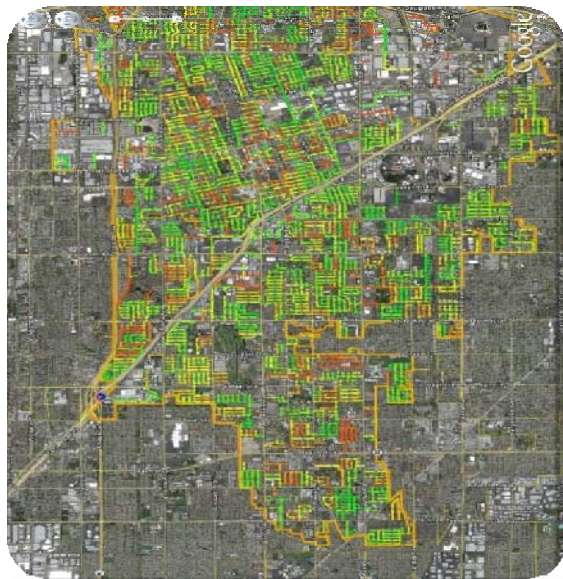




**PAVEMENT MANAGEMENT
IMPLEMENTATIONS**

ONE SIZE DOES NOT FIT ALL



IMS Infrastructure Management Services

Consultants | Engineers

Pavement management is the process of evaluating, prioritizing and monitoring pavements in an effort to provide maximum benefits from available funds.

In reality, it is the process of picking winners and losers in a defensible manner.

Jim Tourek
West Region Client Services Manager

Success Starts Right Here...



GISID: 769

Street Name: CLINE AVE

SEGMENT_ID: 2601



City of
Port Orchard

Image: ORCH003_000368_0010_Cf.jpg

RD_LOG_ID: 100

Roads must be treated as an asset

far more cost effective to maintain good roads than start from the worst

Network must be adequately funded

near the steady state requirement (PCI & Backlog)

long term underfunding results in equity removal that must be repaid through total reconstruction

Preconceived conclusions must be set aside

Full suite of rehab activities, options, & procedures must be included

Outside influence must be minimized

obtaining defensible results minimizes outside influence

CF IMS

2016/06/24 19:51:23

IN

Determine Your End Game

The background features a screenshot of the 'Scottsdale IMS Demo' software interface. On the left, there's a 'IMSVue' window showing a street view with a car. On the right, there's a 'Safety' dropdown menu and 'Tools' options. A large, semi-transparent blue box with a grid pattern is centered over the screenshot, containing the main text. At the bottom, there are five blue bowls representing the years 2017 to 2021. Each bowl contains a clipboard with a document and a purple dollar sign. Above the 2017 and 2021 bowls are orange diamond-shaped signs that say 'GOOD ROADS AHEAD'. The background also has faint, large dollar signs and the word 'GOOD' repeated in a grid pattern.

Determine roadway condition
walking – windshield – or semi automated

Define acceptable PCI & Backlog
good, bad, or indifferent
these answers start the process of setting policy

Configure analysis operating parameters
worst first – prioritized – optimized – “Must Do’s”

Develop 5-year plan based on end game
defensible results and based on end game

2017 2018 2019 2020 2021

Basic End Game Checks...



Asphalt Deficiency	Total Cost (\$)	% of Total	PART	MnART	MCOL	MnCOL	LOC	Life Cycle (years)	Life Cycle Cost (\$)
Reconstruction (Base)	1,622,700	2.7	0	131,200	0	74,000	1,417,500	50	32,000
Reconstruction (Surface)	18,054,800	30.4	0	521,100	540,800	3,555,400	13,437,500	35	516,000
Thick Olay (> 2.0 - 3.0)	21,094,600	35.5	439,300	2,425,800	16,800	4,194,500	14,018,200	25	844,000
Mod Overlay (2.0 - 3.0)	13,457,500	22.7	115,300	2,007,000	406,000	2,334,000	8,595,200	20	673,000
Thin Overlay (1.5 - 2.0)	4,702,900	7.9	0	467,200	0	814,900	3,420,800	20	235,000
Surface Treatment	251,100	0.4	0	9,300	0	59,600	182,200	10	25,000
Slurry Seal	196,900	0.3	0	3,200	0	87,600	106,100	5	39,000
Routine Maintenance	5,400	0.0	0	0	0	2,200	3,200	2	3,000
Total Asphalt Network:	59,385,900	100	554,600	5,564,800	963,600	11,122,200	41,180,700		2,367,000
Concrete Deficiency	Total Cost (\$)	% of Total	PART	MnART	MCOL	MnCOL	LOC	Life Cycle (years)	Life Cycle Cost (\$)
PCC Reconstruction	0	0.0	0	0	0	0	0	75	0
PCC Partial Recon	0	0.0	0	0	0	0	0	50	0
Extensive Pnl Rplcmnt	0	0.0	0	0	0	0	0	25	0
Moderate Pnl Rplcmnt	31,200	22.7	0	0	0	0	31,200	20	2,000
Slight Pnl Rplcmnt	35,400	25.8	0	0	9,000	0	26,400	20	2,000
Localized Rehab	13,400	9.8	0	0	0	0	13,400	10	1,000
Joint Rehab	22,900	16.7	0	0	7,200	8,000	7,700	5	5,000
Routine Maintenance	34,500	25.1	0	0	0	5,100	29,400	2	17,000
Total Concrete Network:	137,400	100	0	0	16,200	13,100	108,100		27,000
Total Network :	59,523,300		554,600	5,564,800	979,800	11,135,300	41,288,800		2,394,000

Types of Pavement Condition Surveys



Sampling Versus Linear Surveys

Representative samples – 100% of the segment length

Walking – Windshield – Semi Automated

All have pros & cons – comfort level

Step Back Look at Big Picture – Limitations

*Narrow streets, steep hills, alleys,
High Mileage, distress variability*

Methodology Must Match Needs

Safety - speed – cost - distress variability/repeatability

Data Elements/Protocols

ASTM D6433, Roughness, structural, surface distress & environmental

Subgrade Strength Data



Presence of Load Associated Distresses

Utilize Available Core Data

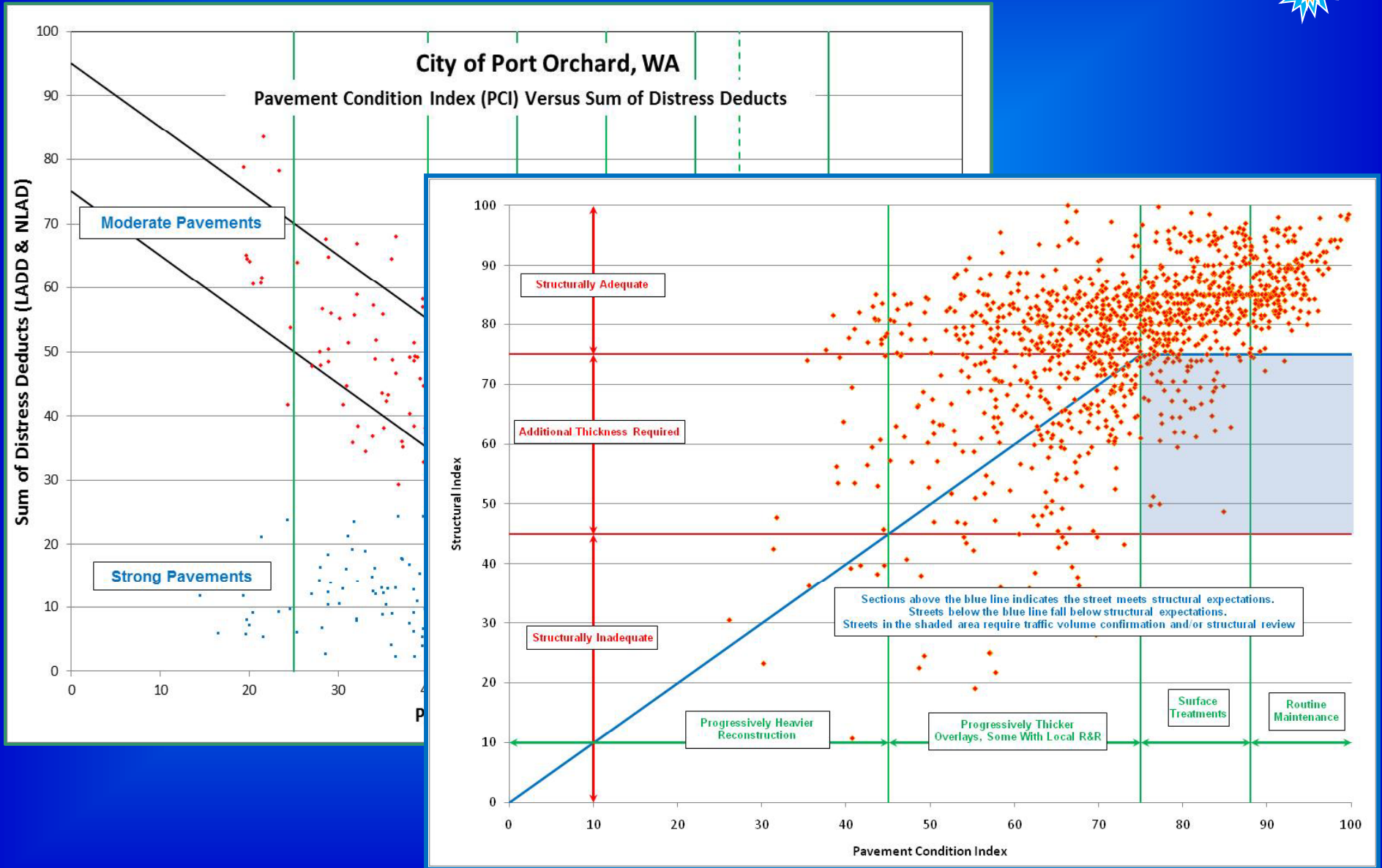
Must be available on all roads

Perform Structural Testing Using
a Dynaflect or FWD

300 – 500 foot intervals



Subgrade Strength Options...





ASTM D6433 was insufficient

**Needed ditch depth, drainage quality, and
constraining width info.**

Deflection testing would have been useless

Roberts Avenue

How Often Should We Update....



Funding
Agency

Surface Distress Only

1 to 3 years

Surface Distress and Roughness

2 to 4 years

**Surface Distress, Roughness
and Deflection**

3 to 5 years

**Critical to update pavement management system between
cycle with completed projects**

Segmentation Is Critical



Homogenous Segmentation

Block-to-block, intersection, mile post, landmark

Software specific, adopt agency standard referencing rules

Develop Logical Projects (supersegments)

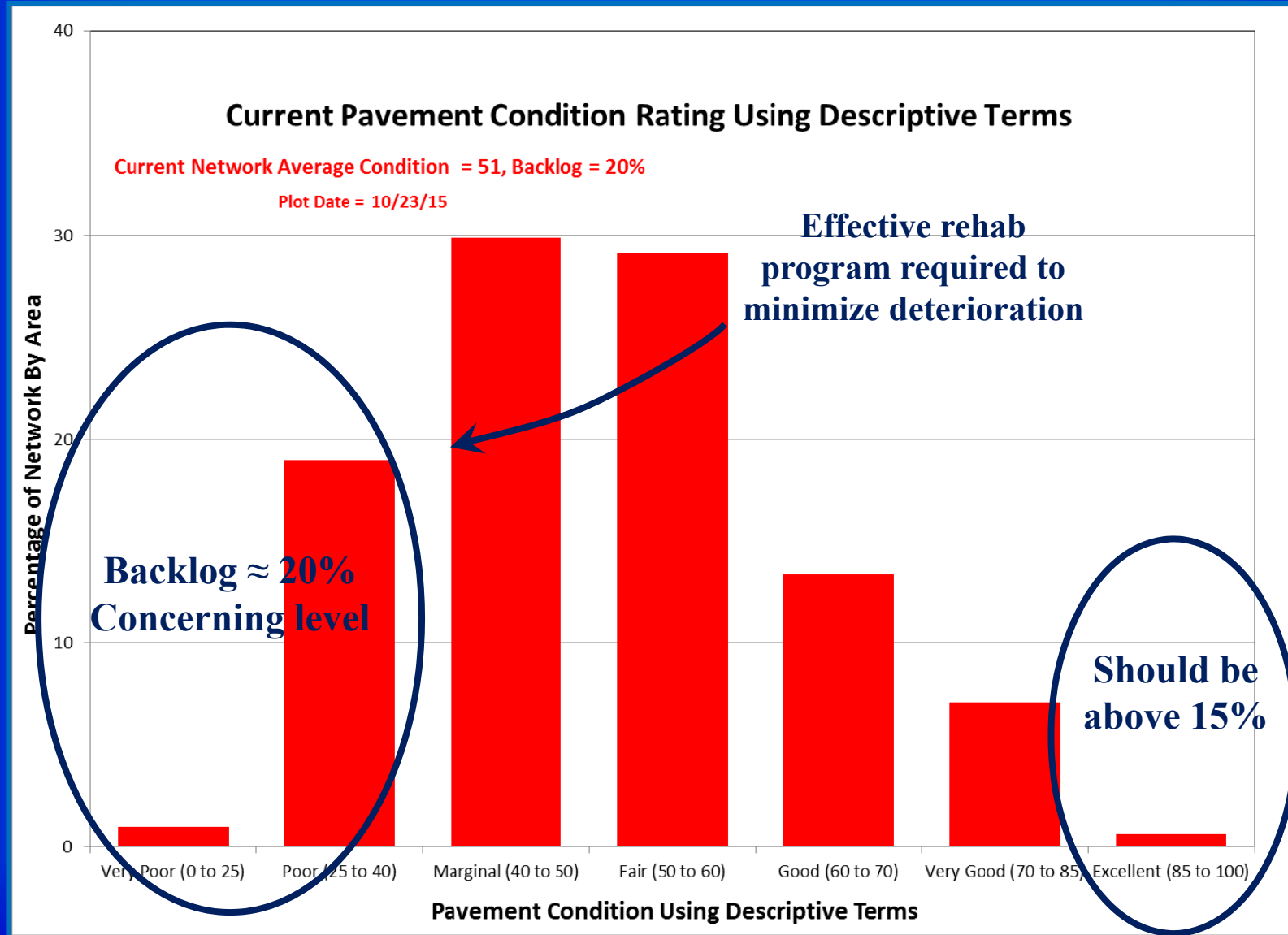
Supersegments are segments aggregated to form projects – must be homogeneous as it blends the data

Rehab is based on supersegment and can be street or neighborhood based

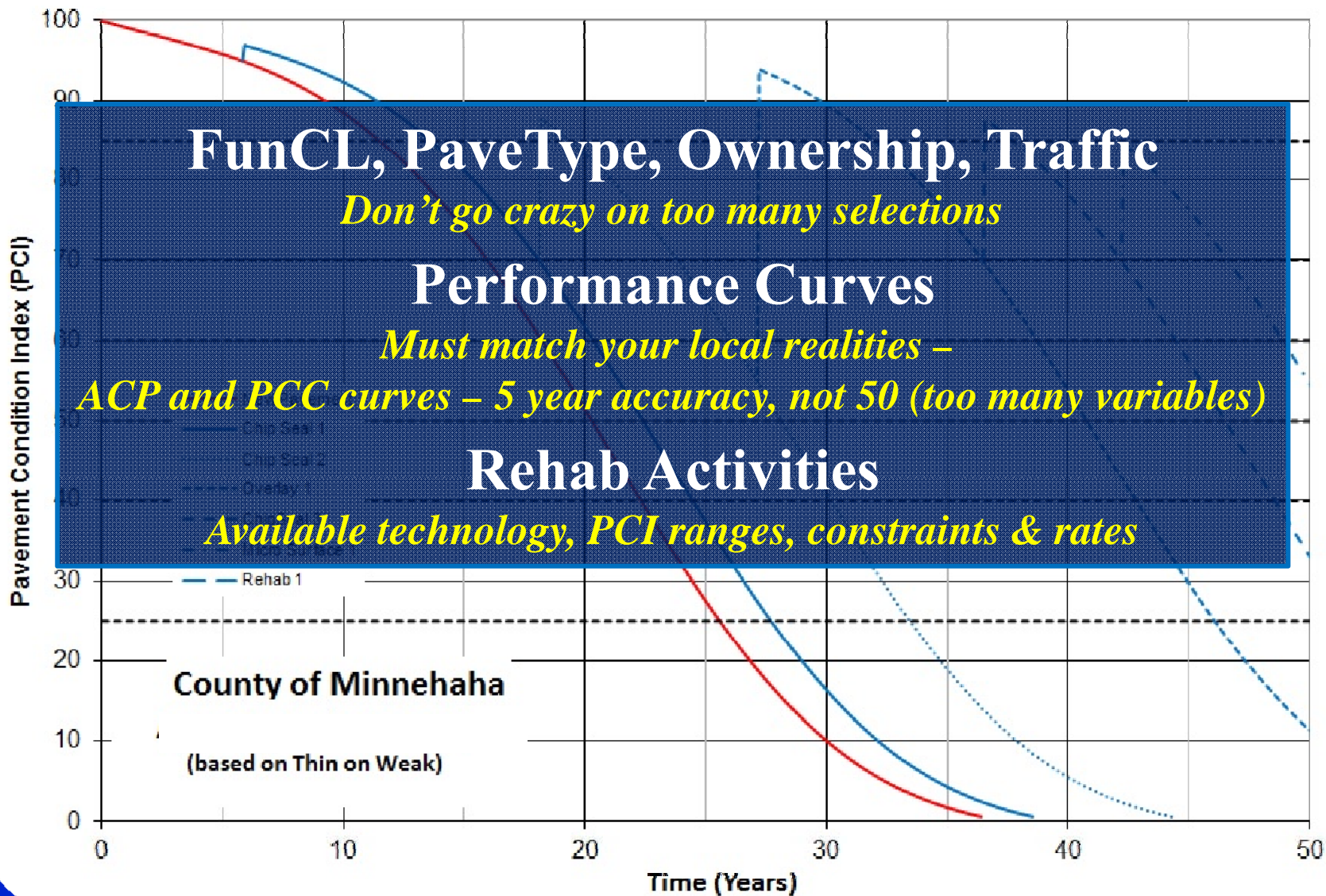
Rules of Thumb:

- ✓ *Any single project < 25% of total budget, upset limit*
- ✓ *Upset length = 1 miles +/- 1/2 mile*
- ✓ *Do not cross arterials/collectors*

Components Of A PCI Score...



Analysis Configuration Options



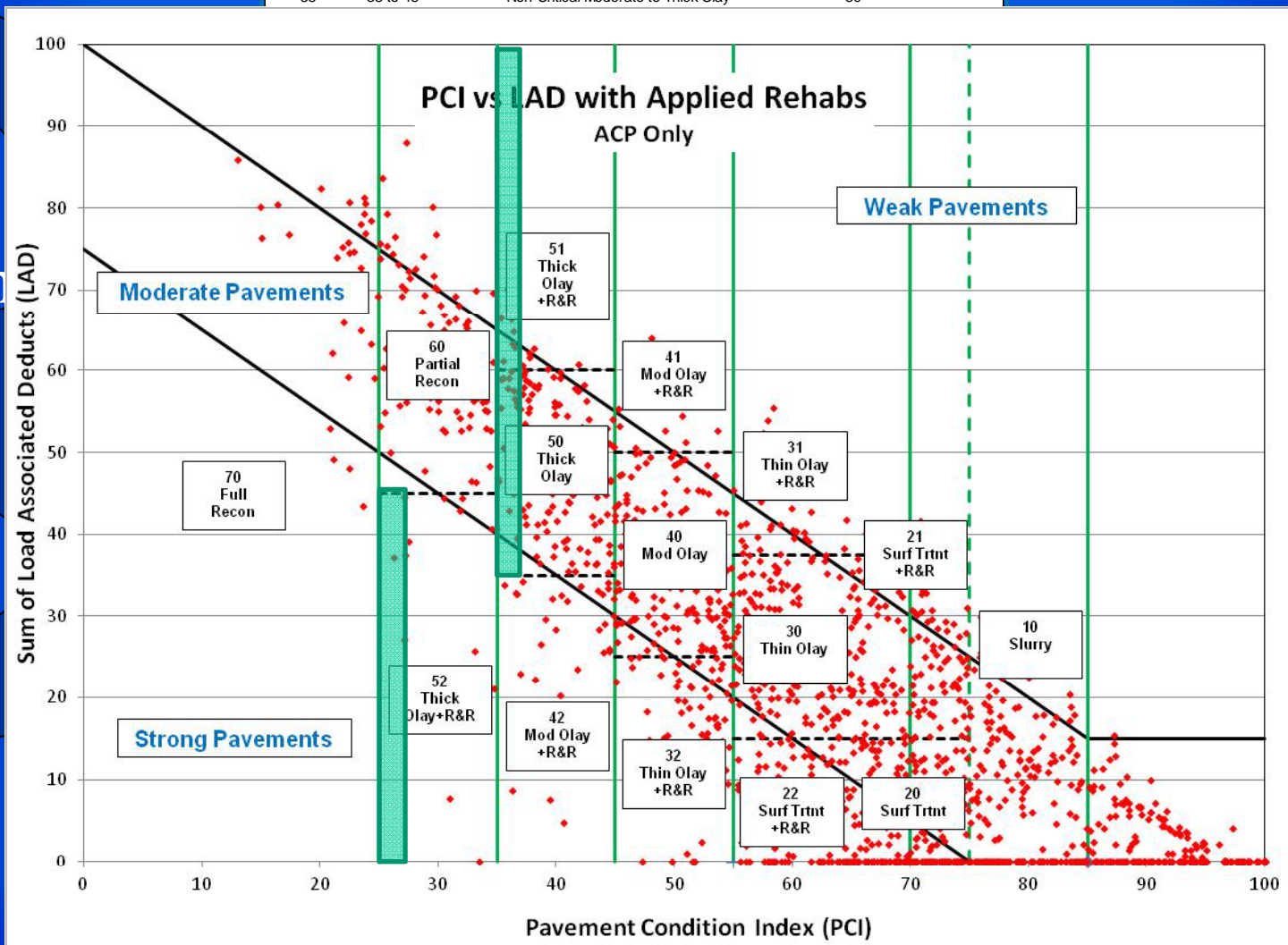
Operating P

Optim

fit



Need Year				
Prioritizes Candidates in Their Need Year Based on Cost of Deferral				
OCI B/P	Range	Action	NPR Factor	Weighting
0	0 to 10	Critical Recon	70	40
10	10 to 20	Non-Critical Recon	5	
20	20 to 25	Critical Thick Olay or Partial Recon	100	
25	25 to 35	Non-Critical Thick Olay or Partial Recon	35	
35	35 to 38	Critical Moderate to Thick Olay	95	
38	38 to 45	Non-Critical Moderate to Thick Olay	30	



OCI	Introduces Worst First Element	= 100-OCI	10
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Analysis Techniques...



Start Outside the System

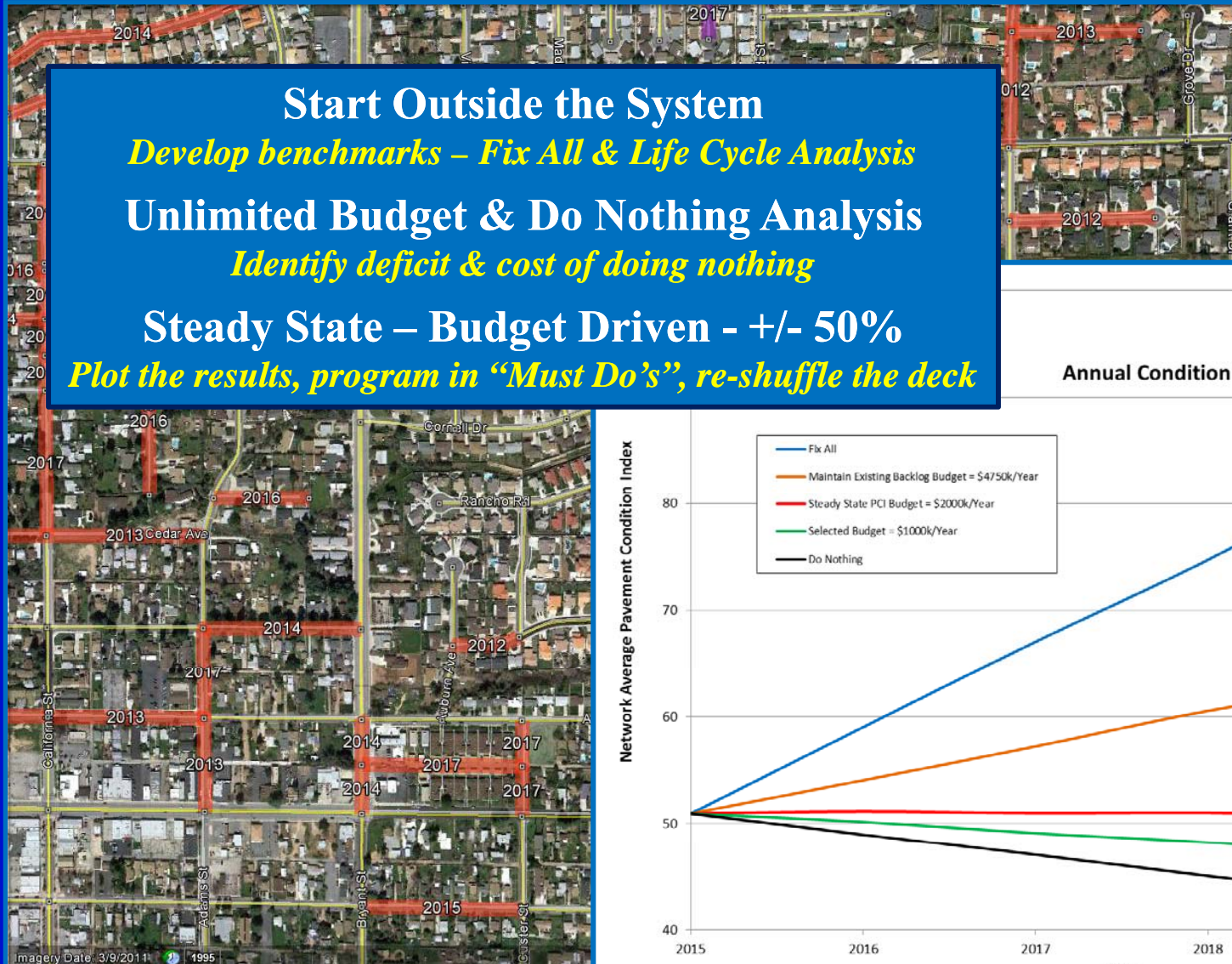
Develop benchmarks – Fix All & Life Cycle Analysis

Unlimited Budget & Do Nothing Analysis

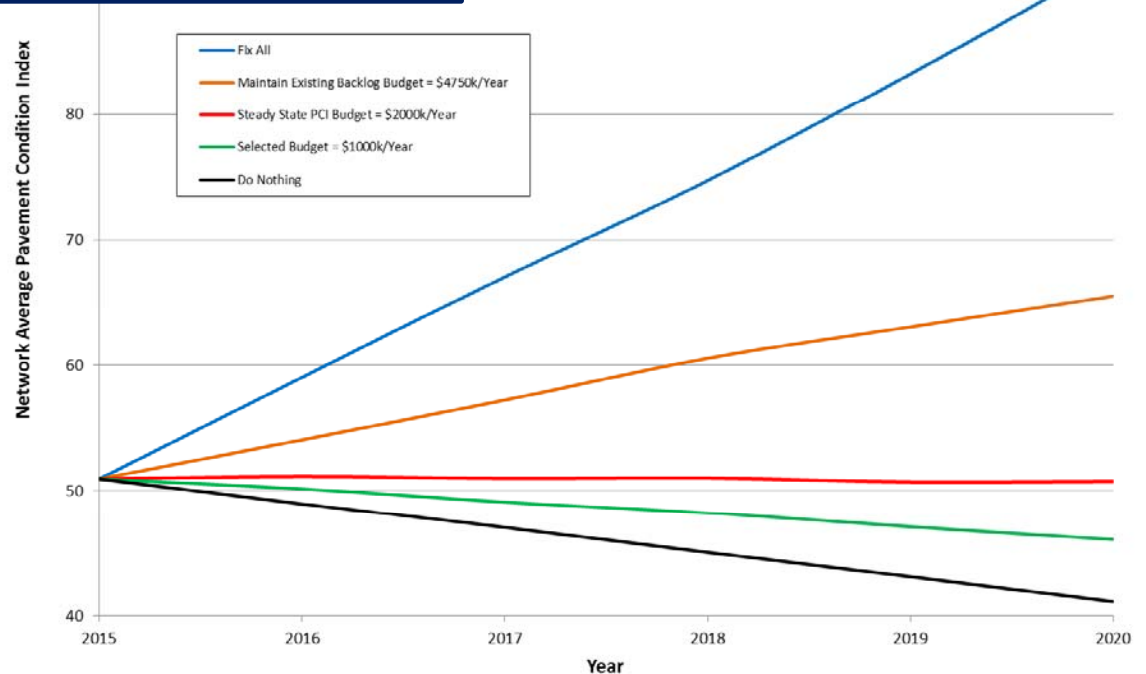
Identify deficit & cost of doing nothing

Steady State – Budget Driven - +/- 50%

Plot the results, program in “Must Do’s”, re-shuffle the deck



Annual Condition for Various Budget Levels



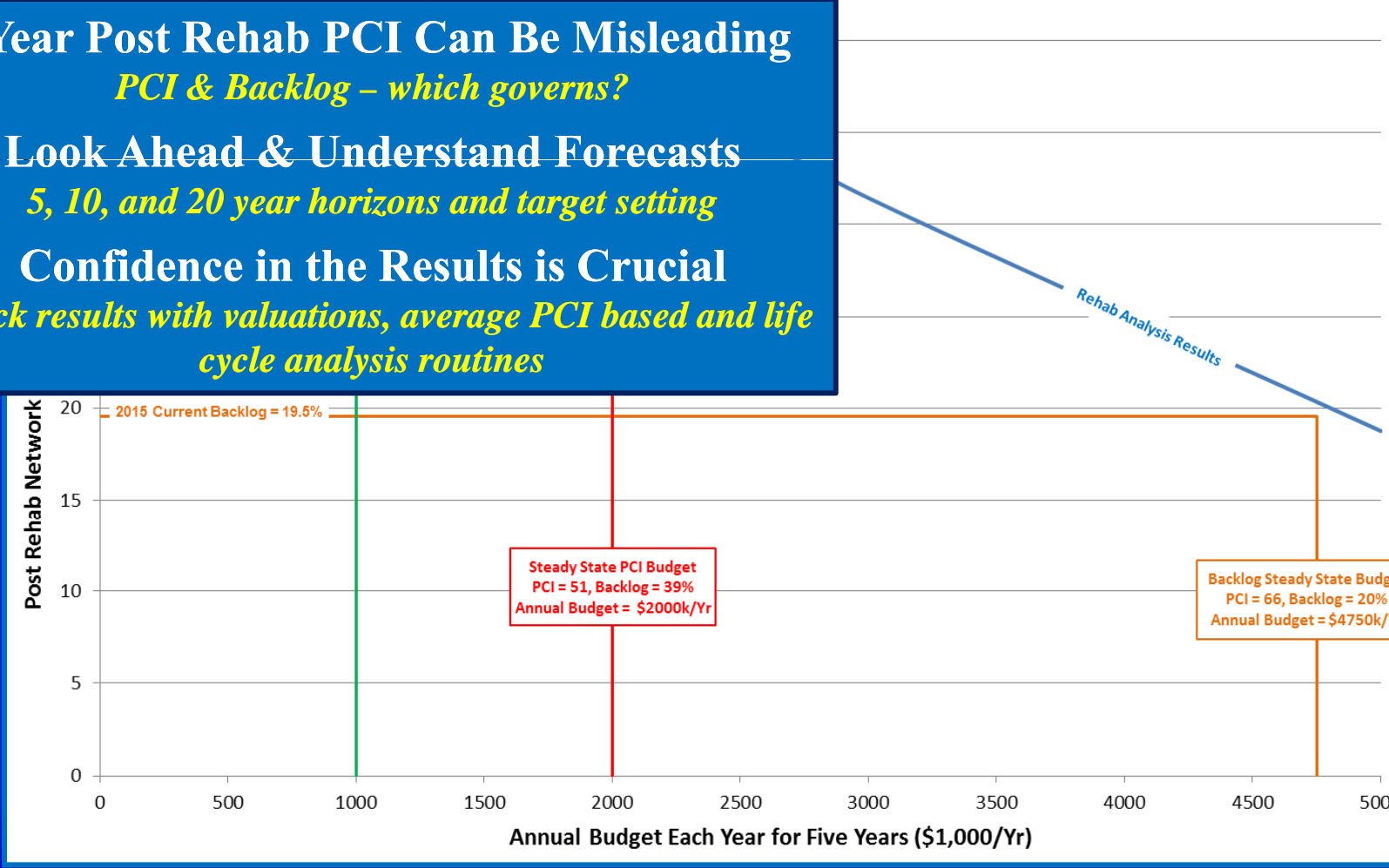
What About Backlog?



5-Year Post Rehab PCI Can Be Misleading
PCI & Backlog – which governs?

Look Ahead & Understand Forecasts
5, 10, and 20 year horizons and target setting

Confidence in the Results is Crucial
Check results with valuations, average PCI based and life cycle analysis routines



Defensible Results... Why This And Not That?



Not Selected

An ugly street stays ugly for a long time,
but good streets deteriorate fast

Reconstruction money was directed to
overlays and surface treatment

What About ADA Compliance...



Ignoring ADA is not an Option

Legal and Risk Opinion



1 mile = 17,600 yd² @ 30'
Approximately 25 to 35 ramps
At \$2,500 ea = \$4.25/yd²

Types of PM Software Available



Comprehensiveness ↑

Engineered Solutions
analytical – optimization

Enterprise Wide Solutions
GIS Integration, Modular, Programming

Publically Maintained
Cost – Acceptance

Roadsoft



STREETSAVER Online
MTC Pavement Management Software v.9

Cityworks

Lucidity

Cartegraph
The Operations Management System.

infor

Deighton

Stantec

Pave Pro Manager
Version for Windows 95/NT
© 1998-IMS Infrastructure Management Services, Inc.

Investment →

Software Alternative: IMS Spreadsheet



City of Monroe, WA Inventory and Condition Summary										Pavement Condition Summary										Peripheral Concrete (optional)										Network Analysis Summary									
GISID	Agency ID	Street Number	Block Number	On St	Miles:	64.4	Total:	339,813	339,813	1387	Subwalk Loading (# of sides)	Subwalk Length (ft)	Subwalk Area (yd2)	Curb Length (ft)	Estimated Ramp Count	Need Year	Committed Year	Year of First Rehab Selection	Segment Rehab Results	Rehab Activity Code	Rehab Activity	Average Unit Rate (\$/yd)	Segment Cost (\$)	\$ Year Post Rehab PCI	Program Year	Annual Budget (\$)	Annual Budget (\$)	Year	Block Count	Annual Expenditure (\$)	Miles	PCI	Backlog (%)						
768	24295	1000	10	136TH	0.00	0	0	0	0	5	0	0	0	0	5	0	5	Selected Yr 5	23	Surface Trmnt / Chip Seal + RR	4.69	33,600	88	Avg:	750,000	750	2015	646	10,687,700	50.1	71	5.1							
803	24327	1010	10	136TH	2.00	784	348	784	3	6	0	0	0	0	6	0	0	Not Selected						1	750,000	2016	51	747,500	3.9	71	88								
804	24328	1010	20	136TH	2.00	301	134	301	3	6	0	0	0	0	6	0	0	Not Selected						2	750,000	2017	50	749,300	3.4	71	89								
814	24336	1020	10	137TH	2.00	2,087	928	2,087	4	6	0	0	0	0	6	0	0	Not Selected						3	750,000	2018	58	745,100	4.5	72	89								
757	24487	1030	10	137TH	2.00	644	286	644	3	6	0	0	0	0	6	0	0	Not Selected						4	750,000	2019	65	746,400	5.4	72	88								
752	24483	1030	20	137TH	0.00	0	0	0	0	6	0	0	0	0	6	0	0	Not Selected						5	750,000	2020	61	740,000	5.7	72	8.8								
833	24497	1040	10	143RD	0.00	0	0	0	0	6	0	0	0	0	6	0	0	Not Selected						Totals:				285	3,728,300	22.9	72	8.8							
834	24498	1040	20	143RD	2.00	612	272	612	3	6	0	0	0	0	6	0	0	Fall Thru Yr 1																					
740	24169	1050	10	146TH	2.00	2,358	1,048	2,358	4	1	0	0	0	0	1	0	0	Fall Thru Yr 1																					
729	24161	1050	20	146TH	1.00	498	221	498	2	1	0	1	0	1	0	1	0	Selected Yr 1	56	FWM + Thick Overlay (> 2.0 - 3.0) + RR	27.74	61,400	92																
539	24576	1060	10	147TH	1.00	247	110	247	2	1	0	1	0	1	0	1	0	Selected Yr 1	56	FWM + Thick Overlay (> 2.0 - 3.0) + RR	32.50	23,200	92																
646	24072	1080	10	149TH	1.00	247	110	247	2	1	0	1	0	1	0	1	0	Selected Yr 1	56	FWM + Thick Overlay (> 2.0 - 3.0) + RR	32.92	22,600	92																
655	24077	1080	20	149TH	0.00	0	0	0	0	1	0	1	0	1	0	1	0	Selected Yr 1	56	FWM + Thick Overlay (> 2.0 - 3.0) + RR	18.77	13,000	92																
645	24071	1080	30	149TH	2.00	1,149	511	1,149	3	6	0	0	0	0	6	0	0	Not Selected																					
1001	36160	1080	40	149TH	2.00	555	247	555	3	6	0	0	0	0	6	0	0	Not Selected																					
1000	36159	1080	50	149TH	2.00	525	233	525	3	6	0	0	0	0	6	0	0	Not Selected																					
644	24070	1080	60	149TH	2.00	470	209	470	3	6	0	0	0	0	6	0	0	Not Selected																					
534	24573	1080	70	149TH	0.00	0	0	0	0	3	0	0	0	0	3	0	3	Selected Yr 3	60	Surface Recon + Base Rehab	29.46	26,600	96																
704	24103	1090	10	150TH	0.00	0	0	0	0	3	0	0	0	0	3	0	3	Selected Yr 3	60	Surface Recon + Base Rehab	29.46	21,600	96																
1006	36164	1100	10	150TH	0.00	0	0	0	0	3	0	0	0	0	3	0	3	Selected Yr 3	60	Surface Recon + Base Rehab	29.46	21,600	96																
721	24156	1100	20	150TH	2.00	346	154	346	3	6	0	0	0	0	6	0	0	Not Selected																					
722	24157	1100	30	150TH	2.00	849	378	849	3	6	0	0	0	0	6	0	0	Not Selected																					
530	24569	1110	10	150TH	2.00	646	287	646	3	6	0	0	0	0	6	0	0	Not Selected																					
533	24572	1110	20	150TH	2.00	519	231	519	3	6	0	0	0	0	6	0	0	Not Selected																					
1088	36201	1120	10	152ND	2.00	521	232	521	3	6	0	0	0	0	6	0	0	Not Selected																					
710	24108	1120	20	152ND	2.00	520	231	520	3	6	0	0	0	0	6	0	0	Not Selected																					
654	24076	1130	10	152ND	2.00	299	133	299	3	6	0	0	0	0	6	0	0	Not Selected																					
1009	36167	1140	10	152ND	2.00	777	345	777	3	6	0	0	0	0	6	0	0	Not Selected																					
1007	36165	1140	20	152ND	2.00	687	306	687	3	1	0	2	0	2	0	2	0	Selected Yr 2	40	EM + Moderate Overlay (2.0 - 3.0)	21.27	26,800	91																
1008	36166	1140	30	152ND	2.00	700	311	700	3	1	0	2	0	2	0	2	0	Selected Yr 2	40	EM + Moderate Overlay (2.0 - 3.0)	21.19	27,200	91																
718	24154	1140	40	152ND	2.00	707	314	707	3	1	0	2	0	2	0	2	0	Selected Yr 2	40	EM + Moderate Overlay (2.0 - 3.0)	21.22	27,500	91																
988	32927	1150	10	153RD	2.00	613	272	613	3	1	0	1	0	1	0	1	0	Selected Yr 1	10	EM + Moderate Overlay (2.0 - 3.0) + Prntive Mntnace	0.17	200	81																
181	9622	1160	10	153RD	2.00	383	213	383	3	4	0	0	0	0	4	0	0	Fall Thru Yr 4																					
182	9623	1160	20	153RD	2.00	435	242	435	3	4	0	0	0	0	4	0	0	Fall Thru Yr 4																					
184	9624	1160	30	153RD	2.00	456	253	456	3	4	0	0	0	0	4	0	0	Fall Thru Yr 4																					
274	9674	1170	10	153RD	2.00	544	302	544	3	4	0	0	0	0	4	0	0	Fall Thru Yr 4																					
990	32928	1180	10	154TH	2.00	305	169	305	3	4	0	0	0	0	4	0	0	Fall Thru Yr 4																					
1037	32865	1180	20	154TH	2.00	956	531	956	3	4	0	0	0	0	4	0	0	Fall Thru Yr 4																					
1036	32864	1180	30	154TH	2.00	336	187	336	3	4	0	0	0	0	4	0	0	Fall Thru Yr 4																					
1035	32863	1180	40	154TH	2.00	379	211	379	3	4	0	0	0	0	4	0	0	Fall Thru Yr 4																					
188	9630	1180	50	154TH	2.00	329	150	329	3	4	0	0	0	0	4	0	0	Fall Thru Yr 4																					
186	9629	1180	60	154TH	2.00	359	167	359	3	4	0	0	0	0	4	0	0	Fall Thru Yr 4																					
1043	32869	1180	70	154TH	2.00	329	150	329	3	4	0	0	0	0	4	0	0	Fall Thru Yr 4																					
1044	32870	1180	80	154TH	2.00	359	167	359	3	4	0	0	0	0	4	0	0	Fall Thru Yr 4																					
992	32930	1180	90	154TH	2.00	353	196	353	3	4	0	0	0	0	4	0	0	Fall Thru Yr 4																					
993	32931	1180	100	154TH	2.00	494	275	494	3	4	0	0	0	0	4	0	0	Fall Thru Yr 4																					
1031	32860	1180	110	154TH	2.00	1,273	707	1,273	3	4	0	0	0	0	4	0	0	Fall Thru Yr 4																					
1032	32861	1180	120	154TH	2.00	519	288	519	3	4	0	0	0	0	4	0	0	Fall Thru Yr 4</																					

Deciding Which Is Right For You?



Buying software in the first place

about 1/3 of the implementations sit on the shelf, accessed a few times a year and folks forget how to operate the system (be honest with yourself)

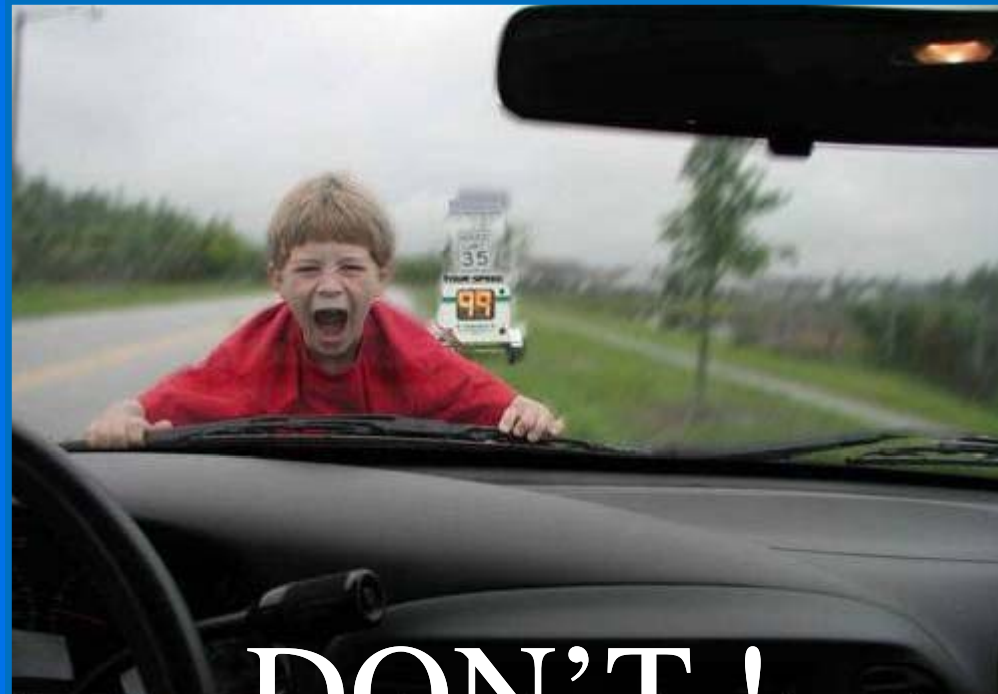
Buying too little software

GIS Integration, rigid segmentation, black box (one size fits all approach), no assets, no optimization, no scalability, no enhancements (IRI, deflection, customization), doesn't integrate with existing agency functions

Buying too much software

empty box, open configuration, unlimited prioritization, operating parameters are customizable, high technical competency

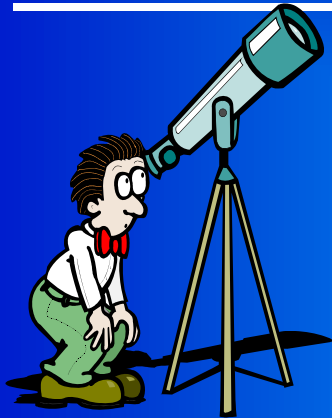
Bonding....



DON'T !

You cannot bond your way out of an ongoing obligation
Think of streets as a utility, not a general fund expense
Bonding doesn't make financial **CENTS!**

One Minute Close...



Its Only Pavement Management
horse shoes and hand grenades;
don't sweat the small stuff

Start From a Good Foundation
GIS, understanding, training



1 Agency, 1 Network, 1 Funding Source
Avoid managing pavements by districts

Questions ?



What If Your Underfunded?



City of Sandy Springs Equity Removal Summary

Strategies For Being Underfunded
There are none, you can only minimize the net loss

Two Almost Workable Strategies
Maintain the best and let the rest slide
Apply substandard rehabs with hopes of recovering later – in reality this never works

				Annual	\$4.00M Annual	Steady State
Annual Budget (\$k/Year):	0	1,000	2,000	3,100	4,000	4,250
Starting PCI	71	71	71	71	71	71
						71
						0
						0
5 Year Budget Expenditure (\$):	0	5,000,000	10,000,000	15,500,000	20,000,000	21,250,000
Total 5 Year Cost (\$):	31,141,000	29,600,000	26,848,000	24,346,000	22,028,000	21,250,000
Cost Over Steady State Budget (\$):	9,891,000	8,350,000	5,598,000	3,096,000	778,000	0
Additional Annual Cost Over Steady State (\$/year):	1,978,200	1,670,000	1,119,600	619,200	155,600	0

Long term underfunding of rehabilitation and maintenance is the direct equivalent of removing equity from an asset – eventually it must be repaid through total reconstruction.