

89 001

MISSOURI SHRP LTPP MONITORING SECTIONS

STRATEGIC HIGHWAY RESEARCH PROGRAM



LONG-TERM PAVEMENT PERFORMANCE STUDIES

L

Compiled By

MISSOURI HIGHWAY AND TRANSPORTATION DEPARTMENT

DIVISION OF MATERIALS AND RESEARCH

RESEARCH SECTION

December 1989

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GLOSSARY

AADT	-	Annual Average Daily Traffic
AC	-	Asphaltic Concrete
CRCP	-	Continuous Reinforced Concrete Pavement
C.T.A.B.	-	Cement Treated Aggregate Base
GPS	-	General Pavement Study
JPCP	-	Jointed Plain Concrete Pavement
JRCP	-	Jointed Reinforced Concrete Pavement
KESALS	-	One Thousand Eighteen-Kip Equivalent Single Axle Loads Per Year Per Lane
LTPP	-	Long Term Pavement Performance
O.G.B.B.	-	Open Graded Bituminous Base
PCC	-	Portland Cement Concrete
RPCCP	-	Reinforced Portland Cement Concrete Pavement
S.C.	-	Seal Coat
SHRP	-	Strategic Highway Research Program
SPS	-	Specific Pavement Study
S.S.B.	-	Sand Soil Base
S.S.C.T.D.	-	Sand Soil Cement Treated Base

INTRODUCTION TO
LONG TERM PAVEMENT PERFORMANCE

GOAL AND OBJECTIVES

THE OBJECTIVE FOR LTPP STUDIES ESTABLISHED BY THE "STRATEGIC TRANSPORTATION RESEARCH STUDY" AND ADOPTED BY THE ADVISORY COMMITTEE FOR PAVEMENT PERFORMANCE AS THEIR GOAL WAS:

"TO INCREASE PAVEMENT LIFE BY INVESTIGATION OF VARIOUS DESIGNS OF PAVEMENT STRUCTURES AND REHABILITATED PAVEMENT STRUCTURES, USING DIFFERENT MATERIALS AND UNDER DIFFERENT LOADS, ENVIRONMENTS, SUBGRADE SOIL, AND MAINTENANCE PRACTICES."

THE SPECIFIC OBJECTIVES DEVELOPED BY THE ADVISORY COMMITTEE ARE:

EVALUATE EXISTING DESIGN METHODS

DEVELOP IMPROVED DESIGN METHODOLOGIES AND STRATEGIES FOR THE REHABILITATION OF EXISTING PAVEMENTS

DEVELOP IMPROVED DESIGN EQUATIONS FOR NEW AND RECONSTRUCTED PAVEMENTS

DETERMINE THE EFFECTS OF (1) LOADING, (2) ENVIRONMENT, (3) MATERIAL PROPERTIES AND VARIABILITY, (4) CONSTRUCTION QUALITY, AND (5) MAINTENANCE LEVELS ON PAVEMENT DISTRESS AND PERFORMANCE.

DETERMINE THE EFFECTS OF SPECIFIC DESIGN FEATURES ON PAVEMENT PERFORMANCE

ESTABLISH A NATIONAL LONG-TERM PAVEMENT DATA BASE TO SUPPORT SHRP OBJECTIVES AND FUTURE NEEDS

IT IS EXPECTED THAT ACCOMPLISHMENT OF THESE OBJECTIVES WILL RESOLVE MOST OF THE DIFFICULTIES CURRENTLY EXPERIENCED IN IMPLEMENTING SUCCESSFUL PAVEMENT MANAGEMENT SYSTEMS.

ALL STATES WERE ASKED TO "BE INVOLVED" IN THE LONG TERM PAVEMENT PERFORMANCE STUDIES. MISSOURI IS INTERESTED IN "GENERAL PAVEMENT STUDIES (GPS)", I.E., IN SERVICE PAVEMENTS, AND, "SPECIFIC PAVEMENT STUDIES (SPS)".

GENERAL PAVEMENT STUDIES (GPS) INCLUDE NINE SEPARATE EXPERIMENTS WHICH ARE:

1. ASPHALTIC CONCRETE ON GRANULAR BASE
2. ASPHALT CONCRETE ON BOUND BASES, ASPHALT TREATED, CEMENT TREATED, AND SOIL CEMENT TREATED.
3. JOINTED PLAIN CONCRETE PAVEMENT - JPCP

4. JOINTED REINFORCED CONCRETE PAVEMENT - JRCP
5. CONTINUOUSLY REINFORCED CONCRETE PAVEMENT - CRCP
- 6A. EXISTING ASPHALT CONCRETE OVERLAY OF ASPHALT CONCRETE PAVEMENT
- 6B. PLANNED ASPHALT CONCRETE OVERLAY OF ASPHALT CONCRETE PAVEMENT
- 7A. EXISTING ASPHALTIC CONCRETE OVERLAY OF PORTLAND CEMENT CONCRETE PAVEMENT
- 7B. PLANNED ASPHALTIC CONCRETE OVERLAY OF PORTLAND CEMENT CONCRETE PAVEMENT
8. PROJECT DELETED (BONDED PCC OVERLAY OF PCC PAVEMENT)
9. UNBONDED PORTLAND CEMENT CONCRETE OVERLAY OF PORTLAND CEMENT CONCRETE PAVEMENT

MISSOURI SUBMITTED 69 CANDIDATE PROJECTS BASED ON TYPE OF SOIL (COARSE OR FINE SUBGRADE), TYPE OF DESIGN OR REHABILITATION, TRAFFIC, (ADT 2500 OR GREATER), LENGTH (MINIMUM OF 1500 FEET WITH NO STEEP GRADES OR CURVES, NO CULVERTS OR DRAINS), DESIGN THICKNESS, NO ADDED LANES, AND ORIGINAL DATE OF CONSTRUCTION (1965 OR LATER FOR RIGID PAVEMENT AND 1970 FOR FLEXIBLE PAVEMENTS OR REHABILITATED PAVEMENTS). IN ADDITION, THE PROJECTS WERE SELECTED GEOGRAPHICALLY AND INCLUDED PROJECTS IN 44 COUNTIES. IT WAS ANTICIPATED THAT WHEN SELECTED, MISSOURI WOULD HAVE FROM 5 TO 15 PROJECTS.

SPECIFIC PAVEMENT STUDIES WILL BE PAVEMENTS TO BE BUILT OR REHABS WITH A STUDY FOR VARIOUS ITEMS SUCH AS EFFECTS OF PREVENTIVE MAINTENANCE, LOAD EQUIVALENCES FACTORS, EFFECTS OF SUBSURFACE DRAINAGE, ENVIRONMENTAL DISTRESS AND HOT OR COLD RECYCLING.

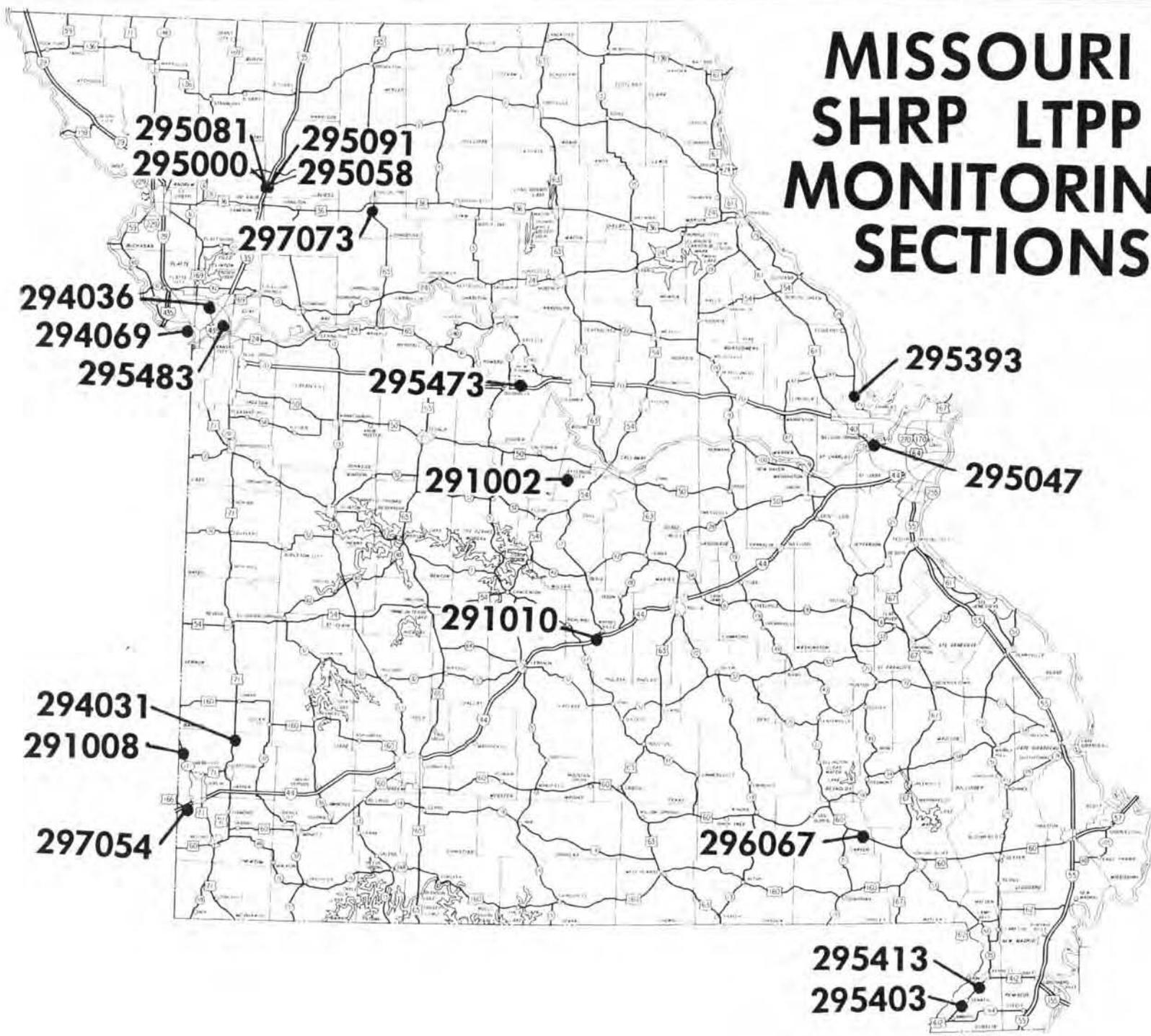
THE EIGHT (8) SPECIFIC PAVEMENT STUDIES (SPS) ARE AS FOLLOWS:

1. FLEXIBLE PAVEMENT STRUCTURAL PARAMETERS
2. RIGID PAVEMENT STRUCTURAL PARAMETERS
3. FLEXIBLE PAVEMENT PREVENTIVE MAINTENANCE TREATMENTS
4. RIGID PAVEMENT PREVENTIVE MAINTENANCE TREATMENTS
5. REHABILITATION OF ASPHALTIC CONCRETE PAVEMENTS
6. REHABILITATION OF JOINTED PORTLAND CEMENT CONCRETE PAVEMENTS

7. BONDED PORTLAND CEMENT CONCRETE OVERLAY OF PORTLAND CEMENT CONCRETE PAVEMENTS
8. ENVIRONMENTAL EFFECTS ON FLEXIBLE AND RIGID PAVEMENTS

WHAT FOLLOWS IS AN OVERVIEW OF THE 19 PROJECTS SELECTED BY SHRP FOR THE GENERAL PAVEMENT STUDY AND THE PROJECTS MISSOURI HAS ELECTED TO PARTICIPATE IN THE SPECIFIC PAVEMENT STUDY.

MISSOURI SHRP LTPP MONITORING SECTIONS

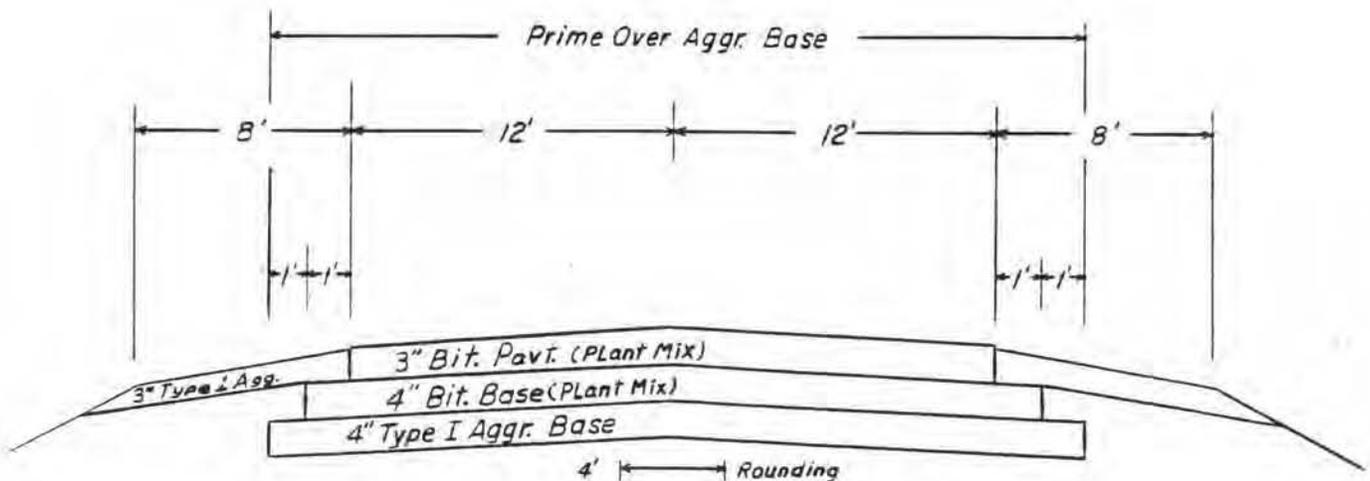
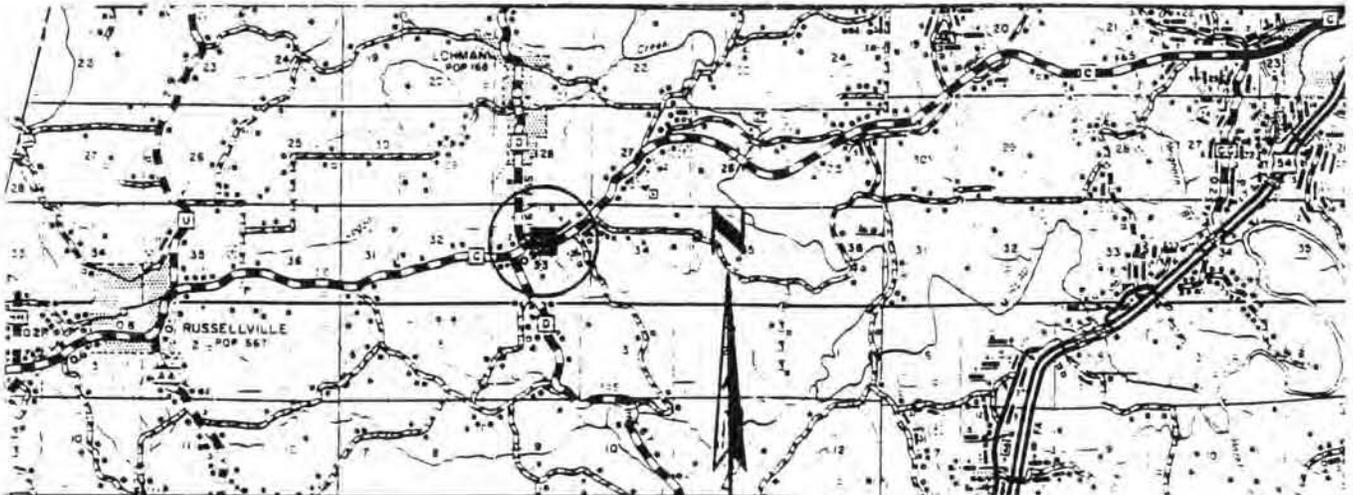


JANUARY 1, 1989

STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 291002
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-1
 Route C, Cole County

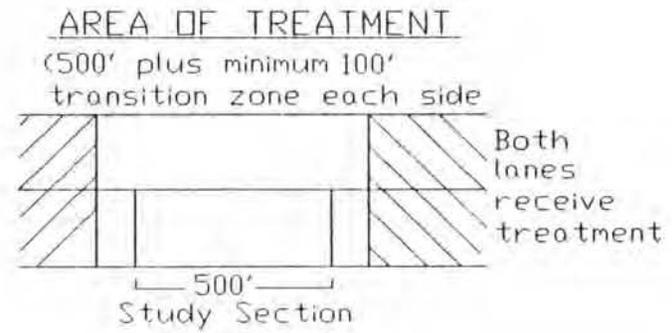
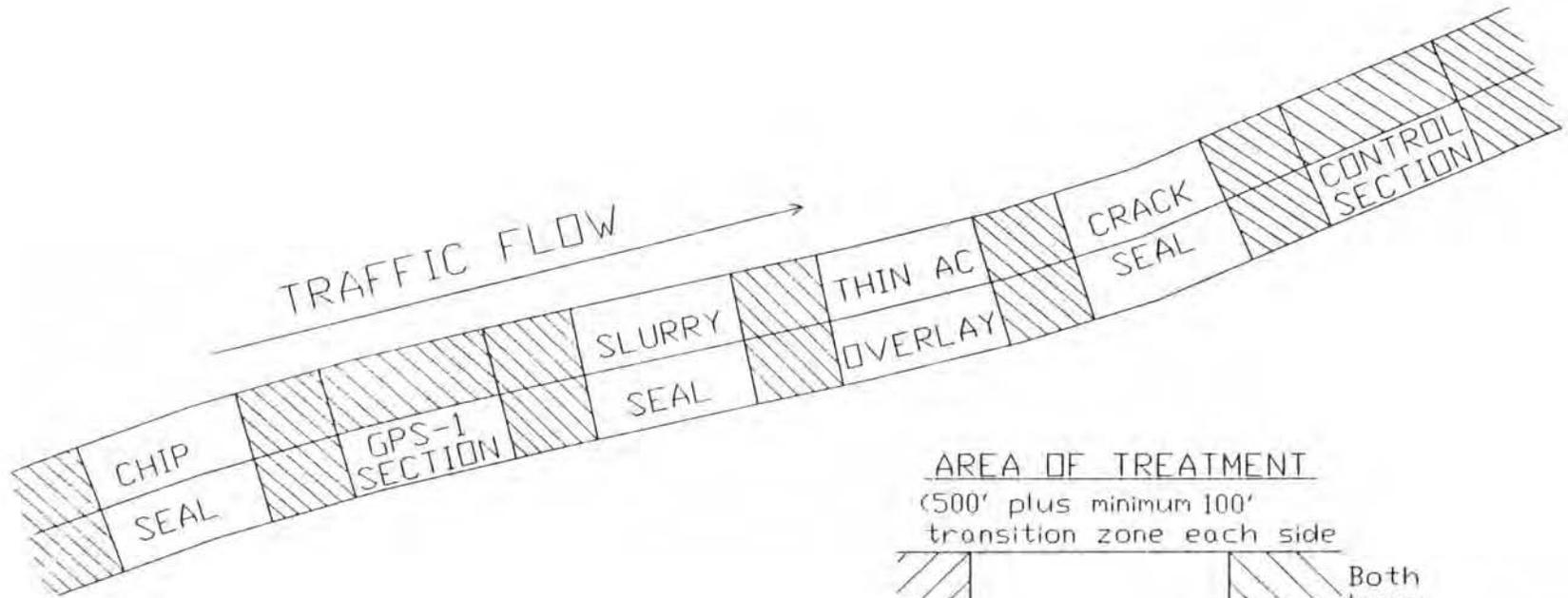
This site is located 0.3 mile east of Route D in the westbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in April 1986 under Project No. RS-RSEGC-169(2). AADT (1985) = 1960. KESALS (1985) = 19.

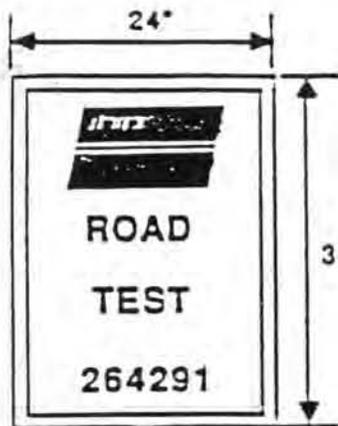
This site is approved to be included in the Specific Pavement Study No. 3 (SPS-3) which is entitled "Flexible Pavement Preventive Maintenance Treatments".



PROPOSED CONSTRUCTION LAYOUT OF H-101 MAINTENANCE TREATMENTS

SPS-3: AC Maintenance Effectiveness

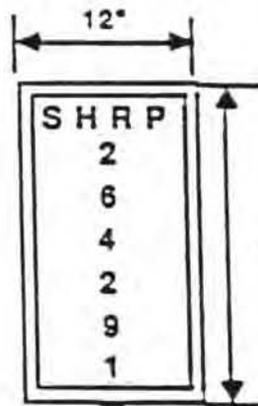




Sign A Detail

Notes:

- Blue Background
- White letters
- White Border, 1" wide
1/2" offset from edge
- Letters and numbers
4" high
- SHRP logo 6" by 9"



Sign B Detail

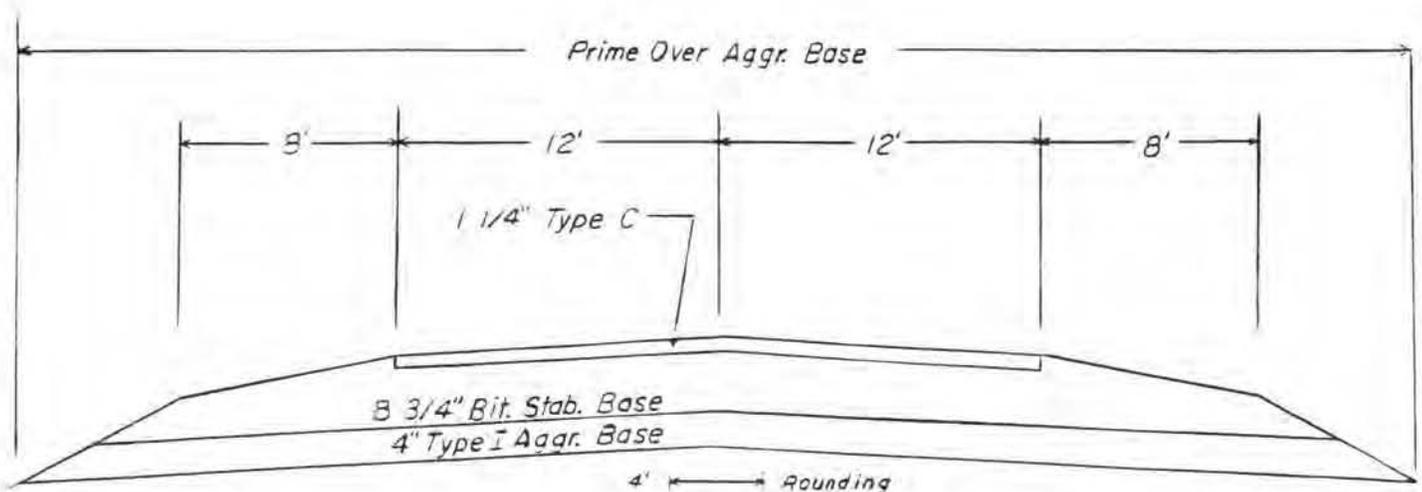
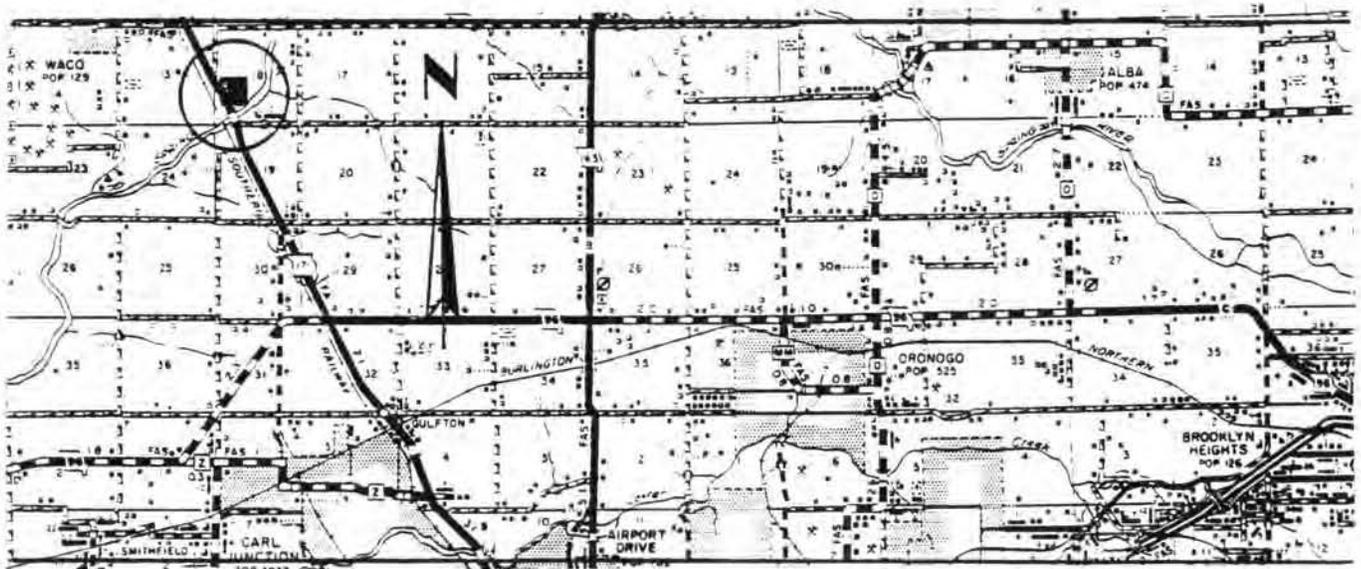
Notes:

- Blue Background
- White Letters
- White Border 1/2" wide
1/2" offset from edge
- Letters and numbers
1 1/2" high

Sign details

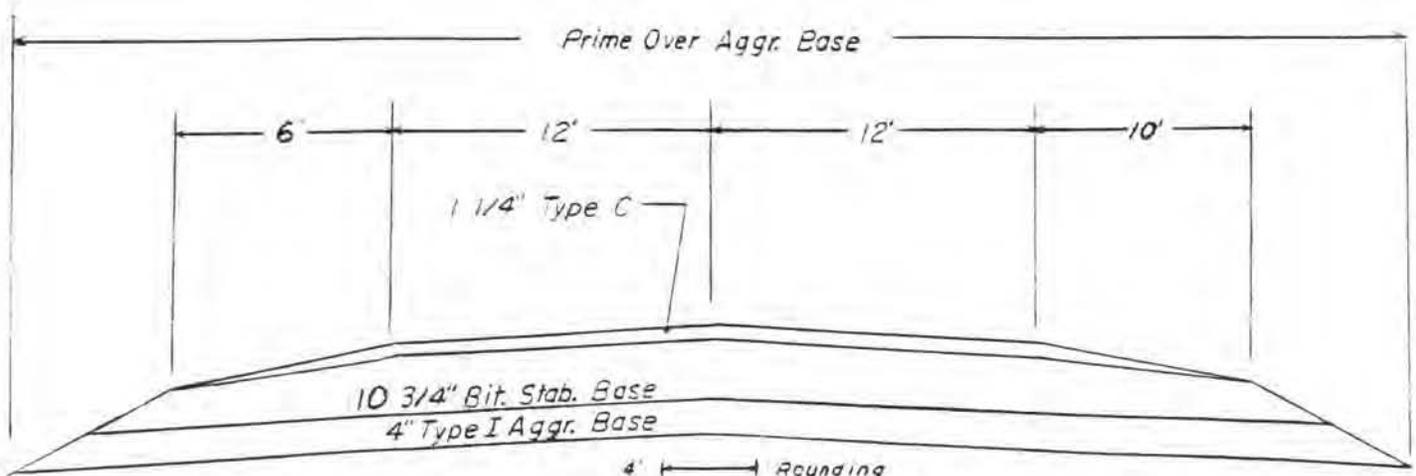
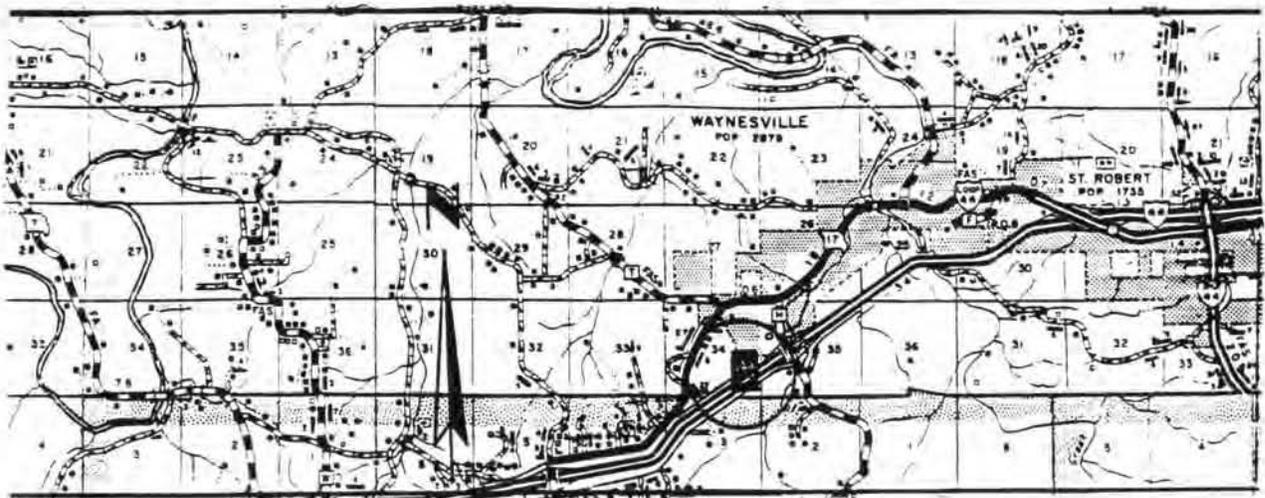
STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 291008
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-1
 Route 171, Jasper County

This site is located 0.8 mile south of Route KK in the southbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1986 under Project No. BRF-171-1(4). AADT (1985) = 3770. KESALS (1985) = 52.



STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 291010
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-1
 Route I-44, Pulaski County

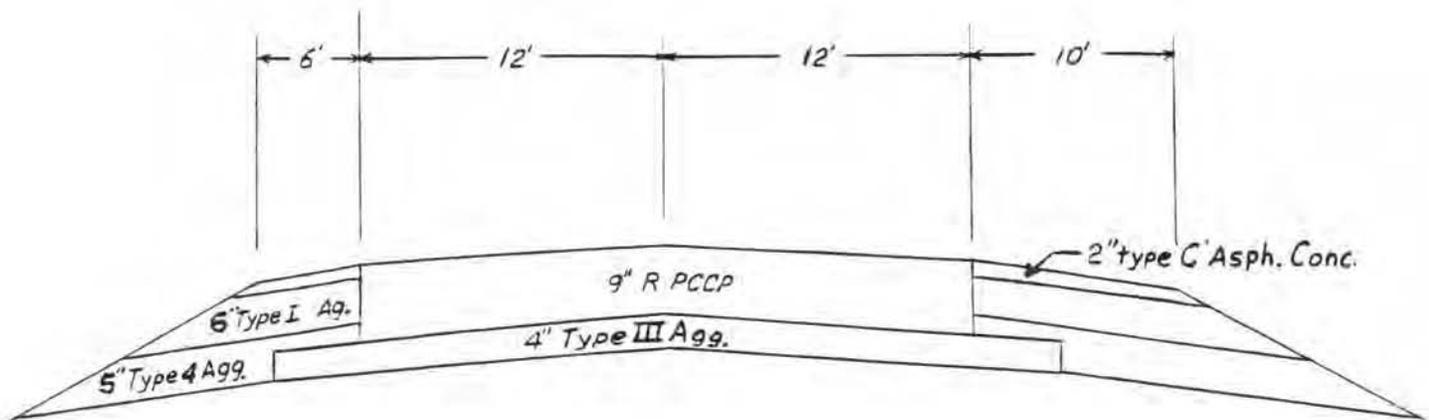
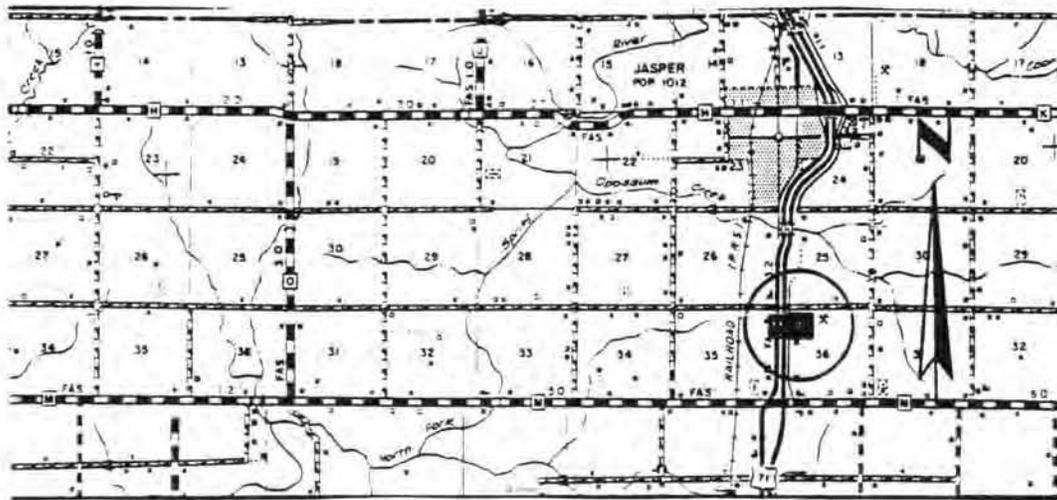
This site is located 0.3 mile west of Route H and 2.65 miles east of Route 17 in the eastbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1980 under Project No. I-44-2(84). AADT (1985) = 15432. KESALS (1985) = 319.



STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 294031
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-4
 Route 71, Jasper County

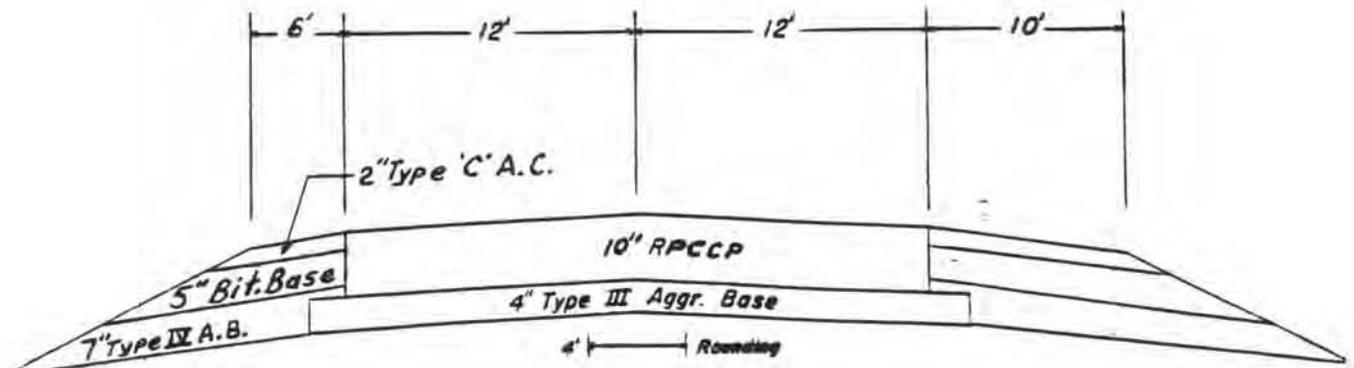
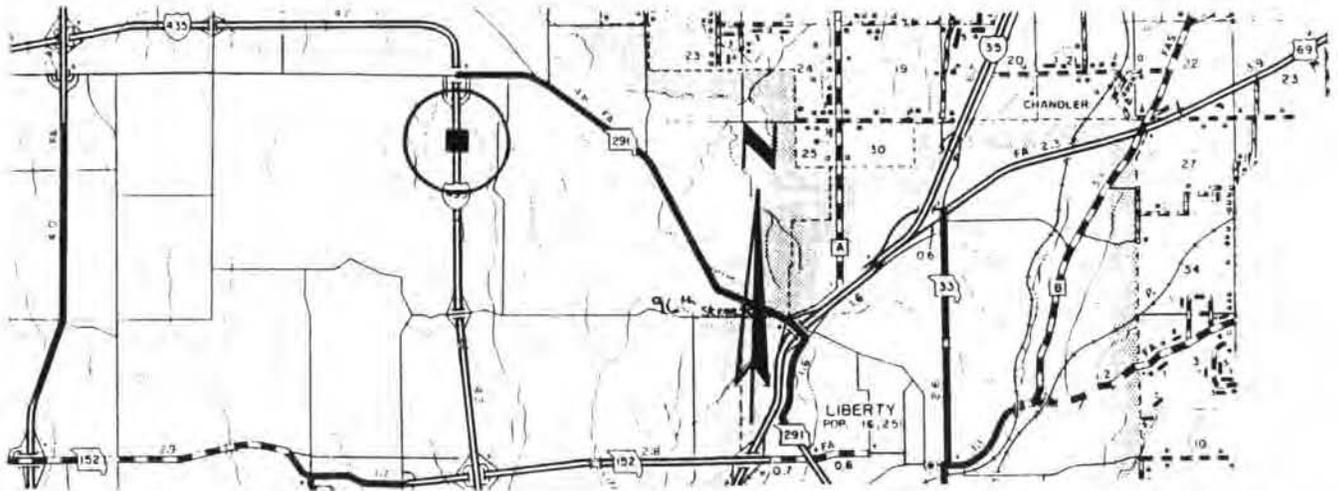
This site is located 1.0 miles south of the Opossum Creek Bridge in the northbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1983 under Project No. F-71-2(35). AADT (1985) = 8023. KESALS (1985) = 327.

This site is now in the northbound lane. At some time in 1990 or 1991, this section will become the southbound lane as the new northbound lane is completed.



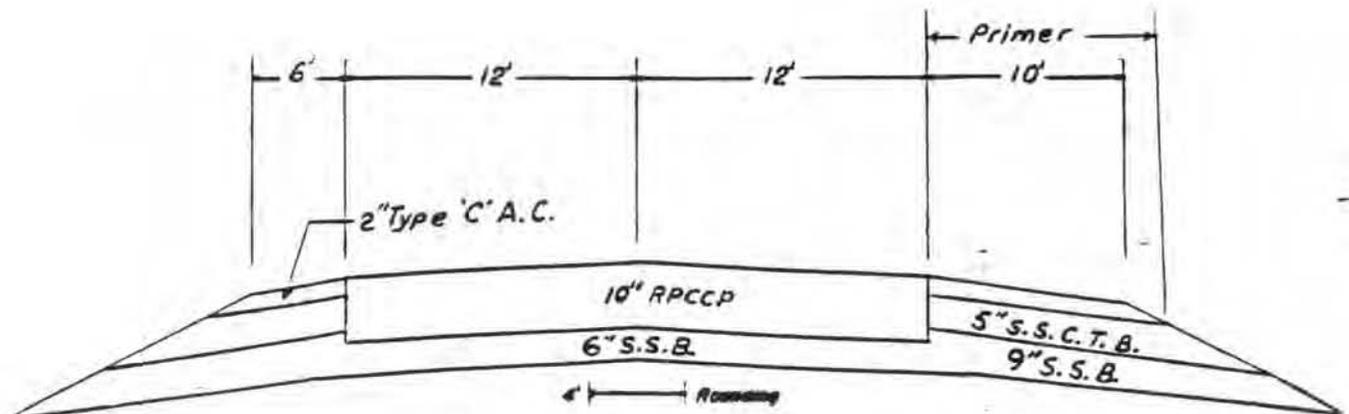
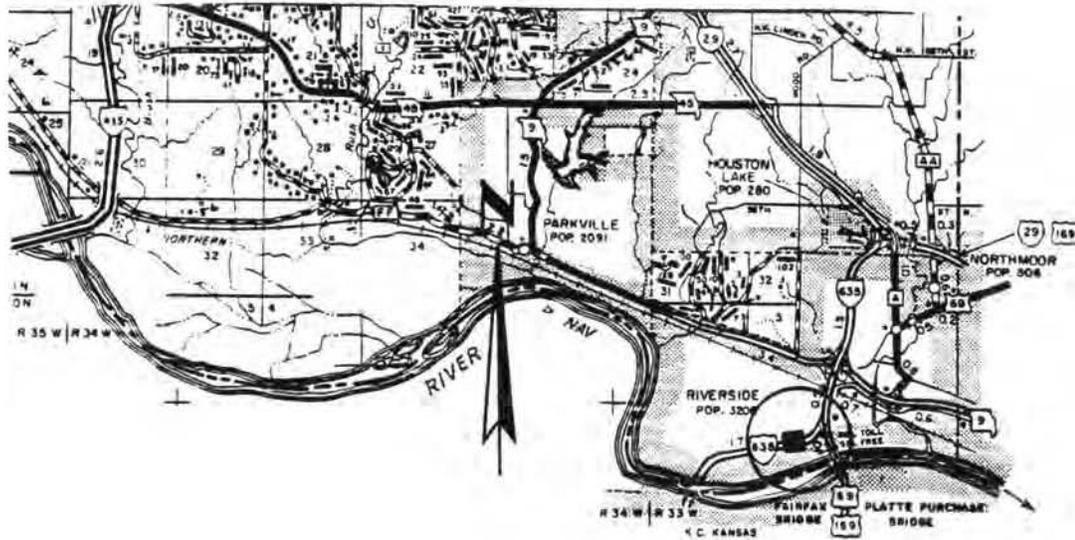
STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 294036
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-4
 Route I-435, Clay County

This site is located 0.15 mile north of 108th Street Bridge and 0.85 mile south of Route 291 in the northbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1983 under Project No. I-435-1(170). AADT (1985) = 10230. KESALS (1985) = 148.



STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 294069
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-4
 Route I-635, Platte County

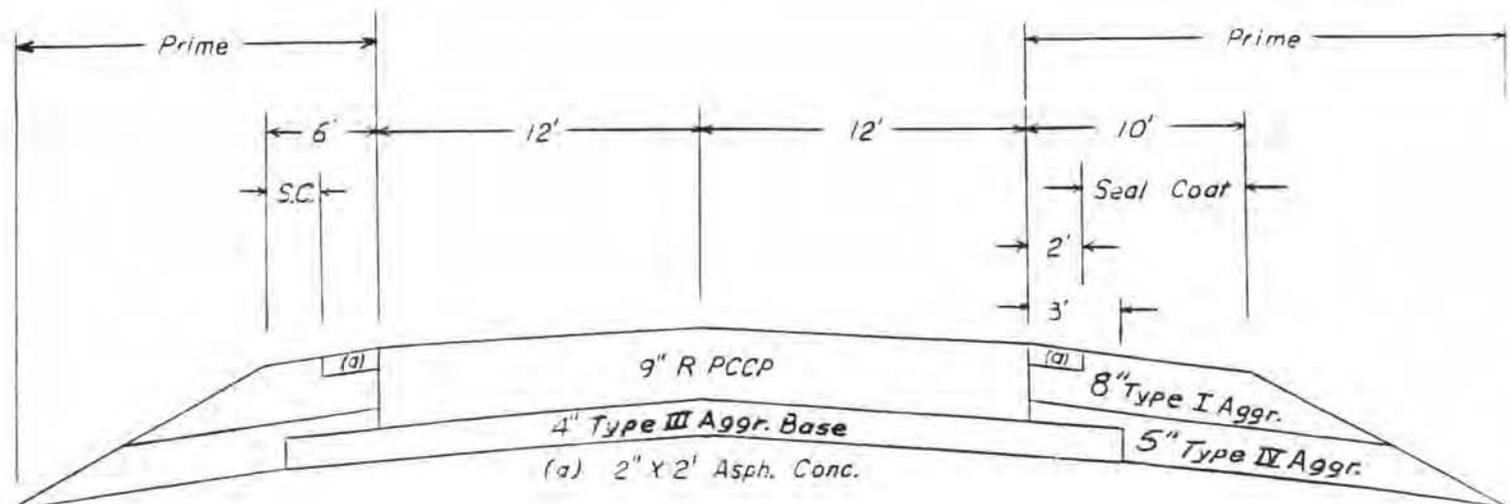
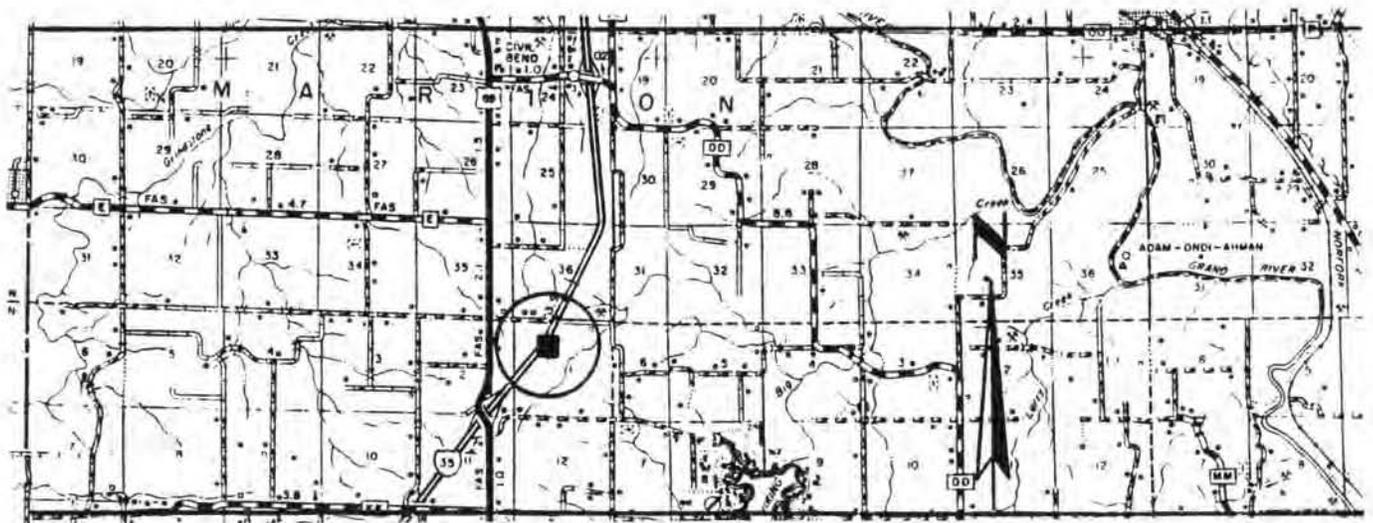
This site is located 0.5 mile south of Route 169 South Junction and 0.4 mile north of Missouri River Bridge in the southbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1974 under Project No. I-635-1(98)5. AADT (1985) = 35100. KESALS (1985) = 447.



STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 295000
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-4
 Route I-35, Daviess County

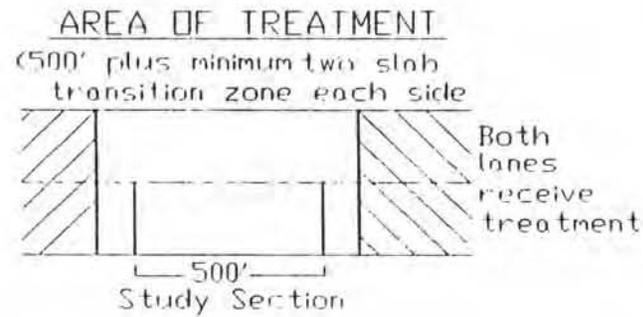
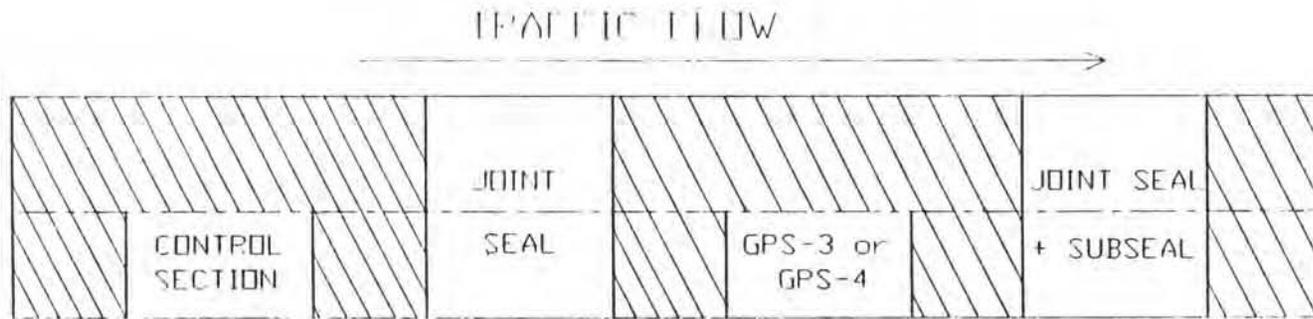
This site is located 0.9 mile north of Route 69 in the northbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1977 under Project No. I-35-2(35)68. AADT (1985) = 8380. KESALS (1985) = 355.

This site is approved to be included in the Specific Study No. 4 (SPS-4) which is entitled "Rigid Pavement Preventive Maintenance Treatments".



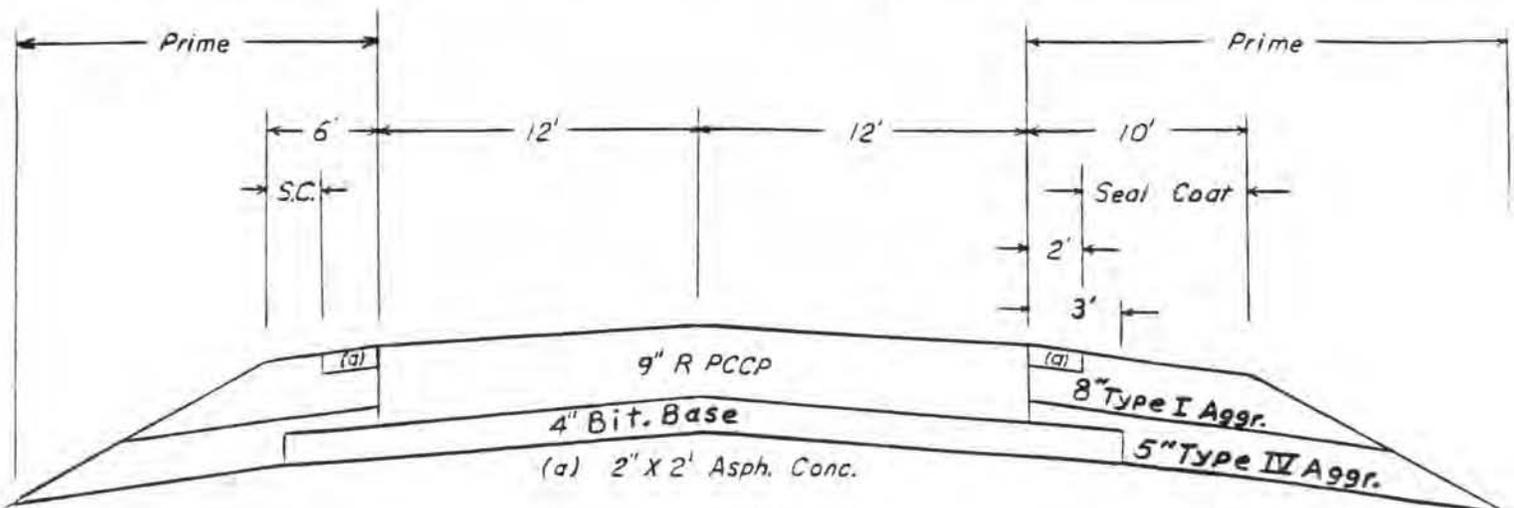
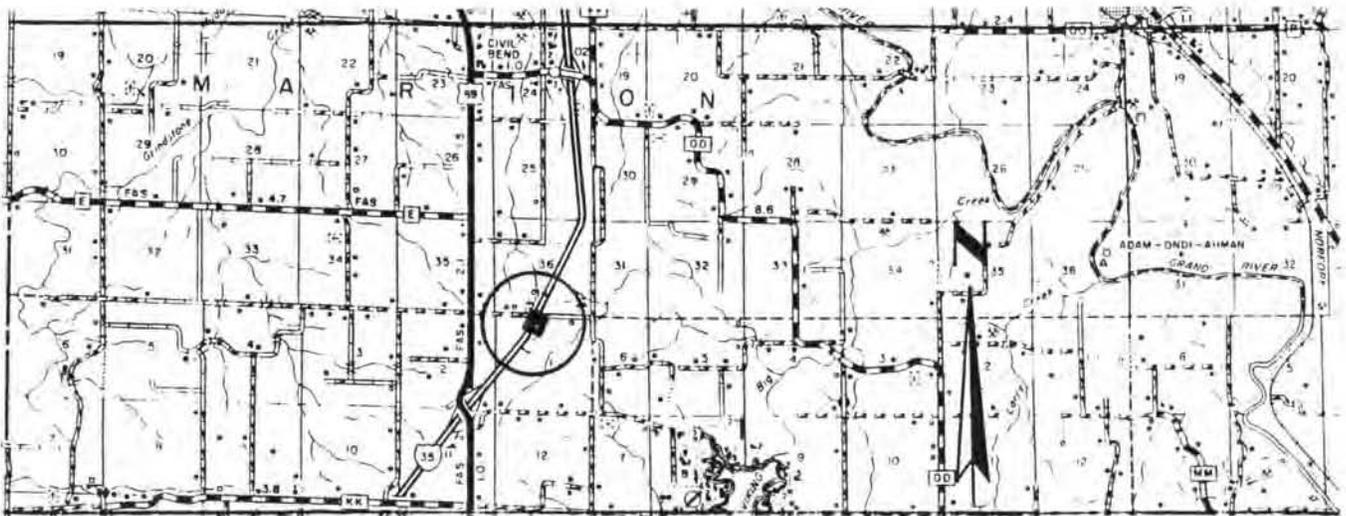
PROPOSED CONSTRUCTION LAYOUT OF H-101 MAINTENANCE TREATMENTS

SPS-4: JCF Maintenance Effectiveness



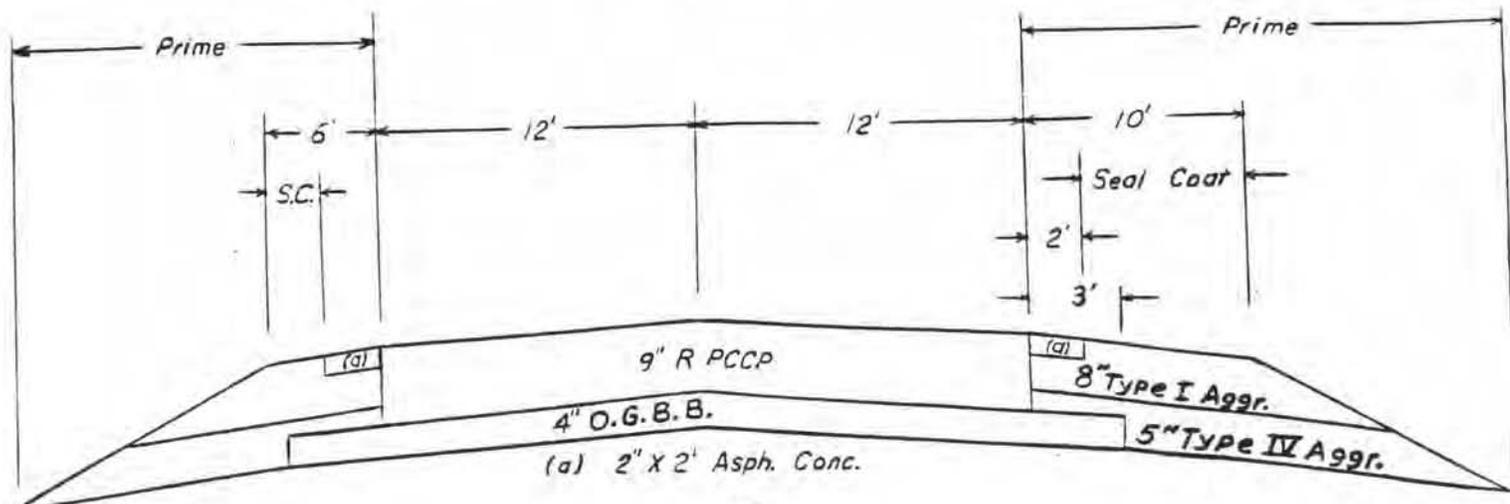
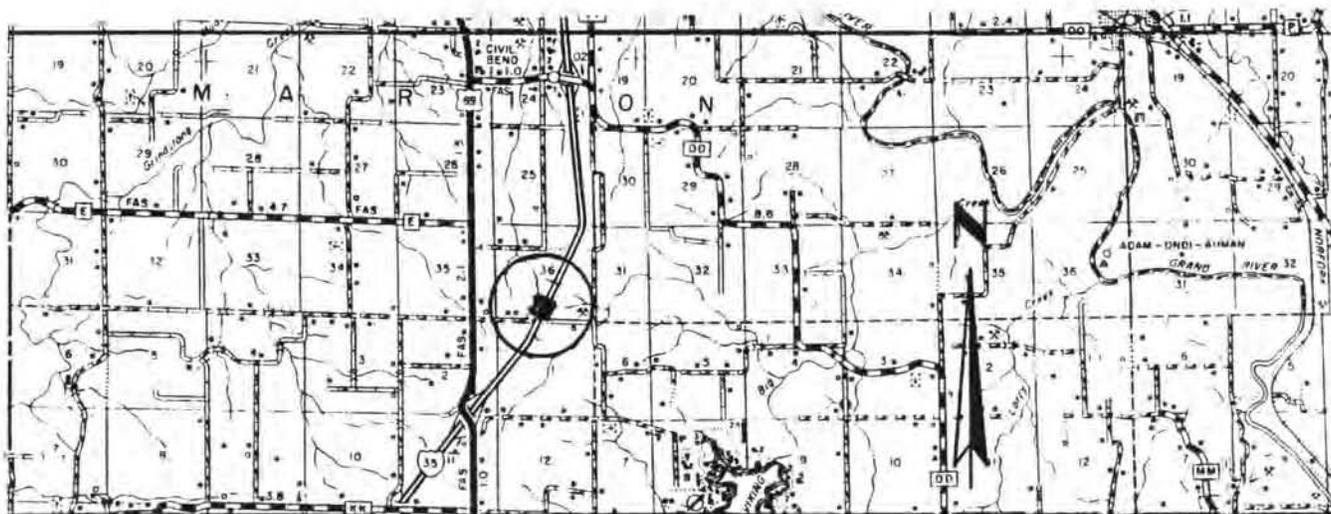
STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 295058
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-4
 Route I-35, Daviess County

This site is located 1.1 miles north of Route 69 in the northbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1977 under Project No. I-35-2(35)68. AADT (1985) = 8380. KESALS (1985) = 355.



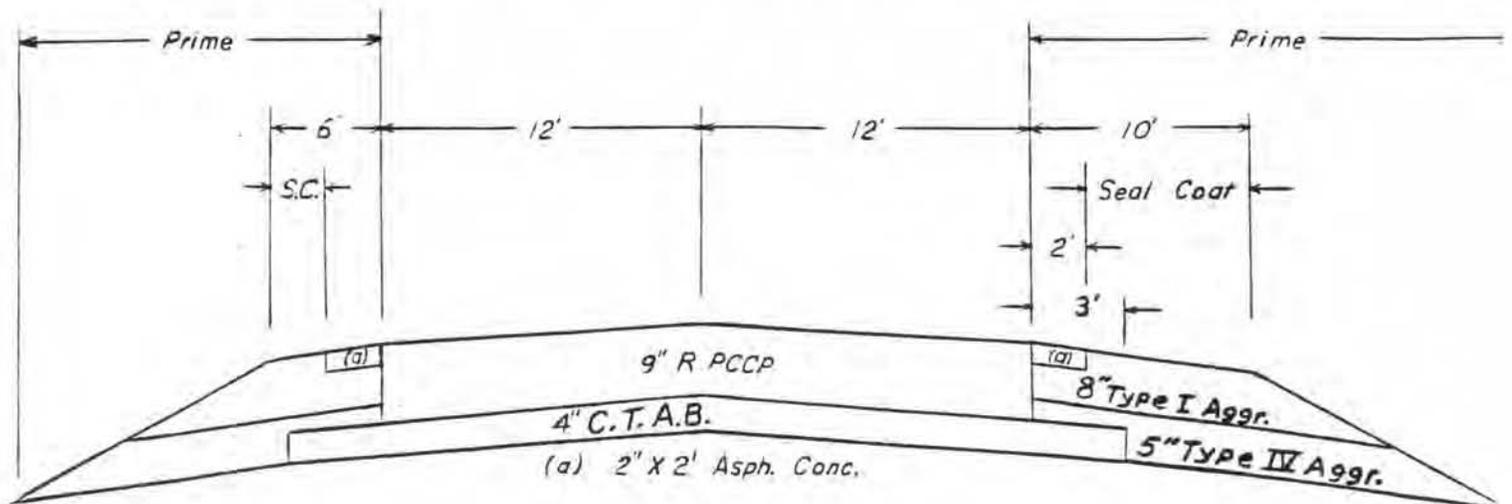
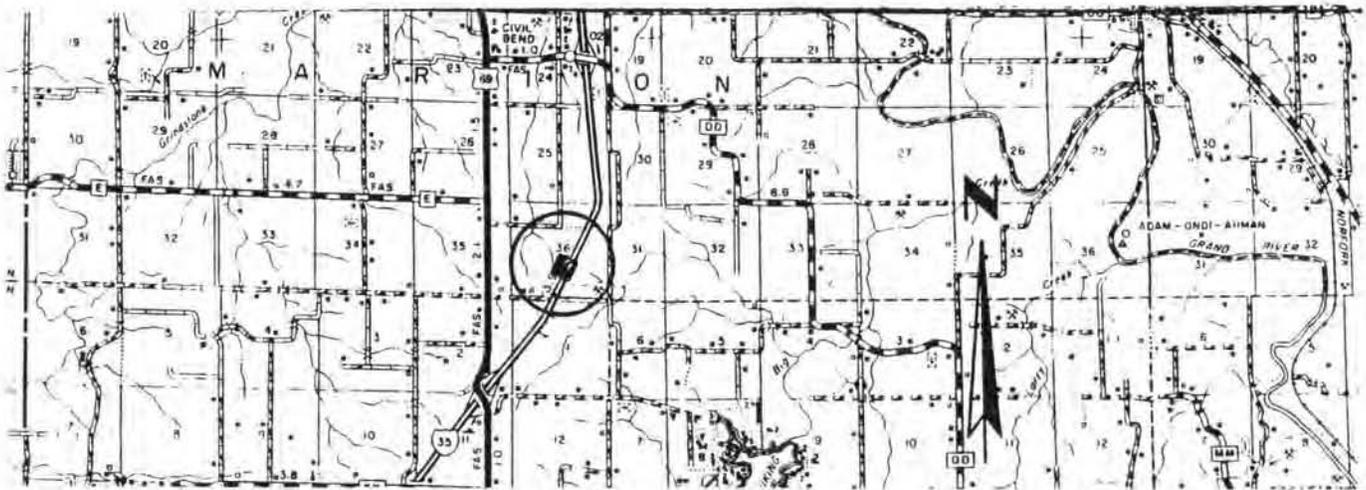
STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 295081
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-4
 Route I-35, Daviess County

This site is located 1.3 miles north of Route 67 in the northbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1977 under Project No. I-35-2(35)68. AADT (1985) = 8380. KESALS (1985) = 355.



STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 295091
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-4
 Route I-35, Daviess County

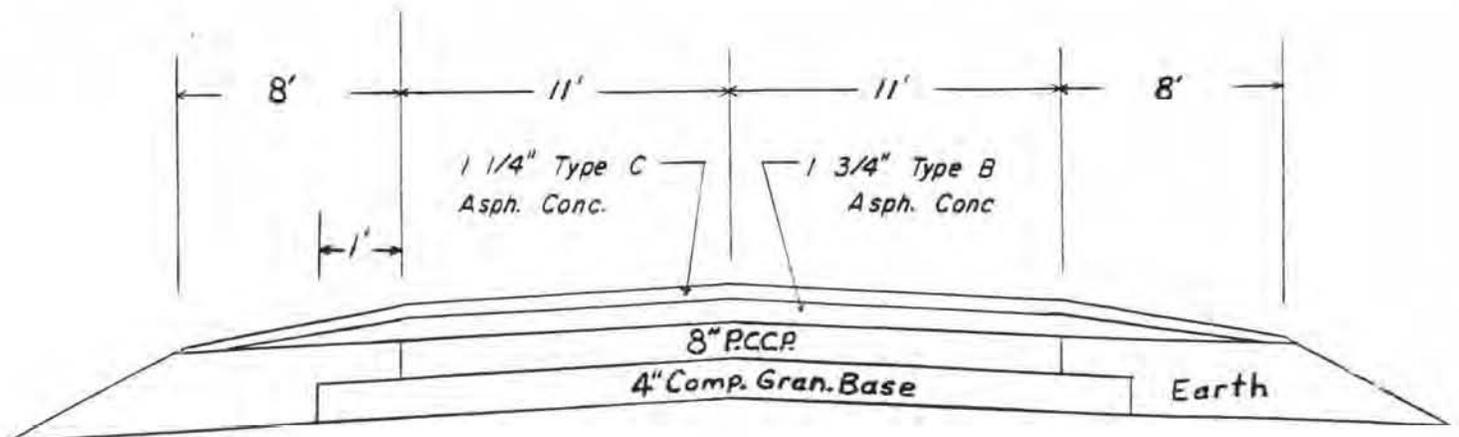
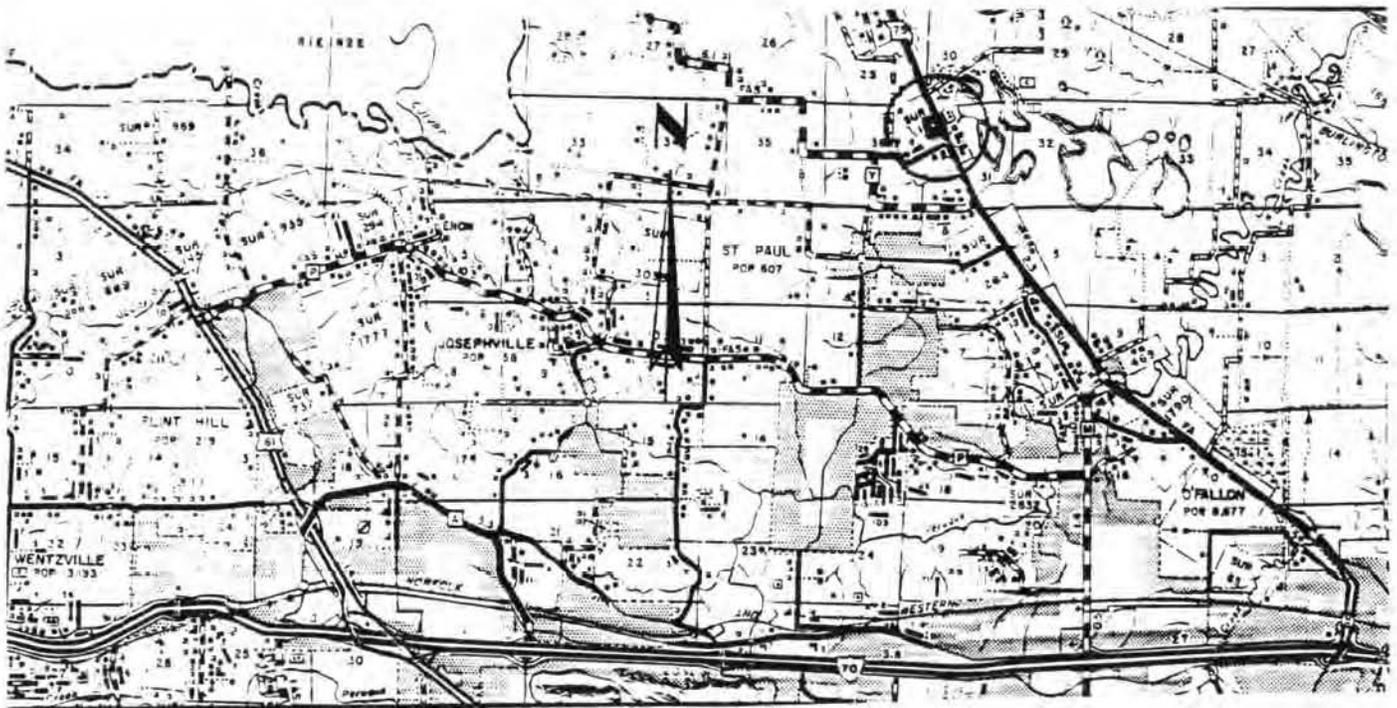
This site is located 1.5 miles north of Route 69 in the northbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1977 under Project No. I-35-2(35)68. AADT (1985) = 8380. KESALS (1985) = 355.



STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 295393
Long Term Pavement Performance Studies (LTPP)
General Pavement Studies (GPS)
GPS-7B
Route 79, St. Charles County

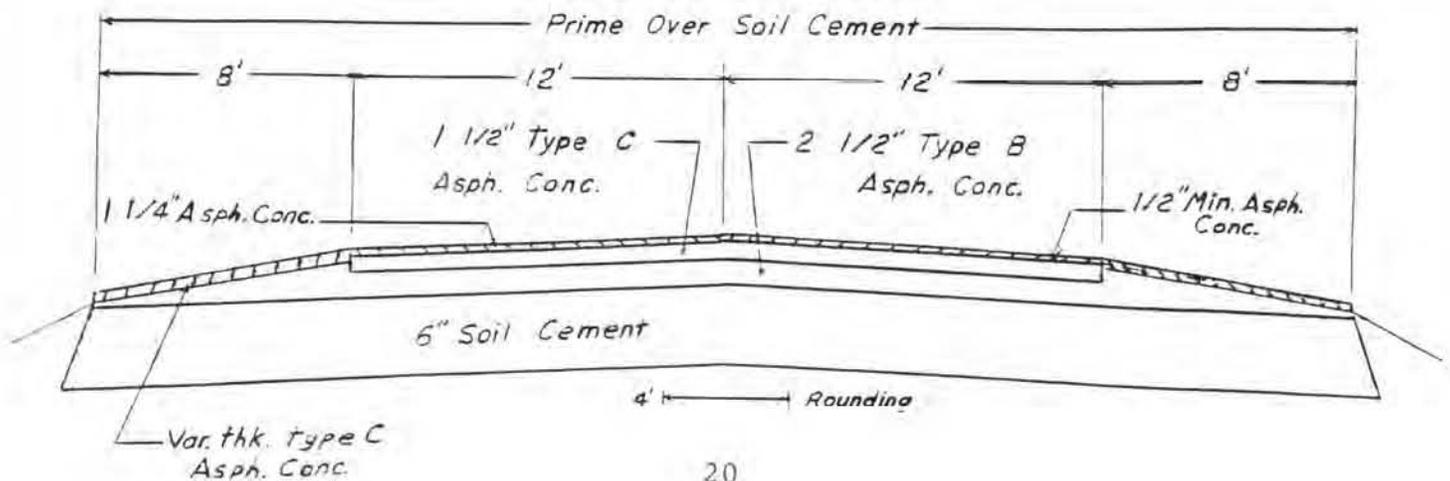
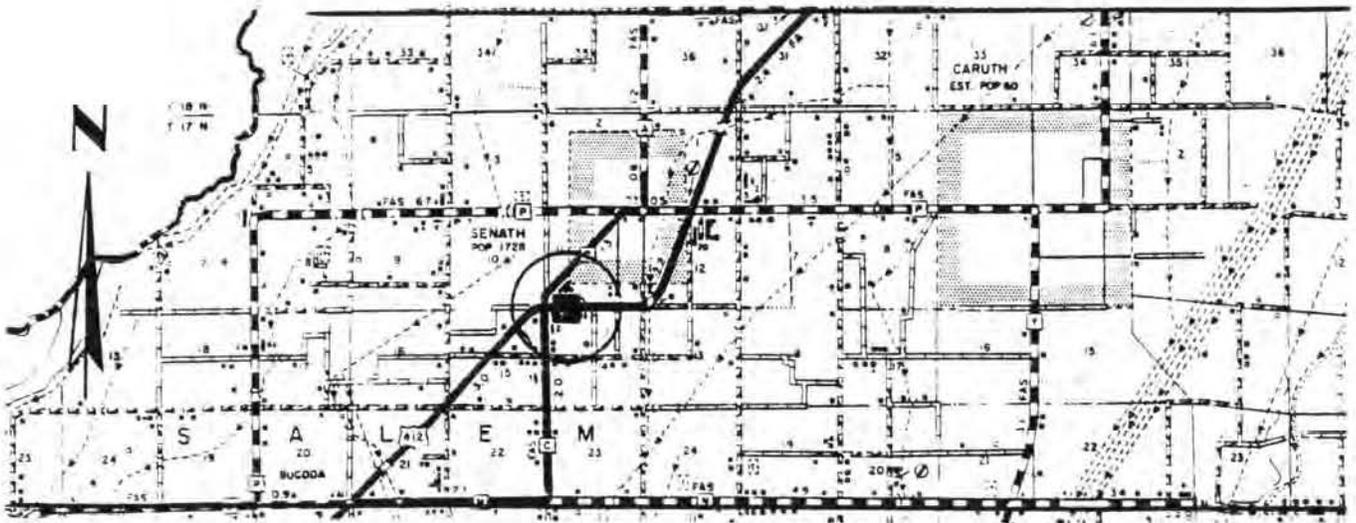
This site is located 0.1 mile north of Route Y in the northbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1957 under Project No. 79-F-299(5). AADT (1987) = 8500. KESALS (1987) = 50.

This site is to be rehabilitated by Project No. 6-P-884 in 1990.



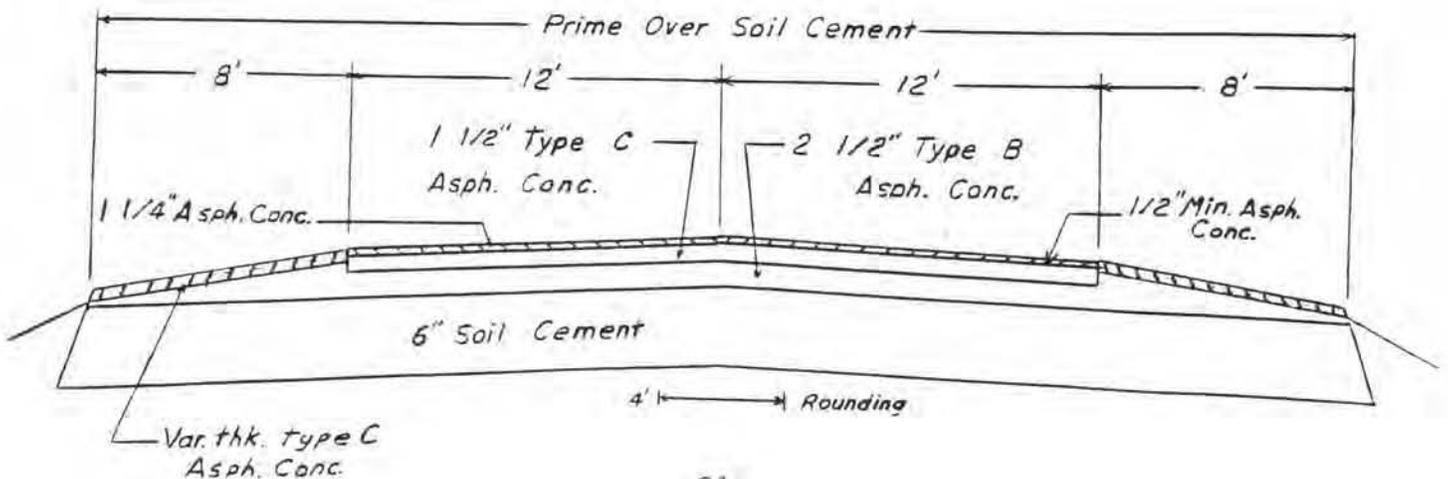
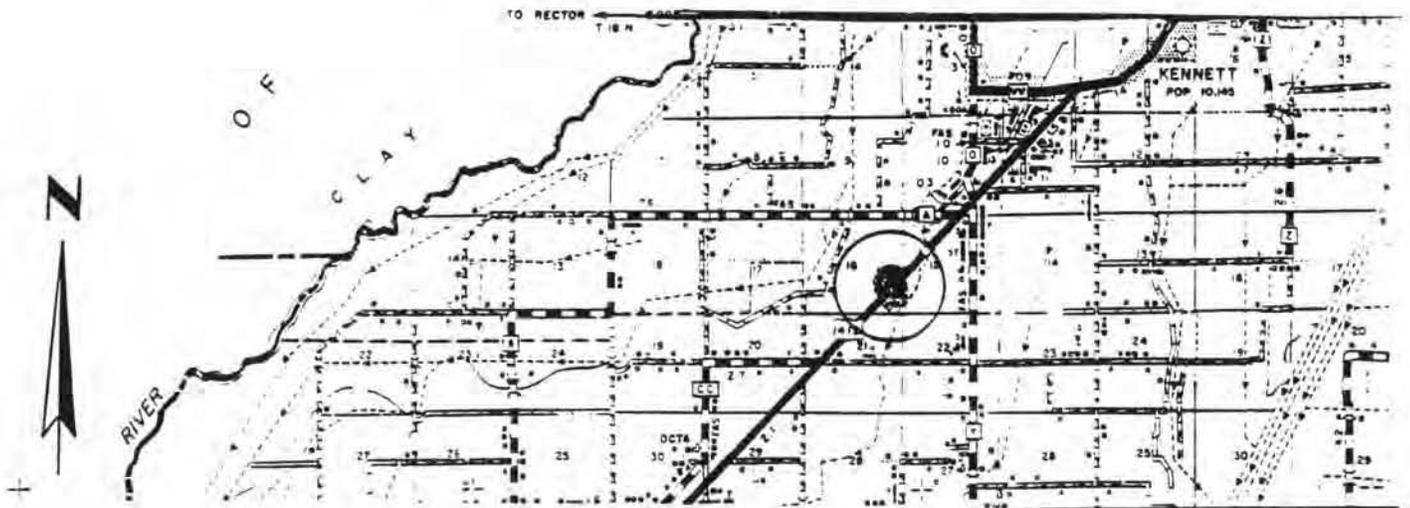
STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 295403
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-6B
 Route 412, Dunklin County

This site is located 0.2 mile north of Route C in the northbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1967 under Project No. CO35-25(4). This site was rehabilitated by Project No. F-25-1(24) in 1989. AADT (1985) = 3100. KESALS (1985) = 90.



STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 295413
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-6B
 Route 412, Dunklin County

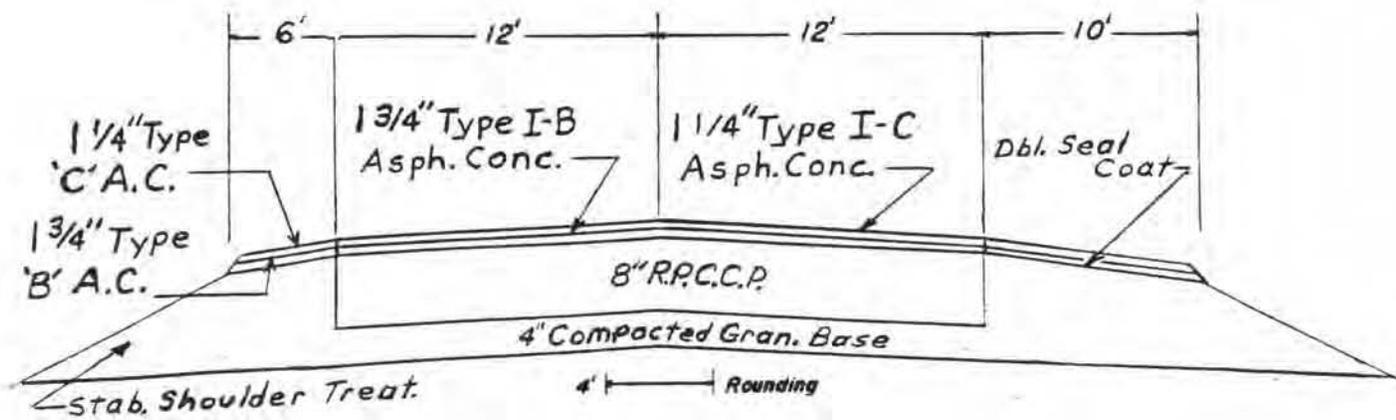
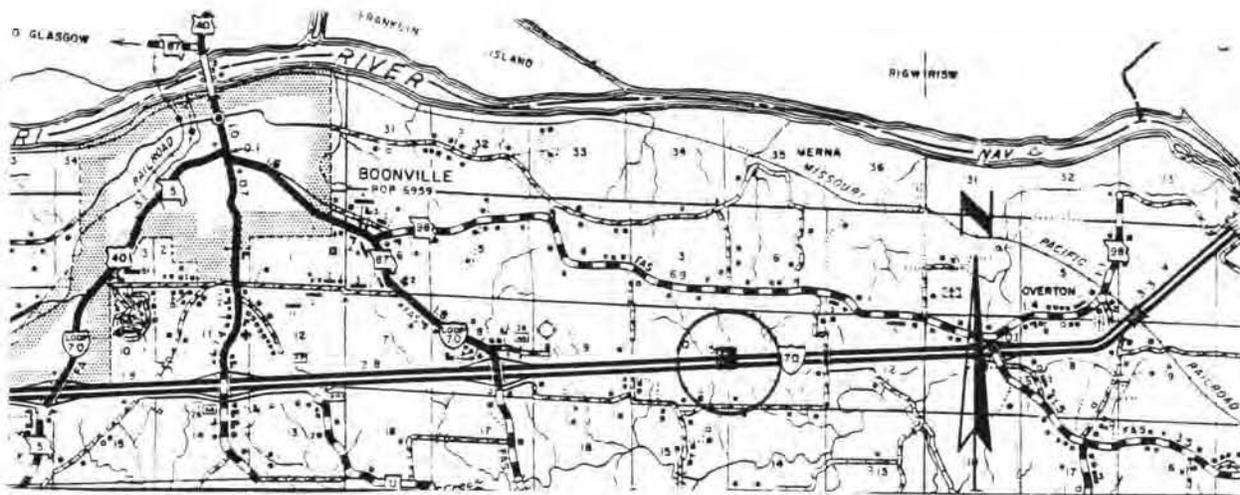
This site is located 1.05 miles north of Route CC in the northbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1965 under Project No. F-25-1(5). This site was rehabilitated by Project No. F-25-1(23), Sec. B, in 1989. AADT (1987) = 5200. KESALS (1987) = 125.



STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 295473
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-7B
 Route I-70, Cooper County

This site is located 2.2 miles east of Route 87 in the westbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1960 under Project No. I-IG-70-3(25)105. AADT (1987) = 9200. KESALS (1987) = 400.

This site is being rehabilitated by Project No. IR-70-3(140). Project was started in 1989 and will be finished in 1990. Samples by SHRP contractor taken after Type I-B mixture was placed.



STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 295483
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-7B
 Route 210, Clay County

This site is located 3.6 miles east of end of divided pavement in the eastbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1973 under Project No. 4-U-902. AADT (1987) = 8700. KESALS (1987) = 205.

This site is tentatively approved to be included in the Specific Study No. 6 (SPS-6) which is entitled "Rehabilitation of Jointed Portland Cement Concrete Pavement".

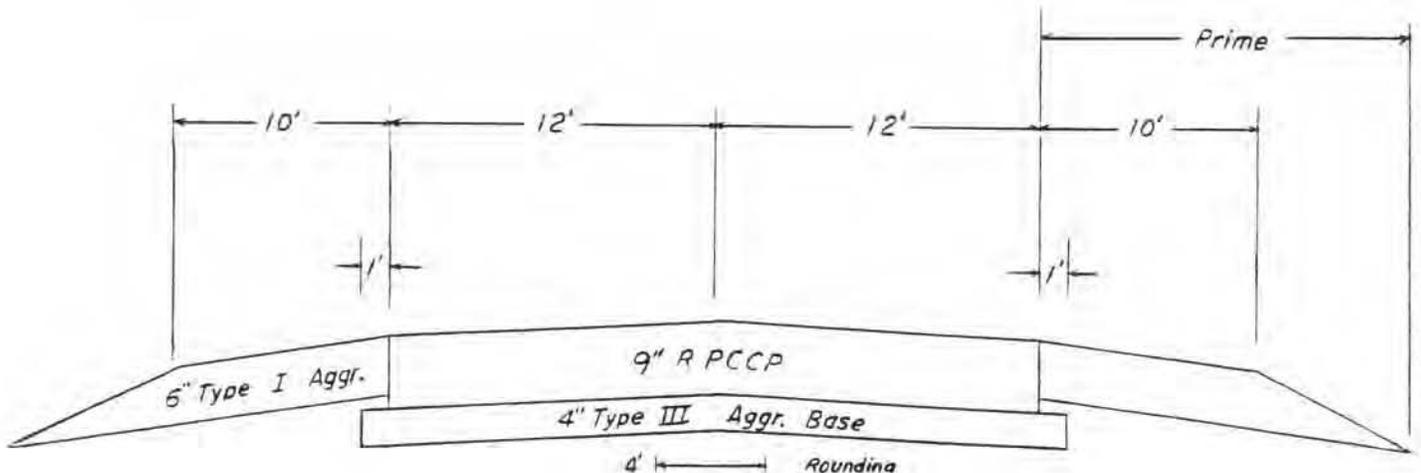
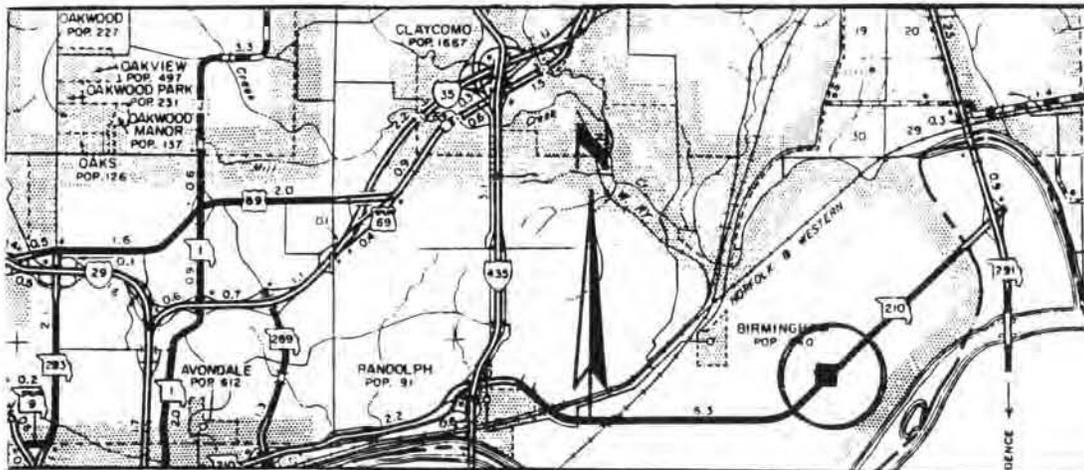
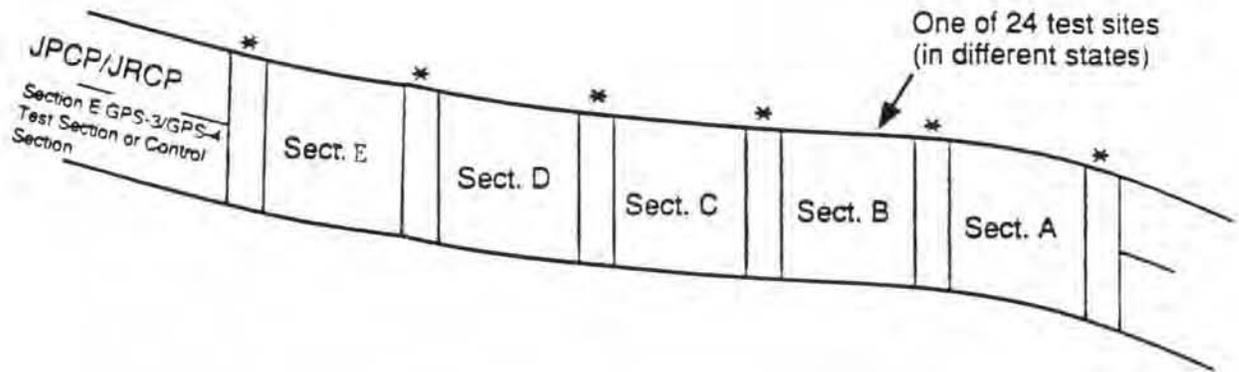


Figure 1. Illustrative test section layout for SPS-6:
JCP restoration and AC overlay.

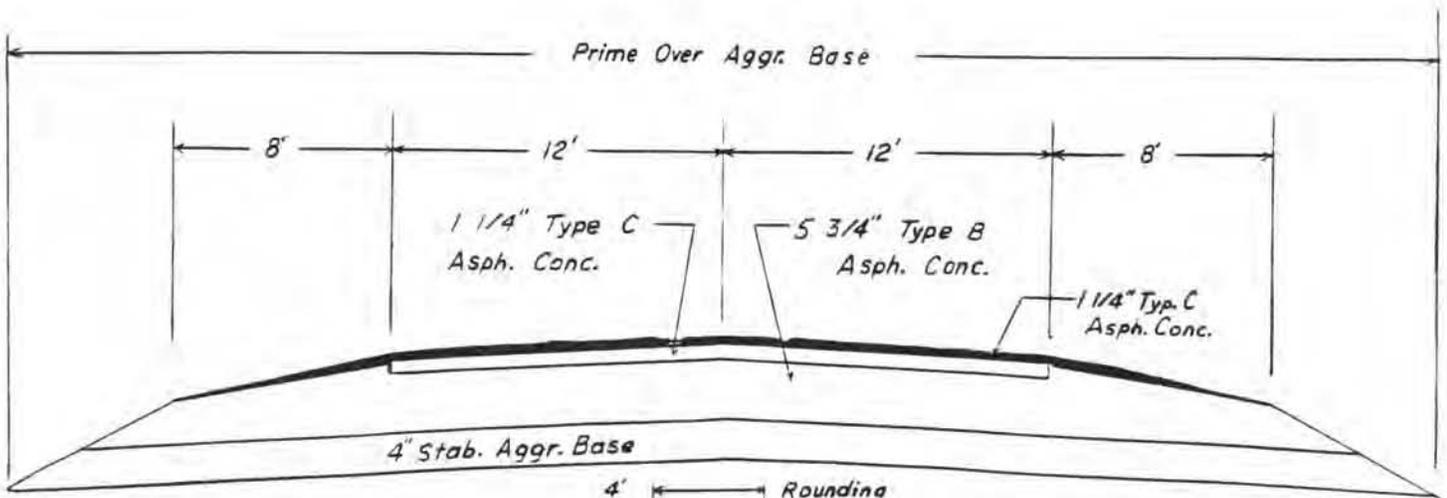
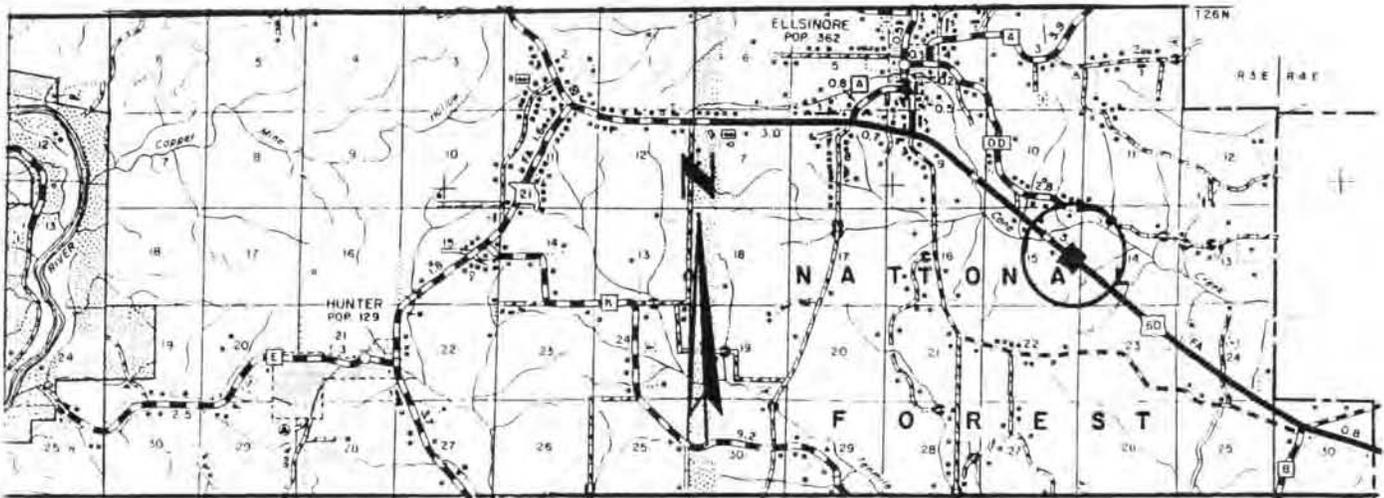


SPS-6	Rehabilitation Treatment
A	Maximum restoration warranted by pavement condition plus 4" AC overlay
B	Maximum restoration - no overlay
C	Minimum restoration indicated by pavement condition plus 4" AC overlay
D	Crack and seat plus 4" AC overlay
E	Crack and seat plus 6" AC overlay
F	Control section - no restoration or overlay (may be GPS-3 or GPS-4 test section)

* These transitions may be of different lengths, but not less than 100 feet long.

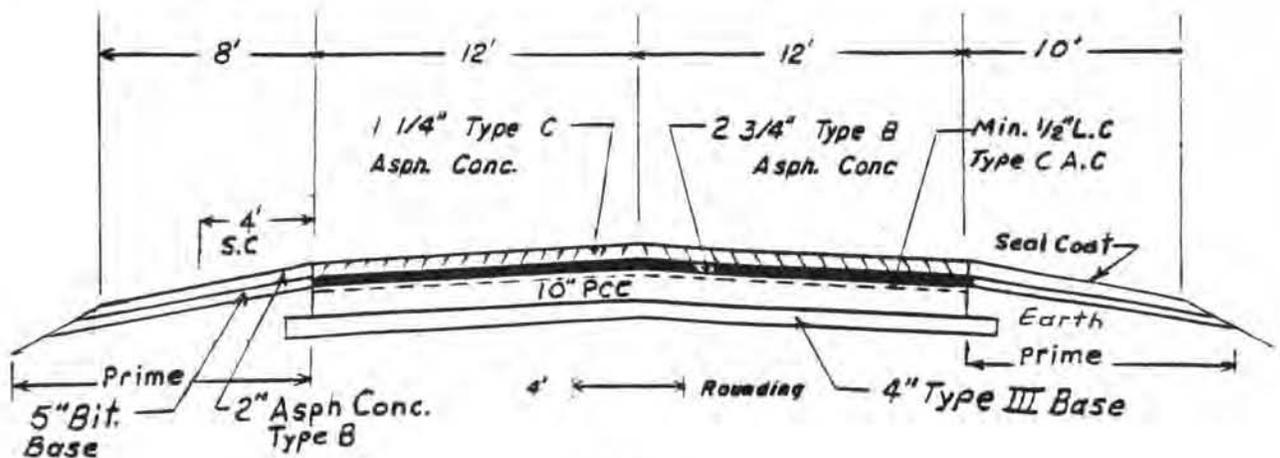
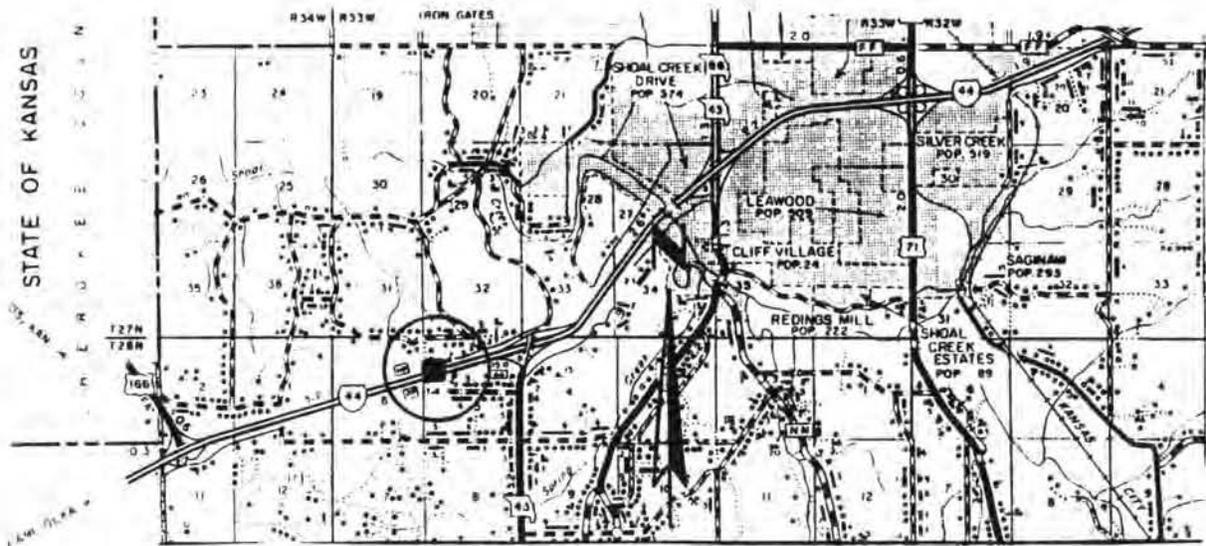
STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 296067
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-6A
 Route 60, Carter County

This site is located 2.92 miles west of Route B in the eastbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1965 under Project No. Sec 18(2). Overlaid in 1981 under Project No. I-PMS-60-3(40). AADT (1985) = 2840. KESALS (1985) = 55.



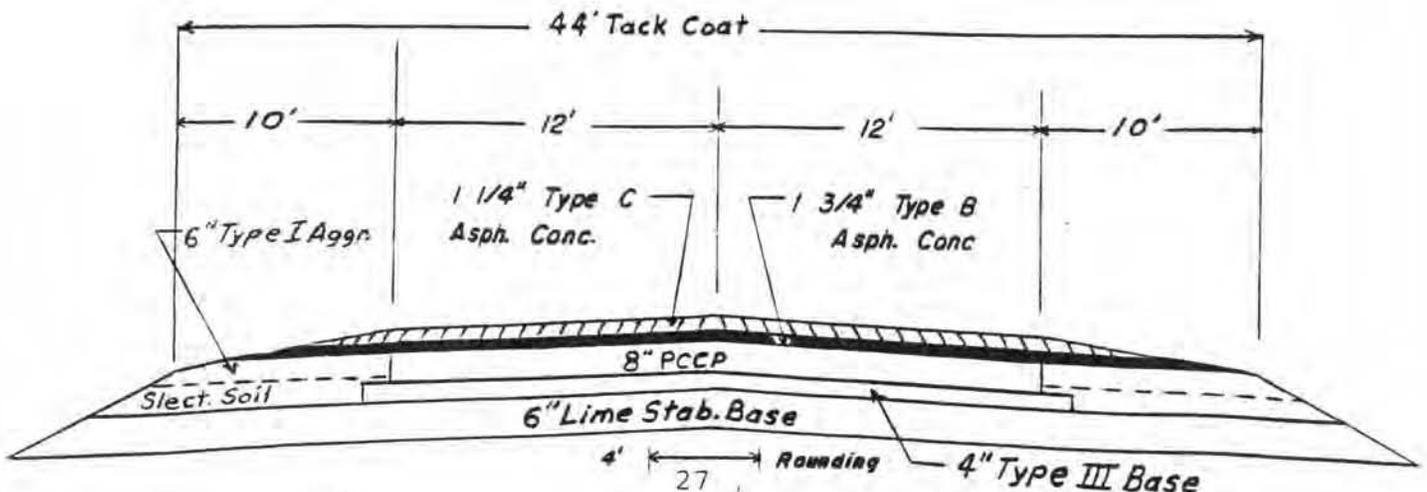
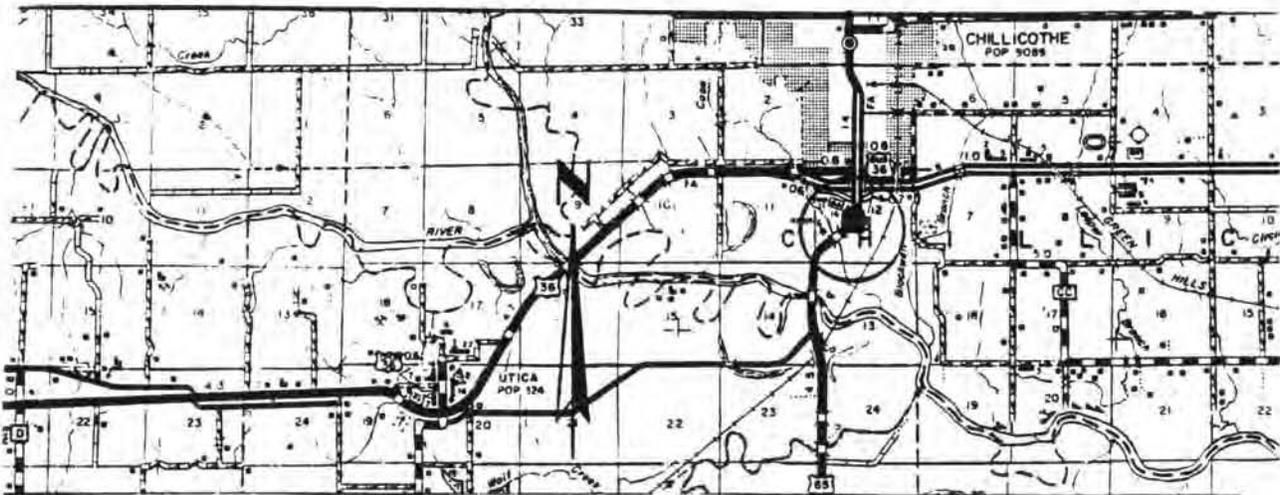
STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 297054
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-7A
 Route I-44, Newton County

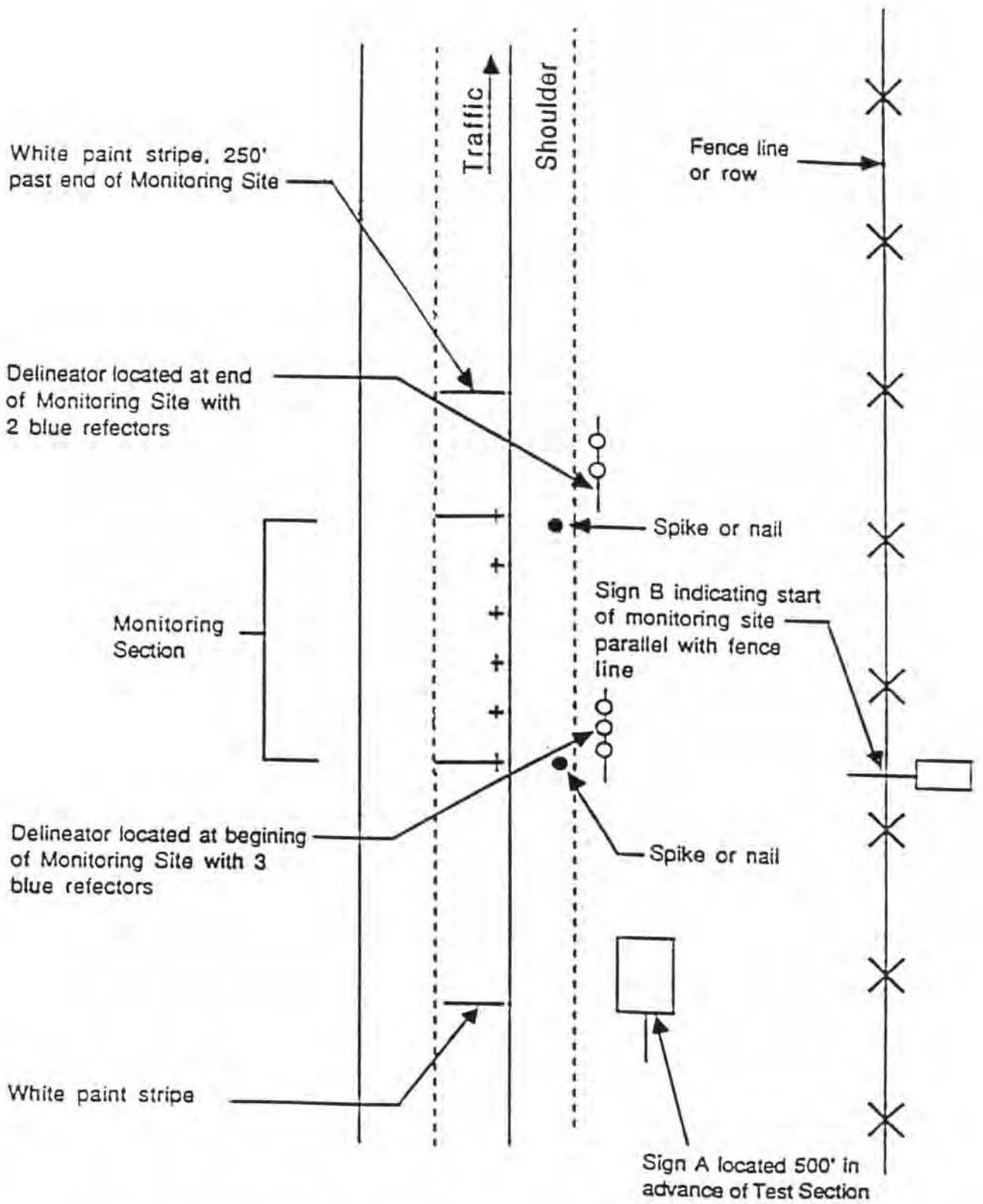
This site is located 0.25 mile west of weight station and 0.45 mile east of rest area exit in eastbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1957 under Project No. IN-FI-432(3). Overlaid in 1972 under Project No. I-FI-44-1(36). AADT (1985) = 11900. KESALS (1985) = 336.



STRATEGIC HIGHWAY RESEARCH PROGRAM
SHRP IDENT. NO. 297073
 Long Term Pavement Performance Studies (LTPP)
 General Pavement Studies (GPS)
 GPS-7A
 Route 65, Livingston County

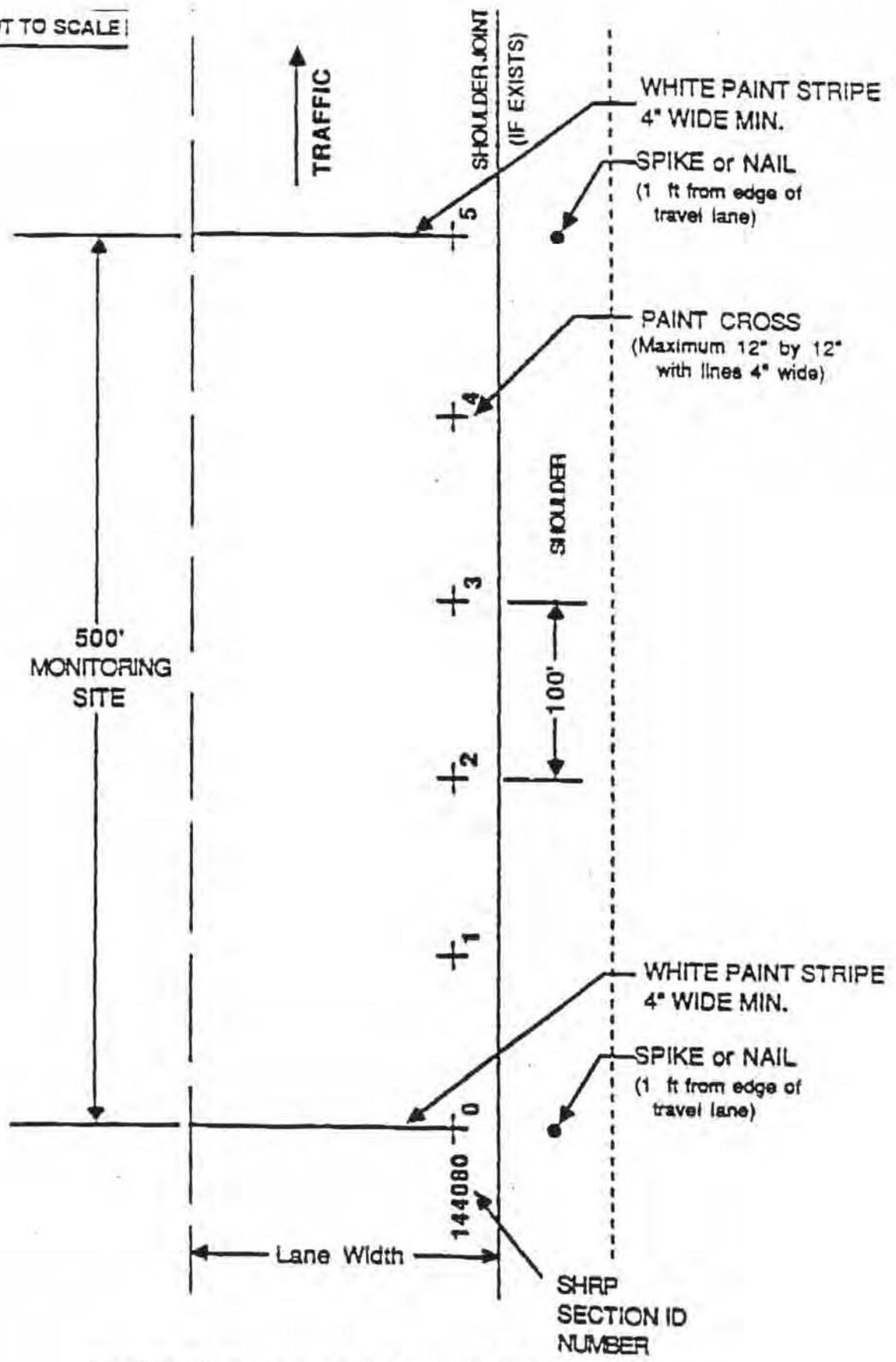
This site is located 0.5 mile south of Route 36 in the southbound lane. A blue sign with the SHRP Logo and the SHRP ID No., facing traffic, is used to locate the sites. A solid white line traverses the pavement with the SHRP ID NO. on the edge of pavement at the beginning of the 500' control section. The pavement was constructed in 1965 under Project No. Sec. 59(2). Overlaid in 1981 under Project No. FR-PMS-65-4(17). AADT (1986) = 3120. KESALS (1986) = 90.





General Layout of test section showing sign locations

NOT TO SCALE



Details of monitoring site paint configuration