

# 10 Critical Steps for

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# Effective Pavement Management

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MTC Program Manager for  
StreetSaver®

Roger E. Smith, P.E., Ph.D.  
Retired








# Part 1

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-  1. Audit PMP database
-  2. Network segmentation
-  3. Conduct periodic network rating
-  4. Perform QA/QC
-  5. Hire MTC Certified Consultants

# Part 2

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-  6. Update Unit Costs
-  7. Update Decision Trees
-  8. Update M&R records
-  9. Ensure M&R Entered is the Correct Treatment Applied
-  10. Communicate Results with Elected Officials/ Upper Management

# Part 3

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 StreetSaver® Demo

 Development Update

# Basic Network-Level PMP Components

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1. Inventory
2. Condition Assessment
3. Needs Analysis
4. Prioritization
5. Impact Of Funding Decisions
6. Feedback

# Inventory

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❧ Defines What Is Being Managed

❧ Requires that Network be Divided Into Management Units

# Basic Information for Each Section

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 Identification

 Begin - End

 Surface Type

 Date Construction (Last Surface)

 Functional Class

 Area (Length & Width)

Required: St ID, Sec ID, Name (Select fm Drop Down), Begin, End, Date Constructed, Area, # Lanes, FC, ST

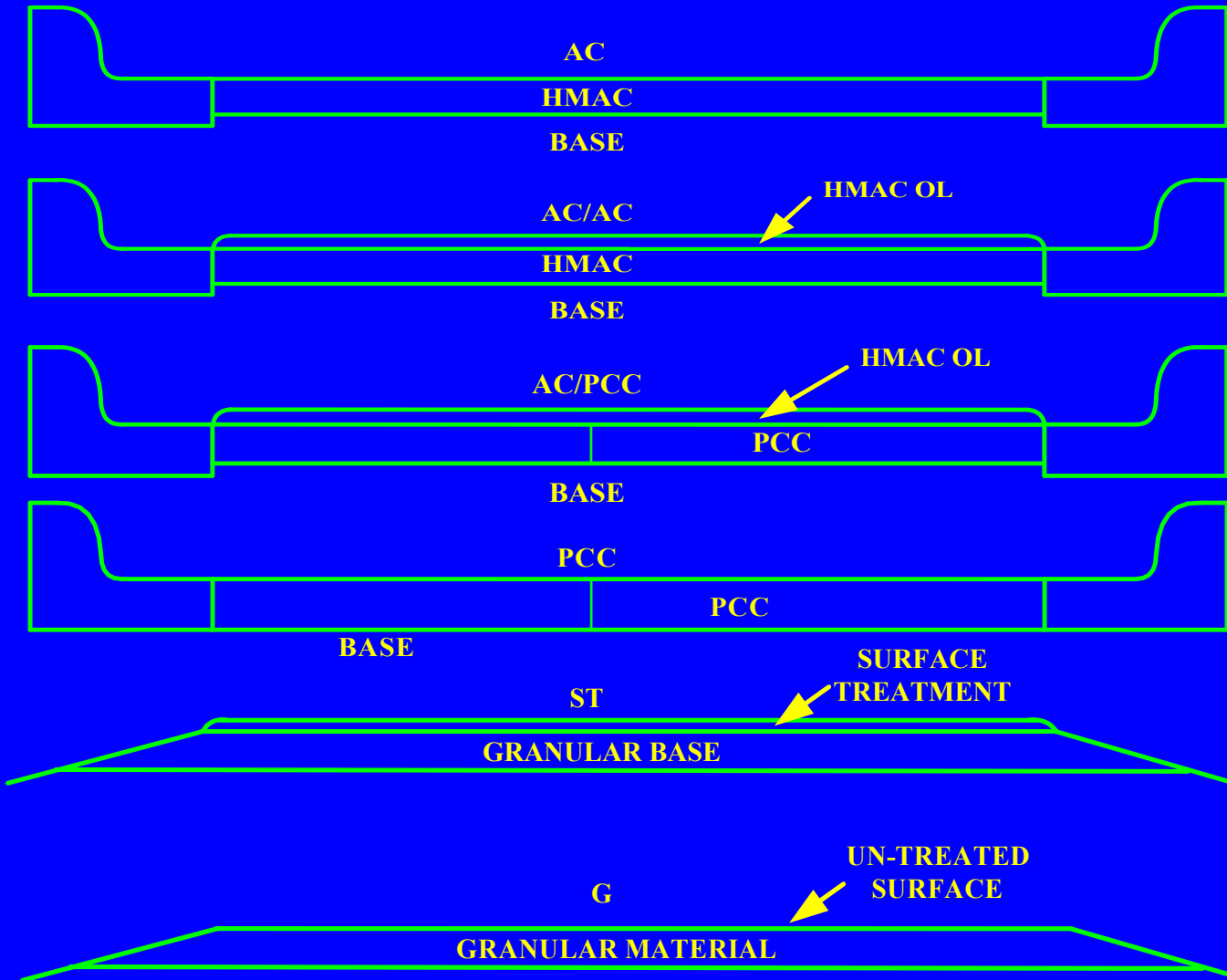
The screenshot shows a software window titled "Create Section". At the top right, there are window control buttons (minimize, maximize, close) and a "Sections:" dropdown menu with navigation arrows. Below this is a "File" menu and a "Management Section Information" section. The form contains several rows of input fields:

- Street ID: 001, Begin Location: Main St, Begin Point: [empty]
- Section ID: 002, End Location: West St, End Point: [empty]
- Road Name: Section 001 - 001, # of Lanes: [empty]
- Functional Class: C - Collector, Length (ft): 1200, Width (ft): 36, Area (sq ft): 43200
- Surface Type: D - AC/AC, Parking Lot Type: [empty], Slab Length: [empty], Slab Width: [empty], # of Slabs: [empty]
- Fund Source: [empty], Effective Date: [empty], Constructed: 08/27/1980, NHS: [checkbox]
- General Code: [empty], Originally Constructed: 08/27/1980, Culdesac: [checkbox], Exclude from Centerline: [checkbox]
- Area ID: [empty], Shoulder Width: [empty], Traffic Index: [empty], ADT: [empty]

Below these fields is a "Comments:" text area. At the bottom, there are two columns of user selection boxes, labeled "User1" through "User10".



# Surface Types - ST



# Functional Class

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 Arterial

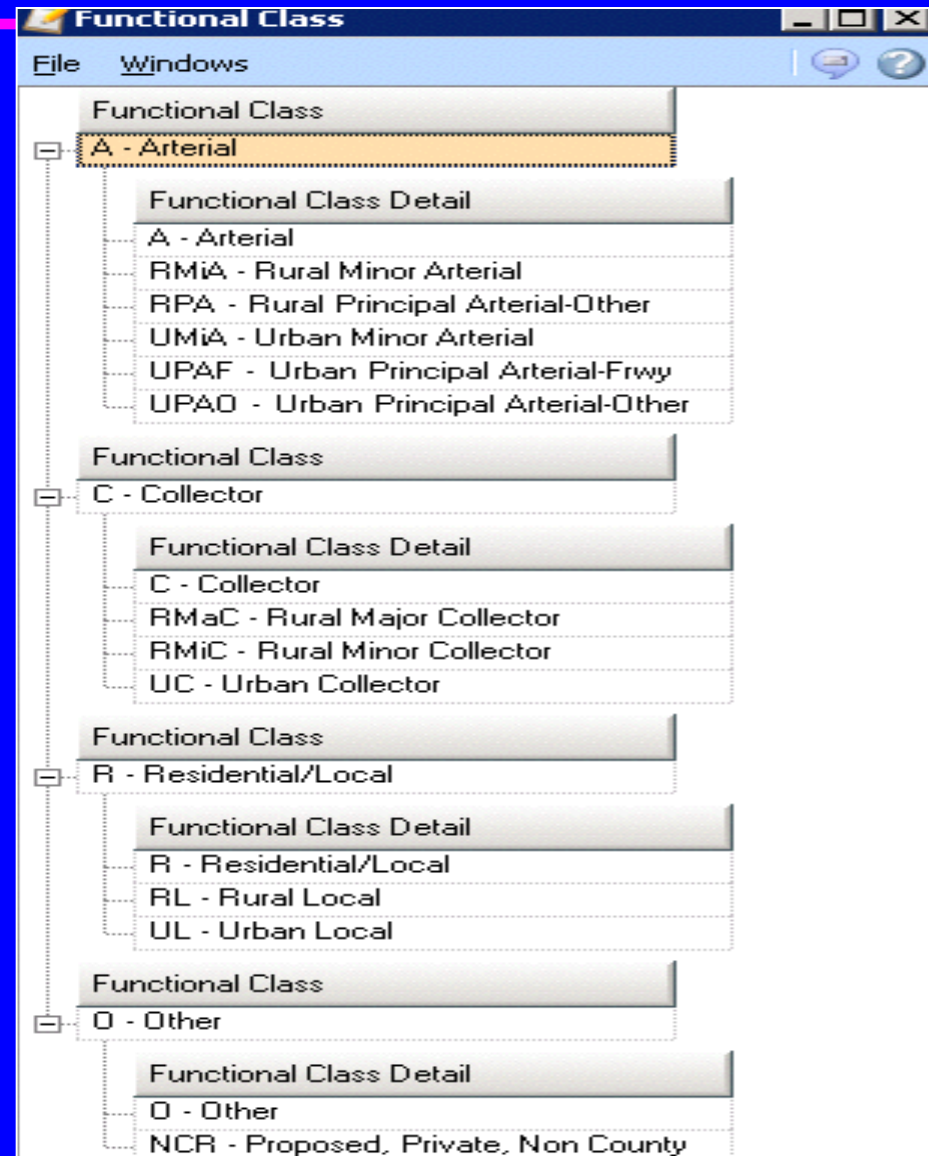
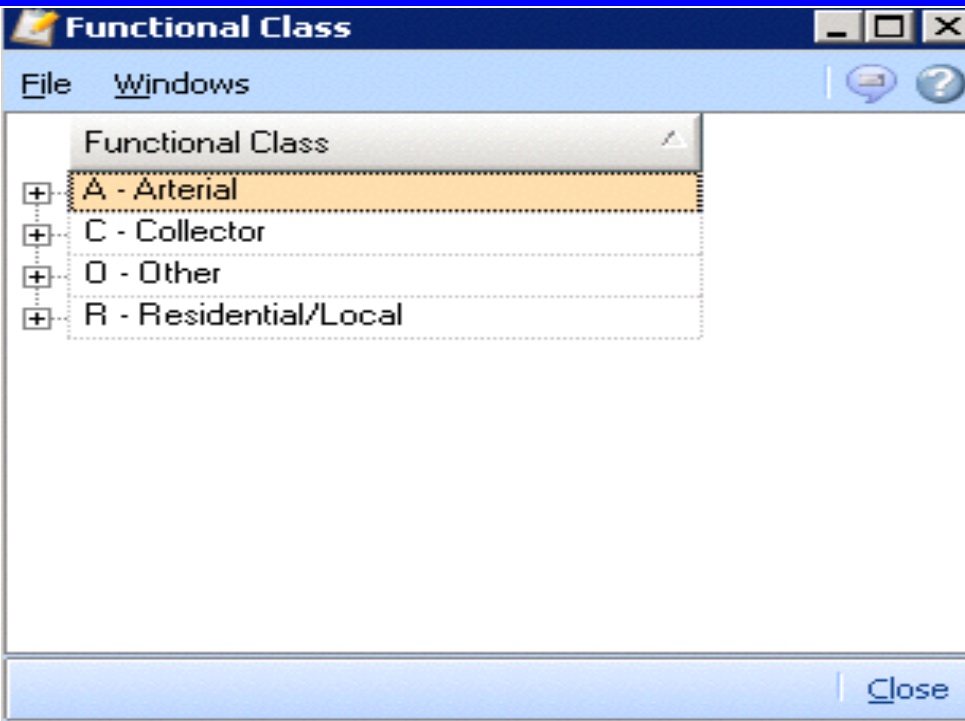
 Collector

 Residential/Local

 Other

 More Detailed Functional Class Still Use  
These in Analysis

# Functional Class



# Other Information and Sort Codes

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 ADT

 TI

 Area ID

 Funding Code

 General Code

 User Defined

# Optional Data

## Once Entered, Pull from Menu

**Edit Section**

File

Management Section Information

Street ID:	ADELE	Begin Location:	LAKE ST.	Begin Point:			
Section ID:	10	End Location:	OAK ST.	End Point:			
Street Name:	ADELE STREET - ADELE			# of Lanes:	2		
Functional Class:	R - Residential/Local	Length (ft):	715.00	Width:	26.00	Area:	18947.5
Surface Type:	A - AC	Slab Width:	0.00	Slab Length:	0.00	# of Slabs:	0
Fund Source:		Effective Date:		Constructed:	01/01/1993	MTS:	<input type="checkbox"/>
General Code:	PS - PARKING/SHOULDER	Originally Constructed:	01/01/1993	Culdesac:	0		
Area ID:		Shoulder Width:		Traffic Index:		ADT:	

Comments:

User1	User6
User2	User7
User3	User8
User4	User9
User5	User10

Documents: 0 | Delete | Clear | Save & New | Save & Close | Close

# Update For Work Completed



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 Computer Does Not Know Work Completed  
Until Data Entered

 Will Recommend Work on Wrong Projects  
Unless Data Updated

# Data Audit

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-  Many of us are using data developed and entered over a number of years by different agency and consultant personnel
-  When was the last time that data was checked for accuracy

# Data Audit

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## Common incorrect section information

- Length & width – check against GIS map
- Functional Class – check against FHWA Functional Classification Map
- Surface Type
- M&R Treatments recorded

 Incorrect information can lead to loss of federal funds



# Reports Provide Access to Information Entered

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Series of General Reports







Custom Report Writer

# Reports



 Pavement Sections	 GIS Toolbox	 Table Maintenance	
 Inspections	 Budgeting	 Reporting	
 Maintenance Treatments	 Asset Management		

## Reporting

 Custom Reporting Tool	 Custom Report Fields	 Reports	 Graphs
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# Reports



Reports

File Windows

Historical PCI/RSL

M&R History - PCI Before and After Treatment

Maintenance and Rehabilitation History

Parking Lot Inventory and Condition Listing

PCI History

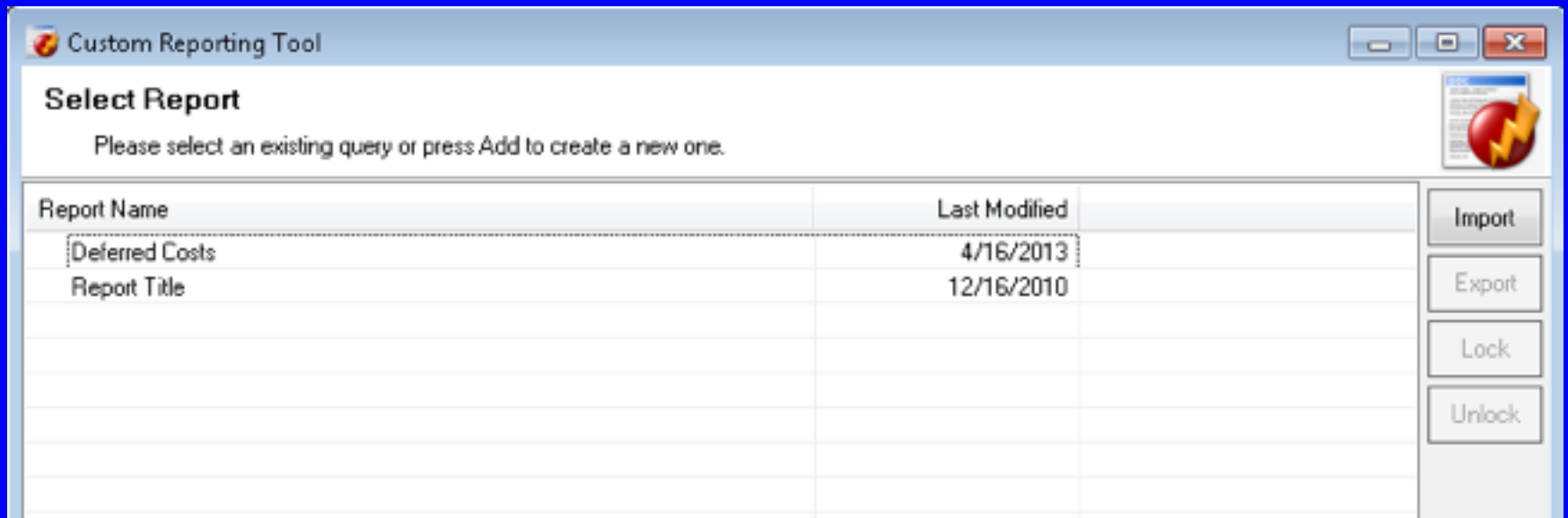
Road Inventory

Section Condition Inventory

Section Description Inventory

# Custom Reporting Tool

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**Custom Reporting Tool**

**Select Report**

Please select an existing query or press Add to create a new one.


Report Name	Last Modified
Deferred Costs	4/16/2013
Report Title	12/16/2010

Import  
Export  
Lock  
Unlock

# Management Section

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 Subdividing Network

 Can Only Have One of Each Basic Data Item

– FC, ST, Sect Width, etc.

 Basic Decision

– Would I Treat This Section As a Single Unit When Planning Work?

# Dividing Network into Management Sections (Segmentation)



# Subdivision Methods

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Intersection



Mile Marker



Standard Length (Block Face)



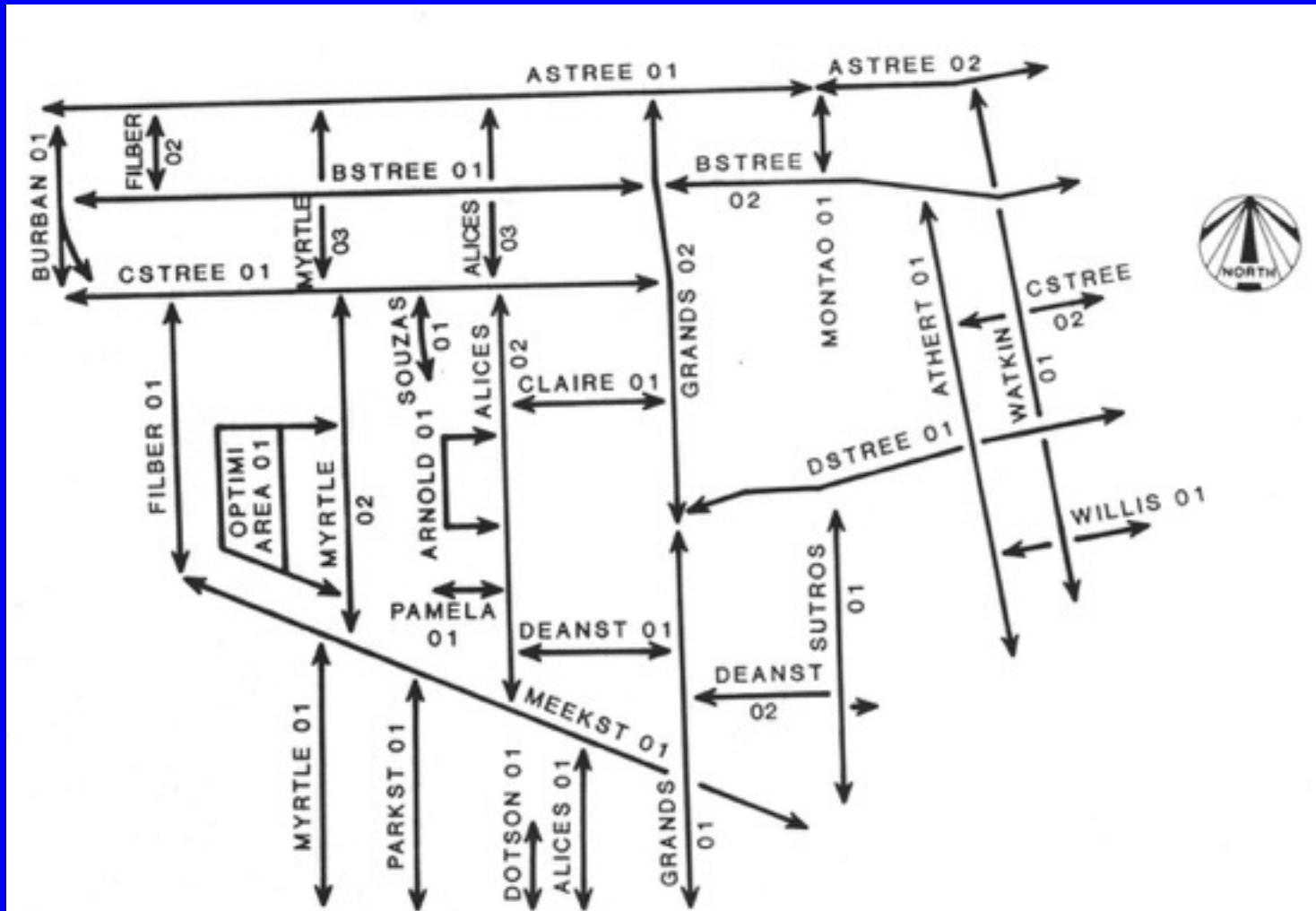
Lane



Combination

# Intersection Method

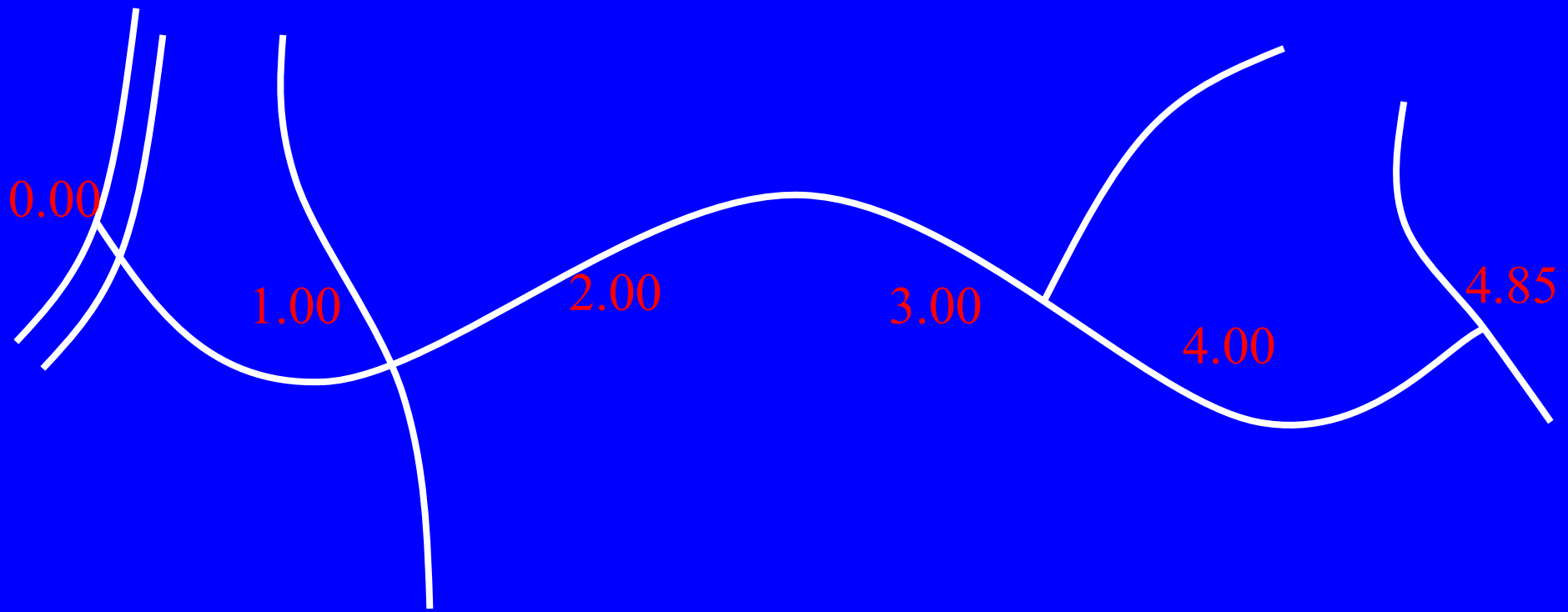
From one intersection to another (not necessarily the next one)





# Mile Marker - County Roads

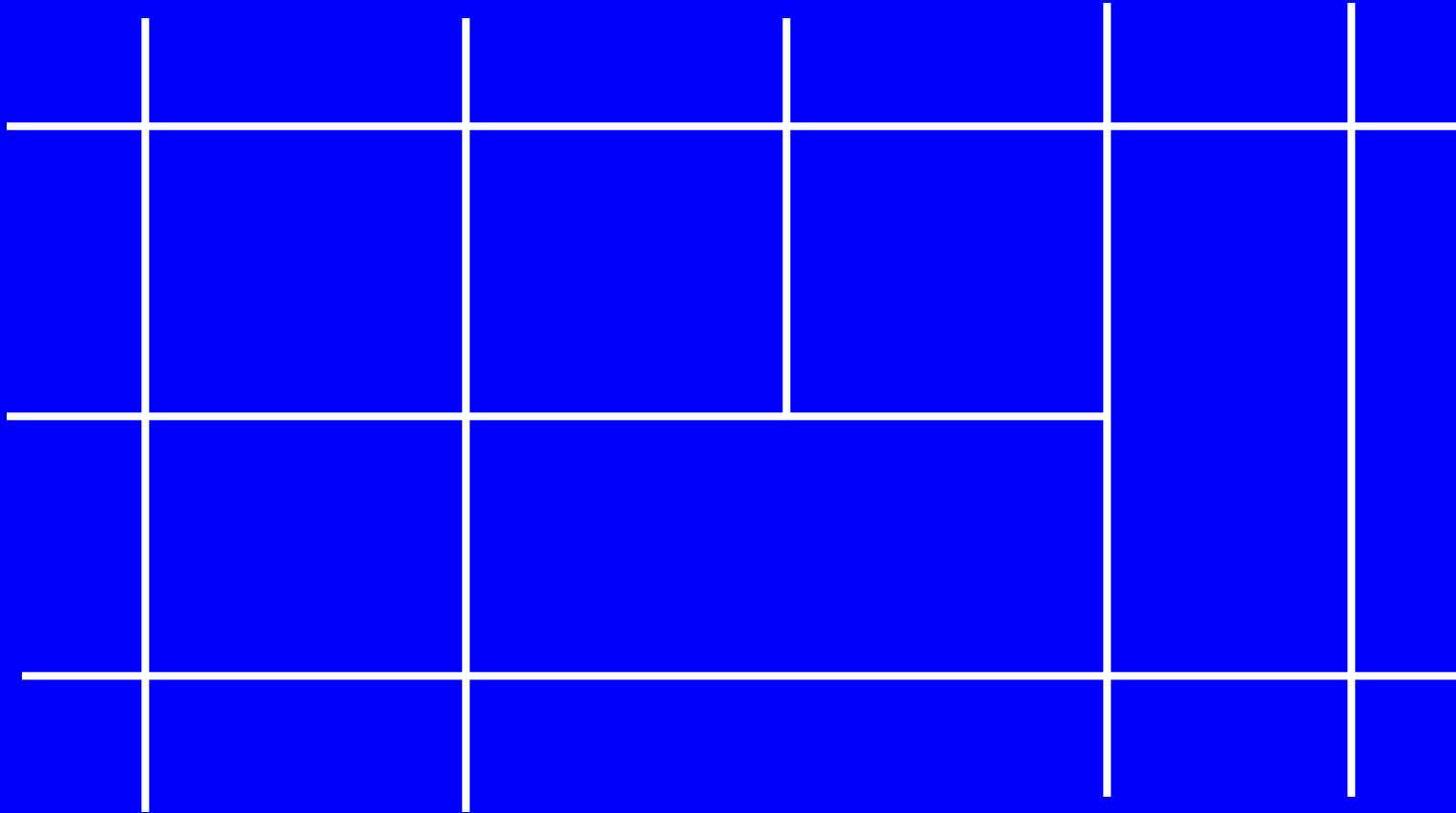
— From one mile-marker to another (not necessarily the next one)



# Standard Length

Block Face (Length may not always be equal)

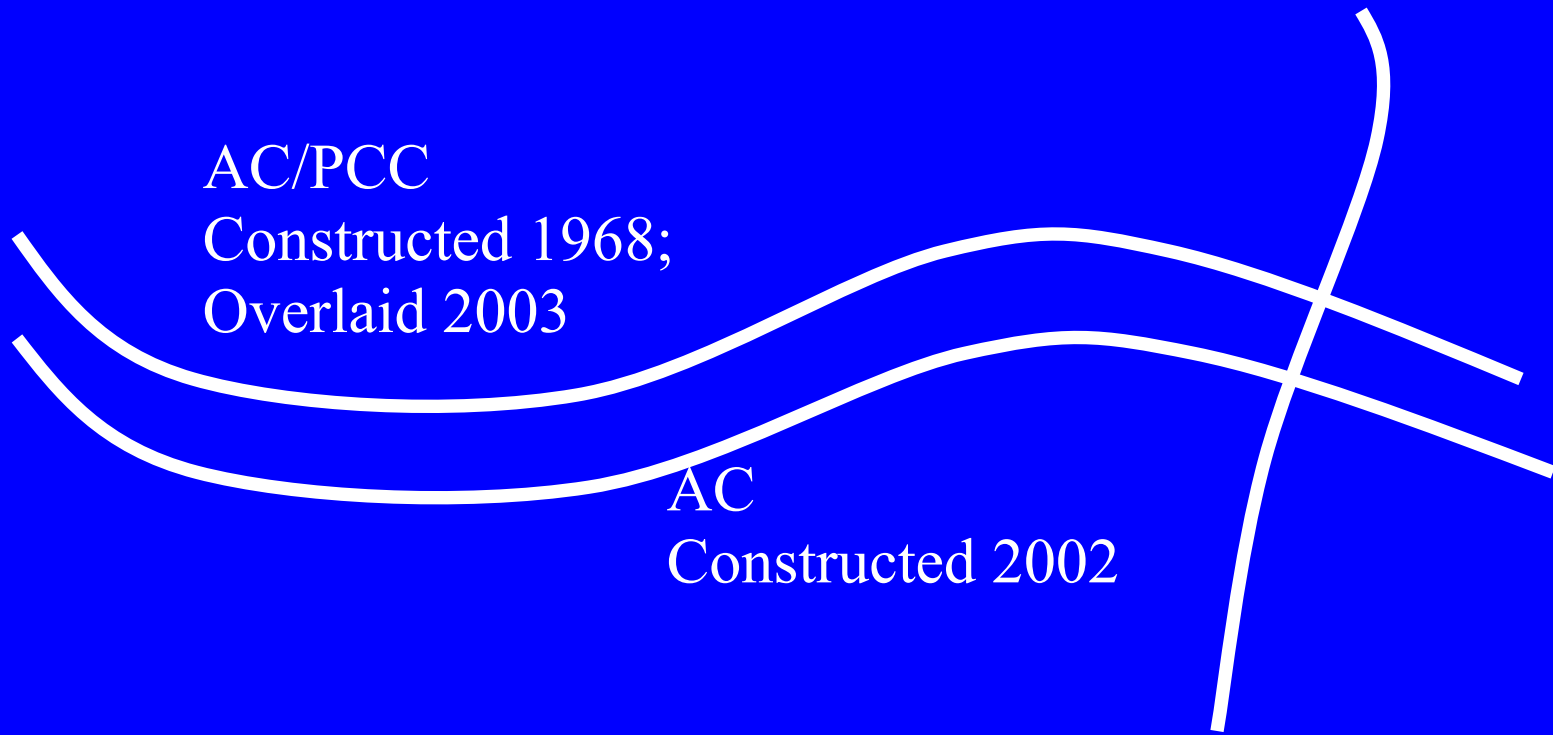
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# Lane

Eastbound section 10e, westbound section 10w

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# Section Size Guidelines

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 Not so large that it cannot be funded

 Not so small that it will not be considered alone

# Small Sections

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- ❏ More likely to be uniform
- ❏ Increases inspection area
- ❏ Increases number of sections in database and database size
- ❏ Increases database processing time (section number dependent)
- ❏ Increases subsequent analysis by agency
- ❏ Often combined with adjacent sections for treatment




# Large Sections

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- ❖ More likely to be non-uniform
- ❖ Decreases database size & processing time
- ❖ May require later sub-division
- ❖ Less than whole section may be treated

# General Guidelines

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-  Intersection (urban) or mile marker (rural) methods generally preferred
-  Block face method more likely be used in older urban areas
-  Lane method only used on multiple lane (generally divided) facilities with different surface types

# Breaking Steps

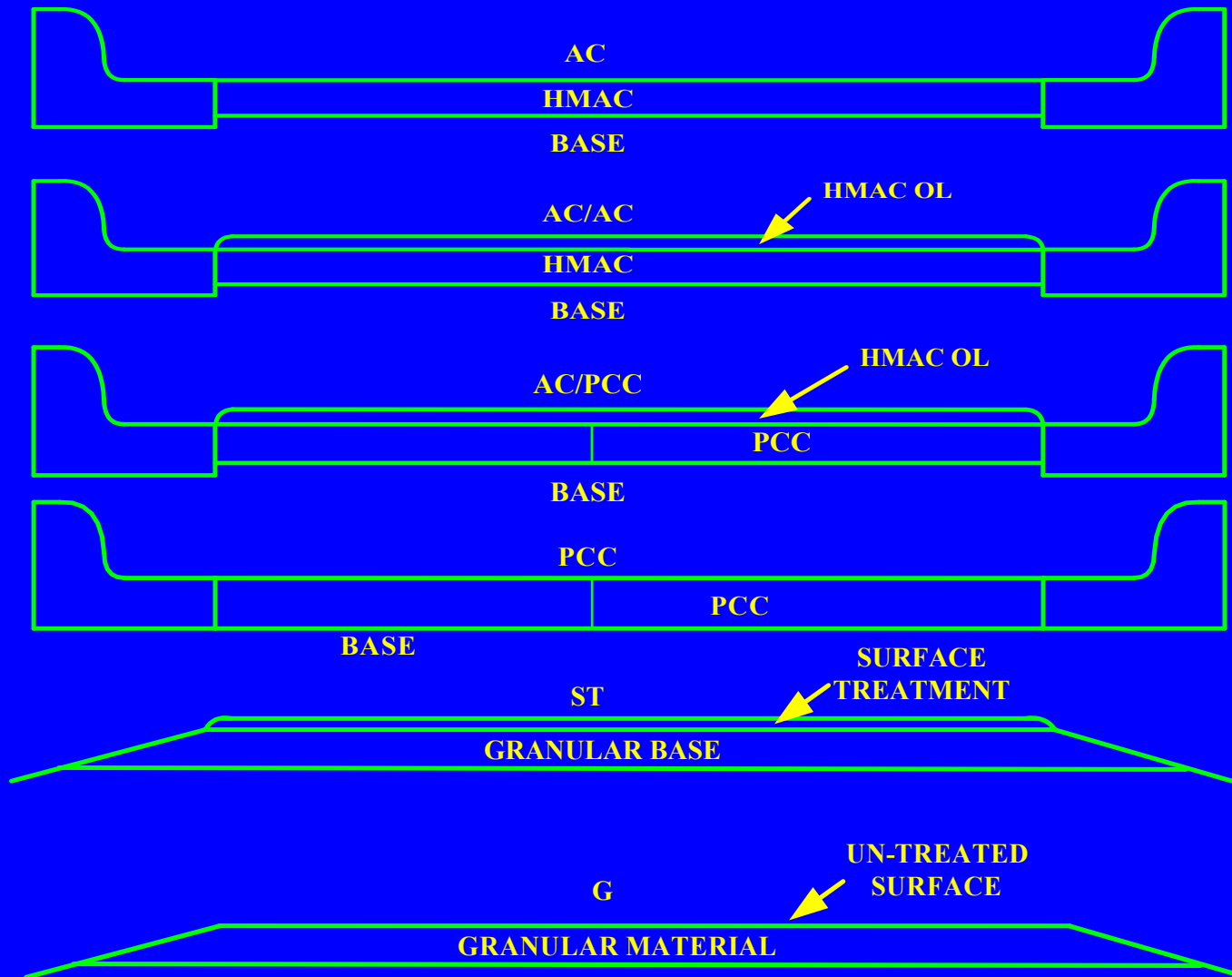
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☒ Identify street or road to be subdivided

☒ Break based on Functional Classification



# Break Based on Surface Type



# Breaking Steps (Cont'd)

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 Break on Date of Construction/Last Overlay/etc.

 Break Based on??

- General Code
- Shoulder Width
- Area Code
- Funding Code
- Other Codes

 Section can only have one

# Breaking Steps (Cont'd)

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 Break based on Condition (PCI) ??

- More than 25 PCI Points Difference Among Inspection Units Within same Management Section??

# Special Cases

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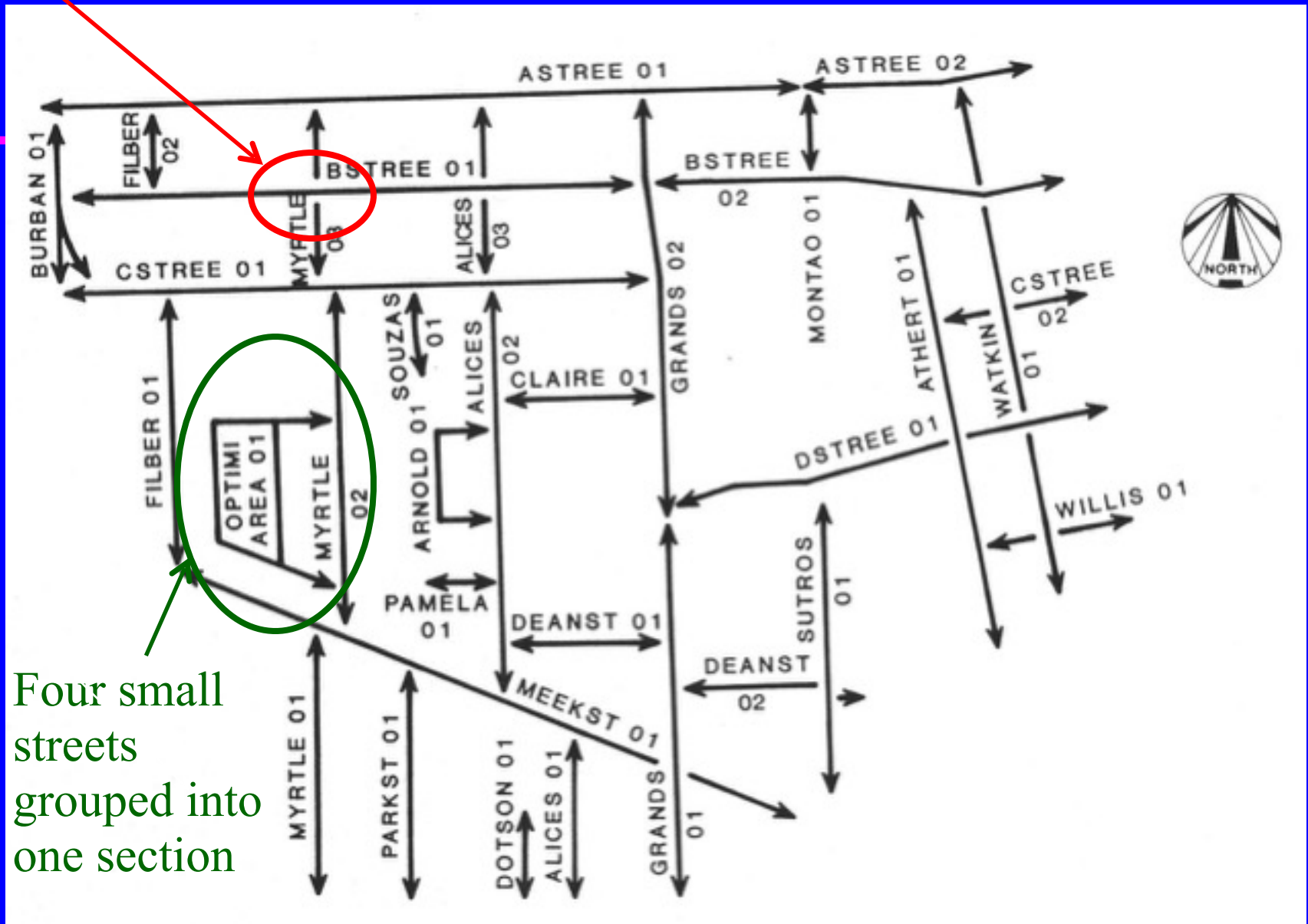
## Intersections

- Must belong to a section
- Can only belong to one section
- Can be a separate section if unique

## Grouped Roads/Streets

- Reflect management policies
- Uniform developments

# Intersection belongs to B Street



Four small streets grouped into one section

# Special Cases

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## Small Areas of Different Materials


- PCC bus turn-outs or parking areas in AC streets
- Ignore small area in section definition
- Rate as patch, if needed

## Different Surface Types in Same Block

- Lane Method or Shoulder?

# Section Adjustments

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 Like our data, most agencies have sections developed over a number of years by different agency and consultant personnel

 Some sections may need to be adjusted

# Splitting & Combining Existing Sections

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Existing sections can be:

- Split

- » A section can be subdivided into two or more sections

- Combined

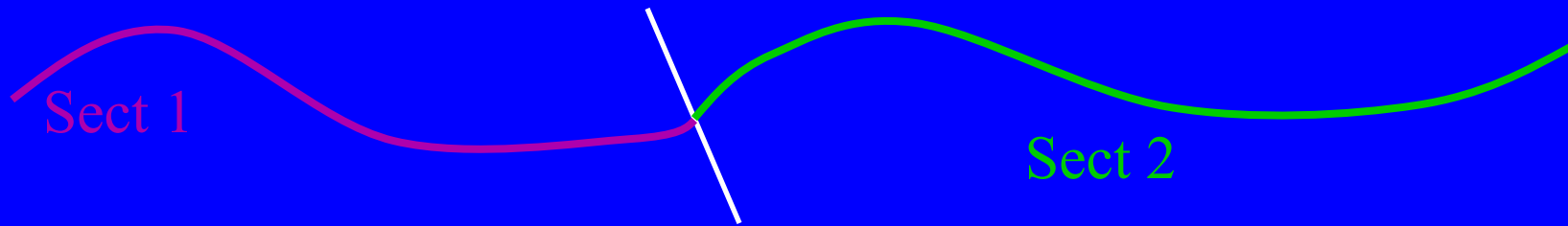
- » Two or more sections can be combined into a single section



# Combining Existing Sections

Same FC, Area Code, etc.

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- ❏ Sect 1 – Const 1952 as AC, overlaid in 1989
- ❏ Sect 2 – Const 1964 as AC, overlaid in 1994
- ❏ Both reworked full-depth to 8 inch depth in 2014, surfaced with 3 inch HMAC
- ❏ Combine both into one section


# Select Sections to Combine

Select Section(s)

File Options Filter: [Icons]

StreetID	SectionID	St ID - Sec ID	Road Name	Beg L
001	0000	001 - 0000	Section 001 - 001	M-0
002	0100	002 - 0100	Section 002 - 002	M-500
003	0200	003 - 0200	Section 003 - 003	M-100
004	0300	004 - 0300	Section 004 - 004	M-150
005	0400	005 - 0400	Section 005 - 005	M-200
006	0010	006 - 0010	Section 006 - 006	M-250
007	0110	007 - 0110	Section 007 - 007	M-300
008	0210	008 - 0210	Section 008 - 008	M-350
009	0310	009 - 0310	Section 009 - 009	M-400
010	0410	010 - 0410	Section 010 - 010	M-450
011	0020	011 - 0020	Section 011 - 011	M-500
012	0120	012 - 0120	Section 012 - 012	M-550
013	0220	013 - 0220	Section 014 - 014	M-600
014	0320	014 - 0320	Section 014 - 014	M-650
015	0420	015 - 0420	Section 015 - 015	M-700

Select All | Select None | 100 Sections available | Add Selected Section(s) | Cancel



StreetSaver®

GIS Toolbox | Table Maintenance

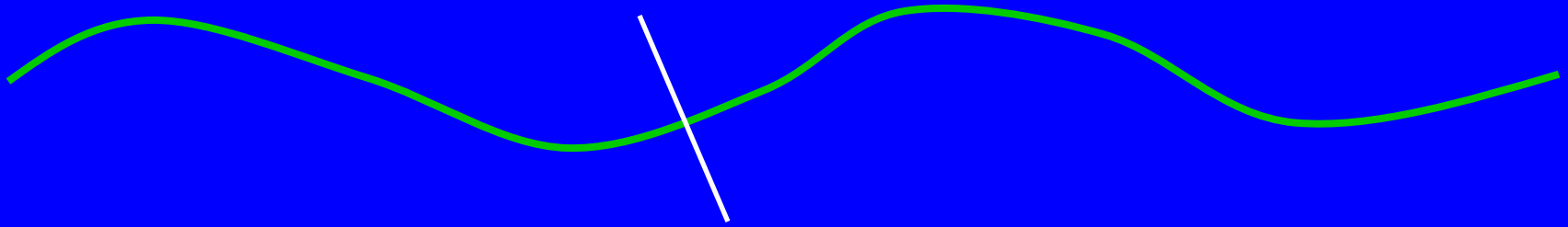
Budgeting | Reporting

Asset Management

Export Sections | Import Section Attributes | Combine Section | Events Migration Info | Import Inspection Units | Export Inspection Units | Import M&R Utility | User Defined Fields

# Splitting or Sub-dividing Existing Sections

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- ❏ Const 1964, overlaid in 1982.
- ❏ First part milled & overlaid in 2012
- ❏ Second part reconstructed in 2014
- ❏ Break into two sections

# Select Sections to split

**Split Management Section**

Select Management Section to be Split

- 001-0000
- 002-0103
- 003-0200
- 004-0300
- 005-0400
- 006-0010
- 007-0110
- 008-0210
- 009-0310
- 010-0410
- 011-0020
- 012-0120

Split Section

Help

Done / Cancel

**Enter Data**

Enter Number of Sections you want to split this section into. Select Cancel to Cancel the split process.

2

OK

Cancel

**Split Section**

Original Section

Street ID: 100000      Begin Location: 1<sup>st</sup> Street

Section ID: 999999      End Location: 5<sup>th</sup> Street

Length: 10000

New Sections				
	Section ID	Begin Location	End Location	Length
▶				

Help      OK      Cancel

# Impacts of Splitting & Combining Existing Sections

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## Ⓜ Impacts

- Combined
  - » Prior inspection & M&R info assumed invalid
- Split
  - » Prior inspection info assumed invalid

Ⓜ Need to reinspect to have valid PCI data

Ⓜ Need to update date of construction, M&R data, etc.

Ⓜ Splitting & Combining should be reserved for major changes

- Avoid frequent splits & combines

# When to “Re-break” Existing Network

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- ❧ When many existing segments are
  - Being combined to create work sections
  - Being sub-divided to create work sections
- ❧ When sections were incorrectly defined in original PMP network definition
- ❧ Just before a major re-inspection effort
  - Need inspection after split or combine to define condition of revised sections

# Reinspection

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 Condition deterioration will vary among similar sections due to differences in:

- Layer thickness & stiffness
- Traffic loads
- Subgrade support
- Localized maintenance

 Need periodic reinspection to ensure condition of sections is correct

# Reinspection Planning

The current year is

Inspect  Years after reconstruction or overlay

Inspect  Years after surface treatment

Inspect  Years if PCI under 25

If the section does not fall in one of the categories above, select on the basis of:

<u>PCI Loss / Year</u>	<u>Inspect every</u>	
<= 2	<input type="text" value="4"/>	years
3 - 5	<input type="text" value="3"/>	years
6 - 9	<input type="text" value="2"/>	years
>= 10	<input type="text" value="1"/>	years

0%

<< Back

Finish

- PCI Deterioration Rate
- % Area by Functional Class
- % of Sections by Functional Class

Cancel

Next >>

Maintenance and Rehabilitation History  
Management Section Event Summary  
Management Section History Without Events  
Management Sections with no Treatments  
Needs - Preventive Maintenance Treatment/Cost Summary  
Needs - Projected PCI/Cost Summary  
Needs - Projected PCIs  
Needs - Rehabilitation Treatment/Cost Summary  
Needs - Sections Not Selected For Treatment  
Needs - Sections Selected For Treatment  
Needs - Treatment/Cost Details  
Network Replacement Cost  
Network Summary Statistics  
Parking Lot Inventory and Condition Listing  
PCI Calculation - Deduct Values  
PCI Calculation - Extrapolated Distresses  
PCI Calculation - Summary  
PCI Differences Between Inspections  
PCI History  
Project Selection - Streets Only  
Project Selection - Unfunded Selected Sections  
Project Selection Detail Report  
Reinspection Schedule  
Road Inventory



Assign percentage of 'Area' to reinspect by functional classification

Arterials	<input type="text" value="100"/>	%
Collectors	<input type="text" value="50"/>	%
Residential	<input type="text" value="25"/>	%
Other	<input type="text" value="25"/>	%

0 %

<< Back

Finish

Assign percentage of 'Sections' to reinspect by functional classification

Arterials	<input type="text" value="100"/>	%
Collectors	<input type="text" value="50"/>	%
Residential	<input type="text" value="25"/>	%
Other	<input type="text" value="25"/>	%

0 %

<< Back

Finish

# Other Approaches for Reinspection Scheduling

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 Select Sections Based on Location

 Consider not Inspecting those with Recent (less than 1 year old) Surface Seals

# Distributed Inspection

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## Year 1

- Inspect all arterial & collector sections in north half
- Inspect all residential/local & others in north-east quadrant

## Year 2

- Inspect all arterial & collector sections in south half
- Inspect all residential/local & others in south-east quadrant

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## Year 3

- Inspect all arterial & collector sections in north half
- Inspect all residential/local & others in north-west quadrant

## Year 2

- Inspect all arterial & collector sections in south half
- Inspect all residential/local & others in south-west quadrant

# Concentrated Inspection

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## Year 1

- Inspect all arterial & collector sections
- Inspect all residential/local & others in north half

## Year 3

- Inspect all arterial & collector sections
- Inspect all residential/local & others in south half

# Reinspection is Critical

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- ❖ Condition projected based on past condition & family curves
- ❖ Changes due to non-normal deterioration will change deterioration rates
- ❖ Projected values will be off

# Distress ID Systems in StreetSaver®

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 MTC Distress ID

 PAVER/ASTM Distress ID

 CRAB recording method

# Quality Control for Supervisors

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-  Check data coming in daily - look for problems
  - 1 sq ft block cracking
  - Only medium severity L&T, Alligator, & Patching
-  Have teams mark inspection units
  - Reinspect same inspection units
-  Supervisor reinspect small percent (2-5%)



# Quality Control for Supervisors

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With more than one team

- Change inspection team members regularly
  - » Don't let divergence develop
- Have teams reinspect sections inspected by other teams (5%)

# Contracting for Distress Data Collection

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- ❏ Define distress ID methodology to be used and precision and accuracy needed
- ❏ Require Data Quality Control Plan
- ❏ Establish Data Quality Assurance Plan
  
- ❏ MTC has plans that agencies can use in developing their contract plans at: <http://www.mtcpms.org/support/consultants.html>

# MTC Data Quality Management Plan

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- ❏ Includes Pre-qualification & Rater Certification for distress identification using the MTC distress definitions
- ❏ **Pre-qualification** ensures that contracting agencies are capable of collecting distress data that is reasonably close to what would be collected by an "expert" rater
- ❏ **Rater Certification Program** Under the P-TAP, even if a firm has pre-qualified, all of the firm's raters must The exam is scheduled on **November 19 & 20, 2014**

# Data Quality Control Plan

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Each firm required to provide Quality Control Plan that includes

- Qualifications of each rater
- Description of their data verification processes including what checks will be made and actions to be taken when issues arise

# MTC Data Quality Acceptance Plan

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## ❧ 1) Administer Rater Certification Program

Pre-qualification of the contractor does not ensure that all raters are capable of rating with the desired level of accuracy.

- All raters employed by the qualified contractors must complete rating of about 20 survey. The net exam is scheduled on **November 19 & 20, 2014**
- Includes a field pavement distress survey test and an online written test.

## ❧ 2) Conduct Audits of Contractors' Quality Control Plans

- MTC reviews quality control plans and approves prior to commencement of work
- CSUC conducts audits of the QCP results to ensure that the data collection contractors are meeting the requirements established in their plans.

## ❧ 3) Verify Data Collected by Contractors

- CSUC conducts full audits of the data collected from selected projects when issues are encountered
- CSUC spot checks data collected by contractors from selected projects

# MTC Maintains List of Consultants that have experience with StreetSaver®

**AMS Consulting LLC\***  
5627 Stoneridge Dr, Suite 320  
Pleasanton, CA 94588  
925.225.9922

Aslab Pty Ltd  
P.O. Box 1061  
Bibra Lake DC,  
Western Australia 6965  
+61-08-9434-2540

California Engineering Company, Inc  
1110 Civic Center Blvd, Ste 404  
Yuba City, CA 95993  
530-751-0452 x111

Farallon Geographics Inc.  
609 Mission St, 2nd Floor  
San Francisco, CA 94105  
415.227.1140

GeoData Analytics, LLC  
2510 Tassajara Avenue  
El Cerrito, CA 94530  
510.234.9485

Kleinfelder Inc.  
8 Pasteur, Suite 190  
Irvine, CA 92618  
949.727.4466

ASCG Inc.  
6501 Americas Parkway, Suite 400  
Albuquerque, NM 87110  
505.247.0294

Bureau Veritas  
6150 Stoneridge Mall Road, Suite 370  
Pleasanton, CA 94588  
925.468.7413

Coastland Civil Engineering, Inc.  
1400 Neotomas Avenue  
Santa Rosa, CA 95405  
707.571.8005

Freiburger Engineering  
P.O. Box O  
Twin Falls, ID 83303  
208.732.5972

**Harris & Associates\***  
120 Mason Circle  
Concord, CA 94520-1272  
925.827.4900

MACTEC Engr. and Consultants, Inc.  
961 Matley Lane, Suite 110  
Reno, NV 89502  
775.329.6123

**Adhara Systems\***  
1735 N. First St. Suite 200  
San Jose, CA 95112  
408.441.0340

CSG Consultants, Inc.  
1660 South Amphlett Blvd., Suite 330  
San Mateo, CA 94402  
650.522.2525

**Capitol Asset & Pavement Services\***  
P.O.Box 7840  
Salem, OR 97303  
503.689.1330

Fugro Consultants  
8613 Cross Park Drive  
Austin, TX 78754  
512-977-1800

IMS  
116 N. Roosevelt, Suite 131  
Chandler, AZ 85226  
480.839.4347

**Nichols Consulting Engineers\***  
501 Canal Blvd, Suite I  
Point Richmond, CA 94804  
510.215.3620

Northwest Management System  
3302 N. 7th Street  
Tacoma, WA 98406  
253.219.8904

Norris Repke Inc  
400 N. Tustin Ave., Suite 230  
Santa Ana, CA 92705  
714.973.2263

**Pavement Engineering Inc. \***  
3820 Cypress Drive, Suite 3  
Petaluma, CA 94954  
707.769.5330

PENCO Engineering  
One Technology Park, Bldg J-725  
Irvine, CA 92618  
949.753.8111

RKA Civil Engineers Inc.  
398 S. Lemon Creek Dr, Suite E  
Walnut, CA 91789-2649  
909.594.9702

Fugro-Roadware Group Inc  
147 E. River Road  
Paris, Ontario N3L 3T6  
Canada  
+1 519.442.2264

STANTEC Consulting Engineers  
8211 S 48th Street  
Phoenix, AZ 85041  
602.438.2200

i-TEN Associates, Inc.  
5 Eton Court  
Berkeley, CA 94705  
510.654.3263

Applied Pavement Technology  
115 W. Main St, Suite 400  
Urbana, IL 61801  
217.398.3977

**Associated Engineering Consultants \***  
20179 Charlanned Drive  
Redding, CA 96002  
530.226.1616

AECOM  
2101 Webster Street, Ste. 1900  
Oakland, CA 94612  
510.622.6627

BKF Engineers  
1646 N. California Boulevard, Suite 400  
Walnut Creek, CA 94596  
925.940.2207

The Barnhardt Group, LLC  
1001 Bayhill Drive, Suite 200  
San Bruno, CA 94066  
650.922.0469

DNMZ Consulting Engineers  
P.O. Box 411818  
Craighall, 2024  
South Africa  
+27-11-789-9512

Pavement Services, Inc  
3835 NE Tillamook Street  
Portland, OR 97086  
503-235-0377

JG3 Consulting, LLC\*  
P. O. Box 2377  
Heath, OH 43056  
800-638-8040

Quality Engineering Solutions\*  
405 Water Street  
Conneaut Lake, PA 16316  
814-382-0373

# Consultant List




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- ❧ <http://www.mtcpms.org/support/consultants.html>
- ❧ These consultants are licensed to use StreetSaver®. Consultants with an \* passed pre-qualification tests in 2012.
- ❧ Highlighted consultants are currently under contract with MTC as qualified PTAP consultants



# QA/QC Is Worth the Effort

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-  You wouldn't let contractors construct pavements without conducting QA/QC
-  You shouldn't purchase distress or other condition data without a QA/QC program
-  Avoid “garbage in > garbage out”

# On-line Distress Training

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Self-Paced Online Courses:

 Pavement Condition Assessment:

- MTC's 7- Distress protocol
- ASTM D6433 (full Paver distresses)

 More info:

[www.mtcpms.org/products](http://www.mtcpms.org/products)

# Rater Certification Program

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Part of MTC Data Quality Management Plan:

- ☒ Must attend a distress survey class or
- ☒ Online pavement condition assessment class
- ☒ Pass a 8-hour field test
- ☒ Pass an online knowledge test
- ☒ Certification good for 2 years

[www.mtcpms.org/support/QualityMgtProgram.html](http://www.mtcpms.org/support/QualityMgtProgram.html)

Next Field Test: November 19 & 20, 2014

# Individual Agency Questions

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