

APPENDIX 7: LIST OF TABLES

Table 2-1 LCCA Analysis Periods

Alternative Life	CAPM	20-Yr	More than 20 years
CAPM	20 years	35 years	55 years
20-Yr	35 years	35 years	55 years
More than 20 years	55 years	55 years	55 years

Table 2-2 Caltrans Climate Region Classification

Caltrans Climate Regions	Climate Regions for Pavement M&R Schedules
North Coast	All Coastal
Central Coast	
South Coast	
Inland Valley	Inland Valley
High Mountain	High Mountain and High Desert
High Desert	
Desert	Desert
Low Mountain	Low Mountain and South Mountain
South Mountain	

Table 2-3 Priority Matrix

Ride Quality	Structural Distress	MSL 1	MSL 2	MSL 3
		Priority Number	Priority Number	Priority Number
Poor Ride	Major	1	2	11
	Minor	3	4	12
	None	5	6	12
Acceptable Ride	Major	7	8	13
	Minor	9	10	14
	None	31, 32, 33	31, 32, 33	31, 32, 33
	No Distress	98, 99	98, 99	98, 99

Table 3-1 Traffic Input Values

Type of Terrain	Two-Lane Highways			Multi-Lane Highways		
	Level	Rolling	Mountainous	Level	Rolling	Mountainous
Free Flow Capacity (vphpl)	1,620	1,480	1,260	2,170	1,950	1,620
Queue Dissipation Capacity (vphpl)	1,710	1,570	1,330	1,700	1,530	1,270
Maximum AADT Per Lane	40,955	37,390	31,850	53,773	48,305	40,140
Work Zone Capacity (vphpl) ⁽³⁾	1,050	960	820	1,510	1,360	1,130
Maximum Queue Length	One or two exits prior to the work zone or 7.0 miles if the estimated maximum queue length is longer than 7.0 miles			One or two exits prior to the work zone or 5.0 miles if the estimated maximum queue length is longer than 5.0 miles		

Notes:

(1) Derived from Highway Capacity Manual 2000.

(2) Refer to the calculation procedures included in Appendix 5, "Traffic Inputs Estimation".

(3) Assumed one lane to be open for traffic in single-lane highways and two or more lanes to be open for traffic in multi-lane highways.

Table 3-2 Transportation Component Consumer Price Indexes*

Year	US	LA CMSA ⁽¹⁾	SF CMSA ⁽²⁾	SD CMSA ⁽³⁾
1996	143.0	144.3	133.5	150.8
1997	144.3	145.2	133.6	152.2
1998	141.6	142.6	132.0	149.4
1999	144.4	146.8	135.8	152.1
2000	153.3	154.2	143.1	162.4
2001	154.3	155.3	143.7	164.9
2002	152.9	154.5	141.0	163.0
2003	157.6	160.3	144.9	168.0
2004	163.1	166.5	149.6	175.6
2005	173.9	174.8	156.1	185.5
2006	180.9	181.6	161.5	190.4
2007	184.7	183.2	166.6	193.2
2008	195.5	192.6	176.3	200.7
2009	179.3	178.6	166.7	184.7
2010	193.4	190.9	178.1	200.4
2011	212.4	207.8	190.8	222.7
2012	217.3	214.0	197.3	227.7

Notes:

* Source: US Department of Labor, Bureau of Labor Statistics

<http://www.bls.gov/cpi/>

(1) LA CMSA (Consolidated Metropolitan Statistical Area): includes counties of Los Angeles, Orange, Riverside, San Bernadino, & Ventura.

(2) SF CMSA (Consolidated Metropolitan Statistical Area): includes counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, & Sonoma.

(3) SD CMSA (Consolidated Metropolitan Statistical Area): includes county of San Diego.

Table 3-3 Final Pavement Surface Choices

Final Pavement Surface		
Flexible	Rigid	
HMA	JPCP	CRCP
HMA W/OGFC	JPCP CPR A	CRCP PR A
HMA W/RHMA	JPCP CPR B	CRCP PR B
RHMA	JPCP CPR C	CRCP PR C
RHMA W/ RHMA O	Composite—HMA or RHMA over Rigid (crack, seat, overlay)	

Table 3-4 Productivity Estimates of Typical Future Rehabilitation Strategies for Flexible Pavements

Final Surface Type	Future M&R Alternative	Pavement Design Life (years)	Maintenance Service Level	Average Lane-mile Completed Per Closure				
				Daily Closure (Weekday)		Continuous Closure		
				5 to 7-Hour Closure	8 to 12-Hour Closure	16 hour/Day Operation	24 hour/day Operation	55-hour Weekend Closure
CAPM								
HMA	Overlay	5+	1,2,3	0.84	1.73	2.9	4.81	12.25
	Mill & Overlay	5+	1,2,3	0.36	0.75	1.18	2.21	5.20
HMA w/OGFC	Overlay	5+	1,2,3	0.55	1.14	1.9	3.17	8.09
	Mill & Overlay	5+	1,2,3	0.30	0.61	0.97	1.86	4.35
HMA w/RHMA	Overlay	5+	1,2,3	0.55	1.14	1.9	3.17	8.09
	Mill & Overlay	5+	1,2,3	0.30	0.61	0.97	1.86	4.35
RHMA-G	Overlay	5+	1,2,3	1.12	2.32	3.86	6.41	16.33
	Mill & Overlay	5+	1,2,3	0.48	1.00	1.56	2.93	6.88
RHMA-G w/RHMA-O	Overlay	5+	1,2,3	0.84	1.73	2.9	4.81	12.25
	Mill & Overlay	5+	1,2,3	0.34	0.72	1.14	2.17	5.13
Rehabilitation								
HMA	Overlay	10	1,2,3	0.47	0.98	1.63	2.72	6.94
		20	1,2,3	0.33	0.69	1.15	1.91	4.87
	Mill & Overlay	10	1,2,3	0.21	0.45	0.73	1.37	3.23
		20	1,2,3	0.15	0.31	0.49	0.93	2.18
HMA w/OGFC	Overlay	10	1,2,3	0.35	0.75	1.26	2.10	5.37
		20	1,2,3	0.27	0.57	0.95	1.58	4.04
	Mill & Overlay	10	1,2,3	0.19	0.39	0.64	1.23	2.9
		20	1,2,3	0.14	0.28	0.45	0.86	2.01
HMA w/RHMA	Overlay	10	1,2,3	0.35	0.75	1.26	2.1	5.37
		20	1,2,3	0.27	0.57	0.95	1.58	4.04
	Mill & Overlay	10	1,2,3	0.19	0.39	0.64	1.23	2.90
		20	1,2,3	0.14	0.28	0.45	0.86	2.01
RHMA-G	Overlay	10	1,2,3	0.84	1.73	2.90	4.81	12.25
		20	1,2,3	0.55	1.14	1.90	3.17	8.09
	Mill & Overlay	10	1,2,3	0.37	0.75	1.18	2.21	5.20
		20	1,2,3	0.25	0.52	0.84	1.58	3.73
RHMA-G w/RHMA-O	Overlay	10	1,2,3	0.55	1.14	1.9	3.17	8.09
		20	1,2,3	0.40	0.83	1.41	2.36	6.03
	Mill & Overlay	10	1,2,3	0.30	0.61	0.97	1.86	4.35
		20	1,2,3	0.21	0.44	0.72	1.39	3.28

Notes:

- (1) Refer to Appendix 1, "Glossary and list of Acronyms" for definitions of terms used in the table.
- (2) Production rates in the table are based on representative assumptions that are applied consistently throughout the table. These rates are only for calculating future user costs for the procedures in this manual and not for any other purpose. More project specific user costs for some freeway situations can be obtained from the CA4PRS software.
- (3) 24-hour continuous closure with 16 hours of operation per day
- (4) 24-hour continuous closure with 24 hours of operation per day
- (5) 55-hour extended closure over the weekend

Table 3-5 Productivity Estimates of Typical Future Rehabilitation Ramp Strategies for Flexible Pavements

Final Surface Type	Future M&R Alternative	Pavement Design Life (years)	Maintenance Service Level	Average Lane-mile Completed Per Closure				
				Daily Closure (Weekday)		Continuous Closure		
				5 to 7-Hour Closure	8 to 12-Hour Closure	16 hour/Day Operation	24 hour/day Operation	55-hour Weekend Closure
CAPM								
HMA	Overlay	5+	1,2,3	0.51	1.02	1.71	2.85	7.29
	Mill & Overlay	5+	1,2,3	0.22	0.44	0.70	1.32	3.10
HMA w/OGFC	Overlay	5+	1,2,3	0.32	0.66	1.11	1.87	4.81
	Mill & Overlay	5+	1,2,3	0.17	0.36	0.57	1.10	2.60
HMA w/RHMA	Overlay	5+	1,2,3	0.32	0.66	1.11	1.87	4.81
	Mill & Overlay	5+	1,2,3	0.17	0.36	0.57	1.10	2.60
RHMA-G	Overlay	5+	1,2,3	0.68	1.36	2.28	3.79	9.69
	Mill & Overlay	5+	1,2,3	0.29	0.59	0.93	1.75	4.10
RHMA-G w/RHMA-O	Overlay	5+	1,2,3	0.51	1.02	1.71	2.85	7.29
	Mill & Overlay	5+	1,2,3	0.20	0.42	0.67	1.29	3.05
Rehabilitation								
HMA	Overlay	10	1,2,3	0.28	0.57	0.96	1.61	4.13
		20	1,2,3	0.19	0.40	0.68	1.13	2.90
	Mill & Overlay	10	1,2,3	0.13	0.26	0.43	0.81	1.92
		20	1,2,3	0.09	0.18	0.29	0.55	1.30
HMA w/OGFC	Overlay	10	1,2,3	0.21	0.43	0.73	1.24	3.19
		20	1,2,3	0.15	0.33	0.55	0.93	2.40
	Mill & Overlay	10	1,2,3	0.11	0.23	0.37	0.72	1.72
		20	1,2,3	0.08	0.16	0.26	0.51	1.19
HMA w/RHMA	Overlay	10	1,2,3	0.21	0.43	0.73	1.24	3.19
		20	1,2,3	0.15	0.33	0.55	0.93	2.40
	Mill & Overlay	10	1,2,3	0.11	0.23	0.37	0.72	1.72
		20	1,2,3	0.08	0.16	0.26	0.51	1.19
RHMA-G	Overlay	10	1,2,3	0.51	1.02	1.71	2.85	7.29
		20	1,2,3	0.32	0.66	1.11	1.87	4.81
	Mill & Overlay	10	1,2,3	0.22	0.44	0.70	1.32	3.10
		20	1,2,3	0.15	0.31	0.50	0.94	2.22
RHMA-G w/RHMA-O	Overlay	10	1,2,3	0.32	0.66	1.11	1.87	4.81
		20	1,2,3	0.23	0.49	0.82	1.39	3.58
	Mill & Overlay	10	1,2,3	0.17	0.36	0.57	1.10	2.60
		20	1,2,3	0.12	0.26	0.42	0.82	1.95

Notes:

- (1) Refer to Appendix 1, "Glossary and list of Acronyms" for definitions of terms used in the table.
- (2) Production rates in the table are based on representative assumptions that are applied consistently throughout the table. These rates are only for calculating future user costs for the procedures in this manual and not for any other purpose. More project specific user costs for some freeway situations can be obtained from the CA4PRS software.
- (3) 24-hour continuous closure with 16 hours of operation per day
- (4) 24-hour continuous closure with 24 hours of operation per day
- (5) 55-hour extended closure over the weekend

Table 3-6 Productivity Estimates of Typical Future Rehabilitation for Rigid and Composite Pavements

Final Surface Type	Future M&R Alternative	Pavement Design Life (years)	Maintenance Service Level	Average Lane-mile Completed Per Closure							
				Daily Closure		Continuous Closure		Weekend Closure (55-Hour)			
				5 to 7-Hour Closure	8 to 12-Hour Closure	16 hour/day Operation	24 hour/day Operation				
CAPM											
Flexible/ Composite	Flexible Overlay		5+	1,2,3	1.16	2.32	3.86	6.41	16.33		
	Flexible Overlay w/Slab Replacements (FO+JPCP SR)	4-hr RSC 12-hr RSC	5+	1,2,3	0.63	1.69	3.05				
Rigid-Jointed Plain Concrete Pavement (JPCP)	Concrete Pavement Rehab A	4-hr RSC 12-hr RSC	5+	1,2,3	0.48	1.79	4.17				
	Concrete Pavement Rehab B	4-hr RSC 12-hr RSC	5+	1,2,3	0.67	2.51	5.84				
	Concrete Pavement Rehab C	4-hr RSC	5+	1,2,3	1.67	6.27	14.61				
		12-hr RSC					3.75	13.77	56.40		
Rigid-Continuously Reinforced Concrete Pavement (CRCP)	Punchout Repair A	4-hr RSC	5+	1,2,3	0.08	0.17	0.66				
		12-hr RSC					0.27	0.67	4.51		
	Punchout Repair B	4-hr RSC	5+	1,2,3	0.11	0.24	0.92				
		12-hr RSC					0.38	0.94	6.31		
	Punchout Repair C	4-hr RSC	5+	1,2,3	0.27	0.60	2.31				
		12-hr RSC					0.96	2.34	15.78		
Rehabilitation											
Flexible / Composite	Flexible Overlay w/ Slab Replacement (FO + JPCP SR)	4-hr RSC	10	1,2,3	0.31	0.89	1.66				
	Flexible Overlay w/ Slab Replacement (FO + JPCP SR)	12-hr RSC					0.91	2.27	6.83		
	Mill, Slab Replacement & Overlay (MSRO)	4-hr RSC	10	1,2,3	0.19	0.50	0.85				
	Mill, Slab Replacement & Overlay (MSRO)	12-hr RSC					0.91	2.27	6.83		
	Mill, Slab Replacement & Overlay (MSRO)	4-hr RSC	20	1,2,3	0.15	0.38	0.64				
	Mill, Slab Replacement & Overlay (MSRO)	12-hr RSC					0.49	1.10	2.82		
	Crack, Seal, & Flexible Overlay (CSFOL)			10	1,2,3	0.47	0.98	1.63	2.72	6.94	
				20		0.44	0.75	1.26	2.10	5.37	
				40		0.21	0.44	0.75	1.26	3.22	
	Replace with Flexible			20	1,2,3	0.15	0.31	0.53	0.89	2.30	
		Replace with Composite	4-hr RSC	20		1,2,3	0.02	0.08	0.18		
			12-hr RSC						0.09	0.16	0.65
			4-hr RSC	40		1,2,3	0.02	0.07	0.17		
	Jointed Plain Concrete Pavement (JPCP)	Lane Replacement	4-hr RSC	20	1,2,3	0.03	0.07	0.17			
12-hr RSC							0.04	0.16	0.62		
4-hr RSC			40	1,2,3	0.02	0.06	0.14				
12-hr RSC							0.05	0.14	0.53		
Continuously Reinforced Concrete Pavement	Lane Replacement	4-hr RSC	20	1,2,3	0.01	0.03	0.11				
		12-hr RSC					0.05	0.11	0.66		
		4-hr RSC	40	1,2,3	0.01	0.03	0.10				
		12-hr RSC					0.04	0.10	0.63		

**FO = Flexible Overlay JPCP = Jointed Plain Concrete Pavement SR = Slab Replacement RSC = Rapid Set Concrete
CRCP = Continuously Reinforced Concrete Pavement**

Notes:

- (1) Refer to Appendix 1, "Glossary and list of Acronyms" for definitions of terms used in the table.
- (2) Production rates are based on the lower end of the representative assumptions for the range and are applied consistently throughout the table.
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More project specifics user cost for some freeway situations can be obtained from the CA4PRS software.
- (3) 24-hour continuous closure with 16 hours of operation per day
- (4) 24-hour continuous closure with 24 hours of operation per day
- (5) 55-hour extended closure over the weekend
- (6) Punchout Repair A involves **significant** punchout repairs and 0.15' of flexible overlay. It applies to continuously reinforced concrete pavement that had previous punchout repairs and a flexible overlay.
- (7) Punchout Repair B involves **moderate** punchout repair and 0.15' of flexible overlay. It applies to continuously reinforced concrete pavement where the total number of current and previous punchout repairs exceed 4 per mile.
- (8) Punchout Repair C involves **minor** punchout repairs and 0.15' of flexible overlay. It applies to continuously reinforced concrete pavement where the total number of current and previous punchout repairs do not exceed 4 per mile.
- (9) Precast panel concrete pavement is under development. See HQ LCCA Coordinator for assistance.

Table 3-7 Productivity Estimates of Typical Future Ramp Rehabilitation for Rigid and Composite Pavements

Final Surface Type	Future M&R Alternative	Pavement Design Life (years)	Maintenance Service Level	Average Lane-mile Completed Per Closure						
				Daily Closure		Continuous Closure		Weekend Closure (55-Hour)		
				5 to 7-Hour Closure	8 to 12-Hour Closure	16 hour/day Operation	24 hour/day Operation			
CAPM										
Flexible/ Composite	Flexible Overlay		5+	1,2,3	0.27	0.54	0.85	1.61	3.78	
	Flexible Overlay w/Salb Replacements (FO+JPCP SR)	4-hr RSC 12-hr RSC	5+	1,2,3	0.20 0.43	0.71	0.52	1.16	3.06	
Rigid-Jointed Plain Concrete Pavement (JPCP)	Concrete Pavement Rehab A	4-hr RSC 12-hr RSC	5+	1,2,3	0.28 0.60	1.26	0.39	1.21	4.63	
	Concrete Pavement Rehab B	4-hr RSC 12-hr RSC	5+	1,2,3	0.40 0.84	1.76	0.54	1.68	6.43	
	Concrete Pavement Rehab C	4-hr RSC 12-hr RSC	5+	1,2,3	0.99 2.10	4.41	1.35	4.20	16.08	
	Punchout Repair A	4-hr RSC 12-hr RSC	5+	1,2,3	0.06 0.13	0.54	0.27	0.54	3.40	
Rigid-Continuously Reinforced Concrete Pavement (CRCP)	Punchout Repair B	4-hr RSC 12-hr RSC	5+	1,2,3	0.08 0.18	0.76	0.26	0.76	4.76	
	Punchout Repair C	4-hr RSC 12-hr RSC	5+	1,2,3	0.21 0.45	1.89	0.93	1.89	11.91	
Rehabilitation										
Flexible / Composite	Flexible Overlay w/ Slab Replacement (FO + JPCP SR)	4-hr RSC	10	1,2,3	0.03	0.07	0.13			
	Flexible Overlay w/ Slab Replacement (FO + JPCP SR)	12-hr RSC					0.04	0.13	0.49	
	Mill, Slab Replacement & Overlay (MSRO)	4-hr RSC	10	1,2,3	0.03	0.06	0.12			
	Mill, Slab Replacement & Overlay (MSRO)	12-hr RSC					0.04	0.12	0.45	
	Mill, Slab Replacement & Overlay (MSRO)	4-hr RSC	20	1,2,3	0.03	0.06	0.11			
	Mill, Slab Replacement & Overlay (MSRO)	12-hr RSC					0.04	0.12	0.42	
	Crack, Seat, & Flexible Overlay (CSFOL)			10	1,2,3	0.28	0.57	0.96	1.61	4.13
				20		0.21	0.43	0.73	1.24	3.19
				40		0.12	0.26	0.43	0.74	1.91
	Replace with Flexible			20	1,2,3	0.08	0.18	0.31	0.52	1.37
				40		0.01	0.05	0.11		
	Replace with Composite	4-hr RSC		20	1,2,3	0.01	0.05	0.11		
12-hr RSC							0.04	0.10	0.39	
4-hr RSC			40	1,2,3	0.01	0.04	0.10			
Jointed Plain Concrete Pavement (JPCP)	Lane Replacement	4-hr RSC	20	1,2,3	0.01	0.04	0.10			
		12-hr RSC					0.04	0.09	0.37	
		4-hr RSC	40	1,2,3	0.01	0.04	0.09			
		12-hr RSC					0.03	0.08	0.33	
Continuously Reinforced Concrete Pavement	Lane Replacement	4-hr RSC	20	1,2,3	0.01	0.02	0.06			
		12-hr RSC					0.03	0.06	0.40	
		4-hr RSC	40	1,2,3	0.01	0.02	0.06			
		12-hr RSC					0.03	0.06	0.38	

FO = Flexible Overlay JPCP = Jointed Plain Concrete Pavement SR = Slab Replacement RSC = Rapid Set Concrete CRCP = Continuously Reinforced Concrete Pavement

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- Precast panel concrete pavement is under development. See HQ LCCA Coordinator for assistance.