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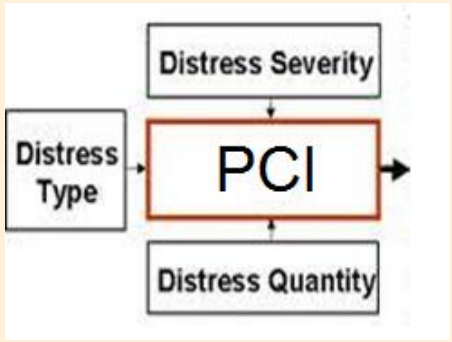
MOST EFFECTIVE PAVEMENT MAINTENANCE TREATMENTS FOR NEW MEXICO AIRPORTS

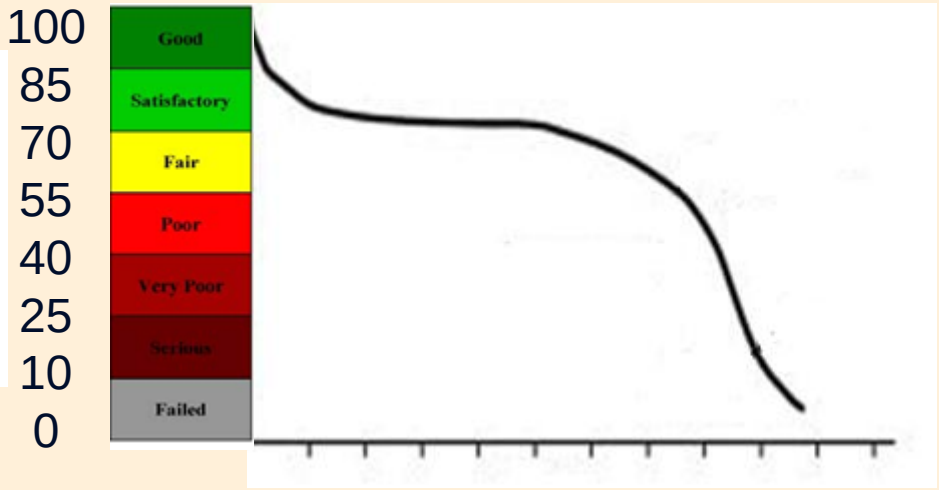
Md Mostaqur Rahman
Dr. Rafiqul A Taterfder
Department of Civil Engineering

THE UNIVERSITY of NEW MEXICO

Motivation

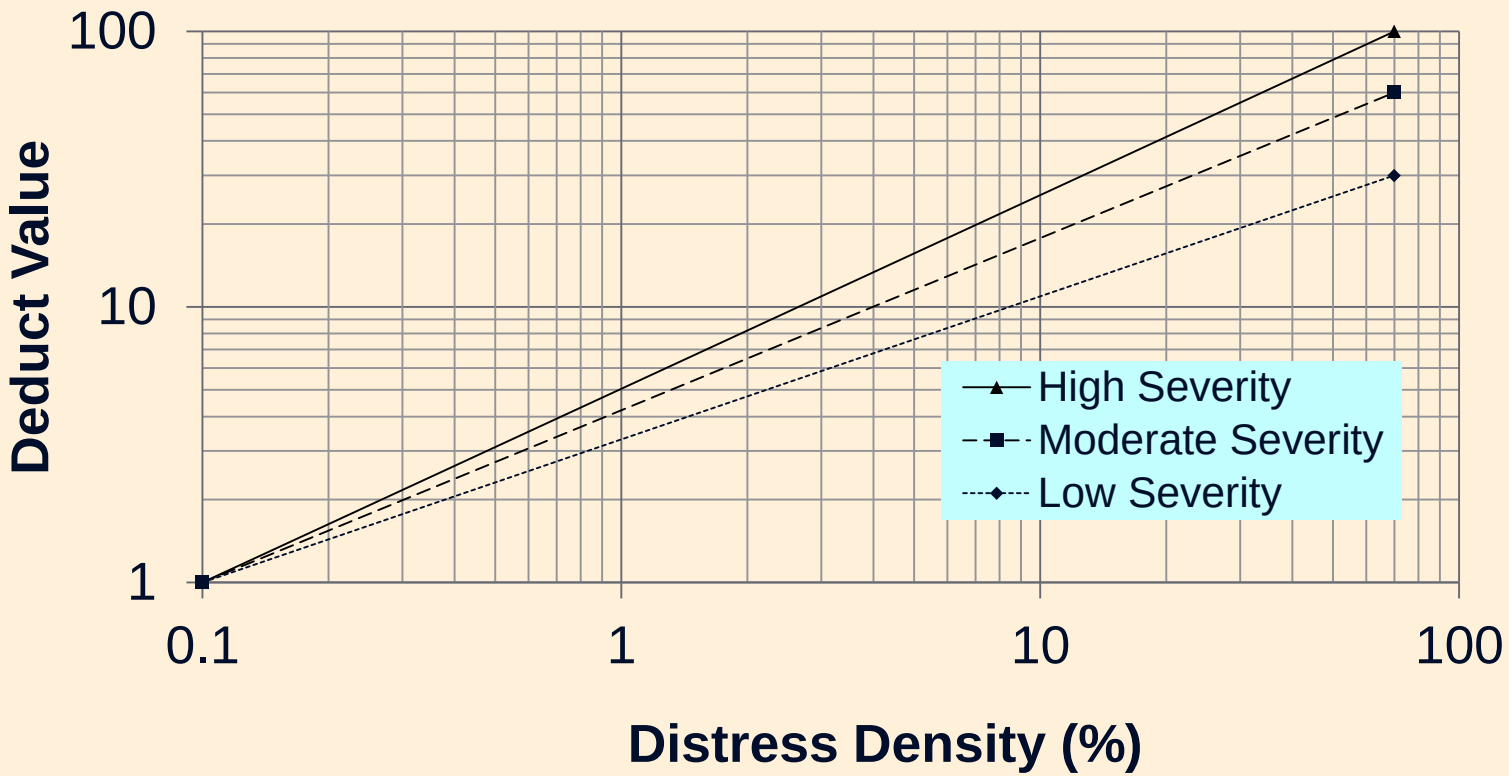
- **Airfields of about 50 airports have been surveyed to record visual surface distresses in 2007**
- **4 airports have been analyzed in current study**





❖ **Critical PCI** Deterioration Rate (↑) Maintenance Cost (↑)

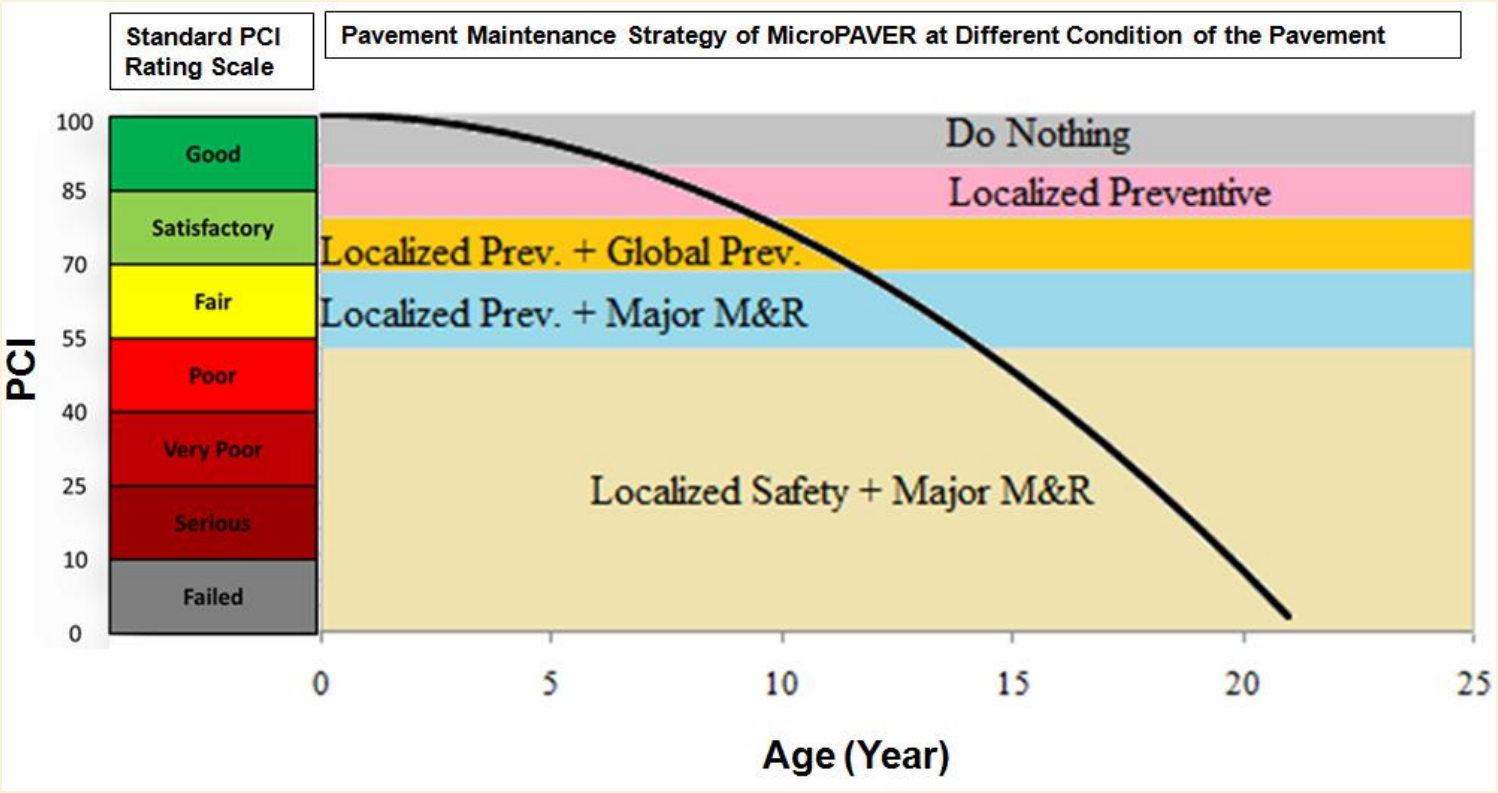
PCI Calculation (ASTM D 5340)



PCI of New Mexico Airports

Airport	Pavement Area (sq. m)	Current PCI	Deterioration Rate (PCI/yr)	Average PCI Maintained, (M)	Required Money ($)
Fort Sumner	150,542	61	1.68	77	23,325,225
Grants	84,449	59	1.74	84	9,272,285
Santa Rosa	93,638	67	1.37	74	13,199,833
Questa	55,860	62	1.79	81	7,927,892

MicroPAVER M&R Strategy



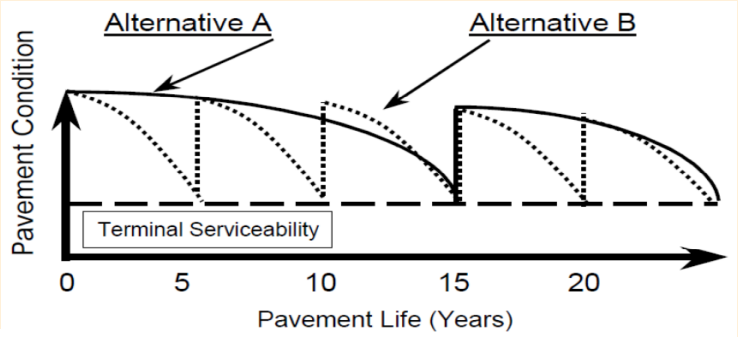
Objectives

- **PCI Improvement (Functional Benefit)**
- **Life Cycle Cost (Economic Benefit)**
- **Emission Cost (Environmental Benefit)**
- **Accident Cost (Social Benefit)**
- **Benefit to Cost Ratio**

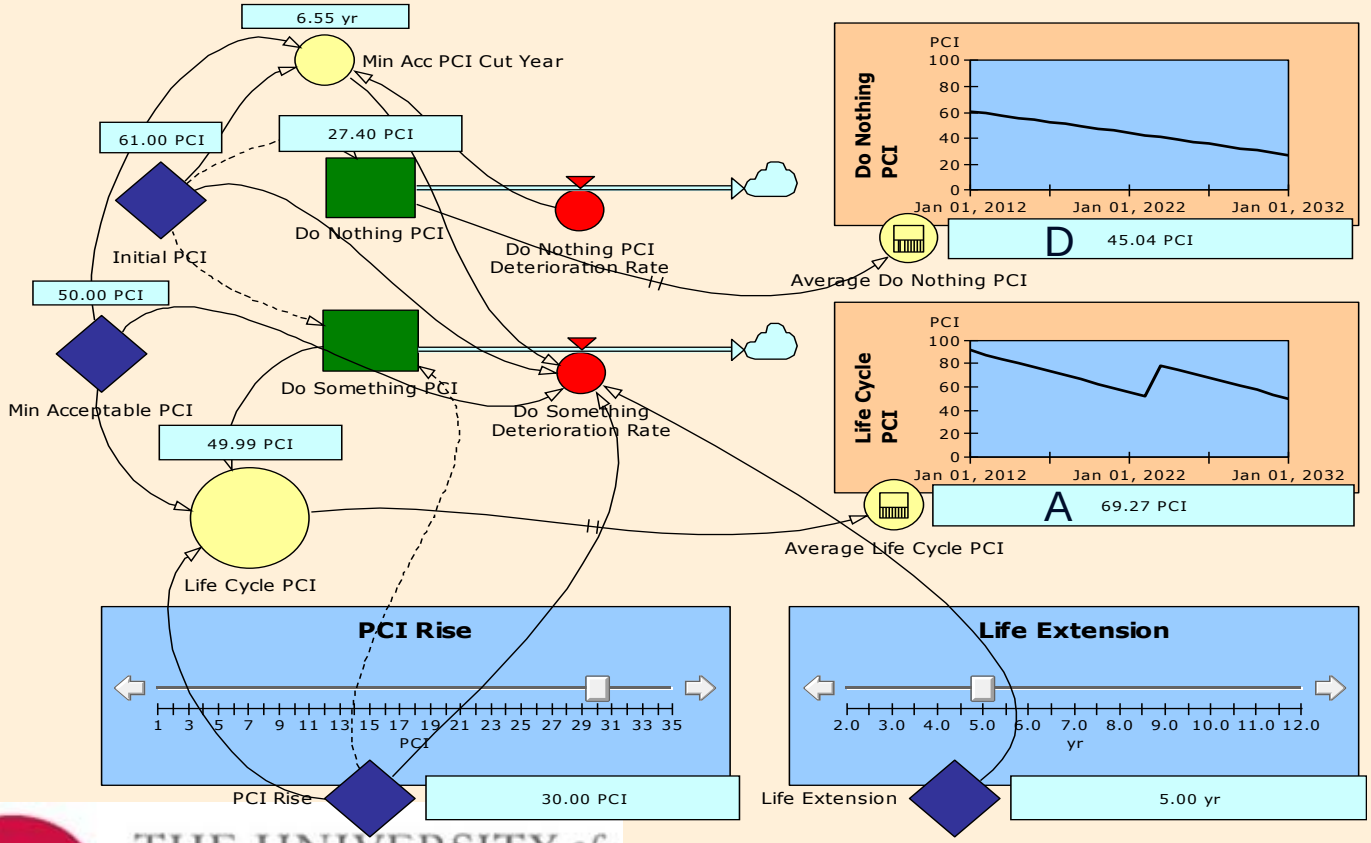
$$BenefittoCostRatio = \frac{FunctionalBenefit}{LCC + EmissionCost + AccidentCost}$$

Project Alternatives

Alternative	Maintenance	Unit Cost ($/ Sq. m)	Life Extension (yrs)	PCI Rise
1	Crack Sealing	1.19-2.38	2-3	5
2	Spray Patching	3.57-9.52	2-5	5
3	Slurry Seal	2.38-4.76	3-7	30
4	Thin Overlay	7.14-10.71	7-12	35



Functional Benefit



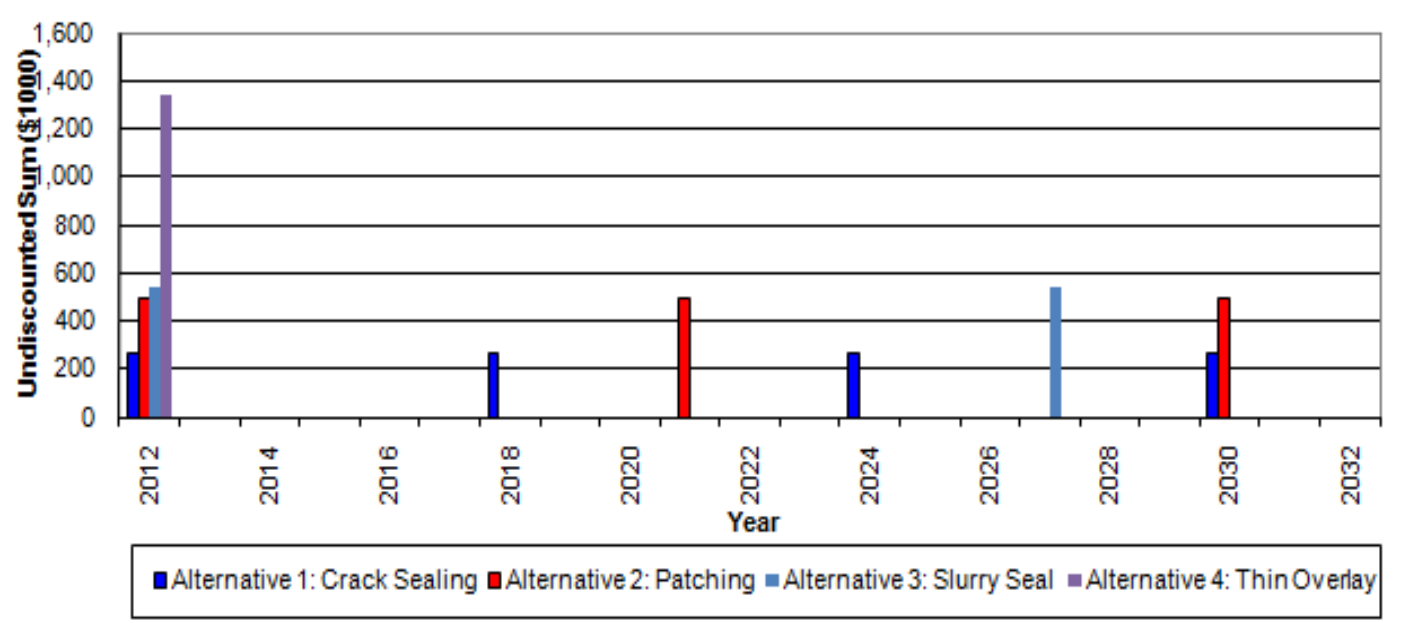
$$B = \$ \times \frac{A - D}{M - D}$$

Benefit Results

Alternative	Average PCI	Frequency (yrs)	No. of Application	Functional Benefit ($ 1000)
Do Nothing	45.04	NA	0	0
1	52.91	6	4	5,742
2	52.93	9	3	5,759
3	68.41	15	2	17,057
4	70.03	21	1	18,239

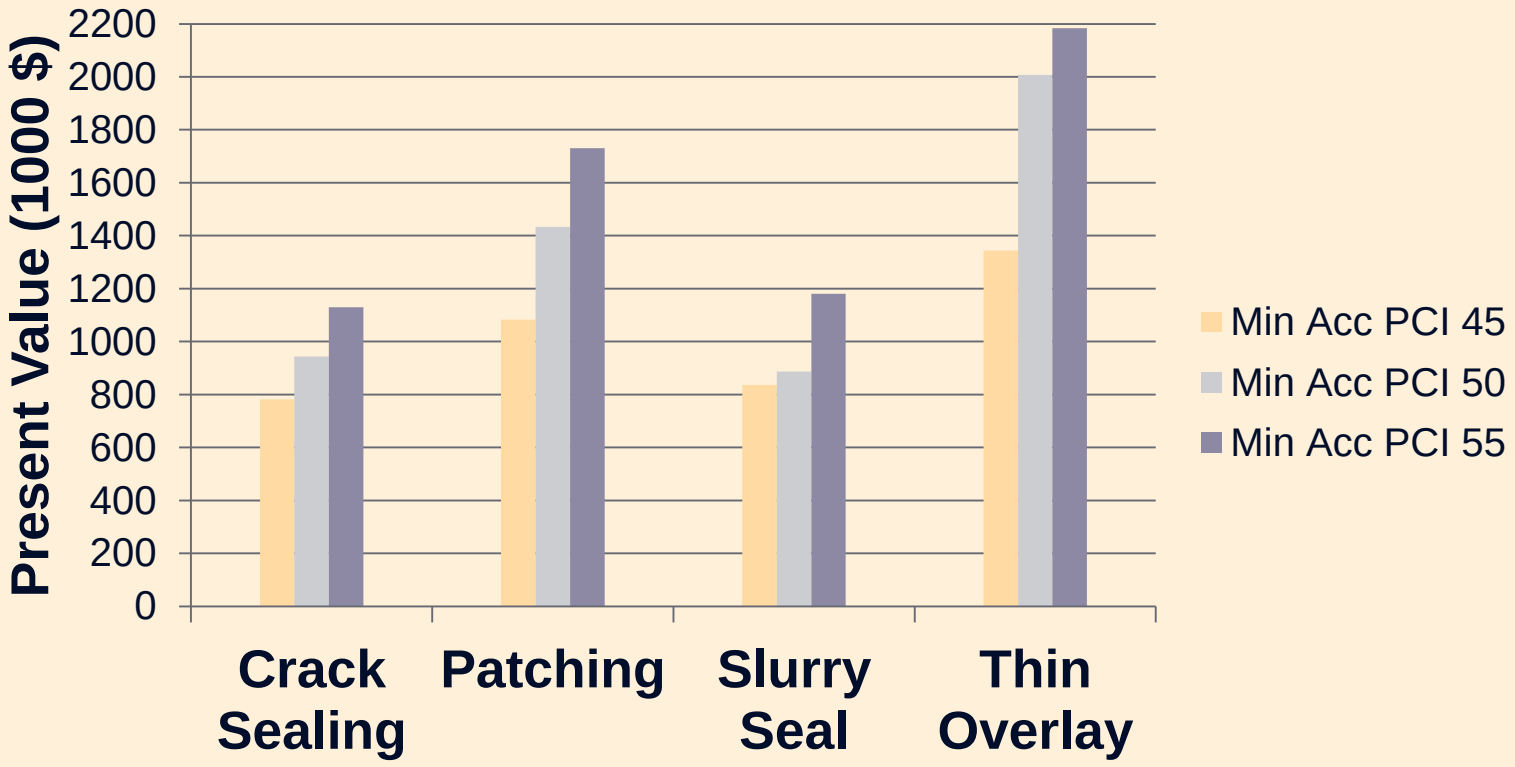
Fort Sumner Airport (Minimum Acceptable PCI = 45)

Life Cycle Cost Analysis



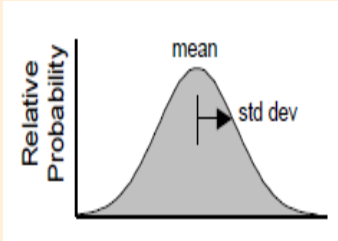
$$NPW = InitialCost + \sum FutureCost \times \left(\frac{1}{(1+i)^n}\right)$$

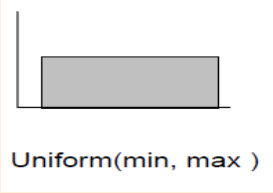
Deterministic LCCA

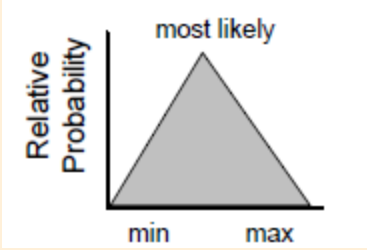


Probabilistic LCCA Inputs

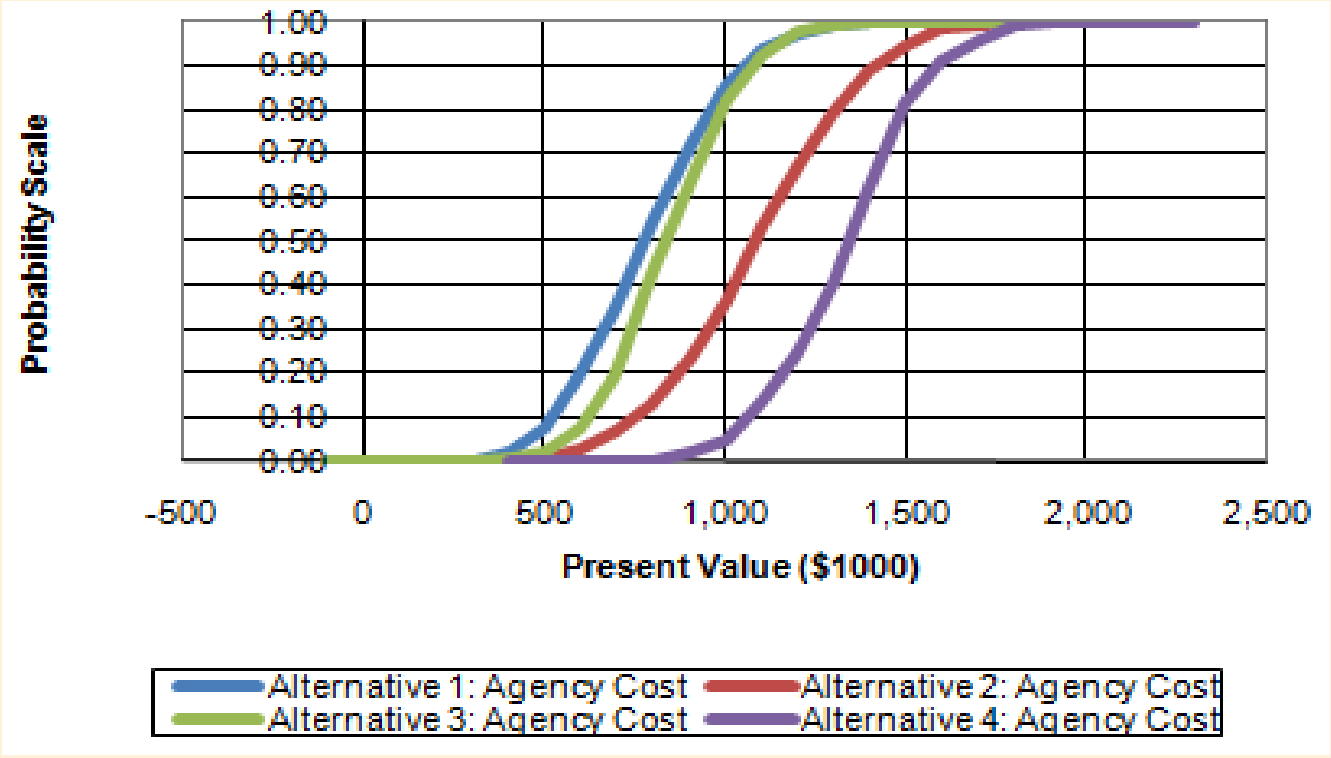
Variables	Distribution Types	Controlling Parameters
Cost	Normal	(Mean, SD) $/sq. m. Alt 1 (1.79, 0.6) Alt 2 (6.55, 2.04) Alt 3 (3.57, 0.98) Alt 4 (8.93, 1.33)
Work Zone Duration	Uniform	(Min, Max) days All Alt (90, 120)
Discount Rate	Triangular	(Min, Most Likely, Max) All Alt (3, 4, 5) %







Probabilistic LCCA



Emission

Alternative	Area Applied (sq. m.)	Thickness (mm)	Density (ton/ cu. m.)	No. of Application	Volume of Work (cu. m.)
1	150542	3	1.09	4	1806
2	75272	6	1.60	3	1354
3	150542	15	1.60	2	4516
4	150542	25	2.38	1	3764

Alternative	NO (ton)	PM (ton)	SO2 (ton)
1	15.38	2.58	59.96
2	11.54	1.92	44.93
3	38.48	6.43	149.9
4	32.57	5.44	126.81

Environmental Cost

Emission	Environmental Cost ($/ per ton)
NO	10, 300
PM	63,300
SO2	13,620

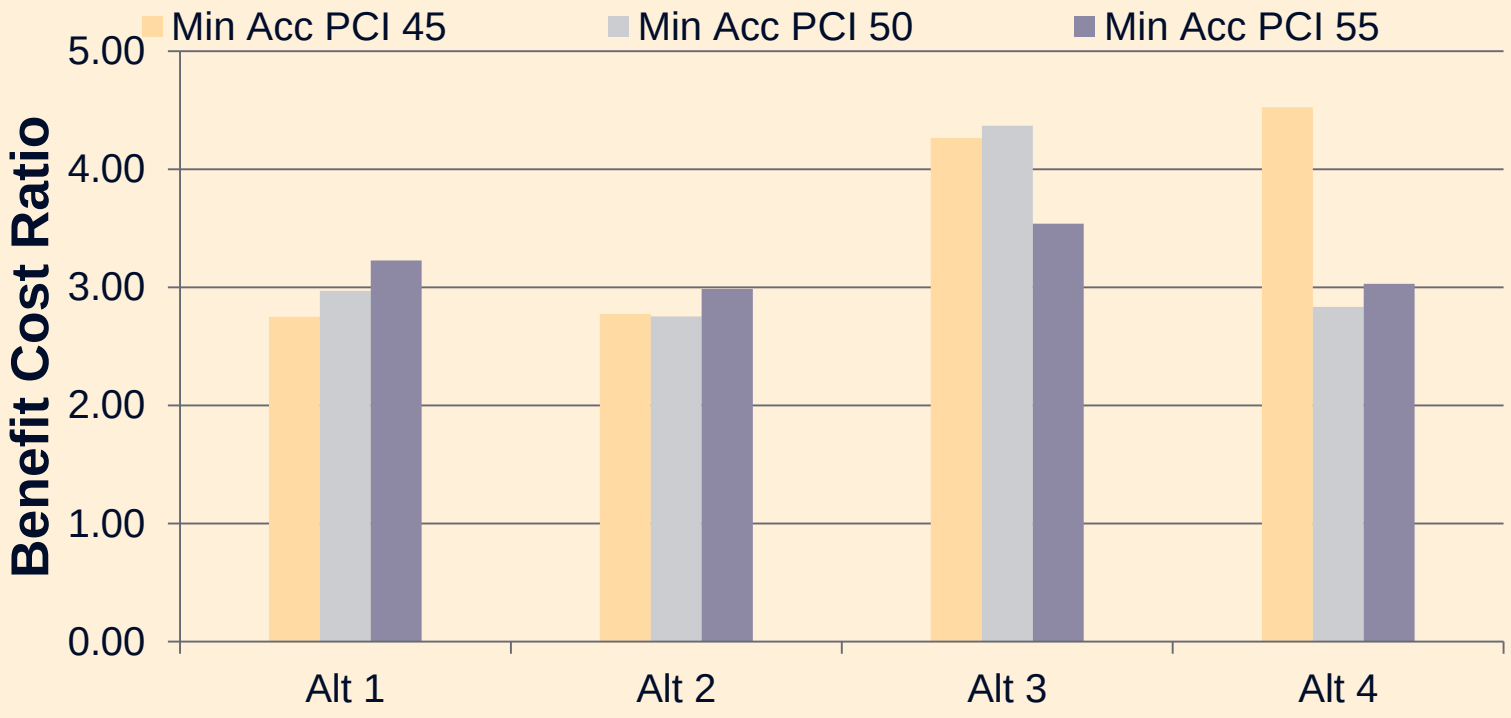
Alternative	Environmental Cost ($)
1	1,238,814
2	927,540
3	3,095,993
4	2,619,323

Accident Cost Analysis

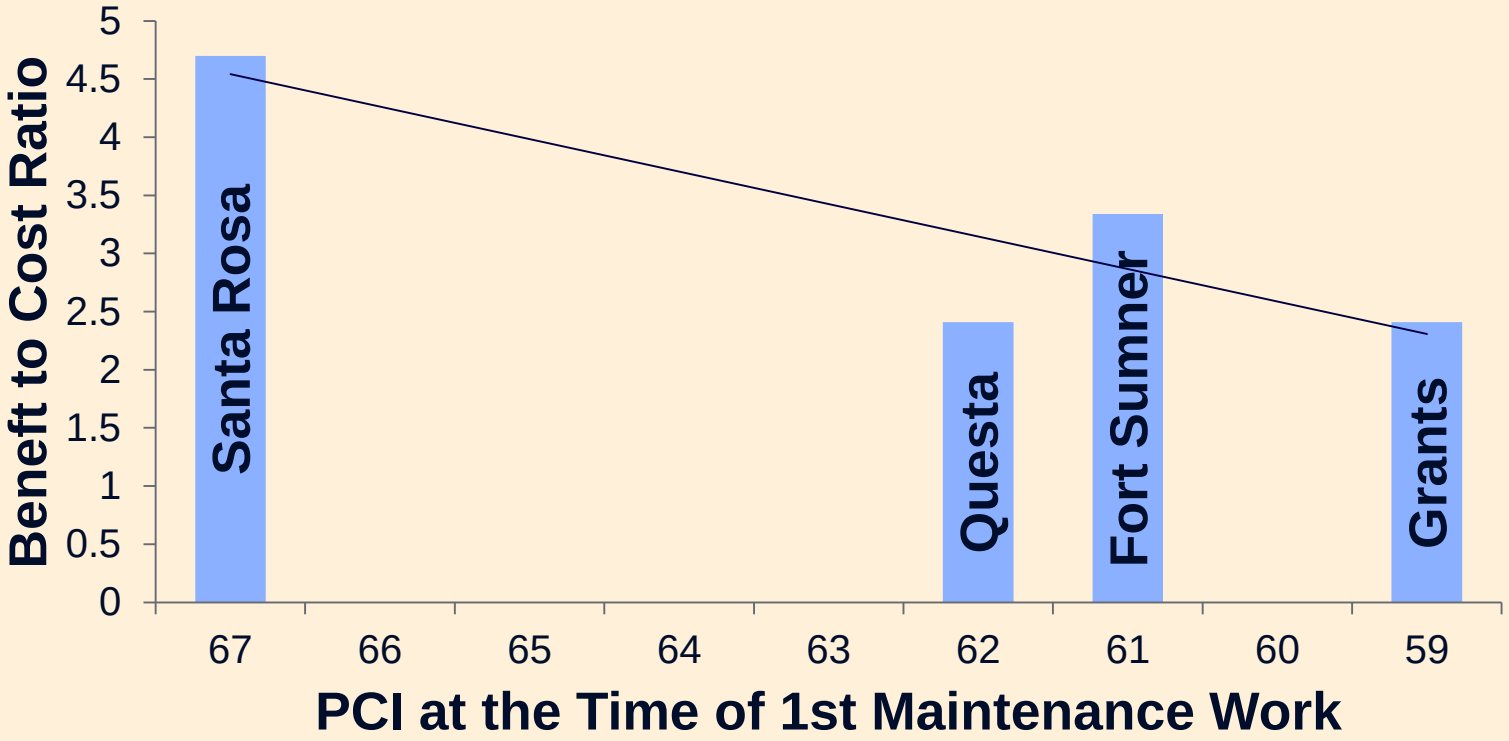
Airport	Annual Operation	No. of Accidents	Accident Cost ($)
Fort Sumner	150	1	66,045
Grants	8450	6	396,270
Santa Rosa	2130	2	132,090
Questa	3000	2	132,090

Accident = f (IRI, Traffic)

Benefit to Cost Ratio



Benefit to Cost Ratio



Conclusion

- Crack sealing is better than Patching
- Slurry seal is better than Overlay
- Minimum PCI 50 has given highest benefit
- Overlay has more functional benefit
- Patching is more environment friendly
- Maximum B/C is obtained for better airfield

Thank You

Any Question?