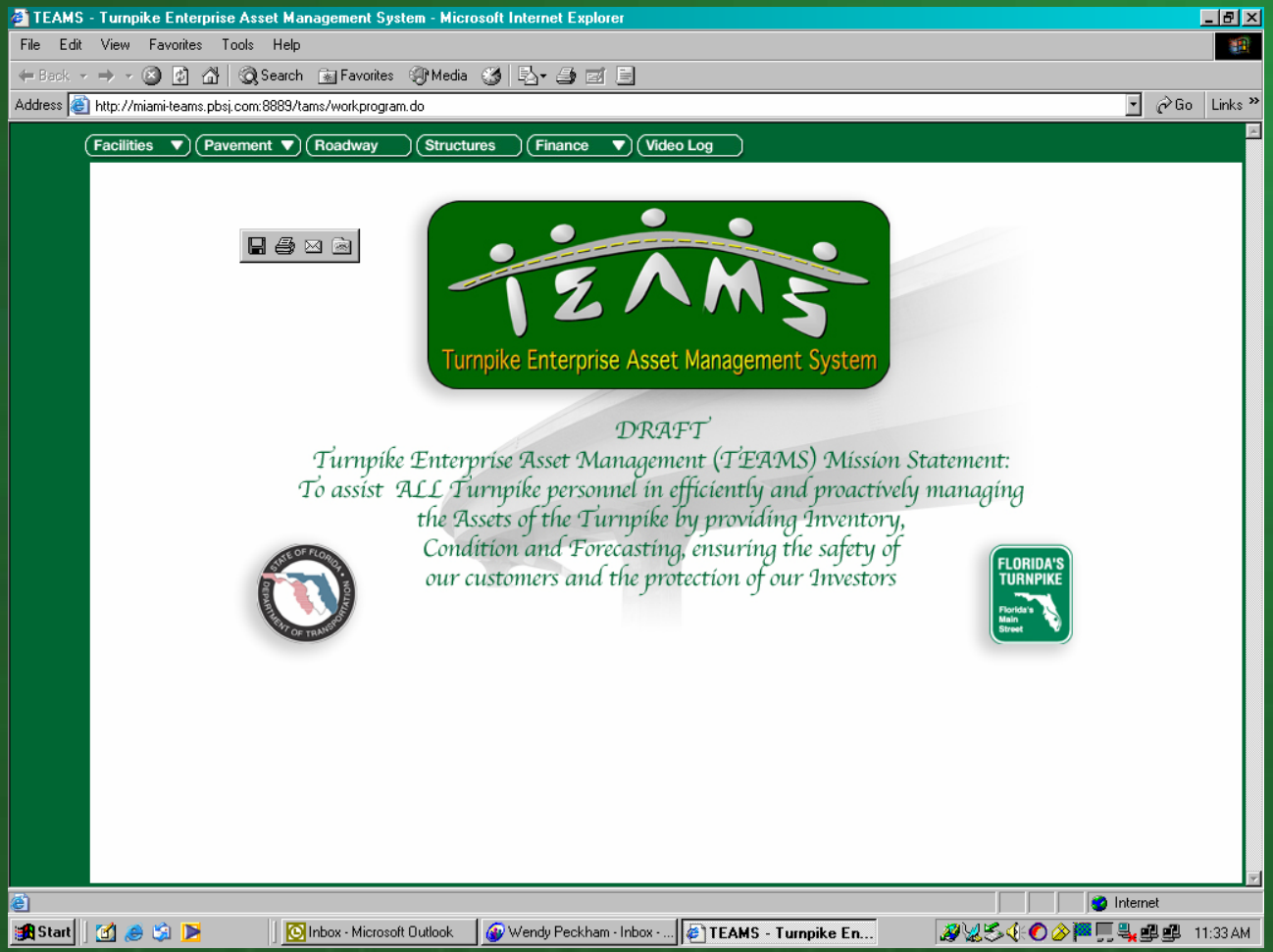
TEAMS Demo


TEAMS - Turnpike Enterprise Asset Management System - Microsoft Internet Explorer
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Go Links
Facilities Pavement Roadway Structures Finance Video Log
TEAMS
Turnpike Enterprise Asset Management System
DRAFT
Turnpike Enterprise Asset Management (TEAMS) Mission Statement:
To assist ALL Turnpike personnel in efficiently and proactively managing the Assets of the Turnpike by providing Inventory, Condition and Forecasting, ensuring the safety of our customers and the protection of our Investors
FLORIDA'S TURNPIKE
Florida's Main Street
Internet
Start
Inbox - Microsoft Outlook
Wendy Peckham - Inbox - ...
TEAMS - Turnpike En...
11:33 AM

For the long haul, or just around town…
we're with you all the way.

Thank You

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