Hot Mix Recycling Evaluation in Washington

Appendix Project Evaluations

WA-RD 98.2

Final Report
December 1986

Washington State Department of Transportation
Planning, Research and Public Transportation Division
in cooperation with the
United States Department of Transportation
Federal Highway Administration

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

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15. SUPPLEMENTARY NOTES

This study was conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration.

16. ABSTRACT

The Washington State Department of Transportation (WSDOT) has completed construction of twenty-four hot-mix recycle projects as of January, 1985. At the begining of this study there were sixteen completed projects that were to be examined. Evaluation of the laboratory and pavement performance data shows that WSDOT's initial two projects, Renslow to Ryegrass (1977) and Yakima River to West Ellensburg Interchange (1978), are still performing very well. Although the other fourteed projects have been constructed only within the last two and a half years, the early data indicates equally promising results. Because of the impressive pavement performance exhibited by the recycled pavements, together with hot-mix recycle benefits such as conservation of natural resources, feasibility of construction, and its cost advantage over new ACP, hot-mix recycling has become an attractive addition to the WSDOT paving program.

17. KEY WORDS	18. DISTRIBUTION STATEMENT
Asphalt Concrete, Asphalt, Recycling, Rejuvenating Agents	

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HOT MIX RECYCLING EVALUATION IN WASHINGTON APPENDIX PROJECT EVALUATIONS

by
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Final Report
Research Project HR-619

Prepared for
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and in cooperation with
U.S. Department of Transportation
Federal Highway Administration

December, 1986

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C-0758

SR-90 Renslow to Ryegrass

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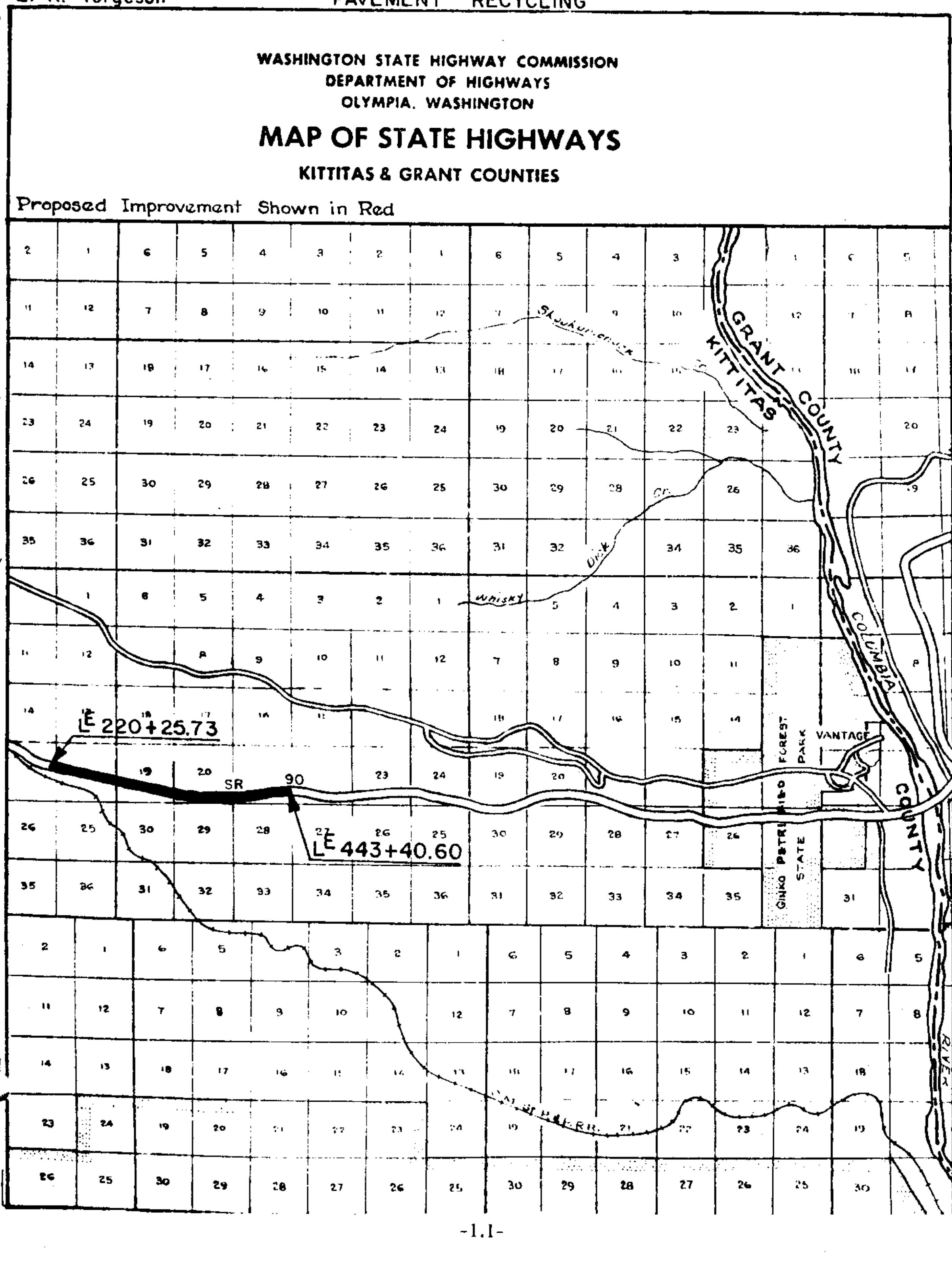
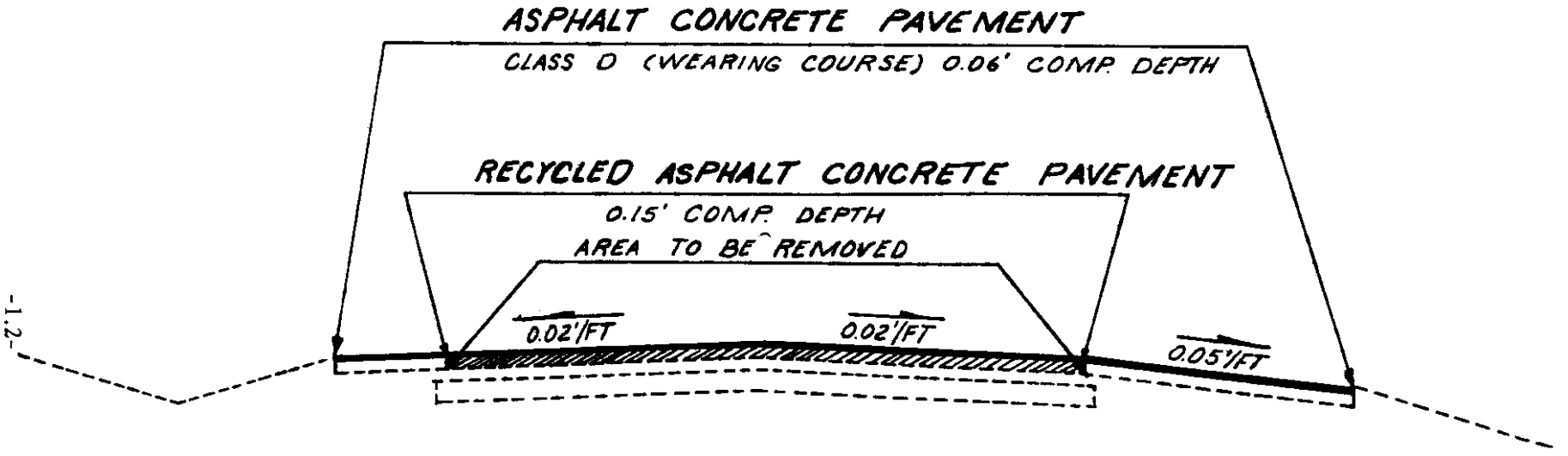
E. R. Torgeson

SR 90 RENSLOW TO RYEGRASS—
PAVEMENT RECYCLING





RENSLOW TO RYEGRASS

SR 90

C-0758

CONTRACT 0758

ACP MIX DESIGN

	Final Recommendation	Amount Used
Planings	70-75%	71.75%
New Aggregate	25-30%	28.25%

Gradation	Average of Cold-Plane Samples	Calculated Design Grading*
5.8	100	100
1/2	100	96
3/8	96	80
1/4	84	62
10	45	45
40	21	21
80	15	15
200	8.5	8.5

	Final Recommendation	Amount Used
Old Asphalt	4.6-5.0%	4.7%
RA-5 Rejuvenator	<1.0%	.75%
AR-4000W	<0.6%	0.0%
Total Fluids	<6.6%	5.4%

*Calculated based on median of Final Recommendation range.

CONTRACT 0758

CONTROL SAMPLES - RECYCLED MIXTURE**

	Average	Range
Gradation (28 samples)		
1"	100	100
5/8"	100	100
1/2"	97	95-99
3/8"	84	76-89
1/4"	65	54-70
No. 10	37	33-40
No. 40	19	17-20
No. 80	14	13-15
No. 200	8.4	7.8-9.1
Percent Asphalt	5.6	4.8-6.6
Hveem Stability	19	9-32
Cohesion	343	170-580
Percent Voids	2.2	0-4.2
Sand/Silt Ratio	4.4	4.0-4.6
Resilient Modulus (18 samples)		
0.05 sec. (PSI)	$13x10^5$	$1.4-27x10^5$
0.10 sec. (PSI)	$8.4x10^5$	$1.2-20x10^5$
Abson Recovery (3 samples)		
39.2F Pen.	29	18-21
*77F Pen.	48	32-60
60F Visc. (10^{-7} Poise)	6.2	5.3-7.2
*140F Visc. (Poise)	3,894	2,466-7,408
275F Visc. (CS)	365	332-403
45F Duct. (cm)	24.3	18.0-30.0
77F Duct. (cm)	60+	60+
Chemical Analysis (6 samples)		
Asphaltenes	30.7	25.2-34.6
Nitrogens (GPI)	4.6	2.8-6.2
Nitrogens (GPII)	22.5	20.6-25.0
1st Acidaffins	5.8	4.0-10.9
2nd Acidaffins	22.3	20.5-23.4
Paraffins	14.3	12.5-15.2

*27 samples

**Samples from field production of recycled mix

CONTRACT 0785

COMPACTION DATA

Nuclear Acceptance Testing

	Eastbound		Westbound	
	Lane 1	Lane 2	Lane 1	Lane 2
Void Content (%)				
Average	8.4	6.9	6.9	5.5
Range	3.0-10.9	2.9-10.0	3.0-11.0	0.3-9.3

Record Core Testing (24 samples)

Void Content (%)	
Average	6.6
Range	4.1-11.0

CONTRACT 0758
CONSTRUCTION CORES***

	Average	Range
Gradation (24 samples)		
1"	100	100
5/8"	100	100
1/2"	98	94-99
3/8"	87	76-90
1/4"	68	56-72
No. 10	38	31-42
No. 40	20	17-22
No. 80	15	12-16
No. 200	9.4	7.8-10.2
Percent Asphalt	5.7	4.8-6.2
Sand/Silt Ratio	4.1	3.8-4.3
Density (PCF)	147.2	140.3-151.0
Percent Voids	6.6	4.1-11.0
Resilient Modulus (24 samples)		
0.05 sec. (PSI)	4.7×10^5	$3.0-6.1 \times 10^5$
0.10 sec. (PSI)	3.1×10^5	$2.0-4.5 \times 10^5$
Abson Recovery (5 samples)		
39.2F Pen.	20	16-22
*77F Pen.	58	40-75
60F Visc. (Poise)	5.7×10^7	$1.6-7.7 \times 10^7$
**140F Visc. (Poise)	2,900	2,057-5,338
275F Visc. (CS)	349	313-374
45F Duct. (cm)	32.6	24.0-46.75
77F Duct. (cm)	60+	60+
Chemical Analysis (5 samples)		
Asphaltenes	30.2	29.6-31.6
Nitrogens (GPI)	4.4	3.7-5.3
Nitrogens (GPII)	21.5	20.1-22.2
1st Acidaffins	5.4	4.2-6.2
2nd Acidaffins	23.0	20.9-25.9
Paraffins	15.5	14.3-17.1

*24 samples
**29 samples
***Construction cores were random throughout the project and were removed shortly after construction.

CONTRACT 0758
ONE-YEAR CORES
OVERLAID SECTION**

Gradation (16 samples)	Average	Range
5/8"	100	100
1/2"	98	96-100
3/8"	87	81-91
1/4"	66	63-71
No. 10	39	35-43
No. 40	20	19-22
No. 80	15	14-16
No. 200	9.7	8.9-11.0
Percent Asphalt	6.2	5.5-6.9
Sand/Silt Ratio	4.0	3.6-4.6
Density (PCF)	150.6	147.5-155.0
Percent Voids	4.5	1.7-6.5
Resilient Modulus		
0.05 sec. (PSI)	$4.1x10^5$	$2.2-6.2x10^5$
0.10 sec. (PSI)	$2.5x10^5$	$1.3-4.3x10^5$
Abson Recovery		
*39.2F Pen.	19	17-20
77F Pen	50	39-62
*60F Visc. (Poise)	$4.9x10^7$	$4.3-5.9x10^7$
140F Visc. (Poise)	3394	2332-5459
275F Visc. (CS)	387	311-485
*45F Duct. (cm)	18.2	14.0-22.5
*77F Duct. (cm)	100+	100+
Chemical Analysis		
Asphaltenes	30.0	28.0-31.1
Nitrogens (GPI)	4.9	3.3-7.2
Nitrogens (GPII)	21.2	18.4-25.3
1st Acidaffins	8.3	6.8-9.4
2nd Acidaffins	25.0	24.6-28.0
Paraffins	11.0	9.0-12.8

*All cores combined to make 5
**Overlaid with 0.06' Open Graded Class D Friction Seal

CONTRACT 0758
ONE-YEAR CORES
NON-OVERLAID SECTION

	Average	Range
Gradation (6 samples)		
5/8"	100	100
1/2"	99	98-99
3/8"	89	86-93
1/4"	69	65-71
No. 10	41	39-43
No. 40	21	20-22
No. 80	15	14-16
No. 200	10.0	9.3-10.6
Percent Asphalt	6.1	5.6-6.5
Sand/Silt Ratio	4.2	4.0-4.3
Density (PCF)	151.3	148.7-153.0
Percent Voids	4.0	3.0-5.7
Resilient Modulus		
0.05 sec. (PSI)	6.5×10^5	$3.6\text{-}12.0 \times 10^5$
0.10 sec. (PSI)	3.9×10^5	$2.9\text{-}5.4 \times 10^5$
Abson Recovery		
39.2F Pen.	15	15
77F Pen.	45	43-47
60F Visc. (Poise)	5.8×10^7	5.8×10^7
140F Visc. (Poise)	4.29	3,335-5,101
275F Visc. (CS)	391	357-432
45F Duct. (cm)	11.0	11.0
77F Duct. (cm)	100+	100+
Chemical Analysis		
Asphaltenes	30.0	
Nitrogens (GPI)	9.3	
Nitrogens (FPII)	16.8	
1st Acidaffins	9.2	
2nd Acidaffins	19.8	
Paraffins	15.0	

*All cores combined for these tests.

CONTRACT 0758
TWO-YEAR CORES
OVERLAID SECTION*

Gradation (18 samples)	Average	Range
5/8"	100	100
1/2"	98	96-99
3/8"	88	81-96
1/4"	70	64-79
No. 10	39	29-59
No. 40	19	15-21
No. 80	14	11-16
No. 200	9.2	7.1-10.4
Percent Asphalt	6.7	6.0-7.6
Sand/Silt	4.3	3.4-6.2
Density (PCF)	147.5	138.9-152.0
Percent Voids	6.6	3.8-12.1
Abson Recovery		
77F Pen.	51	40-60
140F Viscosity (Poise)	3,564	2,222-4,978
275F Visc. (CS)	399	338-519

*Overlaid with 0.06' Open Graded Class D Friction Seal.

CONTRACT 0758
TWO-YEAR CORES
NON-OVERLAID SECTION

Gradation (4 samples)	Average	Range
5/8"	100	100
1/2"	99	98-99
3/8"	88	86-92
1/4"	69	63-71
No. 10	41	37-44
No. 40	21	20-23
No. 80	16	15-17
No. 200	10.3	9.3-11.4
Percent Asphalt	6.0	5.8-6.3
Sand/Silt	4.0	3.6-4.2
Density (PCF)	152.2	149.3-153.6
Percent Voids	3.7	2.8-5.5
Abson Recovery		
77F Pen.	44	40-47
140F Viscosity (Poise)	4,159	3,263-4,668
275F Visc. (CST)	426	394-484

CONTRACT 0758
THREE-YEAR CORES
NON-OVERLAID SECTION

Gradation (4 samples)	Average	Range
5/8"	100	100
1/2"	99	99-100
3/8"	89	85-91
1/4"	68	65-72
No. 10	41	38-43
No. 40	21	20-22
No. 80	16	15-18
No. 200	10.0	9.4-10.5
Percent Asphalt	5.9	5.6-6.1
Sand/Silt	4.1	4.0-4.2
Density (PCF)	152.8	151.8-153.4
Percent Voids	3.3	3.0-3.9
Abson Recovery		
77F Pen.	46	40-52
140F Viscosity (Poise)	4,829	3,585-6,154
275F Visc. (CST)	422	372-467

CONTRACT 0758
FIVE-YEAR CORES
OVERLAID SECTION***

Test (6 samples)	Average	Range
Percent Asphalt	5.6	5.5-5.8
Percent Voids*	4.8	3.4-6.6
77F Pen.	48	45-51
140F Visc. (Poise)	4,467	3,891-5,505
275F Visc. (CS)	--	--
Resilient Modulus -0.05 sec (PSI)**	4.42×10^5	$3.18\text{-}6.21 \times 10^5$
Resilient Modulus -0.10 sec (PSI)**	3.00×10^5	$2.04\text{-}4.55 \times 10^5$

*10 samples in average

**4 samples in average

***Overlaid with 0.06 Open Graded Class D Friction Seal

CONTRACT 0758
FIVE-YEAR CORES
NON-OVERLAID SECTION

Test (1 sample)	Average	Range
Percent Asphalt	5.6	
Percent Voids*	2.85	2.5-3.2
77F Pen.	53	
140F Visc. (Poise)	3,093	
275F Visc. (CS)	--	
Resilient Modulus -0.05 sec (PSI)	3.51×10^5	
Resilient Modulus -0.10 sec (PSI)	2.43×10^5	

*Two Samples

CONTRACT 0758
SEVEN-YEAR CORES
OVERLAID SECTION*

Gradation (7 samples)	Average	Range
5/8"	100	100
1/2"	98	93-99
3/8"	88	81-90
1/4"	69	61-72
No. 10	41	37-43
No. 40	21	19-23
No. 80	16	14-18
No. 200	9.4	8.1-12.2
Percent Asphalt	5.6	3.8-6.8
Sand/Silt	4.4	3.5-5.2
Density (PCF)	148.7	146.8-150.5
Percent Voids	5.6	4.3-6.9
Abson Recovery (6 samples)		
77F Pen.	27	26-43
140F Viscosity (Poise)	4,487	3,798-5,290
45F Ductility (cm)		
Resilient Modulus (7 samples)		
77F -0.10 sec (PSI)	4.83×1^5	$1.57\text{-}11.0 \times 10^5$

*Overlaid with 0.06' Open Graded Class D Friction Seal

CONTRACT 0758
SEVEN-YEAR CORES
NON-OVERLAID SECTION

Gradation (3 samples)	Average	Range
5/8"	100	100
1/2"	98	96-99
3/8"	87	85-89
1/4"	69	66-70
No. 10	41	40-43
No. 40	21	20-21
No. 80	15	14-16
No. 200	9.6	8.6-10.2
Percent Asphalt	6.0	5.7-6.2
Sand/Silt	4.3	4.0-4.7
Density (PCF)	151.0	148.3-152.5
Percent Voids	4.7	3.2-7.0
Abson Recovery (3/1 samples)		
77F Pen.	62	
140F Viscosity (Poise)	4,915	1,849-6,977
45F Ductility (cm)	14	
Resilient Modulus (3 samples)		
77F -0.10 sec (PSI)	5.40×10^5	

CONTRACT 0758

PAVEMENT PERFORMANCE

Year	Pavement Rating
1977	100
1979	90
1981	90
1983	86
1984	85
1986	83

Average Daily Traffic (1984) = 10,300

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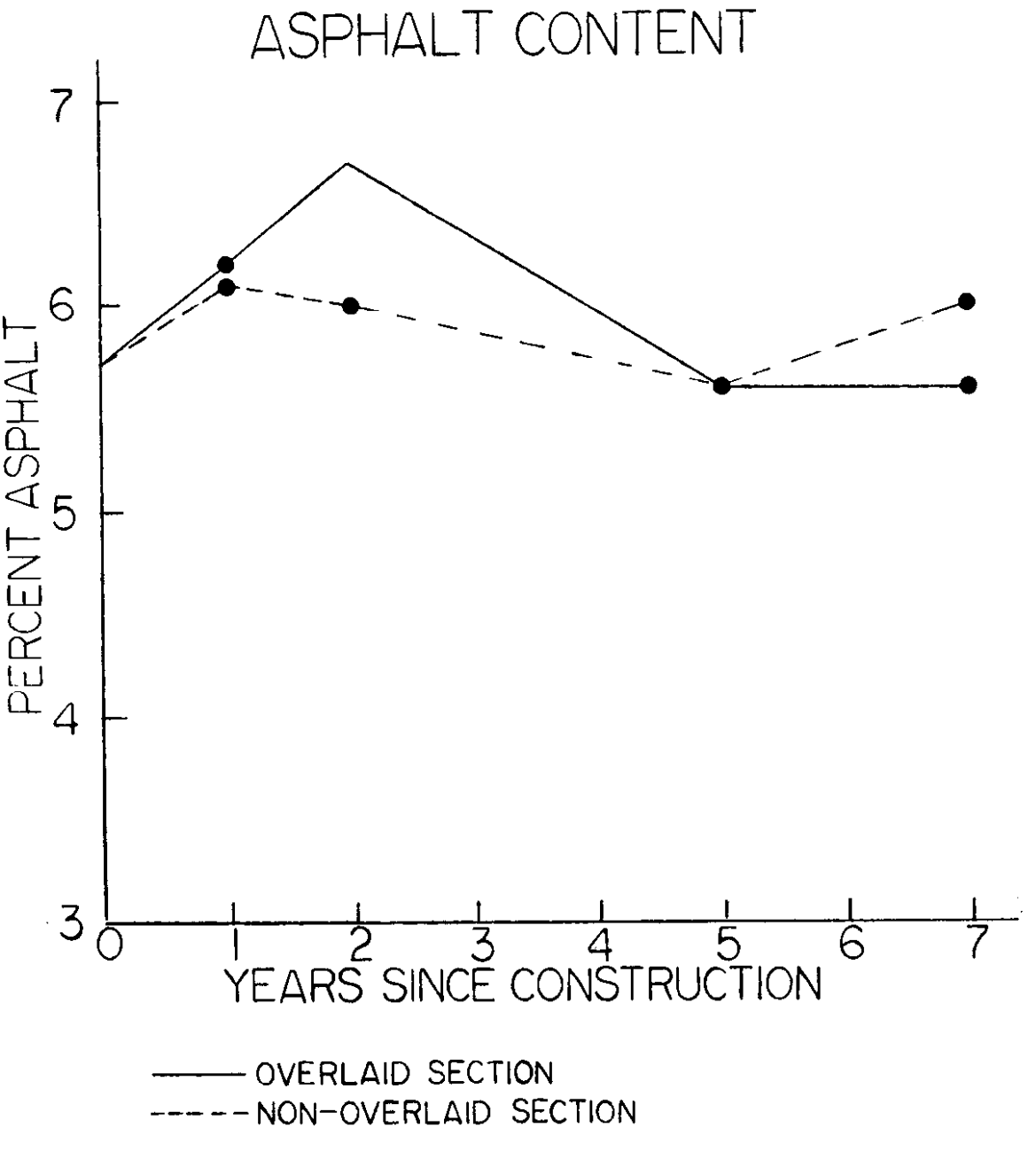
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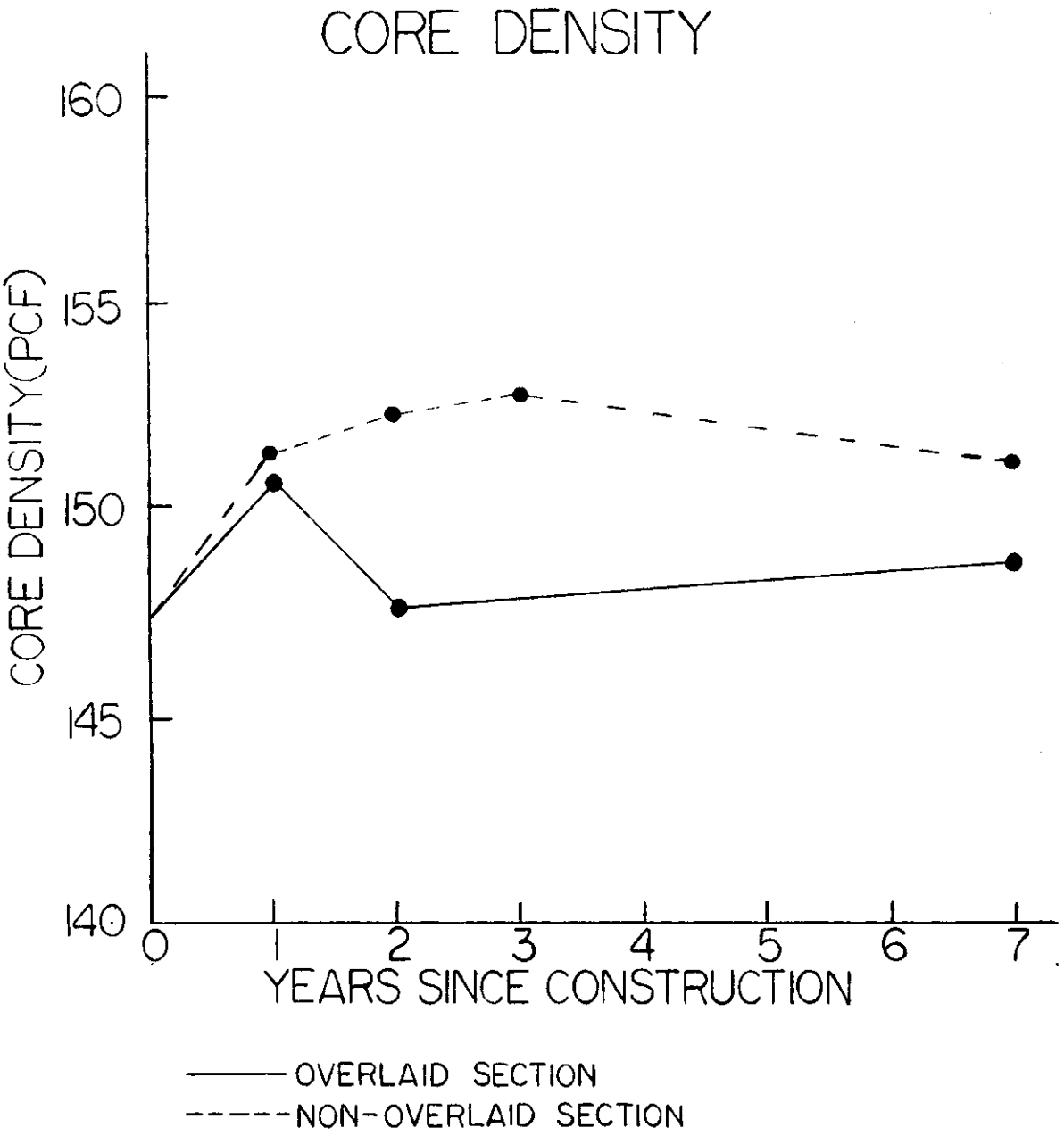
YEARS SINCE CONSTRUCTION
OVERLAID SECTION
NON-OVERLAID SECTION

C-0758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CORE DENSITY(PCF)
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YEARS SINCE CONSTRUCTION
OVERLAID SECTION
NON-OVERLAID SECTION

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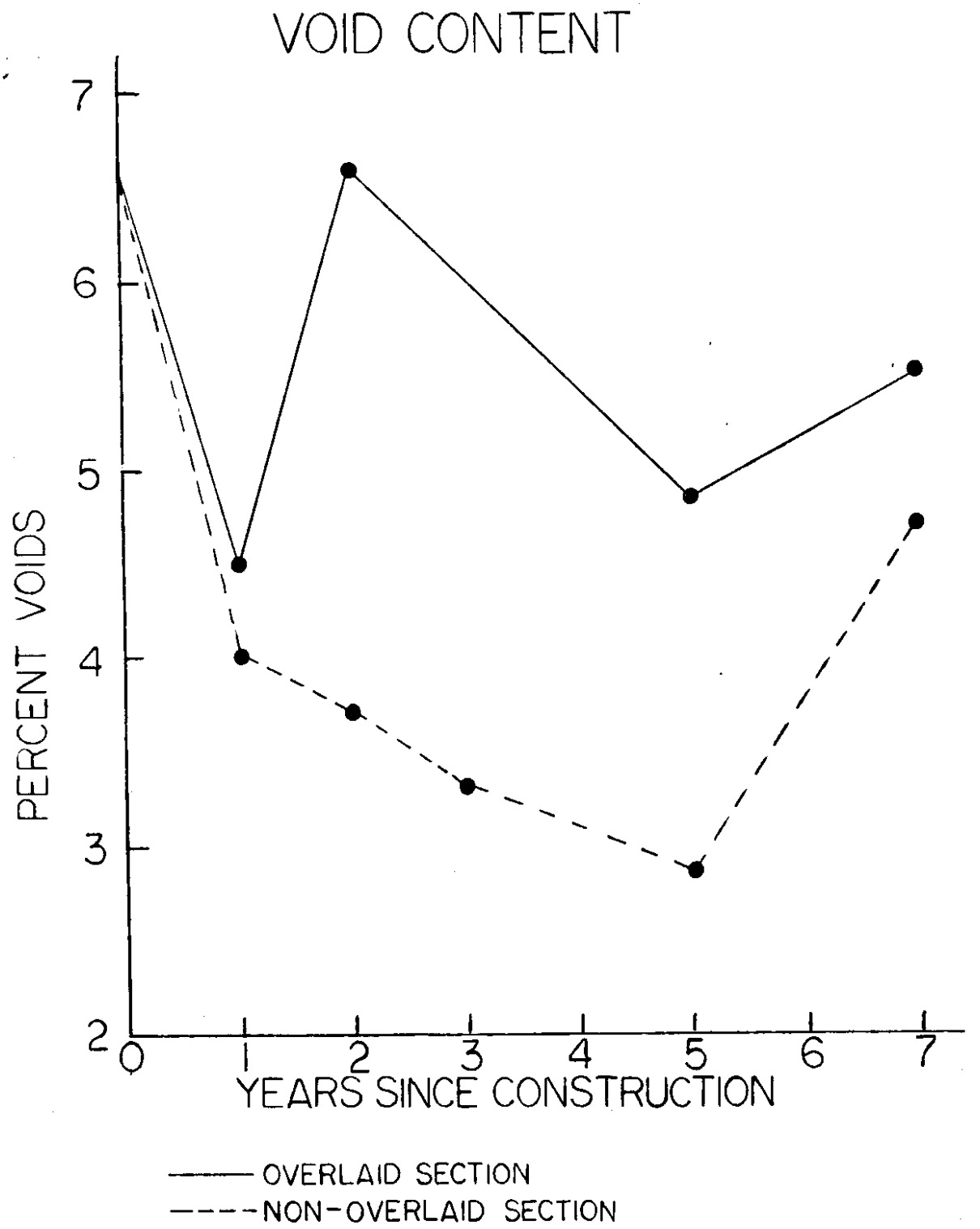
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OVERLAID SECTION
NON-OVERLAID SECTION

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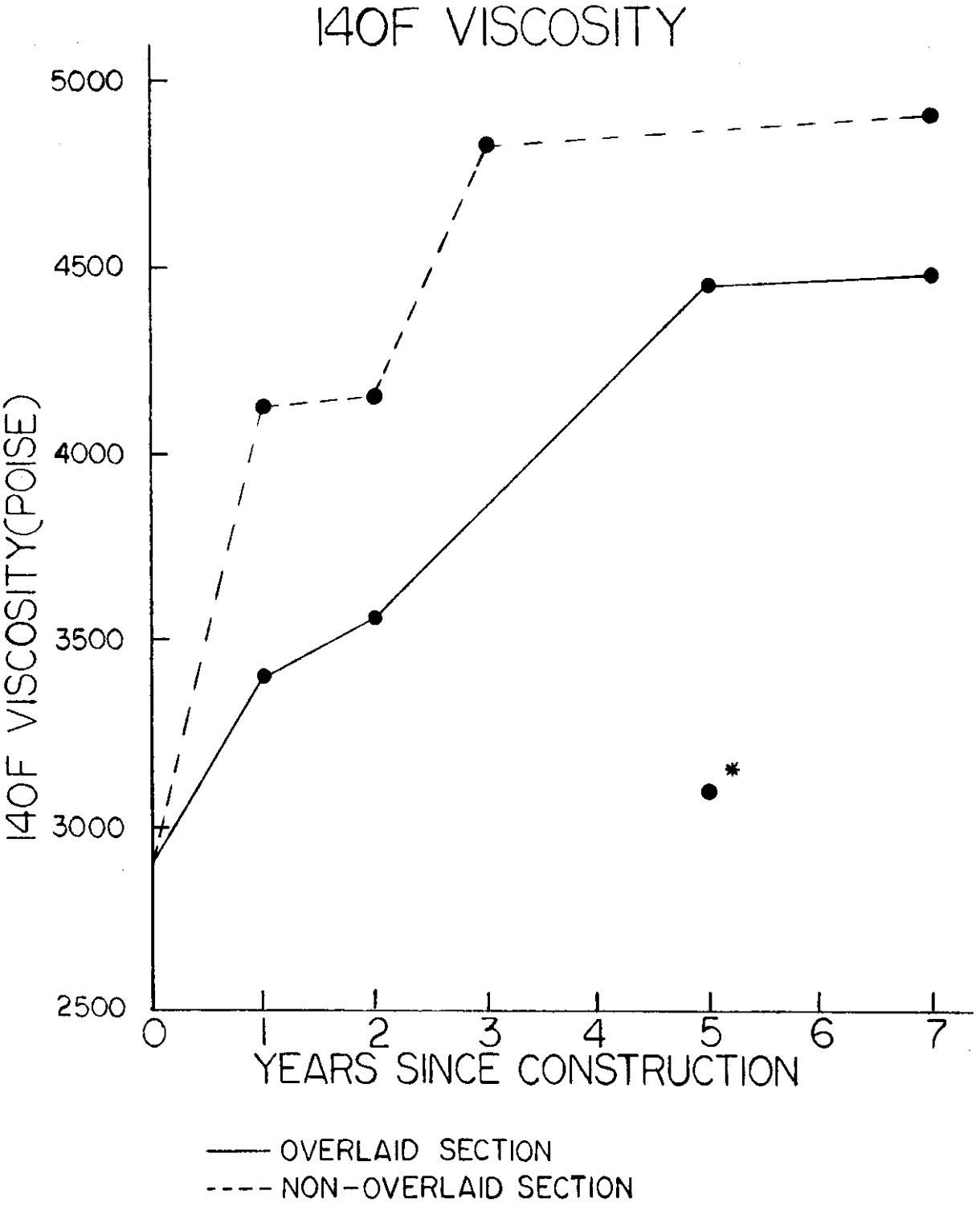
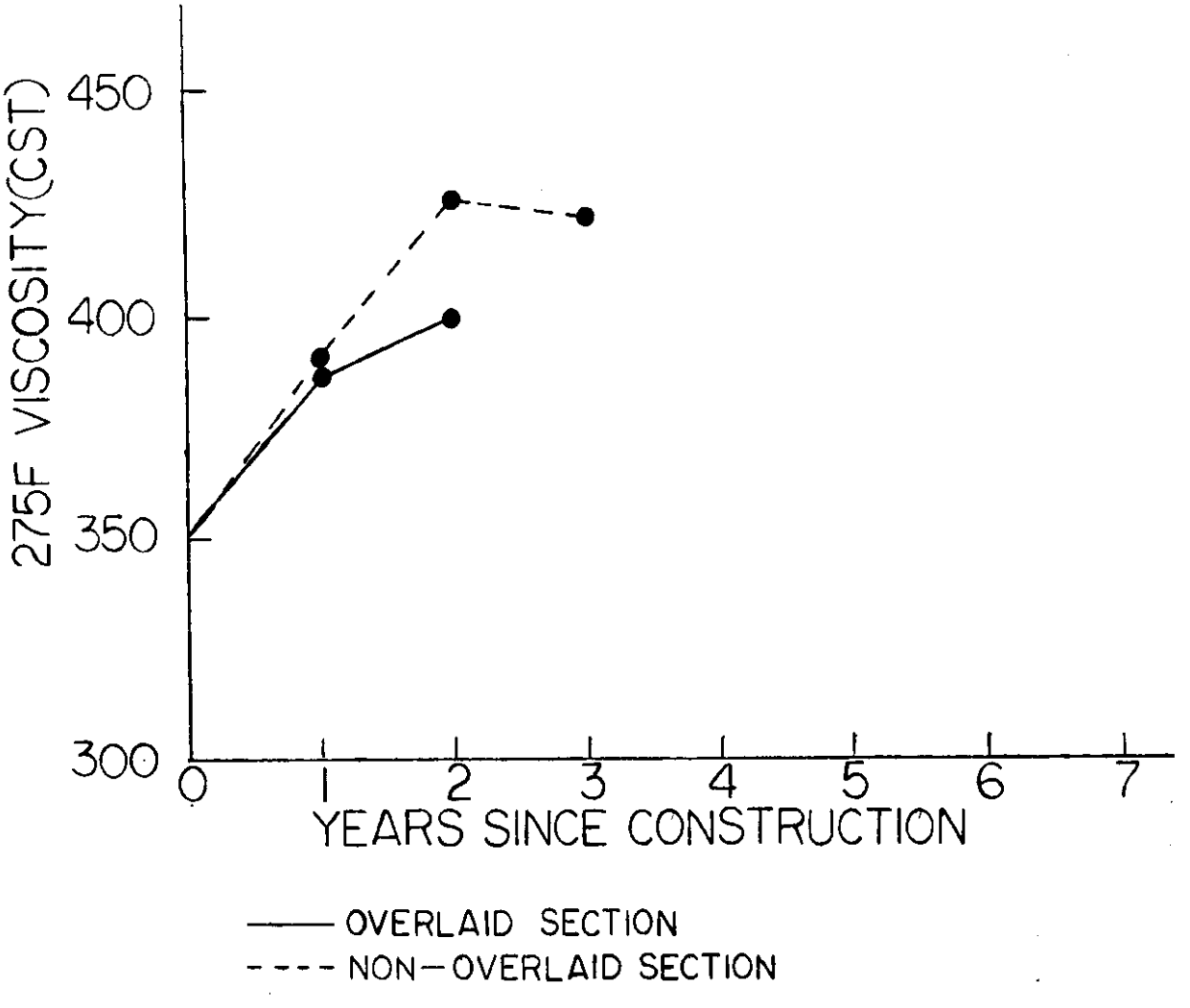


*ONLY 1 SAMPLE (NON-OVERLAID SECTION)

C-0758

275F VISCOSITY



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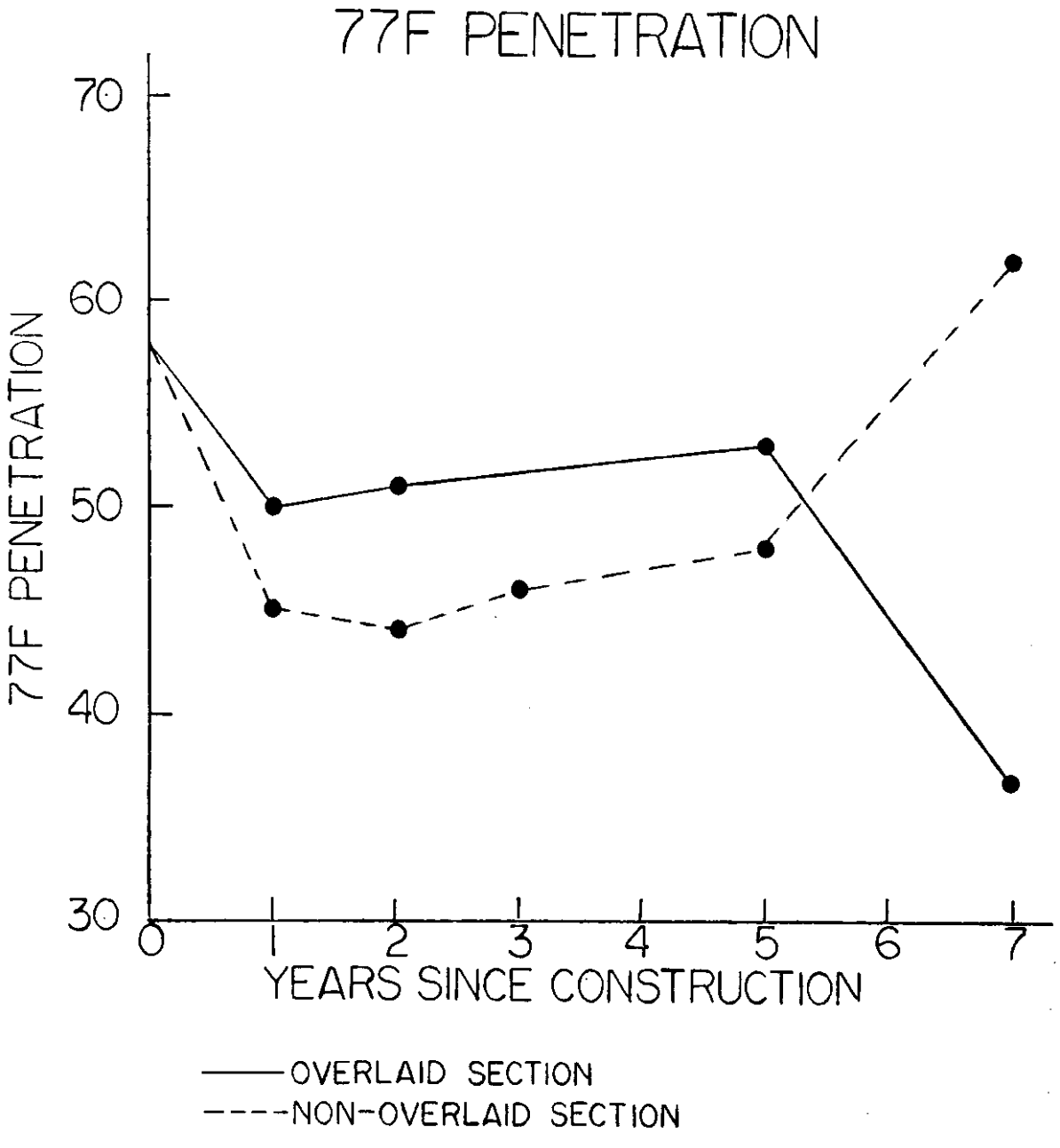
77F PENETRATION
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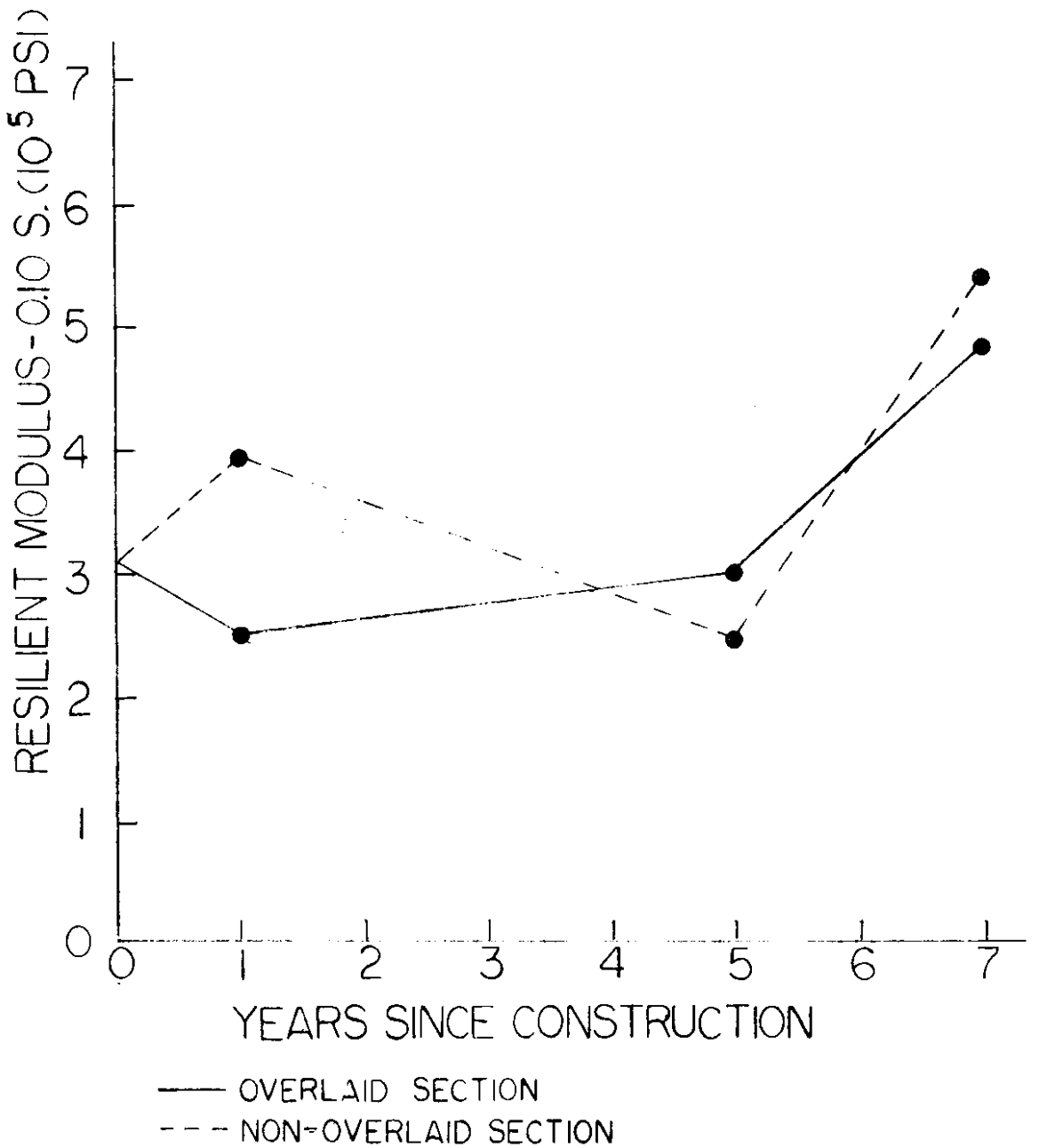
YEARS SINCE CONSTRUCTION
OVERLAID SECTION
NON-OVERLAID SECTION

C-0758

RESILIENT MODULUS



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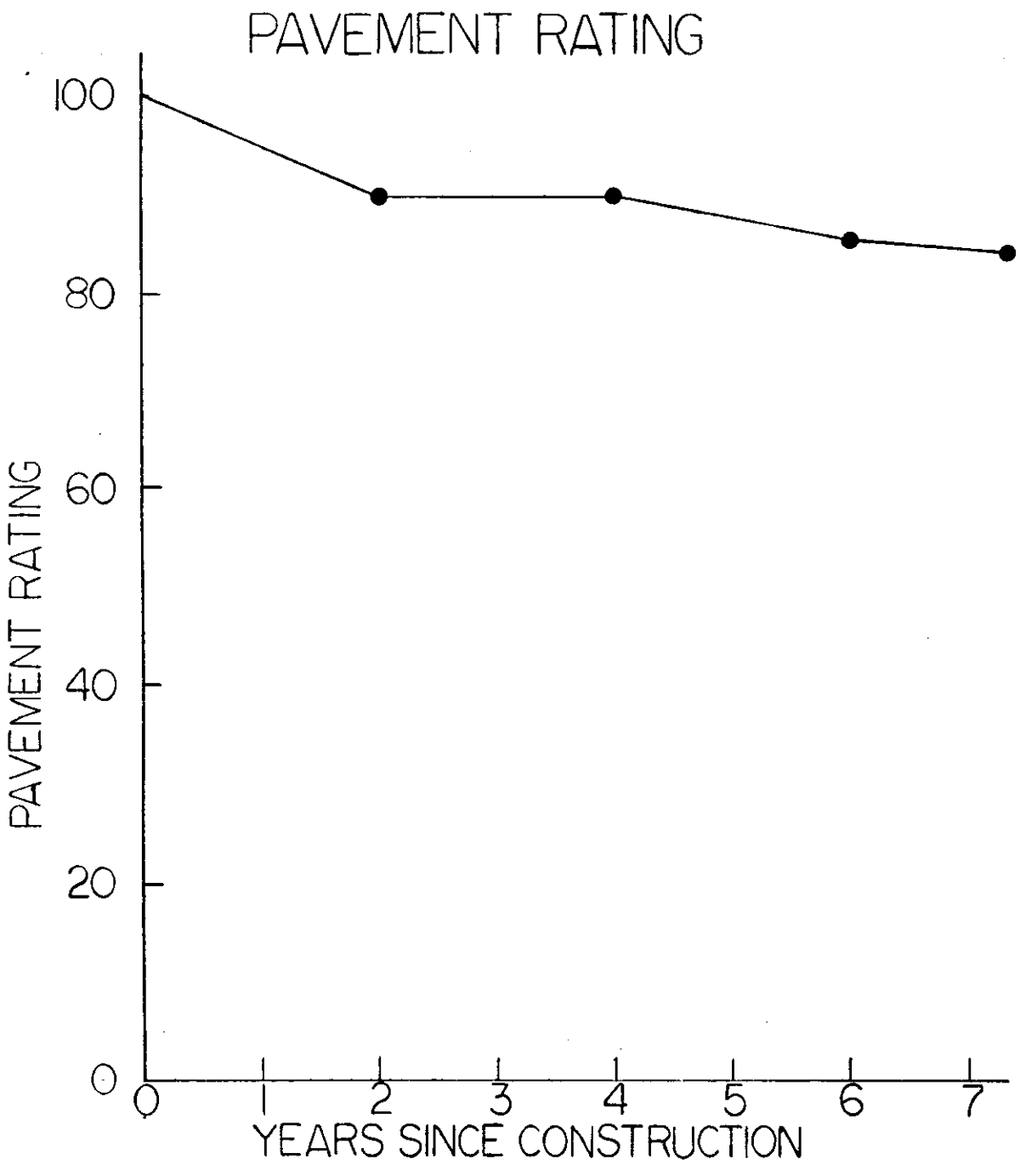
PAVEMENT RATING
100
80
60
40
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PAVEMENT RATING
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YEARS SINCE CONSTRUCTION

CONTRACT 1012

SR 90 YAKIMA RD. TO W. ELLENSBURG

M.P. 102.61 - M.P. 106.34

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SR 90 Yakima Rd. to W. Ellensburg
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SR 90
CLE ELUM & ELLENSBURG VIC.- PAVING Job No. 77 W 232

L.Myhr 5-3A

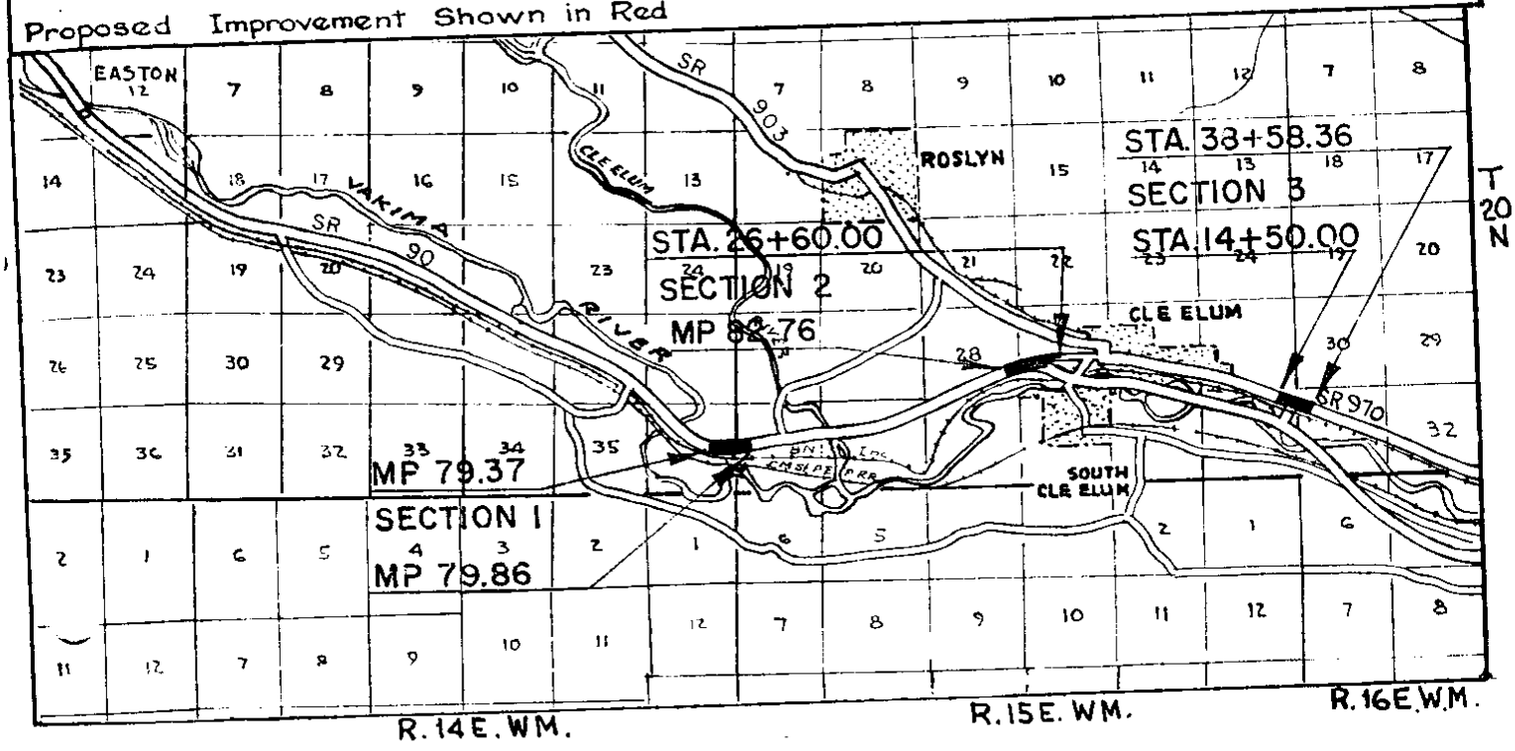
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

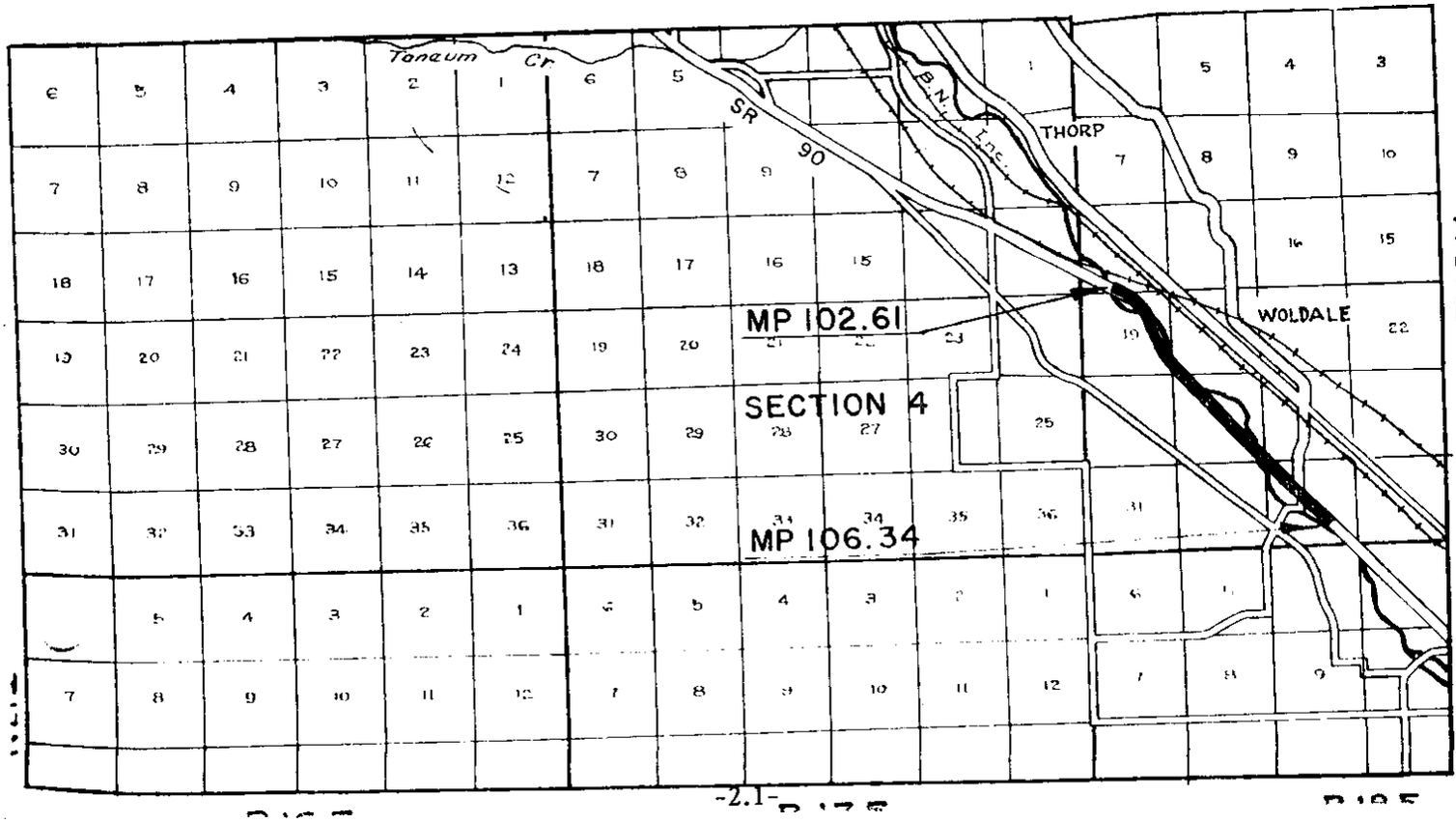
OLYMPIA, WASHINGTON

MAP OF STATE HIGHWAYS

KITTITAS COUNTY

Proposed Improvement Shown in Red





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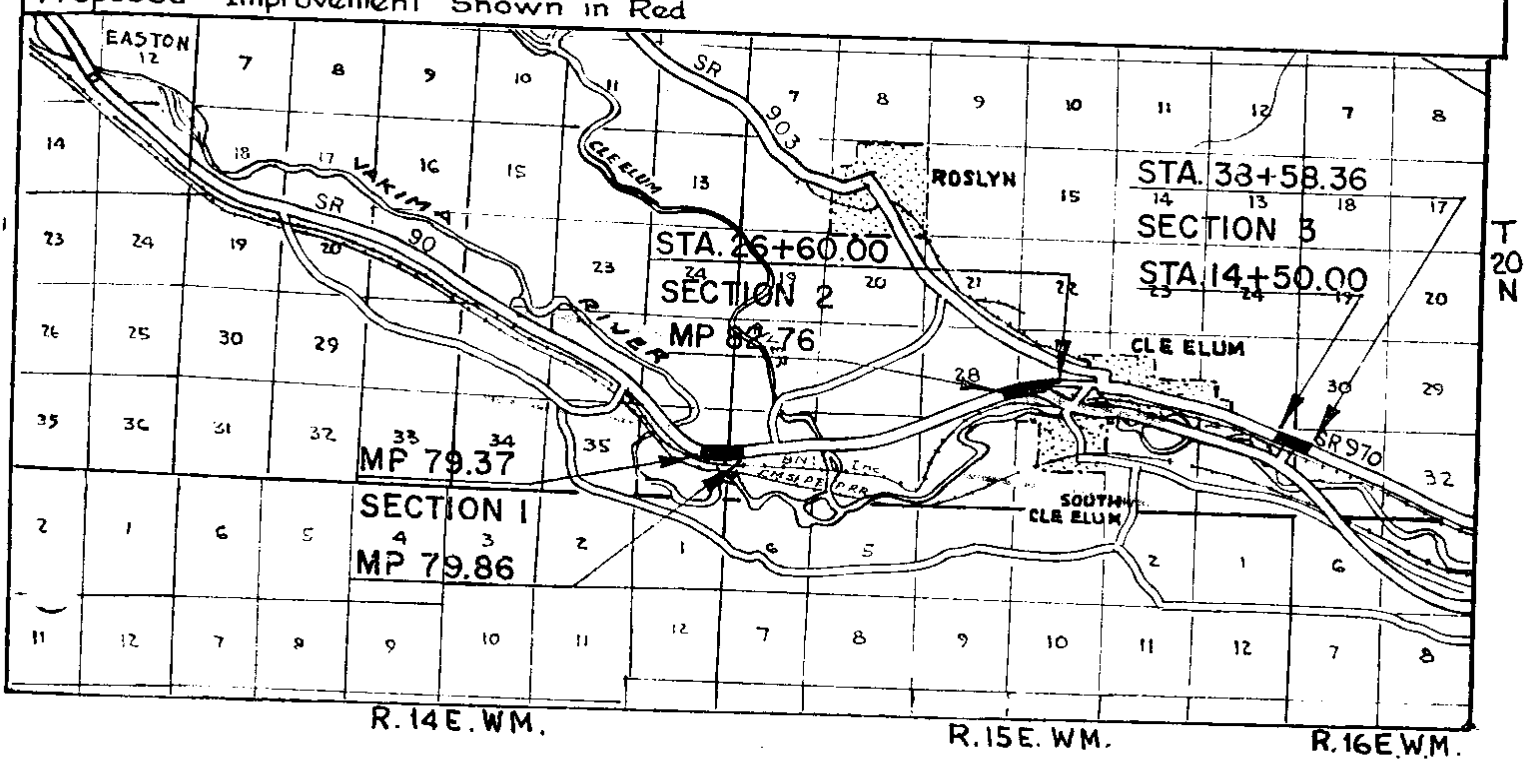
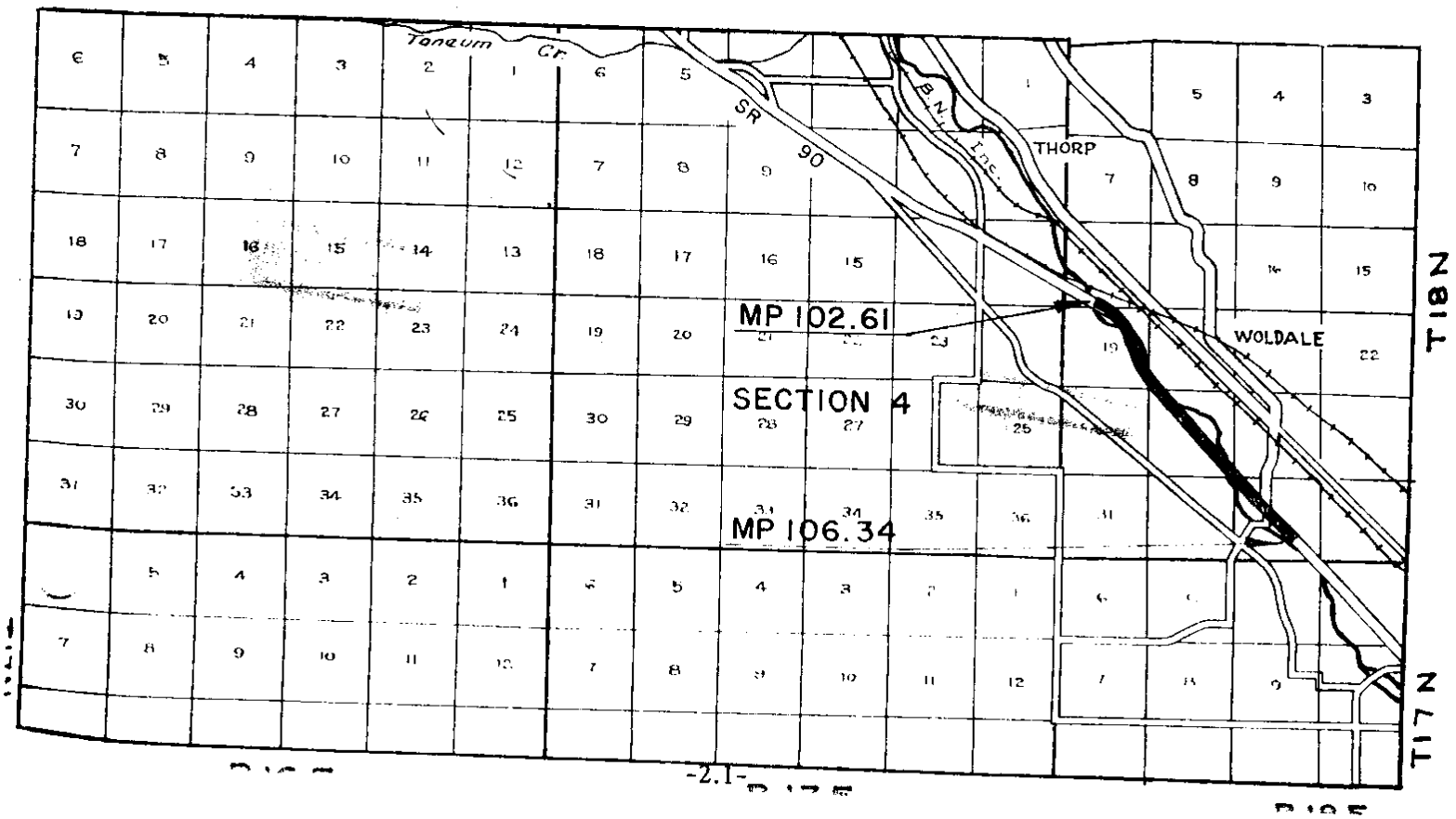
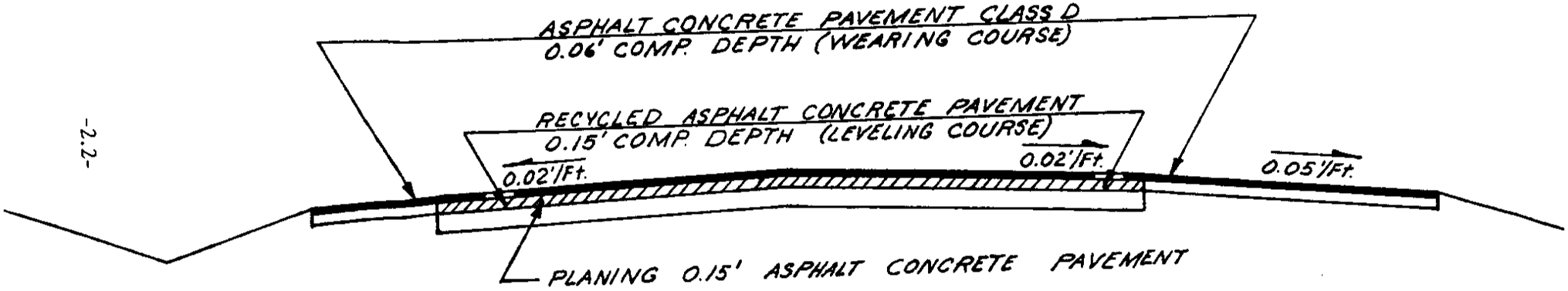






YAKIMA RIVER TO W. ELLENSBURG INTERCHANGE

SR 90

C-1012

CONTRACT 1012
ACP MIX DESIGN

New Aggregate		20%	25%	30%	35%
Planings		80%	75%	70%	65%
Gradation	Average of Cold-Plane Samples	Calculated Design Gradings			
5/8"	100	100	100	100	100
1/2"	100	97	96	96	95
3/8"	98	86	83	80	77
1/4"	85	69	64	60	56
No. 10	46	37	35	32	30
No. 40	20	16	15	14	13
No. 80	13	10	10	9	9
No. 200	8.5	7.0	6.6	6.2	5.8
Old Asphalt		5.2%	4.9%	4.6%	4.2%
RA-5 Rejuvenator		1.6%	1.5%	1.4%	1.3%
AR-4000W		0%	0%	0%	0%
Total Fluids		6.8%	6.4%	6.0%	5.5%

CONTRACT 1012
CONTROL SAMPLES - RECYCLED MIXTURE
25% REJUVENATOR

	Average	Range
Gradation (4 samples)		
1"	100	100
5/8"	100	100
1/2"	98	98-99
3/8"	88	88-90
1/4"	64	61-66
No. 10	32	31-33
No. 40	16	15-16
No. 80	10	10-11
No. 200	7.4	7.0-7.8
Percent Asphalt	5.0	4.8-5.1
Hveem Stability	28	26-32
Cohesion	206	175-250
Percent Voids	4.1	2.9-4.9
Sand/Silt Ratio	4.3	4.2-4.4
Resilient Modulus (4 samples)		
0.05 sec. (PSI)	6.7×10^5	$4.5\text{-}8.1 \times 10^5$
0.10 sec. (PSI)	5.0×10^5	$3.2\text{-}6.9 \times 10^5$
Absorption Recovery (4 samples)		
*39.2F Pen.	26	
77F Pen.	66	60-71
*60F Visc. (Poise)	2.7×10^7	
140F Visc. (Poise)	2,227	2,123-2,367
*275F Visc. (CS)	300	
*45F Duct. (cm)	60+	
*77F Duct. (cm)	100+	
Chemical Analysis (3 samples)		
Asphaltenes	28.5	28.4-28.6
Nitrogens (GPI)	4.3	3.9-4.7
Nitrogens (GPII)	21.2	21.0-21.6
1st Acidaffins	9.1	8.8-9.4
2nd Acidaffins	24.1	23.6-24.6
Paraffins	12.8	12.3-13.0
$(N+A_1)$ $(P+A_2)$	0.94	0.92-0.96

*Samples combined for one complete series.

CONTRACT 1012
CONTROL SAMPLES - RECYCLED MIXTURE
30% REJUVENATOR

Gradation (4 samples)	Average	Range
1"	100	100
5/8"	100	100
1/2"	99	98-100
3/8"	88	86-90
1/4"	62	61-65
No. 10	33	32-35
No. 40	16	16-18
No. 80	12	11-13
No. 200	7.6	7.5-7.8
Percent Asphalt	4.8	4.8-4.9
Hveem Stability	30	29-32
Cohesion	154	140-175
Percent Voids	4.0	3.6-4.4
Sand/Silt Ratio	4.5	4.3-4.8
Resilient Modulus (4 samples)		
0.05 sec. (PSI)	4.3×10^5	$3.9-5.0 \times 10^5$
0.10 sec. (PSI)	3.2×10^5	$2.9-3.6 \times 10^5$
Abson Recovery (4 samples)		
*39.2F Pen.	35	
77F Pen.	80	
*60F Visc. (Poise)	1.5×10^7	78-81
140F Visc. (Poise)	1,538	
*275F Visc. (CS)	272	1,365-1,605
*45F Duct. (cm)	60+	
*77F Duct. (cm)	100+	
Chemical Analysis (3 samples)		
Asphaltenes	27.7	26.5-28.8
Nitrogens (GPI)	2.1	1.1-2.9
Nitrogens (GPII)	24.4	23.8-25.1
1st Acidaffins	7.9	7.6-8.4
2nd Acidaffins	27.5	27.0-28.0
Paraffins	9.8	9.2-10.8
$(N+A_1)/(P+A_2)$	0.92	0.89-0.95

*Samples combined for one complete series.

CONTRACT 1012
COMPACTION DATA

	Nuclear		Core Densities(7 samples)	
	Average	Range	Average	Range
Void Content	8.5	0.6-15.2	11.8	7.7-17.3

CONTRACT 1012
CONSTRUCTION CORES - 25% REJUVENATOR
NON-OVERLAID

	Average	Range
Gradation (4 samples)		
1"	100	100
5/8"	100	100
1/2"	99	98-100
3/8"	89	87-91
1/4"	64	62-66
No. 10	34	32-35
No. 40	16	14-18
No. 80	11	9-13
No. 200	8.0	5.8-10.1
Percent Asphalt	5.2	5.0-5.4
Sand/Silt Ratio	4.4	3.5-5.5
Density (PCF)	142.6	139.4-144.3
Percent Voids	10.7	9.6-12.7
Resilient Modulus (3 samples)		
0.05 sec. (PSI)	4.0×10^5	$3.5\text{-}4.4 \times 10^5$
0.10 sec. (PSI)	2.2×10^5	$1.9\text{-}2.5 \times 10^5$
Abson Recovery (4 samples)		
*39.2F Pen.	23	
77F Pen.	55	51-58
*60F Visc. (Poise)	3.8×10^7	
140F Visc. (Poise)	3,028	2,812-3,417
275F Visc. (CS)	339	327-360
*45F Duct. (cm)	60+	
*77F Duct. (cm)	100+	
Chemical Analysis (3 samples)		
Asphaltenes	32.1	32.0-32.8
Nitrogens (GPI)	6.2	5.5-6.8
Nitrogens (GPII)	18.4	17.3-19.1
1st Acidaffins	7.3	7.1-7.5
2nd Acidaffins	20.8	20.1-21.4
Paraffins	15.6	15.1-16.1
$(N+A_1)/(P+A_2)$		

*Cores combined for one complete series.

CONTRACT 1012
CONSTRUCTION CORES -25% REJUVENATOR
OVERLAID**

	Average	Range
Gradation (7 samples)		
1"	100	100
5/8"	100	100
1/2"	99	98-99
3/8"	88	87-90
1/4"	64	61-74
No. 10	33	32-34
No. 40	16	16-17
No. 80	11	11-12
No. 200	7.9	7.4-8.5
Percent Asphalt	5.4	5.2-5.5
Sand/Silt Ratio	4.2	4.0-4.4
Density (PCF)	141.0	132.1-147.4
Percent Voids	11.8	7.7-17.3
Resilient Modulus (6 samples)		
0.05 sec. (PSI)	3.6×10^5	$2.0\text{-}4.7 \times 10^5$
0.10 sec. (PSI)	2.0×10^5	$1.1\text{-}2.6 \times 10^5$
Abson Recovery (7 samples)		
*39.2F Pen.	26	26
77F Pen.	58	51-66
*60F Visc. (Poise)	3.9×10^7	3.7-4.1
140F Visc. (Poise)	2,928	2,144-3,543
275F Visc. (CST)	344	295-394
*45F Duct. (cm)		37.5 & 60+
*77F Duct. (cm)	100+	100+
Chemical Analysis (7 samples)		
Asphaltenes	31.4	29.4-32.4
Nitrogens (GPI)	7.1	6.0-9.0
Nitrogens (GPII)	17.0	14.8-18.5
1st Acidaffins	7.9	6.6-8.9
2nd Acidaffins	21.2	20.0-22.6
Paraffins	15.6	14.4-17.0
$(N+A_1)/(P+A_2)$	0.87	0.79-0.95

*Cores combined for two complete series.
**Overlaid with 0.06' Open Graded Class D Friction Seal

CONTRACT 1012
CORES AFTER RECYCLING
30% REJUVENATOR
CONSTRUCTION CORES**

	Average	Range
Gradation (3 samples)		
1"	100	100
5/8"	100	100
1/2"	99	99-100
3/8"	90	90-91
1/4"	65	63-67
No. 10	34	34-35
No. 40	16	16-17
No. 80	11	11-12
No. 200	8.0	7.3-8.6
Percent Asphalt	5.3	4.6-6.1
Sand/Silt Ratio	4.4	4.0-4.8
Density (PCF)	144.3	142.6-146.6
Percent Voids	9.7	8.2-10.7
Resilient Modulus (3 samples)		
0.05 sec. (PSI)	3.1×10^5	$2.6\text{-}3.6 \times 10^5$
0.10 sec. (PSI)	1.9×10^5	$1.5\text{-}2.2 \times 10^5$
Absorn Recovery (3 samples)		
*39.2F Pen.	36	
77F Pen.	77	73-83
*60F Visc. (Poise)	0.22×10^7	
140F Visc. (Poise)	1,852	1,608-2,010
275F Visc. (CS)	280	258-294
*45F Duct. (cm)	60+	
*77F Duct. (cm)	100+	
Chemical Analysis (2 samples)		
Asphaltenes	32.2	30.6-33.8
Nitrogens (GPI)	5.8	5.4-6.3
Nitrogens (GPII)	15.9	14.6-17.2
1st Acidaffins	7.2	7.1-7.2
2nd Acidaffins	21.8	20.9-22.8
Paraffins	16.5	16.3-16.7
$(N+A_1)/(P+A_2)$	0.75	0.75-0.93

*Cores combined for one complete series.
**Construction cores were random throughout the project and were removed shortly after construction.

CONTRACT 1012
ONE-YEAR CORES - EASTBOUND
25% REJUVENATOR
NON-OVERLAID

	Average	Range
Gradation		
5/8"	100	100
1/2"	99	98-100
3/8"	87	83-90
1/4"	65	62-71
No. 10	35	33-42
No. 40	18	16-25
No. 80	13	11-20
No. 200	9.7	7.9-16.0
Percent Asphalt	5.5	5.3-5.7
Sand/Silt	3.8	2.6-4.2
Density (PCF)	149.3	145.1-152.8
Percent Voids	6.6	4.4-9.2
Abson Recovery		
77F Pen.	61.0	58-64
140F Viscosity (Poise)	2,771	2,547-2,954
275F Visc. (CS)	327	315-335

CONTRACT 1012
ONE-YEAR CORES - EASTBOUND
25% REJUVENATOR
OVERLAID*

	Average	Range
Gradation		
5/8"	100	100
1/2"	99	97-100
3/8"	87	80-91
1/4"	64	57-68
No. 10	33	30-35
No. 40	16	15-18
No. 80	11	10-12
No. 200	8.3	7.4-8.9
Percent Asphalt	5.8	5.3-6.2
Sand/Silt	4.0	3.9-4.4
Density (PCF)	146.4	137.5-151.2
Percent Voids	8.4	5.4-14.0
Abson Recovery		
77F Pen.	66	52-82
140F Viscosity (Poise)	2,331	1,710-3,179
275F Visc. (CS)	303	260-347

*Overlaid with 0.06' Open Graded Class D Friction Seal

CONTRACT 1012
ONE-YEAR CORES - WESTBOUND
30% REJUVENATOR
OVERLAID*

	Average	Range
Gradation		
5/8"	100	100
1/2"	99	98-100
3/8"	89	81-92
1/4"	66	58-69
No. 10	35	30-37
No. 40	17	16-18
No. 80	11.5	11-12
No. 200	8.3	7.7-10.0
Percent Asphalt	5.6	5.2-5.9
Sand/Silt	4.2	3.8-4.6
Density (PCF)	147.9	144.8-151.9
Percent Voids	7.5	5.0-9.4
Abson Recovery		
77F Pen.	78	62-91
140F Viscosity (Poise)	1,801.3	1,326-2,402
275F Visc. (CS)	302	244-484

*Overlaid with 0.06' Open Graded Class D Friction Seal

CONTRACT 1012
TWO-YEAR CORES - EASTBOUND
25% REJUVENATOR
NON-OVERLAID

	Average	Range
Gradation		
5/8"	100	100
1/2"	98	97-99
3/8"	87	86-88
1/4"	64	62-65
No. 10	35	32-37
No. 40	17	16-17
No. 80	12	12
No. 200	8.2	7.9-8.4
Percent Asphalt	5.4	5.3-5.6
Sand/Silt	4.3	4.1-4.5
Density (PCF)	149.4	143.1-153.3
Percent Voids	6.5	4.1-10.5
Abson Recovery		
77F Pen.	51	39-57
140F Viscosity (Poise)	4,001	2,967-5,838
275F Visc. (CS)	393	331-455

CONTRACT 1012
TWO-YEAR CORES - EASTBOUND
25% REJUVENATOR
OVERLAID*

	Average	Range
Gradation		
5/8"	100	100
1/2"	99	99-100
3/8"	89	88-90
1/4"	66	62-68
No. 10	35	33-38
No. 40	16.5	16-17
No. 80	11.6	11-12
No. 200	7.9	7.6-8.5
Percent Asphalt	5.8	5.4-6.2
Sand/Silt	4.4	4.3-4.6
Density (PCF)	149.7	144.7-154.3
Percent Voids	6.3	3.5-9.4
Abson Recovery		
77F Pen.	59	51-70
140F Viscosity (Poise)	2,981.9	2,251-3,927
275F Visc. (CS)	346.2	307-383

*Overlaid with 0.06' Open Graded Class D Friction Seal

CONTRACT 1012
TWO-YEAR CORES - WESTBOUND
30% REJUVENATOR
OVERLAID*

	Average	Range
Gradation		
5/8"	100	100
1/2"	99	98-100
3/8"	89.6	86-93
1/4"	64	62-70
No. 10	34	31-37
No. 40	16	16-17
No. 80	11	11-12
No. 200	7.6	7.3-8.0
Percent Asphalt	5.4	4.9-5.8
Sand/Silt	4.5	4.2-4.7
Density (PCF)	147.2	145.0-150.1
Percent Voids	7.9	6.1-9.3
Absorption Recovery		
77F Pen.	63	56-70
140F Viscosity (Poise)	2,837	2,177-3,664
275F Visc. (CS)	332	296-374

*Overlaid with 0.06' Open Graded Class D Friction Seal

CONTRACT 1012
FOUR-YEAR CORES
25% REJUVENATOR
OVERLAID**

Test (8 samples)	Average	Range
Percent Asphalt	5.5	5.2-5.8
Percent Voids	5.6	4.0-7.2
77F Pen.	46	36-55
140F Visc. (Poise)	4,229	3,281-6,708
275F Visc. (CS)	--	--
Resilient Modulus - 0.05 sec. (PSI)*	4.76×10^5	$3.37\text{-}5.84 \times 10^5$
Resilient Modulus - 0.10 sec. (PSI)*	3.48×10^5	$2.32\text{-}4.20 \times 10^5$

*Four samples in average.

**Overlaid with 0.06 Open Graded Class D Friction Seal

CONTRACT 1012
SIX-YEAR CORES - EASTBOUND
25% REJUVENATOR
NON-OVERLAID

Gradation (3 samples)	Average	Range
5/8"	100	100
1/2"	99	98-99
3/8"	89	88-89
1/4"	67	65-70
No. 10	35	34-37
No. 40	17	17-18
No. 80	12	12-13
No. 200	8.4	8.1-8.7
Percent Asphalt	5.1	5.0-5.2
Sand/Silt	4.2	4.2-4.3
Density (PCF)	151.1	149.7-152.3
Percent Voids	5.0	4.0-6.2
Absorption Recovery (3 samples)		
77F Pen.	39	27-50
140F Viscosity (Poise)	4,697	3,629-5,367
45F Ductility (cm)	23	11-34
Resilient Modulus (3 samples)		
77F -0.10 sec. (PSI)	3.13×10^5	$2.48-3.52 \times 10^5$

CONTRACT 1012
SIX-YEAR CORES - 25% REJUVENATOR
OVERLAID*

Gradation (4 samples)	Average	Range
5/8"	100	100
1/2"	99	99-100
3/8"	90	87-93
1/4"	67	63-69
No. 10	24	31-35
No. 40	17	15-17
No. 80	12	11-12
No. 200	7.8	7.3-8.4
Percent Asphalt	5.4	5.1-5.7
Sand/Silt	4.4	4.2-4.6
Density (PCF)	148.7	147.1-149.7
Percent Voids	6.3	5.3-7.5
Absen Recovery (4 samples)		
77F Pen.	51	44-57
140F Viscosity (Poise)	3,590	2,728-4,675
45F Ductility (cm)	43+	15-60+
Resilient Modulus (4 samples)		
77F -0.10 sec. (PSI)	1.78×10^5	$1.24-2.42 \times 10^5$

CONTRACT 1012
SIX-YEAR CORES - 30% REJUVENATOR
OVERLAID*

Gradation	Average	Range
5/8"	100	100
1/2"	99	99-100
3/8"	91	90-93
1/4"	69	68-70
No. 10	34	34-35
No. 40	16	16-17
No. 80	11	11
No. 200	7.2	7.0-7.4
Percent Asphalt	5.5	5.3-5.6
Sand/Silt	4.8	4.6-4.9
Density (PCF)	148.3	145.9-150.4
Percent Voids	6.4	5.2-8.5
Abson Recovery		
77F Pen.	63	43-79
140F Viscosity (Poise)	2,920	1,780-4,561
45F Ductility (cm)	46+	17-60+
Resilient Modulus		
77F -0.10 sec. (PSI)	2.05×10^5	$1.84\text{-}2.20 \times 10^5$

*Overlaid with 0.06' Open Graded Class D Friction Seal

CONTRACT 1012

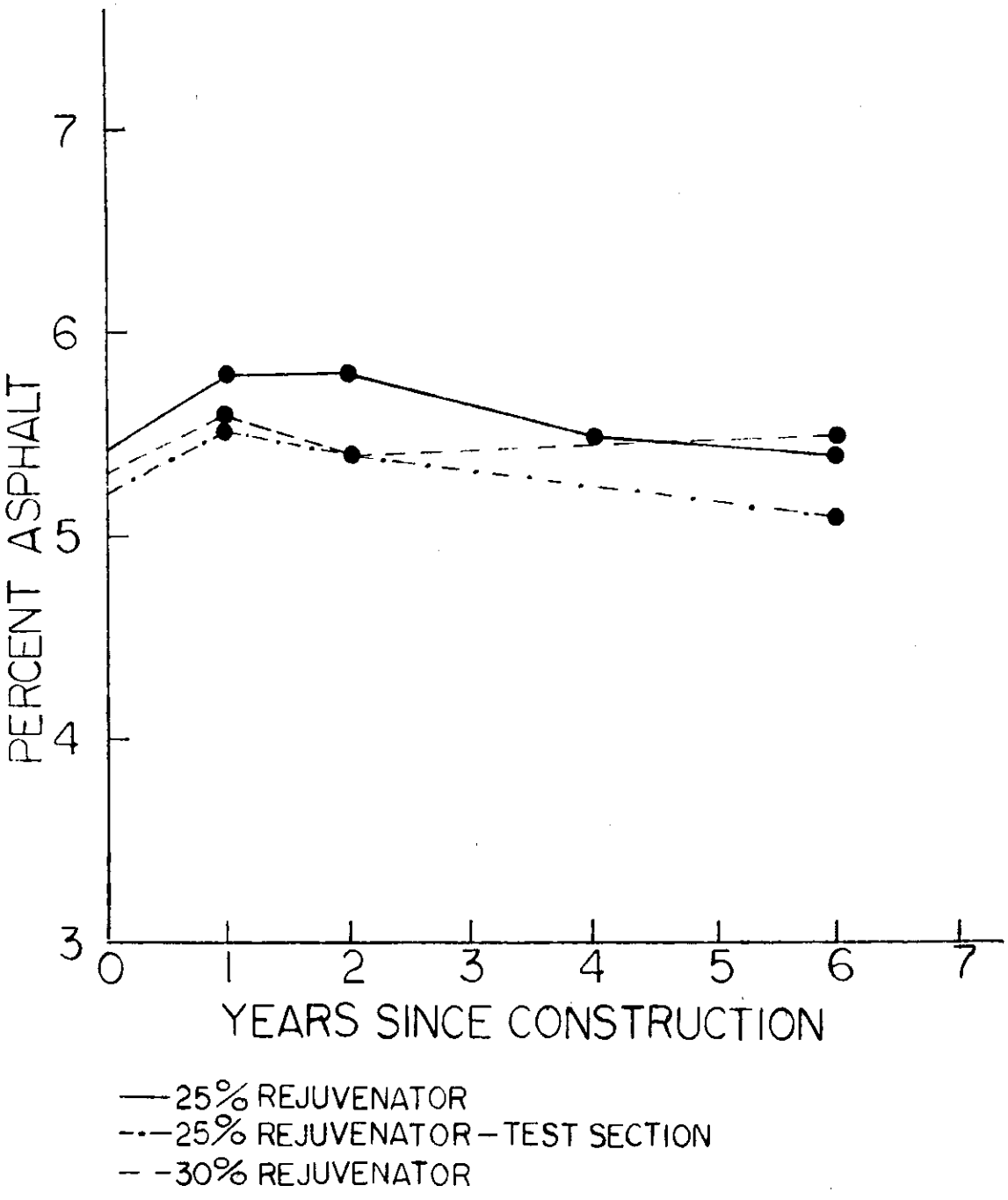
PAVEMENT PERFORMANCE

Year	Pavement Rating
1978	100
1981	99
1983	98.5
1984	99.5

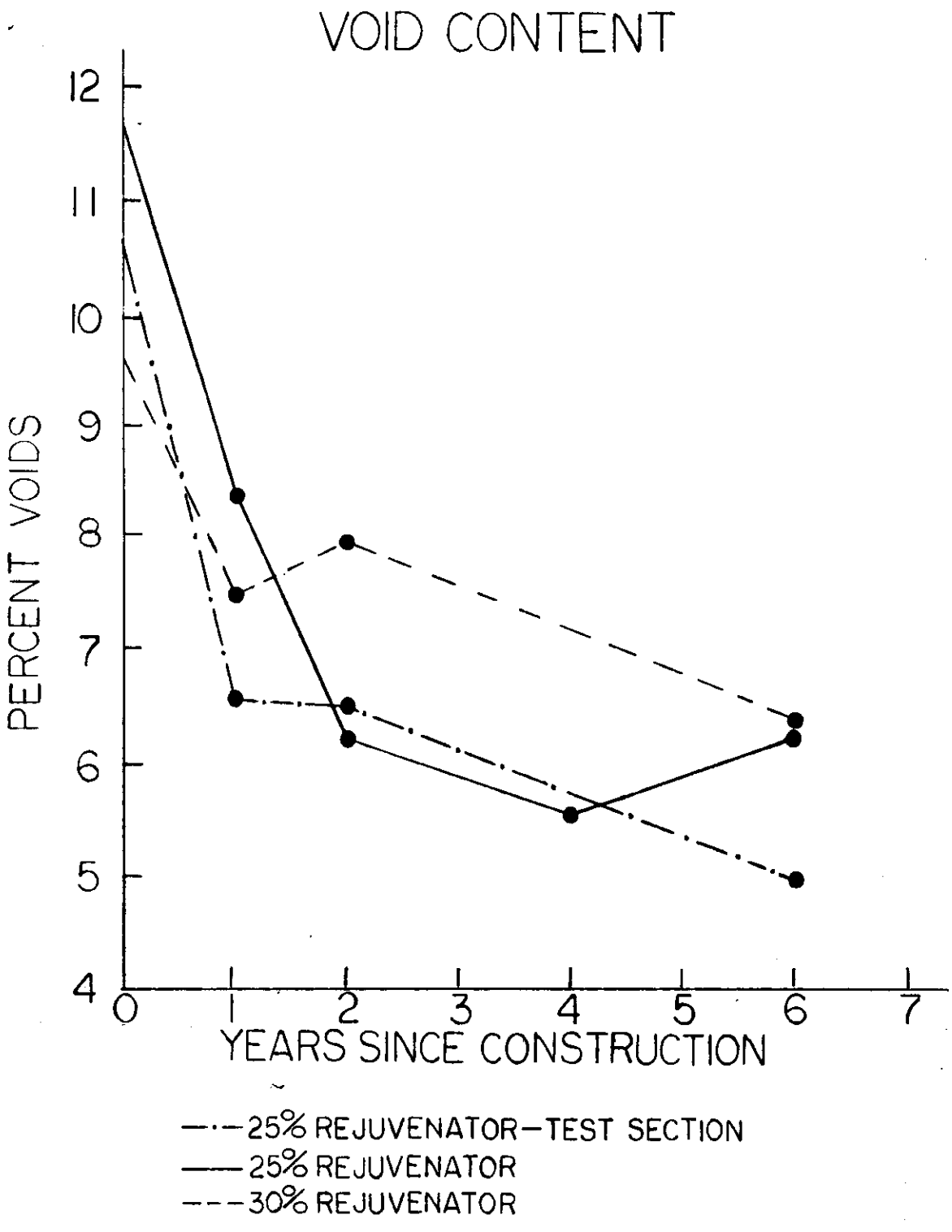
Average Daily Traffic (1986) = 14,700

C-1012

ASPHALT CONTENT



C-1012


VOID CONTENT
PERCENT VOIDS
12
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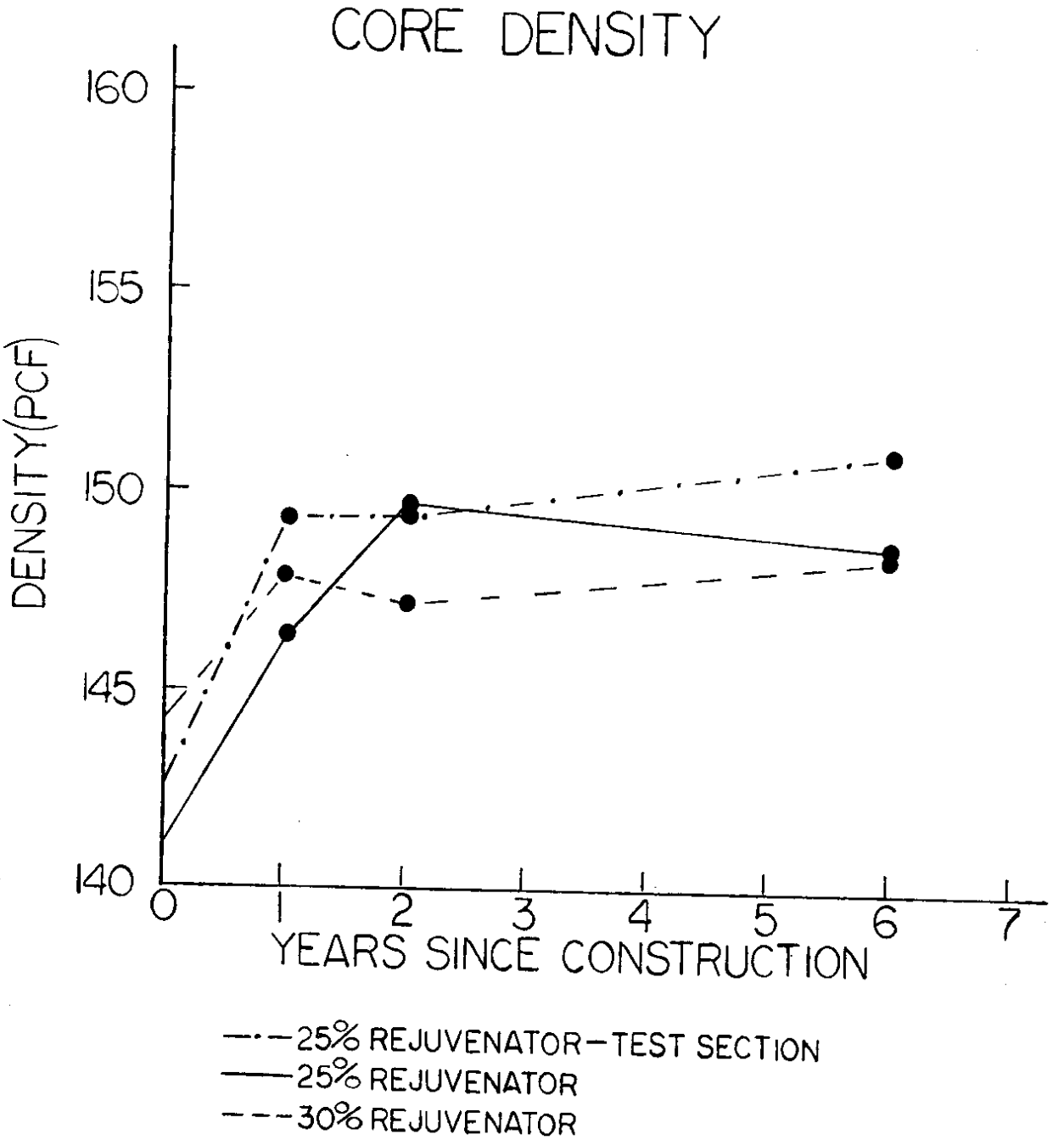
7
YEARS SINCE CONSTRUCTION
—·—25% REJUVENATOR—TEST SECTION
——25% REJUVENATOR
– – –30% REJUVENATOR

C-1012


CORE DENSITY
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155
150
145
140
DENSITY(PCF)
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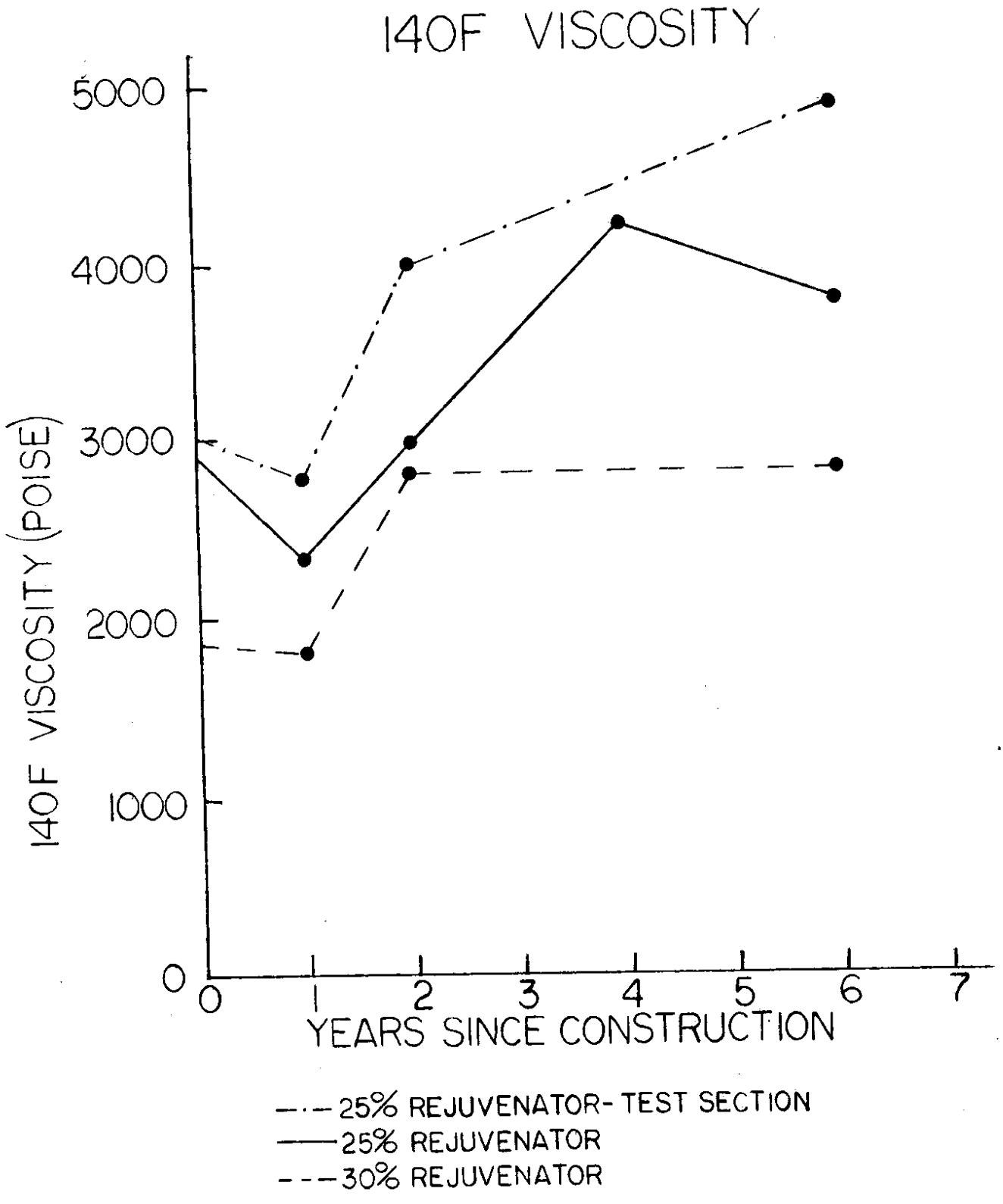
7
YEARS SINCE CONSTRUCTION
25% REJUVENATOR—TEST SECTION
25% REJUVENATOR
30% REJUVENATOR

C-1012


140F VISCOSITY
5000
4000
3000
2000
1000
0
140F VISCOSITY (POISE)
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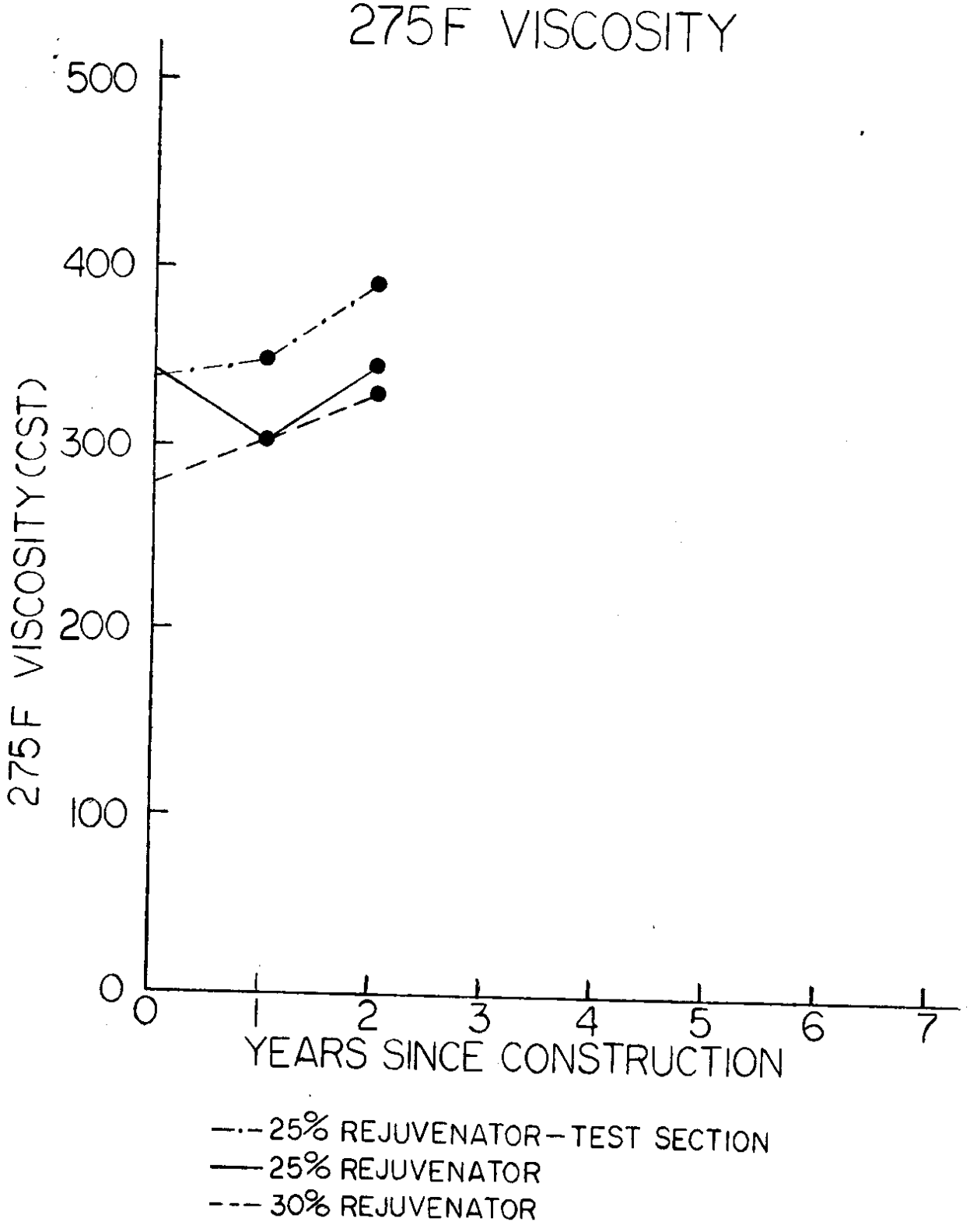
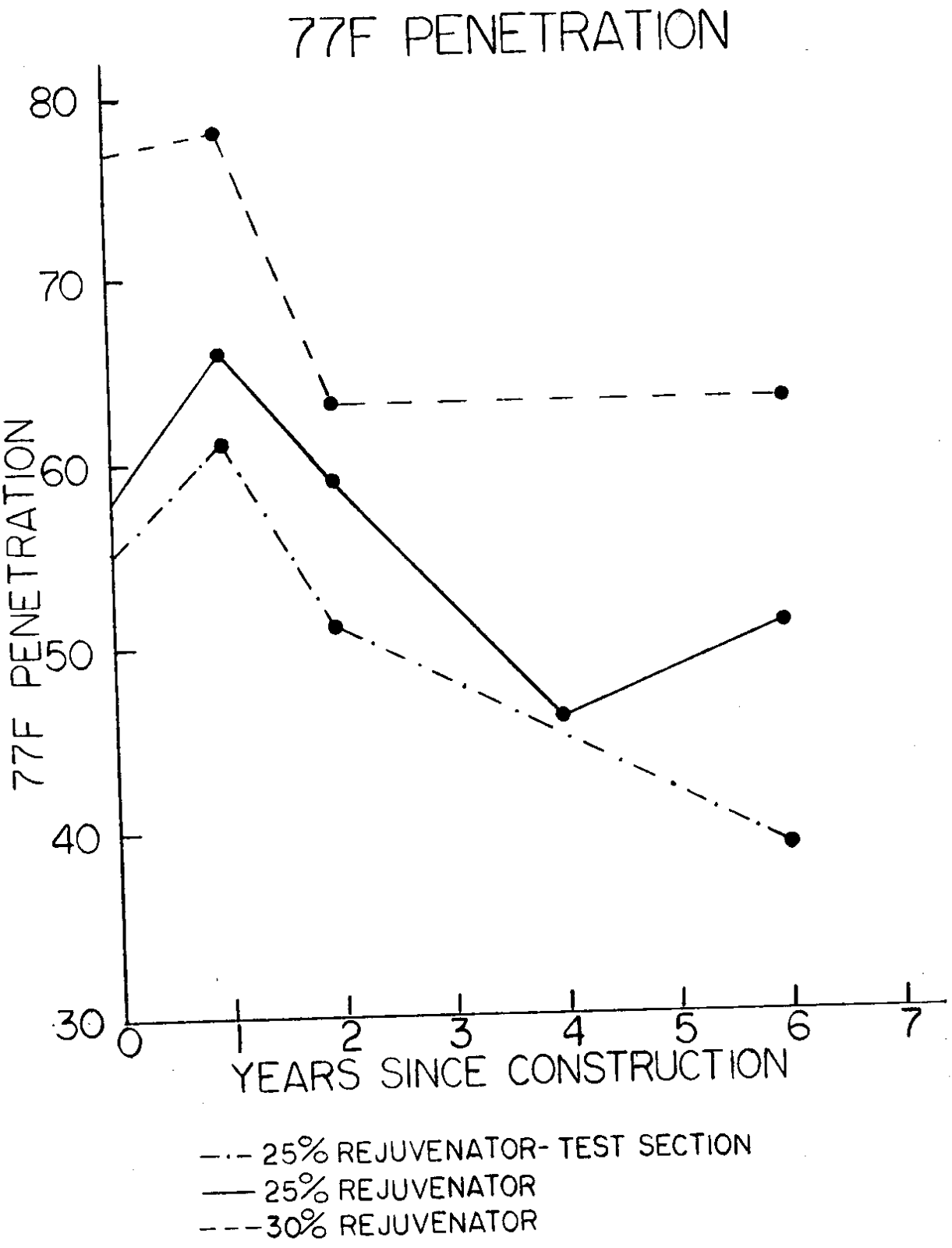
4
5
6
7
YEARS SINCE CONSTRUCTION
—·—25% REJUVENATOR- TEST SECTION
——25% REJUVENATOR
- - -30% REJUVENATOR

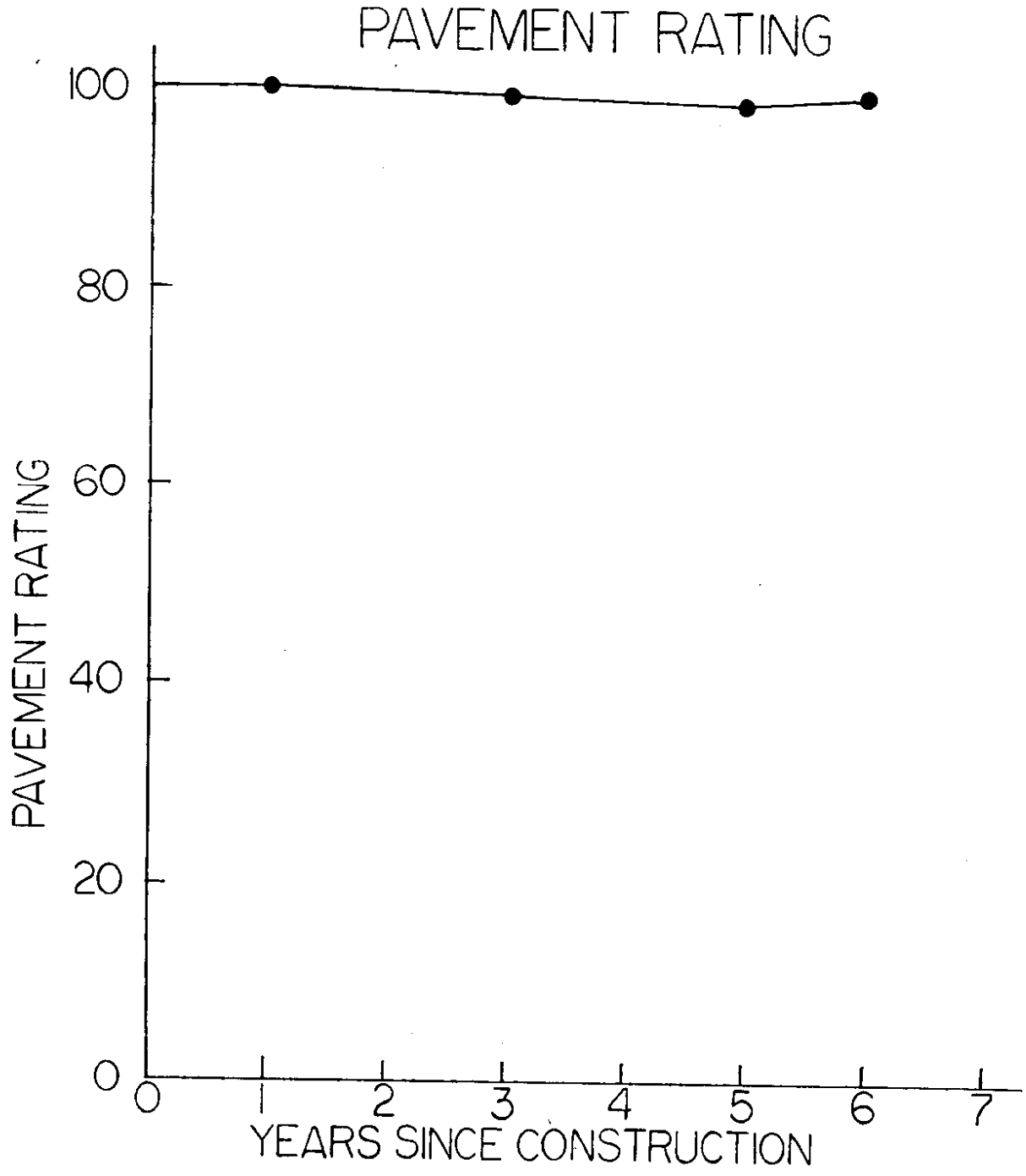
C-1012


275F VISCOSITY
500
400
300
200
100
0
275F VISCOSITY (CST)
0
1
2
3
4
5
6
7
YEARS SINCE CONSTRUCTION
25% REJUVENATOR – TEST SECTION
25% REJUVENATOR
30% REJUVENATOR

C-1012


77F PENETRATION
80
70
60
50
40
30
77F PENETRATION
0
1
2
3
4
5
6
7
YEARS SINCE CONSTRUCTION
—·— 25% REJUVENATOR- TEST SECTION
—— 25% REJUVENATOR
– – – 30% REJUVENATOR

C-1012


PAVEMENT RATING
100
80
60
40
20
0
PAVEMENT RATING
0
1
2
3
4
5
6
7
YEARS SINCE CONSTRUCTION

C-2058

SR 90 Adams Co. Line to Tyler

Section 1: MP 239.11 - MP 244.90
Section 2: MP 254.31 - MP 257.35

C-2058
SR 90 Adams Co. Line to Tyler
Section 1: MP 239.11-MP 244.90
Section 2: MP 254.31-MP 257.35
Paving Completed - 1982

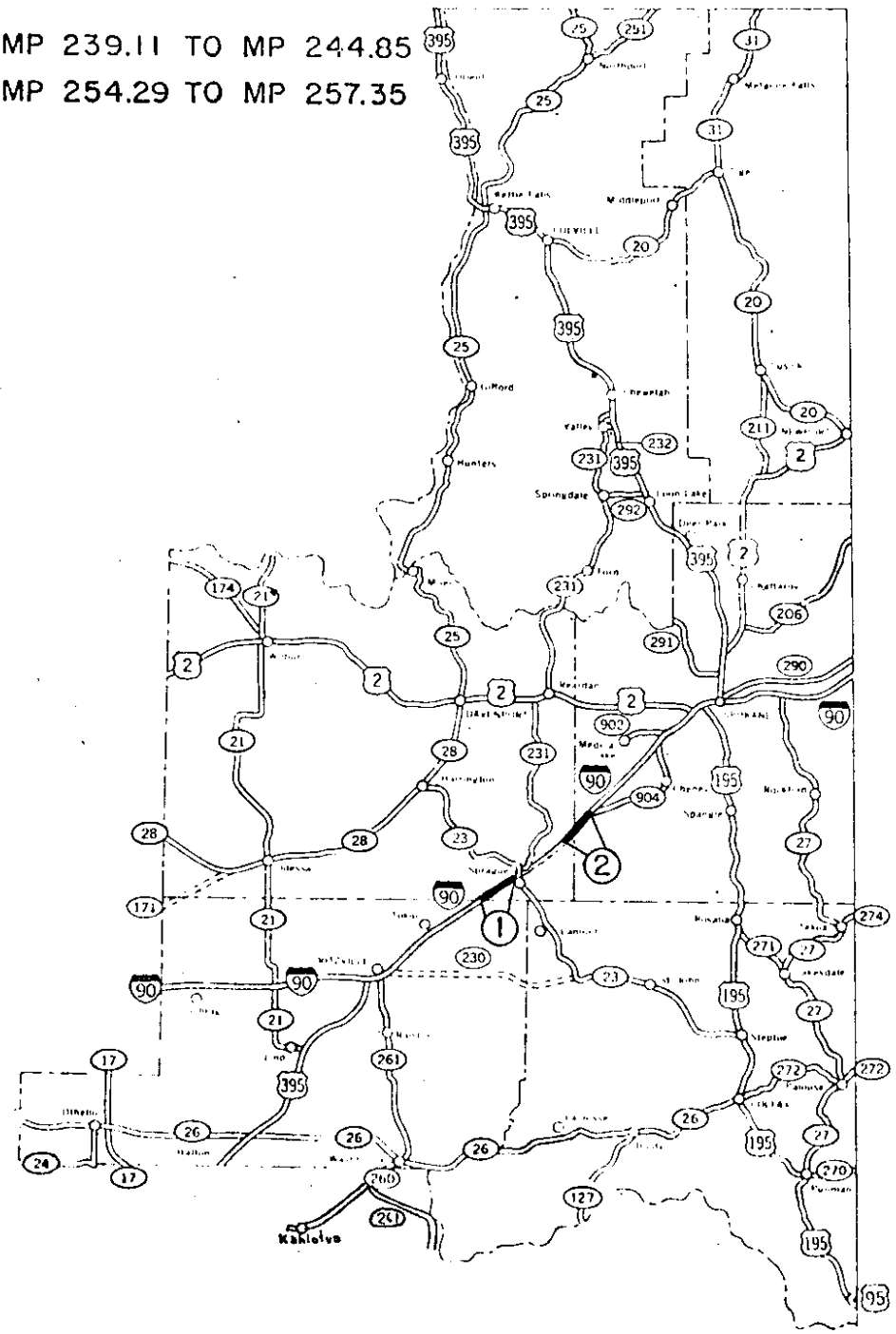
Vicinity Map	3.1
Road Section	3.2
ACP Mix Design - Section 1	3.3
ACP Mix Design - Section 2	3.4
Laboratory Testing:	
Recycled Mix Samples	3.5
Compaction Data	3.5
Construction Cores	3.6
Two-Year Cores	3.7
Pavement Performance	3.8

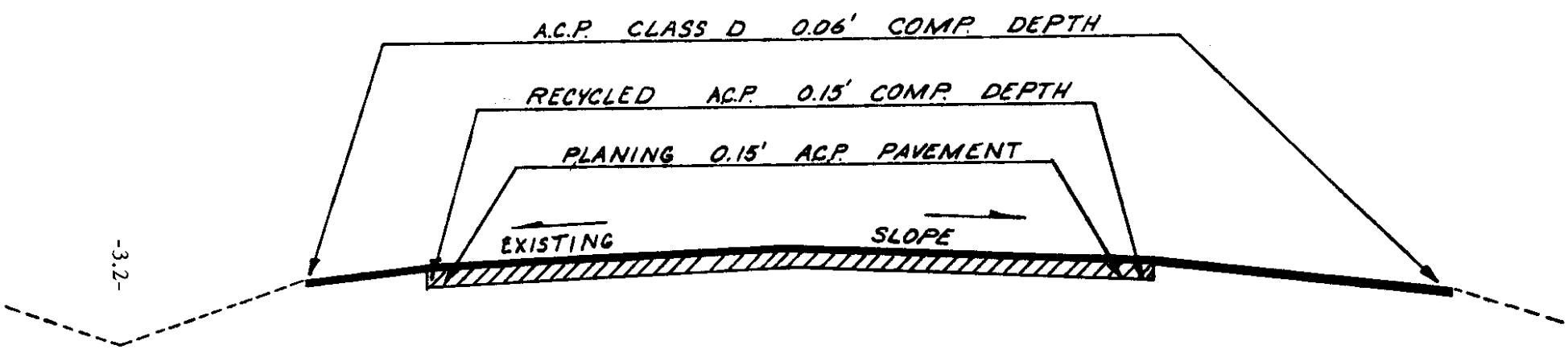
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

OLYMPIA, WASHINGTON

MAP OF STATE HIGHWAYS
DISTRICT NO. 6

1. SECTION 1 MP 239.11 TO MP 244.85
2. SECTION 2 MP 254.29 TO MP 257.35





ADAMS COUNTY LINE TO TYLER

SR 90

C - 2058

CONTRACT 2058
SECTION 1
ACP MIX DESIGN

Planings = 65%

New Aggregate = 35%

Gradation	Average of Cold-Plane Samples	Design Calculated Grading
5/8"	100	100
1/2"	100	94
3/8"	100	76
1/4"	96	62
No. 10	69	45
No. 40	35	22
No. 80	25	16
No. 200	17.1	11.1

Old Asphalt	= 4.6%
RA-5 Rejuvenator	= 0.7%
AR-4000W	= 0.3%
Total Fluids	= 5.6%

CONTRACT 2058
SECTION 2
ACP MIX DESIGN

Planings	= 75%
New Aggregate	= 25%

Gradation	Average of Cold-Plane Samples	Design Calculated Grading
5/8"	100	100
1/2"	100	96
3/8"	99	82
1/4"	92	69
No. 10	60	45
No. 40	28	21
No. 80	18	14
No. 200	10.8	8.3

Old Asphalt	= 3.8%
RA-5 Rejuvenator	= 1.1%
AR-4000W	= 0.5%
Total Fluids	= 5.4%

CONTRACT 2058
RECYCLED MIX SAMPLES

Gradation (25 samples)	Average	Range
5/8"	100	100
1/2"	98	96-99
3/8"	86	79-95
1/4"	67	55-71
No. 10	36	26-41
No. 40	18	16-22
No. 80	13	10-16
No. 200	8.2	5.4-11.0
Percent Asphalt	5.9	4.1-6.9
Stability	25	14-45
140F Viscosity (Poise)	31,479	1,950-163,464

COMPACTION DATA

	Nuclear		Core Density (6 samples)	
	Average	Range	Average	Range
Void Content	8.4	1.2-12.7	12.1	9.3-14.9

CONTRACT 2058

CONSTRUCTION CORES

Gradation (6 samples)	Average	Range
5/8"	100	100
1/2"	98	97-100
3/8"	86	78-93
1/4"	67	56-73
No. 10	35	30-37
No. 40	17	15-18
No. 80	11	9-12
No. 200	6.6	4.3-7.4
Percent Asphalt	4.9	4.5-5.8
Sand/Silt	5.5	4.7-8.1
Density (PCF)	141.9	137.4-146.4
Percent Voids	12.1	9.3-14.9

CONTRACT 2058

TWO-YEAR CORES

Gradation(2 samples)	Average	Range
5/8"	100	100
1/2"	99	98-99
3/8"	91	90-91
1/4"	74	72-76
No. 10	43	42-44
No. 40	22	21-22
No. 80	15	14-15
No. 200	5.1	8.3-11.9
Percent Asphalt	7.9	5.0-10.8
Sand/Silt	4.4	3.5-5.3
Density (PCF)	150.6	149.7-151.5
Percent Voids	3.4	1.1-5.6
Abson Recovery (2 samples)		
77F Pen.	35	33-36
140F Viscosity (Poise)	7,067	4,891-9,243
45F Ductility (cm)	8	5.5-10.5
Resilient Modulus		
77F -0.10 sec. (PSI)	6.0×10^5	$3.2 - 8.8 \times 10^5$

CONTRACT 2058

PAVEMENT PERFORMANCE

Year	Pavement Rating
1983	100
1984	92
1986	92

Average Daily Traffic (1986) = 11,400

C-2116

SR 395 Spokane Co. Line to Loon Lake

MP 183.69 - MP 190.61

C-2116
SR 395 Spokane Co. Line to Loon Lake
MP 183.69 - MP 190.61
Paving Completed - 1982

	Page
Vicinity Map	4.1
Roadway Section	4.2
ACP Mix Design	4.3
Laboratory Testing:	
Recycled Mix Samples	4.4
Compaction Data	4.4
Construction Cores (Wearing)	4.5
Construction Cores (Leveling)	4.6
Two-Year Cores (Wearing)	4.7
Two-Year Cores (Leveling)	4.8
Pavement Performance	4.9

N.Ostrander

SR 395
SPOKANE CO. LINE TO LOON LAKE

81E055

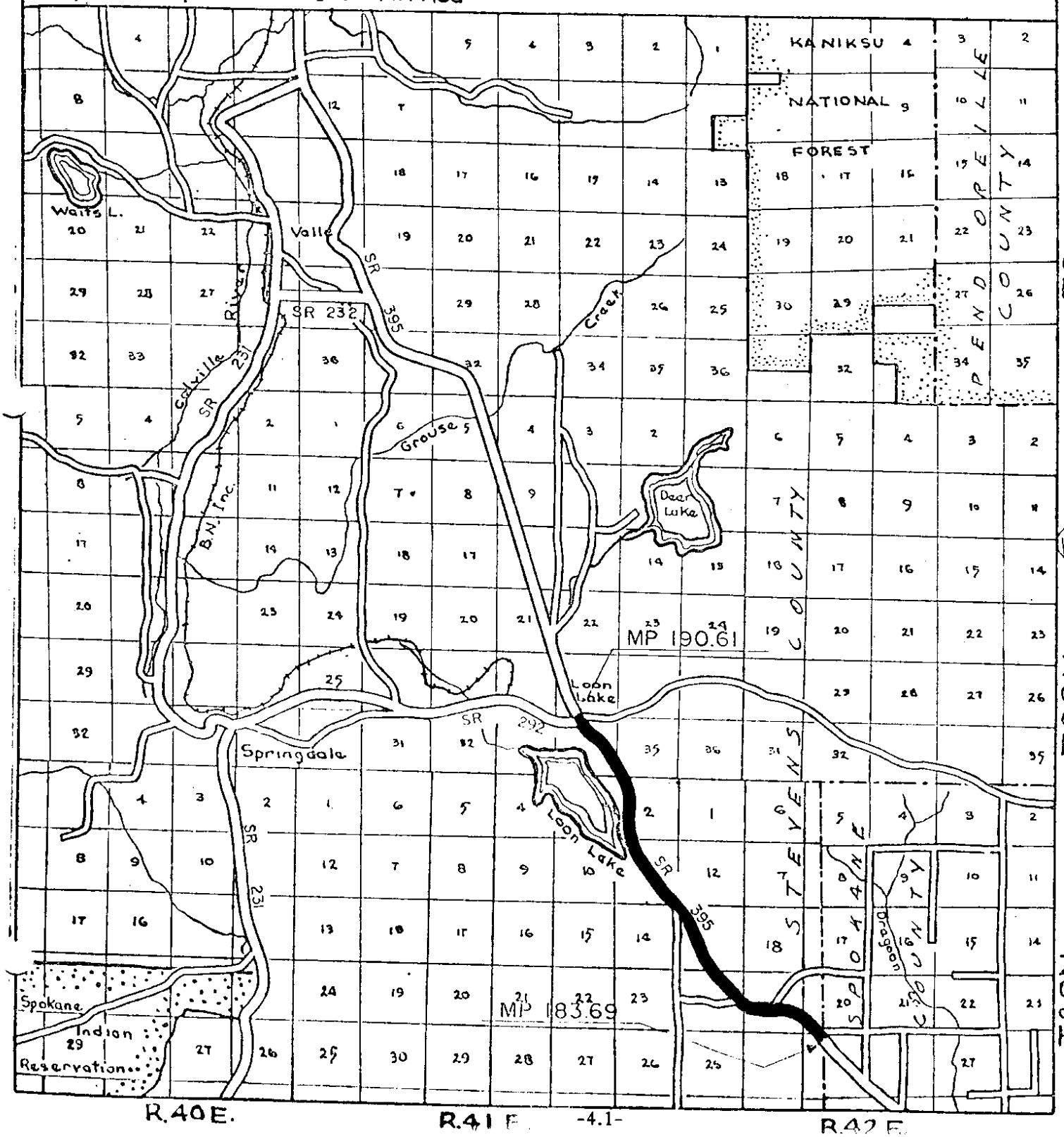
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

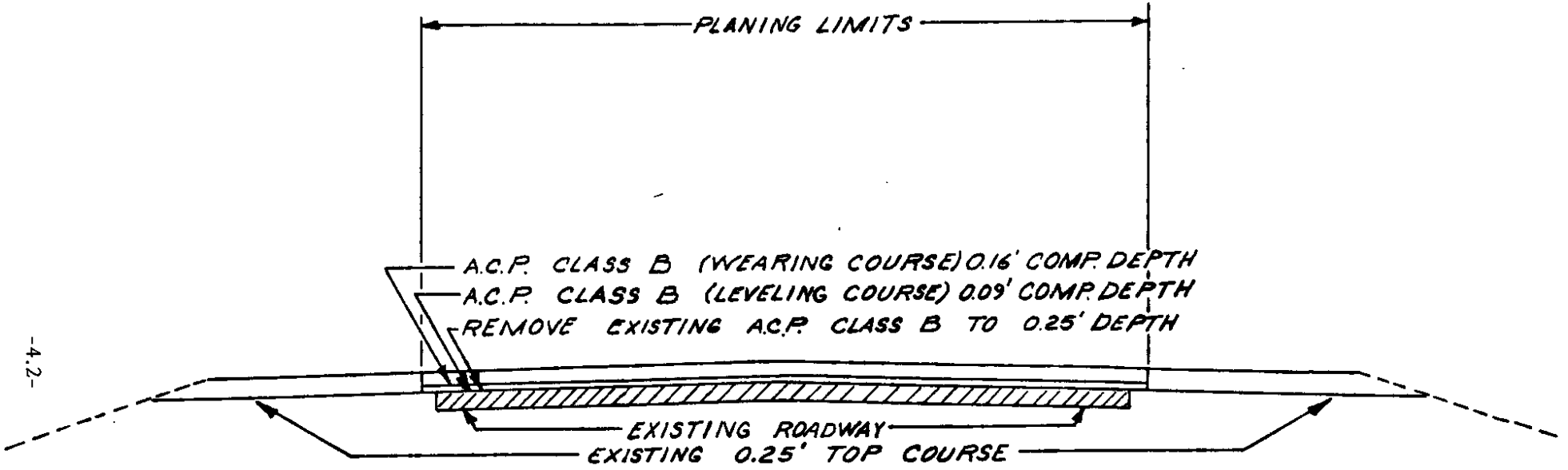
OLYMPIA, WASHINGTON

MAP OF STATE HIGHWAYS

STEVENS, SPOKANE & PEND ORILLE COUNTIES

Proposed Improvement Shown in Red





SPOKANE CO. LINE TO LOON LAKE

SR 395

C-2116

CONTRACT 2116
ACP MIX DESIGN

Planings	= 70%
New Aggregate	= 30%

Gradation	Average of Cold-Plane Samples	Design Calculated Grading
5/8"	100	100
1/2"	99	89
3/8"	94	74
1/4"	83	60
No. 10	46	32
No. 40	24	17
No. 80	16	11
No. 200	8.3	5.8

Old Asphalt	= 4.1%
RA-5 Rejuvenator	= 1.0%
AR-4000W	= 0.0%
Total Fluids	= 5.1%

CONTRACT 2116
RECYCLED MIX SAMPLES

Gradation (17 samples)	Average	Range
5/8"	100	98-100
1/2"	95	91-99
3/8"	82	76-87
1/4"	63	60-74
No. 10	32	30-38
No. 40	17	15-19
No. 80	12	11-14
No. 200	8.1	3.6-10.2
Percent Asphalt	5.2	4.2-7.2
Stability	24	17-34
140F Viscosity (Poise)	2,848	1,909-3,946

COMPACTION DATA

	Nuclear		Core Densities (7 samples)	
	Average	Range	Average	Range
Void Content	8.4	5.2-9.9	9.4	7.8-11.6

CONTRACT 2116

CONSTRUCTION CORES (WEARING)

Gradation (7 samples)	Average	Range
5/8"	100	100
1/2"	93	90-94
3/8"	83	78-87
1/4"	66	62-68
No. 10	35	34-36
No. 40	18	18
No. 80	13	13-14
No. 200	9.2	8.9-9.6
Percent Asphalt	5.3	5.1-5.4
Sand/Silt	3.8	3.7-3.8
Density (PCF)	138.9	135.7-141.4
Percent Voids	9.4	7.8-11.6

CONTRACT 2116

CONSTRUCTION CORES (LEVELING)

Gradation (7 samples)	Average	Range
5/8"		
1/2"		
3/8"		
1/4"		
No. 10		
No. 40		
No. 80		
No. 200		
Percent Asphalt		
Sand/Silt		
Density (PCF)	138.5	133.8-143.4
Percent Voids	9.7	6.5-12.8

CONTRACT 2116

TWO-YEAR CORES (WEARING)

Gradation (5 samples)	Average	Range
5/8"	100	100
1/2"	96	94-99
3/8"	84	80-90
1/4"	65	60-70
No. 10	34	31-37
No. 40	18	17-20
No. 80	13	13-15
No. 200	9.8	8.9-10.8
Percent Asphalt	4.0	3.0-5.1
Sand/Silt	3.4	3.1-3.8
Density (PCF)	143.5	140.1-144.8
Percent Voids	4.1	2.2-4.9
Absorption Recovery (5 samples)		
77F Pen.	40	27-48
140F Viscosity (Poise)	5,133	3,324-9,969
45F Ductility (cm)	14.7	5.5-20.5
Resilient Modulus (4 samples)		
77F -0.10 sec. (PSI)	11.5×10^5	$4.8\text{-}16.0 \times 10^5$

CONTRACT 2116

TWO-YEAR CORES (LEVELING)

Gradation (5 samples)	Average	Range
5/8"	100	100
1/2"	96	94-97
3/8"	86	83-90
1/4"	69	63-74
No. 10	36	32-40
No. 40	19	18-21
No. 80	14	13-15
No. 200	10.2	9.6-10.8
Percent Asphalt	4.5	2.9-8.4
Sand/Silt	3.6	3.3-3.9
Density (PCF)	138.4	136.4-140.9
Percent Voids	7.2	1.3-9.6
Abson Recovery (5 samples)		
77F Pen.	40	30-58
140F Viscosity (Poise)	4,787	2,359-6,595
45F Ductility (cm)	17.95+	1.25-60+
Resilient Modulus (4 samples)		
77F -0.10 sec. (PSI)	7.0×10^5	$3.9\text{-}13.6 \times 10^5$

CONTRACT 2116

PAVEMENT PERFORMANCE

Year	Pavement Rating
1983	100
1984	96
1986	96

Average Daily Traffic (1986) = 9,900

C-2142

SR 2 Rocklyn Rd. to MP 240.77

MP 245.40 - MP 240.77

C-2142
SR 2 Rocklyn Rd. to MP 240.77
MP 245.40 - MP 240.77
Paving Completed - 1982

	Page
Vicinity Map	5.1
Roadway Section	5.2
ACP Mix Design	5.3
Laboratory Testing:	
Recycled Mix Samples	5.4
Compaction Data	5.4
Construction Cores	5.5
Two-Year Cores	5.6
Pavement Performance	5.7

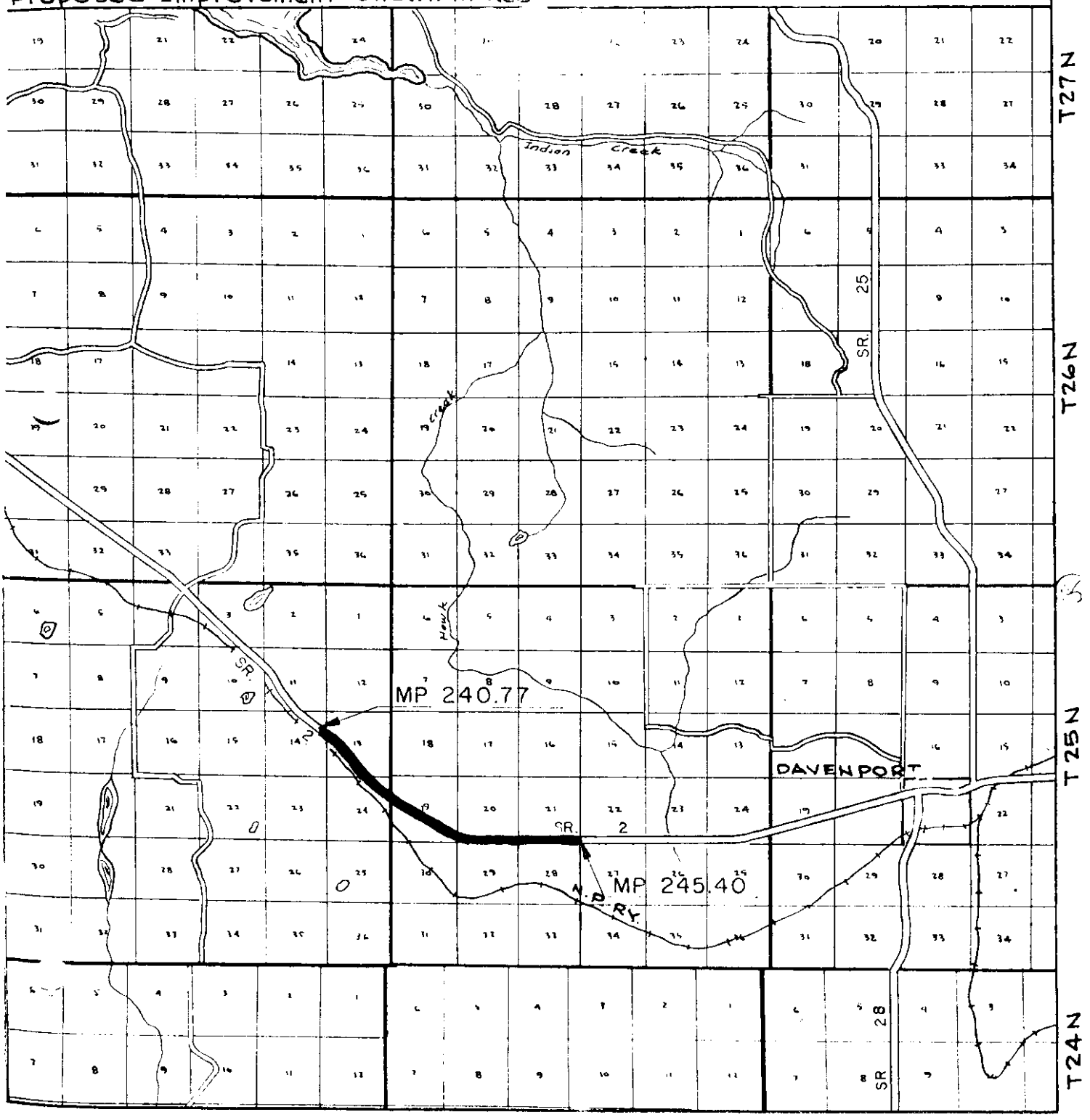
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

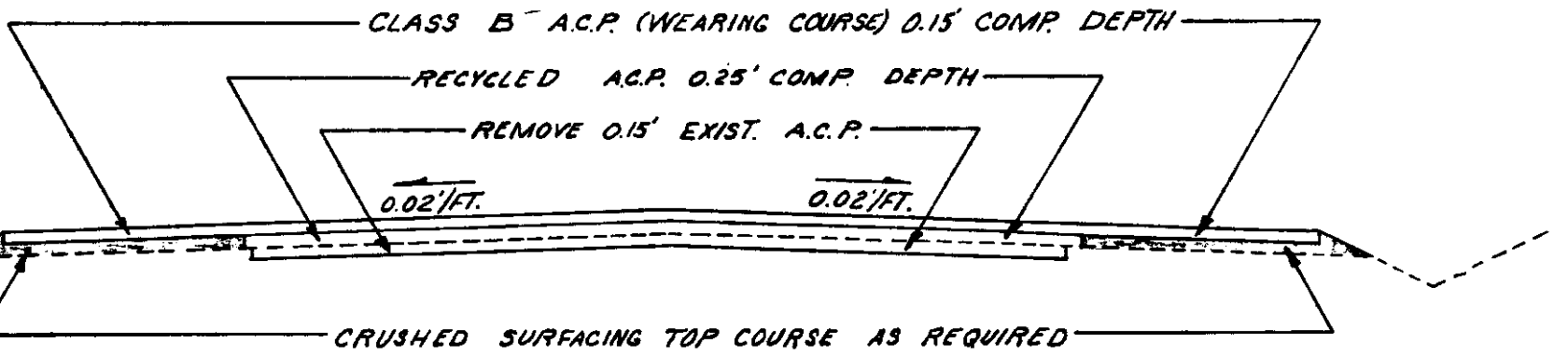
OLYMPIA, WASHINGTON

MAP OF STATE HIGHWAYS

LINCOLN COUNTY

Proposed Improvement Shown in Red





ROCKLYN ROAD TO MP 240.77

SR 2

C-2142

CONTRACT 2142
ACP MIX DESIGN
CLASS F

*Planings New Aggregate		40% 60%	50% 50%
Gradation	Average of Cold-Plane Samples	Calculated Design Grading	Calculated Design Grading
3/4"	100	100	100
5/8"	100		
1/2"	99	91	90
3/8"	92		
1/4"	79	60	58
No. 10	43	31	31
No. 40	23		
No. 80	15		
No. 200	9.8	7.0	6.4
		Mix Design	Mix Design
Old Asphalt		2.0%	2.6%
RA-250 Rejuvenator		3.1%	2.7%
AR-4000W		0.0%	0.0%
	Total Fluids	5.1%	5.3%

*Alternate mix designs were submitted.

CONTRACT 2142
Class F

RECYCLED MIX SAMPLES

Gradation (8 samples)	Average	Range
5/8"	100	100
1/2"	93	88-97
3/8"		
1/4"	61	54-69
No. 10	32	29-39
No. 40		
No. 80		
No. 200	7.9	7.5-8.7
Percent Ashalt	5.3	5.2-5.6
Stability	25	15-35
140F Viscosity (Poise)	1,981	1,382-3,094

COMPACTION DATA

	Nuclear		Core Densities (8 samples)	
	Average	Range	Average	Range
Void Content (%)	7.7	6.1-9.5	9.6	7.7-11.4

CONTRACT 2142

CONSTRUCTION CORES

Gradation (6 samples)	Average	Range
5/8"	100	100
1/2"	98	96-100
3/8"	87	80-91
1/4"	66	64-71
No. 10	34	31-37
No. 40	19	16-22
No. 80	11	10-12
No. 200	6.7	6.3-7.1
Percent Asphalt	5.6	5.1-6.0
Sand/Silt	5.2	4.7-5.7
Density (PCF)	148.7	145.7-151.8
Percent Voids	9.6	7.7-11.4

CONTRACT 2142

TWO-YEAR CORES

Gradation (2 samples)	Average	Range
5/8"	100	100
1/2"	93	92-93
3/8"	78	76-79
1/4"	62	58-65
No. 10	34	32-35
No. 40	18	17-18
No. 80	13	12-13
No. 200	9.1	8.8-9.4
Percent Asphalt	4.1	4.0-4.2
Sand/Silt	3.7	3.6-3.7
Density (PCF)	150.8	149.4-152.1
Percent Voids	7.5	6.8-8.2
Abson Recovery (2 samples)		
77F Pen.	34	34
140F Viscosity (Poise)	5,055	5,020-5,089
45F Ductility (cm)	8.63	7.75-9.50
Resilient Modulus (2 samples)		
77F -0.10 sec. (PSI)	8.4×10^5	$7.6\text{-}9.2 \times 10^5$

CONTRACT 2142

PAVEMENT PERFORMANCE

Year	Pavement Rating
1983	100
1984	100
1986	90

Average Daily Traffic (1986) = 2,300

C-2196

SR 90 to Thrall Road

MP 0.62 - MP 3.30

C-2196
SR 90 to Thrall Road
MP 0.62 - MP 3.30
Paving Completed - 1982

	Page
Vicinity Map	6.1
Roadway Section	6.2
ACP Mix Design	6.3
Laboratory Testing:	
Recycled Mix Samples	6.4
Compaction Data	6.4
Construction Cores	6.5
Two-Year Cores	6.6
Pavement Performance	6.7

5-6

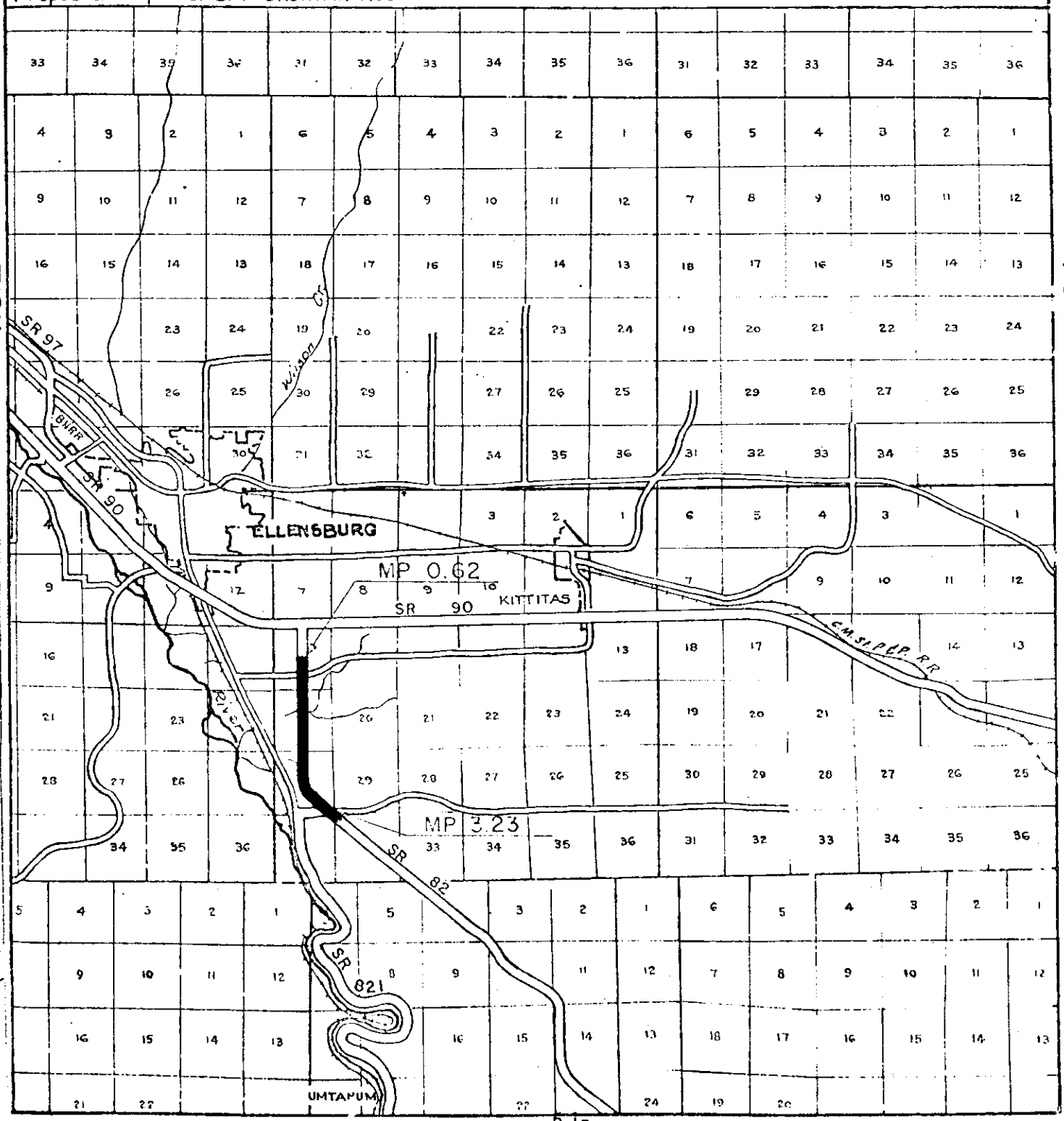
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

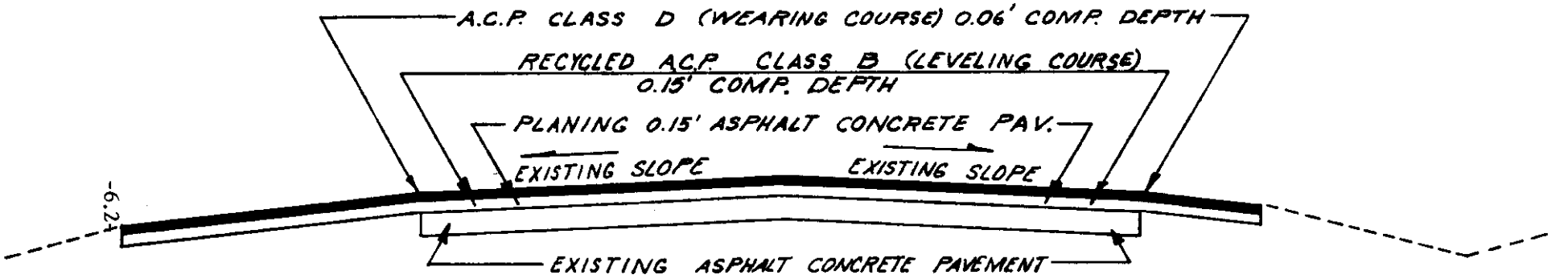
OLYMPIA, WASHINGTON

MAP OF STATE HIGHWAYS

KITTITAS COUNTY

Proposed Improvement Shown in Red





SR 90 TO THRALL ROAD

SR 82

C-2196

CONTRACT 2196
ACP MIX DESIGN

Planings		50%
New Aggregate		50%
Gradation	Average of Cold-Plane Samples	Calculated Design Grading
5/8"	100	100
1/2"	99	99
3/8"	88	85
1/4"	70	70
No. 10	36	37
No. 40	18	17
No. 80	11	10
No. 200	6.8	6.3
Old Asphalt		2.7%
RA-5 Rejuvenator		0.6%
AR-4000W		2.3%
Total Fluids		5.6%

CONTRACT 2196
RECYCLED MIX SAMPLES

Gradation (11 samples)	Average	Range
5/8"	100	100
1/2"	98	94-99
3/8"	87	83-93
1/4"	72	60-82
No. 10	38	30-49
No. 40	18	15-21
No. 80	11	10-14
No. 200	7.1	6.2-8.2
Percent Asphalt	5.4	4.0-7.9
Stability	24	10-38
140F Viscosity (Poise)	5,258	2,044-10,919

COMPACTION DATA

	Nuclear		Core Densities (9 samples)	
	Average	Range	Average	Range
Void Content (%)	6.6	5.6-7.8	9.2	5.5-14.8

CONTRACT 2196
CONSTRUCTION CORES

Gradation (9 samples)	Average	Range
5/8"	100	100
1/2"	99	98-99
3/8"	90	86-94
1/4"	73	68-80
No. 10	41	36-48
No. 40	19	16-22
No. 80	12	9-15
No. 200	8.1	5.3-10.2
Percent Asphalt	5.7	5.2-6.1
Sand/Silt	5.2	4.6-7.2
Density (PCF)	145.1	140.5-148.0
Percent Voids	9.2	5.5-14.8

CONTRACT 2196

TWO-YEAR CORES

Gradation (2 samples)	Average	Range
5/8"	100	100
1/2"	99	99
3/8"	86	84-87
1/4"	67	66-67
No. 10	34	32-35
No. 40	17	16-18
No. 80	12	11-12
No. 200	8.2	7.7-8.7
Percent Asphalt	5.0	4.8-5.1
Sand/Silt	4.1	4.0-4.2
Density (PCF)	143.5	140.8-146.2
Percent Voids	8.9	7.1-10.7
Abson Recovery (2 samples)		
77F Pen.	41	41
140F Viscosity (Poise)	5,488	5,052-5,925
45F Ductility (cm)	16.1	13.0-19.3
Resilient Modulus (2 samples)		
77F -0.10 sec. (PSI)	9.0×10^5	$8.7\text{-}9.3 \times 10^5$

CONTRACT 2196

PAVEMENT PERFORMANCE

Year	Pavement Rating
1983	100
1984	92
1986	92

Average Daily Traffic (1986) = 9,000

C-2231

SR 90 Ryegrass to Vantage

MP 126.14 - MP 137.20

C-2231
SR 90 Ryegrass to Vantage
MP 126.14 - MP 137.20
Paving Completed - 1982

	Page
Vicinity Map	7.1
Roadway Section	7.2
ACP Mix Design	7.3
Laboratory Testing:	
Recycled Mix Samples	7.4
Compaction Data	7.4
Construction Cores	7.5
Two-Year Cores	7.6
Pavement Performance	7.7

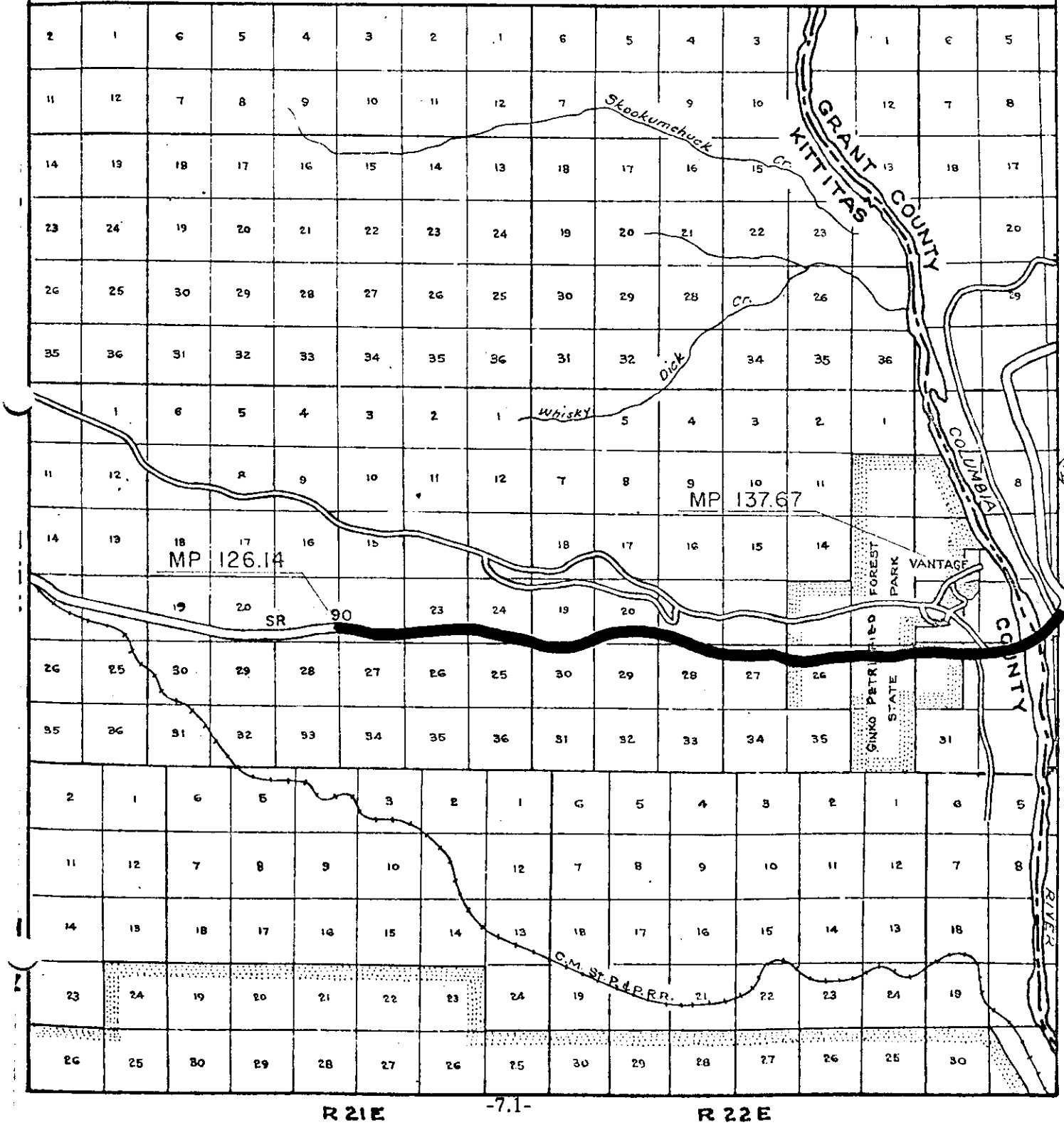
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

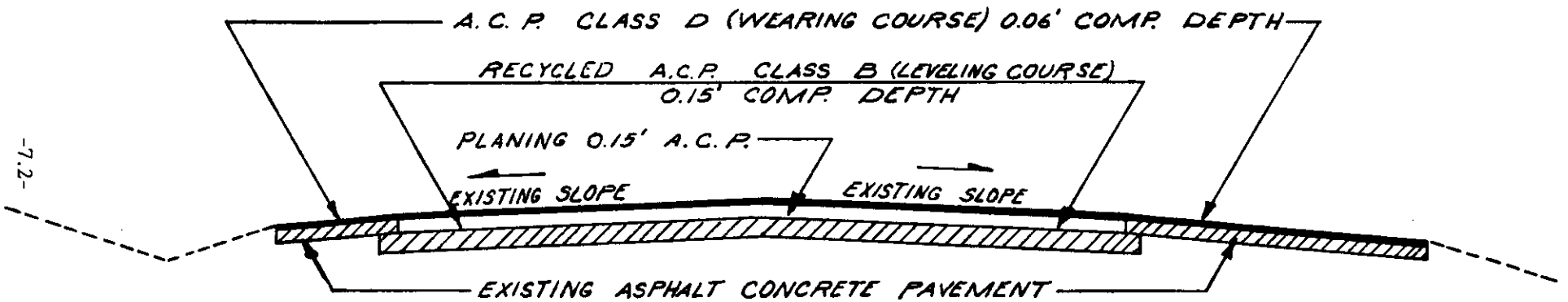
OLYMPIA, WASHINGTON

MAP OF STATE HIGHWAYS

KITTITAS & GRANT COUNTIES

Proposed Improvement Shown in Red





RYEGRASS TO VANTAGE

SR 90

C-2231

CONTRACT 2231

ACP MIX DESIGN

Planings		75%
New Aggregate		24%
Gradation	Average of Cold-Plane Samples	Calculated Grading
5/8"	100	100
1/2"	100	97
3/8"	99	86
1/4"	89	73
No. 10	52	40
No. 40	25	19
No. 80	17	13
No. 200	9.6	7.4
Old Asphalt		4.4%
RA-5 Rejuvenator		1.3%
AR-4000W		0.0%
Total Fluids		5.7%

CONTRACT 2231

RECYCLED MIX SAMPLES

Gradation (20 samples)	Average	Range
5/8"	100	100
1/2"	98	95-100
3/8"	85	82-90
1/4"	66	54-77
No. 10	34	27-42
No. 40	17	14-20
No. 80	12	10-15
No. 200	7.4	6.0-9.6
Percent Asphalt	5.5	4.8-6.4
Stability	23	10-33
140F Viscosity (Poise)	4,067	1,826-9,238

COMPACTION DATA

	Nuclear		Core Densities (32 samples)	
	Average	Range	Average	Range
Void Content	7.3	5.4-10.1	8.2	2.9-12.9

CONTRACT 2231

CONSTRUCTION CORES

Gradation (32 samples)	Average	Range
5/8"	100	100
1/2"	97	94-100
3/8"	85	76-93
1/4"	69	58-77
No. 10	37	31-43
No. 40	18	16-21
No. 80	13	11-14
No. 200	8.2	6.6-10.4
Percent Asphalt	5.5	4.8-7.0
Sand/Silt	4.5	3.9-5.3
Density (PCF)	149.3	141.7-158.0
Percent Voids	8.2	2.9-12.9

CONTRACT 2231

TWO-YEAR CORES

Gradation	Average	Range
5/8"	100	100
1/2"	99	97-100
3/8"	90	86-94
1/4"	72	71-73
No. 10	42	40-44
No. 40	24	20-28
No. 80	19	14-23
No. 200	14.2	9.2-19.2
Percent Asphalt	5.2	4.5-5.9
Sand/Silt	3.3	2.3-4.3
Density (PCF)	153.8	153.2-154.3
Percent Voids	4.3	3.2-5.3
Abson Recovery (2 samples)		
77F Pen.	42.5	27-58
140F Viscosity (Poise)	7,333	3,358-11,308
45F Ductility (cm)	19.8	8.75-30.8
Resilient Modulus (2 samples)		
77F -0.10 sec. (PSI)	7.8×10^5	$15.1\text{-}16.0 \times 10^5$ $7.6\text{-}8.0 \times 10^5$

CONTRACT 2231

PAVEMENT PERFORMANCE

Year	Pavement Rating
1983	100
1984	100
1986	97

Average Daily Traffic (1986) = 10,000

C-2246

SR 90 Dodson Road to Mae Valley

MP 164.25 - MP 175.62

C-2246
SR 90 Dodson Road to Mae Valley
MP 164.25 - MP 175.62
Paving Completed - 1982

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Laboratory Testing:	
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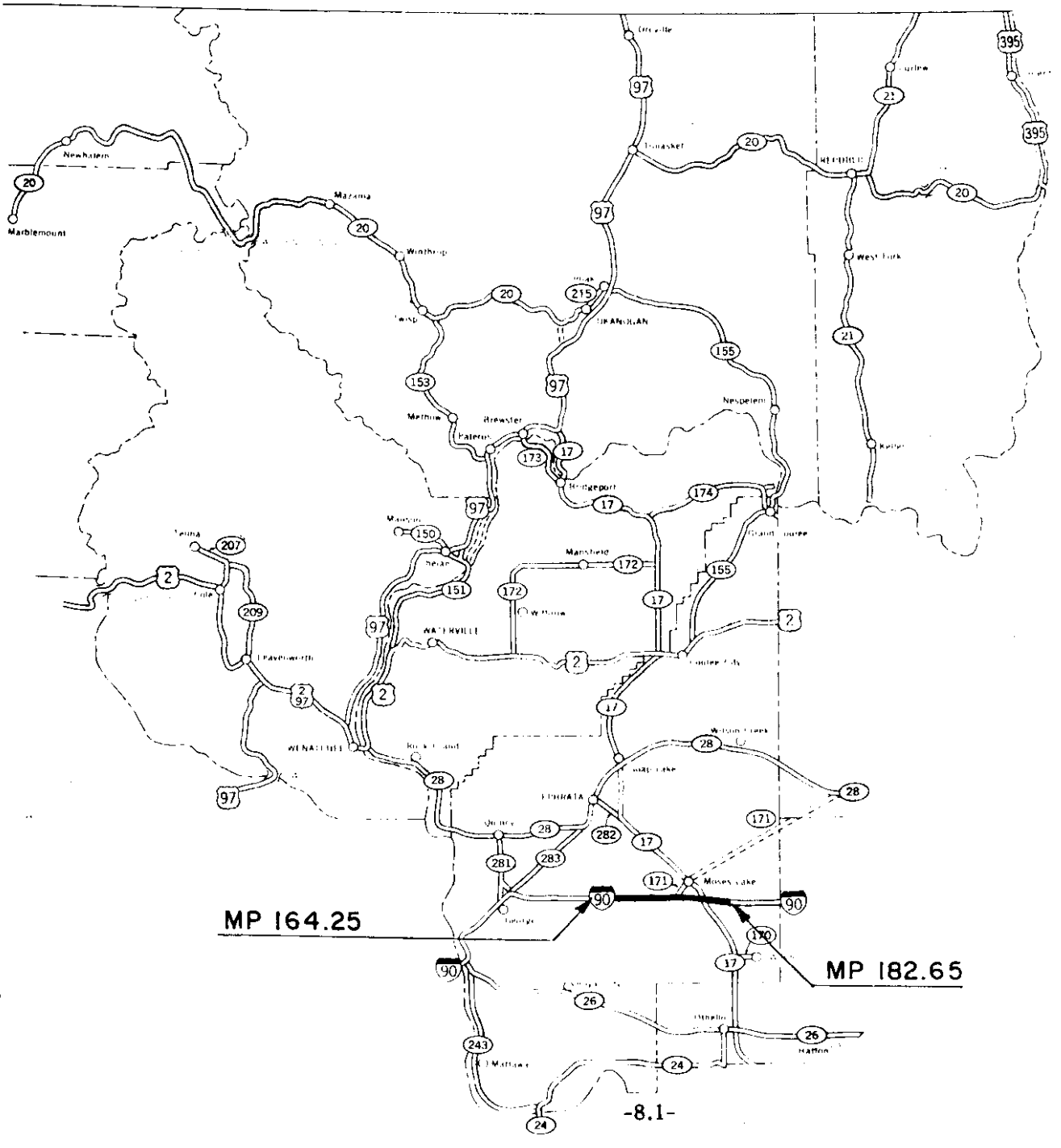
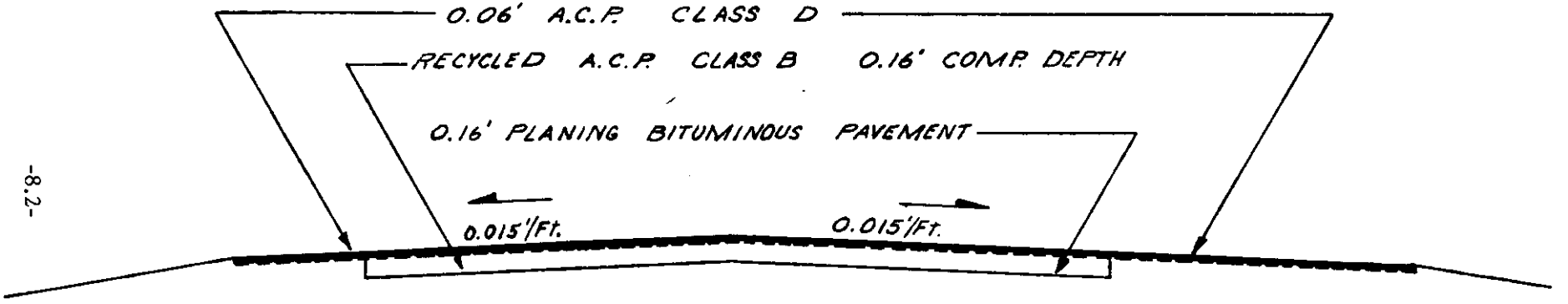
Construction Cores	8.5
Two-Year Cores	8.6
Pavement Performance	8.7

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

OLYMPIA, WASHINGTON

MAP OF STATE HIGHWAYS
DISTRICT NO. 2





DODSON ROAD TO MAE VALLEY

SR 90

C-2246

CONTRACT 2246

ACP MIX DESIGN

Planings		75%
New Aggregate		25%
Gradation	Average of Cold-Plane Samples	Calculated Grading
5.8"	100	100
1/2"	98	96
3/8"	87	81
1/4"	69	60
No. 10	41	35
No. 40	23	19
No. 80	15	12
No. 200	7.6	6.3
Old Asphalt		3.9%
RA-5 Rejuvenator		0.6%
AR-4000W		0.6%
Total Fluids		5.1%

CONTRACT 2246

RECYCLED MIX SAMPLES

Gradation (13 samples)	Average	Range
5/8"	100	100
1/2"	97	94-99
3/8"	84	78-92
1/4"	63	54-75
No. 10	35	31-44
No. 40	19	17-23
No. 80	13	12-16
No. 200	7.9	6.8-9.2
Percent Asphalt	5.2	4.6-6.6
Stability	19	4-29
140F Viscosity (Poise)	3,825	2,273-7,020

COMPACTION DATA

	Nuclear		Core Densities (15 samples)	
	Average	Range	Average	Range
Void Content (%)	7.7	5.0-14.4	7.5	4.4-13.7

CONTRACT 2246

CONSTRUCTION CORES

Gradation (15 samples)	Average	Range
5/8"	100	100
1/2"	98	96-99
3/8"	85	77-89
1/4"	66	55-72
No. 10	36	31-40
No. 40	18	17-20
No. 80	13	12-14
No. 200	8.4	7.6-9.1
Percent Asphalt	5.2	4.4-6.0
Sand/Silt	4.3	4.1-4.7
Density (PCF)	150.4	148.5-155.4
Percent Voids	7.5	4.4-13.7

CONTRACT 2246

TWO-YEAR CORES

Gradation (2 samples)	Average	Range
5/8"	100	100
1/2"	96	94-97
3/8"	80	75-87
1/4"	60	53-66
No. 10	33	28-37
No. 40	18	17-19
No. 80	14	13-14
No. 200	9.3	9.3
Percent Asphalt	3.2	1.9-4.4
Sand/Silt	2.6	2.1-3.0
Density (PCF)	153.9	150.4-157.4
Percent Voids	4.4	1.7-7.1
Absorption Recovery (2 samples)		
77F Pen.	42	35-48
140F Viscosity (Poise)	4,689	3,504-5,874
45F Ductility (cm)	6.75	5.5-8.0
Resilient Modulus (3 samples)		
77F -0.10 sec. (PSI)	7.4×10^5	$6.1\text{-}8.4 \times 10^5$

CONTRACT 2246

PAVEMENT PERFORMANCE

Year	Pavement Rating
1983	100
1984	97
1986	97

Average Daily Traffic (1986) = 7,300

C-2279

SR 90 Grant Co. Line to Schrag

MP 191.89 - MP 200.35

C-2279
SR 90 Grant Co. Line to Schrag
MP 191.89 - MP 200.35
Paving Completed - 1982

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Vicinity Map	9.1
Roadway Section	9.2
ACP Mix Design	9.3
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Recycled Mix Samples	9.4
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Construction Cores	9.5
Two-Year Cores	9.6
Pavement Performance	9.7

SR 90
GRANT COUNTY LINE TO SCHRAG

J. Jones

82E010

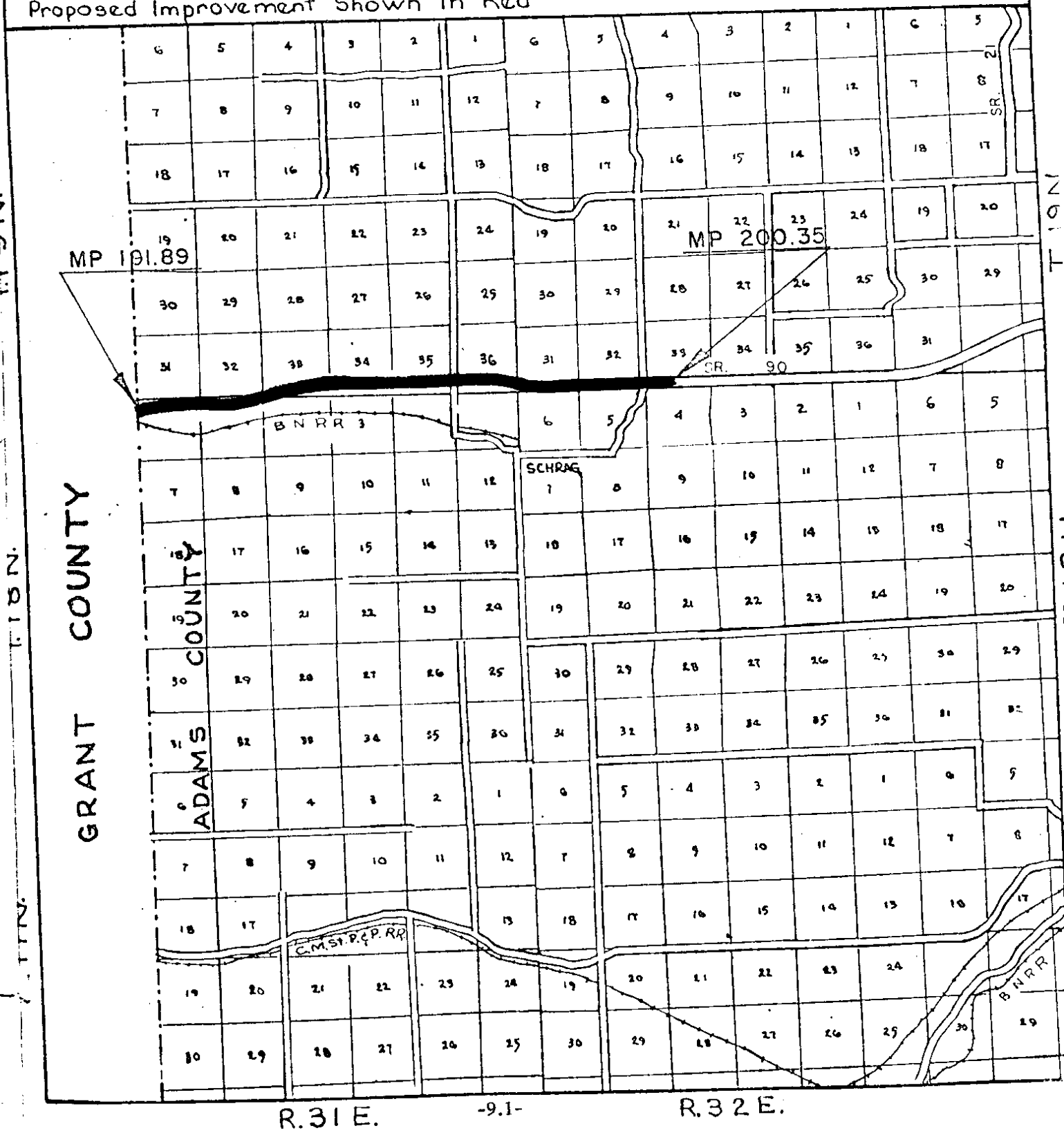
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

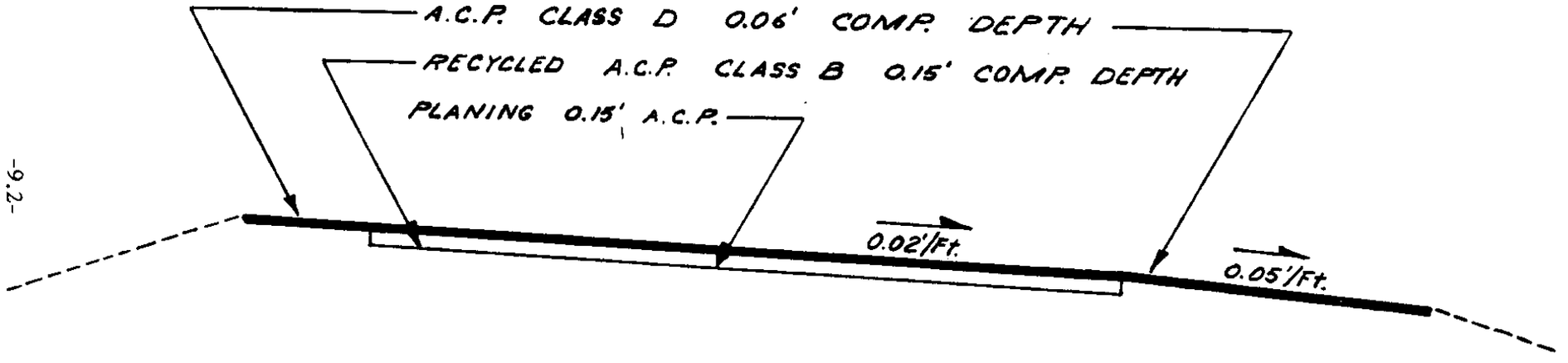
OLYMPIA, WASHINGTON

MAP OF STATE HIGHWAYS

ADAMS COUNTY

Proposed Improvement Shown in Red





GRANT COUNTY LINE TO SCHRAG

SR 90

C-2279

CONTRACT 2279

ACP MIX DESIGN

Planings		65%
New Aggregate		35%
Gradation	Average of Cold-Plane Samples	Calculated Design Grading
5/8"	100	100
1/2"	99	98
3/8"	94	87
1/4"	79	67
No. 10	48	36
No. 40	26	19
No. 80	17	12
No. 200	9.8	7.4
Old Asphalt		3.6%
RA-75 Rejevenator		1.6%
AR-4000W		0.0%
Total Fluids		5.2%

CONTRACT 2279

RECYCLED MIX SAMPLES

Gradation (22 samples)	Average	Range
5/8"	100	100
1/2"	98	96-99
3/8"	86	81-90
1/4"	65	61-69
No. 10	33	29-36
No. 40	17	15-18
No. 80	12	10-13
No. 200	7.4	6.3-8.3
Percent Asphalt	5.4	4.2-6.7
Stability	26	14-40
140F Viscosity (Poise)	4,279	3,061-6,409

COMPACTION DATA

	Nuclear		Core Densities (19 samples)	
	Average	Range	Average	Range
Void Content (%)	--	--	7.5	2.5-10.2

CONTRACT 2279

CONSTRUCTION CORES

Gradation (19 samples)	Average	Range
5/8"	100	100
1/2"	98	96-100
3/8"	87	81-93
1/4"	67	60-70
No. 10	35	29-40
No. 40	18	16-20
No. 80	13	12-14
No. 200	8.5	7.6-9.6
Percent Asphalt	5.6	4.8-6.2
Sand/Silt	4.1	3.7-4.6
Density (PCF)	149.2	144.9-157.3
Percent Voids	7.5	2.5-10.2

CONTRACT 2279

TWO-YEAR CORES

Gradation (2 samples)	Average	Range
5/8"	100	100
1/2"	98	96-99
3/8"	89	88-90
1/4"	69	67-71
No. 10	35	33-37
No. 40	20	18-21
No. 80	15	13-16
No. 200	10.7	8.9-12.4
Percent Asphalt	3.5	2.6-4.3
Sand/Silt	3.4	3.0-3.7
Density (PCF)	147.9	146.6-149.2
Percent Voids	8.0	7.6-8.4
Abson Recovery (2 samples)		
77F Pen.	32	26-38
140F Viscosity (Poise)	7,751	5,791-9,711
45F Ductility (cm)	7.13	5.25-9.00
Resilient Modulus (3 samples)		
77F -0.10 sec. (PSI)	7.8×10^5	$6.8\text{-}9.2 \times 10^5$

CONTRACT 2279

PAVEMENT PERFORMANCE

Year	Pavement Rating
1983	100
1984	95
1986	95

Average Daily Traffic (1986) = 6,500

C-2293

SR 90 Sprague to Fishtrap

MP 244.90 - MP 254.31

C-2293
SR 90 Sprague to Fishtrap
MP 244.90 - MP 254.31
Paving Completed - 1982

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Two-Year Cores	10.6
Pavement Performance	10.7

N.Ostrander

SR 90 AND SR 23
SPRAGUE TO FISHTRAP

82E019

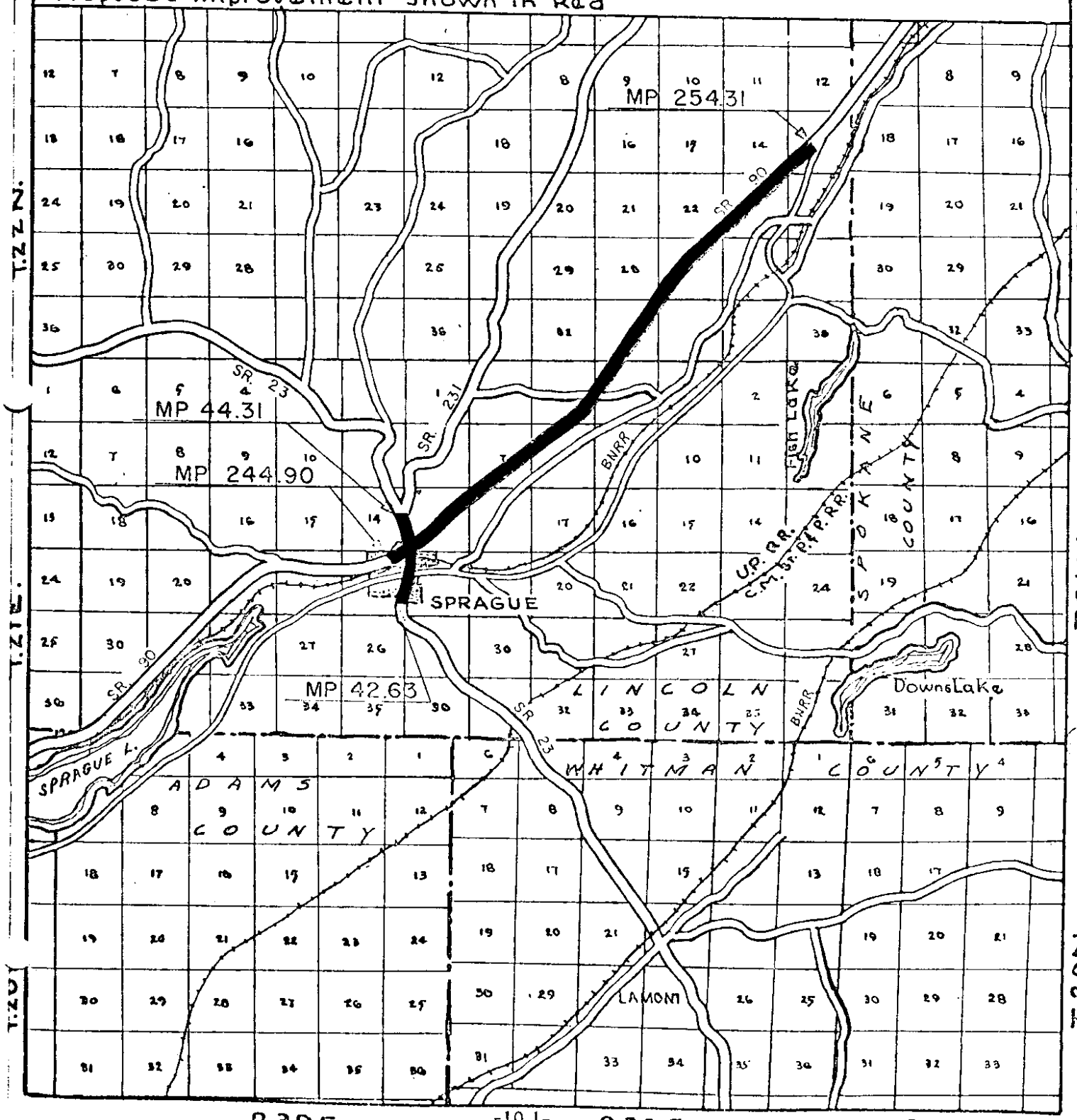
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

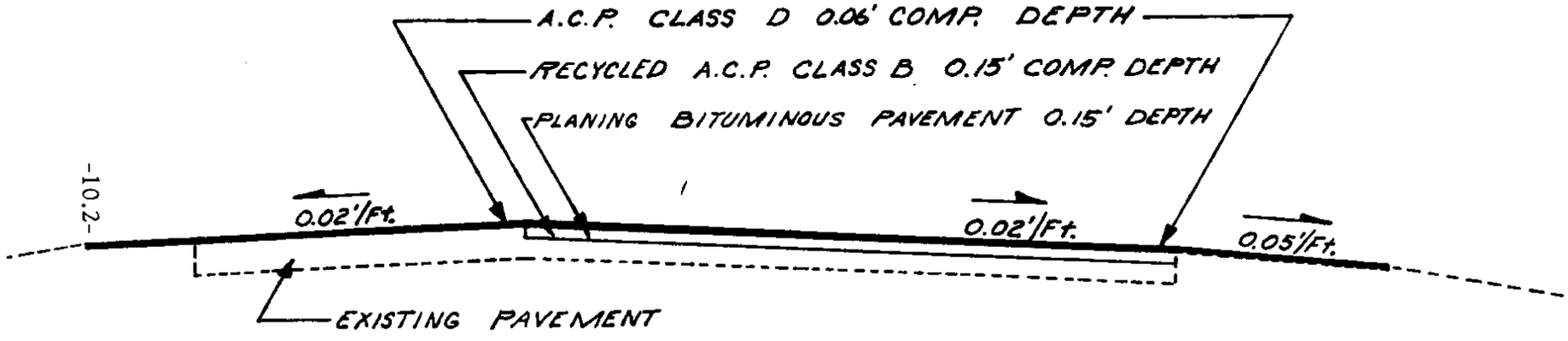
OLYMPIA, WASHINGTON

MAP OF STATE HIGHWAYS

ADAMS, LINCOLN, SPOKANE & WHITMAN COUNTIES

Proposed Improvement Shown in Red





SPRAGUE TO FISHTRAP

SR 90 & SR 23

C-2293

CONTRACT 2293

ACP MIX DESIGN

Planings		71%
New Aggregate		29%
Gradation	Average of Cold-Plane Samples	Calculated Design Grading
5/8"	100	100
1/2"	100	97
3/8"	97	88
1/4"	87	73
No. 10	52	42
No. 40	24	20
No. 80	18	15
No. 200	12.4	10.1
Old Asphalt		3.7%
RA-5 Rejuvenator		0.6%
AR-4000W		1.8%
Total Fluids		6/1%

CONTRACT 2293

RECYCLED MIX SAMPLES

Gradation (15 samples)	Average	Range
5/8"	100	100
1/2"	97	96-99
3/8"	86	80-91
1/4"	65	58-75
No. 10	36	32-40
No. 40	18	16-20
No. 80	13	11-15
No. 200	9.7	7.2-11.2
Percent Asphalt	5.6	5.0-6.1
Stability	26	16-38
140F Viscosity (Poise)	9,229	5,472-24,534

COMPACTION DATA

	Nuclear		Core Densities(5 samples)	
	Average	Range	Average	Range
Void Content (%)	7.2	3.8-10.7	8.4	6.4-9.8

CONTRACT 2293

CONSTRUCTION CORES

Gradation (5 samples)	Average	Range
5/8"	100	100
1/2"	97	96-98
3/8"	85	82-89
1/4"	65	59-71
No. 10	36	33-39
No. 40	18	17-20
No. 80	13	12-15
No. 200	9.7	8.7-10.8
Percent Asphalt	5.6	5.2-6.0
Sand/Silt	3.7	3.6-3.8
Density (PCF)	145.1	141.6-146.7
Percent Voids	8.4	6.4-9.8

CONTRACT 2293

TWO-YEAR CORES

Gradation (2 samples)	Average	Range
5/8"	100	100
1/2"	99	98-99
3/8"	87	86-87
1/4"	64	63-65
No. 10	35	34-36
No. 40	18	17-18
No. 80	13	13
No. 200	9.3	8.9-9.6
Percent Asphalt	6.2	5.5-6.9
Sand/Silt	3.8	3.5-4.0
Density (PCF)	150.4	146.7-154.0
Percent Voids	5.4	1.6-9.1
Abson Recovery (2 samples)		
77F Pen.	36	34-38
140F Viscosity (Poise)	6,562	5,814-7,310
45F Ductility (cm)	7.63	7.25-8.00
Resilient Modulus (2 samples)		
77F -0.10 sec. (PSI)	7.1×10^5	$6.8\text{-}7.3 \times 10^5$

CONTRACT 2293

PAVEMENT PERFORMANCE

Year	Pavement Rating
1983	100
1984	100
1986	100

Average Daily Traffic (1986) = 8,700

C-2319

SR 9 Clearview to Lowell Rd. - Stage 1

MP 5.35 - MP 7.15

C-2319
SR 9 Clearview to Lowell Rd. - Stage 1
MP 5.35 - MP 7.15
Paving Completed - 1982

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Construction Cores (Wearing)	11.5
Construction Cores (Leveling)	11.6
Two-Year Cores (Wearing)	11.7
Two-Year Cores (Leveling)	11.8
Pavement performance	11.9

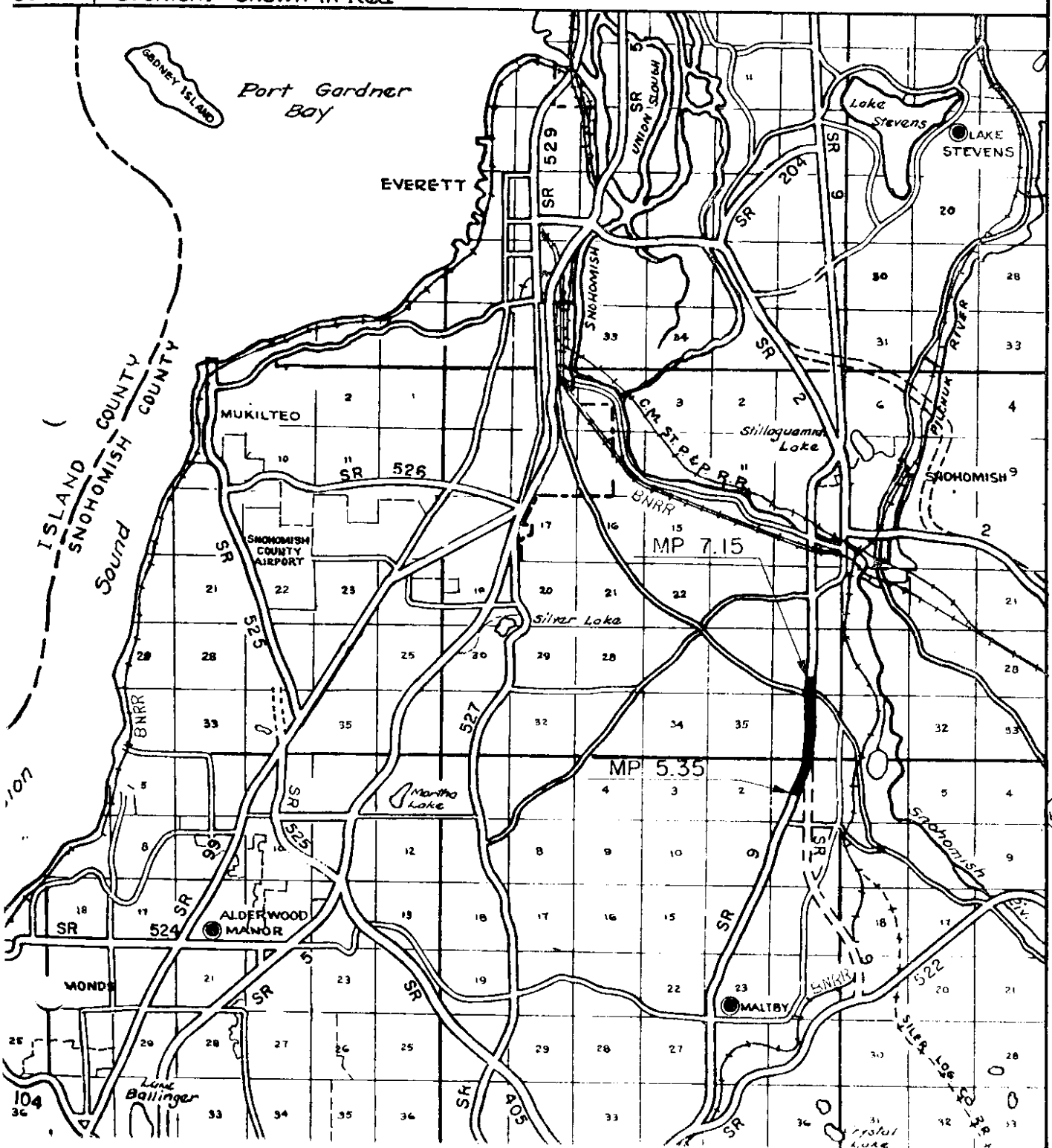
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

OLYMPIA, WASHINGTON

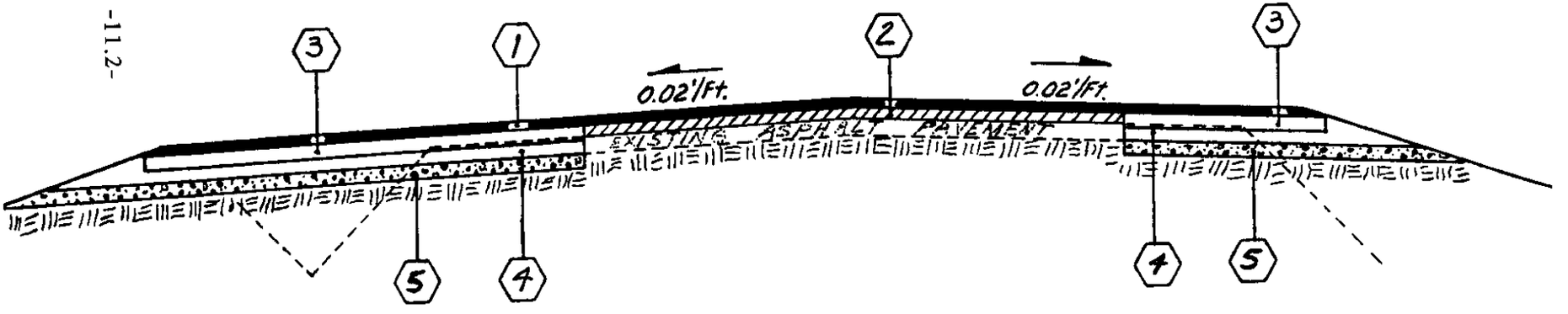
MAP OF STATE HIGHWAYS

SNOHOMISH COUNTY

ed Improvement Shown in Red



1. 0.15' COMP. DEPTH A.C.P. CL.B WEARING COURSE
2. 0.15' COMP. DEPTH A.C.P. CL. B LEVELING COURSE
3. 0.30' COMP. DEPTH A.C.P. CL.B LEVELING COURSE
4. 0.30' COMP. DEPTH CRUSHED SURFACING TOP COURSE
5. 0.40' COMP. DEPTH GRAVEL BASE CLASS B



CLEARVIEW TO LOWELL ROAD

SR 9

C-2319

CONTRACT 2319

ACP MIX DESIGN

Percent Old ACP = <10%*

Percent New Aggregate - >90%

Gradation

5/8"

1/2"

3/8"

1/4"

No. 10

No. 40

No. 80

No. 200

Percent Asphalt = 5.4%

*Since percent recycled material less than 10%, no new mix design was required. A reference mix design was used for C-2319.

CONTRACT 2319

RECYCLED MIX SAMPLES

Gradation (15 samples)	Average	Range
5/8"	100	100
1/2"	97	96-99
3/8"	85	83-87
1/4"	67	63-70
No. 10	39	34-43
No. 40	18	16-20
No. 80	9	8-11
No. 200	6.2	5.1-7.6
Percent Asphalt	5.4	5.0-5.6
Stability	20	9-23
140F Viscosity (Poise)	2,854	2,344-3,278

COMPACTION DATA

	Nuclear		Core Densities)10 samples)	
	Average	Range	Average	Range
Void Content	7.3	4.1-10.5	9.2	6.3-11.5

CONTRACT 2319

CONSTRUCTION CORES (WEARING)

Gradation (5 samples)	Average	Range
5/8"		
1/2"		
3/8"		
1/4"		
No. 10		
No. 40		
No. 80		
No. 200		
Percent Asphalt		
Sand/Silt		
Density (PFC)	141.1	137.1-145.6
Percent Voids	9.2	6.3-11.5

CONTRACT 2319

CONSTRUCTION CORES (LEVELING)

Gradation (3 samples)	Average	Range
5/8"		
1/2"		
3/8"		
1/4"		
No. 10		
No. 40		
No. 80		
No. 200		
Percent Asphalt		
Sand/Silt		
Density (PCF)	146.3	145.3-148.3
Percent Voids	5.9	4.6-6.6

CONTRACT 2319

TWO-YEAR CORES (WEARING)

Gradation (2 samples)	Average	Range
5/8"	100	100
1/2"	99	99
3/8"	90	86-93
1/4"	72	66-77
No. 10	43	40-45
No. 40	18	17-18
No. 80	10	10
No. 200	7.1	6.8-7.4
Percent Asphalt	4.3	3.9-4.7
Sand/Silt	6.0	5.4-6.6
Density (PCF)	145.8	145.7-145.8
Percent Voids	5.5	5.1-5.8
Absorption Recovery (2 samples)		
77F Pen.	40	35-44
140F Viscosity (Poise)	5,890	4,666-7,113
45F Ductility (cm)	36+	12-60+
Resilient Modulus (2 samples)		
77F -0.10 sec. (PSI)	9.3×10^5	$9.0\text{-}9.5 \times 10^5$

CONTRACT 2319

TWO-YEAR CORES (LEVELING)

Gradation (2 samples)	Average	Range
5/8"	100	100
1/2"	99	98-99
3/8"	87	86-87
1/4"	68	67-68
No. 10	42	42
No. 40	19	19
No. 80	10	10
No. 200	6.6	6.4-6.7
Percent Asphalt	5.0	4.5-5.4
Sand/Silt	4.7	2.8-6.6
Density (PCF)	146.7	143.7-149.7
Percent Voids	5.7	3.3-8.0
Abson Recovery		
77F Pen.	51	41-61
140F Viscosity (Poise)	5,090	3,564-6,616
45F Ductility (cm)	41+	21-60+
Resilient Modulus		
77F -0.10 sec. (PSI)	8.6×10^5	$7.5\text{-}9.6 \times 10^5$

CONTRACT 2293

PAVEMENT PERFORMANCE

Year	Pavement Rating
1983	100
1984	99
1986	99

Average Daily Traffic (1986) = 9,000

C-2360

SR 97 B.P.A. Crossing to Swauk Creek

MP 144.64 - MP 149.56

C-2360
SR 97 B.P.A. Crossing to Swauk Creek
MP 144.64 - MP 149.56
Paving Completed - 1982

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Vicinity Map	12.1
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5-3

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

5-3

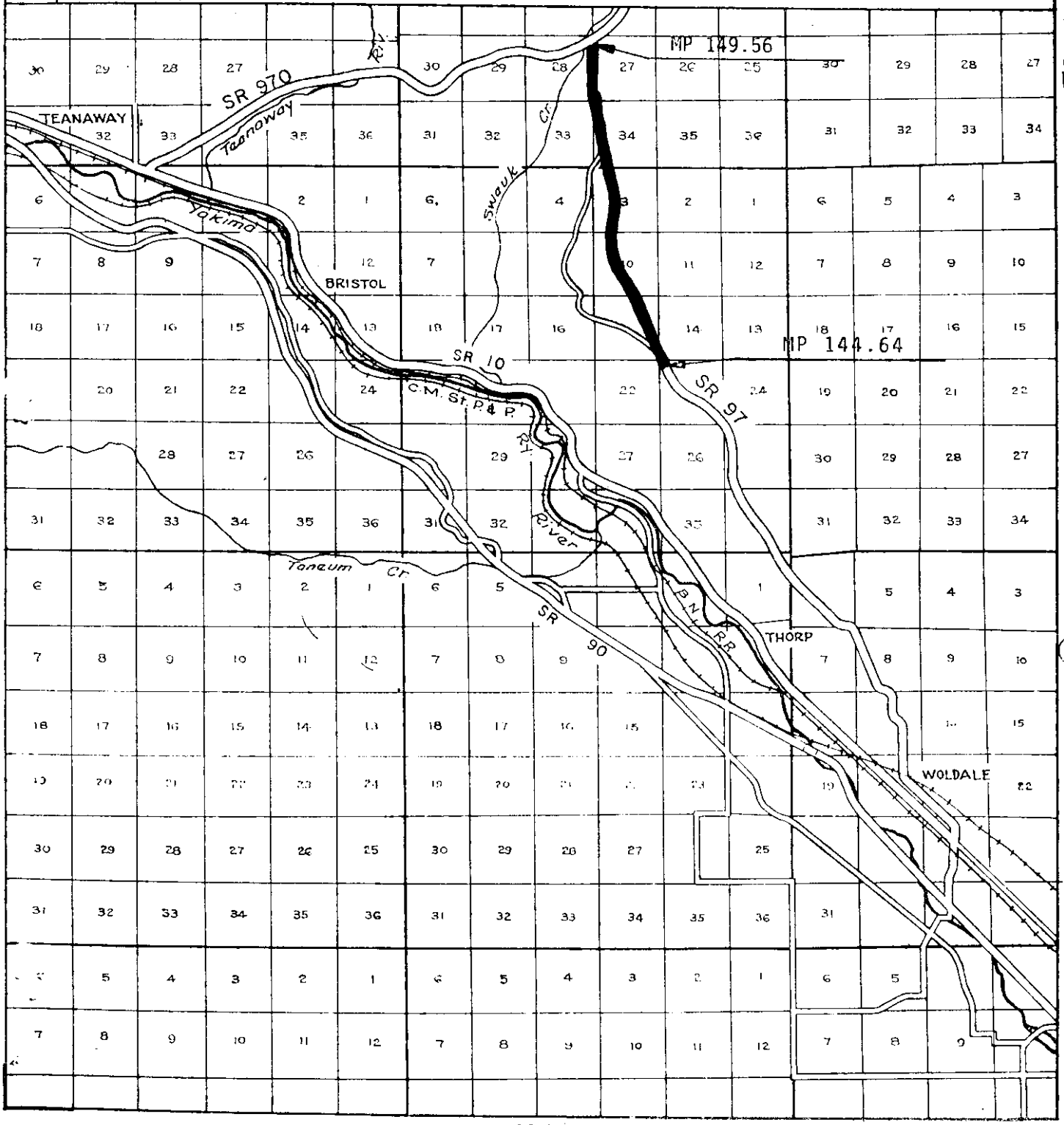
OLYMPIA, WASHINGTON

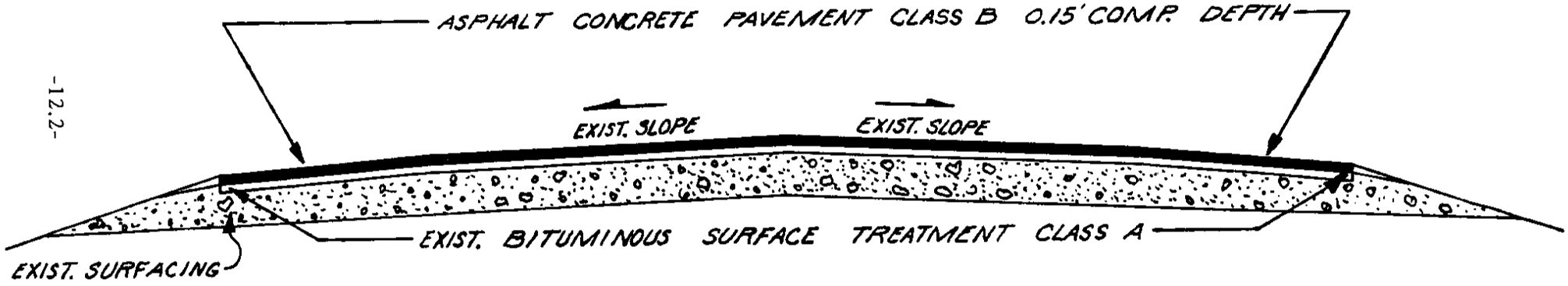
REV. 5-27-82

MAP OF STATE HIGHWAYS

KITTITAS COUNTY

Proposed Improvement Shown in Red





BPA CROSSING TO SWAUK CREEK

SR 97

C-2360

CONTRACT 2360

ACP MIX DESIGN

Planings		9%
New Aggregate		91%
Gradation	Average of Cold-Plane Samples	Calculated Design Grading
5/8"	100	100
1/2"	99	99
3/8"	88	85
1/4'	70	70
No. 10	36	37
No. 40	18	17
No. 80	11	10
No. 200	6.8	6.3
Old Asphalt		0.5%
RA-5 Rejuvenator		0.0%
AR-4000W		5.1%
Total Fluids		5.6%

CONTRACT 2360

RECYCLED MIX SAMPLES

Gradation (7 samples)	Average	Range
5/8"	100	100
1/2"	97	96-99
3/8"	86	81-91
1/4"	70	67-78
No. 10	35	30-39
No. 40	14	13-15
No. 80	8	7-9
No. 200	4.5	4.0-5.2
Percent Asphalt	6.0	4.8-6.6
Stability	29	25-32
140F Viscosity (Poise)	4,527	3,328-8,052

COMPACTION DATA

	Nuclear		Core Densities(13 samples)	
	Average	Range	Average	Range
Void Content (%)	7.1	5.9-10.7	10.2	6.6-12.5

CONTRACT 2360

CONSTRUCTION CORES

Gradation (13 samples)	Average	Range
5/8"	100	100
1/2"	98	94-99
3/8"	85	75-93
1/4"	63	49-80
No. 10	34	22-40
No. 40	15	11-19
No. 80	9	7-12
No. 200	5.5	4.0-7.4
Percent Asphalt	5.9	4.6-7.0
Sand/Silt	6.2	5.5-7.4
Density (PCF)	141.5	136.3-147.0
Percent Voids	10.2	6.6-12.5

CONTRACT 2360

TWO-YEAR CORES

Gradation (2 samples)	Average	Range
5/8"	100	100
1/2"	97	97
3/8"	85	84-86
1/4"	63	62-63
No. 10	31	30-32
No. 40	15	15
No. 80	11	10-11
No. 200	7.0	6.5-7.5
Percent Asphalt	7.1	6.3-7.8
Sand/Silt	4.5	4.0-4.9
Density (PCF)	146.3	144.9-147.7
Percent Voids	4.8	4.2-5.3
Abson Recovery (2 samples)		
77F Pen.	47	42-52
140F Viscosity (Poise)	4,351	3,787-4,915
45F Ductility (cm)	26.0	13.5-38.5
Resilient Modulus (2 samples)		
77F -0.10 sec. (PSI)	3.3×10^5	$3.2\text{-}3.4 \times 10^5$

CONTRACT 2360

PAVEMENT PERFORMANCE

Year	Pavement Rating
1983	88
1984	99
1986	96

Average Daily Traffic (1986) = 1,700

C-2483

Mae Valley to SR 17, Et Al

SR 90 MP 175.62 - MP 179.8
SR 17 MP 50.38 - MP 50.81

C-2483
Mae Valley to SR 17, Et Al.
SR 90 MP 175.62 - MP 179.8
SR 17 MP 50.38 - MP 50.81
Paving Completed - 1983

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One-Year Cores	
Pavement Performance	13.6

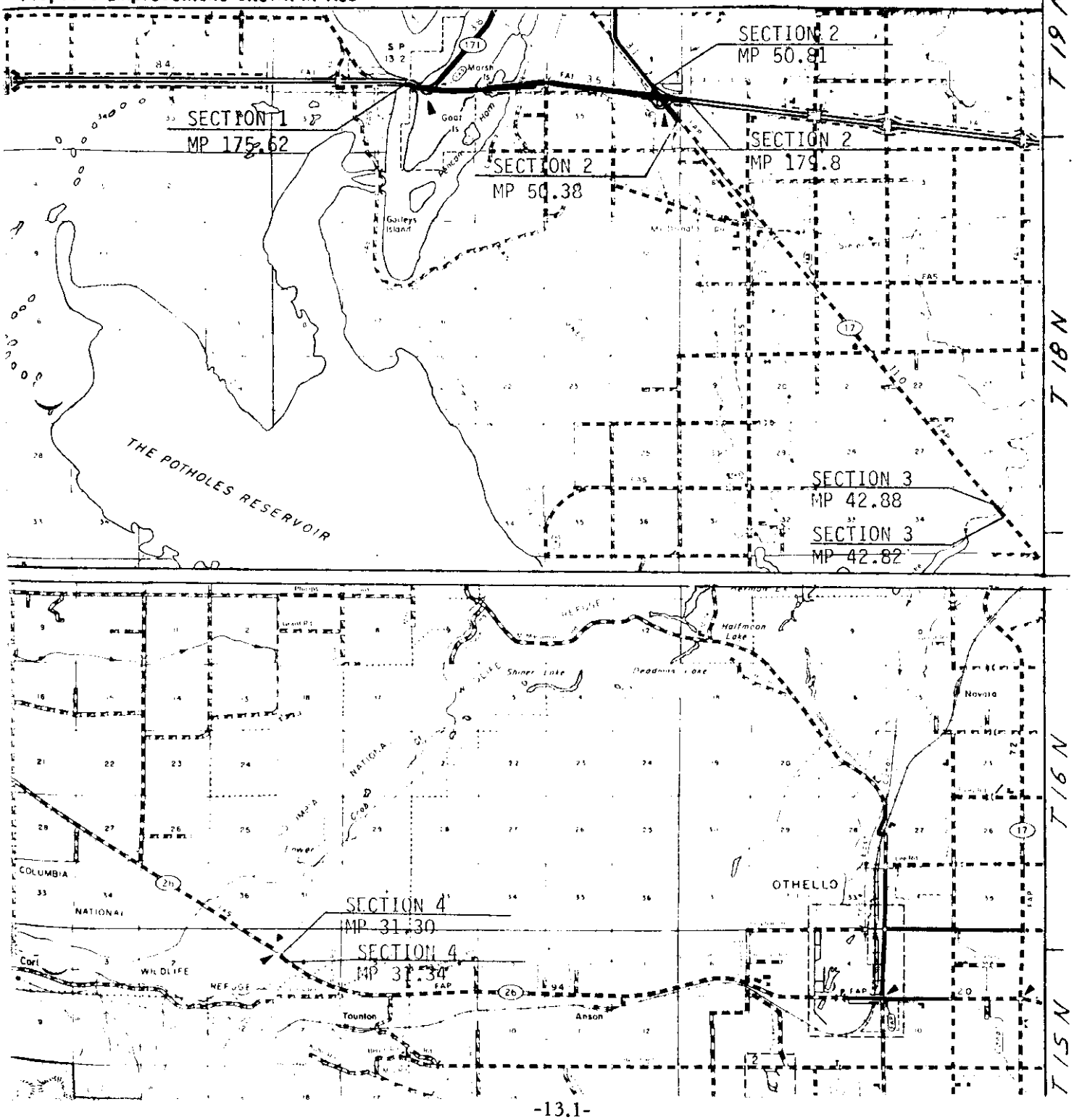
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

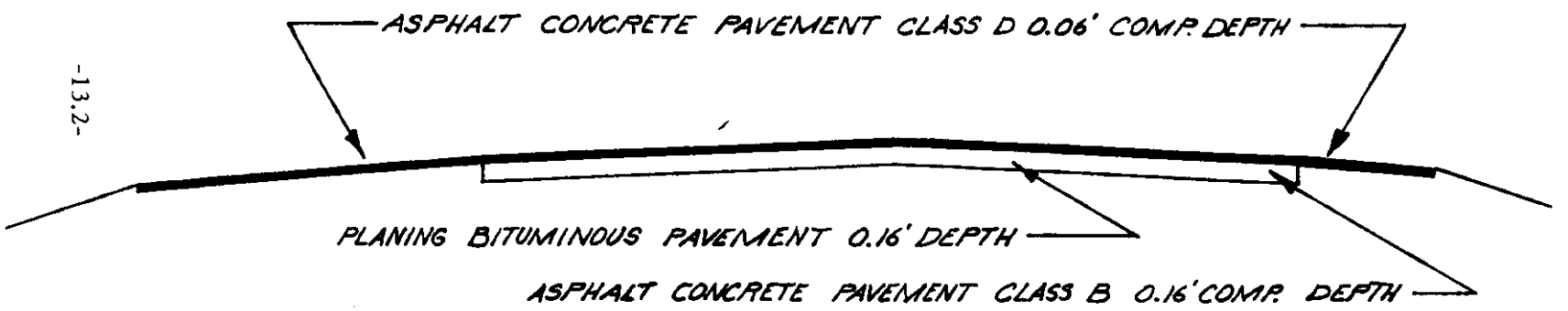
OLYMPIA, WASHINGTON

MAP OF STATE HIGHWAYS

GRANT & ADAMS COUNTIES

Proposed Improvement Shown in Red





MAE VALLEY TO SR 17, ET AL

SR 90, SR 17, SR 26 AND SR 171

C-2483

CONTRACT 2483

ACP MIX DESIGN

Planings		35%
New Aggregate		65%6
Gradation	Average of Cold-Plane Samples	Calculated Design Grading
5/8"	100%	100%
1/2"	98	99
3/8"	84	86
1/4"	66	68
No. 10	42	41
No. 40	24	16
No. 80	15	10
No. 200	8.5	6.3
Old Asphalt		1.8%
RA-500 Rejuvenator		3.4%
AR-4000W		0.0%
Total Fluids		5.2%

CONTRACT 2483

RECYCLED MIX SAMPLES

Gradation (12 samples)	Average	Range
5/8"	100	100
1/2"	98	97-99
3/8"	88	84-90
1/4"	69	60-72
No. 10	39	35-43
No. 40	15	13-17
No. 80	9	7-11
No. 200	5.3	4.2-6.3
Percent Asphalt	4.9	4.6-5.0
Stability	41	38-47
140F Viscosity (Poise)	2,574	1,859-4,053

COMPACTION DATA

	Nuclear		Core Densities	
	Average	Range	Average	Range
Void Content (%)	6.2	4.1-7.6	--	--

CONTRACT 2483

ONE-YEAR CORES

Gradation (2 samples)	Average	Range
5/8"	100	100
1/2"	99	99
3/8"	90	88-92
1/4"	73	72-73
No. 10	37	31-43
No. 40	18	18
No. 80	13	12-13
No. 200	8.1	8.0-8.1
Percent Asphalt	4.3	4.2-4.3
Sand/Silt	4.6	3.9-5.3
Density (PCF)	150.2	149.8-150.5
Percent Voids	6.9	5.8-8.0
Abson Recovery (2 samples)		
77F Pen.	46	44-48
140F Viscosity (Poise)	7,830	3,122-12,537
45F Ductility (cm)	30.1	21.8-38.5
Resilient Modulus (2 samples)		
77F -0.10 sec. (PSI)	6.2×10^5	$6.1\text{-}6.4 \times 10^5$

CONTRACT 2483

PAVEMENT PERFORMANCE

Year	Pavement Rating
1984	93
1986	92

Average Daily Traffic (1986) = 8,600

C-2551

SR 99 S. 124th Street to S. Holden St.

MP 22.53 - MP 25.98

C-2551
SR 99 S. 124th Street to S. Holden St.
MP 22.53 - MP 25.98
Paving Completed - 1984

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Pavement Performance	14.6

R. Putas
1-28

1-28
Rev. 3/7/83

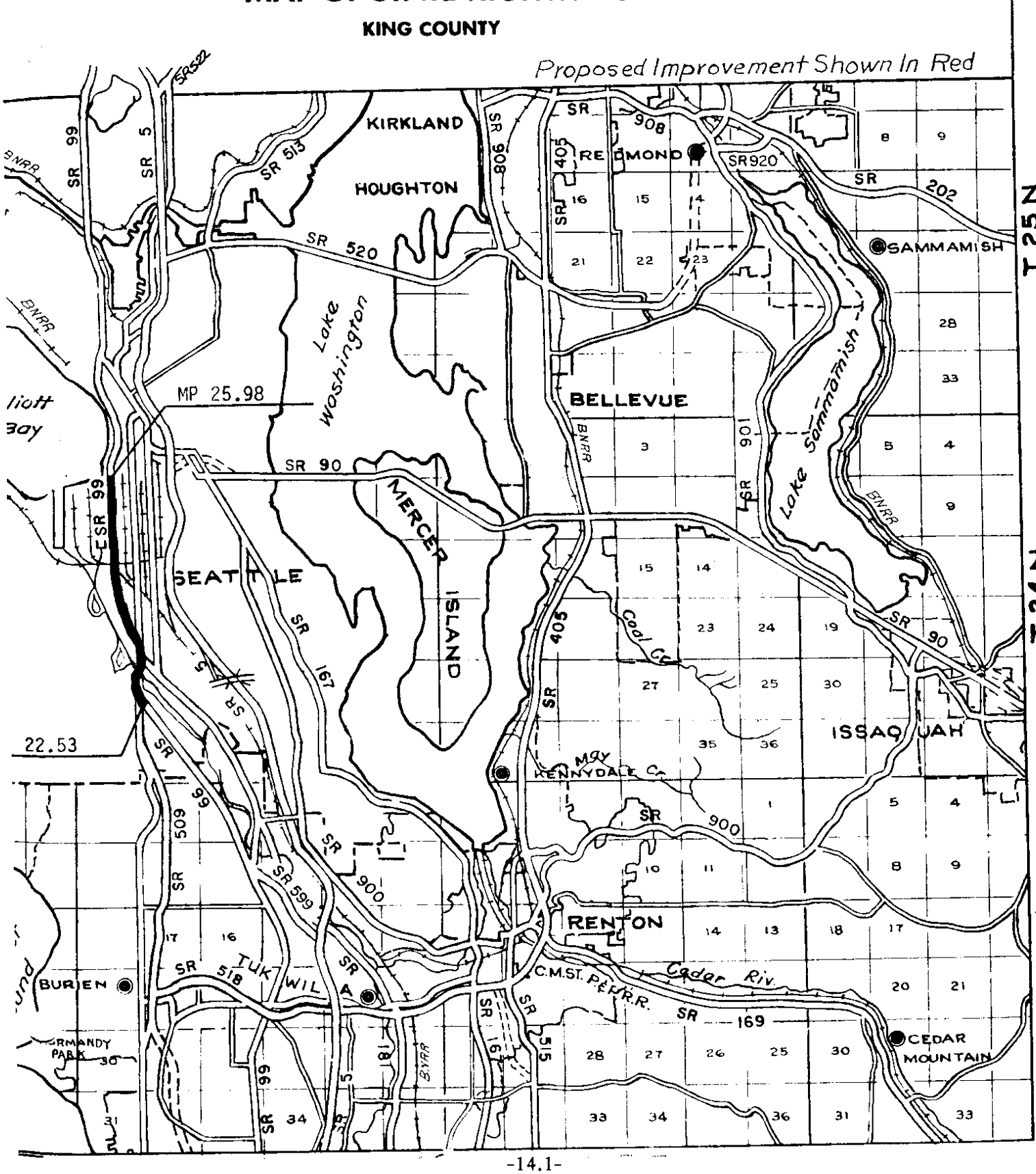
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

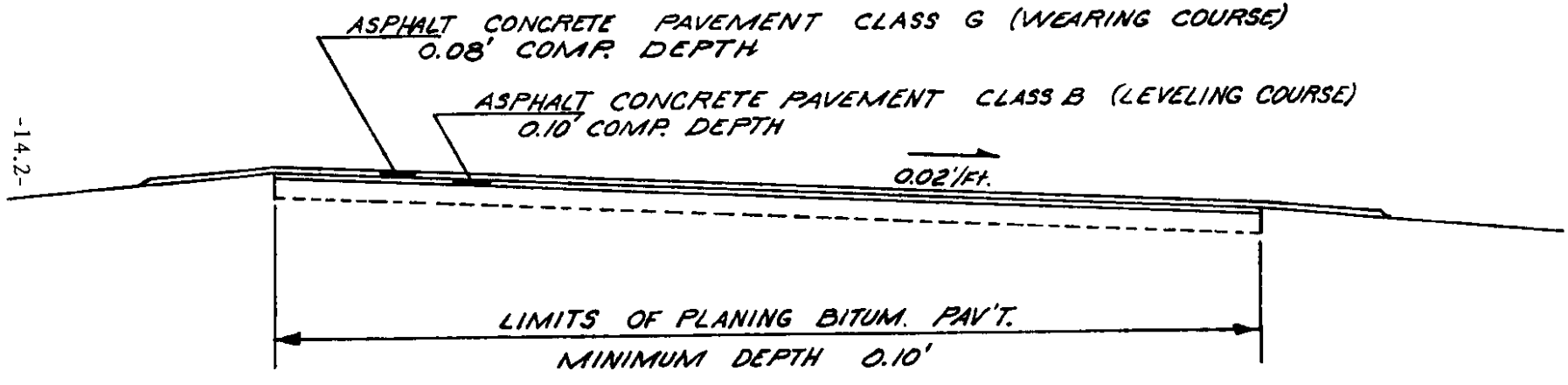
OLYMPIA, WASHINGTON

MAP OF STATE HIGHWAYS

KING COUNTY

Proposed Improvement Shown In Red





S. 124TH ST. TO S. HOLDEN ST.

SR 90

C-2551

CONTRACT 2551

ACP MIX DESIGN

Planings		33%
New Aggregate		67%
Gradation	Average of Cold-Plane Samples	Calculated Design Grading
5/8"	100	100
1/2"	99	99
3/8"	87	89
1/4"	74	71
No. 10	44	36
No. 40	23	15
No. 80	13	8
No. 200	8.2	4.0
Old Asphalt		1.7%
RA-500 Rejuvenator		3.8%
AR-4000W		0.0%
Total Fluids		5.5%

CONTRACT 2551

RECYCLED MIX SAMPLES

Gradation (20 samples)	Average	Range
5/8"	100	100
1/2"	99	97-100
3/8"	84	78-89
1/4"	67	43-74
No. 10	39	33-46
No. 40	19	15-24
No. 80	10	6-12
No. 200	6.1	3.2-8.0
Percent Asphalt	5.5	5.1-5.9
Stability	33	14-41
140F Viscosity (Poise)*	6,949	-

COMPACTION DATA

	Nuclear		Core Densities(3 samples)	
	Average	Range	Average	Range
Void Content (%)	8.0	5.3-11.2	5.0	1.6-7/3

CONTRACT 2551

CONSTRUCTION CORES

Gradation (3 samples)	Average	Range
5/8"	100	100
1/2"	96	96-97
3/8"	78	75-81
1/4"	60	55-64
No. 10	35	34-36
No. 40	19	17-22
No. 80	12	11-12
No. 200	6.4	5.9-6.8
Percent Asphalt	4.2	4.0-4.5
Sand/Silt	4.6	2.8-5.9
Density (PCF)	146.0	143.2-151.6
Percent Voids	5.0	1.6-7.3
Abson Recovery (4 samples)		
77F Pen.	21	11-25
140F Viscosity (Poise)	12,009	3,043-15,401
45F Ductility (cm)	1.19	0.25-3.5
Resilient Modulus (4 samples)		
77F -0.10 sec. (PSI)	11.1×10^5	$8.3\text{-}12.6 \times 10^5$

CONTRACT 2551

PAVEMENT PERFORMANCE

Year	Pavement Rating
1984	100
1986	93

Average Daily Traffic (1986) = 29,600

C-2571

SR 12 to Lathrop Rd. and Lathrop Rd. to Trosper Rd.

SR 5 MP 88.02 - MP 102.70
SR 12 MP 46.32 - MP 46.62

C-2571
SR 12 to Lathrop Rd. and
Lathrop Rd. to Trosper Rd.
SR 5 MP 88.02 - MP 102.70
SR 12 MP 46.32 - MP 46.62
Paving Completed - 1983

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J. Jones
T. Gordon
3-28

3-28
Rev. 5/9/83

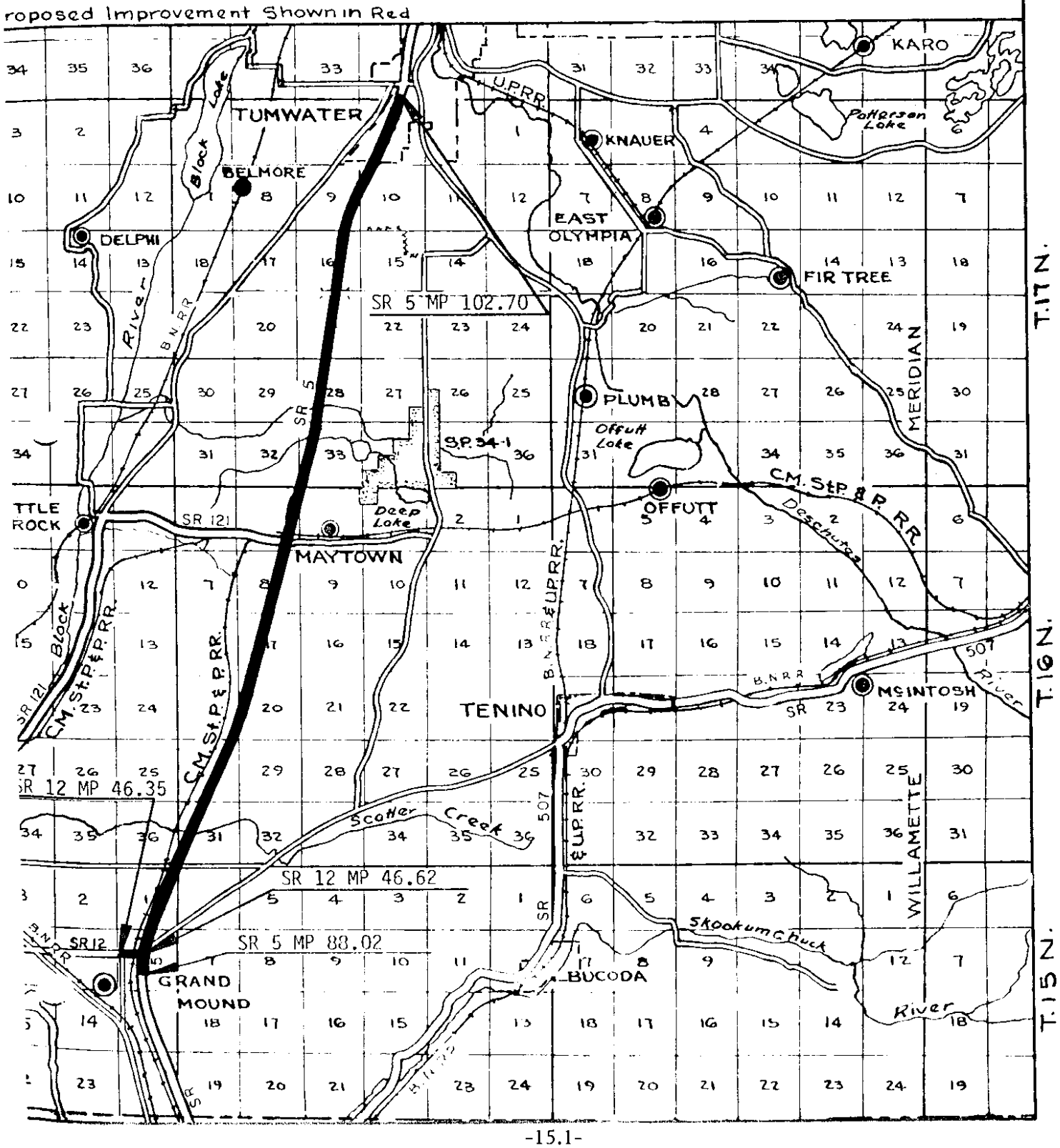
Rev. 6/27/83

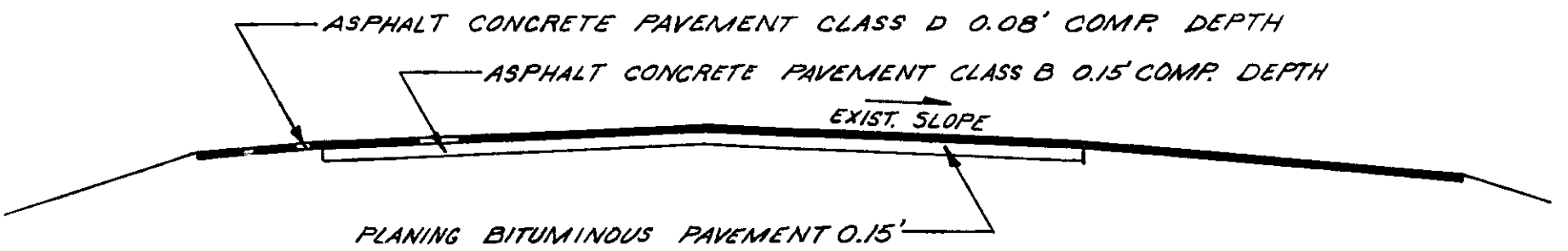
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

OLYMPIA, WASHINGTON

MAP OF STATE HIGHWAYS

THURSTON COUNTY





SR 12 TO LATHROP ROAD

SR 5 AND SR 12

C-2571

CONTRACT 2571

ACP MIX DESIGN

Planings		70%
New Aggregate		30%
Gradation	Average of Cold-Plane Samples	Calculated Design Gradings
5/8"	100	100
1/2"	100	96
3/8"	95	81
1/4"	85	67
No. 10	53	40
No. 40	29	22
No. 80	18	14
No. 200	9.7	8.1
Old Asphalt		4.0%
RA-75 Rejuvenator		0.8%
AR-4000W		0.0%
Total Fluids		4.8%

CONTRACT 2571

RECYCLED MIX SAMPLES

Gradation (3 samples)	Average	Range
5/8"	100	100
1/2"	96	95-98
3/8"	83	77-85
1/4"	65	57-69
No. 10	38	32-45
No. 40	18	16-22
No. 80	9	8-11
No. 200	5.8	5.1-6.7
Percent Asphalt	4.9	4.6-5.2
Stability	40	25-46
140F Viscosity (Poise)	3,215	1,259-6,481

COMPACTION DATA

	Nuclear		Core Densities (3 samples)	
	Average	Range	Average	Range
Void Content	7.0	5.4-10.3	6.3	4.9-7.6

CONTRACT 2571

ONE-YEAR CORES

Gradation (2 samples)	Average	Range
5/8"	100	100
1/2"	98	97-98
3/8"	85	84-86
1/4"	65	63-66
No. 10	37	36-37
No. 40	22	21-22
No. 80	15	14-15
No. 200	8.9	8.3-9.4
Percent Asphalt	4.4	3.8-5.0
Sand/Silt	4.1	3.9-4.3
Density (PCF)	145.0	144.9-145.0
Percent Voids	6.3	4.9-7.6
Abson Recovery (2 samples)		
77F Pen.	44	39-49
140F Viscosity (Poise)	4,391	4,248-4,534
45F Ductility (cm)	14.4	14.3-14.5
Resilient Modulus (2 samples)		
77F -0.10 sec. (PSI)	7.5×10^5	$6.6\text{-}8.4 \times 10^5$

CONTRACT 2571

PAVEMENT PERFORMANCE

Year	Pavement Rating
1984	100
1986	100

Average Daily Traffic (1986) = 32,700

C-2576

SR 527 132nd St. S.E. to 112th St. S.E.

MP 8.90 - MP 10.34

C-2576
SR 527 132nd St. S.E. to 112th St. S.E.
MP 8.90 - MP 10.34
Paving Completed - 1984

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I-22A

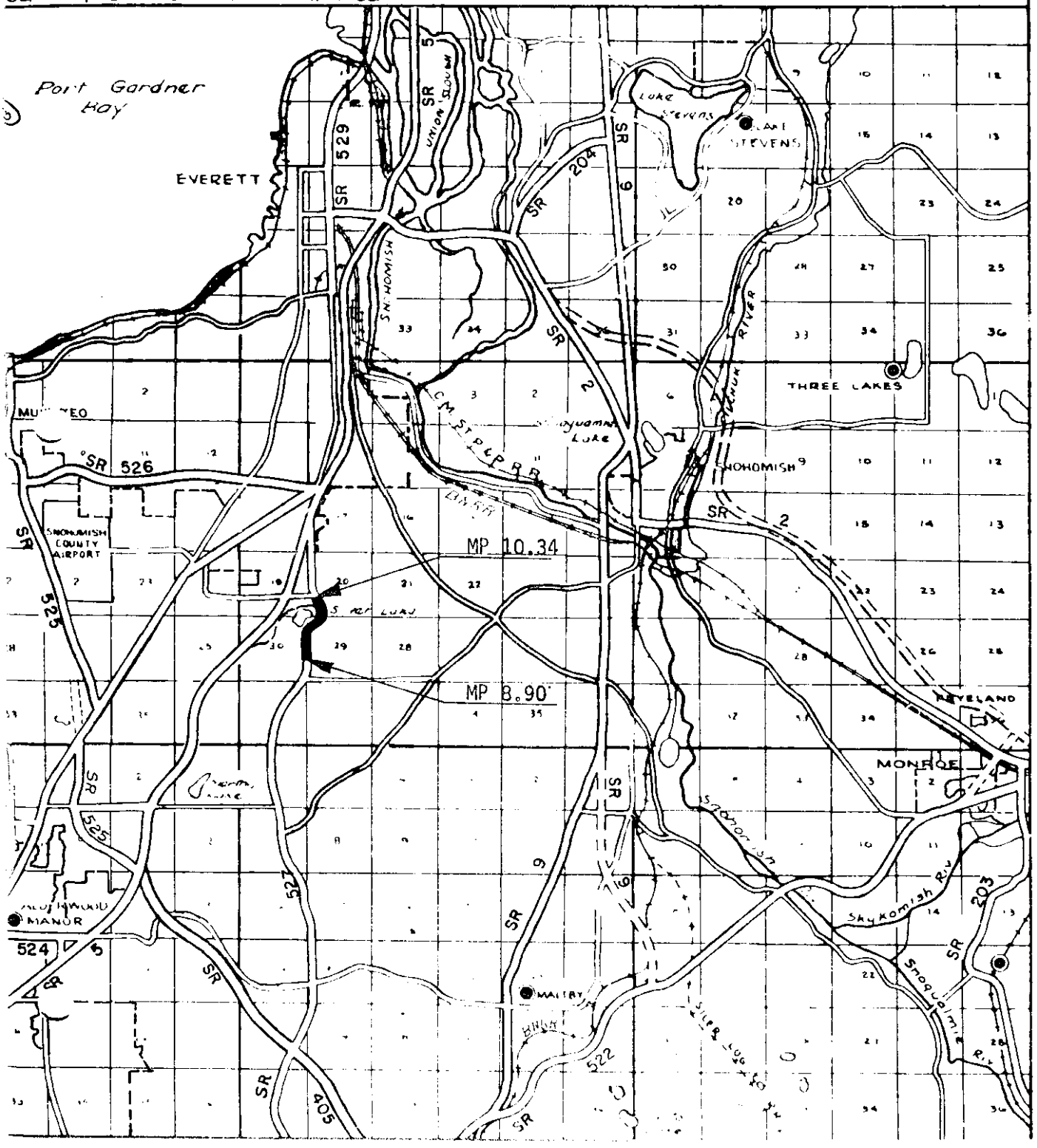
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

OLYMPIA, WASHINGTON

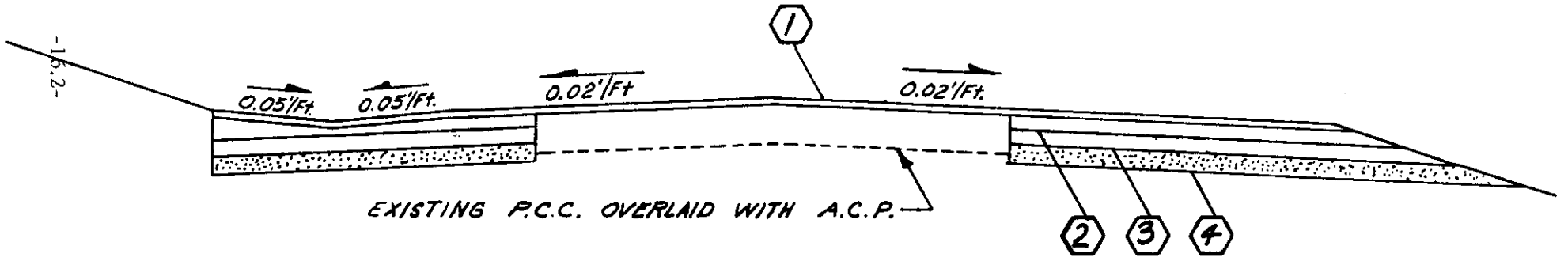
MAP OF STATE HIGHWAYS

SNOHOMISH COUNTY

ed Improvement Shown in Red



1. 0.15' COMP. DEPTH ASPHALT CONCRETE PAVEMENT CLASS B (WEARING COURSE)
2. 0.30' COMP. DEPTH ASPHALT CONCRETE PAVEMENT CLASS B (LEVELING COURSE)
3. 0.20' MIN. COMP. DEPTH CRUSHED SURFACING TOP COURSE
4. 0.35' MIN. COMP. DEPTH GRAVEL BASE CLASS B



132ND ST. SE TO 112TH ST. SE

SR 527

C-2576

CONTRACT 2576

ACP MIX DESIGN

Planings		35%
New Aggregate		65%
Gradation	Average of Cold Plane Samples	Calculated Grading
5/8"	100	100
1/2"	98	98
3/8"	85	82
1/4"	67	64
No. 10	41	35
No. 40	21	15
No. 80	11	8
No. 200	6.2	4.6
Old Asphalt		1.9%
RA-500 Rejuvenator		3.4%
AR-4000W		0.0%
Total Fluids		5.3%

CONTRACT 2576

RECYCLED MIX SAMPLES

Gradation (7 samples)	Average	Range
5/8"	100	100
1/2"	99	98-100
3/8"	88	85-90
1/4"	67	63-72
No. 10	39	37-41
No. 40	17	15-18
No. 80	10	9-11
No. 200	6.3	6.1-6.8
Percent Asphalt	5.1	5.0-5.2
Stability	39	37-44
140F Viscosity (Poise)	2,770	2,234-3,326

	Nuclear		Core Densities (25 samples)	
	Average	Range	Average	Range
Void Content (%)	6.3	5.3-7.0	7.5	5.4-9.5

CONTRACT 2576

CONSTRUCTION CORES

Gradation (2 samples)	Average	Range
5/8"	100	100
1/2"	99	98-99
3/8"	92	91-93
1/4"	76	73-78
No. 10	44	43-44
No. 40	21	20-21
No. 80	13	12-13
No. 200	8.2	7.6-8.7
Percent Asphalt	3.9	3.5-4.3
Sand/Silt	5.4	4.9-5.8
Density (PCF)	144.2	141.2-147.2
Percent Voids	7.5	5.4-9.5
Abson Recovery (2 samples)		
77F Pen.	38	37-38
140F Viscosity (Poise)	3,761	3,312-4,209
45F Ductility (cm)	16.0	10.8-21.3
Resilient Modulus (2 samples)		
77F -0.10 sec. (PSI)	6.1×10^5	$4.4\text{-}7.5 \times 10^5$

CONTRACT 2576

PAVEMENT PERFORMANCE

Year	Pavement Rating
1984	100
1986	100

Average Daily Traffic (1986) = 9,400