

Data Collection, Management, and Modeling using GPS/GIS

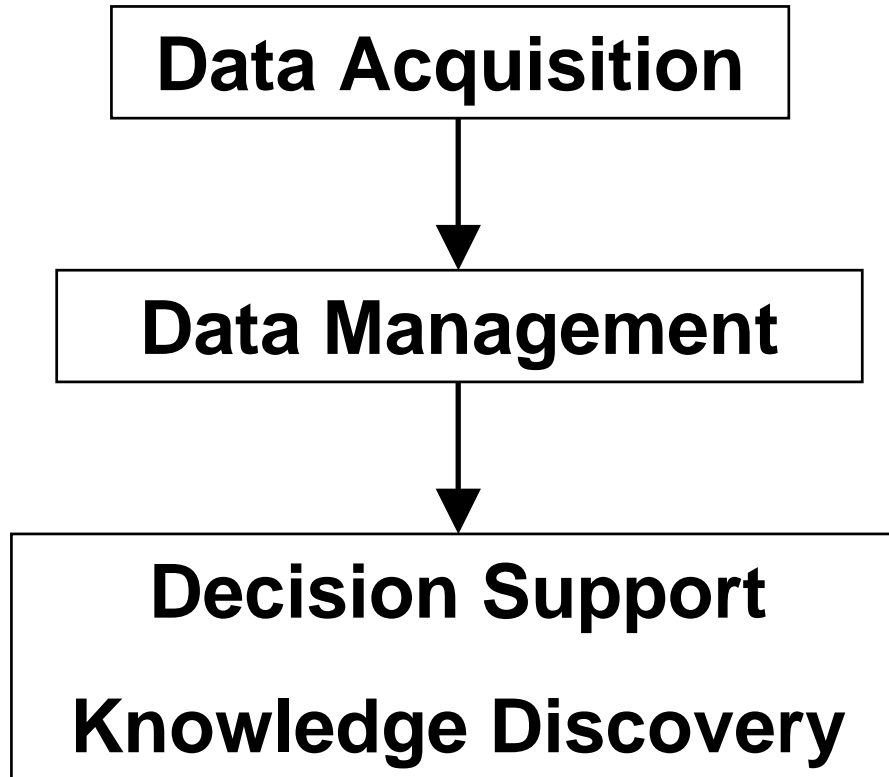
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Georgia Institute of Technology**

June 21, 2005

Outline

- Components of Pavement Management
- Data collection case
- Data Management case
- Data Modeling case
- Benefits of using GPS/GIS

Components in Pavement Management



Data Collection Using GPS/GIS

– Fulton County Case


GPS/GIS-based Data Collection - 1

Main Screen


Fulton County

Computerized Pavement Condition Evaluation System


Distress Identification



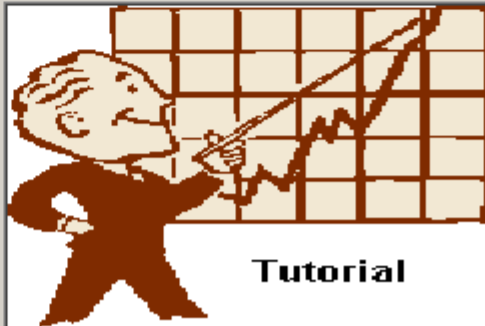
Field Data Entry & Management



PACES Manual



Tutorial



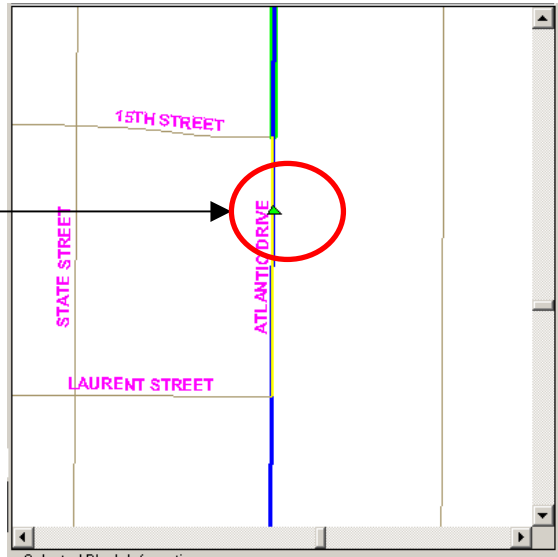
GPS/GIS-based Data Collection - 2

Center At GPS Nur

GPS Track Record:

Start

ON (Left-click to turn off)



Street Block Field Data Entry : Survey Block

Save Cancel New Block Copy Distress from Previous Block GPS Pickup Exit

General Survey

General Information

Trip Date: 2/2/2005 3:38:32 PM Rater: KERRY WILLIAMS

Street Name: ATLANTIC DRIVE Region: AT County/City: ATLANTA

Quadrant: NW SystemID: 100420

Road Info

Road Type: UNDIVIDED AADT: 10000 Pavement Width (ft.): 24 Shoulder Width (ft.): 6

No. of Bridges: 0 Bridge Width (ft.): GDOT Surface Type: ASPHALT CONCRETE

Remarks: Discort. Street Name: Other:

Street Block Information

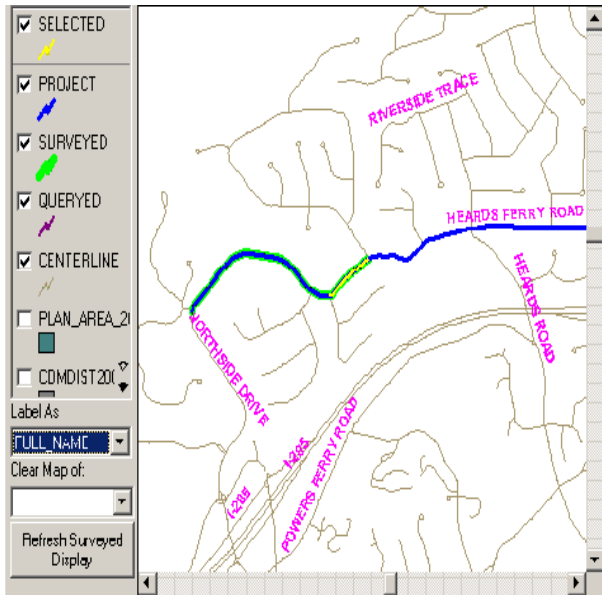
GEO_ID: 209912 Street Block From: LAURENT STREET To: 15TH STREET

Sequence: 2 Status: NORMAL Length: 430.762 Width (ft.): 24

Curb/Gutter Left: YES Right: YES Sidewalk Left: YES Right: YES

Is Crack Width greater than 1/8 inch? NO Cracks have been Sealed?

Remarks: Street Name Changed to: Other:



Street Block Field Data Entry : Survey Block

Save Cancel New Block Copy Distress from Previous Block GPS Pickup Exit

General Survey

Distress Information

Rut Depth

Outside W.P. (1/8"): % Severity:

Inside W.P. (1/8"): % Severity:

Load Cracking (3)

Severity Level 1: 10 % Severity:

Severity Level 2: 20 % Severity:

Severity Level 3: 30 % Severity:

Severity Level 4: % Severity:

Reflection Cracking

No. of cracks: Total Length: Severity (1,2,3):

Block Cracking

% Severity:

Patches and Potholes

Raveling % Severity:

Edge Distress

% Severity:

Bleeding/Flushing

% Severity:

Corrugation/Pushing

% Severity:

Loss Pavement Section

% Severity:

Stripping Assessment

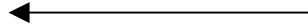
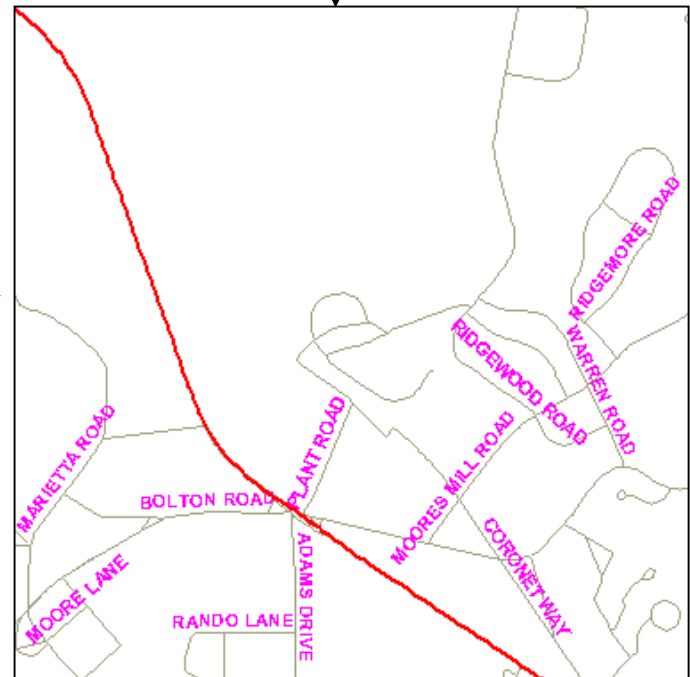
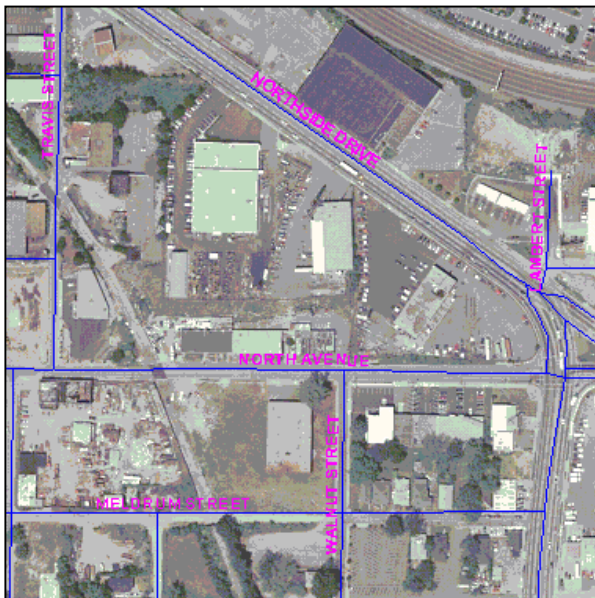
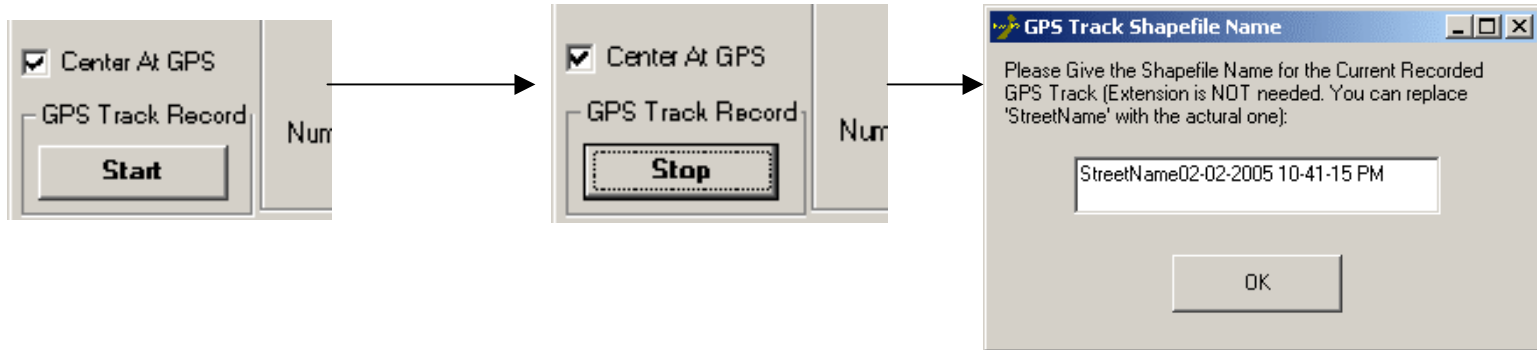
RPM Condition: GOOD

EL Condition: GOOD

CL Type: Condition:

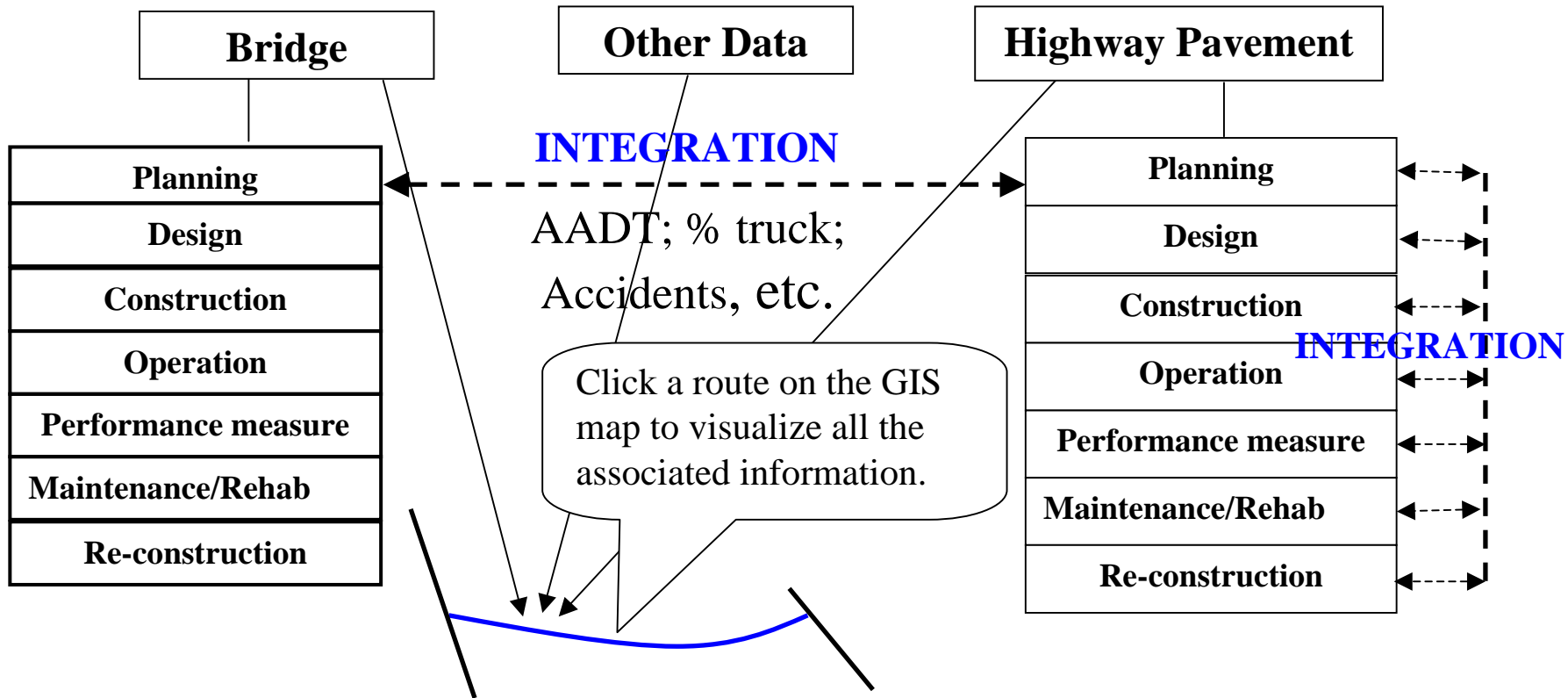
GPS/GIS-based Data Collection - 3

- Can also collect the GPS/GIS data for new streets.
- Can integrate with aerial photo.



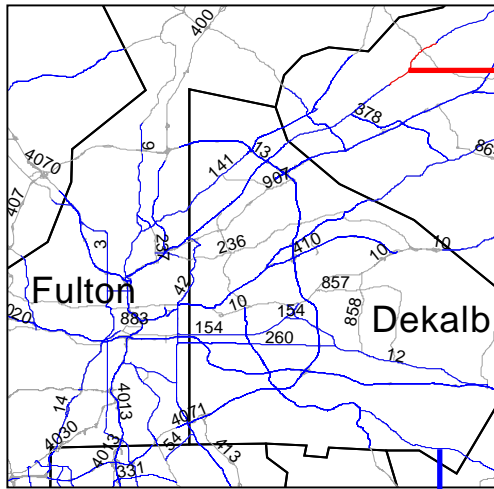
Data Management Using GIS – GDOT Case

GIS for Data Integration and Analysis

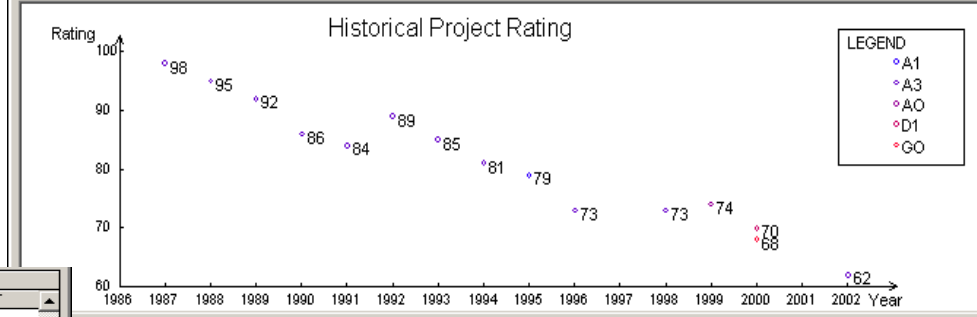


Common Location Reference System (LRS)

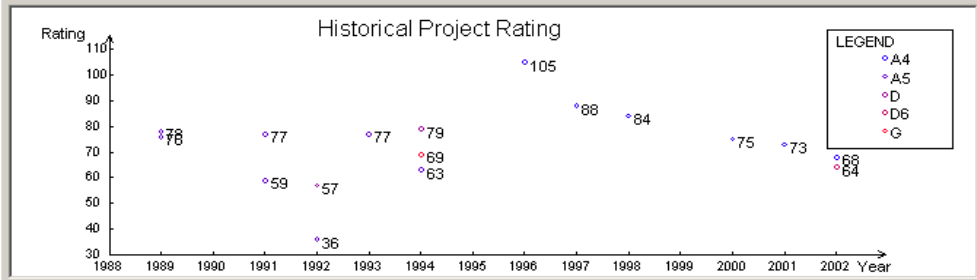
Historical Pavement Performance Analysis



Historical survey data of selected project													
Status	Tripdate	RouteN	RouteS	RouteT	Project	Rater	Distri	Office	Count	MilePo	MilePos	AADT	
NORMAL	5/13/1992 6:47:06 AM	0051	00	1	89	JAMES MOORE	1	A3	147	10.7	14.7		
NORMAL	6/2/1993 8:14:44 AM	0051	00	1	85	JAMES MOORE	1	A3	147	10.6	14.7		
NORMAL	4/11/1994 12:59:09 PM	0051	00	1	81	JAMES MOORE	1	A3	147	10.7	14.4		
NORMAL	4/20/1995 1:58:57 PM	0051	00	1	79	JAMES S. MOORE	1	A1	147	10.7	14.4		
NORMAL	3/26/1996 5:03:31 PM	0051	00	1	73	FRED T. APPLING	1	A3	147	10.7	14.4		
NORMAL	4/3/1998 1:43:39 PM	0051	00	1	73	JEFF JACQUES	1	A3	147	10.7	14.4		
Normal	2/25/1999 7:45:15 AM	0051	00	1	74	JEFF JACQUES	1	A0	147	10.7	14.4	11800	
NORMAL	1/20/2000 2:35:18 PM	0051	00	1	68	JEFF JACQUES	1	A3	147	10.7	14.4	11800	
NORMAL	1/21/2000 4:49:56 PM	0051	00	1	70	GREGORY	1	D1	147	10.7	14.4	11800	
NORMAL	2/17/2000 9:07:55 AM	0051	00	1	68	SWINFORD	1	GO	147	10.7	14.4	11800	
NORMAL	10/17/2001 8:29:50 AM	0051	00	1	62	TMCDUFFIE	1	A3	147	10.7	14.4	11800	

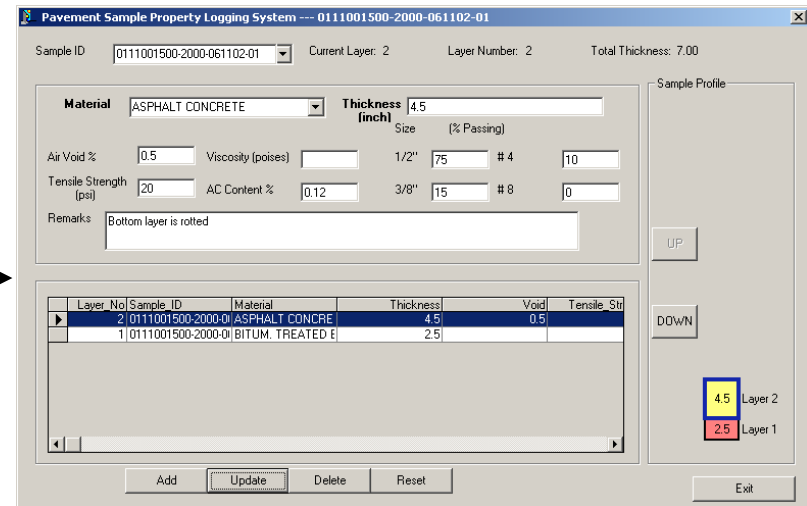
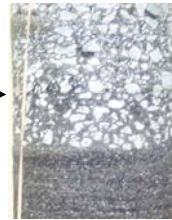
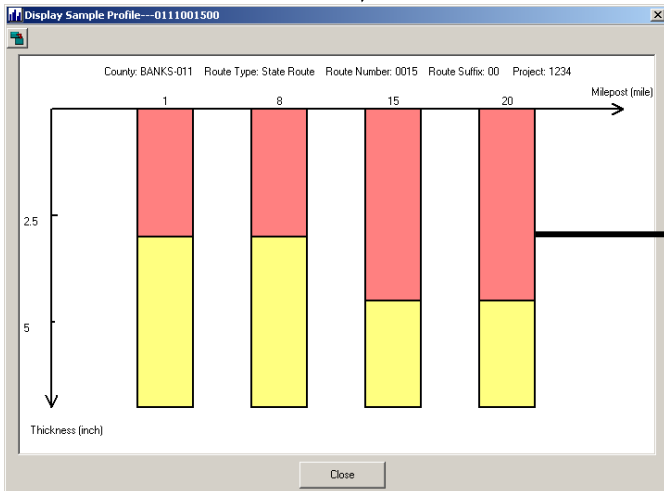
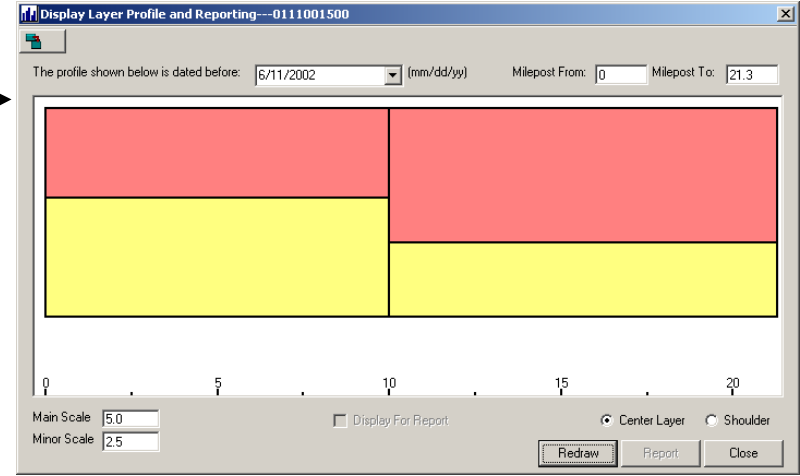
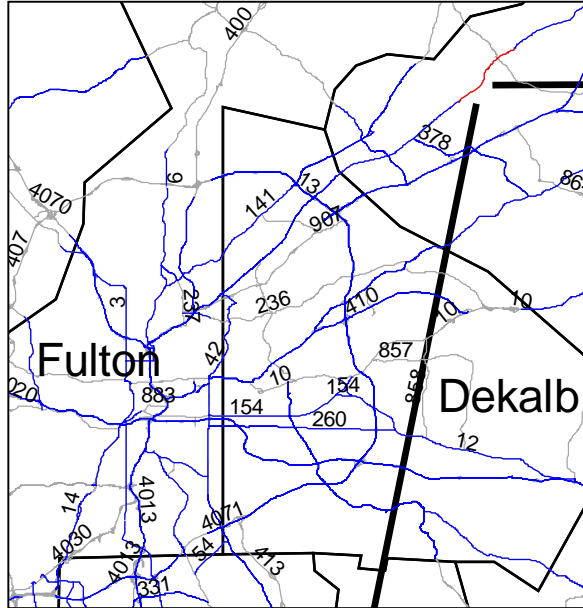


Historical survey data of selected project													
Status	Tripdate	RouteN	RouteS	RouteT	Project	Rater	Distri	Office	Count	MilePo	MilePost	AADT	
NORMAL	4/21/1993 7:00:53	00	1	77	TERRY WRIGHT	6	A5	115	21.9	23.7			
NORMAL	2/7/1994 12:00:53	0053	00	1	63	TERRY D. WRIGHT	6	A5	115	21.8	23.4		
NORMAL	3/10/1994 12:00:53	0053	00	1	79	CLIFF HARDEN	6	D	115	21.8	23.4		
NORMAL	5/24/1994 12:00:53	0053	00	1	69	TERRY JONES	6	G	115	21.8	23.4		
UNDER CON	8/2/1995 2:50:53	0053	00	1	105	TERRY WRIGHT	6	A4	115	21.8	23.4		
NORMAL	6/13/1997 3:00:53	0053	00	1	88	TERRY D. WRIGHT	6	A4	115	21.8	23.4		
NORMAL	6/5/1998 1:30:53	0053	00	1	84	GARRY PRATHER	6	A4	115	21.8	23.4		
NORMAL	2/9/2000 8:50:53	0053	00	1	75	GARRY PRATHER	6	A4	115	21.8	23.4	20000	
NORMAL	10/13/2000 1:00:53	0053	00	1	73	GARRY PRATHER	6	A4	115	21.8	23.4	20000	
NORMAL	10/24/2001 9:00:53	0053	00	1	68	GARRY PRATHER	6	A4	115	21.8	23.4	20000	
NORMAL	4/30/2002 9:00:53	0053	00	1	64	T. RUTLEDGE	6	D6	115	21.8	23.4	39800	

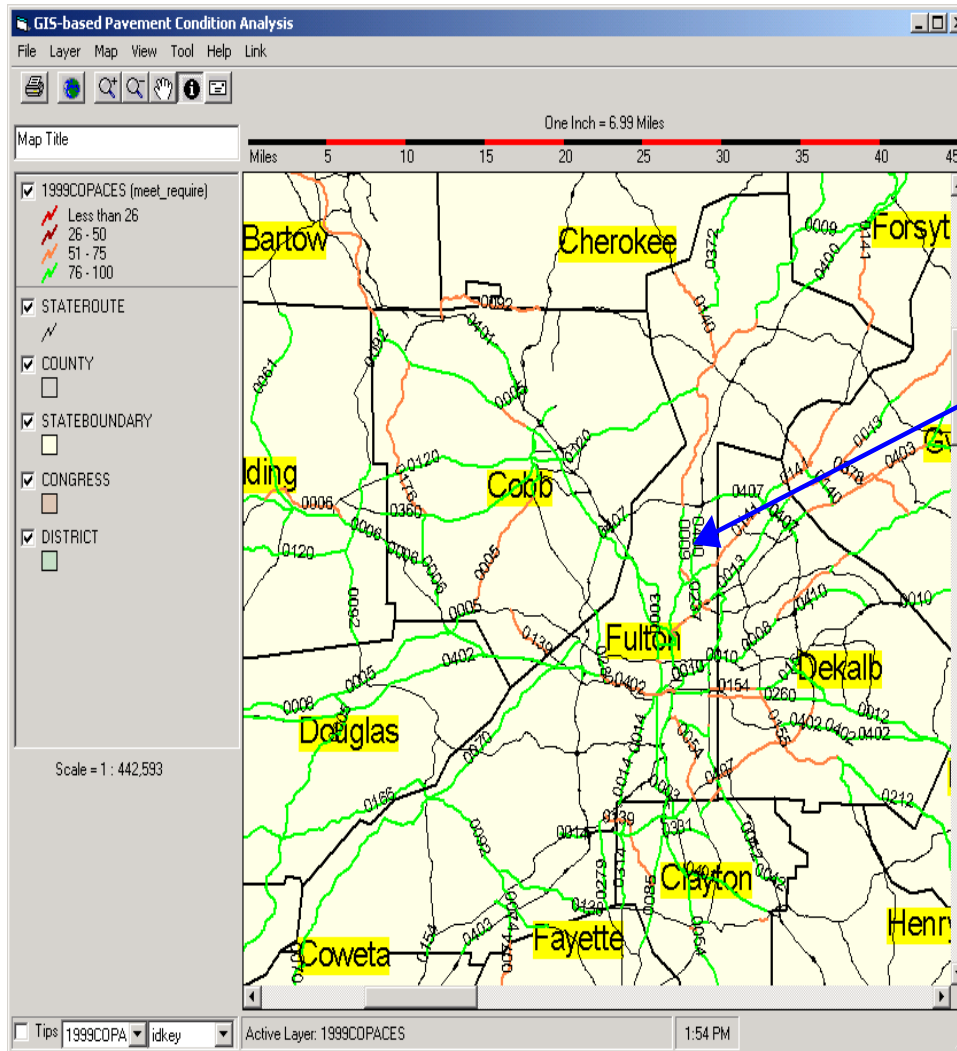


Project-level

Pavement Thickness and Material



Visualization and Identification of Project-level Pavement Information



Identifying Results

1 feature found

Location: (-084.34,034.16)

1081

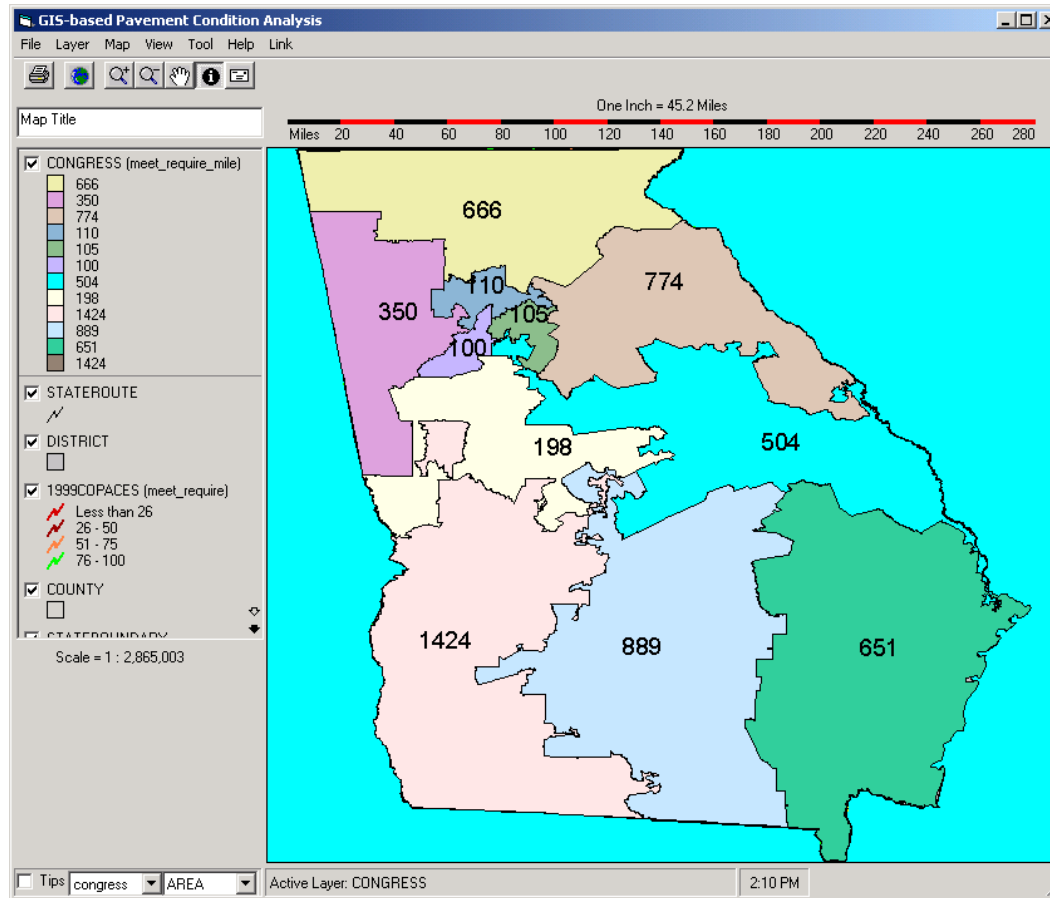
Project and Segment Info:

AADT = 13700
AllTreatment =
BridgeWidth =
CGLength =
CGMilling =
cnty_fips = 121
CombineOffice = 1
countyno = 121
Direction =
District = 7
DividedHighway =
FeatureId = 1081
FinalTreatment =
idkey = 6/27/1999 11:59:20 AM_0372
meet_require = 98
milepostfrom = 1.2
milepostto = 8.89
NoBridge =
Office = A0
PavementWidthMax = 0
PavementWidthMin = 0
ProjectLimit =
ProjectRating = 98
ProjectRemark =
Rater = BURRELL

Theme: 1999COPACES

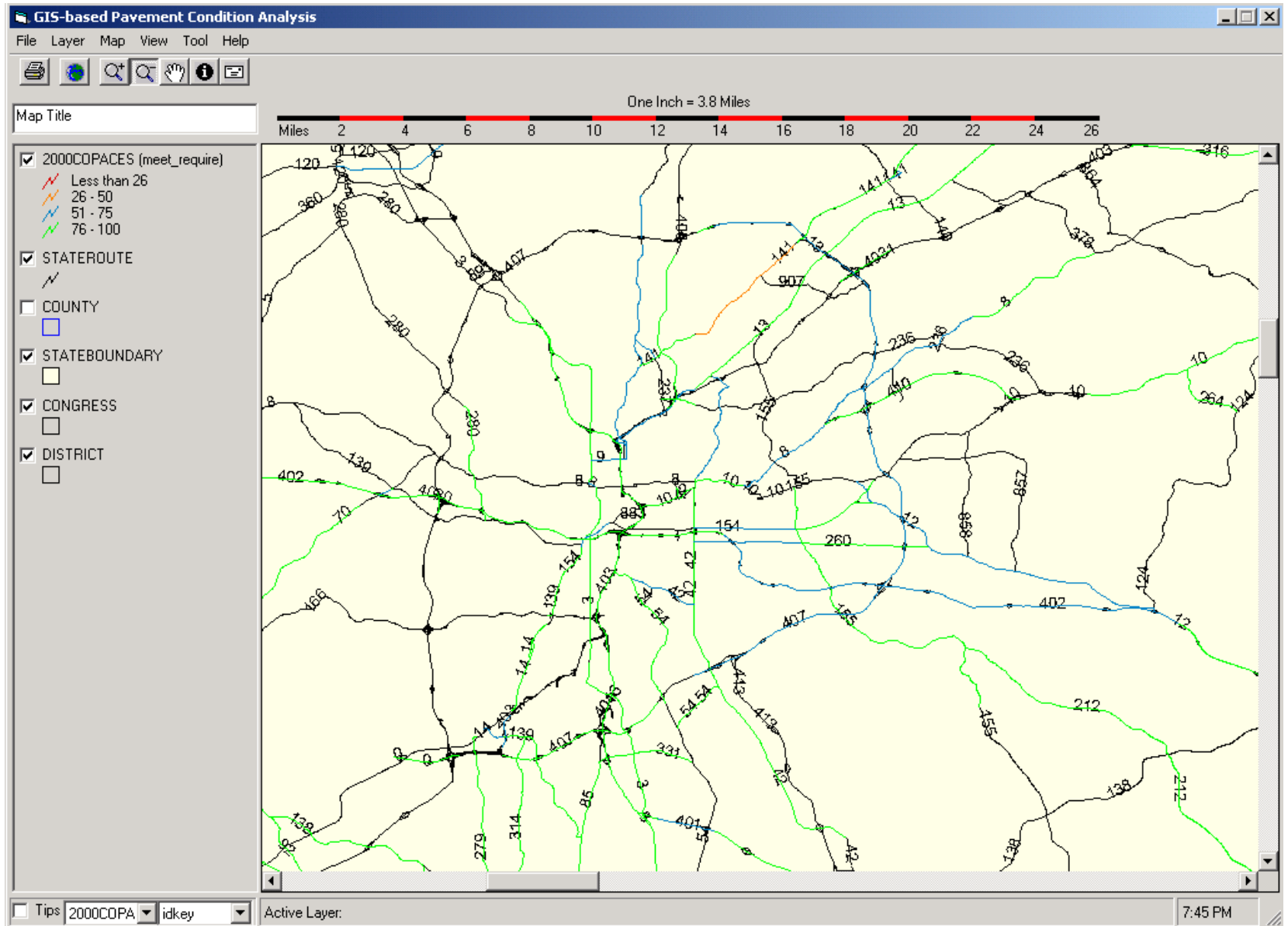
Shape Type: Line

Spatial Analysis for Visualizing and Quantifying Pavement Information for Different Jurisdictions

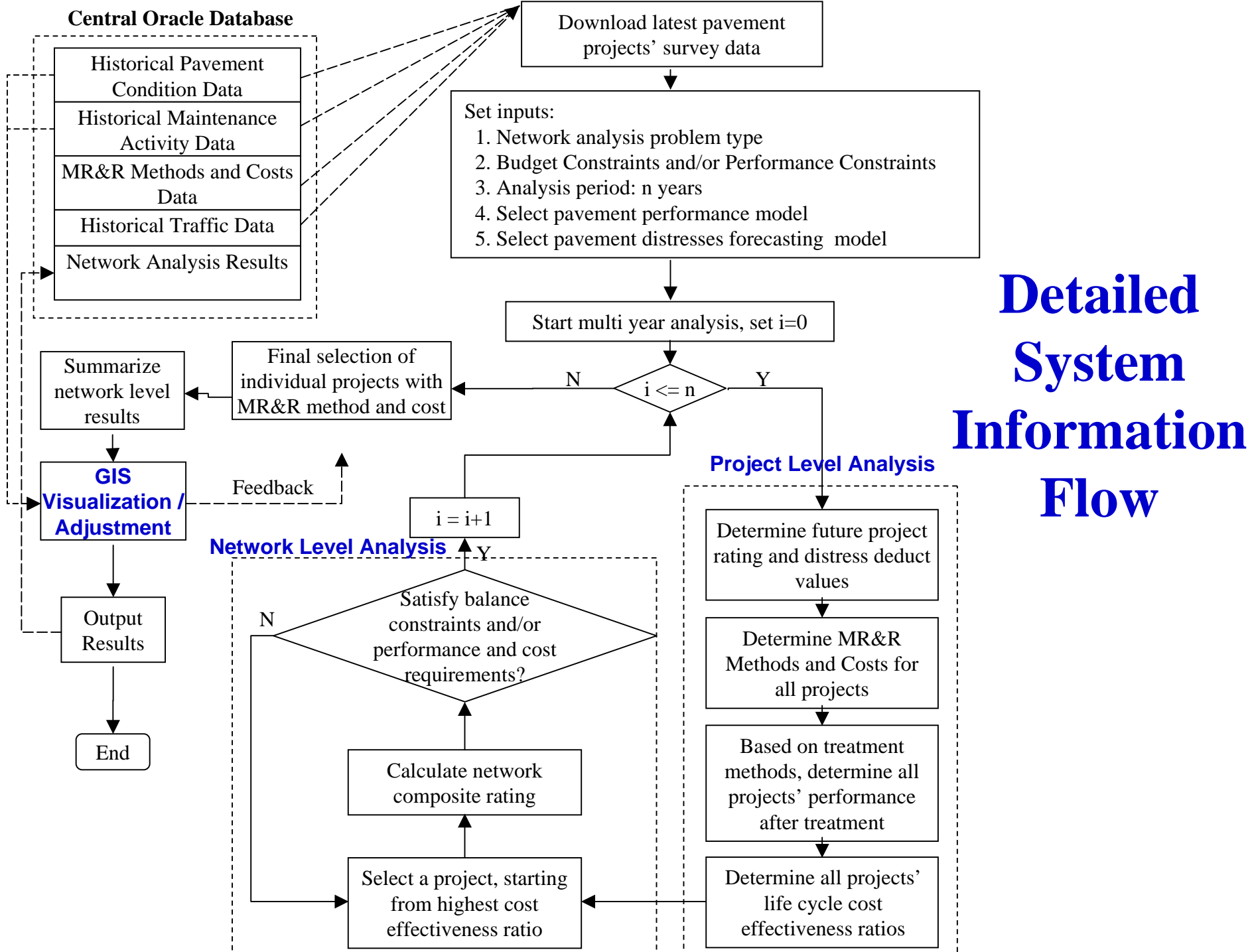


Total Miles for Projects with Rating Values Less Than and Equal to 80 in Each Congressional District

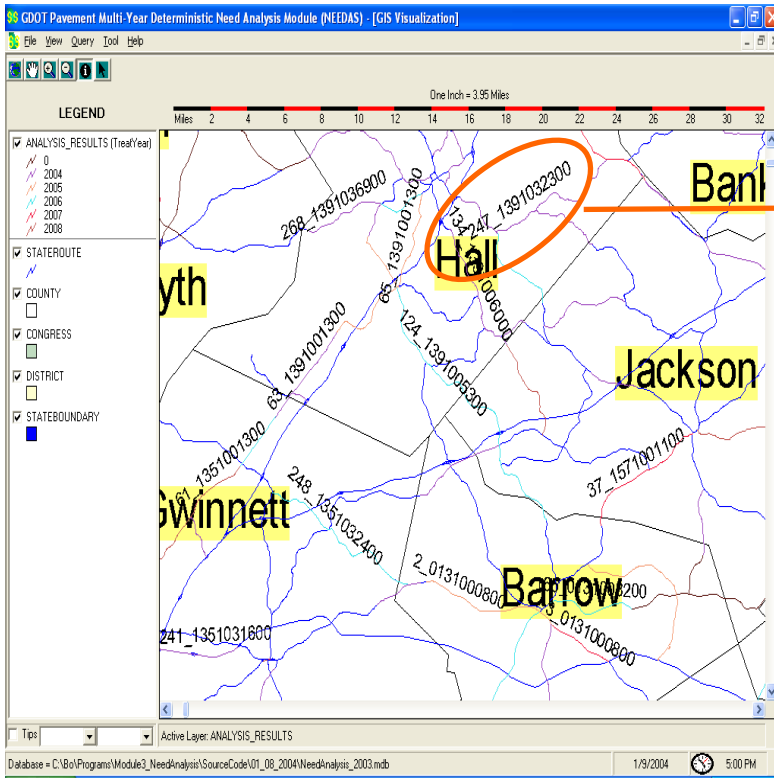
Network-level Pavement Condition



Data Modeling Using GIS – GDOT Case



Project-Level Results



Identify Results

Location:
6 features found

Feature:
247_1391032300

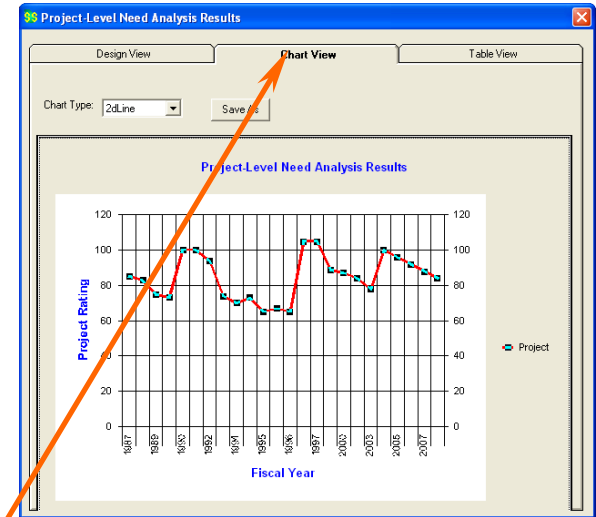
Attributes:

```

AADT_Y2006 = 7641
AADT_Y2007 = 7794
Method = Micro Seal
AADT_Y2008 = 7950
RouteSuf = 00
RouteNo = 0323
TreatYear = 2004
FeatureId = 889
Rating_Y2003 = 78
Rating_Y2004 = 100
District = 1
RouteTyp = 1
Rating_Y2005 = 96
Rating_Y2006 = 92
RCLink = 1391032300
MPFrom = 0
Office = A1
    
```

Theme: Analysis_Results
Shape Type: Line

Project Info. Adjust



Project-Level Need Analysis Results

Design View | Chart View | **Table View**

Output To Excel

TripDate	Rating	Rut_Deduct	Load_Deduct	Block_Deduct	Reflect_Deduct	Ravel_Deduct	Edge_Deduct	Bleed
1986 12:51	85	0	10	5	0	0	0	0
1987 1:59	93	0	13	0	0	0	0	0
1988 2:55	80	5	13	5	0	0	0	0
1989 3:52	73	2	13	12	0	0	0	0
1990 4:39	100	0	0	0	0	0	0	0
1991 6:02	100	0	0	0	0	0	0	0
1992 6:46	94	0	1	5	0	0	0	0
1993 7:33	74	2	14	10	0	0	0	0
994 12:32	70	2	15	11	0	0	0	0
994 12:20	73	2	12	13	0	0	0	0
1995 1:38	65	2	15	18	0	0	0	0
1995 2:17	67	2	15	16	0	0	0	0
995 6:05	65	2	15	18	0	0	0	0
996 10:24	105	0	0	0	0	0	0	0
997 10:44	105	0	0	0	0	0	0	0
1999 9:49	89	2	4	5	0	0	0	0
2000 1:15	87	2	6	5	0	0	0	0
2001 1:53	84	2	7	7	0	0	0	0
2002 10:38	78	5	7	8	0	0	0	0
2004	100	0	0	0	0	0	0	0
2005	96	1.1	0.4	1.9	0	0	0	0
2006	92	0.8	3.9	2.9	0	0	0	0
2007	88	1.7	6.6	3.6	0	0	0	0
2008	84	1.7	7.8	5.7	0	0	0	0

Impact on Network-Level – Cost

SS GDOT District-Level Need Analysis Results

Design View | Chart View | Table

Title: GDOT District-Level Need Analysis Results

X Axis: Fiscal Year

Y Axis: Yearly MR&R Cost (\$1,000)

Data Range: GDOT District 1

Refresh Output

X Axis	Y1 Axis
Current	0
2004	19020.5
2005	8595.8
2006	10458.7
2007	11652.2
2008	12378

SS GDOT District-Level Need Analysis Results

Design View | Chart View | Table

Title: GDOT District-Level Need Analysis Results

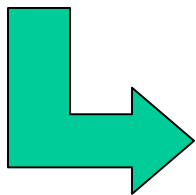
X Axis: Fiscal Year

Y Axis: Yearly MR&R Cost (\$1,000)

Data Range: GDOT District 1

Refresh Output To

X Axis	Y1 Axis
Current	0
2004	19360.1
2005	8595.8
2006	10119.1
2007	11652.2
2008	12378



Adjust Select Project's Treatment(s)

Project ID: 125

Current Treatment(s)

ProjectID	FutureYear	ForecastRatio	Treat	TreatmentMethod
125	2003	83	NO	Do Nothing
125	2004	80	NO	Do Nothing
125	2005	77	NO	Micro Seal
125	2006	100	YES	Micro Seal
125	2007	96	NO	Do Nothing
125	2008	92	NO	Do Nothing

Update Treatment(s)

Select a fiscal Year: 2006

Select a treatment: Micro Seal

Update Reset

Back

Adjust Select Project's Treatment(s)

Project ID: 125

Current Treatment(s)

ProjectID	FutureYear	ForecastRatio	Treat	TreatmentMethod
125	2003	83	NO	Do Nothing
125	2004	100	YES	Micro Seal
125	2005	96	NO	Micro Seal
125	2006	92	NO	Do Nothing
125	2007	88	NO	Do Nothing
125	2008	84	NO	Do Nothing

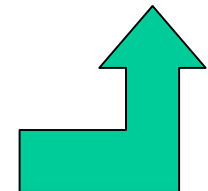
Update Treatment(s)

Select a fiscal Year: 2004

Select a treatment: Micro Seal

Update Reset

Back



Benefits of GPS/GIS

- Improve data collection productivity and data quality.
- Support integration of different data based on their common location reference. This will lead to
 - Easier data access
 - Easier data correlation
 - More accurate performance forecasting
 - More reliable economic analysis
 - Prompter pavement management response
 - More effective cross-asset management

Benefits of GPS/GIS (Cont.)

- Visualize pavement condition such as historical and predicted pavement performance.
- Determine pavement performance at different jurisdiction levels using spatial analysis
- Determine logic project termini based on pavement condition and network connectivity.
- Facilitate data management and decision making by clicking a route to access all roadway info.
- Integrate with “what-if” analysis and modeling based on different treatment scenarios and balancing constraints to facilitate decision making.

Benefits of using GPS/GIS

- Improve data collection productivity and data quality.
- Facilitate data management and decision making by clicking a route to access all roadway info.
- Integrate with “what-if” analysis and modeling based on different treatment scenarios and balancing constraints to facilitate decision making.

Questions

Contact Info

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