

**FEDERAL HIGHWAY ADMINISTRATION**

Long Term Pavement Performance  
Specific Pavement Studies

**California SPS-5**

**CONSTRUCTION REPORT ON SECTION 060500  
CALIFORNIA DEPARTMENT OF TRANSPORTATION**

Prepared By:

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**SPS-5 CONSTRUCTION REPORT - SHRP PROJECT 060500  
Barstow, California**

**February 25, 1992 - May 13, 1992**

**Introduction**

A Strategic Highway Research Program (SHRP) Specific Pavement Study (SPS-5) experimental project was constructed on Interstate 40 near Barstow, California, February 25 - May 13, 1992. The SPS-5 experiment addresses the rehabilitation of asphalt concrete (AC) pavements. Each experiment requires the construction of multiple test sections with similar details and materials at each of the 16 sites equally distributed in the four climatic regions. This report documents the construction operations on project 060500, the SPS-5 project in California.

In addition to this report, the State of California published a report entitled, "Rehabilitation of Asphalt Concrete Pavements, SPS-5, Strategic Highway Research Program," dated December 31, 1993. The author was Stephen Wiley and the experimental project number was CER CA-93-94. Portions of that report have been included here.

**Background**

The objective of the SPS-5 experiment is to develop improved performance prediction models to be used for determining the additional pavement life that can be expected from a variety of asphalt concrete (AC) rehabilitation methods and strategies ranging from minimal to maximum investment in the rehabilitation treatments. The treatments being studied include surface preparations (minimum, intensive), overlay thickness (2", 5") and AC overlay material type (virgin, 30% recycle). Other considerations include environmental zone, existing pavement condition, subgrade soil, and traffic loads. In addition to the core experiment design, participating highway agencies are encouraged to extend the SPS-5 experiment by constructing supplemental test sections on the same project. For the California SPS-5 project, 13 supplemental state test sections were constructed. The treatments studied included stone mastic mixes, rubberized mixes, pavement reinforcing fabrics, stress absorbing membrane interlayers (SAMIs), open graded mixes, a chip seal, virgin mixes, and virgin mixes with large size aggregates. All of the state supplemental sections included an intensive surface preparation, (milling off approximately 2" of the original surface), prior to the overlay.

The core experiment design for the SPS-5 is shown in Figure 1. The combinations of rehabilitation treatment factors are shown on the left side of the chart and environmental zones across the top. Thus, an SPS-5 project consists of 9 test sections, one control section in which only routine maintenance is performed, and 8 test sections with different combinations of treatment factors. The control section provides an indication of the rate of change expected for the test sections had they not been rehabilitated. The test section numbering convention and treatment combinations for a typical project are shown in Figure 2. Figures 2a and 2b show the test section layout and treatment combinations for the California SPS-5 project, including the state supplemental test sections.

The experiment design for the SPS-5 experiment is detailed in the report "Specific Pavement Studies, Experiment Design and Research Plan for Experiment SPS-5, Rehabilitation of Asphalt Concrete Pavements," Strategic Highway Research Program, April 1989. Guidelines on uniform construction procedures for these test sections are contained in the document "Specific Pavement Studies, Construction Guidelines for Experiment SPS-5, Rehabilitation of Asphalt Concrete Pavements," SHRP Operational Memorandum No. SHRP-LTPP-OM-012, June 1990.

## **Monitoring Requirements**

### ***Pre-Construction***

Pre-construction monitoring of the SPS-5 site consists of: a distress survey, profile measurements, deflection measurements, and material sampling.

Distress surveys are completed using either an automated or manual mapping system. The automated distress surveys are currently contracted out to and completed by Photographic Aerial Survey Company (PASCO). PASCO creates a film of the distress throughout the section and prints a transverse profile every 50 feet. If an automated distress survey is not feasible (geographical or other restrictions), the distress survey may be completed by manually mapping individual distress for each section. All cracking and other forms of distress are noted on a 1-foot by 1-foot scale.

Profile measurements are performed using a high speed profilometer. Measurements are made every two inches. These measurements are averaged over a moving 1 foot base length. This average is then stored every six inches. The result is a longitudinal profile of the travel lane for each section at 6-inch increments.

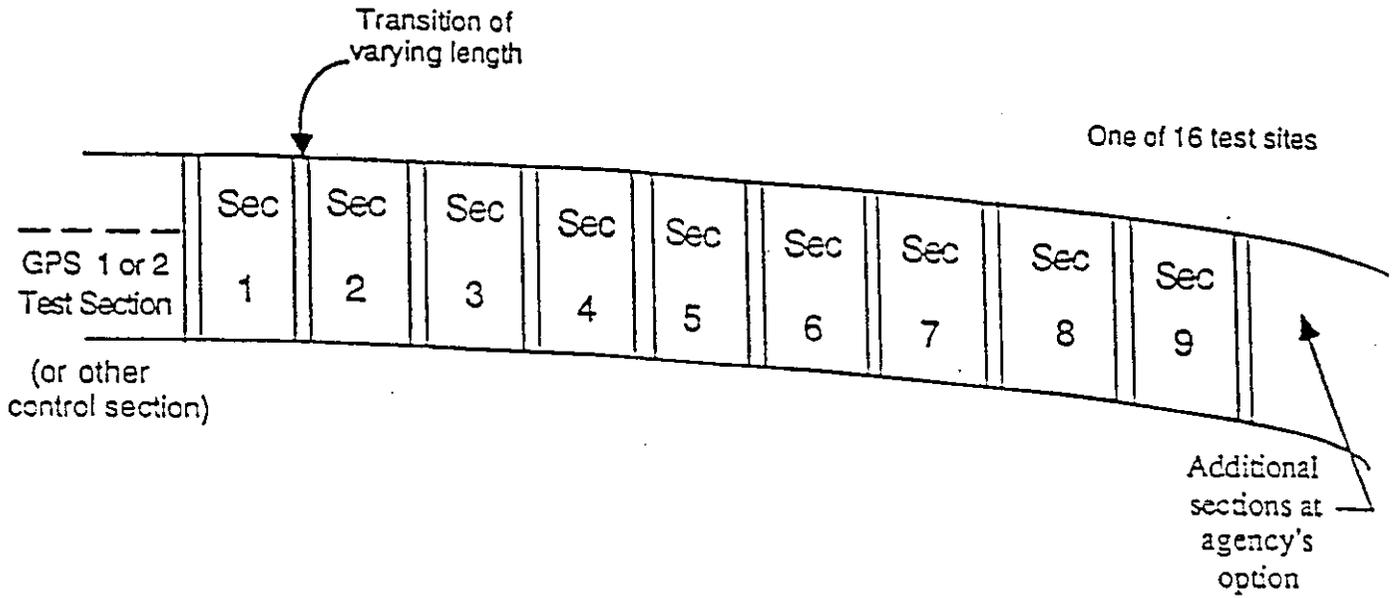
Deflection measurements are performed using a Falling Weight Deflectometer (FWD). The FWD makes a series of drops at 50 foot intervals to measure the deflection of the pavement. Two passes of the FWD are made, one in the mid-lane and one in the outer wheel path.

| FACTORS FOR<br>MOISTURE,<br>TEMPERATURE,<br>AND<br>PAVEMENT<br>CONDITION |                     |                      | WET    |      |           |      | DRY    |      |           |      |
|--|---------------------|----------------------|--------|------|-----------|------|--------|------|-----------|------|
|  |                     |                      | FREEZE |      | NO FREEZE |      | FREEZE |      | NO FREEZE |      |
|  |                     |                      | FAIR   | POOR | FAIR      | POOR | FAIR   | POOR | FAIR      | POOR |
|  |                     |                      |        |      |           |      |        |      |           |      |
| REHABILITATION<br>PROCEDURES   |                     |                      |        |      |           |      |        |      |           |      |
| Surface<br>Prep.   | Overlay<br>Material | Overlay<br>Thickness |        |      |           |      |        |      |           |      |
| Routine<br>Maint.<br>(Control)   |                     | 0                    | xx     | xx   | xx        | xx   | xx     | xx   | xx        | xx   |
| Minimum  | Recycled            | 2-inch               | xx     | xx   | xx        | xx   | xx     | xx   | xx        | xx   |
|  | AC                  | 5-inch               | xx     | xx   | xx        | xx   | xx     | xx   | xx        | xx   |
|  | Virgin              | 2-inch               | xx     | xx   | xx        | xx   | xx     | xx   | xx        | xx   |
|  | AC                  | 5-inch               | xx     | xx   | xx        | xx   | xx     | xx   | xx        | xx   |
| Intensive  | Recycled            | 2-inch               | xx     | xx   | xx        | xx   | xx     | xx   | xx        | xx   |
|  | AC                  | 5-inch               | xx     | xx   | xx        | xx   | xx     | xx   | xx        | xx   |
|  | Virgin              | 2-inch               | xx     | xx   | xx        | xx   | xx     | xx   | xx        | xx   |
|  | AC                  | 5-inch               | xx     | xx   | xx        | xx   | xx     | xx   | xx        | xx   |

Notes: Each "x" designates a test section  
 Traffic: > 85 KESAL/Year  
 Subgrade Soil: Fine

↑  
 California SPS-5  
 Project

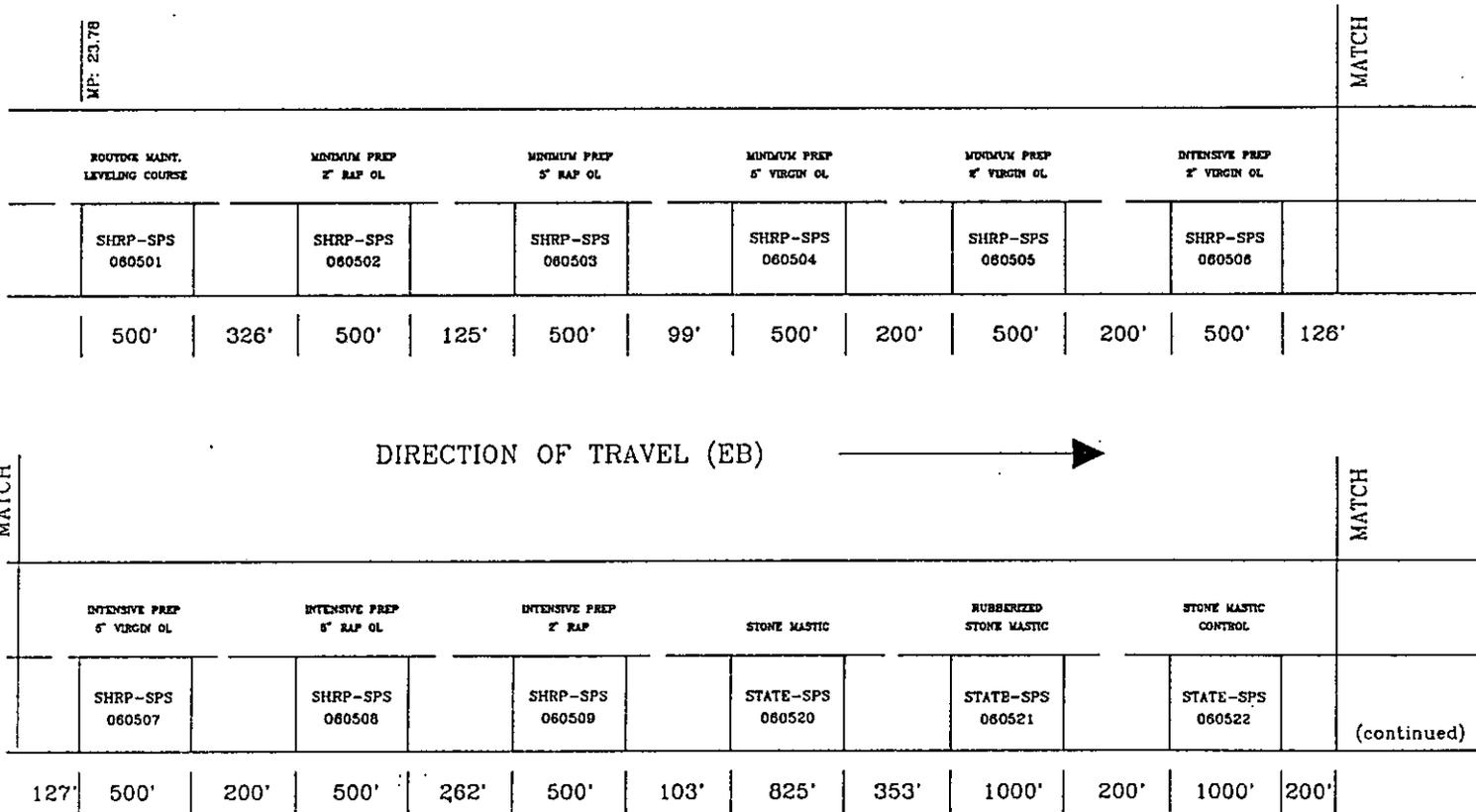
Figure 1. Experimental Design for SPS-5, Rehabilitation of Asphalt Concrete Pavements



| SPS-5 SECTION | SURFACE PREPARATION | OVERLAY MATERIAL | OVERLAY THICKNESS |
|---------------|---------------------|------------------|-------------------|
| 1             | Routine Maintenance | Control Section  | 0                 |
| 2             | Minimum             | Recycled AC      | 2-inches          |
| 3             | Minimum             | Recycled AC      | 5-inches          |
| 4             | Minimum             | Virgin AC        | 5-inches          |
| 5             | Minimum             | Virgin AC        | 2-inches          |
| 6             | Intensive           | Virgin AC        | 2-inches          |
| 7             | Intensive           | Virgin AC        | 5-inches          |
| 8             | Intensive           | Recycled AC      | 5-inches          |
| 9             | Intensive           | Recycled AC      | 2-inches          |

Figure 2. Illustrative Test Section for SPS-5, Rehabilitation of Asphalt Concrete Pavements

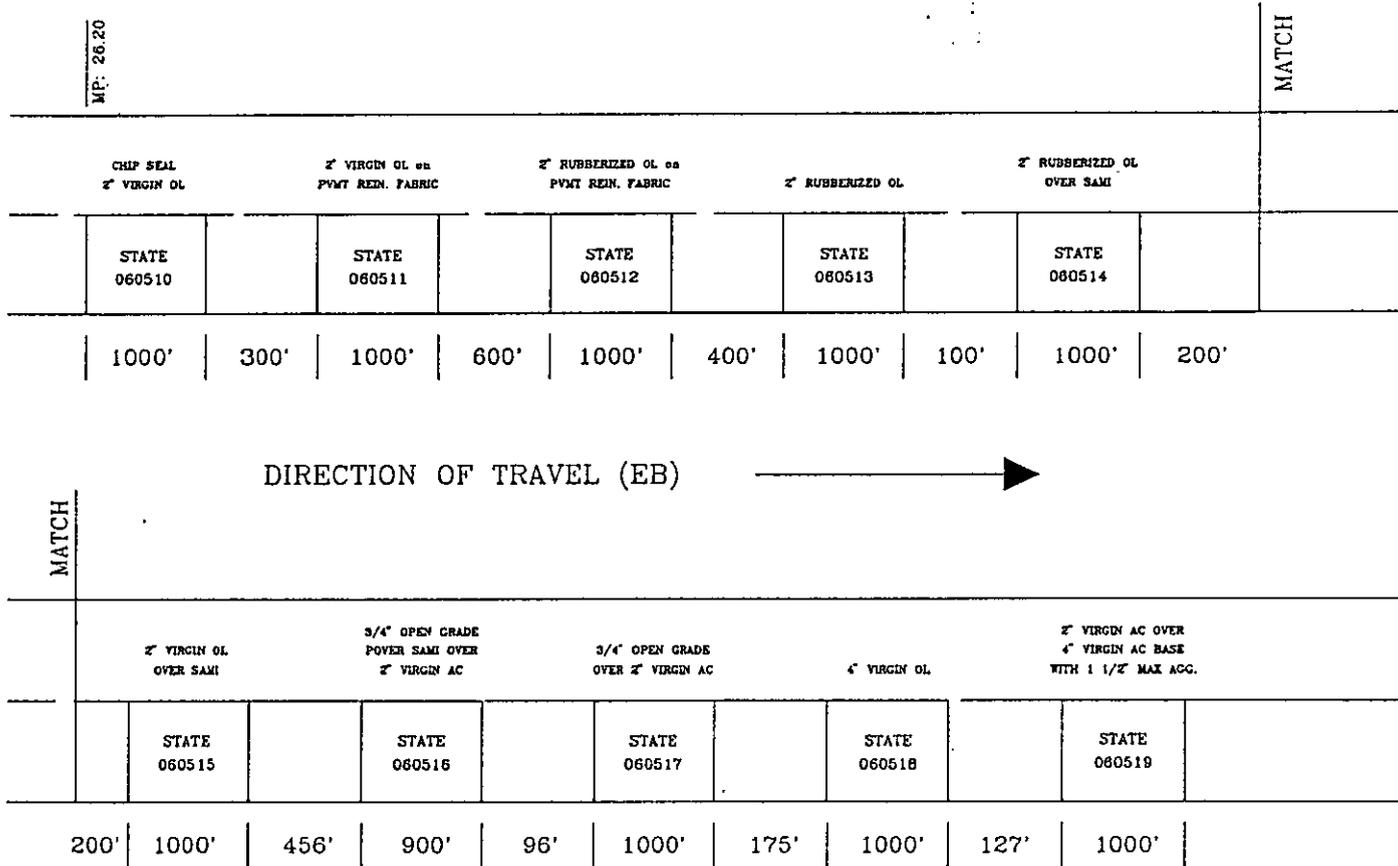
SPS-5 SHRP TEST SECTION LAYOUT  
 060500, EAST OF BARSTOW, CALIFORNIA  
 I-40 EASTBOUND



NOT TO SCALE

Figure 2a. Test Section Layout, California SPS-5

SPS-5 CALTRANS TEST SECTION LAYOUT (continued)  
 060500, EAST OF BARSTOW, CALIFORNIA  
 I-40 EASTBOUND



NOT TO SCALE

Figure 2b. Test Section Layout, California SPS-5 (cont.)

Material sampling includes extracting 4, 6, and 12-inch diameter pavement cores, 6-inch auger probes, 12-inch bore holes, and 6-foot by 4-foot test pits to a depth of 12 inches below the top of the untreated subgrade. Sampling and testing is the agencies responsibility. Table 1 shows the pre-construction material sampling requirements and Table 2 the pre-construction material testing requirements. Figures 3a and 3b present the actual pre-construction sampling layout used on the California SPS-5 project. Pre-construction sampling was not performed on sections 060520-22 (Stone Mastic Asphalt sections) since they were added just prior to construction.

### ***Construction***

Monitoring during construction consists primarily of documenting data items related to surface preparation and placement of the overlay material. In addition, these data items include material properties measured as part of the mix design and construction control operations. Guidelines on data collection procedures for this project are detailed in the document "Specific Pavement Studies, Data Collection Guidelines for Experiment SPS-5, Rehabilitation of Asphalt Concrete Pavements," SHRP Operational Memorandum No. SHRP-LTPP-OM-015, October 1990.

### ***Post-Construction***

Post-construction monitoring of the SPS-5 site consists of a distress survey, profile measurements, deflection measurements, and 4-inch core sampling of the overlay material. Sampling of the overlay material should be completed no later than six months after construction and is performed in the transition areas outside the test sections. The California SPS-5 post-construction sampling layout is shown in Figures 4a and 4b. The SHRP cores, (4 inch cores shown Figure 4a) were taken 20 feet from the beginning and end of each section. Table 3 presents the post-construction material testing requirements for the SHRP cores taken. Additional cores sampled were tested by the University of California-Berkeley and CALTRANS.

### ***Continuation-Monitoring***

Continuation monitoring of the SPS-5 site consists of a distress survey completed every other year, profile measurements completed every year, and deflection measurements completed approximately every year.

### **California SPS-5 Project Layout**

Nine standard SHRP test sections (060501 - 060509) were constructed by California Department of Transportation (CALTRANS) as part of the core SPS-5 experiment. These test sections, each 500 feet long, are located in the eastbound travel lane of Interstate 40 between M.P. 23.78 and M.P. 24.96. The nine sections were constructed on 5 to 8 feet of fill on a straight flat grade. Five sections of recycle mix and four sections of virgin mix were constructed. The recycled mix consisted of 30% Recycled Asphalt Pavement (RAP) with additional asphalt and virgin aggregate. Both the virgin and the RAP mixes utilized the same asphalt cement.

Table 1. California SPS-5 Material Sampling Requirements

| MATERIAL AND SAMPLE DESCRIPTION  | TYPICAL # OF MATERIAL SAMPLES | ACTUAL # SAMPLED, SHRP SEC.S | ACTUAL # SAMPLED, CALTRANS SEC.S |
|--|-------------------------------|------------------------------|----------------------------------|
| <u>PRE-CONSTRUCTION SAMPLING</u>   |                               |                              |                                  |
| 1. Asphalt Concrete (original layer)                                       |                               |                              |                                  |
| Coring - 4" diam. cores  | 26                            | 26                           | 27                               |
| Coring - 6" diam. cores  | 3                             | 10                           | 11                               |
| Coring - 12" diam. cores   | 6                             | 6                            | 6                                |
| Bulk Sampling (12" by 12" slab)  | 2                             | 2                            | 2                                |
| 2. Unbound Base/Subbase Layers (per layer)                                 |                               |                              |                                  |
| Augering 6" diam. holes  | 3                             | 10                           | 11                               |
| Bulk sampling in 12" diam. holes   | 6                             | 12                           | 12                               |
| Bulk sampling in test pit  | 1                             | 8                            | 15                               |
| In situ density and moisture content (nuclear gauge)                       | 1                             | 2                            | 2                                |
| Moisture content samples   | 8                             | 10                           | 14                               |
| 3. Bound Base/Subbase Layers (per layer)                                   |                               |                              |                                  |
| Coring - 4" diam. cores  | 6                             | 7                            | 4                                |
| Coring - 6" diam. cores  | 3                             | 8                            | 7                                |
| Coring - 12" diam. cores   | 6                             | 1                            | 3                                |
| 4. Subgrade  |                               |                              |                                  |
| Splitspoon sampling  | 6*                            | 0                            | 0                                |
| Thin-walled tube sampling (* 2 tubes or 2 spoons or combinations per hole) | 6*                            | 20                           | 22                               |
| Bulk sampling in 12" diam. holes   | 6                             | 15                           | 18                               |
| Bulk sampling in test pit  | 1                             | 8                            | 10                               |
| In situ density and moisture content (nuclear gauge)                       | 1                             | 2                            | 2                                |
| Moisture content samples   | 8                             | 10                           | 10                               |
| 5. Shoulder Auger Probes   |                               |                              |                                  |
|  | 3                             | 1                            | 1                                |

Table 2. California SPS-5 Material Testing Requirements (Pre-Construction)

| MATERIAL TYPE AND PROPERTIES                            | SHRP TEST DESIGNATION | SHRP PROTOCOL | TYPICAL # OF TESTS PER LAYER | ACTUAL # TESTED, SHRP SEC.5 | ACTUAL # TESTED, CALTRANS SEC.5 |
|---|-----------------------|---------------|------------------------------|-----------------------------|---------------------------------|
| <u>PRE-CONSTRUCTION</u>                                 |                       |               |                              |                             |                                 |
| I. ASPHALT CONCRETE                                     |                       |               |                              |                             |                                 |
| A. ASPHALTIC CONCRETE:                                  |                       |               |                              |                             |                                 |
| Core Examination/Thickness                              | AC01                  | P01           | 26                           | 26                          | 27                              |
| Bulk Specific Gravity                                   | AC02                  | P02           | 9                            | 9                           | 9                               |
| Maximum Specific Gravity                                | AC03                  | P03           | 3                            | 5                           | 5                               |
| Asphalt Content (Extraction)                            | AC04                  | P04           | 3                            | 5                           | 5                               |
| Creep Compliance <sup>1</sup>                           | AC06                  | P06           | 3                            | 3                           | 3                               |
| Resilient Modulus                                       | AC07                  | P07           | 6                            | 6                           | 6                               |
| Tensile Strength  | AC07                  | P07           | 9                            | 9                           | 9                               |
| Field Moisture Damage                                   | AC08                  | P08           | 3                            | 0                           | 0                               |
| B. EXTRACTED AGGREGATE:                                 |                       |               |                              |                             |                                 |
| Type and Classification:                                | AG03                  | P13           | 3                            | 5                           | 5                               |
| Coarse Aggregate  | AG03                  | P13           | 3                            | 5                           | 5                               |
| Fine Aggregate  | AG04                  | P14           | 3                            | 5                           | 5                               |
| Gradation of Aggregate                                  |                       |               |                              |                             |                                 |
| NAA Test for Fine Aggregate Particle Shape <sup>2</sup> | AG05                  | P14A          | 3                            | 5                           | 5                               |
| C. ASPHALT CEMENT:                                      |                       |               |                              |                             |                                 |
| Abson Recovery  | AE01                  | P21           | 3                            | 5                           | 5                               |
| Penetration at 77° and 115°F                            | AE02                  | P22           | 3                            | 5                           | 5                               |
| Specific Gravity (60°F)                                 | AE03                  | P23           | 3                            | 5                           | 5                               |
| Viscosity at 77°F                                       | AE04                  | P24           | 3                            | 5                           | 5                               |
| Viscosity at 140° and 275°F                             | AE05                  | P25           | 3                            | 5                           | 5                               |

- Notes: 1 Creep compliance will be performed when suitable procedures are developed – cores will be stored.  
 2 The National Aggregate Association will perform tests at no cost to the State.

Table 2. California SPS-5 Material Testing Requirements (Pre-Construction) - cont'd

| MATERIAL TYPE AND PROPERTIES                      | SHRP TEST DESIGNATION | SHRP PROTOCOL | TYPICAL # OF TESTS PER LAYER | ACTUAL # TESTED, SHRP SEC.S | ACTUAL # TESTED, CALTRANS SEC.S |
|---|-----------------------|---------------|------------------------------|-----------------------------|---------------------------------|
| <b>II. BOUND (TREATED) BASE AND SUBBASE</b>       |                       |               |                              |                             |                                 |
| Type and Classification of Material and Treatment | TB01                  | P31           | 3                            | 3                           | 3                               |
| Pozzolanic/Cementitious: Compressive Strength     | TB02                  | P32           | 3                            | 3                           | 3                               |
| Asphalt Treated: Dynamic Modulus (77°F)           | TB03                  | P33           | 3                            | 0                           | 0                               |
| HMAC: Resilient Modulus                           | AC07                  | P07           | 3                            | 0                           | 0                               |
| <b>III. UNBOUND GRANULAR BASE AND SUBBASE</b>     |                       |               |                              |                             |                                 |
| Particle Size Analysis                            | UG01                  | P41           | 3                            | 5                           | 5                               |
| Sieve Analysis (washed)                           | UG02                  | P42           | 3                            | 5                           | 5                               |
| Atterberg Limits                                  | UG04                  | P43           | 3                            | 5                           | 5                               |
| Moisture-Density Relations                        | UG05                  | P44           | 3                            | 5                           | 5                               |
| Resilient Modulus                                 | UG07                  | P46           | 3                            | 5                           | 5                               |
| Classification                                    | UG08                  | P47           | 3                            | 5                           | 5                               |
| Permeability                                      | UG09                  | P48           | 3                            | 5                           | 5                               |
| Natural Moisture Content                          | UG10                  | P49           | 3                            | 5                           | 5                               |
| <b>IV. SUBGRADE</b>                               |                       |               |                              |                             |                                 |
| Sieve Analysis                                    | SS01                  | P51           | 3                            | 5                           | 5                               |
| Hydrometer to 0.001mm                             | SS02                  | P42           | 3                            | 5                           | 5                               |
| Atterberg Limits                                  | SS03                  | P43           | 3                            | 5                           | 5                               |
| Classification                                    | SS04                  | P52           | 3                            | 5                           | 5                               |
| Moisture-Density Relations                        | SS05                  | P55           | 3                            | 5                           | 5                               |
| Resilient Modulus                                 | SS07                  | P46           | 3                            | 5                           | 5                               |
| Unit Weight                                       | SS08                  | P56           | 3                            | 5                           | 5                               |
| Natural Moisture Content                          | SS09                  | P49           | 3                            | 5                           | 5                               |
| Depth to Rigid Layer                              |                       |               | 3                            | 1                           | 1                               |

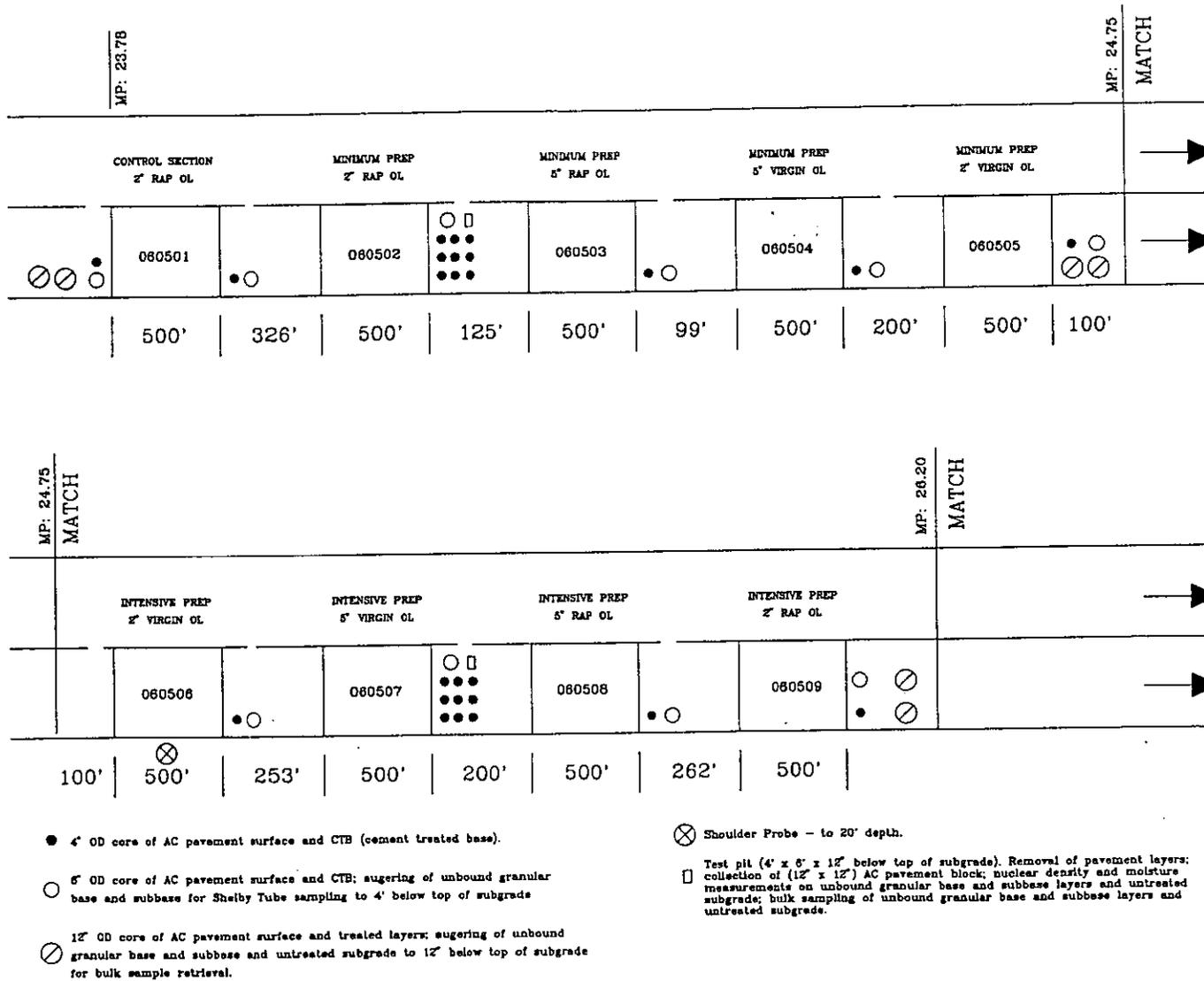


Figure 3A Pre-Construction Sampling Layout

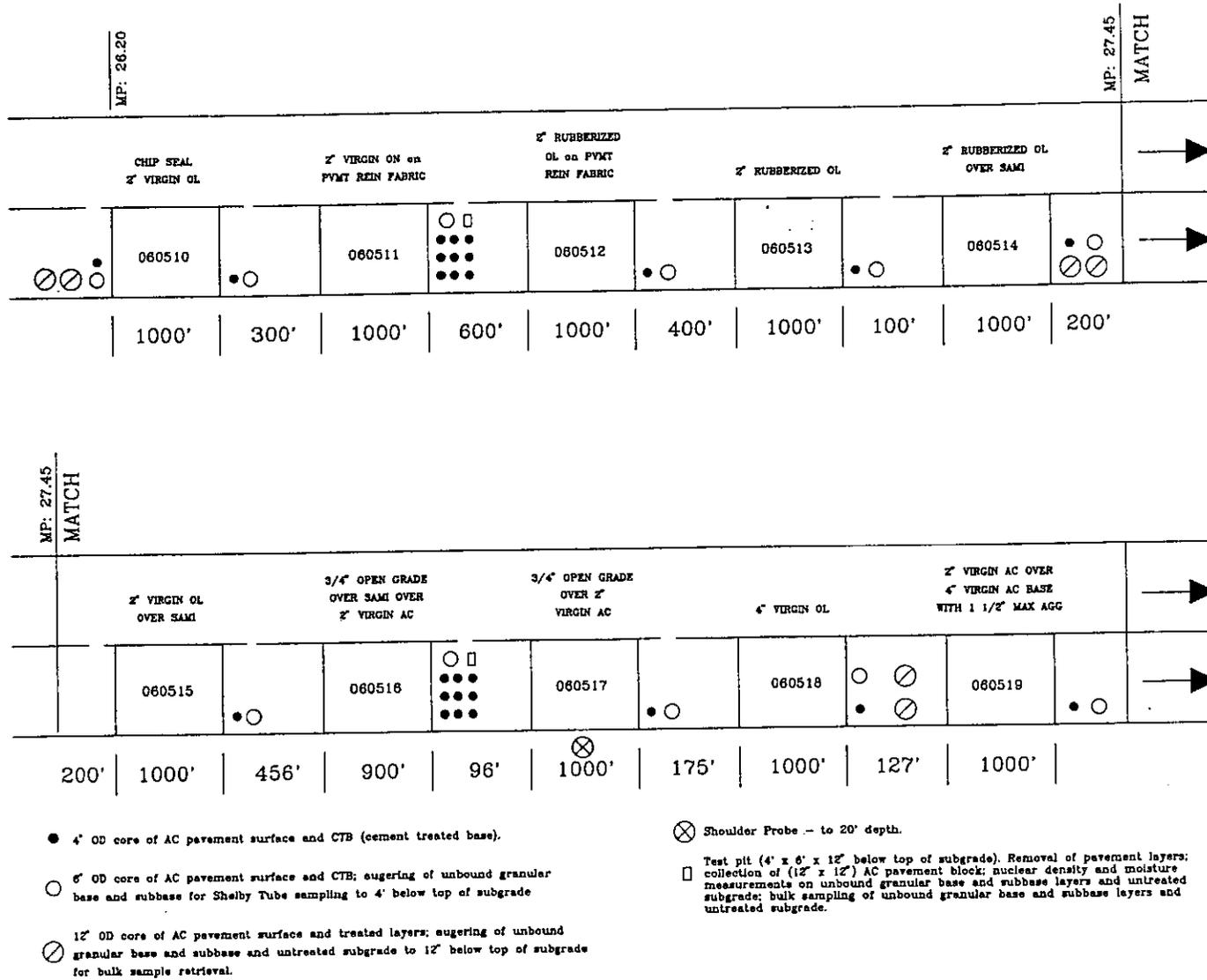
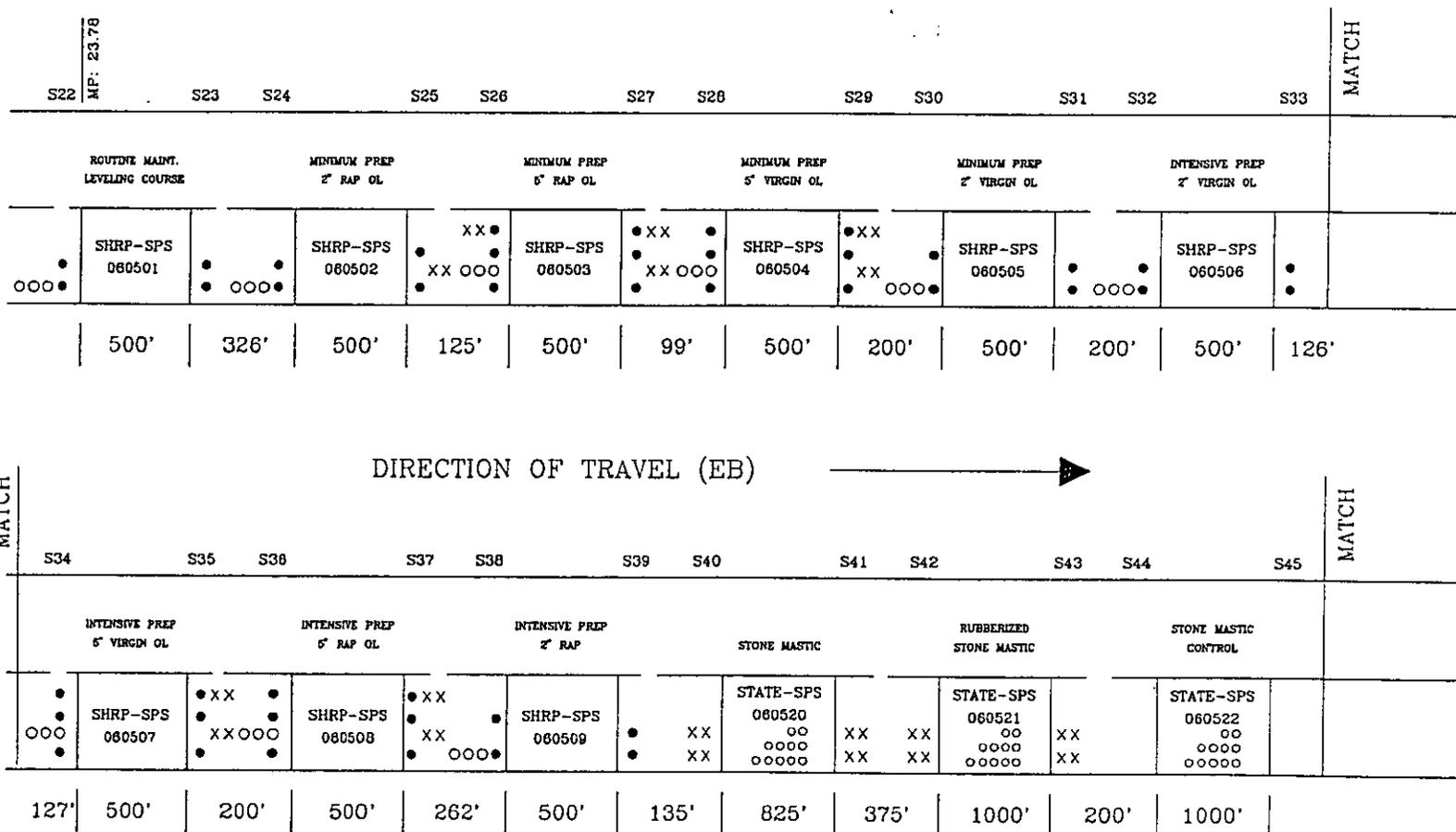


Figure 3B Pre-construction Sampling Layout (cont.)

SPS-5 POST CONSTRUCTION SAMPLING LAYOUT  
 060500 I-40, EAST OF BARSTOW, CALIFORNIA  
 EASTBOUND



- 4 inch cores for SHRP-LTPP
- x 6 inch cores for Berkeley
- o 4 inch cores for CalTrans

NOT TO SCALE

Figure 4a. Post Construction Sampling Layout

SPS-5 POST CONSTRUCTION SAMPLING LAYOUT  
CALTRANS SECTIONS CONTINUED

|           |                              |      |  |      |  |                |  |      |                               |      |       |
|-----------|------------------------------|------|--|------|--|----------------|--|------|-------------------------------|------|-------|
| MP: 26.20 | S46                          | S47  | S48                                    | S49  | S50                                      | S51            | S52                                    | S53  | S54                           | S55  | MATCH |
|           | CHP SEAL<br>2" VIRGIN OL     |      | 2" VIRGIN OL ON<br>PVMT REIN. FABRIC   |      | 2" RUBBERIZED OL ON<br>PVMT REIN. FABRIC |                | 2" RUBBERIZED OL                       |      | 2" RUBBERIZED OL<br>OVER SAMI |      |       |
|           | STATE<br>060510<br>OO<br>OOO |      | STATE<br>060511<br>OO<br>OOOO<br>OOOOO |      | STATE<br>060512<br>OO<br>OOO             | XX XX<br>XX XX | STATE<br>060513<br>OO<br>OOOO<br>OOOOO |      | STATE<br>060514<br>OO<br>OOO  |      |       |
|           | 1000'                        | 300' | 1000'                                  | 600' | 1000'                                    | 400'           | 1000'                                  | 100' | 1000'                         | 200' |       |

DIRECTION OF TRAVEL (EB) 

|       |                              |       |  |      |                                      |       |                                      |       |  |       |       |
|-------|------------------------------|-------|--|------|--------------------------------------|-------|--------------------------------------|-------|--|-------|-------|
| MATCH | S56                          | S57   | S58  | S59  | S60                                  | S61   | S62                                  | S63   | S64  | S65   | MATCH |
|       | 2" VIRGIN OL<br>OVER SAMI    |       | 3/4" OPEN GRADE<br>POVER SAMI OVER<br>2" VIRGIN AC |      | 3/4" OPEN GRADE<br>OVER 2" VIRGIN AC |       | 4" VIRGIN OL                         |       | 2" VIRGIN AC OVER<br>4" VIRGIN AC BASE<br>WITH 1 1/2" MAX AGG. |       |       |
|       | STATE<br>060515<br>OO<br>OOO |       | STATE<br>060518<br>OO<br>OOOO<br>OOOOO             |      | STATE<br>060517<br>OO<br>OOO         |       | STATE<br>060518<br>OO<br>OOO<br>XXXX |       | STATE<br>050819<br>OO<br>OOOO<br>OOOOO                         |       |       |
|       | 200'                         | 1000' | 456'   | 900' | 96'                                  | 1000' | 175'                                 | 1000' | 127'   | 1000' |       |

NOT TO SCALE

Figure 4b. Post Construction Sampling Layout (cont.)

Table 3. California SPS-5 material testing requirements (post-construction).

| Material Type and Properties                            | SHRP Test Designation | SHRP Protocol | Typical # of Tests per Layer | Actual # Tested, SHRP SEC.S | Actual # Tested, Caltrans SEC.S |
|---|-----------------------|---------------|------------------------------|-----------------------------|---------------------------------|
| <b>A. Asphaltic Concrete</b>                            |                       |               |                              |                             |                                 |
| Core Examination/Thickness                              | AC01                  | PO1           | 40                           | 44                          | 0                               |
| Bulk Specific Gravity                                   | AC02                  | PO2           | 40                           | 44                          | 0                               |
| Maximum Specific Gravity                                | AC03                  | PO3           | 6                            | 6                           | 0                               |
| Asphalt Content (Extraction)                            | AC04                  | PO4           | 6                            | 6                           | 0                               |
| Moisture Susceptibility                                 | AC05                  | PO5           | 6                            | 6                           | 0                               |
| Creep Compliance <sup>1</sup>                           | AC06                  | PO6           | 2                            | 6                           | 0                               |
| Resilient Modulus                                       | AC07                  | PO7           | 6                            | 12                          | 0                               |
| Tensile Strength  | AC07                  | PO7           | 18                           | 18                          | 0                               |
| <b>B. Extracted Aggregate</b>                           |                       |               |                              |                             |                                 |
| Bulk Specific Gravity                                   |                       |               |                              |                             |                                 |
| Coarse Aggregate  | AG01                  | P11           | 6                            | 6                           | 0                               |
| Fine Aggregate  | AG02                  | P12           | 6                            | 6                           | 0                               |
| Type and Classification                                 |                       |               |                              |                             |                                 |
| Coarse Aggregate  | AG03                  | P13           | 6                            | 6                           | 0                               |
| Fine Aggregate  | AG03                  | P13           | 6                            | 6                           | 0                               |
| Gradation of Aggregate                                  | AG04                  | P14           | 6                            | 6                           | 0                               |
| NAA Test for Fine Aggregate Particle Shape <sup>2</sup> | AG05                  | P14A          | 6                            | 6                           | 0                               |
| <b>C. Asphalt Cement</b>                                |                       |               |                              |                             |                                 |
| Abson Recovery  | AE01                  | P21           | 6                            | 6                           | 0                               |
| Penetration at 77° and 115°F                            | AE02                  | P22           | 6                            | 6                           | 0                               |
| Specific Gravity (60°F)                                 | AE03                  | P23           | 6                            | 6                           | 0                               |
| Viscosity at 77°F                                       | AE04                  | P24           | 6                            | 6                           | 0                               |
| Viscosity at 140° and 275°F                             | AE05                  | P25           | 6                            | 6                           | 0                               |

Notes: <sup>1</sup> Creep compliance will be performed when suitable procedures are developed -- cores will be stored.

<sup>2</sup> The National Aggregate Association will perform at no cost to the State.

Section 060501 was originally laid out to be the control section, with no overlay placed for at least one year. However, due to extensive road deterioration and costly future rehabilitation, CALTRANS proposed overlaying this section during construction of the other sections for both safety and financial reasons. SHRP discussed the need for a control section, but CALTRANS decided it was to their benefit to overlay and thus overlaid this section with 2 inches of recycled AC.

In addition to the SHRP sections, thirteen state supplemental test sections (as shown in Figures 4a and 4b) were constructed. Originally, CALTRANS was to construct ten supplemental sections (060510-060519). However, three more sections were added (060520,21,22). These three additional sections utilized Stone Mastic Asphalt (SMA) mix designs. The CALTRANS test sections, each typically 1000 feet long, are located in the eastbound travel lane of Interstate 40 between M.P. 24.96 and M.P. 28.58. The terrain over both the supplemental and core sections was identical. All CALTRANS supplemental sections, except the SMA sections (060520,21,22), were subjected to the same intensive surface preparation as the SHRP sections (cold milled 2"). The SMA sections were cold milled 3.6 inches. Table 4 presents a summary of both the core and supplemental CALTRANS sections. Figure 5 graphically shows the proposed lift thicknesses for all sections.

### **Construction Operations**

The following is a summary of the construction operations. Weather conditions were clear and warm, ambient temperatures ranged from the mid 60's - 80's (°F). Winds were calm, except for April 21 and the morning of April 22 when heavy easterly winds swept across the desert. However, there were no delays attributable to weather. The construction of the test sections began with milling operations on February 25, 1992 and open grade paving operations ended on May 13, 1992. The contractor was Forth Neff Forth (FNF) Construction Inc. of Phoenix, Arizona. SHRP Representatives present during the various stages of construction included: Joe Hannon and Steve Wiley, CALTRANS; Doug Frith, Pete Pradere and Ron Witt, Nichols Consulting Engineers (Western Region SHRP office); and John Hoole, SHRP/FHWA. The Caltrans RE was Gary Mayer and the FNF project supervisor was J. Kevin Turner.

### ***Surface Preparation***

Milling of the passing lane was completed prior to the arrival of SHRP Representatives. All sections of the driving lane were milled using a Caterpillar PR 1000 with a 12.5 foot wide cutting head. The shoulders were not milled. Delamination in the milled surface was present only in small confined areas. Milling depths were measured at the edge of the trench. Because of fast paced successive construction procedures, rod-and-level surveys were not taken between the milling and first lift paving operations.

Minimum preparation consisted of cold milling the open graded friction course, while intensive preparation consisted of cold milling 2 inches of the entire surface layer. It should be noted that

**Table 4. California SPS-5 Test Section Layout**

| SECTION # | SURFACE PREPARATION | OVERLAY MATERIAL AND THICKNESS                                    |
|-----------|---------------------|---|
| 060501    | None                | Control Section, 2" Recycled Asphalt Pavement (RAP) Overlay       |
| 060502    | Minimum             | 2" RAP Overlay  |
| 060503    | Minimum             | 5" RAP Overlay  |
| 060504    | Minimum             | 5" Virgin Overlay   |
| 060505    | Minimum             | 2" Virgin Overlay   |
| 060506    | Intensive           | 2" Virgin Overlay   |
| 060507    | Intensive           | 5" Virgin Overlay   |
| 060508    | Intensive           | 5" RAP Overlay  |
| 060509    | Intensive           | 2" RAP Overlay  |
| 060510    | Intensive           | 3/8" Chip Seal on 2" Virgin Overlay                               |
| 060511    | Intensive           | 2" Virgin Overlay on Pavement Reinforcing Fabric (PFR)            |
| 060512    | Intensive           | 2" Rubberized Overlay on PFR                                      |
| 060513    | Intensive           | 2" Rubberized Overlay   |
| 060514    | Intensive           | 2" Rubberized Overlay on SAMI                                     |
| 060515    | Intensive           | 2" Virgin Overlay on SAMI   |
| 060516    | Intensive           | 3/4" Open Graded AC on SAMI on 2" Virgin Overlay                  |
| 060517    | Intensive           | 3/4" Open Graded AC on 2" Virgin Overlay                          |
| 060518    | Intensive           | 4" Virgin Overlay   |
| 060519    | Intensive           | 2" Virgin Overlay on 4" Virgin AC Base with 1 1/2" Max. Aggregate |
| 060520    | Intensive           | 2" Stone Mastic Asphalt (Vestoplast) Overlay                      |
| 060521    | Intensive           | 2" Stone Mastic Asphalt (Modified) Overlay                        |
| 060522    | Intensive           | Stone Mastic Asphalt Control Section, 2" Dense Grade Overlay      |

Notes: SHRP Sections (060501-09)  
 CALTRANS Sections (060510-22)  
 SAMI - Stress Absorbing Membrane Interlayer  
 The 1 1/2" Max. Aggregate in section 060519 is also known as "Monster Rock"



for this report, the first lift following milling is classified as trench replacement only when that section was subjected to intensive surface preparation. Otherwise, the first lift is classified as the intermediate lift. The first lift was replaced with the same material as the overlay on that section.

All sections were broomed and a tack coat placed between successive paving lifts. The tack coat, an SS-1 emulsion, was applied at a rate of 0.05 gallon per square yard with a dilution rate of 60%.

### *Paving Operations*

The asphalt concrete was hauled in belly dumps from the hot plant to each test section and unloaded forming a windrow in the middle of the driving lane. Passing lane first lift paving was completed prior to the arrival of SHRP Representatives.

A Blaw Knox PF 200 paver used a Barber Green pickup to load the asphalt mix into the hopper, then proceeded to lay the mix for the first lift. A 30-foot ski was utilized for electronic grade control. Minor segregation occurred at times and was remedied by hand spreading the asphalt mix behind the paver. The centerline joint was not raked but instead pinched by rollers. The same setup and equipment was used for all paving layers over the first lift. Minor mat checking occurred in all test sections. The crown of the road was changed and this change was made with the top lift of the AC placement. Therefore, the top lift varies in thickness transversely across the lane.

Compaction was performed using combinations of several rollers. Table 5 summarizes the compaction equipment and patterns used on the project. Breakdown rolling was performed by either a double-drum vibratory roller or a steel-wheel tandem roller, depending on the test section and paving layer. The double-drum vibratory roller, a Caterpillar, weighed 12.5 tons, had a frequency of 2300 vibrations/minute, an amplitude of 0.26", and made three passes at 4 mph. The steel-wheel tandem roller, also a Caterpillar, weighed 12.5 tons and made 4 passes. Intermediate rolling was performed by either a pneumatic-tired or steel-wheel tandem roller, depending on the section and layer. The pneumatic-tired roller, a Hyster C550A, weighed 15 tons, and made 5 passes with a tire pressure of 110 psi. The steel-wheel tandem roller, a Caterpillar, weighed 12.5 tons and also made 5 passes. Finish rolling was performed by a 12.5 ton Caterpillar steel-wheel tandem roller which made 3,4, or 5 passes, again depending upon the section and pavement layer.

Overall, compaction techniques and patterns remained fairly consistent for test sections 080501 through 080519. Sections 080520 through 080522, the stone mastic sections, used a slightly different rolling pattern (Table 5). Section 080520 was constructed first, and they experimented with the rolling patterns. As a result, the compaction effort was nonuniform for this section. Section 080521 (rubberized stone mastic) was constructed late at night. The contractor was in a

**Table 5. Compaction Equipment and Rolling Patterns Summary**

**Lift 1 (Sections 060501 – 060519)**

| Rolling Stage | Equipment                             | Weight (ton) | Passes |
|---------------|---------------------------------------|--------------|--------|
| Breakdown     | Catepillar Double Drum Vibratory      | 12.5         | 3      |
| Intermediate  | Hyster C550A Pneumatic (Rubber Tired) | 15           | 5      |
| Finish        | Catepillar Steel Wheel Tandem         | 12.5         | 3      |

**Lift 2 (Sections 1 – 5)**

| Rolling Stage | Equipment                        | Weight (ton) | Passes |
|---------------|----------------------------------|--------------|--------|
| Breakdown     | Catepillar Double Drum Vibratory | 12.5         | 3      |
| Intermediate  | Catepillar Steel Wheel Tandem    | 12.5         | 5      |
| Finish        | Catepillar Steel Wheel Tandem    | 12.5         | 5      |

**Lift 2 (Sections 6 – 19)**

| Rolling Stage | Equipment                             | Weight (ton) | Passes |
|---------------|---------------------------------------|--------------|--------|
| Breakdown     | Catepillar Double Drum Vibratory      | 12.5         | 3      |
| Intermediate  | Hyster C550A Pneumatic (Rubber Tired) | 15           | 5      |
| Finish        | Catepillar Steel Wheel Tandem         | 12.5         | 5      |

**Lift 3 (Sections 18,19)**

| Rolling Stage | Equipment                             | Weight (ton) | Passes |
|---------------|---------------------------------------|--------------|--------|
| Breakdown     | Catepillar Double Drum Vibratory      | 12.5         | 3      |
| Intermediate  | Hyster C550A Pneumatic (Rubber Tired) | 15           | 5      |
| Finish        | Catepillar Steel Wheel Tandem         | 12.5         | 5      |

**Lift 3 (Sections 20,21,22)**

| Rolling Stage | Equipment                     | Weight (ton) | Passes |
|---------------|-------------------------------|--------------|--------|
| Breakdown     | Catepillar Steel Wheel Tandem | 12.5         | 4      |
| Finish        | Catepillar Steel Wheel Tandem | 12.5         | 4      |

Note: Rolling patterns unknown for lifts 1 and 2, sections 060520, 060521, 060522.

hurry to get done and therefore the compaction equipment made quick stops which resulted in shoving and tearing of the asphalt mat. Section 080522 was constructed last and the compaction techniques were uniform.

Nuclear density measurements for the project were taken by CALTRANS with an Ingusan #6182 nuclear density machine. The measurements for each section are listed in Table 6.

### *AC Mix Plant*

The AC mix plant, a CMI eight-foot Doggie Bone Drum, was located 2.5 miles from the beginning of section 060501 and 7.3 miles from the end of section 060519. The AC mix plant was a center feeding CMI, Model PVM 10X. The asphalt contents of the various pavement mixes were as follows:

|                               |      |
|-------------------------------|------|
| Virgin (AR-4000)              | 5.3% |
| Recycled (AR-4000)            | 3.8% |
| Rubberized                    | 7.5% |
| Virgin Monster Rock (AR-8000) | 5.1% |
| Vestoplast Stone Mastic       | 6.0% |
| Rubberized Stone Mastic       | 6.8% |

The 3.8% asphalt added to the 70/30 recycle was in addition to the residual asphalt content. Samples of the various pavement mixes were also taken in 5 gallon pails and 55 gallon drums (500 pounds), summarized as follows:

#### Virgin Mixture:

- 1000 pounds (two 55-gallon drums) of virgin aggregate
- 10 Five-gallon pails of virgin asphalt mix

#### Recycled Mixture:

- 11 Five-gallon pails of asphalt cement
- 1000 pounds (two 55-gallon drums) of virgin aggregate (mixed with RAP)
- 1000 pounds (two 55-gallon drums) of recycled aggregate (RAP)
- 10 Five-gallon pails of recycled asphalt mixture

#### Stone Mastic Mixture:

- 11 Five-gallon pails of asphalt cement
- 1000 pounds (two 55-gallon drums) of virgin aggregate
- 1 Five-gallon pail of Vestoplast
- 1 Five-gallon pail of Rubber
- 8 Five-gallon pails of Vestoplast SMA Mixture
- 8 Five-gallon pails of Rubberized SMA Mixture

**Table 6. Nuclear Density Measurement Summary**

**Nuclear Densities: % of Optimum Density**

| Section | Mill Replacement Layer | Surface Course (Average of lifts) |
|---------|------------------------|-----------------------------------|
| 080501  |                        | 93.8                              |
| 080502  |                        | 93.8                              |
| 080503  |                        | 95.6                              |
| 080504  |                        | 96                                |
| 080505  |                        | 95.6                              |
| 080506  | 97.8                   | 95.2                              |
| 080507  | 97.4                   | 96.5                              |
| 080508  | 96.9                   | 95.6                              |
| 080509  | 96.9                   | 93.4                              |
| 080510  | 96.5                   | 95.2                              |
| 080511  | 96.9                   | 95.6                              |
| 080512  | 96                     | 90.2                              |
| 080513  | 95.6                   | 92                                |
| 080514  | 96.5                   | 91.1                              |
| 080515  | 95.6                   | 94.3                              |
| 080516  | 98.2                   | 95.2                              |
| 080517  | 96.5                   | 95.2                              |
| 080518  | 96.5                   | 96.9                              |
| 080519  | 96.1                   | 96.3                              |
| 080520  | 96.5                   | 89.6                              |
| 080521  | 97.4                   | 92.4                              |
| 080522  | 96                     | 94.7                              |

Aggregate for the AC was crushed and came from the quarry where the hot-mix plant was located. The RAP material came from the roadway after the surface treatments were removed.

### ***Traffic Control***

During construction of the driving lane, traffic was diverted to the passing lane and vice versa. Traffic was switched from lane to lane regularly since paving operations were staggered with many different pavement criteria.

### ***Problems***

Overall, construction operations went well. However, both segregation of the first lift and mat checking in the overlays were present. Frequent starts and stops by the paver may have caused inconsistencies in paving thicknesses. At some point, most sections had at least a five minute wait on the belly dumps. As mentioned, there were some problems and inconsistencies during compaction of the stone mastic sections, 080520-080522. Refer to the detailed construction notes for problems pertaining to a particular section. The compaction problems already addressed will not be discussed further.

Pictures of the various construction operations are shown in Figures 6 through 15.

### **Detailed Construction Notes**

The following is a summary of the construction activities and data collected during the construction operations on SHRP sections (060501-09) and CALTRANS sections (060510-060522). When available, paving limits into the transition areas are reported. A standard procedure of measuring loose lift thicknesses consisted of either a centerline or shoulder measurement at each station, although some measurements were taken at half stations. Loose lift thicknesses on all CALTRANS supplemental sections were measured at whole stations. Loose lift thicknesses were obtained by measuring the penetration of a probe pushed into the asphalt. Table 7 summarizes the various loose lift thicknesses measured for each section. Due to the contractor's operations, compacted lift thicknesses were not taken. Appendix A lists the milling depths, nominal mill replacement paving thicknesses, and nominal overlay paving thicknesses for all of the sections milled or paved. Compaction methods and equipment were previously discussed and summarized in Table 6 and will not be discussed in these notes.

#### ***Section 060501***

***Pavement Structure.*** Control Section, 2-inch Recycle Mix

***SHRP Lane.*** No milling took place on this section. April 20, after a tack coat application, recycle overlay paving started at 7:45 AM and ended at 8:00 AM. Paving extended 100 feet beyond station 5+00. The average windrow and laydown temperatures were 295°F and



**Figure 6. Milling Operations**



**Figure 7. CMI AC Hot Plant**



**Figure 8. Tack Coat Prior to Placement of the Pavement Reinforcing Fabric**



**Figure 9. Placement of the Pavement Reinforcing Fabric**



**Figure 10. Pavement Reinforcing Fabric in Place**



**Figure 11. Rubberized AC Windrow over the Pavement Reinforcing Fabric**



**Figure 12. Rubberized Overlay Paving on the Pavement Reinforcing Fabric.**



**Figure 13. Placement of the Stress Absorbing Membrane Interlayer**



**Figure 14. Partially Rolled Stress Absorbing Membrane Interlayer**



**Figure 15. Rolling of Vestoplast Stone Mastic Asphalt**

**Table 7. Loose Laydown Thicknesses**

| Section #,<br>Station | Trench Replacement<br>Lift<br>(inches) |                 | Intermediate Lift<br>(inches) |                 | Top Lift<br>(inches) |                 |
|-----------------------|--|-----------------|-------------------------------|-----------------|----------------------|-----------------|
|                       | SHRP<br>Lane                           | Passing<br>Lane | SHRP<br>Lane                  | Passing<br>Lane | SHRP<br>Lane         | Passing<br>Lane |
| 060501                |  |                 |                               |                 |                      |                 |
| 0+00                  |  |                 |                               |                 |                      | 2.50            |
| 1+00                  |  |                 |                               |                 | 2.75                 | 2.25            |
| 3+00                  |  |                 |                               |                 | 2.25                 | 2.88            |
| 5+00                  |  |                 |                               |                 | 2.38                 | 2.75            |
| 060502                |  |                 |                               |                 |                      |                 |
| 0+00                  |  |                 |                               |                 | 2.25                 | 2.38            |
| 1+00                  |  |                 |                               |                 | 3.00                 | 3.00            |
| 3+00                  |  |                 | 1.44                          |                 | 2.75                 | 3.00            |
| 5+00                  |  |                 | 1.80                          |                 | 3.00                 | 3.00            |
| 060503                |  |                 |                               |                 |                      |                 |
| 0+00                  |  |                 |                               |                 | 3.63                 | 3.00            |
| 1+00                  |  |                 | 3.84                          |                 | 3.63                 | 3.50            |
| 3+00                  |  |                 | 4.20                          |                 | 3.63                 | 3.75            |
| 5+00                  |  |                 | 4.80                          |                 | 4.00                 | 4.00            |
| 060504                |  |                 |                               |                 |                      |                 |
| 0+00                  |  |                 | 4.80                          |                 | 3.50                 | 4.00            |
| 1+00                  |  |                 | 4.20                          |                 | 4.00                 | 3.88            |
| 3+00                  |  |                 | 3.96                          |                 | 3.38                 | 4.00            |
| 5+00                  |  |                 | 3.36                          |                 | 3.88                 | 3.50            |
| 060505                |  |                 |                               |                 |                      |                 |
| 0+00                  |  |                 | 1.44                          |                 | 2.75                 | 3.13            |
| 1+00                  |  |                 | 1.32                          |                 | 2.63                 | 3.38            |
| 3+00                  |  |                 | 1.44                          |                 | 2.63                 | 3.25            |
| 5+00                  |  |                 | 1.32                          |                 | 3.00                 | 3.25            |

**Table 7. Loose Laydown Thicknesses (cont.)**

| Section #,<br>Station | Trench Replacement<br>Lift<br>(inches) |                 | Intermediate Lift<br>(inches) |                 | Top Lift<br>(inches) |                 |
|-----------------------|--|-----------------|-------------------------------|-----------------|----------------------|-----------------|
|                       | SHRP<br>Lane                           | Passing<br>Lane | SHRP<br>Lane                  | Passing<br>Lane | SHRP<br>Lane         | Passing<br>Lane |
| 060506                |  |                 |                               |                 |                      |                 |
| 0+00                  | 2.76                                   |                 |                               |                 | 3.00                 | 3.13            |
| 1+00                  | 2.64                                   |                 |                               |                 | 3.13                 | 3.38            |
| 3+00                  | 2.76                                   |                 |                               |                 | 2.88                 | 3.25            |
| 5+00                  | 2.88                                   |                 |                               |                 | 3.50                 | 3.25            |
| 060507                |  |                 |                               |                 |                      |                 |
| 0+00                  | 3.00                                   |                 | 2.40"                         | 2.40"           | 3.00                 | 3.25            |
| 1+00                  | 2.40                                   |                 | 2.40"                         | 2.40"           | 3.00                 | 3.38            |
| 3+00                  | 2.76                                   |                 | 2.40"                         | 2.40"           | 3.00                 | 3.25            |
| 5+00                  | 2.64                                   |                 | 2.40"                         | 2.40"           | 3.00                 | 3.25            |
| 060508                |  |                 |                               |                 |                      |                 |
| 0+00                  | 2.52                                   |                 | 2.40"                         | 2.40"           | 3.13                 | 2.88            |
| 1+00                  | 2.64                                   |                 | 2.40"                         | 2.40"           | 3.00                 | 3.13            |
| 3+00                  | 2.52                                   |                 | 2.40"                         | 2.40"           | 2.75                 | 3.13            |
| 5+00                  | 2.40                                   |                 | 2.40"                         | 2.40"           | 3.00                 | 2.88            |
| 060509                |  |                 |                               |                 |                      |                 |
| 0+00                  | 2.40                                   |                 |                               |                 | 2.75                 | 2.38            |
| 1+00                  | 2.88                                   |                 |                               |                 | 2.88                 | 2.50            |
| 3+00                  | 2.40                                   |                 |                               |                 | 3.00                 | 2.38            |
| 5+00                  | 3.12                                   |                 |                               |                 | 2.63                 | 2.63            |
| 060510                |  |                 |                               |                 |                      |                 |
| 0+00                  | 2.00"                                  |                 |                               |                 |                      |                 |
| 3+00                  | 2.00"                                  |                 |                               |                 |                      | 2.88            |
| 7+00                  | 2.00"                                  |                 |                               |                 |                      | 2.72            |
| 10+00                 | 2.00"                                  |                 |                               |                 | 3.00                 | 2.75            |

*Table 7. Loose Laydown Thicknesses (cont.)*

| Section #,<br>Station | Trench Replacement<br>Lift<br>(inches) |                 | Intermediate Lift<br>(inches) |                 | Top Lift<br>(inches) |                 |
|-----------------------|--|-----------------|-------------------------------|-----------------|----------------------|-----------------|
|                       | SHRP<br>Lane                           | Passing<br>Lane | SHRP<br>Lane                  | Passing<br>Lane | SHRP<br>Lane         | Passing<br>Lane |
| 060511                |  |                 |                               |                 |                      |                 |
| 0+00                  | 2.00"                                  |                 |                               |                 | 3.00                 | 3.13            |
| 3+00                  | 2.00"                                  |                 |                               |                 | 2.75                 | 3.13            |
| 7+00                  | 2.00"                                  |                 |                               |                 | 3.00                 | 2.75            |
| 10+00                 | 2.00"                                  |                 |                               |                 | 2.63                 | 3.00            |
| 060512                |  |                 |                               |                 |                      |                 |
| 0+00                  | 2.00"                                  |                 |                               |                 | 2.75                 | 2.38            |
| 3+00                  | 2.00"                                  |                 |                               |                 | 3.00                 | 2.63            |
| 7+00                  | 2.00"                                  |                 |                               |                 | 2.50                 | 2.88            |
| 10+00                 | 2.00"                                  |                 |                               |                 | 2.63                 | 2.25            |
| 060513                |  |                 |                               |                 |                      |                 |
| 0+00                  |  |                 |                               |                 | 2.63                 | 2.75            |
| 3+00                  |  |                 |                               |                 | 3.00                 | 2.88            |
| 7+00                  | 3.12                                   |                 |                               |                 | 2.63                 | 2.75            |
| 10+00                 | 3.12                                   |                 |                               |                 | 2.88                 | 3.00            |
| 060514                |  |                 |                               |                 |                      |                 |
| 0+00                  | 3.48                                   |                 |                               |                 | 3.00                 | 3.25            |
| 3+00                  | 3.12                                   |                 |                               |                 | 2.88                 | 2.88            |
| 7+00                  | 3.24                                   |                 |                               |                 | 3.00                 | 3.00            |
| 10+00                 | 3.24                                   |                 |                               |                 | 2.88                 | 2.88            |
| 060515                |  |                 |                               |                 |                      |                 |
| 0+00                  | 2.88                                   |                 |                               |                 | 3.00                 | 3.00            |
| 3+00                  | 2.64                                   |                 |                               |                 | 3.00                 | 3.00            |
| 7+00                  | 2.64                                   |                 |                               |                 | 2.88                 | 2.75            |
| 10+00                 | 3.00                                   |                 |                               |                 | 2.88                 | 3.00            |

*Table 7. Loose Laydown Thicknesses (cont.)*

| Section #,<br>Station | Trench Replacement<br>Lift<br>(inches) |                 | Intermediate Lift<br>(inches) |                 | Top Lift<br>(inches) |                 |
|-----------------------|--|-----------------|-------------------------------|-----------------|----------------------|-----------------|
|                       | SHRP<br>Lane                           | Passing<br>Lane | SHRP<br>Lane                  | Passing<br>Lane | SHRP<br>Lane         | Passing<br>Lane |
| 060516                |  |                 |                               |                 |                      |                 |
| 0+00                  | 3.00                                   |                 | 2.50                          | 2.63            |                      |                 |
| 3+00                  | 3.00                                   |                 | 2.75                          | 2.75            |                      |                 |
| 7+00                  | 3.24                                   |                 | 2.50                          | 2.63            |                      |                 |
| 10+00                 | 3.12                                   |                 |                               |                 |                      |                 |
| 060517                |  |                 |                               |                 |                      |                 |
| 0+00                  | 3.00                                   |                 |                               |                 |                      |                 |
| 3+00                  | 3.00                                   |                 |                               |                 |                      |                 |
| 7+00                  | 2.76                                   |                 |                               |                 |                      |                 |
| 10+00                 | 2.52                                   |                 |                               |                 |                      |                 |
| 060518                |  |                 |                               |                 |                      |                 |
| 0+00                  | 2.64                                   |                 | 3.25                          | 3.00            | 3.13                 | 2.00"           |
| 3+00                  | 2.88                                   |                 | 3.25                          | 3.25            | 2.88                 | 2.00"           |
| 7+00                  | 3.00                                   |                 | 3.00                          | 3.00            | 2.75                 | 2.00"           |
| 10+00                 | 2.76                                   |                 | 3.25                          | 3.00            | 3.00                 | 2.00"           |
| 060519                |  |                 |                               |                 |                      |                 |
| 0+00                  | 3.00                                   |                 | 5.13                          | 4.75            | 2.50                 | 2.00"           |
| 3+00                  | 2.76                                   |                 | 5.50                          | 4.75            | 3.00                 | 2.00"           |
| 7+00                  | 2.88                                   |                 | 5.13                          | 4.75            | 2.75                 | 2.00"           |
| 10+00                 | 7.20                                   |                 | 2.38                          |                 | 3.25                 | 2.00"           |
| 060520                |  |                 |                               |                 |                      |                 |
| 0+00                  | 3.60"                                  | 3.60"           |                               |                 | 2.50                 | 2.00            |
| 3+00                  | 3.60"                                  | 3.60"           |                               |                 | 2.50                 | 2.50            |
| 7+00                  | 3.60"                                  | 3.60"           |                               |                 | 2.25                 | 2.63            |
| 10+00                 | 3.60"                                  | 3.60"           |                               |                 | 2.00                 | 2.75            |

**Table 7. Loose Laydown Thicknesses (cont.)**

| Section #,<br>Station | Trench Replacement<br>Lift<br>(inches) |                 | Intermediate Lift<br>(inches) |                 | Top Lift<br>(inches) |                 |
|-----------------------|--|-----------------|-------------------------------|-----------------|----------------------|-----------------|
|                       | SHRP<br>Lane                           | Passing<br>Lane | SHRP<br>Lane                  | Passing<br>Lane | SHRP<br>Lane         | Passing<br>Lane |
| 060521                |  |                 |                               |                 |                      |                 |
| 0+00                  | 3.60"                                  | 3.60"           |                               |                 | 2.00                 | 2.50            |
| 3+00                  | 3.60"                                  | 3.60"           |                               |                 | 2.00                 | 2.50            |
| 7+00                  | 3.60"                                  | 3.60"           |                               |                 | 2.00                 | 2.50            |
| 10+00                 | 3.60"                                  | 3.60"           |                               |                 | 2.00                 | 2.50            |
| 060522                |  |                 |                               |                 |                      |                 |
| 0+00                  | 3.60"                                  | 3.60"           |                               |                 | 1.80"                | 1.80"           |
| 3+00                  | 3.60"                                  | 3.60"           |                               |                 | 1.80"                | 1.80"           |
| 7+00                  | 3.60"                                  | 3.60"           |                               |                 | 1.80"                | 1.80"           |
| 10+00                 | 3.60"                                  | 3.60"           |                               |                 | 1.80"                | 1.80"           |

280°F, respectively. Loose lift thicknesses ranged from 2.3" to 2.8", averaging 2.4". The RAP overlay was not subjected to pneumatic rolling.

**Passing Lane.** No milling took place on this section. April 21, after a tack coat application, recycle overlay paving started at 12:11 PM and ended at 12:30 PM. The average windrow and laydown temperatures were 260°F and 241°F, respectively. Loose lift thicknesses ranged from 2.3" to 2.9", averaging 2.6".

### **Section 060502**

**Pavement Structure.** Minimum Preparation, 2-inch Recycle Mix

**SHRP Lane.** Milling and intermediate lift paving were performed February 25. No milling data was obtained for this section due to simultaneous construction elsewhere. A full depth patch existed between the end of section 060501 and station 1+50 (section 060502), and was not tack coated. The patch was neither milled nor intermediate lift paved (except for the last 25'). Intermediate lift paving began at 11:55 AM, following a tack coat application, and ended at 12:10 PM. Paving began at station 1+25 and ended 50 feet beyond station 5+00. The average windrow and laydown temperatures were 260°F and 220°F, respectively. Loose lift thicknesses ranged from 1.4" to 1.9", averaging 1.6". April 20, after a tack coat application, recycle overlay paving started at 8:03 AM and ended at 8:18 AM. The average windrow and laydown temperatures were 325°F and 298°F, respectively. Loose lift thicknesses ranged from 2.3" to 3.0", averaging 2.7". The RAP overlay was not subjected to pneumatic rolling.

**Passing Lane.** Milling and intermediate lift paving were completed prior to the arrival of SHRP Representatives. April 21, after a tack coat application, recycle overlay paving began at 12:43 PM and ended at 1:03 PM. The average windrow and laydown temperatures were 238°F and 217°F, respectively. Loose lift thicknesses ranged from 2.4" to 3.3", averaging 2.9".

### **Section 060503**

**Pavement Structure.** Minimum Preparation, 5-inch Recycle Mix

**SHRP Lane.** Milling and intermediate lift paving were completed on February 25. A full depth patch existing between stations 1+50 and 2+50 was milled and paved. This resulted in fairly inconsistent milling depths in this portion of the section. The intermediate lift was hand patched along the shoulder joint to accommodate for a low spot between stations 0+50 and 1+00. Milling depths ranged from 1" to 2.1", averaging 1.4". After a tack coat application, intermediate lift paving started at 12:10 PM and ended at 12:44 PM. Paving began 20 feet prior to station 0+00 and ended 50 feet beyond station 5+00. Loose lift thicknesses ranged from 3.8" to 4.8", averaging 4.3". The average windrow and laydown temperatures were 260°F and 225°F, respectively. April 20, after a tack coat application, recycle overlay paving started at 8:20 AM and ended at 9:06 AM. The average windrow and laydown temperatures were 293°F and 273°F,

respectively. Loose lift thicknesses ranged from 3.3" to 4.0", averaging 3.7". The RAP overlay was not subjected to pneumatic rolling.

**Passing Lane.** Milling and intermediate lift paving were completed prior to the arrival of SHRP Representatives. April 21, after a tack coat application, recycle overlay started at 1:09 PM and ended at 1:32 PM. The average windrow and laydown temperatures were 250°F and 238°F, respectively. Loose lift thicknesses ranged from 3.0" to 4.0", averaging 3.6".

#### **Section 060504**

**Pavement Structure.** Minimum Preparation, 5-inch Virgin Overlay

**SHRP Lane.** Milling and intermediate lift paving were completed on February 25. Milling depths ranged from 1.3" to 1.5", averaging 1.4". After a tack coat application, intermediate lift paving started at 12:50 PM and ended at 1:02 PM. Paving started 50 feet prior to station 0+00 and ended 20 feet beyond station 5+00. The average windrow and laydown temperatures were 280°F and 238°F, respectively. Loose lift thicknesses ranged from 2.9" to 4.8", averaging 4.1". April 20, after a tack coat application, virgin overlay paving started at 9:11 AM and ended at 9:26 AM. Paving extended 100 feet beyond station 5+00. The average windrow and laydown temperatures were 300°F and 242°F, respectively. Loose lift thicknesses ranged from 3.6" to 4.0", averaging 3.8". The virgin overlay was not subjected to pneumatic rolling.

**Passing Lane.** Milling and mill replacement paving were completed prior to the arrival of SHRP Representatives. The virgin overlay was placed on April 21 from 1:35 PM to 1:58 PM, following tack coat application. The average windrow and laydown temperatures were 275°F and 258°F, respectively. Loose lift thicknesses ranged from 3.5" to 4.0", averaging 3.8".

#### **Section 060505**

**Pavement Structure.** Minimum Preparation, 2-inch Virgin Overlay

**SHRP Lane.** Milling and intermediate lift paving were completed on February 25. Milling depths ranged from 1.1" to 1.3", averaging 1.2". After a tack coat application, intermediate lift paving started at 1:08 PM and ended at 1:17 PM. Paving started 100 feet prior to station 0+00 and extended 50 feet beyond station 5+00. The average windrow and laydown temperatures were 264°F and 213°F, respectively. Loose lift thicknesses ranged from 1.2" to 1.6", averaging 1.4". April 20, after a tack coat application, virgin overlay paving started at 9:34 AM and ended at 9:42 AM. Paving extended 100 feet beyond station 5+00. The average windrow and laydown temperatures were 293°F and 273°F, respectively. Loose lift thicknesses ranged from 2.6" to 3.0", averaging 2.7". The virgin overlay was not subjected to pneumatic rolling.

**Passing Lane.** Milling and intermediate lift paving were completed prior to the arrival of SHRP Representatives. April 21, after a tack coat application, virgin overlay paving started at 2:04 PM and ended at 2:22 PM. The average windrow and laydown temperatures were 260°F and 235°F, respectively. Loose lift thicknesses ranged from 2.7" to 3.0", averaging 2.8".

#### **Section 060506**

**Pavement Structure.** Intensive Preparation, 2-inch Virgin Overlay

**SHRP Lane.** Milling and trench replacement paving were completed on February 25. Milling depths ranged from 1.4" to 2.0", averaging 1.7". After a tack coat application, trench replacement paving started at 1:22 PM and ended at 1:33 PM. Paving started 70 feet prior to station 0+00 and extended 50 feet beyond station 5+00. The average windrow and laydown temperatures were 265°F and 232°F, respectively. Loose lift thicknesses ranged from 2.6" to 3.0", averaging 2.7". April 20, after a tack coat application, virgin overlay paving started at 9:48 AM and ended at 10:01 AM. The average windrow and laydown temperatures were 296°F and 273°F, respectively. Loose lift thicknesses ranged from 2.9" to 3.5", averaging 3.2". The virgin overlay was subjected to pneumatic rolling after considerable mat cooling.

**Passing Lane.** Milling and trench replacement paving were completed prior to the arrival of SHRP Representatives. April 21, after a tack coat application, virgin overlay paving started at 2:31 PM and ended at 2:51 PM. The average windrow and laydown temperatures were 265°F and 245°F, respectively. Loose lift thicknesses ranged from 3.1" to 3.4", averaging 3.2".

#### **Section 060507**

**Pavement Structure.** Intensive Preparation, 5-inch Virgin Overlay

**SHRP Lane.** Milling and trench replacement paving were completed on February 25. Milling depths ranged from 1.1" to 2.3", averaging 1.9". After a tack coat application, trench replacement paving started at 1:37 PM and ended at 1:54 PM. Paving started 50 feet prior to station 0+00 and extended 20 feet beyond station 5+00. The average windrow and laydown temperatures were 270°F and 238°F, respectively. Loose lift thicknesses ranged from 2.4" to 3.0", averaging 2.6". The intermediate lift was placed on April 17, prior to the arrival of SHRP Representatives. April 20, after a tack coat application, virgin overlay paving started at 10:09 AM and ended at 10:28 AM. Paving extended 100 feet beyond station 5+00. The average windrow and laydown temperatures were 298°F and 262°F, respectively. Loose lift thicknesses ranged from 3.0" to 3.4", averaging 3.1". The top lift of the virgin overlay was subjected to pneumatic rolling after considerable mat cooling.

**Passing Lane.** Milling, trench replacement paving, and intermediate lift paving were completed prior to the arrival of SHRP Representatives. April 21, after a tack coat application, top lift paving started at 3:01 PM and ended at 3:19 PM. The average windrow and laydown temperatures were 274°F and 242°F, respectively. Loose lift thicknesses ranged from 3.0" to 3.4", averaging 3.2".

#### **Section 060508**

**Pavement Structure.** Intensive Preparation, 5-inch Recycle Mix

**SHRP Lane.** Milling and trench replacement paving were completed on February 25. Milling depths ranged from 1.5" to 2.1", averaging 1.8". After a tack coat application, trench replacement paving started at 1:58 PM and ended at 2:06 PM. Paving started 20 feet prior to station 0+00 and extended 30 feet beyond station 5+00. The average windrow and laydown temperatures were 255°F and 225°F, respectively. Loose lift thicknesses ranged from 2.4" to 3.0", averaging 2.6". The intermediate lift was placed on April 17, prior to the arrival of SHRP Representatives. April 20, after a tack coat application, recycle overlay paving started at 10:35 AM and ended at 10:49 AM. Paving extended 100 feet beyond station 5+00. The average windrow and laydown temperatures were 293°F and 261°F, respectively. Loose lift thicknesses ranged from 2.8" to 3.1", averaging 3.0". The top lift of the recycle overlay was subjected to pneumatic rolling after considerable mat cooling.

**Passing Lane.** Milling, trench replacement paving, and intermediate lift paving were completed prior to the arrival of SHRP Representatives. April 21, after a tack coat application, top lift paving started at 3:27 PM and ended at 3:46 PM. The average windrow and laydown temperatures were 269°F and 244°F, respectively. Loose lift thicknesses ranged from 2.5" to 3.0", averaging 2.9".

#### **Section 060509**

**Pavement Structure.** Intensive Preparation, 2-inch Recycle Mix

**SHRP Lane.** Milling and trench replacement paving were completed on February 25. Milling depths ranged from 1.6" to 2.3", averaging 2.0". After a tack coat application, trench replacement paving started at 2:11 PM and ended at 2:20 PM. Paving started 90 feet prior to station 0+00 and extended 2 feet beyond station 5+00. No windrow temperatures were taken for the trench replacement lift. However, the average laydown temperature was 232°F. Loose lift thicknesses ranged from 2.4" to 3.4", averaging 2.9". April 20, after a tack coat application, recycle overlay paving started at 10:56 AM and ended at 11:16 AM. Paving extended 65 feet beyond station 5+00. The average windrow and laydown temperatures were 293°F and 264°F, respectively. Loose lift thicknesses ranged from 2.5" to 3.0", averaging 2.8". The top lift of the recycle overlay was subjected to pneumatic rolling after considerable mat cooling.

*Passing Lane.* Milling and trench replacement paving were completed prior to the arrival of SHRP Representatives. April 21, after a tack coat application, recycle overlay paving started at 3:55 PM and ended at 4:07 PM. The average windrow and laydown temperatures were 265°F and 243°F, respectively. Loose lift thicknesses ranged from 2.4" to 2.8", averaging 2.5".

#### **Section 060510**

*Pavement Structure.* Intensive Preparation, Chip Seal on 2-inch Virgin Overlay

*SHRP Lane.* Milling and trench replacement paving were done on February 25. Milling depths ranged from 2.1" to 2.4", averaging 2.3". Trench replacement data was not collected, but plans called for a 2-inch virgin replacement layer. April 22, after a tack coat application, virgin overlay paving started at 8:30 AM and ended at 8:48 AM. The average windrow and laydown temperatures were 270°F and 250°F, respectively. Loose lift thicknesses averaged 3.0". Chip sealing was completed on April 24.

*Passing Lane.* Milling and trench replacement paving were completed prior to the arrival of SHRP Representatives. April 22, after a tack coat application, virgin overlay paving started at 4:08 PM and ended at 4:55 PM. The average windrow and laydown temperatures were 287°F and 257°F, respectively. Loose lift thicknesses ranged from 2.5" to 2.9", averaging 2.7". Chip sealing was completed on April 24.

#### **Section 060511**

*Pavement Structure.* Intensive Preparation, 2-inch Virgin Overlay on Pavement Reinforcing Fabric (PRF)

*SHRP Lane.* Milling and trench replacement paving were completed on February 25. Milling depths ranged from 2.1" to 2.4", averaging 2.3". Trench replacement data was not collected, but plans called for a 2-inch virgin replacement layer. April 22, from 6:00 AM to 6:23 AM, the pavement reinforcing fabric (PRF) was placed on a tack coat applied at 0.25 gallons per square yard, at a temperature of 350°F. The 12.5 foot wide PRF was placed 35 feet prior to station 0+00 and extended 45 feet beyond station 10+00. A total of 1080 feet of PRF went down. A second strip of PRF 18 inches wide was hand rolled on the shoulder adjacent to the lane strip. The PRF was not tack coated prior to virgin overlay paving. The same day, virgin overlay paving started at 8:52 AM and ended at 9:08 AM. The average windrow and laydown temperatures were 273°F and 257°F, respectively. Loose lift thicknesses ranged from 2.5" to 3.0", averaging 2.8".

*Passing Lane.* Milling and trench replacement paving were completed prior to the arrival of SHRP Representatives. April 22, the PRF was placed at 3:32 PM on a tack coat applied at 0.25 gallons per square yard. The PRF was placed 35 feet prior to station 0+00. April 22, after a tack coat application, virgin overlay paving started at 5:05 PM and ended at 5:52 PM. During

virgin overlay paving the paver slipped on the PRF, resulting in torn fabric at stations 4+00 and 8+00. However, the PRF tearing was not significant. The average windrow and laydown temperatures were 274°F and 248°F, respectively. Loose lift thicknesses ranged from 2.9" to 3.1", averaging 3.0".

### ***Section 060512***

***Pavement Structure.*** Intensive Preparation, 2-inch Rubberized Overlay on Pavement Reinforcing Fabric (PRF)

***SHRP Lane.*** Milling and trench replacement paving were done on February 25. Milling depths ranged from 2.1" to 2.4", averaging 2.3". Trench replacement data was not collected, but plans called for a 2-inch virgin replacement layer. April 22, from 6:28 AM to 6:45 AM, the pavement reinforcing fabric (PRF) was placed on a tack coat applied at 0.25 gallons per square yard, at a temperature of 330°F. The 12.5 foot wide PRF was placed 35 feet prior to station 0+00 and extended 40 feet beyond station 10+00. A total of 1075 feet of PRF went down. A second strip of PRF 18 inches wide was hand rolled on the shoulder adjacent to the lane strip. The PRF was not tack coated prior to rubberized overlay paving. The same day, rubberized overlay paving started at 10:30 AM and ended at 10:47 AM. The average windrow and laydown temperatures were 300°F and 286°F, respectively. Loose lift thicknesses ranged from 2.5" to 3.0", averaging 2.8".

***Passing Lane.*** Milling and trench replacement paving were completed prior to the arrival of SHRP Representatives. April 22, the PRF was placed. PRF placement extended 35 feet beyond station 10+00. The same day, rubberized overlay paving started at 6:24 PM and ended at 7:45 PM. The average windrow and laydown temperatures were 286°F and 259°F, respectively. Loose lift thicknesses ranged from 2.3" to 2.9", averaging 2.5". During rubberized overlay paving the paver slipped on the PRF, resulting in several torn areas. Station 4+50 had a small tear. Station 8+70 had a 10 x 7 foot strip, located 1 foot off the shoulder of the passing lane, removed and not replaced. An 8 x 4 foot strip of PRF, near the center of the lane at station 9+75, was removed and not replaced. Stations 10+15 to 10+35 (approximately the end of PRF placement) had a 2' wide strip ripped out at the center of the passing lane.

### ***Section 060513***

***Pavement Structure.*** Intensive Preparation, 2-inch Rubberized Overlay

***SHRP Lane.*** Milling and trench replacement paving were completed on February 25. Milling depths ranged from 2.1" to 2.5", averaging 2.3". After a tack coat application, trench replacement paving started at 4:30 PM and ended at 4:43 PM. The average windrow and laydown temperatures were 260°F and 235°F, respectively. Loose lift thicknesses ranged from 3.1" to 3.5", averaging 3.2". April 22, after a tack coat application, rubberized overlay paving started at 11:02 AM and ended at 11:20 AM. The average windrow and laydown temperatures were

287°F and 278°F, respectively. Loose lift thicknesses ranged from 2.6" to 3.0", averaging 2.8".

*Passing Lane.* Milling and trench replacement paving were completed prior to the arrival of SHRP Representatives. April 22, after a tack coat application, rubberized overlay paving started at 7:59 PM and ended at 8:59 PM. Windrow and laydown temperatures were not recorded due to darkness. Loose lift thicknesses ranged from 2.5" to 3.0", averaging 2.8".

#### **Section 060514**

*Pavement Structure.* Intensive Preparation, 2-inch Rubberized Overlay on Stress Absorbing Interlayer (SAMI)

*SHRP Lane.* Milling and trench replacement paving were completed on February 25. A digout, consisting of milling 3.6" in the driving lane in addition to the planned milling, was performed between stations 8+60 and 9+65. Milling depths ranged from 2.1" to 6.0", averaging 2.6". After a tack coat application, trench replacement paving started at 4:50 PM and ended at 5:40 PM. (The digout was paved in one lift prior to the trench replacement lift and averaged 4.1".) Windrow temperature measurements were not recorded, but laydown temperatures averaged 217°F. Loose lift thicknesses ranged from 2.9" to 3.5", averaging 3.1". The Stress Absorbing Membrane Interlayer (SAMI) was placed on April 21 following a tack coat application. April 22, from 11:30 AM to 12:28 PM, the rubberized overlay was completed. Windrow temperature measurements were not recorded, but laydown temperatures averaged 273°F. Loose lift thicknesses ranged from 2.9" to 3.3", averaging 3.0".

*Passing Lane.* Milling and trench replacement paving were completed prior to arrival of SHRP Representatives. April 21, the SAMI was laid over an applied tack coat. April 22, from 9:01 PM to 9:37 PM, rubberized overlay paving was completed. Laydown temperatures were not recorded, however the average windrow temperature was 285°F. Loose lift thicknesses ranged from 2.8" to 3.5", averaging 3.0".

#### **Section 060515**

*Pavement Structure.* Intensive Preparation, 2-inch Virgin Overlay on Stress Absorbing Interlayer (SAMI)

*SHRP Lane.* Milling and trench replacement paving were completed on February 25. Milling depths ranged from 2.3" to 2.5", averaging 2.3". After a tack coat application, trench replacement paving started at 5:33 PM and ended at 5:50 PM. Sunset occurred when paving reached station 4+00. Windrow temperature measurements were not recorded, but laydown temperatures averaged 227°F. Loose lift thicknesses ranged from 2.6" to 3.0", averaging 2.8". The Stress Absorbing Membrane Interlayer (SAMI) was placed on April 21 following a tack coat application. Both the SAMI placement and virgin overlay paving extended 50 feet beyond station

10+00. April 22, from 12:35 PM to 12:56 PM, virgin overlay paving was completed. Windrow temperature measurements were not recorded, but laydown temperatures averaged 246°F. Loose lift thicknesses ranged from 2.6" to 3.1", averaging 2.9".

**Passing Lane.** Milling and trench replacement paving were completed prior to arrival of SHRP Representatives. April 21, the SAMI was laid but not tack coated. April 23, from 7:43 AM to 8:32 AM, virgin overlay paving was completed. A construction joint was placed at station 0+02. The average windrow and laydown temperatures were 268°F and 246°F, respectively. Loose lift thicknesses ranged from 2.8" to 3.1", averaging 2.9".

### **Section 060516**

**Pavement Structure.** Intensive Preparation, 3/4" Open Grade on Stress Absorbing Membrane Interlayer (SAMI) on 2-inch Virgin Overlay

**SHRP Lane.** Milling and trench replacement paving were completed on February 25. Milling depths ranged from 2.1" to 2.4", averaging 2.3". After a tack coat application, trench replacement paving started at 6:00 PM and ended at 6:25 PM. Windrow temperature measurements were not recorded, but laydown temperatures averaged 232°F. Loose lift thicknesses ranged from 2.9" to 3.2", averaging 3.0". April 22, from 1:02 PM to 1:50 PM, virgin overlay paving was completed. The SAMI was placed on April 23. Paving stopped at station 9+00. Windrow temperature measurements were not recorded, but laydown temperatures averaged 230°F. Loose lift thicknesses ranged from 2.4" to 2.8", averaging 2.6". Open grade AC pavement was placed May 13 at 11:00 AM. Loose lift thicknesses averaged 0.9", windrow temperatures averaged 270°F, and laydown temperatures averaged 260°F.

**Passing Lane.** Milling and mill replacement paving was completed prior to the arrival of SHRP Representatives. April 23, from 8:55 AM to 10:29 AM, the virgin overlay was paved. Paving stopped at station 9+08, with no transition area at the end of the section. Loose lift thickness ranged from 2.6" to 2.9" with an average of 2.7". Windrow temperatures averaged 247°F. A construction joint was placed at station 8+20. Later that day, the SAMI was placed. Open graded AC pavement was placed May 13 at approximately 8:30 AM. Loose lift thicknesses averaged 0.9", windrow temperatures averaged 270°F, and laydown temperatures averaged 260°F.

### **Section 060517**

**Pavement Structure.** Intensive Preparation, 3/4" Open Grade on 2-inch Virgin Overlay

**SHRP Lane.** Milling and trench replacement paving were completed on February 25. Milling depths ranged from 2.0" to 2.5", averaging 2.2". After a tack coat application, trench replacement paving started at 6:27 PM and ended at 6:50 PM. The paving occurred after sundown. A rest area taper began at station 4+00. A 2-foot hand formed bevelled edge was

formed with no compaction. Windrow and laydown temperatures were not recorded due to darkness. Loose lift thicknesses ranged from 2.5" to 3.0", averaging 2.8". April 24, after a tack coat application, virgin overlay paving started at 7:50 AM and ended at 8:20 AM. The average windrow and laydown temperatures were 266°F and 243°F, respectively. Loose lift thicknesses ranged from 2.6" to 3.1", averaging 2.8". Open Graded AC pavement was placed May 13 at approximately 11:30 AM. Loose lift thicknesses averaged 0.9", windrow temperatures averaged 270°F, and laydown temperatures averaged 260°F.

**Passing Lane.** Milling and trench replacement paving were completed prior to the arrival of SHRP Representatives. April 24, after a tack coat application, virgin overlay paving started at 11:00 PM. The average windrow and laydown temperatures were 280°F and 248°F, respectively. Loose lift thicknesses ranged from 2.5" to 3.0", averaging 2.9". Open graded AC pavement was placed May 13 at approximately 9:00 AM. Loose laydown thicknesses averaged 0.9", windrow temperatures averaged 270°F, and laydown temperatures averaged 260°F.

### **Section 060518**

#### **Pavement Structure.** Intensive Preparation, 4-inch Virgin Overlay

**SHRP Lane.** Milling and trench replacement paving were completed on February 25. Milling depths ranged from 2.0" to 2.4", averaging 2.3". After a tack coat application, trench replacement paving started at 6:55 PM and ended at 7:16 PM. Windrow temperatures were not recorded, but laydown temperatures averaged 258°F. Loose lift thicknesses ranged from 2.5" to 3.0", averaging 2.8". Intermediate lift paving was completed on April 17, from 4:03 PM to 4:50 PM. The average windrow and laydown temperatures were 252°F and 233°F, respectively. Loose lift thicknesses ranged from 3.0" to 3.4", averaging 3.2". April 24, after a tack coat application, virgin overlay paving started at 8:29 AM and ended at 8:55 AM. The average windrow and laydown temperatures were 254°F and 233°F, respectively. Loose lift thicknesses ranged from 2.8" to 3.5", averaging 3.0".

**Passing Lane.** Milling and trench replacement paving were completed prior to the arrival of SHRP Representatives. Intermediate lift paving was completed April 21, from 7:45 AM to 8:38 AM. The average windrow and laydown temperatures were 243°F and 222°F, respectively. Loose lift thicknesses ranged from 2.8" to 3.3", averaging 2.9". Top lift virgin overlay paving was completed on April 23. However, SHRP Representatives were not present due to simultaneous construction elsewhere.

### **Section 060519**

**Pavement Structure.** Intensive Preparation, 2-inch Virgin Overlay on 4-inch Virgin AC Base with 1-1/2" Maximum Aggregate

**SHRP Lane.** Milling and trench replacement paving were completed on February 25. A

digout, consisting of milling 3.6" in the driving lane in addition to the planned milling, was performed between stations 8+20 and 10+00. Milling depths ranged from 2.3" to 6.3", averaging 3.0". After a tack coat application, trench replacement paving started at 7:19 PM and ended at 8:20 PM. A 1'x 6' section of pavement, located near the inner wheel path at station 0+60, was removed and replaced by hand. Windrow and laydown temperatures were not recorded due to darkness. Loose lift thicknesses ranged from 2.8" to 2.9", averaging 2.8". (The digout was paved separately in one lift, and averaged 4.1") Intermediate lift paving (4-inch virgin AC base with 1-1/2-inch max. aggregate, a.k.a. Monster Rock) was completed on April 17, from 4:03 PM to 4:50 PM. The average windrow and laydown temperatures were 255°F and 232°F, respectively. Loose lift thicknesses ranged from 2.4" to 5.5", averaging 4.8". April 24, after a tack coat application, virgin overlay paving started at 8:57 AM and ended at 9:24 AM. Paving extended 60 feet beyond station 10+00. The average windrow and laydown temperatures were 260°F and 231°F, respectively. Loose lift thicknesses ranged from 2.5" to 3.3", averaging 2.8".

*Passing Lane.* Milling and trench replacement paving were completed prior to the arrival of SHRP Representatives. The Monster Rock base was paved from 9:06 AM to 9:57 AM on April 21. Windrow temperatures were not recorded, but laydown temperatures averaged 226°F. Loose lift thicknesses ranged from 4.1" to 4.9", averaging 4.6". Top lift virgin overlay paving was completed on April 24. However, SHRP Representatives were not present due to simultaneous construction elsewhere.

### **Section 060520**

*Pavement Structure.* Intensive Preparation, 2-inch Stone Mastic Asphalt (Vestoplast) Overlay

*SHRP Lane.* Milling, trench replacement paving, and intermediate lift paving were completed prior to the arrival of SHRP Representatives. Both the milling and compacted trench replacement depths averaged 3.6". The intermediate lift was paved with 1.8" of hot recycled asphalt concrete (HRAC, 30%). After the vestoplast was added to the mix, stone mastic asphalt (SMA) paving started at 6:06 PM, April 23. The top lift consisted of 1.8" of SMA vestoplast mix. Paving started 130 feet before station 0+00 and extended 75 feet beyond station 10+00. The average windrow and laydown temperatures were 262°F and 240°F, respectively. Loose lift thicknesses ranged from 1.8" to 2.5", averaging 2.1".

*Passing Lane.* Milling, trench replacement paving, and intermediate lift paving were completed prior to the arrival of SHRP Representatives. Both the milling and compacted trench replacement depths averaged 3.6". The intermediate lift was paved with 1.8" of hot recycled asphalt concrete (HRAC, 30%). SMA vestoplast paving was completed April 23, from 1:56 PM to 3:21 PM. The top lift consisted of 1.8" of SMA vestoplast mix. The SMA vestoplast mix was switched to a rubberized SMA mix at station 8+25. Thus, no transition exists between sections 060520 and 060521. The average windrow and laydown temperatures were 282°F and 232°F, respectively. Loose lift thicknesses ranged from 2.0" to 2.8", averaging 2.6".

## **Section 060521**

**Pavement Structure.** Intensive Preparation, 2-inch Rubberized Stone Mastic Asphalt Overlay

**SHRP Lane.** Milling, trench replacement paving, and intermediate lift paving were completed prior to the arrival of SHRP Representatives. Both the milling and compacted trench replacement depths averaged 3.6". The intermediate lift was paved with 1.8" of hot recycled asphalt concrete (HRAC, 30%). Rubberized SMA paving was completed April 23, from 7:09 PM to 7:38 PM. The top lift consisted of 1.8" of rubberized SMA mix. A construction joint was placed at station 10+00. The average windrow and laydown temperatures were 259°F and 244°F, respectively. Loose lift thicknesses ranged from 1.9" to 2.1", averaging 2.0".

**Passing Lane.** Milling, trench replacement paving, and intermediate lift paving were completed prior to the arrival of SHRP Representatives. Both the milling and compacted trench replacement depths averaged 3.6". The intermediate lift was paved with 1.8" of hot recycled asphalt concrete (HRAC, 30%). Rubberized SMA paving was completed April 23, from 3:28 PM to 4:00 PM. The top lift consisted of 1.8" of rubberized SMA mix. Paving started 100 feet before station 0+00. A construction joint was placed at station 10+00. The average windrow and laydown temperatures were 278°F and 253°F, respectively. Loose lift thicknesses ranged from 2.3" to 2.6", averaging 2.5".

## **Section 060522**

**Pavement Structure.** Intensive Preparation, Stone Mastic Asphalt Control Section

**SHRP Lane.** Milling, trench replacement paving, and intermediate lift paving were completed prior to the arrival of SHRP Representatives. Both the milling and compacted trench replacement depths averaged 3.6". The intermediate lift was paved with 4.2" of AC (type A, 1-1/2" Max.). This section was used as a control section for SMA sections 060520 and 060521, and was overlaid with 1.8" of Dense Graded AC. SHRP Representatives were not present during the paving operations.

**Passing Lane.** Milling, trench replacement paving, and intermediate lift paving were completed prior to the arrival of SHRP Representatives. Both the milling and compacted trench replacement depths averaged 3.6". The intermediate lift was paved with 4.2" of hot recycled asphalt concrete (HRAC, 30%). The top lift was overlaid with 1.8" of Dense Graded AC. SHRP Representatives were not present during the paving operations.

## PROBLEMS & COMMENTS

All Sections: Overall, construction of this project went well. However, both segregation of the mill replacement layer and checking in the mat of the overlays were apparent, though not detrimental. Frequent stops and starts by the paver may have caused inconsistencies in paving thicknesses. Most sections, at some point, had at least a five minute wait on the belly dumps. The following is a breakdown of the sections and the problems/comments accompanying them. Again, all stations are approximations.

Section 060501: There was no pneumatic rolling on the recycle overlay.

Section 060502: A full depth patch existed from stations 0+00 to 1+50. This portion was neither milled nor mill replaced. There was no pneumatic rolling on the recycle overlay.

Section 060503: A full depth patch, existing from stations 1+50 to 2+50, was milled and mill replaced. The result was fairly inconsistent mill depths in this portion of the section. The mill replacement layer was hand patched along the shoulder joint to accommodate for a low spot from stations 0+50 to 1+00. No pneumatic rolling was done on the recycle overlay.

Section 060504: No pneumatic rolling was used to compact the virgin overlay on this section.

Section 060505: No pneumatic rollers compacted on the virgin overlay on this section.

Section 060506: The pneumatic roller made passes on the virgin overlay after the mat had cooled considerably.

Section 060507: The pneumatic roller made passes (on the second lift of the virgin overlay) after the mat had cooled considerably.

Section 060508: The pneumatic roller made passes (on the second lift of the recycle overlay) after the mat had cooled considerably.

Section 060509: Milling and mill replacement stopped abruptly at station 5+02 (No transition out of section). Pneumatic rolling of the recycle overlay occurred after considerable mat cooling.

Section 060511: During the virgin overlay, the paver was slipping on the pavement reinforcing fabric (PRF). This resulted in torn fabric at stations 4+00 and 8+00 of the passing lane. This PRF tearing was not significant, however.

Section 060512: During the rubberized overlay, the paver was slipping on the PRF resulting in several torn areas. Station 4+50 had a small tear. Station 8+70 had a 10' x 7' strip, located 1' off the shoulder of the passing lane, removed and not replaced. Station 9+75 had an 8' x 4' strip of PRF, near the center of the passing lane, removed but not replaced. Stations 10+15 to 10+35 (approximately the end of PRF placement) had a 2' wide strip ripped out at the center of the passing lane.

Section 060515: The SAMI was not tacked prior to the virgin overlay. A construction joint was placed at Station 0+02 of the passing lane.

Section 060516: A construction joint was placed at Station 8+20 of the passing lane.

Section 060517: Station 4+00 of the driving lane was the beginning of a mill replacement taper to the Rest Area. A 2-foot hand-formed bevelled edge was formed with no compaction. Trench replacement paving occurred after sundown.

Section 060518: The trench replacement layer was paved after sundown.

Section 060519: Milling digouts began at Station 8+20 and ended at Station 10+00. The trench replacement layer, paved after sundown, had a 6' x 1' piece removed and replaced by hand (near the inner wheel path) at Station 0+60 of the driving lane.

Section 060520: Vestoplast stone mastic asphalt (SMA) was switched to Modified (Rubber) SMA at Station 8+25 of the passing lane.

Section 060521: A construction joint was placed at Station 10+00 of both driving and passing lanes.

## APPENDIX A

## Milling Depths (inches)

| STATION   | SECTIONS |        |        |        |        |        |        |
|-----------|----------|--------|--------|--------|--------|--------|--------|
|           | 060503   | 060504 | 060505 | 060506 | 060507 | 060508 | 060509 |
| 0+00      | 1.50     | 1.25   | 1.13   | 1.75   | 2.00   | 2.00   | 2.13   |
| +50       | 1.50     | 1.38   | 1.25   | 1.50   | 1.88   | 2.00   | 2.00   |
| 1+00      | 1.25     | 1.38   | 1.13   | 1.88   | 2.00   | 1.50   | 2.13   |
| +50       | 2.13     | 1.38   | 1.25   | 1.88   | 2.13   | 1.63   | 2.25   |
| 2+00      | 1.00     | 1.50   | 1.13   | 1.63   | 2.00   | 1.88   | 2.25   |
| +50       | 1.63     | 1.38   | 1.13   | 1.75   | 2.13   | 1.50   | 1.63   |
| 3+00      | 1.25     | 1.25   | 1.13   | 1.38   | 2.00   | 1.75   | 1.88   |
| +50       | 1.38     | 1.50   | 1.13   | 1.75   | 2.00   | 2.13   | 2.00   |
| 4+00      | 1.50     | 1.38   | 1.13   | 1.50   | 2.25   | 1.88   | 2.00   |
| +50       | 1.50     | 1.50   | 1.13   | 2.00   | 1.75   | 1.88   | 1.63   |
| 5+00      | 1.25     | 1.38   | 1.25   | 1.75   | 1.13   | 2.00   | 1.88   |
| Average   | 1.44     | 1.39   | 1.16   | 1.70   | 1.93   | 1.83   | 1.98   |
| Std. Dev. | 0.29     | 0.09   | 0.05   | 0.19   | 0.30   | 0.21   | 0.21   |

## Comments:

Milling depths were taken at shoulder. Milling width is 12'6" and milled surface has coarse texture. Millings were placed just off the shoulder. Passing lane has already been milled and overlaid.

060502 Full depth patching from end of section 060501 to sta. 1+50 of this section.

060503 Full depth patching located from sta. 1+50 to 2+47.

060509 Milling stopped at the end of this section. Recent paving started immediately after the end of this section. There is no transition.

All stations are approximations.

## Milling Depths (inches)

| STATION   | SECTIONS |        |        |        |        |        |        |        |        |        |
|-----------|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|           | 060510   | 060511 | 060512 | 060513 | 060514 | 060515 | 060516 | 060517 | 060518 | 060519 |
| 0+00      | 2.38     | 2.13   | 2.25   | 2.50   | 2.63   | 2.38   | 2.25   | 2.38   | 2.38   | 2.25   |
| 1+00      | 2.38     | 2.25   | 2.25   | 2.13   | 2.38   | 2.38   | 2.38   | 2.13   | 2.25   | 2.38   |
| 2+00      | 2.25     | 2.25   | 2.38   | 2.25   | 2.25   | 2.25   | 2.13   | 2.50   | 2.25   | 2.25   |
| 3+00      | 2.38     | 2.38   | 2.25   | 2.38   | 2.25   | 2.38   | 2.25   | 2.13   | 2.25   | 2.25   |
| 4+00      | 2.25     | 2.25   | 2.25   | 2.25   | 2.13   | 2.25   | 2.13   | 2.38   | 2.38   | 2.25   |
| 5+00      | 2.25     | 2.38   | 2.38   | 2.38   | 2.13   | 2.38   | 2.38   | 2.25   | 2.25   | 2.25   |
| 6+00      | 2.13     | 2.25   | 2.25   | 2.25   | 2.38   | 2.25   | 2.25   | 2.25   | 2.00   | 2.50   |
| 7+00      | 2.13     | 2.38   | 2.25   | 2.13   | 2.00   | 2.50   | 2.38   | 2.00   | 2.38   | 2.25   |
| 8+00      | 2.38     | 2.25   | 2.13   | 2.38   | 2.50   | 2.25   | 2.38   | 2.00   | 2.38   | 2.50   |
| 9+00      | 2.25     | 2.38   | 2.25   | 2.13   | 6.00   | 2.50   | 2.38   | 2.13   | 2.25   | 6.00   |
| 10+00     | 2.38     | 2.25   | 2.13   | 2.13   | 2.38   | 2.25   | —      | 2.00   | 2.25   | 6.25   |
| Average   | 2.28     | 2.28   | 2.25   | 2.26   | 2.64   | 2.34   | 2.29   | 2.19   | 2.27   | 3.01   |
| Std. Dev. | 0.10     | 0.08   | 0.08   | 0.13   | 1.13   | 0.10   | 0.10   | 0.17   | 0.11   | 1.54   |

## Comments:

Milling depths were taken at shoulder. Milling width is 12'6" and milled surface has coarse texture. Millings were placed just off shoulder. Passing lane has already been milled and overlaid.

060514 Digouts are as shown on plans, consist of milling 0.3' more than milling listed for section. 105' of 0.47' milling beginning at sta. 8+60 (see plans).

060519 Digout from sta. 8+20 to 10+00.  
Extra depth measurements were taken:

8+50 5.25"  
9+50 6"

All stations are approximations.

SHRP Sections  
 Mill Replacement  
 AC Paving Thickness (inches)

Barstow, CA

2/25/92

| STATION    | SECTIONS |        |        |        |        |        |        |        |
|------------|----------|--------|--------|--------|--------|--------|--------|--------|
|            | 060502   | 060503 | 060504 | 060505 | 060506 | 060507 | 060508 | 060509 |
| Transition |          |        |        | 1.44   | 2.64   |        |        | 2.52   |
| Transition |          | 3      | 4.8    | 1.56   | 3      | 3      | 2.4    | 2.4    |
| 0+00       |          |        | 4.8    | 1.44   | 2.76   | 3      | 2.52   | 2.4    |
| +50        |          | 3.96   | 3.84   | 1.44   | 2.4    | 3      | 2.64   | 2.28   |
| 1+00       |          | 3.84   | 4.2    | 1.32   | 2.64   | 2.4    | 2.64   | 2.88   |
| +50        |          | 4.32   | 3.96   | 1.44   | 2.64   | 2.76   | 2.64   | 2.64   |
| 2+00       | 1.44     | 3.96   | 4.2    | 1.32   | 2.64   | 2.4    | 3      | 3.12   |
| +50        |          | 4.2    | 3.84   | 1.2    | 2.88   | 2.88   | 2.52   | 2.88   |
| 3+00       | 1.44     | 4.2    | 3.96   | 1.44   | 2.76   | 2.76   | 2.52   | 3.36   |
| +50        | 1.44     | 4.44   | 4.08   | 1.44   | 2.76   | 2.4    | 2.4    | 3.24   |
| 4+00       | 1.92     | 4.8    | 4.08   | 1.56   | 2.64   | 2.76   | 2.64   | 2.88   |
| +50        | 1.68     | 4.56   | 4.2    | 1.32   | 2.88   | 2.64   | 2.4    | 2.76   |
| 5+00       | 1.8      | 4.8    | 3.36   | 1.32   | 2.88   | 2.64   | 2.4    | 3.12   |
| Transition | 1.68     |        | 2.88   | 1.32   | 2.76   | 2.52   | 2.52   |        |
| Average    | 1.62     | 4.31   | 4.05   | 1.39   | 2.73   | 2.7    | 2.57   | 2.87   |
| Std. Dev.  | 0.21     | 0.51   | 0.42   | 0.1    | 0.15   | 0.23   | 0.17   | 0.34   |

Comments:

Paved 12'6" wide.

060502 Sta. 1+25 Started paving.

060503 Sta. 0+50 to 1+00 Hand patching along shoulder joint to accomodate for low spot.

060507 Sta. 5+00 Low temperature reading due to waiting on next truck.

060509 Sta. 5+02 Paving stops.

All stations are approximations

CALTRANS Sections  
 Mill Replacement  
 AC Paving Thickness (inches)

Barstow, CA

2/25/92

| STATION   | SECTIONS |        |        |        |        |        |        |
|-----------|----------|--------|--------|--------|--------|--------|--------|
|           | 060513   | 060514 | 060515 | 060516 | 060517 | 060518 | 060519 |
| 0+00      |          | 3.48   | 2.88   | 3.00   | 3.00   | 2.64   | 3.00   |
| 1+00      |          | 3.00   | 2.76   | 2.88   | 2.88   | 2.52   | 2.76   |
| 2+00      |          | 3.12   | 2.64   | 3.00   | 3.00   | 2.64   | 2.88   |
| 3+00      |          | 3.12   | 2.64   | 3.00   | 3.00   | 2.88   | 2.76   |
| 4+00      |          | 2.88   | 2.64   | 3.00   | 2.88   | 2.88   | 2.88   |
| 5+00      | 3.48     | 3.00   | 3.00   | 3.12   | 2.88   | 2.76   | 2.88   |
| 6+00      | 3.12     | 3.24   | 2.88   | 3.00   | 2.64   | 2.88   | 2.76   |
| 7+00      | 3.12     | 3.12   | 2.64   | 3.24   | 2.76   | 3.00   | 2.88   |
| 8+00      | 3.24     | 3.24   | 2.88   | 3.00   | 2.64   | 3.00   | 2.76   |
| 9+00      | 3.24     | 7.20   | 2.76   | 3.12   | 2.64   | 2.88   | 7.32   |
| 10+00     | 3.12     | 3.24   | 3.00   | 3.12   | 2.52   | 2.76   | 7.20   |
| Average   | 3.22     | 3.51   | 2.79   | 3.04   | 2.80   | 2.80   | 3.64   |
| Std. Dev. | 0.14     | 1.23   | 0.14   | 0.10   | 0.17   | 0.15   | 1.79   |

Comments:

Paving 12'6" wide

060517 Sta. 4+00 Begin taper to Rest Area. Hand formed bevelled edge (2 feet), no compaction.

060519 Sta. 0+60 Removed and replaced 1' x 6', near inner wheel path, by hand.  
 Sta. 8+20 Digouts begin and run to the end of the section.  
 Sta. 10+00 Hand finished the end of AC paving.

Sections 060517-060519 were paved after sundown.

All stations are approximations.

SPS-5 Barstow, CA  
Paving Thicknesses (inches)  
Driving Lanes

| STATION    | SECTIONS |        |        |        |        |        |        |        |        |
|------------|----------|--------|--------|--------|--------|--------|--------|--------|--------|
|            | 060501   | 060502 | 060503 | 060504 | 060505 | 060506 | 060507 | 060508 | 060509 |
| 0+00       |          | 2.25   | 3.63   | 3.50   | 2.75   | 3.00   | 3.00   | 3.13   | 2.75   |
| 1+00       | 2.75     | 3.00   | 3.63   | 4.00   | 2.63   | 3.13   | 3.00   | 3.00   | 2.88   |
| 2+00       | 2.25     | 2.88   | 4.00   | 4.00   | 2.75   | 3.25   | 3.00   | 3.00   | 3.00   |
| 3+00       | 2.25     | 2.75   | 3.63   | 3.38   | 2.63   | 2.88   | 3.00   | 2.75   | 3.00   |
| 4+00       | 2.50     | 2.50   | 3.25   | 3.63   | 2.63   | 3.25   | 3.38   | 2.88   | 2.88   |
| 5+00       | 2.38     | 3.00   | 4.00   | 3.88   | 3.00   | 3.50   | 3.00   | 3.00   | 2.50   |
| Transition | 3.00     |        |        | 3.38   | 2.88   |        | 3.13   | 2.75   |        |
| Average    | 2.43     | 2.73   | 3.69   | 3.73   | 2.73   | 3.17   | 3.06   | 2.96   | 2.84   |
| Std. Dev.  | 0.21     | 0.30   | 0.28   | 0.27   | 0.14   | 0.22   | 0.16   | 0.13   | 0.19   |

All sections constructed on 4/20/92

SPS-5 Barstow, CA  
Paving Thicknesses (inches)  
Driving Lanes

| STATION   | SECTIONS |        |        |        |        |        |        |        |
|-----------|----------|--------|--------|--------|--------|--------|--------|--------|
|           | 060510   | 060511 | 060512 | 060513 | 060514 | 060515 | 060516 | 060517 |
| 0+00      |          | 3.00   | 2.75   | 2.63   | 3.00   | 3.00   | 2.50   |        |
| 1+00      |          | 3.00   | 3.00   | 3.00   | 3.00   | 3.00   | 2.50   |        |
| 2+00      |          | 2.75   | 3.00   | 3.00   | 3.00   | 3.13   | 2.50   |        |
| 3+00      |          | 2.75   | 3.00   | 3.00   | 2.88   | 3.00   | 2.75   |        |
| 4+00      |          | 3.00   | 2.75   | 2.75   | 2.88   | 3.00   | 2.63   |        |
| 5+00      |          | 3.00   | 2.88   | 2.88   | 3.00   | 3.00   | 2.75   |        |
| 6+00      |          | 3.00   | 2.75   | 2.75   | 2.88   | 2.88   | 2.63   |        |
| 7+00      |          | 3.00   | 2.50   | 2.63   | 3.00   | 2.88   | 2.50   | 2.63   |
| 8+00      |          | 2.50   | 2.50   | 2.63   | 3.00   | 2.63   | 2.38   | 2.75   |
| 9+00      |          | 2.63   | 2.63   | 2.75   | 3.25   | 2.88   | 2.50   | 2.75   |
| 10+00     | 3.00     | 2.63   | 2.63   | 2.88   | 2.88   | 2.88   | -      | 3.13   |
| Average   | 3.00     | 2.84   | 2.76   | 2.81   | 2.98   | 2.93   | 2.56   | 2.82   |
| Std. Dev. | 0.00     | 0.19   | 0.19   | 0.15   | 0.11   | 0.13   | 0.12   | 0.22   |

Sections 060510 to 060516 constructed on 4/22/92  
Section 060517 constructed on 4/24/92

SPS--5 Barstow, CA  
Paving Thicknesses (inches)  
Driving Lanes

| STATION   | SECTIONS |        |        |        |
|-----------|----------|--------|--------|--------|
|           | 060518   | 060519 | 060520 | 060521 |
| 0+00      | 3.25     | 5.13   | 2.50   | 2.00   |
| 1+00      | 3.38     | 5.25   | 2.00   | 1.88   |
| 2+00      | 3.25     | 5.38   | 2.13   | 2.00   |
| 3+00      | 3.25     | 5.50   | 2.50   | 2.00   |
| 4+00      | 3.25     | 5.50   | 2.00   | 1.88   |
| 5+00      | 3.25     | 5.13   | 1.75   | 2.00   |
| 6+00      | 3.38     | 4.13   | 1.75   | 2.13   |
| 7+00      | 3.00     | 5.13   | 2.25   | 2.00   |
| 8+00      | 3.00     | 5.00   | 2.00   | 1.88   |
| 9+00      | 3.13     | 4.25   | 2.00   | 2.00   |
| 10+00     | 3.25     | 2.38   | 2.00   | 2.00   |
| Average   | 3.22     | 4.80   | 2.08   | 1.98   |
| Std. Dev. | 0.13     | 0.92   | 0.25   | 0.07   |

Sections 060518 and 060519 constructed 4/20/92  
Sections 060520 and 060521 constructed 4/23/92

| STATION   | SECTIONS |        |
|-----------|----------|--------|
|           | 060518   | 060519 |
| 0+00      | 3.13     | 2.50   |
| 1+00      | 3.50     | 2.75   |
| 2+00      | 3.13     | 3.00   |
| 3+00      | 2.88     | 3.00   |
| 4+00      | 2.75     | 2.88   |
| 5+00      | 3.00     | 2.75   |
| 6+00      | 2.88     | 2.63   |
| 7+00      | 2.75     | 2.75   |
| 8+00      | 2.75     | 2.88   |
| 9+00      | 3.00     | 2.75   |
| 10+00     | 3.00     | 3.25   |
| Average   | 2.98     | 2.83   |
| Std. Dev. | 0.22     | 0.20   |

Sections 060518 and 060519 final  
overlay construction on 4/24/92

SPS-5 Barstow, CA  
Paving Thicknesses (inches)  
Passing Lanes

| STATION   | SECTIONS |        |        |        |        |        |        |        |        |
|-----------|----------|--------|--------|--------|--------|--------|--------|--------|--------|
|           | 060501   | 060502 | 060503 | 060504 | 060505 | 060506 | 060507 | 060508 | 060509 |
| 0+00      | 2.50     | 2.38   | 3.00   | 4.00   | 3.00   | 3.13   | 3.25   | 2.88   | 2.38   |
| 1+00      | 2.25     | 3.00   | 3.50   | 3.88   | 2.75   | 3.38   | 3.38   | 3.13   | 2.50   |
| 2+00      | 2.50     | 2.88   | 3.88   | 3.63   | 2.63   | 3.25   | 3.25   | 3.00   | 2.75   |
| 3+00      | 2.88     | 3.00   | 3.75   | 4.00   | 2.75   | 3.25   | 3.25   | 3.13   | 2.38   |
| 4+00      | 2.63     | 3.25   | 3.50   | 3.63   | 2.75   | 3.13   | 3.13   | 3.00   | 2.50   |
| 5+00      | 2.75     | 3.00   | 4.00   | 3.50   | 3.00   | 3.25   | 3.00   | 2.88   | 2.63   |
| Average   | 2.59     | 2.92   | 3.61   | 3.77   | 2.81   | 3.23   | 3.21   | 3.00   | 2.52   |
| Std. Dev. | 0.22     | 0.29   | 0.36   | 0.21   | 0.15   | 0.09   | 0.13   | 0.11   | 0.15   |

All sections constructed on 4/21/92

SPS-5 Barstow, CA  
Paving Thicknesses (inches)  
Passing Lanes

| STATION   | SECTIONS |        |        |        |        |        |        |        |
|-----------|----------|--------|--------|--------|--------|--------|--------|--------|
|           | 060510   | 060511 | 060512 | 060513 | 060514 | 060515 | 060516 | 060517 |
| 0+00      |          | 3.13   | 2.38   | 2.75   | 3.25   | 3.00   | 2.63   | 2.50   |
| 1+00      | 2.88     | 3.00   | 2.25   | 3.00   | 3.50   | 2.75   | 2.63   | 3.00   |
| 2+00      | 2.88     | 3.13   | 2.38   | 2.88   | 3.00   | 3.00   | 2.75   | 2.88   |
| 3+00      | 2.88     | 3.13   | 2.63   | 2.88   | 2.88   | 3.00   | 2.75   | 3.00   |
| 4+00      | 2.50     | 3.00   | 2.38   | 2.75   | 2.75   | 2.88   | 2.88   | 3.00   |
| 5+00      | 2.50     | 3.13   | 2.50   | 2.88   | 2.75   | 2.75   | 2.75   | 3.00   |
| 6+00      | 2.63     | 2.88   | 2.75   | 2.50   | 2.75   | 3.13   | 2.63   |        |
| 7+00      | 2.75     | 2.75   | 2.88   | 2.75   | 3.00   | 2.75   | 2.63   |        |
| 8+00      | 2.75     | 2.88   | 2.50   | 3.00   | 3.00   | 2.75   | 2.75   |        |
| 9+00      | 2.88     | 3.00   | 2.50   | 2.88   | 3.00   | 2.88   | 2.63   |        |
| 10+00     | 2.75     | 3.00   | 2.25   | 3.00   | 2.88   | 3.00   | -      |        |
| Average   | 2.74     | 3.00   | 2.49   | 2.84   | 2.98   | 2.90   | 2.70   | 2.90   |
| Std. Dev. | 0.15     | 0.13   | 0.20   | 0.15   | 0.23   | 0.14   | 0.09   | 0.20   |

Sections 060510 to 060514 constructed on 4/24/92  
Sections 060515 and 060516 constructed on 4/23/92  
Section 060517 constructed on 4/24/92

SPS-5 Barstow, CA  
Paving Thicknesses (inches)  
Passing Lanes

| STATION   | SECTIONS |        |        |        |
|-----------|----------|--------|--------|--------|
|           | 060518   | 060519 | 060520 | 060521 |
| 0+00      | 3.00     | 4.75   | 2.00   | 2.50   |
| 1+00      | 3.00     | 4.38   | 2.75   | 2.38   |
| 2+00      | 3.25     | 4.75   | 2.63   | 2.50   |
| 3+00      | 3.25     | 4.75   | 2.50   | 2.50   |
| 4+00      | 2.75     | 4.88   | 2.75   | 2.63   |
| 5+00      | 2.75     | 4.75   | 2.50   | 2.63   |
| 6+00      | 2.88     | 4.75   | 2.63   | 2.50   |
| 7+00      | 3.00     | 4.75   | 2.63   | 2.50   |
| 8+00      | 2.75     | 4.50   | 2.38   | 2.50   |
| 9+00      | 2.75     | 4.13   | 2.75   | 2.63   |
| 10+00     | 3.00     |        | 2.75   | 2.25   |
| Average   | 2.94     | 4.64   | 2.57   | 2.50   |
| Std. Dev. | 0.18     | 0.23   | 0.23   | 0.11   |

Sections 060518 and 060519 constructed on 4/21/92  
Sections 060520 and 060521 constructed on 4/23/92

Sections 060518 and 060519 were again overlayed 4/24/92.  
However, due to other construction procedures,  
SHRP representatives were unable to be present.