- CRP-514

GIS in Pavement MGT.

For Dr. BAQEER AL RAMADAN

BY/MUBARAK ALQAHTANI (969260)

Learning Objectives

- Describe the components of a pavement management system
- Describe the types of models that are used in a pavement management system
- Describe the use of pavement management techniques in a transportation agency

Approach

- Introduce Pavement Management Conceptually
- Introduce the Components of a Pavement Management System
- Discuss Each Component in More Detail
- Illustrate the Ways Pavement Management Results Can Be Used

A Conceptual Approach to Pavement Management

Pavement Management Is…

- …a management approach used by personnel to make cost-effective decisions about a road network.

AASHTO Pavement Management Guide (2001)

A Pavement Management System Is…

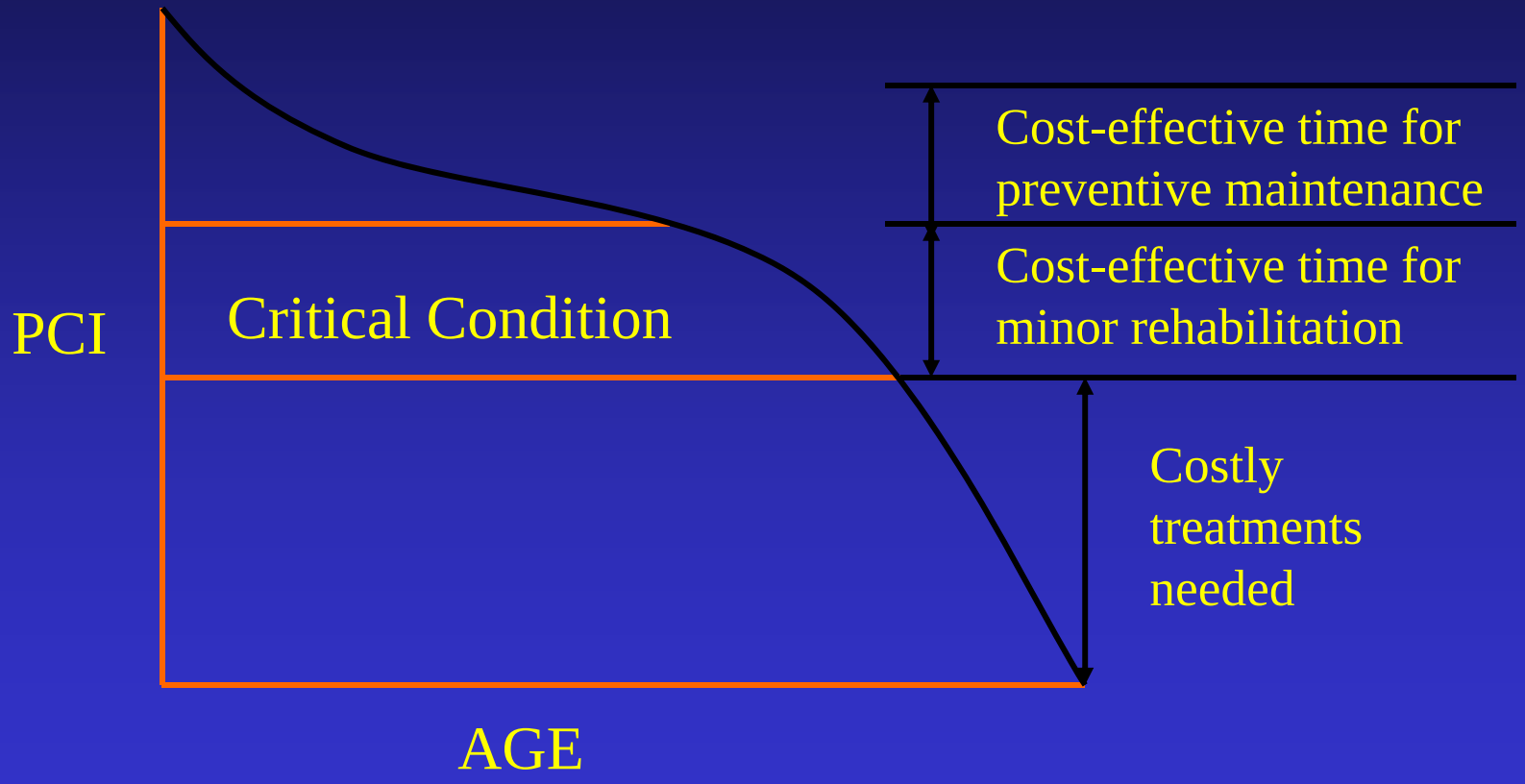
- …a set of tools or methods that assist decision-makers in finding optimum strategies for providing, evaluating, and maintaining pavements in a serviceable condition over a period of time.

AASHTO *Guide for Design of Pavement Structures (1993)*

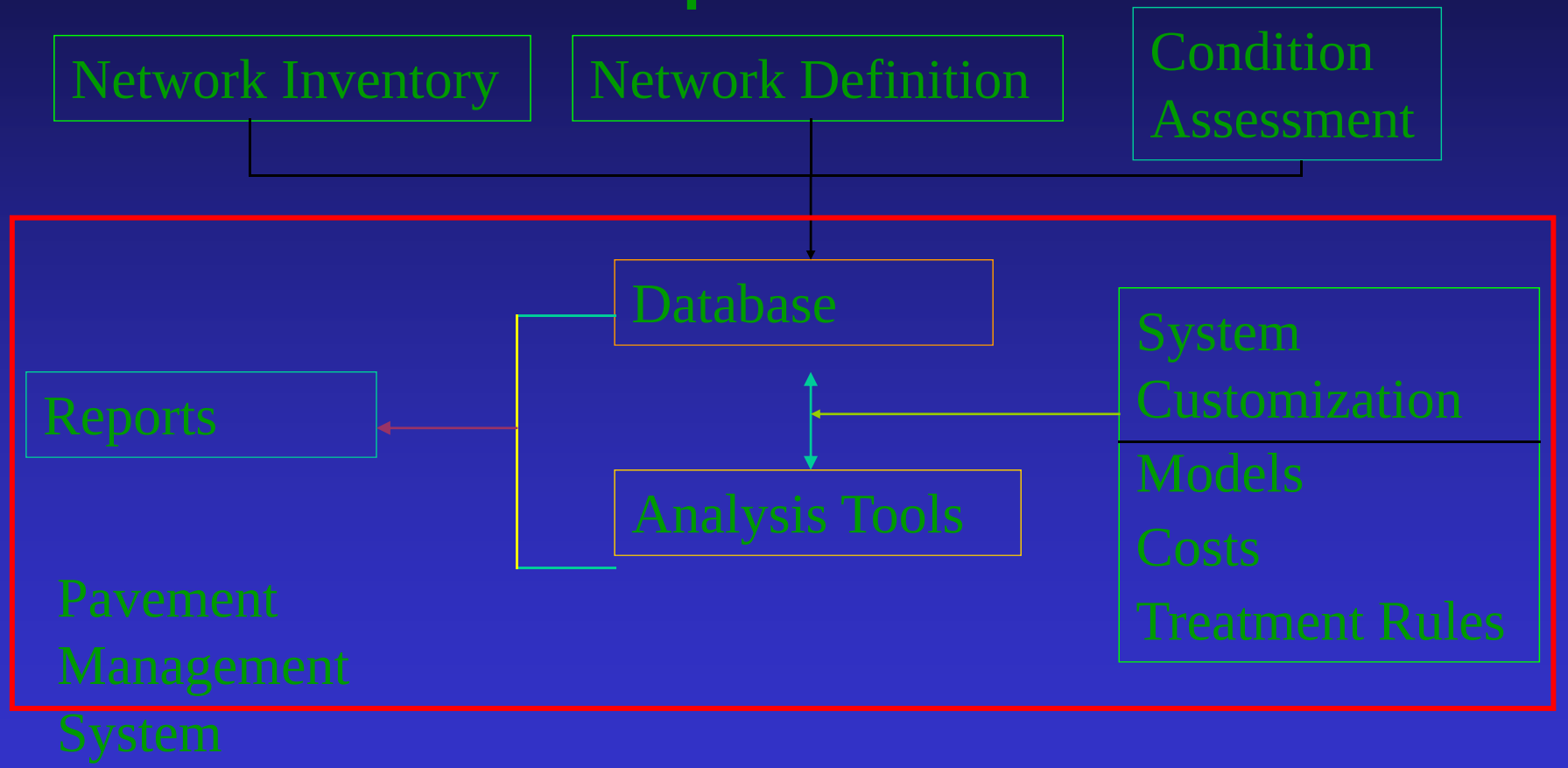
Use of Pavement Management

- Identify and prioritize maintenance and rehabilitation needs
  - Select projects and treatments on an objective, rational basis
- Assist agencies in determining cost-effective treatment strategies
  - Allocate funds so an agency can get the most “bang for the buck”
  - Demonstrate impacts of alternate strategies

Managing Pavement Deterioration



Pavement Management Components



Network Inventory

- Type of Data to be Collected
  - Physical characteristics
  - Construction and maintenance history
  - Traffic levels
  - Climate information
  - Soils information
- Minimal Amount of Information Required
  - Surface type
  - Last construction date
  - Physical dimensions

Case study

Is Pavement Management Important?

City of Carson

100 miles of street has a replacement value of approximately $42,000,000.

100 miles * 5280 ft/mile x 36ft ~ 19,000,000ft^2

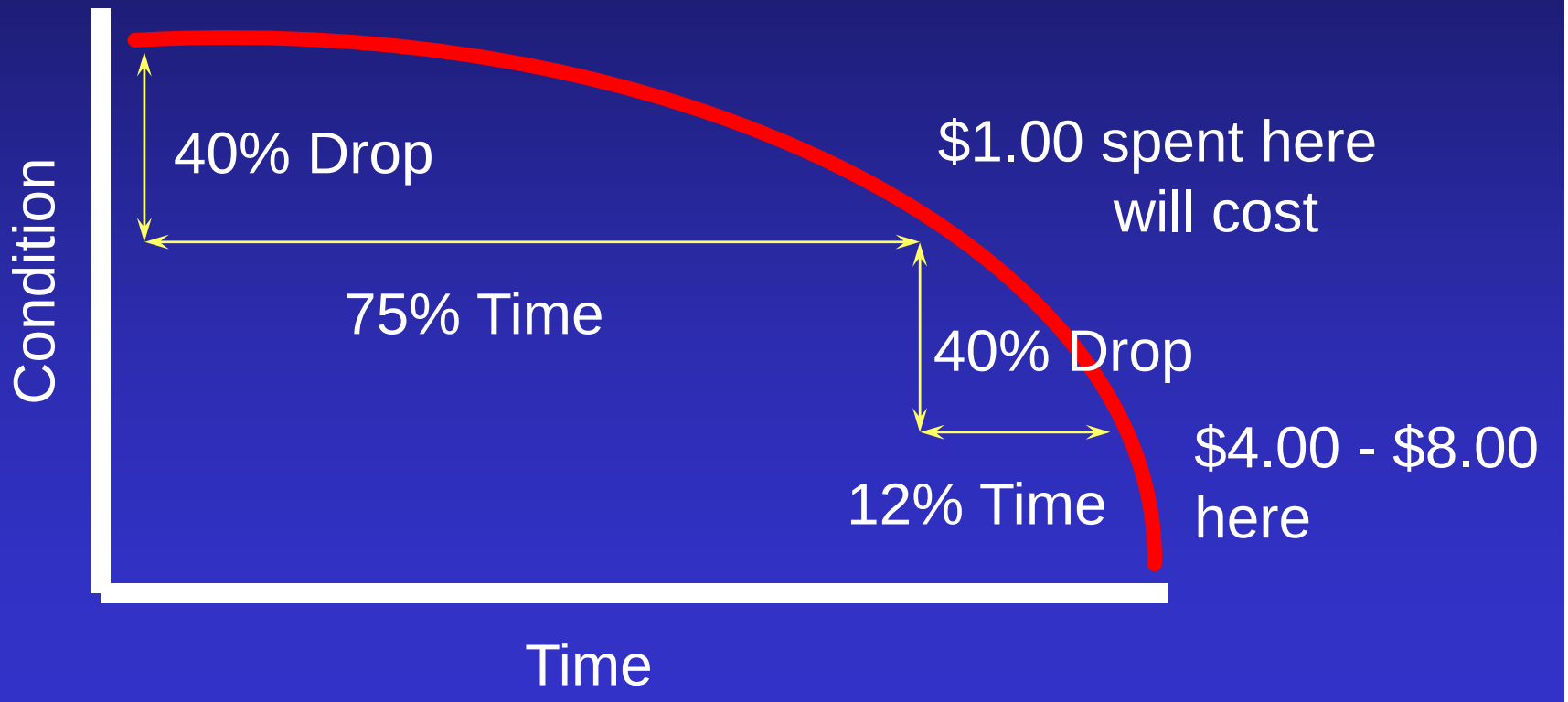
19,000,000ft^2 * 1 yd^2 / 9ft^2 ~ 2,100,000 yd^2

Average replacement value per yd^2 ~ $20.00

$20.00 / yd^2 * 2,000,000 yd^2 = $42,000,000

Good planning and preventative maintenance saves $$$.

Pavement Deterioration Curve



Source: American Public Works Association

Pavement Deterioration

Crop circles?

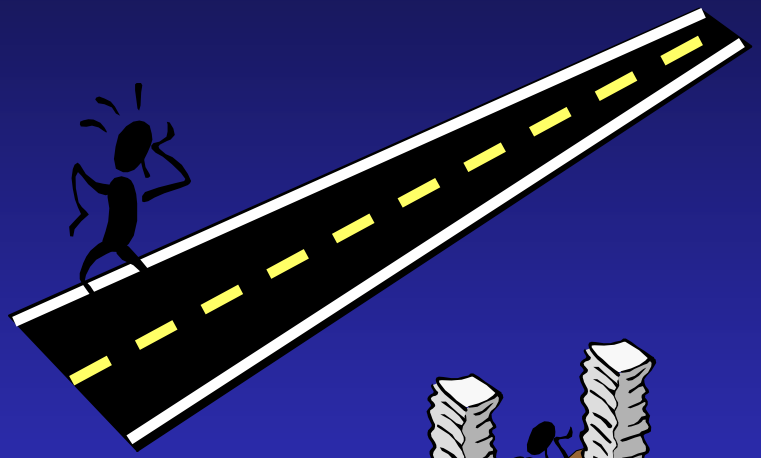
Why integrate GIS and Pavement Management?

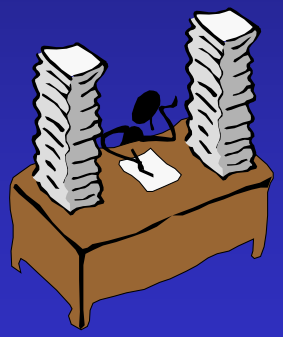
- Better visualization of current and expected conditions
- Better analysis
- Aggregate with other geographic features
- Notify residents and businesses
- Avoid shotgun approach
- Better CIP planning
- Reduce duplication of data

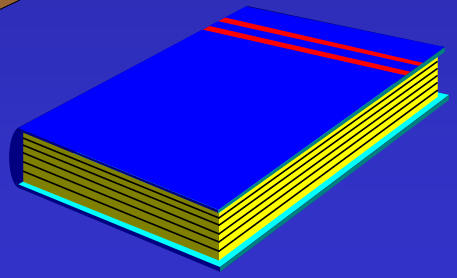
- Traffic Accidents
- Roads
- Traffic Volume
- Structural Data

Fundamental Elements of Pavement Management Systems

- Data Collection
- Data Analysis
- Reporting/Mapping

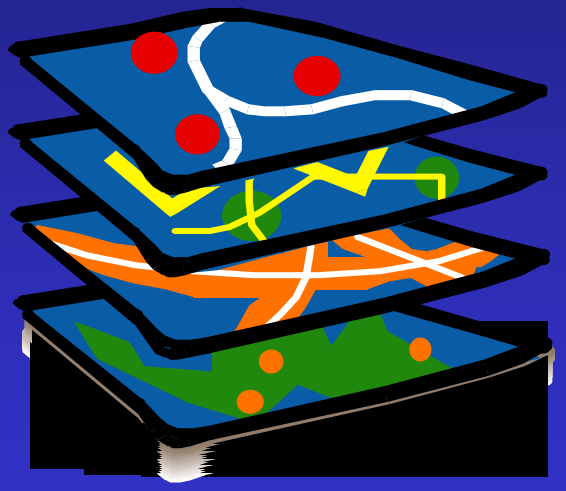






Analysis

- Relate the data to any geographic feature
- Calculate pavement area for any geography
- Overlay projects with other activities to avoid conflicts
- Cluster projects

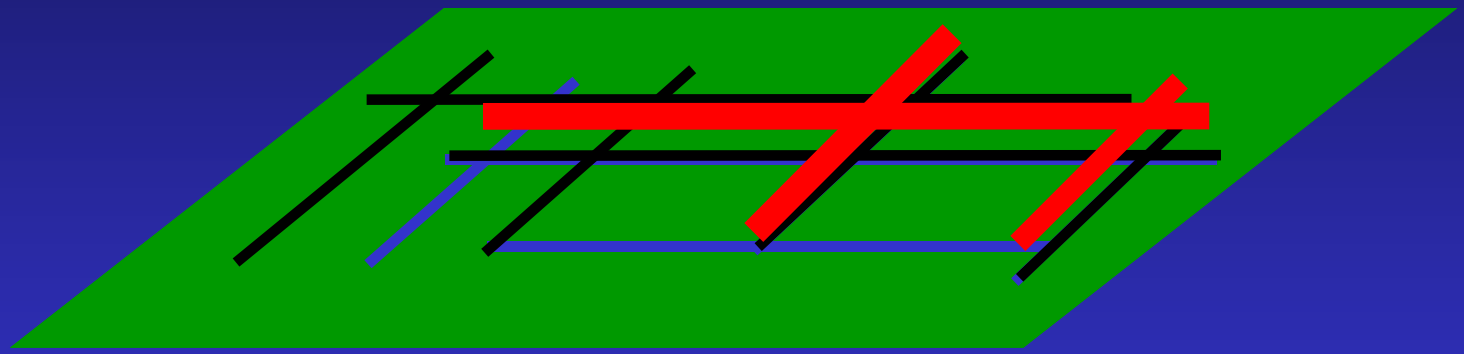


Cluster Projects

- Avoid maintaining a street in 1998 and then an adjoining street in 1999.
- Resurface and repair whole subdivisions
- Simplify and reduce the cost of notifications

Clustering

CIP



Avoid maintaining a street in 1998 and then the storm drain under it in 1999.

CIP

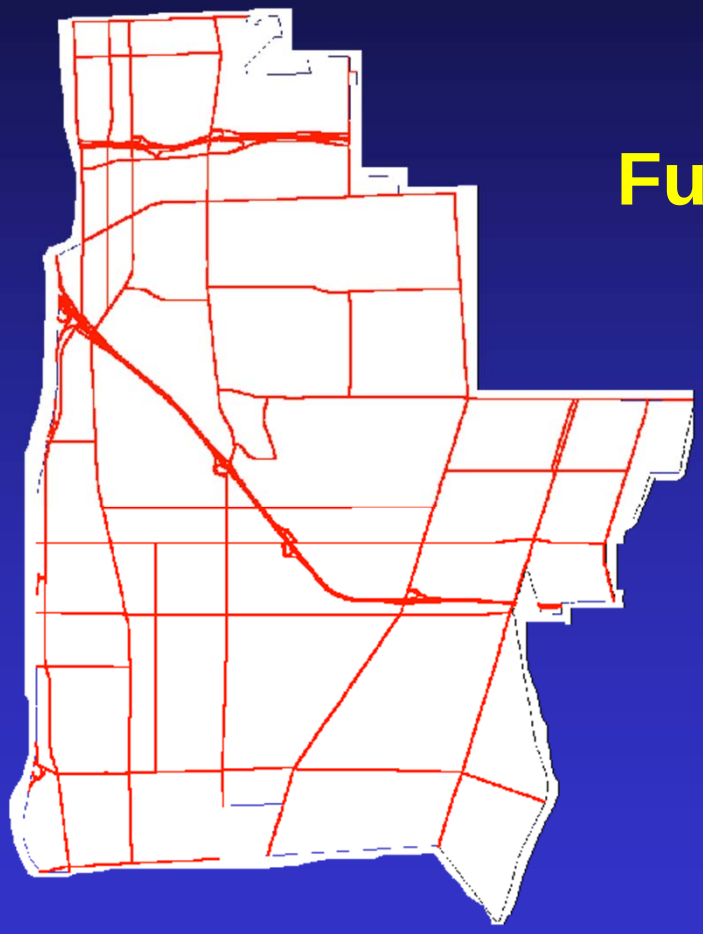
Oops!

Maps

- Functional Classification
- Yearly Improvement Plans
- Pavement Condition
- Future Condition
- Traffic Volumes

Maps

Functional Classification



Arterials

Tabular Data

Project Candidate Summary Worksheet

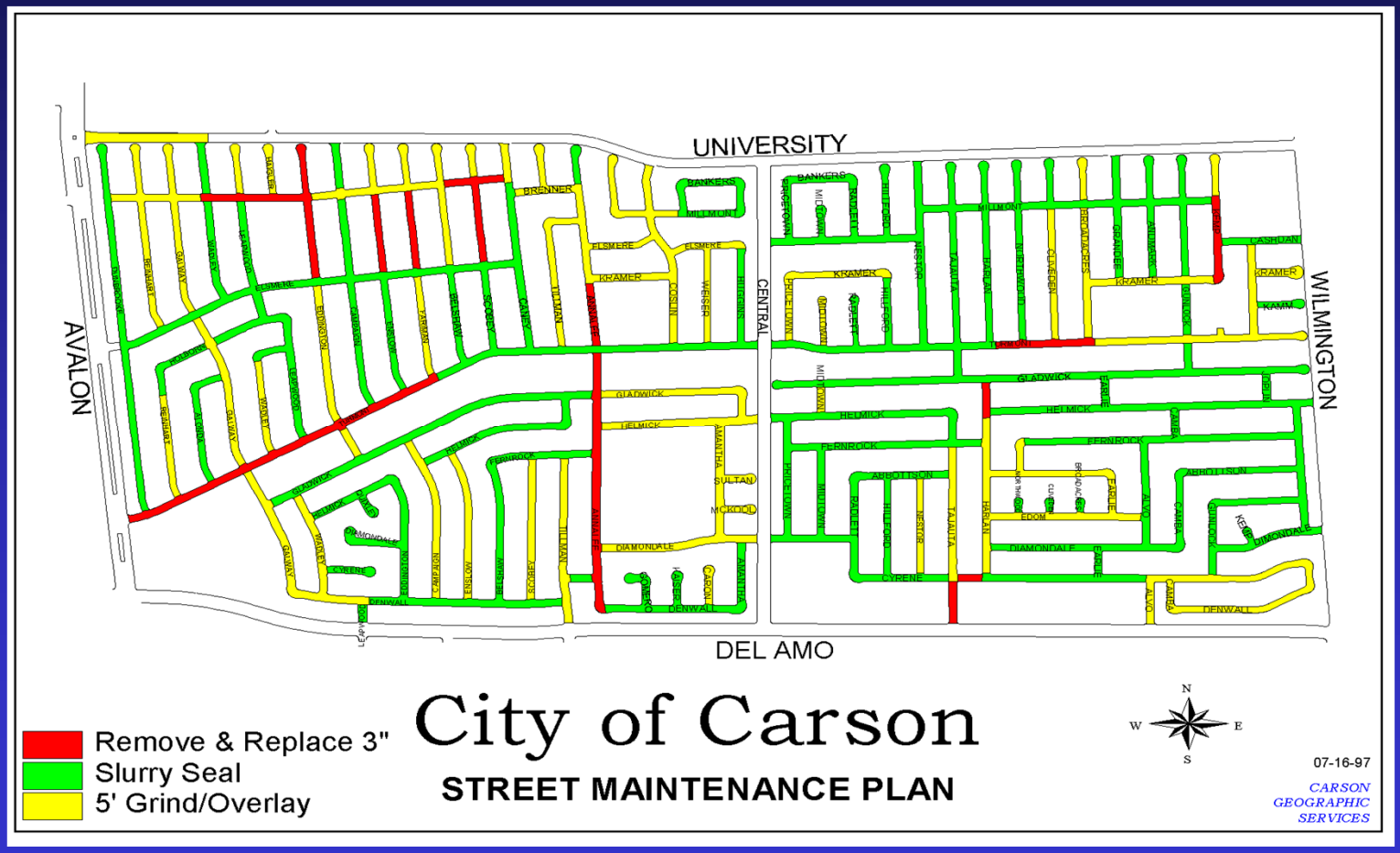
Engineering Services

Carson, CA

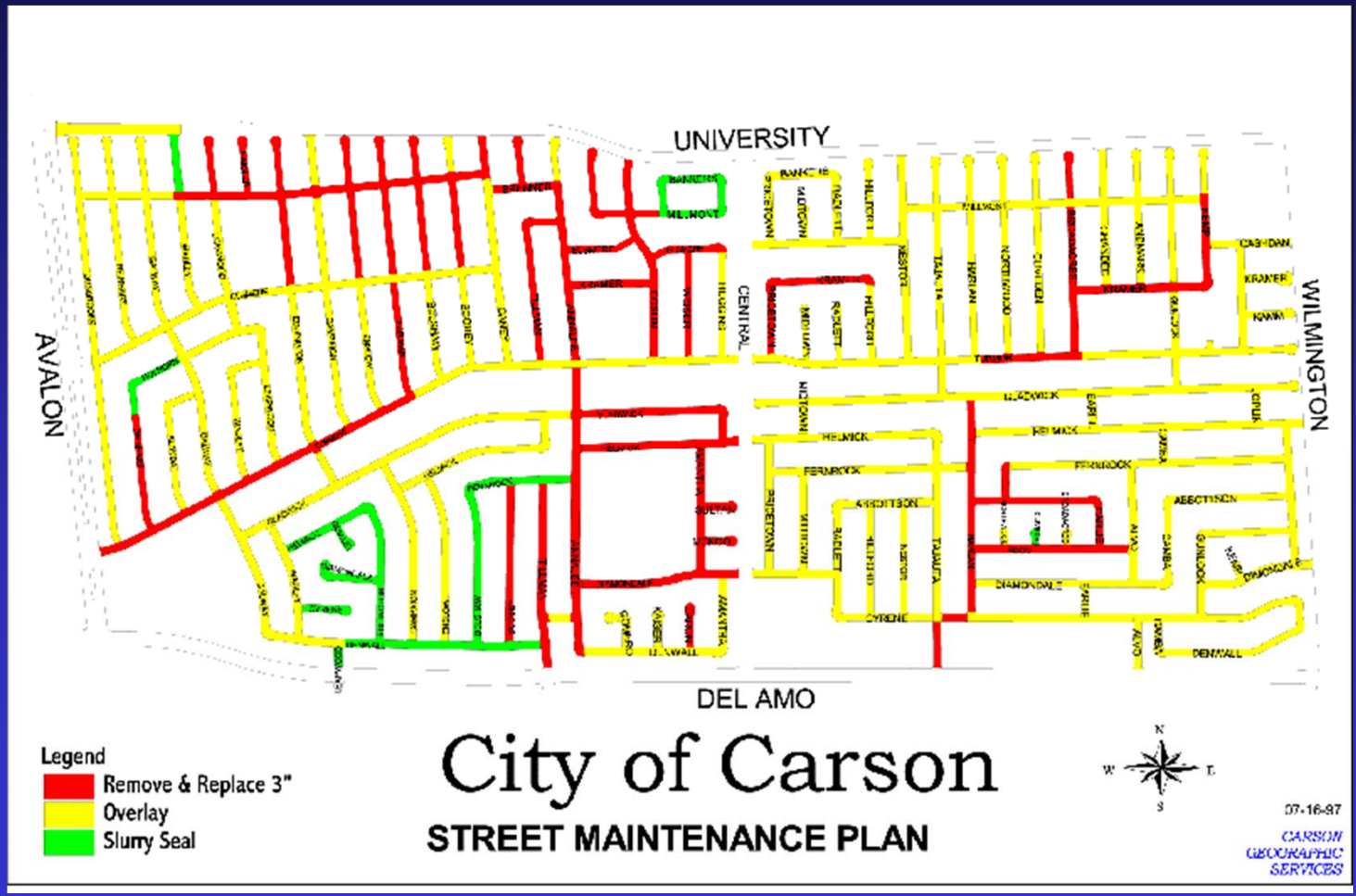
Costs Updated: 6/5/98

Priority	Road Name	From	Offset	To	Offset	Act	Class	Pave Type
199800005	ALAMEDA ST	ADAMS ST	N 0	JACKSON ST	N 0	RS	PNMNN	FLEX
199800006	ALAMEDA ST	JACKSON ST	N 0	DOMINGUEZ ST	N 0	RS	PNMNN	FLEX
199800007	ALAMEDA(E) ST	DEL AMO BL	S 225	EL PRESID ST	S 0	RE	PNMNN	FLEX
199800008	ALAMEDA(E) ST	EL PRESID ST	S 0	DOMINGUEZ ST	S 0	RE	PNMNN	FLEX
199800009	BROADWAY AV	GRIFFITH ST	N 840	GRIFFITH ST	N 1270	RE	PNMNN	FLEX
199800010	FIGUEROUA BL	ON/OFF RAMP	N 0	ON/OFF RAMP	N 670	RE	PNMNN	FLEX
199800011	ALAMEDA ST	WASHINGTO ST	S 0	CARSON ST	S 0	RS	PNMNN	FLEX
199800012	BROADWAY AV	GARDENA AV	N 0	GARDENA AV	N 1040	RE	PNMNN	FLEX
199800013	BROADWAY AV	168TH ST	S 0	SHERMAN AV	S 0	RE	PNMNN	FLEX
199800014	BROADWAY AV	SHERMAN AV	S 0	WALNUT ST	S 0	RS	PNMNN	FLEX
199800015	WILMINGTON BL	VICTORIA ST	S 2240	GLEN CURTIS	S 0	RS	PNMNN	FLEX

Maps


UNIVERSITY
DEL AMO
AVALON
CENTRAL
WILMINGTON
Remove & Replace 3"
Slurry Seal
5' Grind/Overlay
City of Carson
STREET MAINTENANCE PLAN
N
W
E
S
07-16-97
CARSON
GEOGRAPHIC
SERVICES

Maps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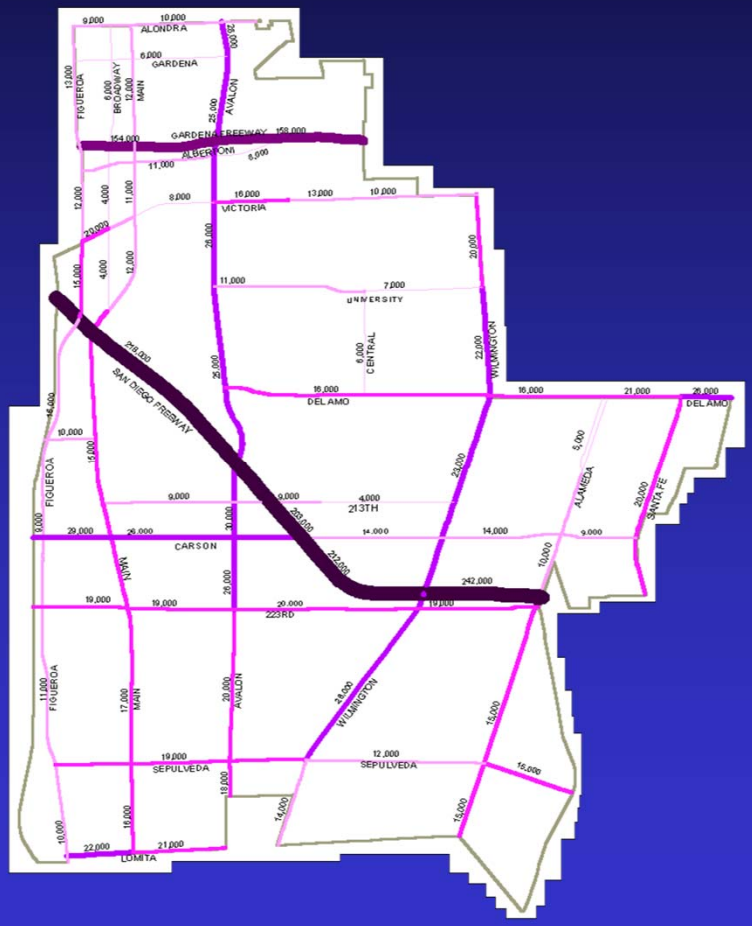
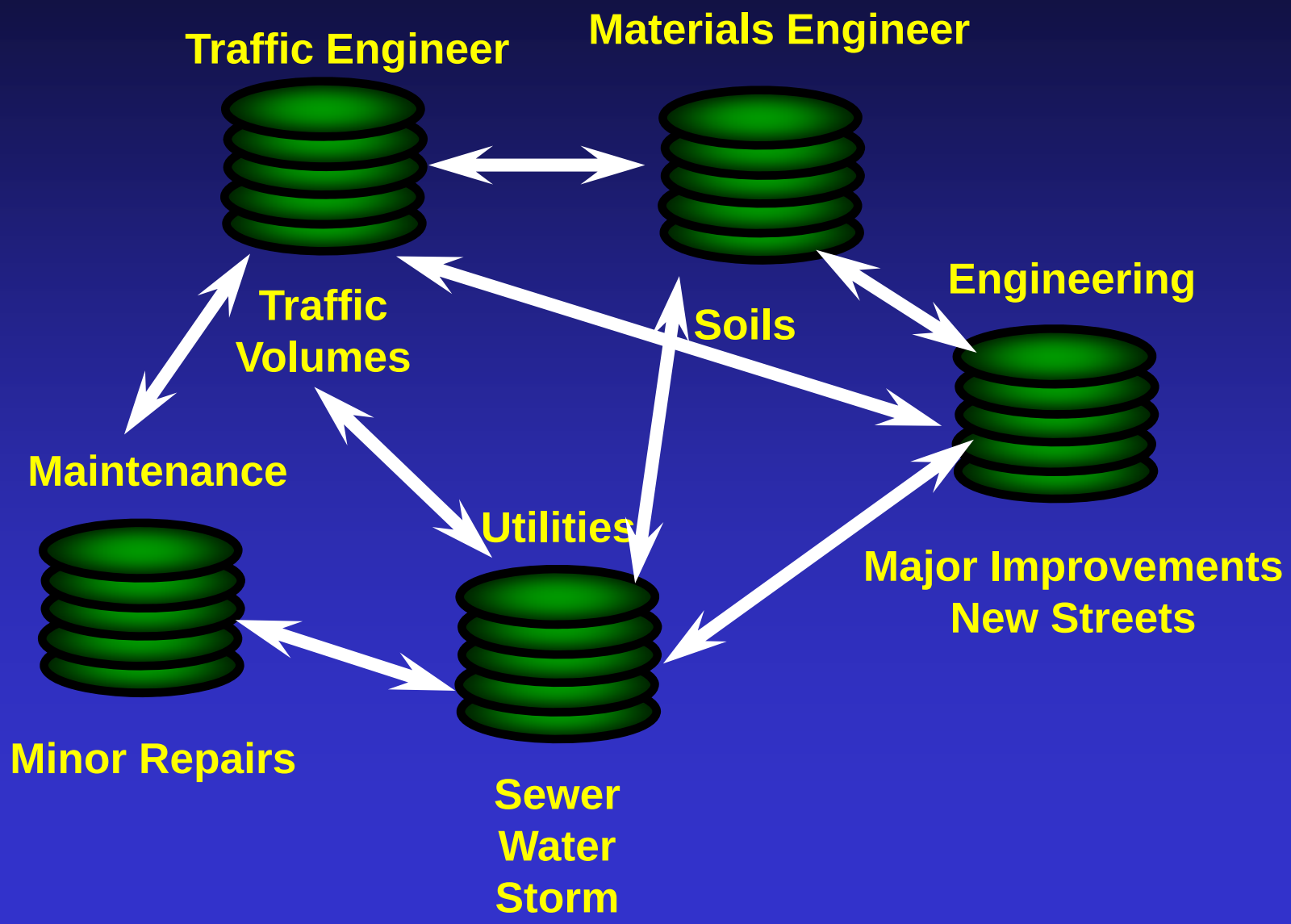


Traffic Volumes

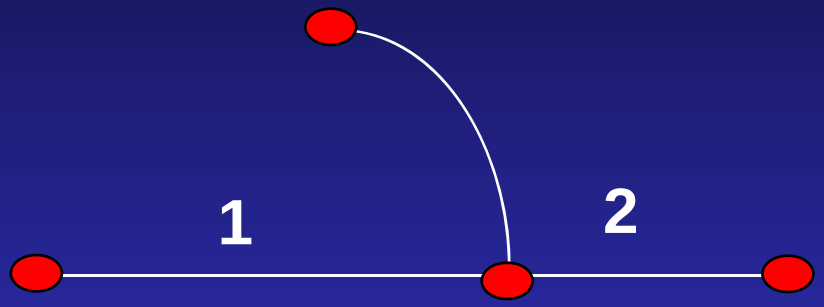
Reporting

- Priorities
- Current conditions
- Recommended corrective action
- Long range plan

Avoid Redundant Data Collection



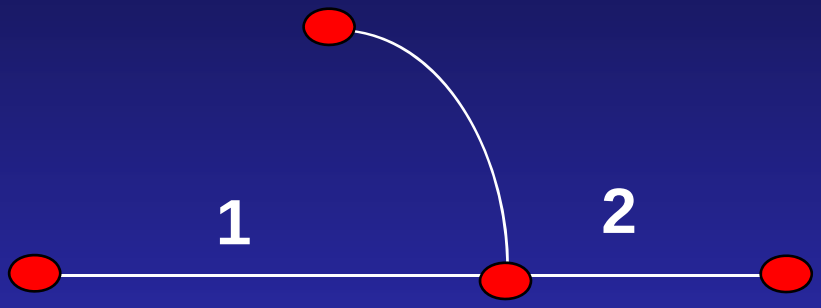
Linking GIS and Pavement Management



GIS	From	To
1	A St	B St
2	B St	C St

PM	From	To
1	A St	B St
2	B St	C St

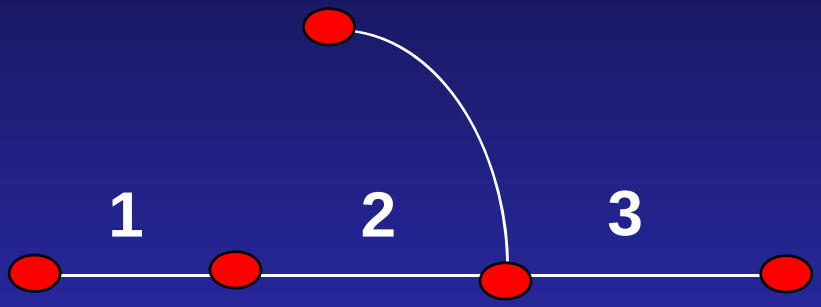
Linking GIS and Pavement Management



GIS	From	To
1	A St	B St
2	B St	C St

PM	From	To
1	A St	500ft
2	500 ft	B St
3	B St	C St

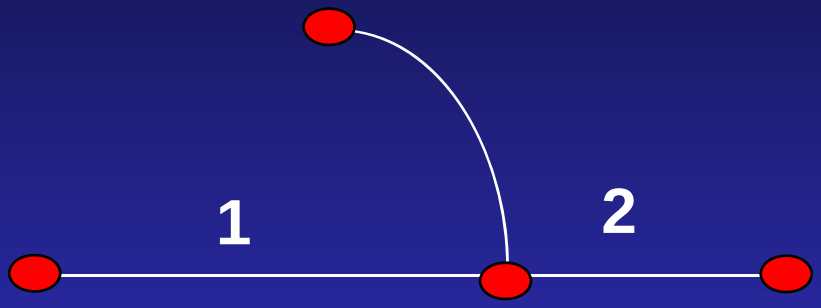
Linking GIS and Pavement Management



GIS	From	To
1	A St	500ft
2	500 ft	B St
3	B St	C St

PM	From	To
1	A St	500ft
2	500 ft	B St
3	B St	C St

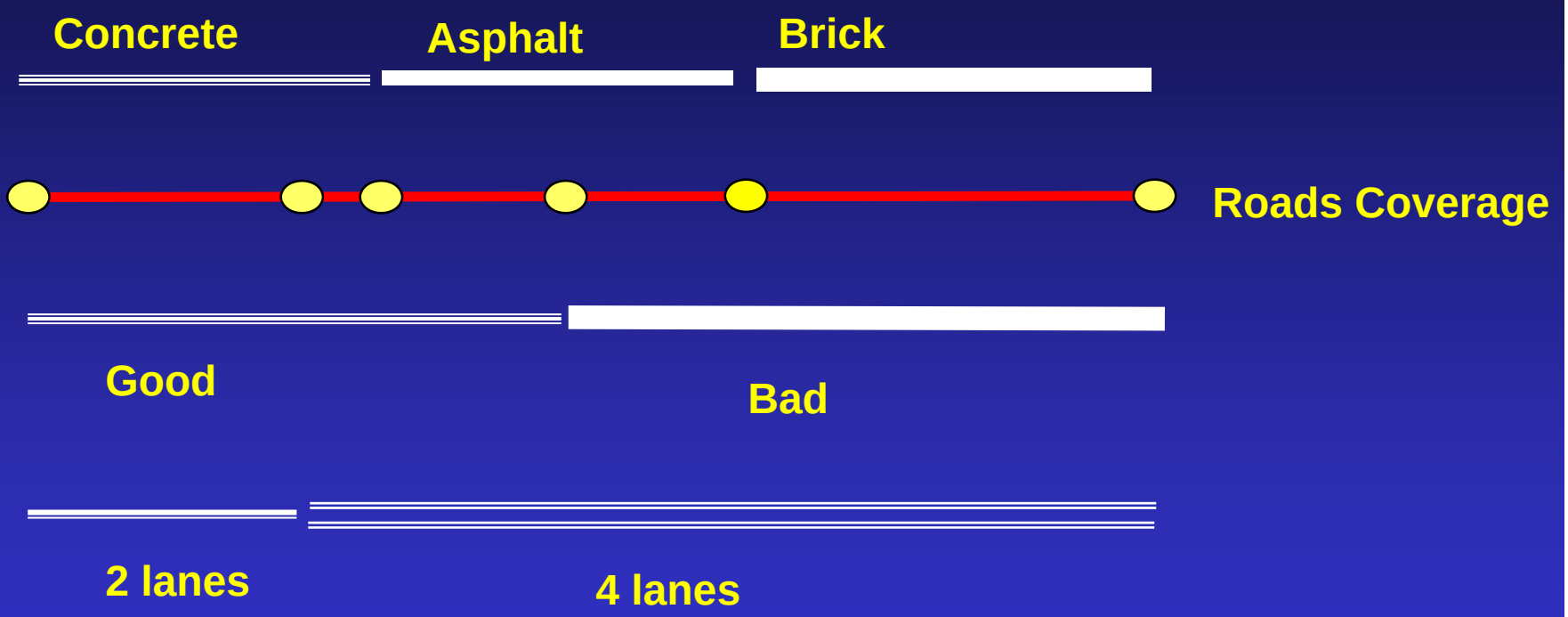
Linking GIS and Pavement Management



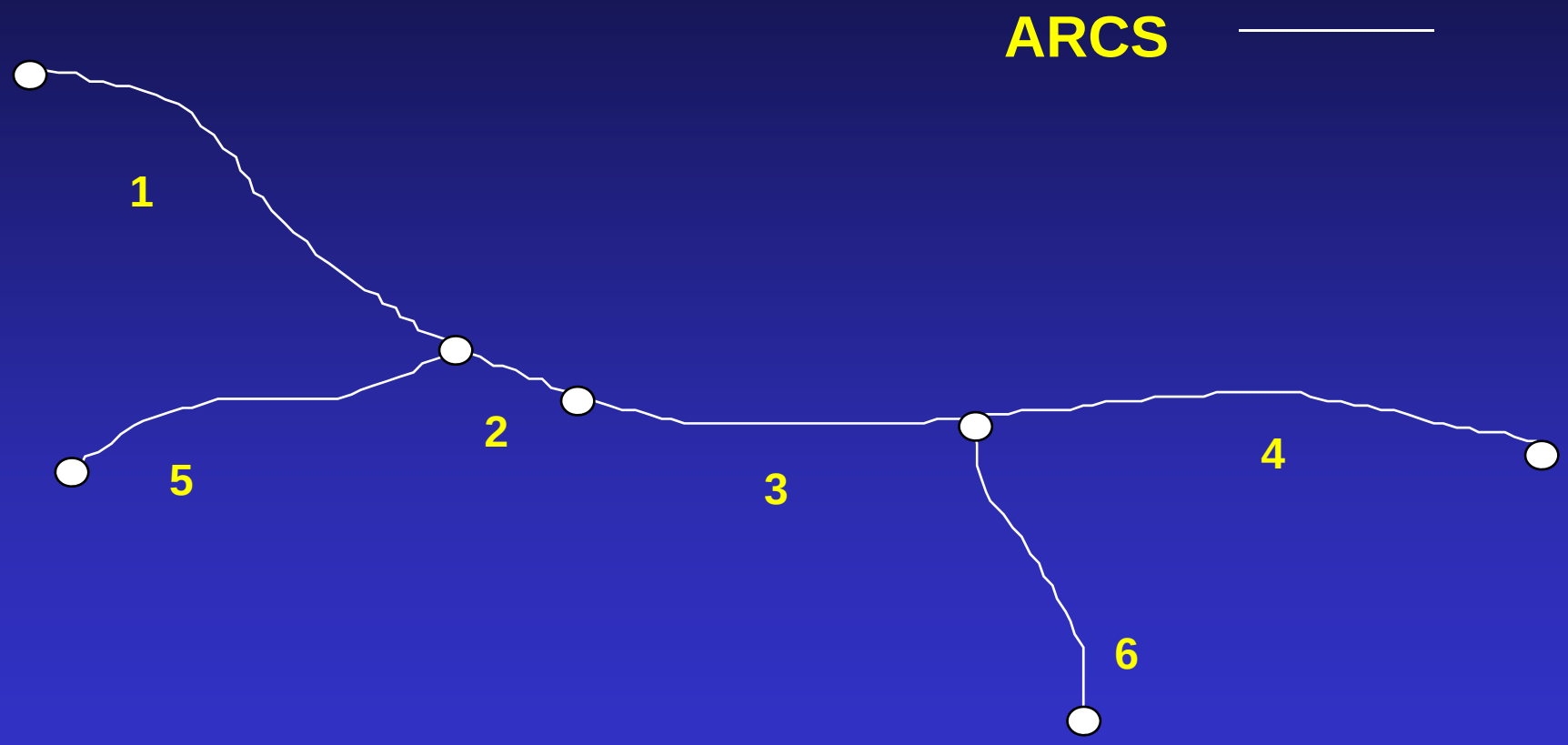
GIS	From	To
1	A St	B St
2	B St	C St

PMS	From	To
1	A St	C St

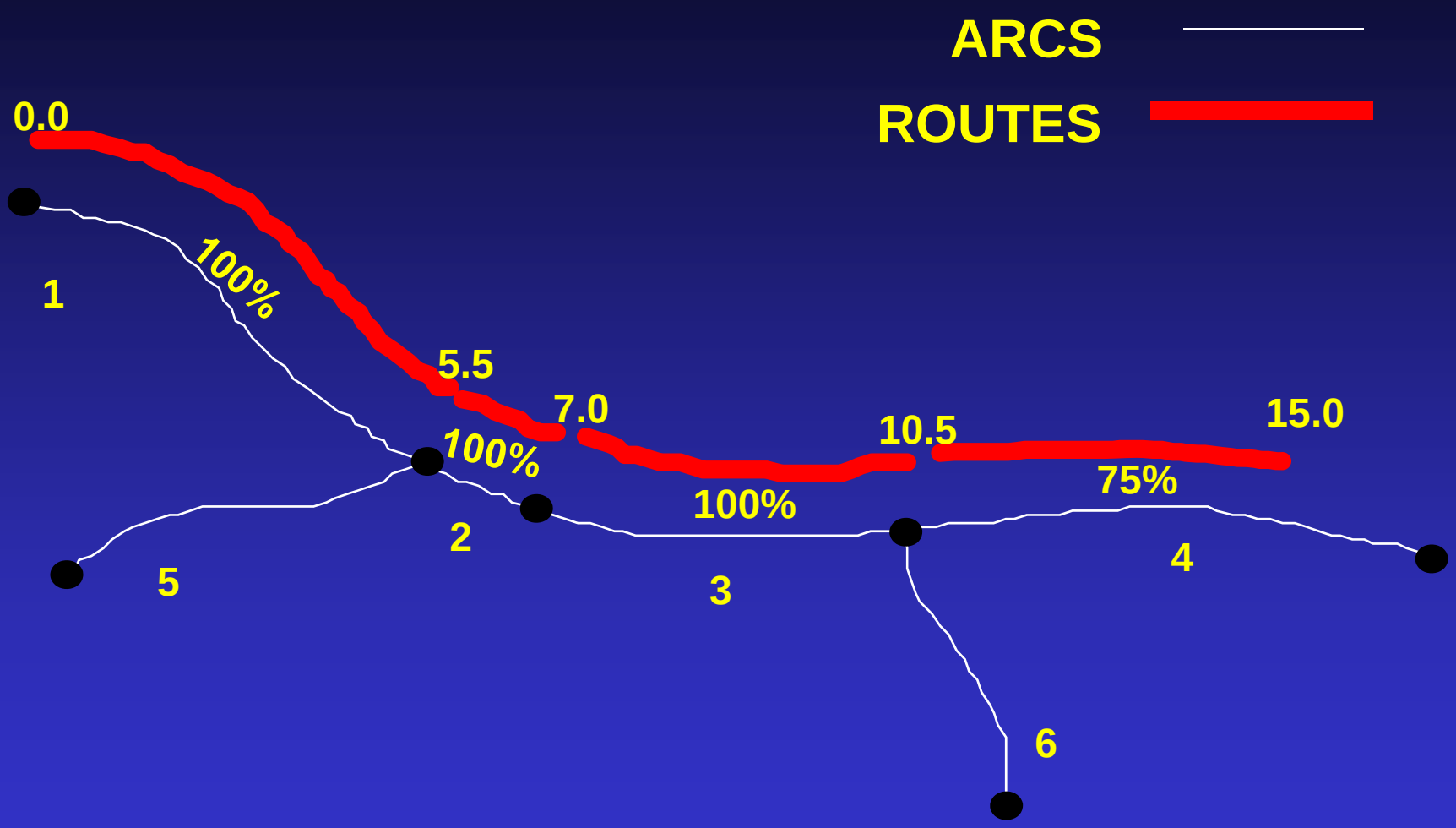
The Problem


Concrete
Asphalt
Brick
Roads Coverage
Good
Bad
2 lanes
4 lanes

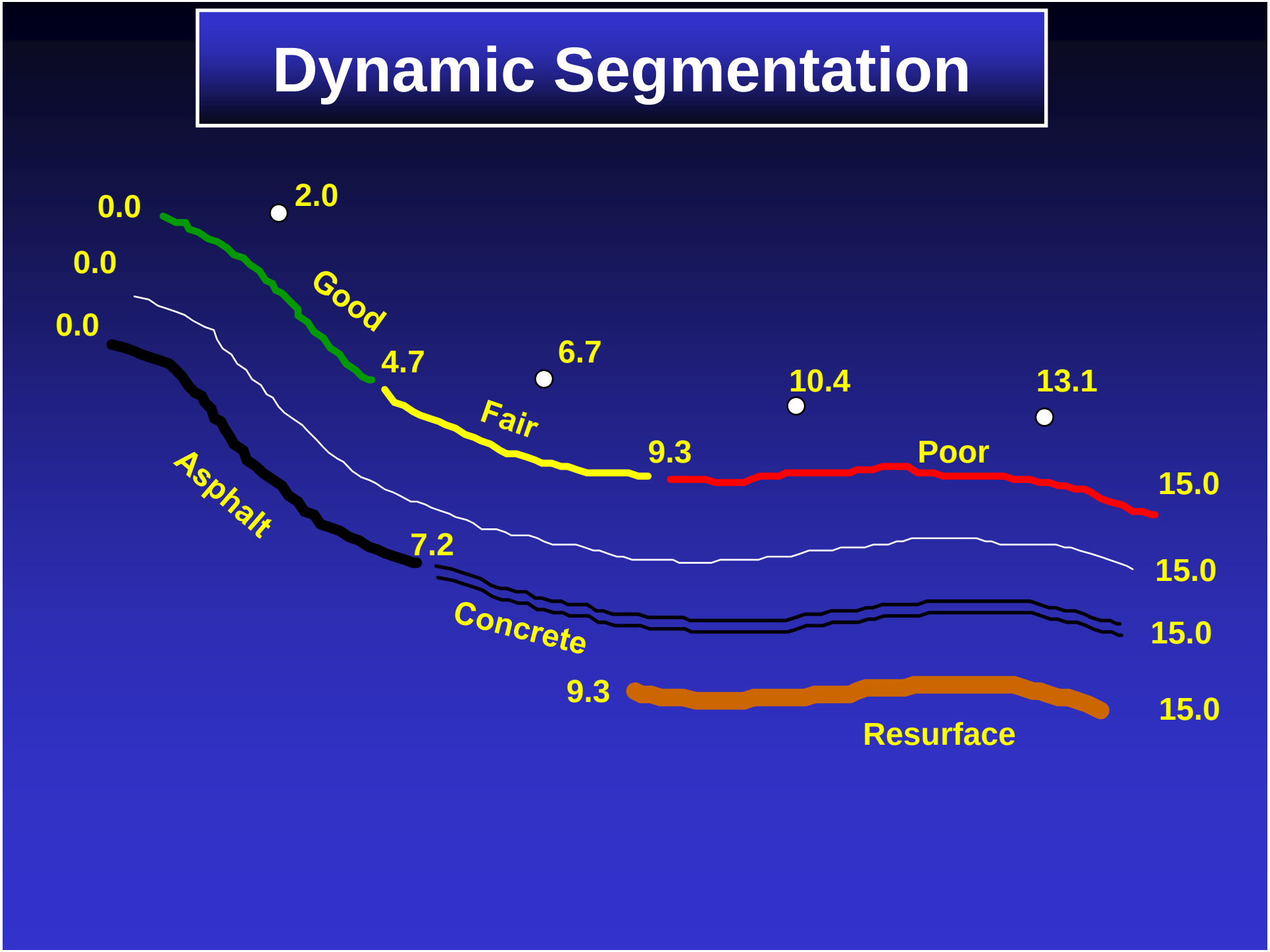
A Solution is Dynamic Segmentation



Dynamic Segmentation



Dynamic Segmentation



Geography is the Missing Link!!!

- Better visualization of current and expected conditions
- Better analysis
- Aggregate with other geographic features
- Notify residents/businesses
- Avoid shotgun approach
- Better CIP planning
- Reduce duplication of data

Sound familiar?

Do as we say, not as we do

- Make sure you or your consultant has a plan for integrating GIS and pavement management
- Use a consultant who has GIS staff in-house
- Collect other data while collecting street conditions
  - Signs
  - Signals
  - Manholes (personnel access covers)
  - Water valves
  - Catch basins
- Visit other agencies who have been through this process
- Do not allow tanks on your streets
- Eat your vegetables