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Construction Report on SHRP 510100, SPS-1 Project, Danville, VA, Summer of 1995

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16. Abstract
This report provides a description of the construction of an SPS-1 experiment, Strategic Study of Structural Factors for Flexible Pavements, conducted as part of the Long Term Pavement Performance (LTPP) program in Danville, Virginia The construction of thirteen asphalt concrete pavement test sections started in May 1995 and was completed in November 1995 The construction started with preparing the subgrade/embankment layer followed by the addition of 10% of hydraulic cement by volume to the top 150 mm of the subgrade of all the sections then adding a layer of dense graded aggregate base (DGAB) type 1 #21B material to eight of the sections Next was the preparation of edge drains to seven of the sections, three of which had geotextile fabric, followed by paving with a layer of permeable asphalt treated base (PATB) type I material Four of these sections also had asphalt treated base (ATB) type BM-3 layer with a total of eight sections having this ATB layer An intermediate binder layer type IM-1A was placed on the VDOT supplemental section while type IM-1B was placed on the other twelve sections Finally paving concluded by placing a surface course type SM-2B on all the sections This report contains a description of the unbound pavement layers preparation, the edge drains construction, the paving operations, the equipment used by the contractor, the field sampling and testing operations during and after construction, problems encountered during construction, specific site circumstances, deviations from the standard guidelines, and a summary of the initial data collection

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Table of Contents

List of Tables

List of Figures

List of Photos

Construction Report on SHRP 510100, SPS-1 Project, Danville, VA, Summer of 1995

I. Introduction

The Virginia Department of Transportation (VDOT) SPS-1 project at Danville, VA, is a study of the influence of strategic factors that affect the performance of asphalt concrete pavements These factors include drainage, base/subbase type and thickness, and asphalt surface thickness, Tables 1 and 2 The experiment looks at the influence of the environment and soil type on these factors. The project lies in the wet-freeze environmental area with a fine grained mica silt with sand subgrade/embankment material. In addition to the twelve SHRP test sections of the main experiment, designated sections 510113 through 510124, there is a VDOT (agency design) supplemental section 510159 Table 3 lists all the sections of this experiment, the construction and experiment stations, length, pavement layer types and thicknesses, embankment, and drainage

The project is built on the south bound lane of Rte 265 just north of the city of Danville, Pittsylvania County, approximately 100 kilometers south of Lynchburg and 10 kilometers north of the North Carolina Border, Figure 1 has site location maps for this project The thirteen test sections are constructed adjacent to each other in series starting at the construction chainage of 687+00 and ending at 552+00 (construction stationing is in feet and increasing south to north) The SHRP station 0+00 of the first section 510114 being at construction station 687+00, and the SHRP station 5+00 of the last section 510113 being at construction station 552+00, Figure 2 Each section is 152.4 meters long and 3 7 meters wide The south bound shoulder, adjacent to the test sections, is a paved 3 0 meter wide shoulder The north bound lane of Rte 265 is also constructed with a width of 3 7 m and a north bound paved shoulder of 3 0 m. This north bound lane and north bound shoulder will become the south bound passing lane and the south bound inside shoulder when the dual carriageway north bound lanes of Rte 265 are built in the future

The project was built as part of the Commonwealth of Virginia, Department of Transportation, Project No 6265-071-F02,P402,P403, FHWA No AC-DPS-0028(003); AC-DPS-0028(004) "Constructing 7 27 km of Grades, Drainage, Asphalt Paving, Experimental Asphalt Paving, Signs, and Weigh in Motion Data Collection System" located in Pittsylvania County on Rte 265 Southbound beginning at 0 48 km North of Rte 58 to 0 15 km North of Rte 360 and from 1 14 km North of Rte 360 to 5 55 km North of Rte 360 The project was advertised for bids in January 1995 using VDOT standard contract administration and construction procedures The contract was awarded to W C English, Inc. of Lynchburg VA in March 1995 for the value of US$ 5,206,401 44 The Notice to Proceed was designated as April 4, 1995 while the date of completion of all construction was December 1, 1995

The early plans for the building of this SPS-1 project were scheduled for 1993 Two meetings were held in Virginia to discuss the details of the Design, Specifications, and Construction of this project in Danville, VA The first meeting was held at the Chatham Residency Office in Virginia on June 29, 1993 The second meeting was held at the Lynchburg District Office in Virginia on August 17, 1993 Because of the need to construct all of the test sections in one construction season, the work on the SPS-1 project was postponed till 1994 and later postponed even further to 1995 Another meeting to discuss the preparations for the construction of this project was held at the Virginia Transportation Research Council in Charlottesville, VA on December 6, 1994 A project showing meeting was held on site on February 2, 1995 where VDOT discussed the details of the two projects that were being bid, one of which included the SPS-1 experiment. The details of the SPS-1 construction and sampling and testing requirements were emphasized to ensure the contractors' awareness of the amount of work needed to fulfill the SPS-1 guidelines and come out with a product acceptable by the Federal Highway Administration (FHWA) Long Term Pavement Performance (LTPP) Division

The Pre-Construction Conference for this project was held at the Chatham Residency Office on April 5, 1995 Attendees were from VDOT Chatham Residency, VDOT Research Council, VDOT Lynchburg District, the main contractor W C English, the subcontractors involved in the construction, and LTPP North Atlantic Regional Office (NARO) Another meeting at the lab facility in Elko, VA was held on April 13, 1995 to go over the laboratory testing to be performed by the VDOT, the sampling procedure, and the quantity of material required for each of the tests After finishing the construction of the north bound lane and shoulder and before starting the construction of the south bound lane which includes the SPS-1 sections and the south bound shoulder, a meeting was held at the project field office to finalize and summarize the details on the SPS-1 testing requirements, construction guidelines, and quality control concerns

On site and in charge of the construction work was Mr A L Simpson, VDOT Project Inspector, Ms Tammy Fielder assistant Project Inspector, and Mr Russell paving inspector, all working under the supervision of the Chatham Residency Resident Engineer Tim Wiles From the Lynchburg District, and responsible for all the material testing and sampling on site as well as sampling from the asphalt plant, were Mr Norman Walton, Mr. Tony Sanchez, and Mr Tripp White, all working under the supervision of the Lynchburg District Office Materials Engineer Mr Dale Grigg Mr Buddy Wood from the VDOT Transportation Research Council helped in all the material sampling and testing, as well as following up on all the construction activities, under the supervision of Mr Tom Freeman A number of consulting firms were associated with the VDOT inspection team. McDonough Bolyard Peck (MBP) from Fairfax VA, Law Engineering from Atlanta GA, A Morton Thomas and Associates from Rockville MD, and S C Myers and Associates from Washington DC All laboratory testing of the subgrade/embankment, dense graded aggregate base (DGAB), loose asphalt concrete mixes and cores are to be performed by two labs, first is the VDOT lab at Elko VA (SHRP Laboratory Assigned Code 5121) and the FHWA Contractor Laboratory, Law Engineering in Atlanta GA (SHRP Laboratory Assigned Code 1311)

The W C English, Inc subcontracted APAC-Virginia, Inc to perform all the paving on this job APAC used asphalt from their batch asphalt plant in Shelton, NC The hauling distance between the SPS-1 site and the plant is 14 km and takes between 20 and 25 minutes travel time This 2 5 ton batch Warren Plant with 2 Silos, 180 ton each, is manufactured by ASTEC in Chattanooga, Tennessee The aggregate used was brought from Vulcan Material Co in Shelton, NC, the sand used was local McCarty sand from Dan River, the hydrated lime was brought from the VA Lime Co in Ripplemead VA, the AC cement used was AC-30 from Chevron in Richmond VA, for the permeable asphalt treated base (PATB) layer, and AC-20 from Coastal in Apex NC, for all other layers The asphalt prime/tack coat used was CRS-1 brought from Central Oil in Greensboro NC, and the additive used was HP Plus brought from ARR MAZ Products in Vanceboro NC. All mix designs used in this project are included in Appendix A Photos of the asphalt plant taken on September 11, 1995 are included in Appendix B

The paving equipment for the construction included a BLAW-KNOX model PF-200B paver and a DRESSER Steel Double Drum Vibratory Roller model type VOS 2-66B, working weight (max) 9263 kg used during the night paving when the PATB, the asphalt treated base (ATB), and the intermediate binder course layer were paved. For the day paving of the final surface course layer a Cedarapids Grayhound AF 6 paver, an Ingersoll-Rand Steel Double Drum Vibratory Roller model type DD-90, operating weight 9110 kg, and a Dynapac Steel Double Drum Static Roller model type CC-42A, working weight 10258 kg, were used

II. Project Details

Layout

The twelve main SHRP SPS sections and the VDOT supplemental section are laid in series starting with the SHRP section 510114 with its beginning station 0+00 at construction station 687+00 followed by the two SHRP sections 510121 and 510120, then the VDOT section 510159 followed by the nine SHRP sections 561019, 510122, 510123, 510124, 510116, 510115, 510117, 510118, and finally section 510113 with its end station 5+00 at construction station 552+00, Figure 2 Sections 510121, 510120, 510159, and 510119 had edge drains installed, while sections 510122, 510123, and 510124 had edge drains installed and geotextile fabric placed on top of the Treated Subgrade layer before placing the 102 mm PATB Type I Drainage layer, which is also placed on the four previously mentioned sections with the edge drains, Figure 8 All sections have 152 mm of Treated Subgrade stabilized with 10% by volume of Hydraulic Cement Eight sections have a layer of the Dense Graded Aggregate Base (DGAB) on top of the Treated Subgrade layer, Sections 510114 and 510121 have 305 mm, Sections 510120, 510159, and 510113 have 203 mm, while Sections 510119, 510117, and 510118 have only 102 mm of the DGAB layer Also eight sections have a layer of the Asphalt Treated Base (ATB) placed on top of the Treated Subgrade layer or the DGAB layer or the PATB layer Sections 510124 and 510116 have 305 mm, Sections 510123, 510115, and 510118 have 203 mm, Sections 510122 and 510117 have 102 mm, while the VDOT section 510159 has 140 mm of the ATB layer The AC intermediate binder and surface course layers were placed on all the sections Sections 510114, 510119, 510123, 510124, 510115, and 510117 have a thick combination of 127 mm binder and 51 mm surface, while sections 510121, 510120, 510122, 510116, 510118, and 510113 have a thin combination of 64 mm binder and 38 mm surface, and the VDOT section 510159 also has a thin combination of 51 mm binder and 38 mm surface layer The combinations of the experimental factors for an SPS-1 study and where each of this project's sections fall, are illustrated in Tables 1 and 2 Table 3 lists the construction stations, experiment stations, length, AC and Base/Subbase thickness and type, and the fill/cut and drainage remarks on each section.

Field Materials Sampling and Testing

Locations for field material sampling and testing are summarized in Figures 3 through 7 Four main stages of field material sampling and testing were involved here; first, on the untreated subgrade/embankment layer, Figure 3, second on the treated subgrade layer, Figure 4, third on the DGAB layer, Figure 5, fourth on the different AC paving components, the PATB and ATB, Figure 6, and the binder and surface mixes, Figure 7, as well as the AC cement and the combined aggregate used in these mixes. Table 4 summarizes the field testing on every layer, showing the number of tests and the location designation Table 5 summarizes the material sampling performed on each layer, listing the number of samples collected and the sample location of each Table 6 is intended to show the number, quantity, and location of the bulk samples collected during paving, and to identify those to be used for testing as part of the SPS-1 experiment, and those to be sent to the Materials Reference Library VDOT performed all the field testing, material sampling, and agency laboratory testing required by the FHWA for the SPS-1 experiment. Table 7 shows the dates of all the field testing and sampling activities throughout the construction periods Table 8 lists the actual date as compared to the guidelines of the initial monitoring measurements collected after construction of the SPS-1 sites

The laboratory material testing plan for each of the layers is summarized in Table 9 The SHRP test designation and Protocol number for each test is tabulated and so are the number of tests per layer and material source or test or sample location In addition to the VDOT Laboratory in Sandston VA (SHRP Laboratory Assigned Code 2321), some of the testing, especially the Resilient Modulus, Tensile Strength, and Creep Compliance will be performed by the FHWA-LTPP Contractor Laboratory, Law Engineering, Inc in Atlanta, Georgia (SHRP Laboratory Assigned Code 1311)

III. Construction

The construction started with the northbound lane from the cement treated subgrade layer through the intermediate binder layer to ensure that the construction traffic use the northbound lane while constructing the southbound SHRP lane The longitudinal joint of the bottom pavement layer placed directly on the soil cement layer was offset into the northbound lane 152 mm right of centerline 305 mm of width was allowed by VDOT to "step" the various pavement layers into the northbound lane giving a 457 mm right of centerline longitudinal joint of the intermediate binder layer

Table 10 lists all the dates of the construction activities for all the sections. Hydraulic cement stabilization of the top 152 mm of the subgrade of all the sections was subcontracted by W C English, Inc to Site Prep, Inc. of NC located in Monroe NC Site Prep used an HAMM RACO 250 Mixer for mixing the soil cement, a CAT CP-563 Sheepsfoot Roller, operating weight 11567 kg, a CAT CS-563 Double Drum Steel Roller, operating weight 11113 kg, a CAT PS-130 Pneumatic Roller, operating weight 12415 kg, a CAT 140G Grader, and a CMI Fine Grading machine The stabilization process started at section 510113 on August 19, 1995 and finished on August 25, 1995 at section 510114. Placing the DGAB layer on 8 of the sections was performed by the main contractor W C English, Inc using a Jersey Spreader 250 model 103, a CAT CS-563 Double Drum Steel Roller, operating weight 11942 kg, a CAT 12G Grader, and a CAT 615 dirt moving machine The DGAB placement started at section 510113 on August 22, 1995 and finished on August 31, 1995 at section 510114 All paving was performed by APAC-Virginia, Inc The equipment used is mentioned in the Introduction of this report The paving of the PATB layer, the ATB layer, and the intermediate binder layer was done at night Night paving started on August 25, 1995 at section 510115 and finished on

September 14, 1995 at section 510114 The surface layer was paved during the day starting at section 510113 on September 26, 1995 and finishing on September 27, 1995 at section 510114 This last section paved (510114) was found to be short by 38 mm, thus on November 28, 1995 a second lift of 38 mm of the surface layer was paved on section 510114 to give the required thickness, Table 15 lists the dates, times, layer paved, lift number and thickness, and air temperature and weather condition during paving.

Rod and Level elevation shots were taken on top of each layer starting on the Treated Subgrade layer (Fig 10 Elev 1), then on the DGAB layer (Fig. 10 Elev 2), then on the PATB layer (Fig 10 Elev 3), then on the ATB layer (Fig 10 Elev 4), then on the binder layer (Fig 10 Elev 5), and finishing on top of the final surface layer (Fig 10 Elev 6). Five shots were taken across the width of the SPS travel lane at 15 24 m intervals starting at station 0+00 and finishing at station 5+00, total 55 shots per section per layer, Figure 9

Subgrade/Embankment Preparation

Before starting the cement stabilization, the subgrade/embankment layer was graded to the required level Sections 510114, 510120, 510119, 510124, 510116, 510115, and 510118 are in a fill area while sections 510121, 510159, 510123, and 510117 are in a cut area The remaining two sections 510122 and 510113 are in a small fill and cut area, Table 3

Shoulder auger probes were performed on May 12, 1995 to a depth of 6 1 m to determine if bedrock or other significantly dense layers exist This information is needed for the analysis of the deflection measurements One probe was augered in the shoulder at the middle (station 2+50) of each of the 13 sections, Figure 3 If a rock or any other dense layer is encountered in the top 6 1 m, another auger is performed to confirm this finding. All of the sections except for five had no indication of any such dense layer in the top 6 1 m The probe at section 510122 stuck a dense layer at a depth of 0 9 m at station 2+50 but when moved to station 2+51 no rock existed in the top 6 1 m The other four sections 510121, 510123, 510116, and 510117 have rock or boulders or a significantly dense layer at the location of both probes performed on each section to depths varying from 0 9 m to 2 4 m

On June 8 and 9, 1995 Shelby tube samples were collected from all 13 sections from the top 0 6 m and from 0 6-1 2 m deep Bulk samples were also collected and nuclear gauge density measurements were performed at the same time at six locations as outlined in Figure 3 Table 13 gives the density and moisture results from the nuclear gauge measurements

Cement Treated Subgrade Layer Preparation

The construction of the cement treated subgrade layer started with spreading the cement on the subgrade/embankment layer then dry mixing, checking the depth, sheepsfoot roller, adding water, wet mixing, checking the depth again, sheepsfoot roller again, grader, adding more water, sheepsfoot roller again, grader again, vibratory steel roller, fine grading, checking the depth again, grader again, vibratory steel roller again, pneumatic roller, and finally adding more water every day till covering with the next layer

This construction started on August 19, 1995 at section 510113 and finished on August 24, 1995 at section 510114, Table 10 and Figure 11 10% by volume of hydraulic cement was mixed with the subgrade to a depth of 152 mm Table 11 lists the depth of the cement treated subgrade layer throughout the southbound lane The bold lines in this Table shows this depth in the SHRP sections between station 0+00 and 5+00. Three nuclear gauge density measurements were performed in each of the sections, at 1 5 m offset from the edge of pavement, at station 1+00, 2+50, and 4+00, Figure 4 The results from these measurements are tabulated in Table 13 Table 12 lists all the quality control nuclear gauge density and moisture measurements conducted by VDOT throughout the southbound lane The bold lines represent results inside the test sections. VDOT practice is that the soil cement must be allowed to cure for 72 hours before the next layer is constructed This was changed to 48 hours provided proof rolling proves that the area is ready to proceed to the next layer The Falling Weight Deflectometer was used to measure the deflection on this layer between August 21 and 29, 1995 as shown in Table 7 The FHWA FWD and the VDOT FWD were used to measure the deflections in sections 510113, 510118, 510117, 510115, and 510116 The FHWA FWD then left the site and only the VDOT FWD was utilized during the construction

Elevation shots were collected on the surface of this layer, Figure 10 Elev 1, after temporary bench marks were established to get accurate layer thicknesses of the next layer

Dense Graded Aggregate Type I #21B Base Layer Preparation (DGAB)

The dense graded aggregate base layer (Job Mix Formula in Appendix A) construction started on August 22 at section 510113 and was completed on August 31, 1995 at section 510114, Table 10 and Figure 11 The DGAB layer of 102 mm in sections 510119, 510117, and 510118 was placed in a single lift Sections 510120, 510159, and 510113 with a 203 mm of DGAB were placed in two equal lifts Three equal lifts of the 305 mm of the DGAB layer were placed in sections 510114 and 510121, Table 10 In addition to matching the shoulders and the northbound lane, this material was also used in the shoulder next to the PATB layer which was only used in the driving lanes Three nuclear gauge density measurements were performed on top of the DGAB layer, in the eight sections that had this layer, at 1 8 m offset from the edge of pavement, at station 1+00, 2+50, and 4+00, Figure 5 Three more densities were also performed at the bulk sample locations which are shown in Figures 5 and 11 The results from these measurements are presented in Table 13 The VDOT Falling Weight Deflectometer was used to measure the deflection on this layer between August 26 and September 5, 1995 as listed in Table 7

Elevation shots were collected on the surface of this layer, Figure 10 Elev 2, using the temporary bench marks established earlier The results in Table 17, and summarized in Table 18, indicate unacceptable values of the average thickness, calculated from the 55 elevation shots taken on sections 510118 and 510159, that came short by 15 mm and 14 mm respectively The other six sections that had this layer were off by 2 to 12 mm which was within the ± 12 mm variation in thickness required by the SPS-1 Guidelines Two of the sections, 510117 and 510113, had no centerline elevation measurements because the northbound lane paving was at the centerline making it difficult for the survey crew to get an actual representative reading at this location

Edge Drains Construction

Edge drains were placed under the outside shoulder of sections 510121, 510120, 510159, 510119, 510122, 510123, and 510124, Figure 8 These edge drains were placed just beyond the edge of the lowest pavement layer, about 305 mm outside the edge of pavement The layer above the PATB extends another 305 mm beyond the edge drain to protect it from damage due to traffic during construction This is a deviation from the guidelines which locate the edge drains at the outside of the shoulder

W C English, Inc hired Greenscape Seeding, Inc of Seaford VA to construct all the drainage work in this project using 152 mm diameter Topsi polyethylene pipes Greenscape used a Vermeer T-455 saw to cut trenches for the drainage pipes, a CAT 416B Backhoe, and a BLAW-KNOX RW-38 Widener for laying the #8 stone in the trenches The edge drain construction started with cutting the trenches, putting geotextile fabric in the trenches, laying some #8 stone on the fabric, installing the pipe on the stone, and finally covering the pipe with the #8 stone, this was all covered by the permeable asphalt treated base layer

Geotextile Fabric Placement

Geotextile filter fabric was used on all drained sections where the PATB layer was placed directly on top of the subgrade to prevent the clogging of the permeable layer due to the migration of fine material from the subgrade Sections 510122, 510123, and 510124 are the three sections where the fabric was placed on the treated subgrade before paving with the PATB layer on August 29, 1995, Figure 8-B The fabric was also used in the drainage trenches before placing the #8 stone and the pipe

When the northbound lane was constructed with the geotextile fabric, sufficient width was placed that left a 0 6 m extra width at the centerline to overlap with the fabric placed in the southbound SHRP lane During the southbound construction, some of this extra fabric at the centerline was punctured or torn The contractor had to repair these areas with fabric lapped to 0 9 m around the damaged area and sewn by double stitched seams with stitching spaced 6 to 13 mm

Open Graded Permeable Asphalt Treated Type I Base Layer Preparation (PATB)

AC-20 was used for all the bound SPS-1 pavement layers except for the PATB layer where AC-30 was used (Job Mix Formula in Appendix A) This layer was paved at night starting on August 29, 1995 on the geotextile fabric, first on section 510124 then on section 510123 and finally on section 510122 On August 31, 1995 this layer was paved on the DGAB layer of sections 510119 and 510159 The last two sections where the PATB layer was placed were sections 510120 and 510121 that were paved on September 12, 1995, Tables 10 and 15 Table 14 lists the laydown temperatures during paving while the weather condition is described in Table 15 Also listed in Table 15 as well as Figure 11 are the PATB paving dates and times for each of these sections, while the bulk sample number and location are shown in Figures 6 and 11 The VDOT Falling Weight Deflectometer was used to measure the deflection on this layer between August 30 and September 13, 1995 as listed in Table 7

Elevation shots were collected on the surface of this layer, Figure 10 Elev. 3, using the temporary bench marks established earlier The results in Table 17, and summarized in Table 18, indicate that the average thickness, calculated from the 55 elevation shots taken on section 510124, was short by 16 mm, the reason here was mainly because of the measurements at the centerline which were not representative of the actual PATB thickness since the northbound paving was at the centerline making it difficult for the survey crew to get an actual representative reading at this location Sections 510119, 510120, and 510121 had an extra 11 mm, 8 mm, and 7 mm respectively of the PATB layer Sections 510122 and 510123 were off by 2 and 3 mm while section 510159 had exactly 102 mm of the PATB layer There was no limit in the SPS-1 Guidelines as to the allowable variation in the thickness of the PATB layer

Dense Graded Asphalt Treated Type BM-3 Base Layer Preparation (ATB)

The ATB layer (Job Mix Formula in Appendix A) was paved at night starting on August 25, 1995 on the treated subgrade layer of sections 510115 and 510116 and finishing on September 6, 1995 when it was finally placed as a third lift on sections 510116 and 510124, Tables 10 and 15 Table 14 lists the laydown temperatures during paving while the weather condition is described in Table 15 Also listed in Table 15 as well as Figure 11 are the ATB paving dates and times, while the bulk sample number and location are shown in Figures 6 and 11 Three nuclear gauge density measurements were performed on the final lift of the ATB layer, in the eight sections that had this layer, at 1 8 m offset from the edge of pavement, at station 1+00, 2+50, and 4+00, Figure 6 Segregation was quite obvious at the 1 8 m offset, thus three more densities were also performed at 1 2 m offset where no segregation was observed The results from these measurements are tabulated in Table 13 The VDOT Falling Weight Deflectometer was used to measure the deflection on this layer on September 7, 1995 as listed in Table 7

Elevation shots were collected on the surface of this layer, Figure 10 Elev 4, using the temporary bench marks established earlier The results in Table 17, and summarized in Table 18, indicate unacceptable values of the average thickness, calculated from the 55 elevation shots taken on section 510115, that had an extra 15 mm of the ATB layer Sections 510118, 510159, 510123, 510122, 510116, and 510124 were off by 1 to 12 mm, which was within the ± 12 mm allowable variation in thickness as per the SPS-1 Guidelines, while section 510117 had exactly 102 mm of the ATB layer

Usually coring of the AC is performed after the construction is complete, but for sections 510124 and 510116 which had an AC and ATB thickness of 483 mm and 407 mm respectively, which was too thick for the VDOT coring barrel to go through, ten cores of the ATB layer of these two sections were collected on September 7, 1995. These cores were supposed to be 305 mm thick, which was the case in only one core, while the other nine cores varied from 310 to 330 mm

AC Dense Graded IM-1B and IM-1A Mix Binder Layer Preparation

Binder layer mix IM-1B was used throughout the southbound and northbound driving lanes except for the VDOT section 510159 and the shoulders which were paved with mix IM-1A The only difference between these two mixes is the asphalt content, which is more in the IM-1A mix (Job Mix Formulas in Appendix A) The binder layer was paved at night starting on September 7, 1995 at section 510113 and finishing on September 14, 1995 at section 510114, Tables 10 and 15 Table 14 lists the laydown temperatures during paving while the weather condition is described in Table 15. Also listed in Table 15 as well as Figure 11 are the binder layer paving dates and times, while the bulk sample number and location are shown in Figures 7 and 11

Elevation shots were collected on the surface of this layer, Figure 10 Elev 5, using the temporary bench marks established earlier. The results in Table 17 indicate unacceptable values of the average thickness, calculated from the 55 elevation shots taken on the thin section (64 mm design thickness) 510116, that had an extra 9 mm The thick sections (127 mm design thickness) 510115, 510124, and 510123 were short in thickness by 13 mm, 8 mm, and 5 mm respectively The SPS-1 Guidelines require that the as compacted thickness of the AC binder and surface layers be within ± 7 mm of the value specified in the experiment design Thus in a few cases where the binder layer was short or over, it was acceptable if the surface layer thickness made up the difference An example is section 510114 where the binder thickness is only 105 mm (design is 127 mm) and the surface layer is 70 mm (design is 51 mm) giving a total AC binder and surface layer thickness of 175 mm (design 178 mm) which is within the limits, Table 18

AC Dense Graded SM-2B Mix Surface Layer Preparation

Surface layer mix SM-2B was used throughout the southbound and northbound driving lanes while the shoulders were paved with mix SM-2A The only difference between these two mixes is the asphalt content, which is more in the SM-2A mix (SM-2B Job Mix Formula in Appendix A) The surface layer was paved during the day starting on September 26, 1995 at section 510113 and finishing on September 27, 1995 at section 510114 Section 510114 was found to be short by 36 mm, thus on November 28, 1995 a second lift of 38 mm of the surface layer was paved on section 510114 to give the required thickness, Tables 10 and 15 Table 14 lists the laydown temperatures during paving while the weather condition is described in Table 15 Also listed in Table 15 as well as Figure 11 are the surface layer paving dates and times, while the bulk sample number and location are shown in Figures 7 and 11 Three nuclear gauge density measurements were performed on the surface layer of all the sections at 1 8 m offset from the edge of pavement, at station 1+00, 2+50, and 4+00, Figure 7 The results from these measurements are tabulated in Table 13 The FHWA and VDOT Falling Weight Deflectometers were used to measure the deflection on this layer between November 27 and 30, 1995 as listed in Table 7 The results from the FHWA FWD are presented in a spreadsheet in Appendix A

Elevation shots were collected on the surface layer, Figure 10 Elev 6, using the temporary bench marks established earlier The results in Table 17 indicate unacceptable values of the average thickness, calculated from the 55 elevation shots taken on the thick sections (127 mm design thickness) 510119, 510124, 510117, 510123, and 510115 that were short in thickness by 15 mm, 11 mm, 7 mm, 7 mm, and 4 mm respectively The SPS-1 Guidelines require that the as compacted thickness of the AC binder and surface layers be within ± 7 mm of the value specified in the experiment design Thus in a few cases where the surface layer was short or over, it was acceptable if the binder layer thickness made up the difference, as is the case in section 510114 Table 18 summarizes the total AC thickness, which includes the binder and surface layers, showing that sections 510124, 510115, 510119, 510123, and 510117 were short by 19 mm, 17 mm, 16 mm, 12 mm, and 9 mm respectively while section 510116 had an extra thickness of 11 mm Table 18 also lists the total thicknesses, which includes the DGAB, the PATB, the ATB, and the AC binder and surface layers, compares the design and the actual, and gives the difference between both, positive indicating extra thickness and negative indicating shy thickness

Coring of the AC surface and base layers was conducted on October 23-24, 1995 on all the sections On March 13, 1996 coring on section 510114 was repeated after adding the second lift of the surface layer The results in Table 16 indicate thickness values outside the limits specified in the Guidelines, mainly ± 19 mm for the AC surface, binder, and ATB and ± 7 mm for the sections with no ATB layer Section 510116 had all four cores exceeding the limit, section 510119 had 5 out of 6 cores below the limit, section 510114 had two cores over and one core out of four below the limit, section 510121 had one core out of four below the limit, and section 510113 had one core out of six below the limit. The thicknesses from the cores are not as accurate as the thicknesses from the rod and level for two reasons, first these cores are taken from the sampling areas before (station 0-25) and after (station 5+25) each section, second the measurements are done on site with a regular measuring tape or ruler

Asphalt Cement and Aggregate Sampling

The asphalt plant was visited three times on August 30 and September 11 and 27, 1995. Pictures were taken throughout the plant site on September 11, 1995, Photos in Appendix B Samples were taken of the asphalt cement and the combined aggregate of the ATB, binder, and surface layer, used in all the asphalt concrete paving Three 20-liter buckets of asphalt cement were collected from the plant on August 30, 1995 for shipment to the FHWA Materials Reference Library (MRL), and two were collected on September 11, 1995 for the VDOT lab to be used in the SPS-1 laboratory testing Three 200-liter drums of the combined aggregate were also collected from the asphalt plant and shipped to MRL The ATB BM-3 combined aggregate was collected on August 30, 1995, while the binder and surface layer aggregates were sampled on September 11 and 27, 1995 Table 6 lists all the asphalt and aggregate bulk sampling performed during the construction and separates the part to be used for testing as part of the SPS-1 experiment and the part to be used for shipping to the MRL facility in Reno, Nevada

Deviations from the Construction Guidelines

The SPS-1 Guidelines require that the entire length of a test section be located in a cut or a fill section Unfortunately two sections, 510122 and 510113, had cut-fill transitions located inside them

Segregation was obvious in the ATB layer during paving, which was definitely a paver problem Although there was no definite mention in the ATB construction guidelines on this problem, it was mentioned under the construction requirements for the DGAB layer that no segregation or degradation of materials should occur during laydown and compaction

Edge drains were placed under the outside shoulder of sections 510121, 510120, 510159, 510119, 510122, 510123, and 510124 These edge drains were placed just beyond the edge of the lowest pavement layer, about 305 mm outside the edge of pavement The layer above the PATB extends another 305 mm beyond the edge drain to protect it from damage due to traffic during construction. This is a deviation from the guidelines which require that the edge drains be located at the outer edge of the shoulders (inner and outer).

The SPS-1 Construction Guidelines require that the as-compacted thickness of the DGAB layer, the ATB layer, and the combined binder and surface layers shall not vary from design by more than 12 mm, 12 mm, and 7 mm respectively, based on a rod and level survey This survey indicated a deviation from these guidelines in the DGAB layer (± 12 mm allowed) of sections 510159 (design 203 mm - survey 189 mm = 14 mm short) and section 510118 (design 102 mm - survey 87 mm = 15 mm short) Also in the ATB layer (± 12 mm allowed) of section 510115 (design 203 mm - survey 218 mm = 15 mm extra) and in the combined binder and surface layers (± 7 mm allowed) of sections 510119 (design 178 mm - survey 162 mm = 16 mm short), 510124 (design 178 mm - survey 159 mm = 19 mm short), 510123 (design 178 mm - survey 166 mm = 12 mm short), 510116 (design 102 mm - survey 113 mm = 9 mm extra), 510115 (design 178 mm - survey 161 mm = 17 mm short), and 510117 (design 178 mm - survey 169 mm = 9 mm short)

Also according to the Guidelines the monitoring with the Profilometer is supposed to be performed less than two months after the construction is completed Because the site was not marked till February 1996, five months after paving, the Profilometer survey was not conducted till April 1996, seven months after paving was completed

IV. Post Construction Operations and Initial Performance

The site was marked on February 15 and 22, 1996 according to the guidelines Figure 12 shows the paint marks used on the sections to identify the location of the beginning of each of the sections and at 30 5 m intervals

Profilometer testing was performed on April 24 and 25, 1996, which is always done after the site is marked The average International Roughness Index (IRI) values from five runs for each of the thirteen sections are presented in Table 19 Plots of the elevation measurements, in the left wheel path and the right wheel path, from all the sites are presented in Figures 13 to 25 The site was also videoed on April 24, 1996

The Falling Weight Deflectometer (FWD) and Manual Distress Survey (MDS), including transverse Dipstick measurements, on the final layer of the sections were performed between November 27 and December 1, 1995 The FWD results are presented in a spreadsheet in Appendix A, while the rut depth values in the left and right wheel paths, as determined from the Dipstick are summarized in Table 20 and plotted in Figures 26 to 33.

During the initial monitoring period, November 1995 to April 1996, the site was reported as having no obvious distresses except for a circular mark, caused by a barrel when the surface was still fresh, at station 0+40 of section 510115 and a scrape mark in section 510116

The road will not be opened for traffic till a construction project north of the current one is finished, which is anticipated to be in the fall of 1996

As part of the Seasonal Monitoring Program (SMP), two sets of Seasonal Instrumentation equipment were installed on site during October of 1995 The first was installed at the 5+ side of section 510114 and the second was installed at the 0- side of section 510113 An Automated Weather Station (AWS) was also installed during October 1995 close to the north end of the project Correspondence related to the Seasonal Instrumentation and the AWS installation is included in Appendix A A Weigh-In-Motion data collection system was also installed during March of 1996 at the north end of the project

Table 1 Experimental Design for SPS-1 Experiment 510100

Base/Subbase			Surface+Binder	Section ID
Drainage	**Thickness (mm)**	**Type**	**Thickness (mm)**	
NO	203	DGAB*	102	510113
		DGAB*	178	
		ATB	102	
		ATB	178	510115
		(DGAB+ATB)*	102	
		(DGAB+ATB)*	178	510117
	305	DGAB*	102	
		DGAB*	178	510114
		ATB	102	510116
		ATB	178	
		(DGAB+ATB)*	102	510118
		(DGAB+ATB)*	178	
YES	203**	DGAB	102	
		DGAB	178	510119
		ATB	102	510122
		ATB	178	
	305**	DGAB	102	510120
		DGAB	178	
		ATB	102	
		ATB	178	510123
	406**	DGAB	102	510121
		DGAB	178	
		ATB	102	
		ATB	178	510124

Notes * Includes 102 mm thick DGAB layer that is considered equivalent (total structural number) to the PATB layer

** Includes 102 mm thick PATB layer

DGAB Dense Graded Aggregate Base Layer

ATB Asphalt Treated Base Layer

PATB Permeable Asphalt Treated Base Layer

Total 24 Pavement Structure Combinations, 12 included in this SPS-1 Experiment 510100, and 12 included in a similar SPS-1 Experiment in Delaware

Table 2 Base/Subbase Type and Thickness Combinations for SPS-1 Experiment 510100

		No Drainage Layer		With Drainage Layer	
		102 mm Surf.+Bind.	**178 mm Surf.+Bind.**	**102 mm Surf.+Bind.**	**178 mm Surf.+Bind.**
Base/ Subbase Type	**Total Base/ Subbase Thickness (mm)**	**Section ID Base/ Subbase Thickness (mm) - Type**	**Section ID Base/ Subbase Thickness (mm) - Type**	**Section ID Base/ Subbase Thickness (mm) - Type**	**Section ID Base/ Subbase Thickness (mm) - Type**
DGAB	203	**510113** 102 DGAB* 102 DGAB Subgrade			**510119** 102 PATB 102 DGAB Subgrade
	305		**510114** 102 DGAB* 203 DGAB Subgrade	**510120** 102 PATB 203 DGAB Subgrade	
	406			**510121** 102 PATB 305 DGAB Subgrade	
DGAB+ ATB	203		**510117** 102 ATB 102 DGAB* Subgrade	**510122** 102 ATB 102 PATB Fabric Subgrade	
	305	**510118** 203 ATB 102 DGAB* Subgrade			**510123** 203 ATB 102 PATB Fabric Subgrade
	406				**510124** 305 ATB 102 PATB Fabric Subgrade
ATB	203		**510115** 203 ATB Subgrade		
	305	**510116** 305 ATB Subgrade			

Notes DGAB Dense Graded Aggregate Base Layer
ATB Asphalt Treated Base Layer
PATB Permeable Asphalt Treated Base Layer
Total 24 Pavement Structure Combinations, 12 included in the SPS-1 Experiment 510100.
* This 102 mm DGAB layer in the undrained pavement sections is considered equivalent (total structural number) to the 102 mm PATB layer in the drained pavement sections.

Table 3 Site Layout, SPS-1 Project 510100 on South Bound Rte 265

Construction Stations	Experiment Stations	Length (m)	AC Thickness mm	Base/Subbase Thickness mm	Remarks	Section ID
687+00 - 682+00	0+00 - 5+00	152 4	51 Top 127 Binder	0 ATB 0 PATB 305 DGAB	Fill	**510114**
659+00 - 654+00	0+00 - 5+00	152 4	38 Top 64 Binder	0 ATB 102 PATB 305 DGAB	Cut Edge Drains	**510121**
651+00 - 646+00	0+00 - 5+00	152 4	38 Top 64 Binder	0 ATB 102 PATB 203 DGAB	Fill Edge Drains	**510120**
643+50 - 638+50	0+00 - 5+00	152 4	38 Top 51 Binder	140 ATB 102 PATB 203 DGAB	Cut Edge Drains	**510159**
636+50 - 631+50	0+00 - 5+00	152 4	51 Top 127 Binder	0 ATB 102 PATB 102 DGAB	Fill Edge Drains	**510119**
628+50 - 623+50	0+00 - 5+00	152 4	38 Top 64 Binder	102 ATB 102 PATB 0 DGAB	Fill/Small 1 2 m Cut Edge Drains Geotextile Fabric	**510122**
619+50 - 614+50	0+00 - 5+00	152 4	51 Top 127 Binder	203 ATB 102 PATB 0 DGAB	Cut Edge Drains Geotextile Fabric	**510123**
611+50 - 606+50	0+00 - 5+00	152 4	51 Top 127 Binder	305 ATB 102 PATB 0 DGAB	Fill Edge Drains Geotextile Fabric	**510124**
601+00 - 596+00	0+00 - 5+00	152 4	38 Top 64 Binder	305 ATB 0 PATB 0 DGAB	Fill	**510116**
588+50 - 583+50	0+00 - 5+00	152 4	51 Top 127 Binder	203 ATB 0 PATB 0 DGAB	Fill	**510115**
579+00 - 574+00	0+00 - 5+00	152 4	51 Top 127 Binder	102 ATB 0 PATB 102 DGAB	Cut	**510117**
571+50 - 566+50	0+00 - 5+00	152 4	38 Top 64 Binder	203 ATB 0 PATB 102 DGAB	Deep Fill	**510118**
557+00 - 552+00	0+00 - 5+00	152 4	38 Top 64 Binder	0 ATB 0 PATB 203 DGAB	Fill/Small 0 9 m Cut	**510113**

Notes
- Top -AC Dense Graded SM-2B Mix Asphalt Concrete Surface Layer
- Binder -AC Dense Graded IM-1B Mix Asphalt Concrete Binder Layer (IM-1A only for section 510159)
- ATB -AC Dense Graded BM-3 Mix Asphalt Concrete Treated Base Layer
- PATB -AC Open Graded Type 1 Mix Permeable Asphalt Treated Base Layer
- DGAB -Dense Graded Type 1 #21-B Aggregate Base Layer

All sections have 152 mm of Treated Subgrade stabilized with 10% by volume of Hydraulic Cement

Table 4 Scope of Field Testing

Layer	Number of Tests	Location Designation
Asphalt Concrete Surface In-Situ Density (Nuclear Gauge)	39 3	T95 - T133 T160 - 162*
Asphalt Treated Base In-Situ Density (Nuclear Gauge)	24 24	T71 - T94 T136 - T159**
Unbound Base/Subbase In-Situ Density and Moisture Content (NG)	27	T44 - T70
Treated Subgrade In-Situ Density and Moisture Content (NG)	39	T5 - T43
Embankment or Subgrade > 1.2 m Thick In-Situ Density and Moisture Content (NG)	6	T1 - T4, T134, T135
Shoulder Auger Probes (Depth to Rigid Layer)	13	S1 - S13

Note. * The surface layer of section 510114 was tested twice, T95-T97 on the first lift during September 1995 and T160-T162 on the second lift during March 1996
** 24 Nuclear Gauge densities were taken at locations T71 - T94 at 1 83 m offset as planned. Because of the segregation at this offset, 24 additional Nuclear Gauge densities had to be taken at locations T136 - T159 at 1 22 m offset, where no segregation existed.

Table 5 Scope of Material Sampling

Layer	Number of Samples	Sample Location
Asphalt Concrete		
Coring - 102 mm Diameter	80	C1 - C80
Bulk Sampling (Surface Layer)	3	B23 - B25
Bulk Sampling (Binder Layer)	4	B19 - B22
(Uncompacted 90 kg per sample)		
Asphalt Cement Bulk Sampling	1	Asphalt Plant
(Liquid Cement 40 liter per sample		
Asphalt Treated Base		
Coring - 102 mm Diameter	48	C15 - C28, C35 - C68
Bulk Sampling	3	B13 - B15
(Uncompacted 90 kg per sample)		
Permeable Asphalt Treated Base		
Bulk Sampling	3	B10 - B12
(Uncompacted 90 kg per sample)		
Unbound Base/Subbase		
Bulk Sampling	3	B7 - B9
(180 kg per sample)		
Moisture Content Samples	3	B7 - B9
Embankment or Subgrade > 1.2 m Thick		
Thin Wall Tube Sampling	36	A1 - A18
(2 samples per hole)		
Bulk Sampling	6	B1 - B6
(180 kg per sample)		
Moisture Content Samples	6	B1 - B6

Table 6 Asphalt and Aggregate Bulk Material Sampling During Construction

A Materials for Testing as Part of the SPS-1 Experiment

Material Description	Number of Samples	Quantity of Each Sample	Sample Location
AC Surface (SM-2B)	3	8-12 kg bags	B23-B25
AC Binder (IM-1B)	3	8-12 kg bags	B20-B22
AC Binder (IM-1A)	1	8-12 kg bags	B19
AC Base (BM-3)	3	8-12 kg bags	B13-B15
Permeable AC Base	3	8-12 kg bags	B10-B12
AC Cement	1	2-20 liter buckets	Asphalt Plant

B Materials for Shipping to the SHRP Materials Reference Library

Material Description	Number of Samples	Quantity of Each Sample	Sample Location
AC Surface (SM-2B)	1	3-20 kg buckets	B24
AC Binder (IM-1B)	1	3-20 kg buckets	B21
AC Binder (IM-1A)	1	3-20 kg buckets	B19
AC Base	1	3-20 kg buckets	B13
AC Cement	1	3-20 liter buckets	Asphalt Plant
Combined Aggregate (Uncoated)			
As used in the AC Surface Mix	1	1-200 liter drum	Asphalt Plant
As used in the AC Binder Mix	1	1-200 liter drum	Asphalt Plant
As used in the AC Base Mix	1	1-200 liter drum	Asphalt Plant

Table 7 Field Activities During and Post Construction

	Subg./ Embank. Layer	Cement Treated Subg. Layer	DGAB Layer	AC PATB Layer	AC ATB Layer	AC Binder Layer	AC Surface Layer	AC Cement	Combined Aggreg. Material
In-Situ Density	95/06/08 95/06/09	95/08/19 95/08/20 95/0821 95/0822 95/08/23 95/08/25	95/08/23 95/08/24 95/08/25 95/08/29 95/08/30 95/08/31 95/09/01		95/09/05 95/09/06 95/09/07		95/09/27 96/03/13		
Shelby Tube Sampling	95/06/08 95/06/09								
Shoulder Probe	95/05/12								
Bulk and Moisture Sampling	95/06/08 95/06/09		95/08/23 95/08/30 95/08/31	95/08/29 95/08/31 95/09/12	95/08/30 95/09/01 95/09/05	95/09/08 95/09/11	95/09/26	95/08/30 95/09/11	95/08/30 95/09/11 95/09/27
Rod&Level Elevations*		95/08/21 95/08/22 95/08/23 95/08/25 *elev #1*	95/08/24 95/08/25 95/08/29 95/08/30 95/09/01 *elev #2*	95/08/30 95/09/01 95/09/13 *elev #3*	95/08/29 95/08/31 95/09/06 95/09/07 95/09/08 *elev #4*	95/09/11 95/09/12 95/09/15 *elev #5*	95/09/27 96/03/13 *elev #6*		
Photos Taken	95/05/12 95/06/08 95/06/09	95/08/21 95/08/22 95/08/23 95/08/24 95/08/25	95/08/22 95/08/23 95/08/24 95/08/25 95/08/26 95/08/28 95/08/29 95/08/30 95/08/31	95/08/29 95/08/30 95/08/31 95/09/12 95/09/13	95/08/25 95/08/26 95/08/28 95/08/29 95/08/30 95/08/31 95/09/07 95/09/08	95/09/08 95/09/11 95/09/12	95/09/26 95/09/27 95/10/23 95/10/24 95/10/26 95/12/01 96/03/20	95/08/30 95/09/11	95/08/30 95/09/11 95/09/27
Video Recording							96/04/24		
Site Markings							96/02/15 96/02/22		
Profilo-meter Testing							96/04/24 96/04/25		
FWD Testing		95/08/21 95/08/22 95/08/23 95/08/24 95/08/25 95/08/29	95/08/26 95/08/31 95/09/05	95/08/30 95/09/01 95/09/13	95/09/07		95/11/27 95/11/28 95/11/29 95/11/30		
MDS and Dipstick Survey							95/11/28 95/11/29 95/11/30 95/12/01		
Coring					95/09/07 95/10/23 95/10/24		95/10/23 95/10/24 96/03/13		

Notes * Refer to Figure 10 for elevation number locations
Date format is in yy/mm/dd

Table 8 SPS-1 Guidelines vs Actual Monitoring Measurement Dates

Measurement Type	Monitoring Period After Construction	Monitoring Date as per the Guidelines - Construction Finished 27 Sep 95*	Actual Monitoring Completion Date After Construction
Deflection	1-3 Months**	27 Oct 95 - 27 Dec 95	30 Nov 95
Profile	< 2 Months	Before 27 Nov 95	25 Apr 96
Distress Survey	< 6 Months	Before 27 Mar 96	01 Dec 95
Friction	3-12 Months	27 Dec 95 - 27 Sep 96	-

Note * Construction finished 28 Nov 95 for section 510114
** The LTPP Manual for FWD Testing, Version 2 0/February 1993, requires that FWD testing for SPS-1 be performed 3 to 6 months after construction is completed

Table 9 Field and Laboratory Material Testing

Test Type	SHRP Test Desig.	SHRP Prot-ocol	Tests per Layer	Material Source /Test Location
Subgrade or Embankment > 1.2 m Thick				
Sieve Analysis	SS01	P51	6	B1-B6
Hydrometer to 0 001 mm	SS02	P42	6	B1-B6
Atterberg Limits	SS03	P43	6	B1-B6
Classification (visual-manual	SS04	P52	6	B1-B6
only on thin wall tube)			18	A1-A18
Moisture/Density Relations	SS05	P55	6	B1-B6
Resilient Modulus	SS07	P46	6	A2,A5,A9,A11,A14,A17
Unit Weight	SS08	P56	6	A1,A4,A8,A10,A13,A16
Natural Moisture Content	SS09	P49	6	B1-B6
Unconfined Comp Strength	SS10	P54	6	A1,A4,A8,A10,A13,A16
Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter	SS11	P57	3	A3,A7,A18
Nuclear Density/Moisture		LTPP	6	T1-T4,T134,T135 (B1-B6)
Depth to Rigid Layer		LTPP	13	S1-S13
Cement Treated Subgrade				
Nuclear Density/Moisture		LTPP	39	T5-T43
Unbound Dense Graded Aggregate Base (DGAB)				
Particle Size Analysis	UG01	P41	3	B7-B9
Sieve Analysis (washed)	UG02	P41	3	B7-B9
Atterberg Limits	UG04	P43	3	B7-B9
Moisture/Density Relations	UG05	P44	3	B7-B9
Resilient Modulus	UG07	P46	3	B7-B9
Classification	UG08	P47	3	B7-B9
Permeability	UG09	P48	3	B7-B9
Natural Moisture Content	UG10	P49	3	B7-B9
Nuclear Density/Moisture		LTPP	27	T44-T70 (including B7-B9)
Permeable Asphalt Treated Base (PATB)				
Asphalt Content (Extraction)	AC04	P04	3	B10-B12
Extracted Aggregate Gradation of Aggregate	AG04	P14	3	B10-B12

Table 9(Cont) Field and Laboratory Material Testing

Test Type	SHRP Test Desig.	SHRP Prot-ocol	Tests per Layer	Material Source /Test Location
Asphalt Treated Base (ATB) Type BM-3				
Core Exam /Thickness	AC01	P01	48	C15-C28, C35-C68
Bulk Specific Gravity	AC02	P02	48	C15-C28, C35-C68
Maximum Specific Gravity	AC03	P03	3	B13-B15
Asphalt Content (Extraction)	AC04	P04	3	B13-B15
Moisture Susceptibility	AC05	P05	3	B13-B15
Resilient Modulus	AC07	P07	3	C18-C20, C43-C45, C63-C65
Tensile Strength	AC07	P07	3	C18-C21, C43-C46, C63-C66
Nuclear Density		LTPP	48	T71-T94, T136-T159*
Extracted Aggregate				
Specific Gravity				
Coarse Aggregate	AG01	P11	3	B13-B15
Fine Aggregate	AG02	P12	3	B13-B15
Gradation of Aggregate	AG04	P14	3	B13-B15
Asphalt Cement				
Abson Recovery	AE01	P21	4	B13-B15
Penetration at 25C, 46C	AE02	P22	4	B13-B15
Specific Gravity at 16C	AE03	P23	4	B13-B15
Viscosity at 25C	AE04	P24	4	B13-B15
Viscosity at 60C, 135C	AE05	P25	4	B13-B15

Note * 24 Nuclear Gauge densities were taken at locations T71 - T94 at 1 83 m offset as planned Because of the segregation at this offset 24 additional Nuclear Gauge densities had to be taken at locations T136 - T159 at 1 22 m offset, where no segregation existed

Table 9(Cont) Field and Laboratory Material Testing

Test Type	SHRP Test Desig.	SHRP Prot-ocol	Tests per Layer	Material Source /Test Location
AC Surface (SM-2B) and Binder (IM-1A & IM-1B)				
Core Exam /Thickness	AC01	P01	74	C1-C80
Bulk Specific Gravity	AC02	P02	74	C1-C80
Maximum Specific Gravity	AC03	P03	7	B19-B25
Asphalt Content (Extraction)	AC04	P04	7	B19-B25
Moisture Susceptibility	AC05	P05	7	B19-B25
Creep Compliance	AC06	P06	3	C41, C47, C55
Resilient Modulus	AC07	P07	7	C9-C11,C18-C20,C29-C31,C43-C45, C57-C59,C63-C65,C69-C71
Tensile Strength	AC07	P07	7	C9-C12,C18-C21,C29-C32,C43-C46, C57-C60,C63-C66,C69-C72
Nuclear Density		LTPP	42	T95-T133, T160-T162*
Extracted Aggregate				
Specific Gravity				
Coarse Aggregate	AG01	P11	13	B19-B25
Fine Aggregate	AG02	P12	13	B19-B25
Gradation of Aggregate	AG04	P14	13	B19-B25
Asphalt Cement				
Abson Recovery	AE01	P21	7	B19-B25
Penetration at 25C, 46C	AE02	P22	7	B19-B25
Specific Gravity at 16C	AE03	P23	7	B19-B25
Viscosity at 25C	AE04	P24	7	B19-B25
Viscosity at 60C	AE05	P25	7	B19-B25
Asphalt Cement (from tanker)				
Penetration at 25C, 46C	AE02	P22	1	B26
Specific Gravity at 16C	AE03	P23	1	B26
Viscosity at 25C	AE04	P24	1	B26
Viscosity at 60C	AE05	P25	1	B26

Notes The surface layer of section 510114 was tested twice, T95-T97 on the first lift during September 1995 and T160-T162 on the second lift during March 1996

Sample B19 IM-1A Mix
Samples B20-B22 IM-1B Mix
Samples B23-B25 SM-2B Mix

Table 10 Dates of Construction of Layers/Lifts

Section ID and Layer Thicknesses (mm)	Treated Sub. Construction yy/mm/dd	DGAB Construction yy/mm/dd	AC PATB Paving yy/mm/dd	AC ATB Paving yy/mm/dd	AC BINDER Paving yy/mm/dd	AC TOP Paving yy/mm/dd
510114 305 DGAB 0 PATB 0 ATB 178 BIND & TOP	95/08/24 95/08/25	3 lifts 95/08/30 95/08/31 95/08/31	-	-	2 lifts 95/09/14 95/09/14	2 lifts 95/09/27 95/11/28
510121 305 DGAB 102 PATB 0 ATB 102 BIND & TOP	95/08/23	3 lifts 95/08/29 95/08/29 95/08/29	95/09/12	-	95/09/14	95/09/27
510120 203 DGAB 102 PATB 0 ATB 102 BIND & TOP	95/08/23	2 lifts 95/08/28 95/08/28	95/09/12	-	95/09/14	95/09/27
510159 203 DGAB 102 PATB 140 ATB 89 BIND & TOP	95/08/23	2 lifts 95/08/28 95/08/28	95/08/31	95/09/05	95/09/08	95/09/27
510119 102 DGAB 102 PATB 0 ATB 178 BIND & TOP	95/08/22	95/08/25 95/08/28	95/08/31	-	2 lifts 95/09/08 95/09/11	95/09/26
510122 0 DGAB 102 PATB 102 ATB 102 BIND & TOP	95/08/22	-	95/08/29 (Geotextile)	95/08/30	95/09/08	95/09/26
510123 0 DGAB 102 PATB 203 ATB 178 BIND & TOP	95/08/21 95/08/22	-	95/08/29 (Geotextile)	2 lifts 95/08/30 95/09/05	2 lifts 95/09/08 95/09/11	95/09/26
510124 0 DGAB 102 PATB 305 ATB 178 BIND & TOP	95/08/21	-	95/08/29 (Geotextile)	3 lifts 95/08/30 95/09/05 95/09/06	2 lifts 95/09/08 95/09/11	95/09/26
510116 0 DGAB 0 PATB 305 ATB 102 BIND & TOP	95/08/21	-	-	3 lifts 95/08/25 95/09/01 95/09/06	95/09/07	95/09/26
510115 0 DGAB 0 PATB 203 ATB 178 BIND & TOP	95/08/20	-	-	2 lifts 95/08/25 95/09/05	2 lifts 95/09/07 95/09/11	95/09/26
510117 102 DGAB 0 PATB 102 ATB 178 BIND & TOP	95/08/20	95/08/23	-	95/08/28	2 lifts 95/09/07 95/09/11	95/09/26
510118 102 DGAB 0 PATB 203 ATB 102 BIND & TOP	95/08/19 95/08/20	95/08/22	-	2 lifts 95/08/28 95/09/01	95/09/07	95/09/26
510113 203 DGAB 0 PATB 0 ATB 102 BIND & TOP	95/08/19	2 lifts 95/08/22 95/08/22	-	-	95/09/07	95/09/26

Notes

Treated Sub	Stabilized Subgrade Layer with 10% by Volume of Hydraulic Cement
DGAB	Unbound Type 1 #21-B Dense Graded Aggregate Base Layer
AC PATB	Asphalt Concrete Open Graded Type 1 Permeable Asphalt Treated Base Layer
AC ATB	Asphalt Concrete Dense Graded BM-3 Asphalt Treated Base Layer
AC BINDER	Asphalt Concrete Dense Graded IM-1A and IM-1B Binder Layer
AC TOP	Asphalt Concrete Dense Graded SM-2B Surface Layer

Table 11 Agency Measurements for Depth of Treated Subgrade Layer

Date dd mmm yy	Construction Station	Experiment Section	Experiment Station	Depth mm @ Offset -2.44 m	Depth mm @ Offset 0.00 m	Depth mm @ Offset 2.44 m
19 Aug 95	552+00	**510113**	**5+00**	150	**173**	**142**
	557+00	**510113**	**0+00**	127*	**145**	**132**
	562+00	510118	5+450	127*	165	127*
	567+00	**510118**	**4+50**	132	**168**	**130**
20 Aug 95	572+00	510118	0-50	130	137	127
	577+00	**510117**	**2+00**	165	**165**	**145**
	582+00	510115	5+150	132	150	137
	587+00	**510115**	**1+50**	157	**130**	**127***
21 Aug 95	592+00	510115	0-350	140	130	155
	597+00	**510116**	**4+00**	157	**165**	**157**
	602+00	510116	0-100	157	140	152
	607+00	**510124**	**4+50**	147	**135**	**150**
	612+00	510124	0-50	160	155	173
22 Aug 95	617+00	**510123**	**2+50**	130	**127***	**175****
	622+00	510122	5+150	155	157	147
	627+00	**510122**	**1+50**	150	**145**	**157**
	632+00	**510119**	**4+50**	132	**132**	**132**
	637+00	510119	0-50	130	137	135
23 Aug 95	642+00	**510159**	**1+50**	142	**142**	**150**
	647+00	**510120**	**4+00**	163	**145**	**147**
	652+00	510120	0-100	137	135	140
	657+00	**510121**	**2+00**	155	**152**	**160**
24 Aug 95	662+00	510121	0-300	147	145	175**
	667+00	510121	0-800	160	127*	137
	672+00	510114	5+1000	145	150	165
	677+00	510114	5+500	157	168	152
	682+00	**510114**	**5+00**	163	**170**	**163**
25 Aug 95	687+00	**510114**	**0+00**	155	**168**	**160**
	692+00	510114	0-500	147	157	163
	695+00	510114	0-800	147	150	155

Notes * Minimum Soil Cement Treated Subgrade Layer measured = 127 mm
** Maximum Soil Cement Treated Subgrade Layer measured = 175 mm
Required Soil Cement Treated Subgrade Layer as per VDOT Specifications = 152 ± 25 mm
Experiment Stations **(in Bold)** are inside the section.
All others are related to the "0" or "5" of the section.
Offset readings are measured from the edge of pavement, negative means in the shoulder

Table 12 Agency Density and Moisture Content of Treated Subgrade Layer

				One-Point Proctor				Nuclear Embankment Densities (Unit Masses)			
Date	Construction Station	Experiment Section & Station	Offset from EOP (m)	Wet Density (Unit Mass) kg/m³	% Moist. Cont. from Speedy Chart	Max Dry Density (Unit) (Mass) kg/m³	% Optim. Moist. Cont.	Wet Density (Unit Mass) kg/m³	Dry Density (Unit Mass) kg/m³	% Moist.	% Density (Unit Mass)
950819	553+50	510113 3+50	-2 74 should	1893	22 6	1560	22 7	1860	1520	22 3	97.4
	560+00	510113 0-300	-0 61 should	1884	22 3	1560	22 7	1853	1501	23 5	96.2
	566+00	510118 5+50	2 13	2018	13 9	1756	16 4	1996	1732	15 2	98 7
950820	573+50	510117 5+50	-2 74 should	2062	14 4	1794	15 3	2009	1717	16 9	95 7
	580+00	510117 0-100	-0 61 should	1994	17 7	1716	17 6	1980	1635	21 1	95 3
	586+00	**510115 2+50**	**2.13**	**2014**	**12.4**	**1836**	**14.1**	**2103**	**1826**	**15.2**	**99.5**
	593+50	510116 5+250	-2 74 should	2052	14 4	1794	15 3	1977	1714	15 4	95 5
950821	599+00	510116 2+00	-0 61 should	1994	13 9	1794	15 3	1983	1733	14 4	96 6
	606+00	510124 5+50	2 13	2018	13 9	1794	15 3	1946	1730	12 5	96 4
	613+50	510123 5+100	-2 44 should	2004	13 9	1794	15 3	1972	1746	13 0	97 3
950822	619+00	510123 0+50	-0 61 should	1985	13 9	1794	15 3	2017	1780	13 3	99 2
	628+25	**510122 0+25**	**2.13**	**2090**	**13.4**	**1836**	**14.1**	**2010**	**1773**	**13.4**	**96.6**
	633+00	510119 3+50	-3 05 should	2071	13 7	1836	14 1	1946	1746	11 6	95 1
950823	639+50	510159 4+00	-1 22 should	2033	13 7	1794	15 3	1967	1748	12 5	97 4
	646+00	**510120 5+00**	**2.74**	**2023**	**14.7**	**1794**	**15.3**	**1956**	**1709**	**14.5**	**95.2**
	653+00	510121 5+100	-2 74 should	2018	13 9	1794	15 3	1985	1754	13 1	97 8
	658+50	**510121 0+50**	**0.00**	**1970**	**15.0**	**1756**	**16.4**	**1922**	**1690**	**13.8**	**96.2**
950824	665+00	510121 0-600	2 44	1889	14 7	1677	19 2	1967	1648	19 4	98 3
	672+00	510114 5+1000	-2 44 should	1908	15 8	1677	19 2	1927	1635	17 8	97 5
	677+00	510114 5+500	-0 30 should	1951	16 4	1677	19 2	1890	1627	16 1	97 1
	684+00	**510114 3+00**	**1.83**	**1941**	**16.9**	**1677**	**19.2**	**1951**	**1660**	**17.5**	**99.0**
950825	691+00	510114 0-400	0 91	1903	16 6	1677	19 2	1909	1647	16 0	98 2
	694+00	510114 0-700	2 74	1898	16 4	1677	19 2	1959	1669	17 4	99 5

Notes Nuclear Gauge used is Troxler Model No 3440
Experiment Stations **(in Bold)** are inside the section
All others are related to the "0" or "5" of the section
Offset readings are measured from the edge of pavement, negative means in the shoulder

Table 13 SPS-1 Nuclear Gauge In Situ Densities and Moisture Contents

		Bulk Sample Location			Station 1+00		Station 2+50		Station 4+00	
Section ID	**Offset (m)**	**Station**	**Density kg/m³**	**Moisture %**	**Density kg/m³**	**Moisture %**	**Density kg/m³**	**Moisture %**	**Density kg/m³**	**Moisture %**
510114 Treat Sub	1 5				1549	21 2	1597	19 2	1503	26.0
DGAB	1 8				2044	5 6	2060	5 5	2095	6 0
AC Surface	1 8				2187/2111		2153/2071		2164/2007	
510121 Subg/Emb	1 5	5+50	1834	11 7						
Treated Subg	1 5				1708	15 1	1674	11 3	1658	15 0
DGAB	1 8	0-35	2129	4 2	2114	4 6	2074	4 2	2097	5.1
AC Surface	1 8				2169		2095		2204	
510120 Treat. Sub	1 5				1603	16 8	1791	10 4	1752	12.7
DGAB	1 8	5+35	2127	4 9	2065	4 0	2089	4 2	2124	4 2
AC Surface	1 8				1956		2007		2108	
510159 Subg/Emb	1 5	5+50	1643	19 5						
Treated Subg	1 5				1640	15 2	1712	14 0	1695	16 7
DGAB	1 8				2114	4 2	2118	3 9	2015	3 6
ATB	1 8/1 2				2039/2134		2089/2175		2207/2228	
AC Surface	1 8				2177		2137		2177	
510119 Treat Sub	1 5				1382	24 9	1621	13 7	1664	16 0
DGAB	1 8				2049	5 3	2076	4 6	1957	5 3
AC Surface	1 8				2129		2082		2146	
510122 Subg/Emb	1 5	5+50	1825	12 9						
Treated Subg	1 5				1698	14 6	1679	17 7	1775	11 4
ATB	1 8/1 2				2001/2180		2127/2180		2150/2209	
AC Surface	1 8				2087		2049		2137	
510123 Treat Sub	1 5				1740	12 3	1701	10 4	1716	12.3
ATB	1 8/1 2				1945/2169		1975/2151		1985/2146	
AC Surface	1 8				2169		2148		2103	
510124 Subg/Emb	1 5	5+50	1812	10 1						
Treated Subg	1 5				1775	13 5	1728*	20 0*	1634	14.6
ATB	1 8/1 2				2209/2047		2121/2081		2180/2162	
AC Surface	1 8				2100		2158		2111	
510116 Treat Sub	1 5				1775	15 0	1671	15 6	1695	17 1
ATB	1 8/1 2				2182/2223		2145/2203		2129/2207	
AC Surface	1 8				2151		2074		2137	
510115 Subg/Emb	1 5	4+75	1768	13 8						
Treated Subg	1 5				1773	16 2	1740	12 0	1652	18 2
ATB	1 8/1 2				2025/2119		2105/2140		1988/2132	
AC Surface	1 8				2180		2138		2159	
510117 Treat Sub	1 5				1392	31 2	1552	22 7	1658	14 8
DGAB	1 8	0-35	1866	5 9	2007	6 3	2026	5 9	1983	5 0
ATB	1 8/1 2				2007/2233		1998/2151		2078/2062	
AC Surface	1 8				2140		2162		2179	
510118 Subg/Emb	1 5	5+50	1816	15 1						
Treated Subg	1 5				1695	15 7	1704	16 6	1674	17.6
DGAB	1 8				1969	4 9	1989	5 5	2026	4 6
ATB	1 8/1 2				2052/2175		2074/2185		2066/2201	
AC Surface	1 8				2219		2166		2187	
510113 Treat. Sub	1 5				1610**	23 3**	1531	22 7	1422	27.6
DGAB	1 8				2073	4 7	2081	4 0	2042	4 3
AC Surface	1 8				2065		2145		2076	

Notes *Station 2+17

**Offset 2 1 m

Densities for the ATB and Surface Layers are measured in the Back Scatter Method

Moisture and Density for Unbound Layers are measured in the Direct Transmission Method

Rod Depth is 152 mm for the Subgrade/Embankment and Treated Subgrade Layers and 102 mm (Sections 13,17,18,19) and 203 mm (Sections 14,20,21,59) for the DGAB Layer

For the ATB layer, segregation was quite obvious at 1 8 m offset, additional densities were taken at 1 2 m offset Offset readings are measured from the edge of pavement

Troxler Thin Layer Density Gauge 4640B was used for the Surface and 3440 for all other layers.

Table 14 Asphalt Concrete Laydown Temperatures During Paving - °C

Section ID	PATB	ATB			BINDER		TOP
		1st lift	2nd lift	3rd lift	1st lift	2nd lift	
510114	-	-	-	-	6 temp * 113-146	5 temp * all 138	5 temp * 138-141 plant 146 loaded138
510121	11 temp 141-146	-	-	-	6 temp 138-146	-	4 temp 132-141 plant 138
510120	10 temp 135-143 plant 143 hopper149	-	-	-	6 temp 124-135 plant 152 loaded135	-	4 temp 132-138 plant 138
510159	9 temp 143-166 plant 149 loaded146	14 temp 135-143	-	-	6 temp 138-143	-	5 temp 138-141
510119	10 temp 138-163 plant 159 hopper163	-	-	-	7 temp 132-143	7 temp 127-141	4 temp 143-149
510122	10 temp 143-166	8 temp 132-143 plant 141 pvmt 132	-	-	7 temp 135-143	-	4 temp 141-152
510123	10 temp 149-163	11 temp 127-141	10 temp 127-143 plant 138	-	8 temp 129-138 plant 135	6 temp 127-143	5 temp 141-143
510124	10 temp 135-160 plant 157 pvmt 149	11 temp 127-146 plant 141	10 temp 129-135	10 temp 129-146 plant 146 loaded138	8 temp 129-141	5 temp 129-141	4 temp 141-143
510116	-	7 temp 141-145	11 temp 129-138 plant 143	10 temp 132-143 plant 146 loaded141 pvmt 135	7 temp 132-143 plant 143 loaded138	-	4 temp 141-143
510115	-	7 temp 141-146 plant 149	11 temp 127-135 plant 139	-	7 temp 135-143	5 temp 141-143	5 temp 138-154 plant 163
510117	-	10 temp 135-141 plant 146 pvmt 141	-	-	6 temp 138-143	6 temp 129-135 plant 143 loaded132	5 temp 132-152 hopper146
510118	-	10 temp 129-141 plant 138	9 temp 129-138 plant 154	-	6 temp 135-143	-	5 temp 141-143
510113	-	-	-	-	9 temp 135-143	-	4 temp 121-138 plant 154

Notes Air temperature and weather conditions, during paving, are summarized in Table 15
* These numbers indicate the number of times the temperature was recorded per layer/lift
All temperature measurements (except those specified) are from the hauling trucks
Plant temperature is measured from the plant before loading to the trucks. Loaded temperature is measured in the plant while loading to the trucks Hopper temperature is taken in the paver hopper. Pavement (pvmt) temperature is measured on the paved surface right after paving.

Table 15. Paving Dates, Times, Locations, Thicknesses, and Weather Conditions

Date dd mmm yy	Time	Section ID	AC Layer	Lift Number	Thick (mm)	Air Temp. °C-Time	Weather
25 Aug 95	1915-2042	510115	ATB	1st lift	102		Night
	2200-2330	510116	ATB	1st lift	102		Paving
28 Aug 95	1930-2040	510118	ATB	1st lift	102		Night
	2253-2400	510117	ATB	only lift	102	21-0015	Paving
29 Aug 95	1945-2105	510124	PATB	only lift	102		Night
	2149-2258	510123	PATB	only lift	102	27-2315	Paving
	0023-0354	510122	PATB	only lift	102		
30 Aug 95	1925-2046	510124	ATB	1st lift	102		Night
	2253-0130	510123	ATB	1st lift	102		Paving
	0300-0430	510122	ATB	only lift	102	21-0300	
31 Aug 95	0121-0250	510119	PATB	only lift	102	21-0244	Night
	0300-0430	510159	PATB	only lift	102		Paving
01 Sep 95	2138-2252	510118	ATB	2nd lift	102		Night
	0058-0207	510116	ATB	2nd lift	102	18-0200	Paving
							Rain*
05 Sep 95	2046-2145	510115	ATB	2nd lift	102	22-2120	Night
	2250-2358	510124	ATB	2nd lift	102	18-0007	Paving
	0027-0125	510123	ATB	2nd lift	102	16-0100	
	0200-0317	510159	ATB	only lift	140	14-0229	
06 Sep 95	2355-0054	510116	ATB	3rd lift	102	19-0007	Night
	0138-0250	510124	ATB	3rd lift	102		Paving
07 Sep 95	2100-2157	510113	Binder	only lift	64	18-2145	Night
	2304-2345	510118	Binder	only lift	64		Paving
	2350-0030	510117	Binder	1st lift	64		
	0055-0142	510115	Binder	1st lift	64		
	0236-0306	510116	Binder	only lift	64		
08 Sep 95	1841-1912	510124	Binder	1st lift	64		Night
	1938-2023	510123	Binder	1st lift	64		Paving
	2053-2132	510122	Binder	only lift	64		
	2152-2234	510119	Binder	1st lift	64		
	2311-2339	510159	Binder	only lift	51	17-2320	

Notes * Few rain drops while paving 2nd lift of ATB on section 510118 on 01 Sep 95 from station 3+00 to 0+00, pavement surface damp in some spots Same night, heavy rain after 0300 after midnight

VDOT allows only paving of loads on hauling trucks during rain

PATB -Asphalt Concrete Open Graded Type 1 Permeable Asphalt Treated Base Layer

ATB -Asphalt Concrete Dense Graded BM-3 Asphalt Treated Base Layer

Binder -Asphalt Concrete Dense Graded IM-1A and IM-1B Binder Layer

Surface -Asphalt Concrete Dense Graded SM-2B Surface Layer

Table 15(Cont) Paving Dates, Times, Locations, Thicknesses, and Weather Conditions

Date dd mmm yy	Time	Section ID	AC Layer	Lift Number	Thick (mm)	Air Temp. °C-Time	Weather
11 Sep 95	1830-1905	510117	Binder	2nd lift	64	20-1920	Night Paving
	1937-2002	510115	Binder	2nd lift	64		
	2029-2046	510124	Binder	2nd lift	64		
	2059-2145	510123	Binder	2nd lift	64		
	2221-2246	510119	Binder	2nd lift	64	18-2236	
12 Sep 95	1910-2020	510120	PATB	only lift	102	19-1945	Night Paving
	2042-2203	510121	PATB	only lift	102	16-0938	
14 Sep 95	1907-1954	510114	Binder	1st lift	64	23-2010	Night Paving
	2044-2106	510120	Binder	only lift	64		
	2119-2216	510121	Binder	only lift	64	22-2121	
	2236-2256	510114	Binder	2nd lift	64		
26 Sep 95	0954-1009	510113	Surface	only lift	38	15-0924	Day Paving Rain*
	1104-1124	510118	Surface	only lift	38		
	1132-1218	510117	Surface	only lift	51		
	1234-1255	510115	Surface	only lift	51	18-1257	
	1349-1402	510116	Surface	only lift	38	19-1403	
	1444-1505	510124	Surface	only lift	51	18-1421	
	1512-1526	510123	Surface	only lift	51		
	1603-1620	510122	Surface	only lift	38		
	1634-1708	510119	Surface	only lift	51	18-1635	
27 Sep 95	0837-0911	510159	Surface	only lift	38	13-0906	Day Paving
	0919-0934	510120	Surface	only lift	38		
	0952-1021	510121	Surface	only lift	38	16-0959	
	1255-1314	510114	Surface	1st lift	51	18-1251	
28 Nov 95		510114	Surface	2nd lift**	38		Day Paving

Notes
* Light rain while paving Surface Layer on section 510117 on 26 Sep 95
** Section 510114 was shy of design by 38 mm and thus a second lift of the Surface Layer was paved on 28 Nov 95 to compensate for the shy AC thickness
VDOT allows only paving of loads on hauling trucks during rain
PATB -Asphalt Concrete Open Graded Type 1 Permeable Asphalt Treated Base Layer
ATB -Asphalt Concrete Dense Graded BM-3 Asphalt Treated Base Layer
Binder -Asphalt Concrete Dense Graded IM-1A and IM-1B Binder Layer
Surface -Asphalt Concrete Dense Graded SM-2B Surface Layer

Table 16 Core Thicknesses from the Field Material Sampling and Testing Forms

		Before Section Station 0-25		After Section Station 5+25		Design Specs H ± 19 mm (ATB ± 12 mm-AC ± 7 mm)		
Section ID	**Offset m**	**Core #**	**Thickness H mm**	**Core #**	**Thickness H mm**	**Thickness H mm**	**Lower Limit**	**Upper Limit**
510114	1 83	CA01	142**	CA03	127**	178	171	185
	0 91	CA02	152**	CA04	142**			
510114	1 83	CA77*	198**	CA79*	163**	178	171	185
	0 91	CA78*	191**	CA80*	175			
510121	1 83	CA05	91**	CA07	97	102	95	109
	0 91	CA06	102	CA08	107			
510120	2 29	CA09	107			102	95	109
	1 83	CA10	107	CA13	99			
	1 37	CA11	107					
	0 91	CA12	109	CA14	99			
510159	1 83	CA15*	231	CA26*	216	229	210	248
	1 37	CA16*	234	CA27*	221			
	0 91	CA17*	239	CA28*	224			
	2 29	CA18	226	CA22	216			
	1 83	CA19	234	CA23	216			
	1 37	CA20	236	CA24	226			
	0 91	CA21	234	CA25	226			
510119	2 29	CA29	163**			178	171	185
	1 83	CA30	168**	CA33	157**			
	1 37	CA31	170**					
	0 91	CA32	175	CA34	170**			
510122	1 83	CA35	198	CA37	208	203	184	222
	0 91	CA36	206	CA38	211			
510123	1 83	CA75*	384	CA41	386	381	362	400
	0 91	CA40	391	CA42	389			
510124	2 29	CA43	472			483	464	502
	1 83	CA44	475	CA47	498			
	1 37	CA45*	485					
	0 91	CA46	475	CA48*	478			
510116	1 83	CA49	434**	CA51	447**	406	387	425
	0 91	CA50	434**	CA52	437**			
510115	1 83	CA53	378	CA55	386	381	362	400
	0 91	CA54	378	CA56	394			
510117	2 29	CA57	284			279	260	298
	1 83	CA58	287	CA61	272			
	1 37	CA59	287					
	0 91	CA60	284	CA62	277			
510118	2 29	CA63	295			305	286	324
	1 83	CA64	300	CA67	305			
	1 37	CA65	307					
	0 91	CA66	312	CA68	312			
510113	2 29	CA69	89**			102	95	109
	1 83	CA76*	97	CA73	102			
	1 37	CA71	97					
	0 91	CA72	102	CA74	99			

Notes * Cores CA15,16,17 Station 0-30, Cores CA26,27,28 Station 5+30,
Cores CA75,45,76 Station 0-24, Cores CA77,78 Station 0-20, Cores CA48,79,80 Station 5+20
** Outside specification thickness limits
Core measurements were done on site and may not be as representative as the thicknesses from the rod and level measurements (Table 17)
Coring dates are 07 Sep 95 for ATB layer of sections 510116 & 510124, 23-24 Oct 95 all others except for the second set of cores (CA77-CA80) on section 510114 taken on 13 Mar 96

Table 17 Layer Thicknesses from Rod and Level Elevations

		510124					510116			
Offset (meters)	Location	Spec Thick Station	102 mm PATB	305 mm ATB	127 mm BIND	51 mm SURF	Spec Thick Station	305 mm ATB	64 mm BIND	38 mm SURF
0	EOP	611+50	81	290	122	48	601+00	302	76	43
0 91	OWP		94	300	124	43		310	74	41
1 83	MID		97	302	127	41		320	71	46
2 74	IWP		112	302	122	41		320	66	43
3 66	CL		46	310	112	43		307	51	43
0	EOP	611+00	79	300	122	51	600+50	300	79	46
0 91	OWP		81	305	124	43		307	79	36
1 83	MID		91	305	124	43		320	74	36
2 74	IWP		104	305	117	41		335	64	30
3 66	CL		5	307	107	41		302	33	41
0	EOP	610+50	79	287	135	48	600+00	302	76	36
0 91	OWP		89	302	135	41		300	79	30
1 83	MID		97	305	135	41		310	74	33
2 74	IWP		107	310	124	41		323	74	30
3 66	CL		13	315	117	41		307	56	36
0	EOP	610+00	86	290	119	58	599+50	302	66	43
0 91	OWP		81	302	127	48		302	71	41
1 83	MID		89	315	124	48		302	76	33
2 74	IWP		102	320	117	48		323	74	28
3 66	CL		94	338	107	46		290	56	33
0	EOP	609+50	76	277	132	46	599+00	295	79	41
0 91	OWP		79	302	122	36		295	89	33
1 83	MID		91	305	119	36		302	91	33
2 74	IWP		104	307	112	41		323	91	28
3 66	CL		71	320	104	41		325	79	30
0	EOP	609+00	79	318	109	51	598+50	325	74	43
0 91	OWP		81	323	112	46		323	71	41
1 83	MID		97	320	117	43		325	74	41
2 74	IWP		102	318	112	46		325	76	36
3 66	CL		51	320	107	46		323	61	41
0	EOP	608+50	91	340	119	48	598+00	318	76	33
0 91	OWP		79	338	127	41		310	76	36
1 83	MID		66	333	127	36		315	81	41
2 74	IWP		94	323	119	43		320	79	36
3 66	CL		89	335	109	30		307	71	41
0	EOP	608+00	89	338	109	46	597+50	307	79	43
0 91	OWP		89	340	119	33		318	74	41
1 83	MID		97	338	112	41		320	81	36
2 74	IWP		109	330	112	41		330	76	43
3 66	CL		51	333	107	36		318	66	43
0	EOP	607+50	89	318	135	48	597+00	305	79	46
0 91	OWP		89	330	135	30		315	79	41
1 83	MID		94	333	124	33		323	76	43
2 74	IWP		104	325	119	36		333	74	41
3 66	CL		58	330	107	41		325	64	46
0	EOP	607+00	104	302	142	43	596+50	305	66	48
0 91	OWP		91	333	127	28		320	76	46
1 83	MID		97	335	117	33		330	76	48
2 74	IWP		102	325	112	30		325	76	46
3 66	CL		71	338	94	33		320	71	46
0	EOP	606+50	104	310	117	33	596+00	320	64	51
0 91	OWP		102	315	124	25		325	74	46
1 83	MID		112	315	119	25		330	74	46
2 74	IWP		117	320	104	25		330	76	41
3 66	CL		66	325	97	28		300	71	43
Average	AVG		86	317	119*	40*		315	73*	40
Minimum	MIN		5	277	94	25		290	33	28
Maximum	MAX		117	340	142	58		335	91	51
Std Dev	DEV		22	15	10	7		11	9	6

* Note Outside specification thickness (Spec Thick) limits of design thickness +/- 12 mm (DGAB and ATB) and +/- 7 mm (AC BIND+SURF)

Table 17(Cont) Layer Thicknesses from Rod and Level Elevations

	510114					510115				510113			
	Spec H	305 mm	127 mm	51 mm		Spec H	203 mm	127 mm	51 mm	Spec H	203 mm	64 mm	38 mm
Location	Station	DGAB	BIND	1st SU	RF 2nd	Station	ATB	BIND	SURF	Station	DGAB	BIND	SURF
EOP	687+00	295	104	46	21	588+50	239	97	61	557+00	188	66	48
OWP		300	112	46	24		229	107	48		193	66	48
MID		279	119	43	27		218	102	48		203	58	48
IWP		284	117	41	30		229	91	46		208	43	48
CL		287	117	33	40		213	94	48			28	51
EOP	686+50	290	109	30	30	588+00	216	109	51	556+50	203	56	56
OWP		292	109	28	37		213	112	46		201	56	51
MID		300	104	33	34		208	107	48		213	48	51
IWP		295	109	30	34		201	107	46		196	46	51
CL		274	119	28	37		218	81	48			36	56
EOP	686+00	279	102	41	24	587+50	216	107	46	556+00	198	61	46
OWP		305	86	41	24		208	117	43		203	61	43
MID		302	91	33	27		213	112	48		218	56	43
IWP		320	79	33	27		216	112	51		218	51	43
CL		318	89	30	30		229	102	56			43	46
EOP	685+50	310	104	43	30	587+00	241	112	56	555+50	196	58	46
OWP		305	94	46	30		239	117	56		203	56	48
MID		318	91	46	27		218	119	58		211	51	48
IWP		310	91	43	27		218	119	51		203	58	43
CL		295	102	36	34		224	117	51			51	41
EOP	685+00	295	119	30	30	586+50	229	124	46	555+00	203	61	43
OWP		315	109	33	30		218	122	46		211	56	43
MID		302	117	33	30		216	124	48		213	56	43
IWP		302	117	28	34		216	119	46		213	51	41
CL		302	109	33	34		213	109	46			46	41
EOP	684+50	287	124	33	30	586+00	224	124	56	554+50	198	74	33
OWP		295	117	36	30		226	124	46		188	61	43
MID		302	119	36	27		229	122	46		201	61	36
IWP		290	112	41	30		218	119	41		198	56	41
CL		269	122	41	30		208	109	43			56	46
EOP	684+00	310	109	28	27	585+50	216	117	51	554+00	185	74	46
OWP		310	109	33	27		218	124	46		185	71	46
MID		305	104	36	30		218	122	43		185	64	43
IWP		305	102	33	30		216	112	46		196	58	43
CL		310	102	33	37		226	107	46			43	43
EOP	683+50	307	104	36	30	585+00	211	132	48	553+50	213	81	41
OWP		323	104	33	40		216	124	46		203	79	33
MID		315	104	33	40		213	119	48		203	64	41
IWP		315	97	33	40		218	117	48		196	51	43
CL		302	104	33	46		229	109	43			58	48
EOP	683+00	290	91	46	40	584+50	203	132	46	553+00	208	81	33
OWP		315	91	43	37		211	112	46		196	71	33
MID		315	89	43	40		208	104	46		188	58	33
IWP		310	94	41	37		211	94	43		193	51	33
CL		300	109	36	37		213	81	46			33	43
EOP	682+50	290	104	43	37	584+00	218	122	56	552+50	198	94	36
OWP		310	94	46	37		224	124	43		208	76	30
MID		318	89	43	40		224	119	46		198	64	41
IWP		315	94	41	34		226	117	41		208	48	36
CL		300	107	36	43		208	102	43			48	43
EOP	682+00	333	109	36	27	583+50	213	137	46	552+00	193	74	30
OWP		323	109	36	30		208	137	43		201	64	30
MID		318	107	33	37		203	132	43		198	58	30
IWP		307	104	33	37		213	122	41		196	46	36
CL		290	102	36	43		213	107	43			56	43
AVG		303	105	37	33		218*	114*	47*		201	58	42
MIN		269	79	28	21		201	81	41		185	28	30
MAX		333	124	46	46		241	137	61		218	94	56
DEV		13	10	5	5		9	12	5		9	12	6

* Note Outside specification thickness (Spec Thick) limits of design thickness +/- 12 mm (DGAB and ATB) and +/- 7 mm (AC BIND+SURF)

Table 17(Cont) Layer Thicknesses from Rod and Level Elevations

	510121					510120				
	Spec H	305 mm	102 mm	64 mm	38 mm	Spec H	203 mm	102 mm	64 mm	38 mm
Location	Station	DGAB	PATB	BIND	SURF	Station	DGAB	PATB	BIND	SURF
EOP	659+00	287	109	66	36	651+00	224	102	74	36
OWP		315	104	58	36		203	112	74	28
MID		320	104	56	36		201	112	66	33
IWP		318	107	48	46		208	104	64	36
CL		323	109	43	51		208	107	56	43
EOP	658+50	300	112	71	43	650+50	198	117	76	25
OWP		320	107	61	36		201	109	74	18
MID		315	117	51	36		203	107	71	25
IWP		323	112	46	46		201	107	66	30
CL		315	119	36	46		193	109	61	36
EOP	658+00	307	107	66	43	650+00	196	117	71	41
OWP		315	107	64	41		203	107	74	30
MID		323	107	51	58		201	117	71	33
IWP		318	112	48	43		203	117	71	30
CL		318	119	36	51		196	122	71	30
EOP	657+50	300	104	66	46	649+50	157	97	81	36
OWP		307	104	61	41		196	91	74	36
MID		325	104	56	33		188	102	71	41
IWP		320	112	51	36		188	104	71	41
CL		333	122	43	43		180	117	64	43
EOP	657+00	305	109	71	51	649+00	193	127	81	28
OWP		320	109	64	43		165	140	79	25
MID		325	112	58	43		165	137	76	30
IWP		320	112	48	43		168	137	76	28
CL		302	119	43	46		163	147	64	30
EOP	656+50	302	112	71	43	648+50	185	104	76	41
OWP		330	104	64	33		185	104	74	33
MID		333	112	58	30		198	97	71	33
IWP		335	117	46	36		201	94	74	36
CL		368	89	43	41		193	102	74	46
EOP	656+00	315	102	74	48	648+00	196	112	74	30
OWP		333	97	66	41		198	109	71	30
MID		325	102	64	41		201	107	76	30
IWP		325	104	61	36		208	104	74	30
CL		320	109	51	43		188	119	76	41
EOP	655+50	305	112	66	56	647+50	229	97	76	33
OWP		310	117	61	46		208	109	74	30
MID		315	112	51	48		213	109	71	33
IWP		320	117	41	56		226	109	71	36
CL		307	127	41	51		257	104	71	33
EOP	655+00	310	107	66	43	647+00	196	117	81	18
OWP		315	107	58	36		211	109	71	20
MID		315	109	56	30		208	104	71	25
IWP		305	122	43	30		213	107	71	28
CL		305	127	33	36		211	107	61	36
EOP	654+50	310	109	71	43	646+50	203	102	76	28
OWP		315	102	61	36		196	104	74	33
MID		300	109	48	41		185	117	71	36
IWP		325	102	36	46		201	107	76	36
CL		295	117	33	46		208	107	76	43
EOP	654+00	320	102	71	43	646+00	185	104	86	33
OWP		320	104	64	36		203	102	74	33
MID		330	102	48	43		213	102	71	36
IWP		333	104	43	33		213	107	66	41
CL		325	112	36	41		201	117	66	48
AVG		317	109	54	42		199	110	72	33
MIN		287	89	33	30		157	91	56	18
MAX		368	127	74	58		257	147	86	48
DEV		13	7	12	7		17	11	5	6

* Note Outside specification thickness (Spec Thick) limits of design thickness +/- 12 mm (DGAB and ATB) and +/- 7 mm (AC BIND+SURF)

Table 17(Cont) Layer Thicknesses from Rod and Level Elevations

	510159						510119				
	Spec H	203 mm	102 mm	140 mm	51 mm	38 mm	Spec H	102 mm	102 mm	127 mm	51 mm
Location	Station	DGAB	PATB	ATB	BIND	SURF	Station	DGAB	PATB	BIND	SURF
EOP	643+50	198	81	168	64	30	636+50	107	102	152	30
OWP		180	104	152	48	30		112	104	137	30
MID		193	102	150	46	36		97	109	132	33
IWP		198	104	140	46	41		89	112	127	36
CL		185	122	137	48	36		66	122	122	33
EOP	643+00	198	94	152	46	41	636+00	91	122	150	28
OWP		183	104	147	46	36		94	122	137	25
MID		193	102	140	46	43		91	122	124	30
IWP		203	102	137	46	46		104	112	117	30
CL		178	122	132	58	36		104	122	104	33
EOP	642+50	183	104	157	51	30	635+50	102	104	140	30
OWP		180	104	150	51	30		107	107	132	33
MID		188	97	142	48	36		109	107	122	33
IWP		196	104	132	46	43		102	109	122	33
CL		188	112	132	46	43		91	122	117	33
EOP	642+00	183	91	152	56	25	635+00	81	109	150	41
OWP		178	104	140	56	28		104	135	104	36
MID		178	107	132	51	33		104	109	124	41
IWP		183	102	135	46	33		109	107	124	33
CL		170	107	135	43	41		109	112	124	36
EOP	641+50	188	76	157	56	30	634+50	91	112	135	36
OWP		183	94	140	51	30		102	107	127	33
MID		185	97	132	48	33		97	112	122	36
IWP		193	104	135	43	33		102	117	124	30
CL		170	109	132	43	36		89	127	122	33
EOP	641+00	183	86	147	71	30	634+00	112	107	135	43
OWP		193	91	135	66	28		107	112	127	36
MID		201	89	135	61	30		109	112	124	41
IWP		208	97	135	58	30		112	117	119	33
CL		198	94	135	51	36		117	122	107	36
EOP	640+50	188	86	150	58	43	633+50	112	109	135	41
OWP		185	102	140	56	36		117	102	135	41
MID		196	104	135	58	41		119	102	127	36
IWP		213	102	137	56	43		119	107	119	33
CL		196	102	142	51	48		109	112	117	33
EOP	640+00	188	86	150	58	30	633+00	97	119	132	43
OWP		193	94	135	58	28		109	107	124	43
MID		198	97	132	51	33		117	102	119	41
IWP		201	97	132	51	33		109	107	117	33
CL		178	112	127	56	33		74	122	109	33
EOP	639+50	188	102	163	46	30	632+50	94	117	147	30
OWP		183	102	147	46	30		94	109	142	28
MID		180	107	132	46	36		104	107	132	33
IWP		173	117	119	46	41		97	112	127	33
CL		142	122	119	48	36		117	109	124	41
EOP	639+00	198	97	135	64	33	632+00	81	107	132	48
OWP		198	102	127	61	30		89	109	127	41
MID		198	104	124	56	33		89	109	122	41
IWP		201	102	124	51	30		89	109	124	33
CL		183	109	124	48	28		61	137	122	33
EOP	638+50	203	102	142	58	41	631+50	94	107	137	51
OWP		211	102	132	56	36		104	107	124	48
MID		203	104	147	46	43		102	112	119	48
IWP		188	109	127	43	41		107	117	117	43
CL		163	124	127	41	33		89	124	119	41
AVG		189*	102	138	52	35		100	113	126	36*
MIN		142	76	119	41	25		61	102	104	25
MAX		213	124	168	71	48		119	137	152	51
DEV		12	10	11	7	5		13	8	11	6

* Note Outside specification thickness (Spec Thick) limits of design thickness +/- 12 mm (DGAB and ATB) and +/- 7 mm (AC BIND+SURF)

Table 17(Cont) Layer Thicknesses from Rod and Level Elevations

	510122					510123				
	Spec H	102 mm	102 mm	64 mm	38 mm	Spec H	102 mm	203 mm	127 mm	51 mm
Location	Station	PATB	ATB	BIND	SURF	Station	PATB	ATB	BIND	SURF
EOP	628+50	104	109	58	41	619+50	117	216	127	51
OWP		104	104	58	36		109	224	135	43
MID		104	97	58	41		122	213	142	43
IWP		117	94	58	43		119	213	132	43
CL		107	97	48	43		102	213	119	46
EOP	628+00	89	102	64	46	619+00	97	218	122	48
OWP		91	109	51	46		104	216	127	41
MID		94	107	56	46		112	213	122	41
IWP		107	109	48	43		119	211	112	36
CL		109	94	46	43		109	211	97	41
EOP	627+50	89	124	51	48	618+50	107	216	119	56
OWP		86	112	48	46		109	211	124	48
MID		97	107	43	48		119	203	122	46
IWP		104	107	36	46		119	208	112	43
CL		102	102	36	43		117	213	97	43
EOP	627+00	89	107	58	41	618+00	112	203	122	58
OWP		91	97	61	46		117	211	122	46
MID		112	81	58	46		122	201	117	48
IWP		109	89	51	43		107	201	107	46
CL		109	86	48	43		109	211	89	48
EOP	626+50	104	117	61	36	617+50	117	208	127	56
OWP		104	112	56	36		117	208	135	41
MID		104	109	46	46		112	208	127	41
IWP		109	109	41	43		119	203	122	41
CL		97	104	36	41		94	203	109	41
EOP	626+00	91	112	58	41	617+00	117	203	124	48
OWP		89	104	61	43		112	198	132	43
MID		107	97	56	46		112	188	135	46
IWP		119	97	48	43		117	185	124	41
CL		107	89	43	41		107	185	107	41
EOP	625+50	102	94	61	43	616+50	89	203	132	46
OWP		102	81	66	48		94	213	132	46
MID		94	86	61	51		94	203	124	43
IWP		97	86	56	51		102	201	107	41
CL		104	81	51	43		97	211	94	41
EOP	625+00	97	97	64	41	616+00	94	196	132	51
OWP		102	97	56	41		86	203	132	43
MID		97	104	48	41		97	198	132	41
IWP		104	104	51	33		112	196	127	33
CL		107	104	43	33		104	198	109	36
EOP	624+50	102	104	58	46	615+50	94	198	132	48
OWP		94	102	64	41		89	203	132	46
MID		94	94	61	43		94	201	135	36
IWP		107	86	58	41		107	201	122	36
CL		104	81	48	36		109	211	104	36
EOP	624+00	94	89	71	36	615+00	86	208	127	46
OWP		86	102	64	33		81	216	127	43
MID		91	94	61	41		94	203	132	43
IWP		102	86	58	43		104	196	127	43
CL		109	79	56	43		107	201	117	43
EOP	623+50	104	91	71	46	614+50	89	196	122	51
OWP		81	97	74	43		81	196	137	41
MID		86	102	66	46		91	196	135	46
IWP		102	86	66	46		104	196	132	41
CL		107	81	61	41		89	198	122	43
AVG		100	98	55	42		105	205	122*	44*
MIN		81	79	36	33		81	185	89	33
MAX		119	124	74	51		122	224	142	58
DEV		8	10	9	4		11	8	12	5

* Note Outside specification thickness (Spec Thick) limits of design thickness +/- 12 mm (DGAB and ATB) and +/- 7 mm (AC BIND+SURF)

Table 17(Cont) Layer Thicknesses from Rod and Level Elevations

	510117					510118				
Location	Spec H Station	102 mm DGAB	102 mm ATB	127 mm BIND	51 mm SURF	Spec H Station	102 mm DGAB	203 mm ATB	64 mm BIND	38 mm SURF
EOP	579+00	97	97	142	46	571+50	86	213	66	46
OWP		102	91	137	46		79	213	66	41
MID		97	94	135	48		79	201	64	43
IWP		102	97	132	46		91	193	56	48
CL			102	117	46		107	183	51	48
EOP	578+50	89	107	142	43	571+00	61	218	61	51
OWP		104	94	137	43		102	203	58	51
MID		97	94	137	46		94	198	56	51
IWP		109	94	132	41		97	188	46	58
CL			102	119	46		117	178	41	51
EOP	578+00	94	104	127	46	570+50	91	203	74	48
OWP		91	104	124	51		66	201	66	46
MID		89	97	127	56		81	193	58	46
IWP		94	94	122	51		97	193	48	48
CL			89	127	48		102	185	41	46
EOP	577+50	91	86	147	41	570+00	104	208	64	43
OWP		94	94	127	43		81	208	61	36
MID		104	94	122	51		86	196	58	43
IWP		109	97	112	48		81	188	56	46
CL			94	102	46		97	188	46	48
EOP	577+00	97	107	127	48	569+50	97	208	71	43
OWP		102	94	132	46		66	213	64	46
MID		107	97	124	48		66	211	61	46
IWP		112	97	119	43		79	198	56	46
CL			107	107	43		97	203	46	46
EOP	576+50	97	107	140	43	569+00	71	224	64	43
OWP		112	97	137	43		76	213	66	43
MID		104	104	127	43		76	208	64	46
IWP		107	104	124	41		79	201	66	48
CL			102	109	41		91	198	61	46
EOP	576+00	79	117	137	41	568+50	74	226	64	48
OWP		119	97	135	41		89	208	66	43
MID		107	104	132	43		76	211	64	46
IWP		109	102	127	46		86	198	61	46
CL			102	127	41		91	196	56	48
EOP	575+50	104	97	142	36	568+00	104	218	58	46
OWP		104	97	127	36		81	211	66	43
MID		104	104	119	41		89	208	64	43
IWP		97	107	109	46		86	196	64	41
CL			109	107	43		91	188	61	41
EOP	575+00	91	94	137	46	567+50	66	224	74	36
OWP		97	102	122	43		91	211	71	33
MID		94	107	112	46		102	198	64	36
IWP		117	102	112	46		102	196	61	36
CL			107	104	46		91	208	51	41
EOP	574+50	91	102	137	48	567+00	86	213	64	36
OWP		94	97	135	41		79	216	71	28
MID		86	109	122	43		79	211	71	33
IWP		91	109	117	41		89	203	61	41
CL			109	97	43		91	208	56	46
EOP	574+00	66	122	140	41	566+50	64	218	71	51
OWP		91	117	119	41		91	203	66	46
MID		89	119	112	43		94	196	66	46
IWP		86	122	117	36		94	201	64	41
CL			119	107	43		97	211	58	46
AVG		98	102	125	44*		87*	204	61	44
MIN		66	86	97	36		61	178	41	28
MAX		119	122	147	56		117	226	74	58
DEV		10	8	12	4		12	11	8	5

* Note Outside specification thickness (Spec Thick) limits of design thickness +/- 12 mm (DGAB and ATB) and +/- 7 mm (AC BIND+SURF)

Table 18 Summary of Average Thicknesses from Rod and Level Survey

Section ID	DGAB Design	DGAB Actual	PATB Design	PATB Actual	ATB Design	ATB Actual	AC (Bind+ Surf) Design	AC (Bind+ Surf) Actual	Total Design	Total Actual	Diff mm
510114	305	303	-	-	-	-	178	175	483	478	-5
510121	305	317	102	109	-	-	102	96	509	522	+13
510120	203	199	102	110	-	-	102	105	407	414	+7
510159	203	189*	102	102	140	138	89	87	534	516	-18
510119	102	100	102	113	-	-	178	162*	382	375	-7
510122	-	-	102	100	102	98	102	97	306	295	-11
510123	-	-	102	105	203	205	178	166*	483	476	-7
510124	-	-	102	86	305	317	178	159*	585	562*	-23
510116	-	-	-	-	305	315	102	113*	407	428*	+21
510115	-	-	-	-	203	218*	178	161*	381	379	-2
510117	102	98	-	-	102	102	178	169*	382	369	-13
510118	102	87*	-	-	203	204	102	105	407	396	-11
510113	203	201	-	-	-	-	102	100	305	301	-4

Thicknesses are in millimeters

* Did not meet the allowable thickness variations which are: DGAB ± 12 mm
ATB ± 12 mm
AC (Bind+Surf) ± 7 mm

Table 19 IRI Values from the Profilometer Survey After Construction

Section ID	Date Surveyed dd mmm yy	Average IRI of 5 Runs m/km
510114	24 Apr 96	0.938
510121	25 Apr 96	0 992
510120	24 Apr 96	1.087
510159	24 Apr 96	1 087
510119	24 Apr 96	0 960
510122	24 Apr 96	0 992
510123	24 Apr 96	0 943
510124	24 Apr 96	0 827
510116	24 Apr 96	0 982
510115	24 Apr 96	1.026
510117	25 Apr 96	0 976
510118	24 Apr 96	1 040
510113	24 Apr 96	0 968

Plots of Profilometer Elevations, Left Wheel Path and Right Wheel Path, are presented in Figures 13-25

Table 20 Rut Depth from the Dipstick Survey After Construction

Section ID	**After Construction 27-30 Nov 95** LWP Avg Rut Depth (mm)	**After Construction 27-30 Nov 95** RWP Avg Rut Depth (mm)	**After Construction 24-25 Apr 96** LWP Avg Rut Depth (mm)	**After Construction 24-25 Apr 96** RWP Avg Rut Depth (mm)
510114	1 2 mm	0 3 mm	2 0 mm	1.4 mm
510121	0 3 mm	0.5 mm		
510120	0 7 mm	0 4 mm		
510159	2.2 mm	1 8 mm		
510119*	1.2 mm	0.7 mm		
510122	1 6 mm	1 3 mm		
510123	1 6 mm	0 5 mm		
510124	1 1 mm	0 5 mm		
510116	1 0 mm	0 9 mm		
510115	2 3 mm	1 5 mm		
510117	2.6 mm	1 8 mm		
510118	1 8 mm	1.6 mm		
510113	1 0 mm	0 6 mm	1 6 mm	1 2 mm

Rut Depth Plots, Left Wheel Path (LWP) and Right Wheel Path (RWP), are presented in Figures 26-33
* Note No data at station 3+00 of section 510119

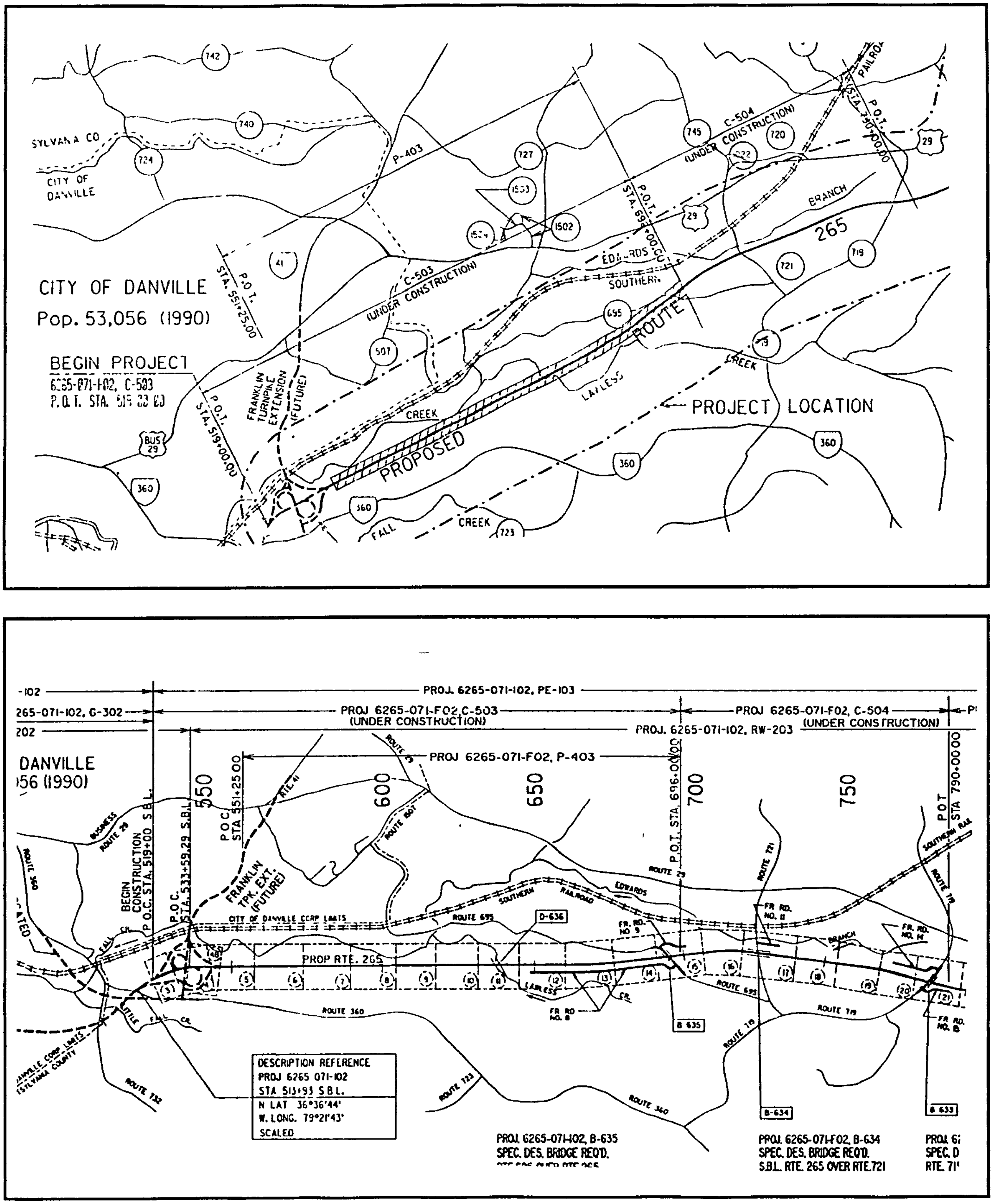


Figure 1 Site Location Maps - SPS Project 510100

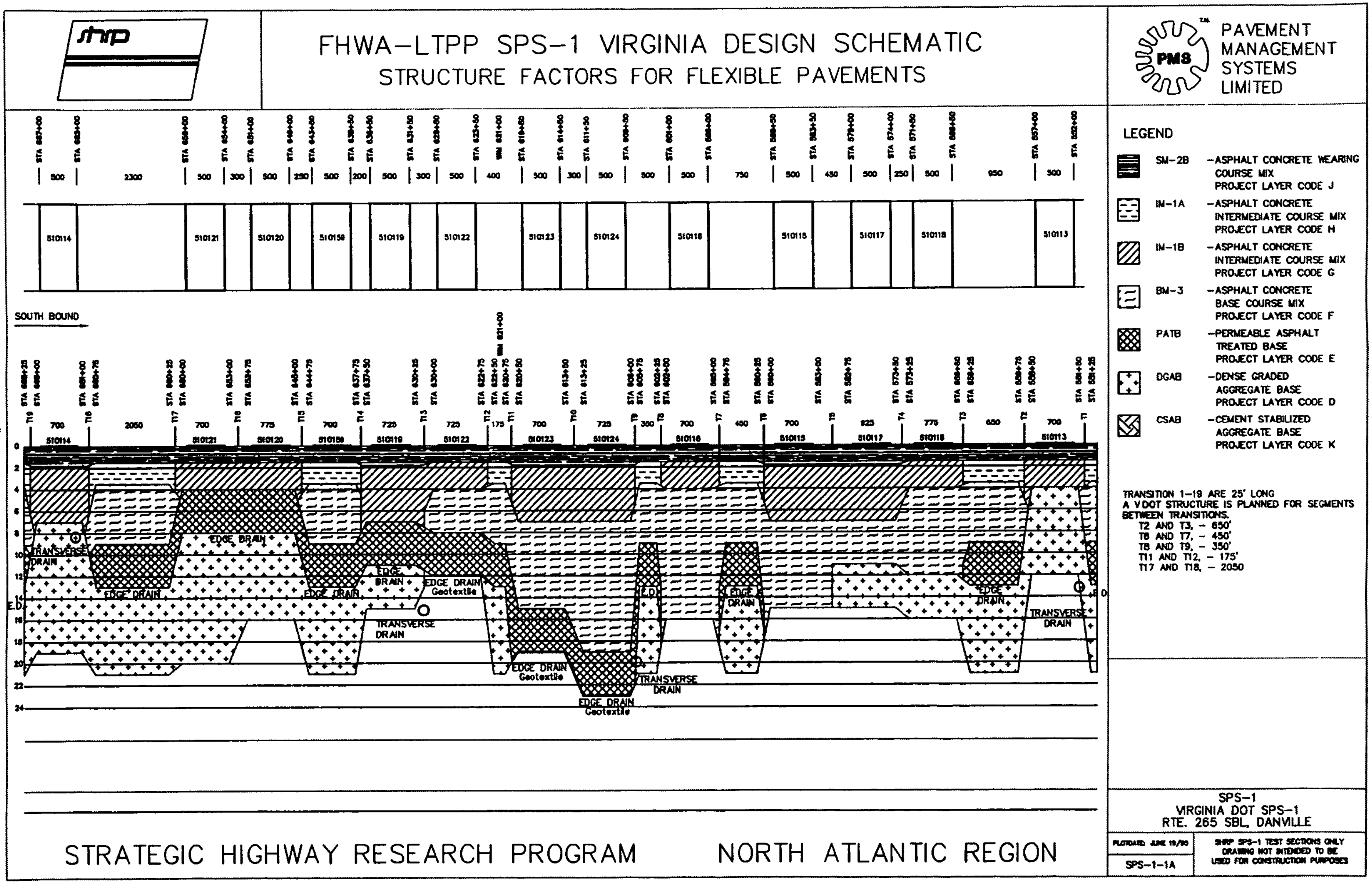


Figure 2 Virginia SPS-1 Project 510100 Design Schematic

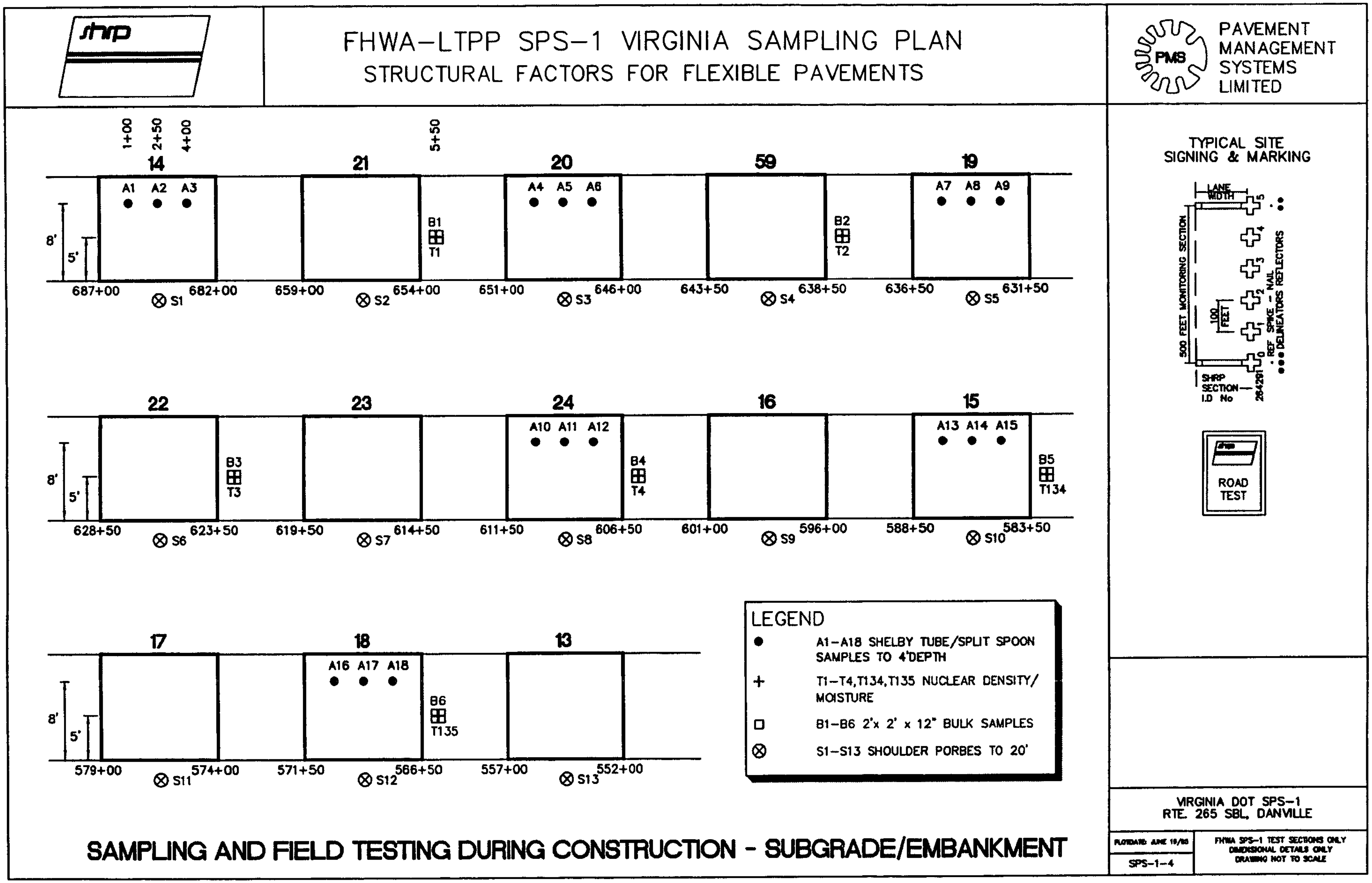


Figure 3 Field Material Sampling and Testing Plan - Subgrade/Embankment Layer

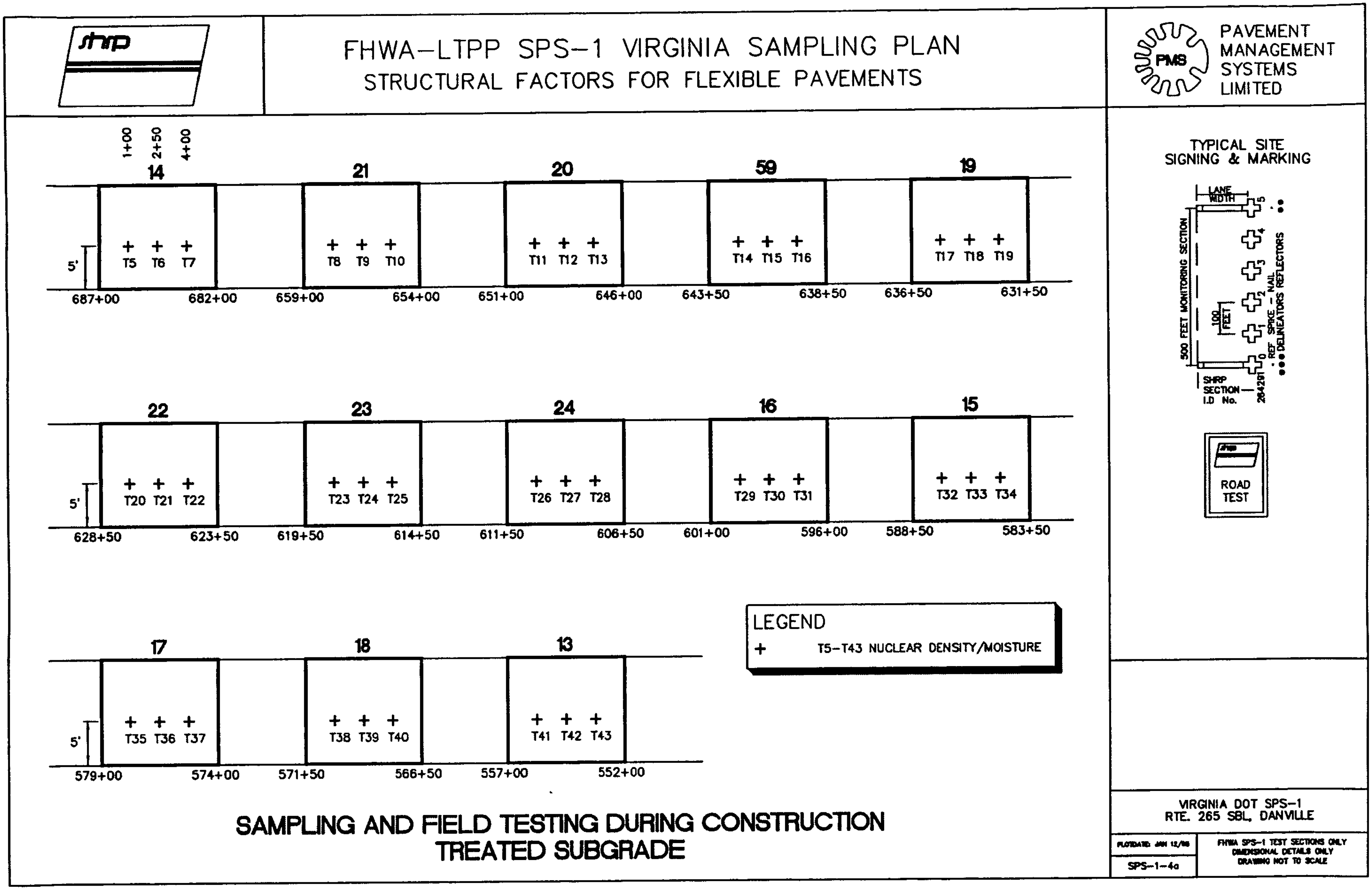


Figure 4 Field Material Sampling and Testing Plan - Treated Subgrade Layer

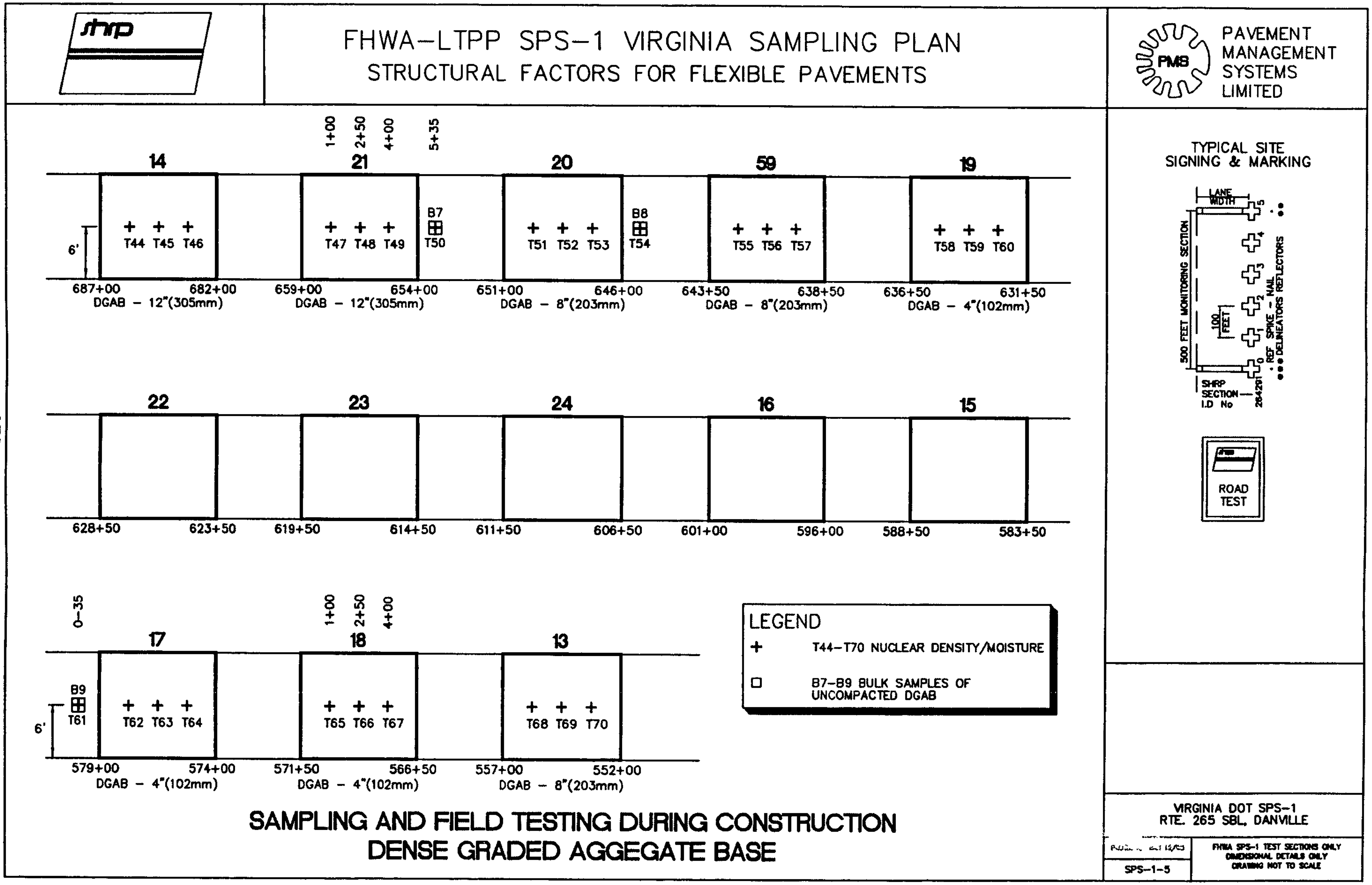


Figure 5 Field Material Sampling and Testing Plan - DGAB Layer

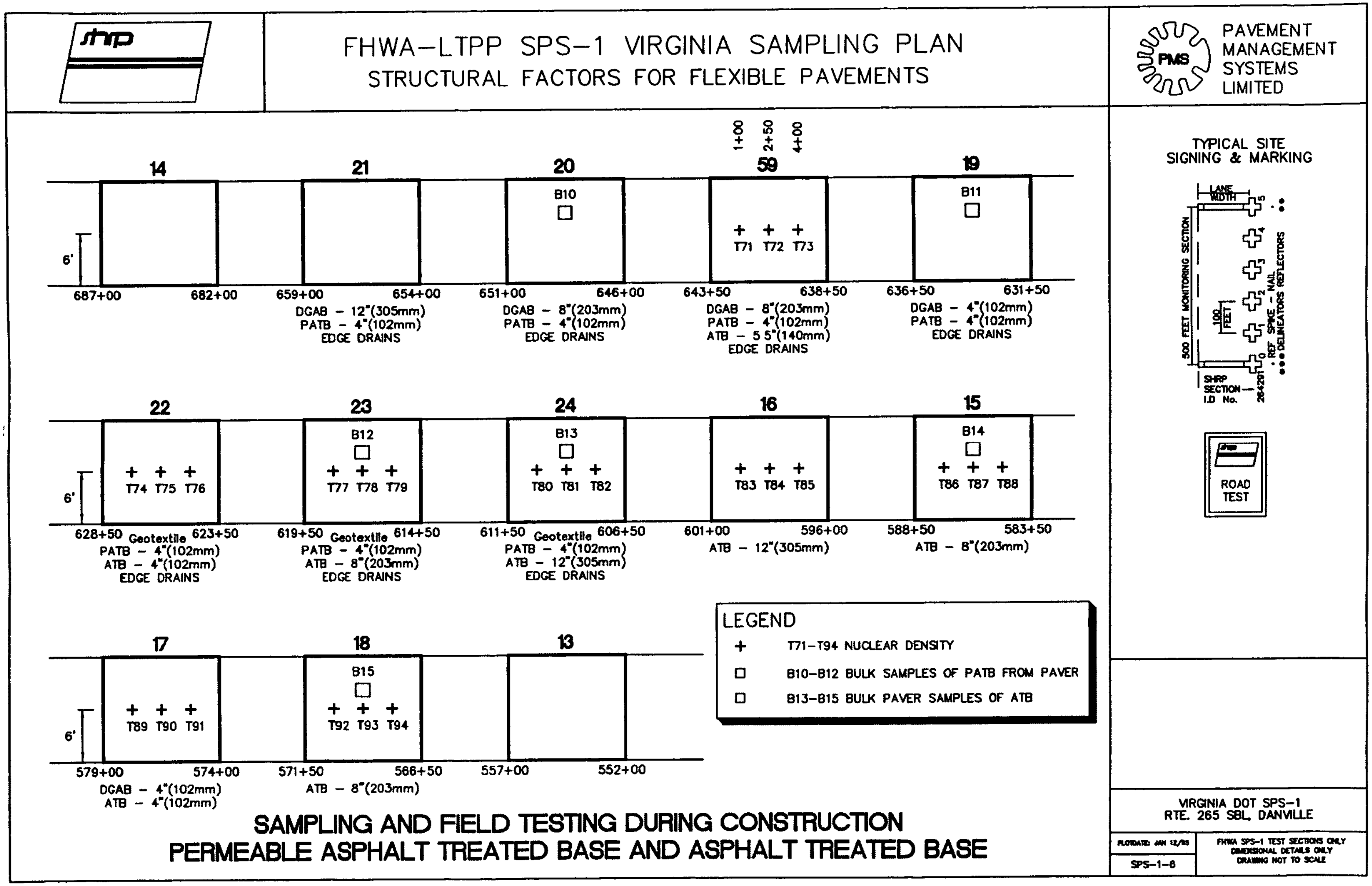


Figure 6 Field Material Sampling and Testing Plan - PATB and ATB Layers

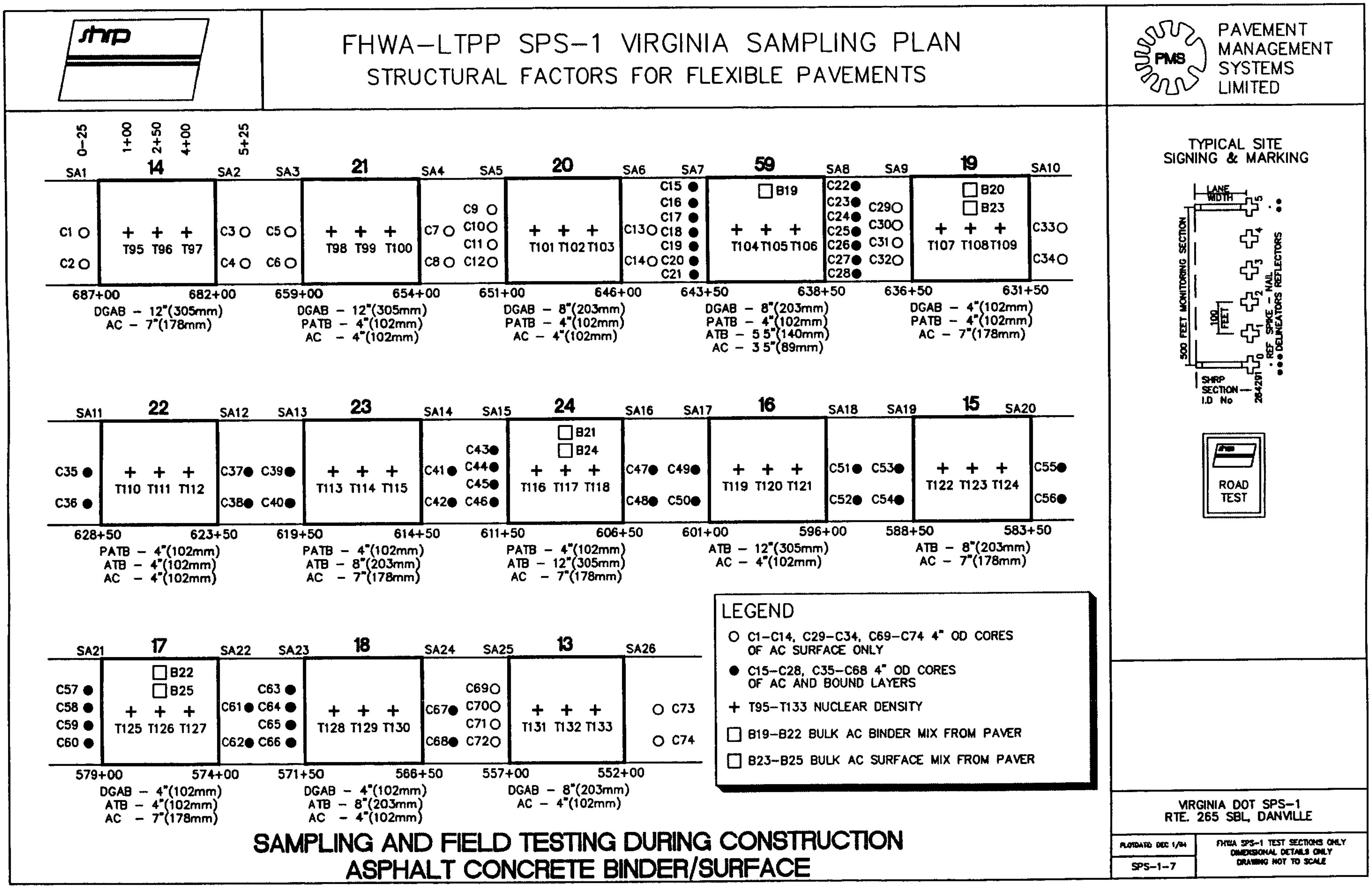
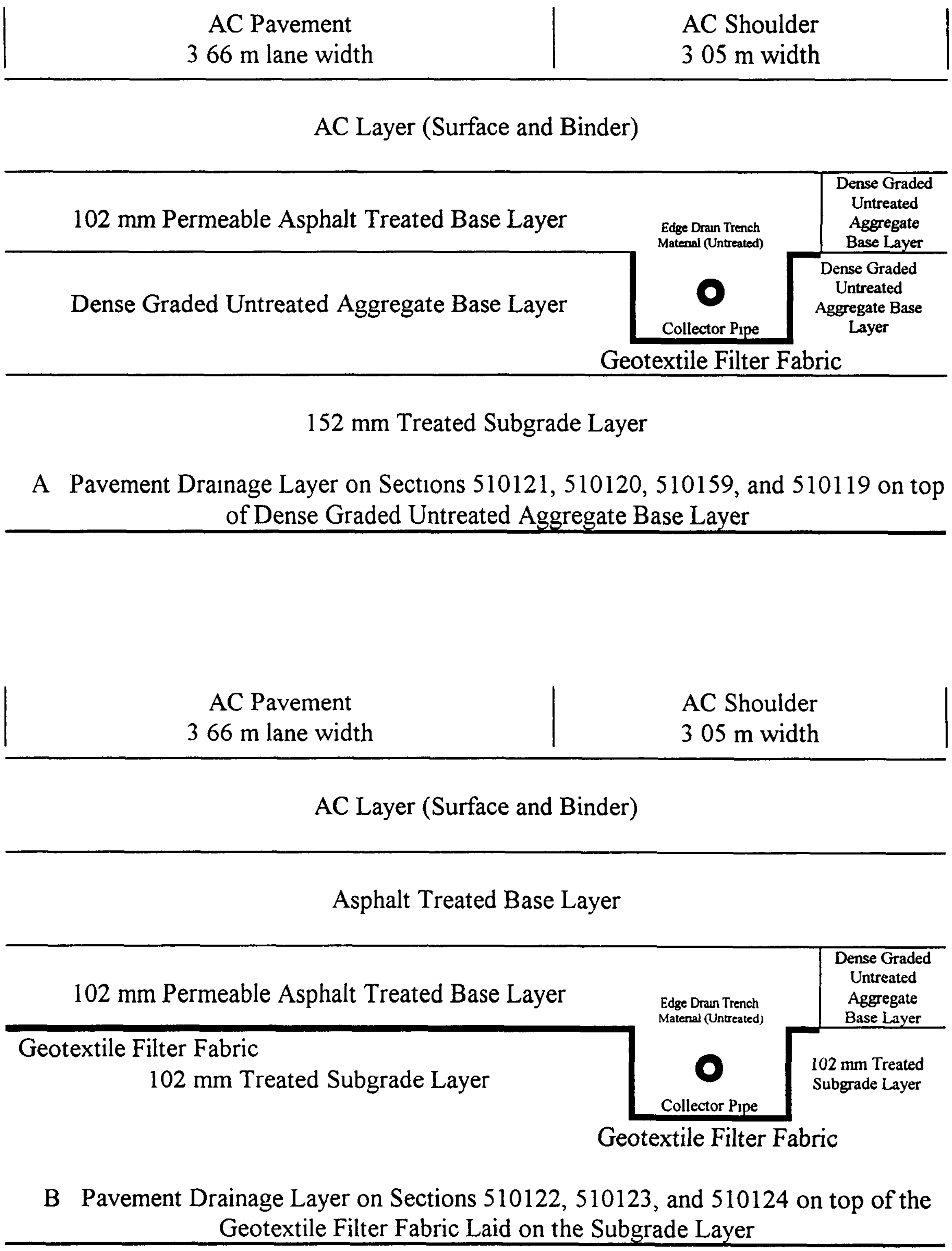


Figure 7 Field Material Sampling and Testing Plan - AC Binder and Surface Layers



Drawings not to scale
Collector Pipe not to scale
Cross Slope not shown in Drawings

Figure 8 Pavement Drainage System Details on SPS-1 Project 510100

North Bound
Outer Shoulder

<======== Route 265
North Bound
Traffic Direction

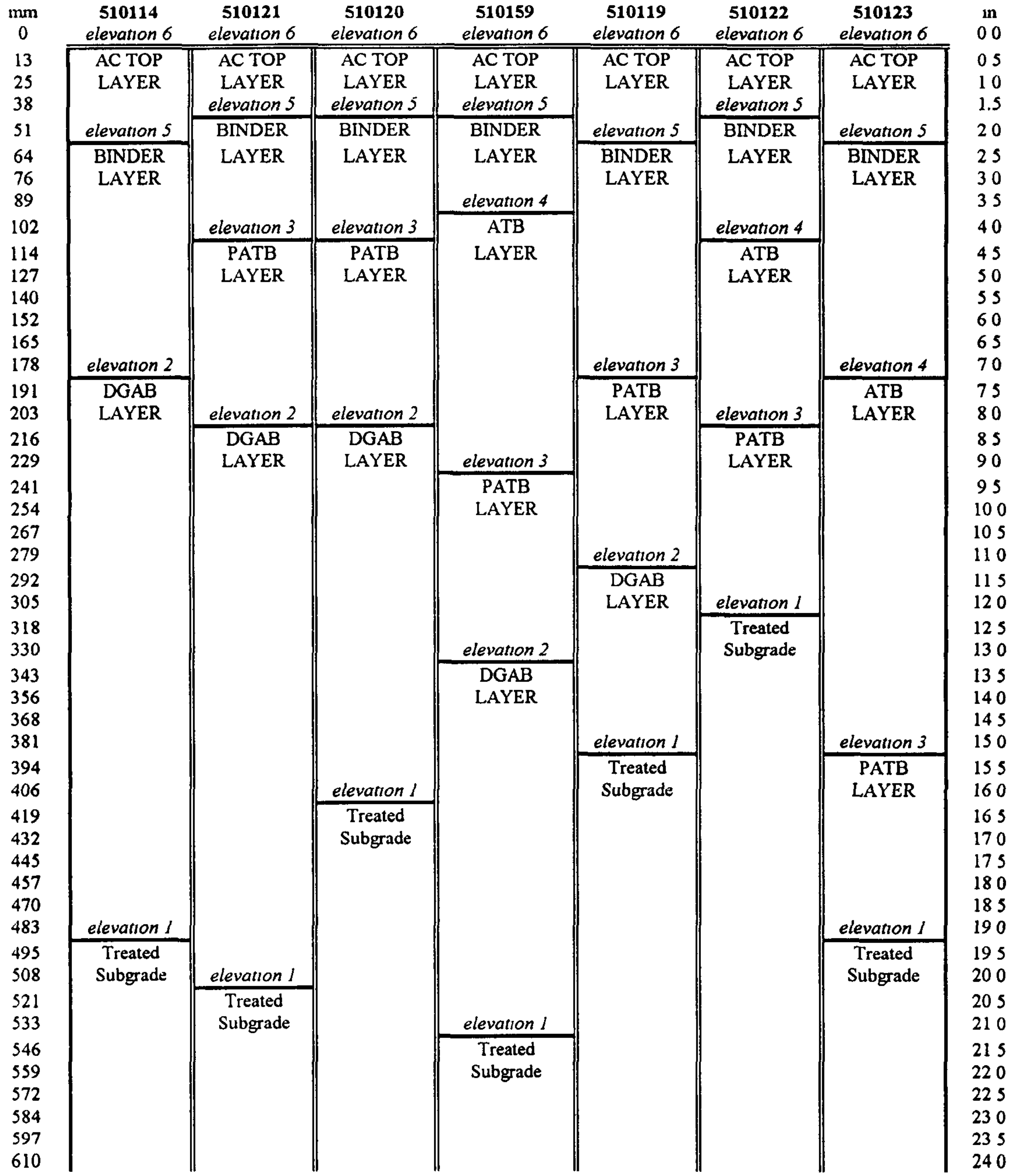
	0+00	0+50		1+00		1+50
x Centerline (CL)	x		x		x
x Inner Wheel Path (IWP)	x		x	Route 265	x
x Midlane (MID)	x	=========>	x	South Bound	x
x Outer Wheel Path (OWP)	x		x	Traffic Direction	x
x Edge of Pavement (EOP)	x		x		x

South Bound
Outer Shoulder

x Location of Elevation Measurement

EOP Offset	0 00 m
OWP Offset	0 91 m
MID Offset	1 83 m
IWP Offset	2 74 m
CL Offset	3 66 m

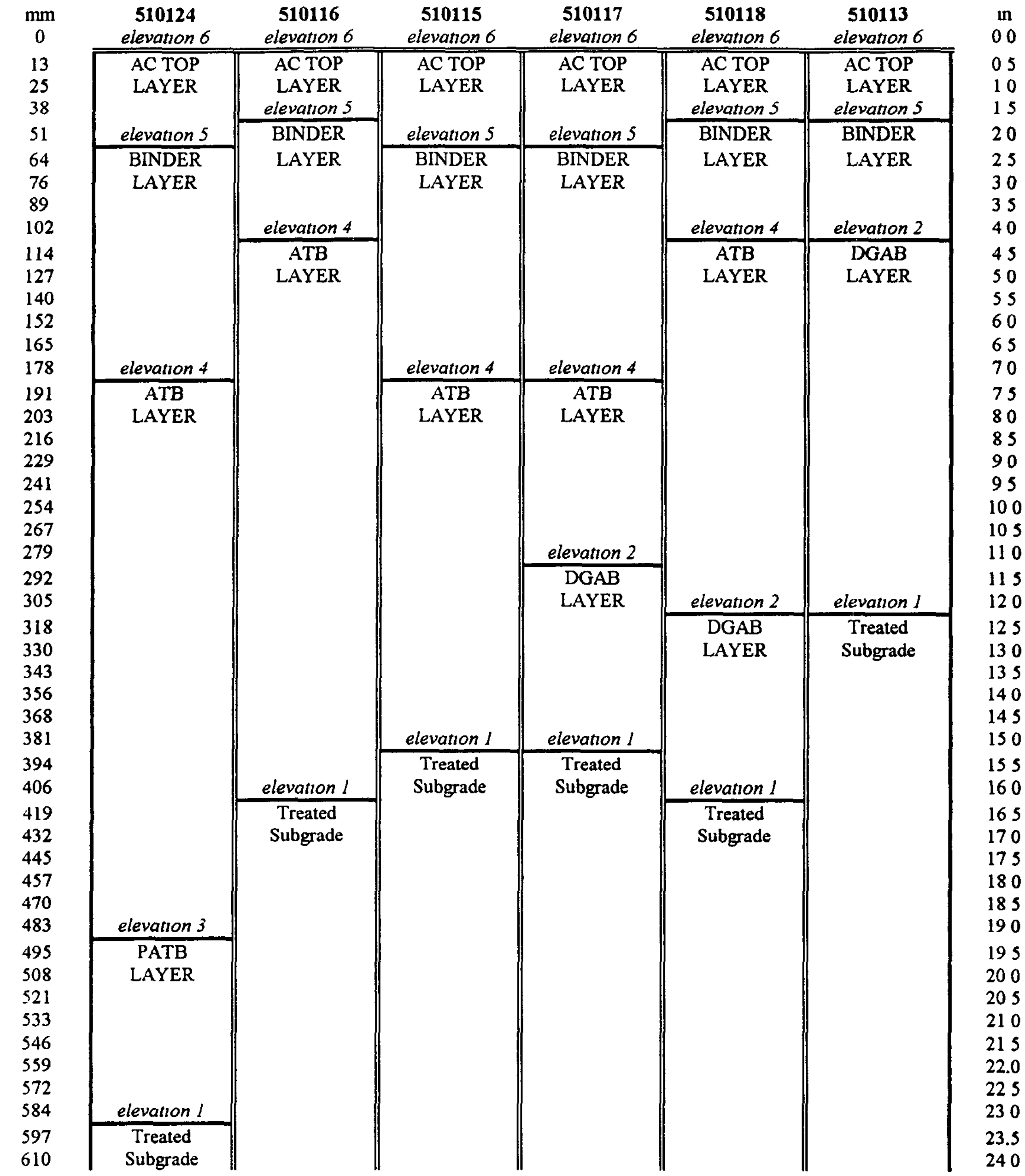
Figure 9 Location of Elevation Measurements



Notes Refer to Table 7 for the dates of the six stages of elevation measurements

First stage	elevation 1	Treated Subgrade	August 21 - August 25, 1995
Second stage	elevation 2	DGAB Layer	August 24 - September 01, 1995
Third stage	elevation 3	PATB Layer	August 30 - September 13, 1995
Fourth stage	elevation 4	ATB Layer	August 29 - September 08, 1995
Fifth stage	elevation 5	AC Binder Layer	September 11 - September 15, 1995
Sixth stage	elevation 6	AC Top Layer	September 27, 1995 & March 13, 1996

Figure 10 Pavement Structures and the Six Stages of Rod and Level Elevations



Notes Refer to Table 7 for the dates of the six stages of elevation measurements

First stage	elevation 1	Treated Subgrade	August 21 - August 25, 1995
Second stage	elevation 2	DGAB Layer	August 24 - September 01, 1995
Third stage	elevation 3	PATB Layer	August 30 - September 13, 1995
Fourth stage	elevation 4	ATB Layer	August 29 - September 08, 1995
Fifth stage	elevation 5	AC Binder Layer	September 11 - September 15, 1995
Sixth stage	elevation 6	AC Top Layer	September 27, 1995 & March 13, 1996

Figure 10(Cont) Pavement Structures and the Six Stages of Rod and Level Elevations

	510113		510118		510117	
Stab. Sub. NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane **Aug.19=>** Mix Date	150 mm 10% cement by volume	**8/19** **8/20** =>	150 mm 10% cement by volume	**8/20** =>	150 mm 10% cement by volume	Thickness Type of Pavement Bulk Sample
SB Shoulder						
DGAB NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane **Aug.22=>** Mix. Date	1st lift 102 mm 2nd lift102 mm Type 1 #21-B	**8/22** =>	only lift 102 mm Type 1 #21-B	**8/23** =>	only lift 102 mm Type 1 #21-B **B9** (0-35)	Thickness Type of Pavement Bulk Sample
SB Shoulder						
PATB NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane Pav Date						Thickness Type of Pavement Bulk Sample
SB Shoulder						SPS Pav Times
	5+00 0+00		5+00 0+00		5+00 0+00	Exper Stations
	552+00 557+00		566+50 571+50		574+00 579+00	Constr Stations

Not to scale

CL - Center Line
B9 - DGAB Bulk Sample Location taken from Station (0-35), Bulk Sample # is BG03 and Moisture Sample # is MG03

Figure 11 Mixing and Paving Dates, Paving Times, and Bulk Sample Locations

ATB

	510113		510118		510117	
NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane Pav. Date		8/28 9/01 =>	1st lift 102 mm 2nd lift102 mm Type BM-3 Mix **B15** (2nd lift)	8/28 =>	only lift 102 mm Type BM-3 Mix	Thickness Type of Pavement Bulk Sample
SB Shoulder			1930 2040		2253 2400	1st lift SPS Pav
			2138 2252			2nd lift SPS Pav.

Binder

	510113		510118		510117	
NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane **Sep.07=>** Pav. Date	only lift 64 mm Type IM1B Mix	9/07 =>	only lift 64 mm Type IM1B Mix	9/07 9/11 =>	1st lift 64 mm 2nd lift 64 mm Type IM1B Mix	Thickness Type of Pavement Bulk Sample
SB Shoulder	2100 2157		2304 2345		2350 0030	1st lift SPS Pav.
					1830 1905	2nd lift SPS Pav.

Surface

	510113		510118		510117	
NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane **Sep.26=>** Pav Date	38 mm Type SM2B Mix	9/26 =>	38 mm Type SM2B Mix	9/26 =>	51 mm Type SM2B Mix **B25**	Thickness Type of Pavement Bulk Sample
SB Shoulder	0954 1009		1104 1124		1132 1218	SPS Pav Times
	5+00 0+00		5+00 0+00		5+00 0+00	Exper Stations
	552+00 557+00		566+50 571+50		574+00 579+00	Constr Stations

Not to scale

CL - Center Line

B15 - ATB Bulk Sample # BT22 collected from Paver Hopper while at Station (2+50)

B25 - AC Surface Bulk Sample # BA07 collected from Paver Hopper while at station (2+50)

Figure 11(Cont.) Mixing and Paving Dates, Paving Times, and Bulk Sample Locations

Stab. Sub.

	510115		510116	
NB Shoulder				
non SPS NB lane				
CL				
SPS SB lane **Aug.20=>** Mix. Date	150 mm 10% cement by volume	**8/21** =>	150 mm 10% cement by volume	Thickness Type of Pavement Bulk Sample
SB Shoulder				

DGAB

NB Shoulder				
non SPS NB lane				
CL				
SPS SB lane Mix Date				Thickness Type of Pavement Bulk Sample
SB Shoulder				

PATB

NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane Pav Date						Thickness Type of Pavement Bulk Sample
SB Shoulder						SPS Paving Times
	5+00	0+00		5+00	0+00	Experiment Stations
	583+50	588+50		596+00	601+00	Construction Stations

Not to scale

CL - Center Line

Figure 11(Cont) Mixing and Paving Dates, Paving Times, and Bulk Sample Locations

ATB

	510115		510116	
NB Shoulder				
non SPS NB lane				
CL				
SPS SB lane **Aug.25,Sep.5=>** Paving Dates	1st lift 102 mm 2nd lift 102 mm Type BM-3 Mix **B14** (2nd lift)	**8/25 9/01 9/06** =>	1st lift 102 mm 2nd lift 102 mm 3rd lift 102 mm Type BM-3 Mix	Thickness Type of Pavement Bulk Sample
SB Shoulder	1915 2042		2200 2330	1st lift SPS Pav Times
	2046 2145		0058 0207	2nd lift SPS Pav Times
			2355 0054	3rd lift SPS Pav Times

Binder

	510115		510116	
NB Shoulder				
non SPS NB lane				
CL				
SPS SB lane **Sep.07,Sep.11=>** Paving Dates	1st lift 64 mm 2nd lift 64 mm Type IM-1B Mix **B22** (2nd lift)	**9/07** =>	only lift 64 mm Type IM-1B Mix	Thickness Type of Pavement Bulk Sample
SB Shoulder	0055 0142		0236 0306	1st lift SPS Pav Times
	1937 2002			2nd lift SPS Pav Times

Surface

	510115		510116	
NB Shoulder				
non SPS NB lane				
CL				
SPS SB lane **Sep.26=>** Pav Date	51 mm Type SM-2B Mix	**9/26** =>	38 mm Type SM-2B Mix	Thickness Type of Pavement Bulk Sample
SB Shoulder	1234 1255		1349 1402	SPS Paving Times
	5+00 0+00		5+00 0+00	Experiment Stations
	583+50 588+50		596+00 601+00	Construction Stations

Not to scale

CL - Center Line
B14 - ATB Bulk Sample # BT21 collected from Paver Hopper while at Station (2+50)
B22 - AC Binder Bulk Sample # BA04 collected from Paver Hopper while at station (2+50)

Figure 11(Cont) Mixing and Paving Dates, Paving Times, and Bulk Sample Locations

	510124		510123		510122	
Stab. Sub. NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane **Aug.21=>** Mix Date	150 mm 10% cement by volume	**8/21 8/22** =>	150 mm 10% cement by volume	**8/22** =>	150 mm 10% cement by volume	Thickness Type of Pavement Bulk Sample
SB Shoulder						

DGAB NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane Mix Date						Thickness Type of Pavement Bulk Sample
SB Shoulder						

PATB NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane **Aug.29=>** Pav Date	102 mm Type 1 Mix	**8/29** =>	102 mm Type 1 Mix **B12**	**8/29** =>	102 mm Type 1 Mix	Thickness Type of Pavement Bulk Sample
SB Shoulder	1945 2105		2149 2258		0023 0354	SPS Pav Times
	5+00 0+00		5+00 0+00		5+00 0+00	Exper Stations
	606+50 611+50		614+50 619+50		623+50 628+50	Constr Stations

Not to scale

CL - Center Line
B12 - PATB Bulk Sample # BT03 collected from Paver Hopper while at Station (2+50)

Figure 11(Cont) Mixing and Paving Dates, Paving Times, and Bulk Sample Locations

ATB

	510124		510123		510122	
NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane **8/30,9/5-6=>** Pav. Date	1st lift 102 mm 2nd lift 102 mm 3rd lift 102 mm **B13** (1st lift)	**8/30 9/05** =>	1st lift 102 mm 2nd lift 102 mm Type BM-3 Mix	**8/30** =>	only lift 102 mm Type BM-3 Mix	Thickness Type of Pavement Bulk Sample
SB Shoulder	1925 2046 2250 2358 0138 0250		2253 0130 0027 0125		0300 0430	1st lift SPS Pav. 2nd lift SPS Pav 3rd lift SPS Pav

Binder

	510124		510123		510122	
NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane **Sep.08,11=>** Pav Date	1st lift 64 mm 2nd lift 64 mm Type IM1B Mix **B21** (1st lift)	**9/08 9/11** =>	1st lift 64 mm 2nd lift 64 mm Type IM1B Mix	**9/08** =>	only lift 64 mm Type IM1B Mix	Thickness Type of Pavement Bulk Sample
SB Shoulder	1841 1912 2029 2046		1938 2023 2059 2145		2053 2132	1st lift SPS Pav 2nd lift SPS Pav

Surface

	510124		510123		510122	
NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane **Sep.26=>** Pav Date	51 mm Type SM2B Mix **B24**	**9/26** =>	51 mm Type SM2B Mix	**9/26** =>	38 mm Type SM2B Mix	Thickness Type of Pavement Bulk Sample
SB Shoulder	1444 1505 5+00 0+00 606+50 611+50		1512 1526 5+00 0+00 614+50 619+50		1603 1620 5+00 0+00 623+50 628+50	SPS Pav Times Exper Stations Constr. Stations

Not to scale

CL - Center Line
B13 - ATB Bulk Sample # BT20 collected from Paver Hopper while at Station (2+50)
B21 - AC Binder Bulk Sample # BA03 collected from Paver Hopper while at station (2+50)
B24 - AC Surface Bulk Sample # BA06 collected from Paver Hopper while at station (2+50)

Figure 11(Cont) Mixing and Paving Dates, Paving Times, and Bulk Sample Locations

	510119		510159	
Stab. Sub. NB Shoulder				
non SPS NB lane				
CL				
SPS SB lane **Aug.22=>** Mix Date	150 mm 10% cement by volume	**8/23** =>	150 mm 10% cement by volume	Thickness Type of Pavement Bulk Sample
SB Shoulder				

DGAB NB Shoulder				
non SPS NB lane				
CL				
SPS SB lane **Aug. 25,28 =>** Mix Date	only lift 102 mm Type 1 #21-B	 **8/28** **8/28** =>	1st lift 102 mm 2nd lift 102 mm Type 1 #21-B	Thickness Type of Pavement Bulk Sample
SB Shoulder				

PATB NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane **Aug. 31 =>** Pav Date	102 mm Type 1 Mix **B11**		**8/31** =>	102 mm Type 1 Mix		Thickness Type of Pavement Bulk Sample
SB Shoulder	0121	0250		0300	0430	SPS Paving Times
	5+00	0+00		5+00	0+00	Experiment Stations
	631+50	636+50		638+50	643+50	Construction Stations

Not to scale

CL - Center Line
B11 - PATB Bulk Sample # BT02 collected from Paver Hopper while at Station (2+50)

Figure 11(Cont) Mixing and Paving Dates, Paving Times, and Bulk Sample Locations

	510119		510159	
ATB NB Shoulder				
non SPS NB lane				
CL				
SPS SB lane Paving Dates		9/05 =>	only lift 140 mm Type BM-3 Mix	Thickness Type of Pavement Bulk Sample
SB Shoulder			0200 0317	SPS Paving Times

	510119		510159	
Binder NB Shoulder				
non SPS NB lane				
CL				
SPS SB lane **Sep.08,Sep.11=>** Paving Dates	1st lift 64 mm 2nd lift 64 mm Type IM-1B Mix **B20** (1st lift)	**9/08** =>	only lift 51 mm Type IM-1A Mix **B19**	Thickness Type of Pavement Bulk Sample
SB Shoulder	2152 2234		2311 2339	1st lift SPS Pav Times
	2221 2246			2nd lift SPS Pav Times

	510119		510159	
Surface NB Shoulder				
non SPS NB lane				
CL				
SPS SB lane **Sep.26=>** Pav Date	51 mm Type SM-2B Mix **B23**	**9/27** =>	38 mm Type SM-2B Mix	Thickness Type of Pavement Bulk Sample
SB Shoulder	1634 1708		0837 0911	SPS Paving Times
	5+00 0+00		5+00 0+00	Experiment Stations
	631+50 636+50		638+50 643+50	Construction Stations

Not to scale

CL - Center Line
B20 - AC Binder Bulk Sample # BA02 collected from Paver Hopper while at Station (2+50)
B19 - AC Binder Bulk Sample # BA01 collected from Paver Hopper while at station (2+50)
B23 - AC Binder Bulk Sample # BA05 collected from Paver Hopper while at station (2+50)

Figure 11(Cont) Mixing and Paving Dates, Paving Times, and Bulk Sample Locations

	510120		510121		510114	
Stab. Sub. NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane **Aug.23=>** Mix Date	150 mm 10% cement by volume	**8/23** =>	150 mm 10% cement by volume	**8/24** **8/25** =>	150 mm 10% cement by volume	Thickness Type of Pavement Bulk Sample
SB Shoulder						

DGAB NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane **Aug.28=>** Mix. Date	1st lift 102 mm 2nd lift 102 mm Type 1 #21-B **B8** (5+35)	**8/29** =>	1st lift 102 mm 2nd lift 102 mm 3rd lift 102 mm **B7** (0-35)	**8/30** **8/31** =>	1st lift 102 mm 2nd lift 102 mm 3rd lift 102 mm Type 1 #21-B	Thickness Type of Pavement Bulk Sample
SB Shoulder						

PATB NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane **Sep.12=>** Pav Date	102 mm Type 1 Mix **B10**	**9/12** =>	102 mm Type 1 Mix			Thickness Type of Pavement Bulk Sample
SB Shoulder	1910 2020		2042 2203			SPS Pav Times
	5+00 0+00		5+00 0+00		5+00 0+00	Exper Stations
	646+00 651+00		654+00 659+00		682+00 687+00	Constr Stations

Not to scale

CL - Center Line
B8 - DGAB Bulk Sample Location taken from Station (5+35), Bulk Sample # is BG02 and Moisture Sample # is MG02
B7 - DGAB Bulk Sample Location taken from Station (0-35), Bulk Sample # is BG01 and Moisture Sample # is MG01
B10 - PATB Bulk Sample # BT01 collected from Paver Hopper while at Station (2+50)

Figure 11(Cont.) Mixing and Paving Dates, Paving Times, and Bulk Sample Locations

	510120		510121		510114	
ATB NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane Pav. Date						Thickness Type of Pavement Bulk Sample
SB Shoulder						

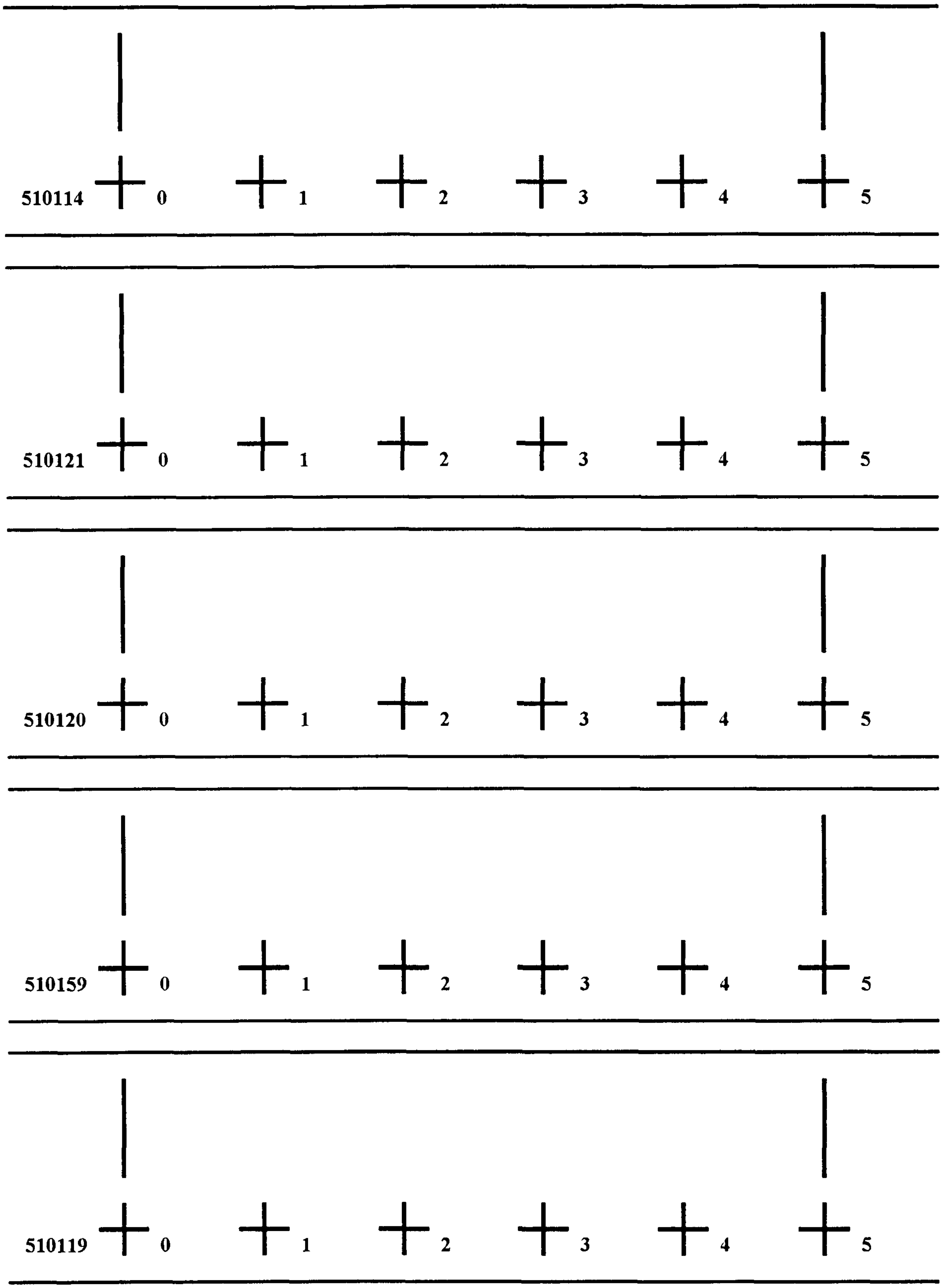
	510120		510121		510114	
Binder NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane **Sep.14=>** Pav. Date	only lift 64 mm Type IM1B Mix	9/14 =>	only lift 64 mm Type IM1B Mix	9/14 =>	1st lift 64 mm 2nd lift 64 mm Type IM1B Mix	Thickness Type of Pavement Bulk Sample
SB Shoulder	2044 2106		2119 2216		1907 1954 2236 2256	1st lift SPS Pav. 2nd lift SPS Pav.

	510120		510121		510114	
Surface NB Shoulder						
non SPS NB lane						
CL						
SPS SB lane **Sep.27=>** Pav. Date	38 mm Type SM2B Mix	9/27 =>	38 mm Type SM2B Mix	9/27 =>	51 mm Type SM2B Mix	Thickness Type of Pavement Bulk Sample
SB Shoulder	0919 0934 5+00 0+00 646+00 651+00		0952 1021 5+00 0+00 654+00 659+00		1255 1314 5+00 0+00 682+00 687+00	SPS Pav. Times Exper. Stations Constr. Stations

Not to scale

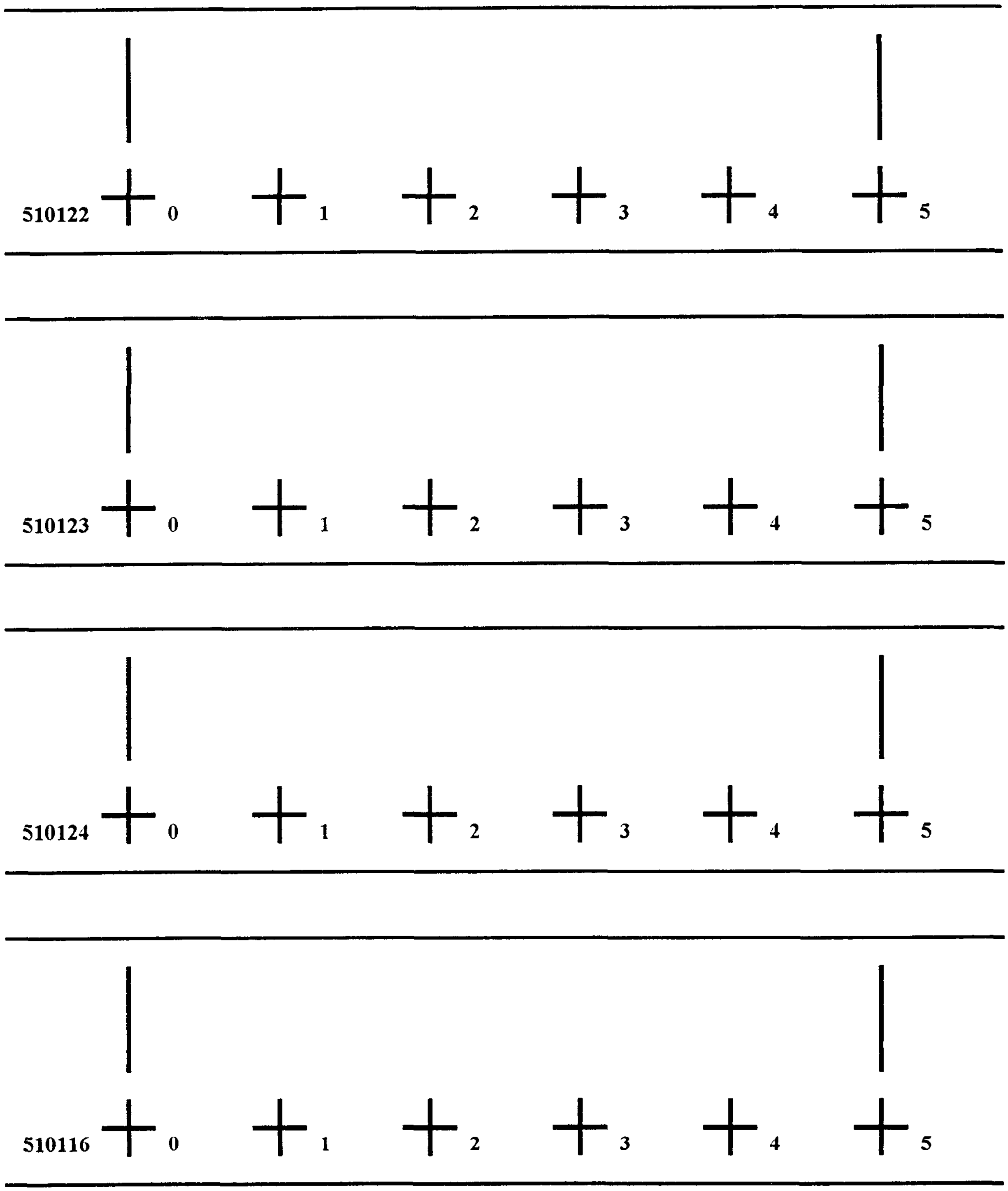
CL - Center Line

Figure 11(Cont.). Mixing and Paving Dates, Paving Times, and Bulk Sample Locations



Not to scale

Figure 12 Site Marking Plan After Construction



Not to scale

Figure 12(Cont) Site Marking Plan After Construction

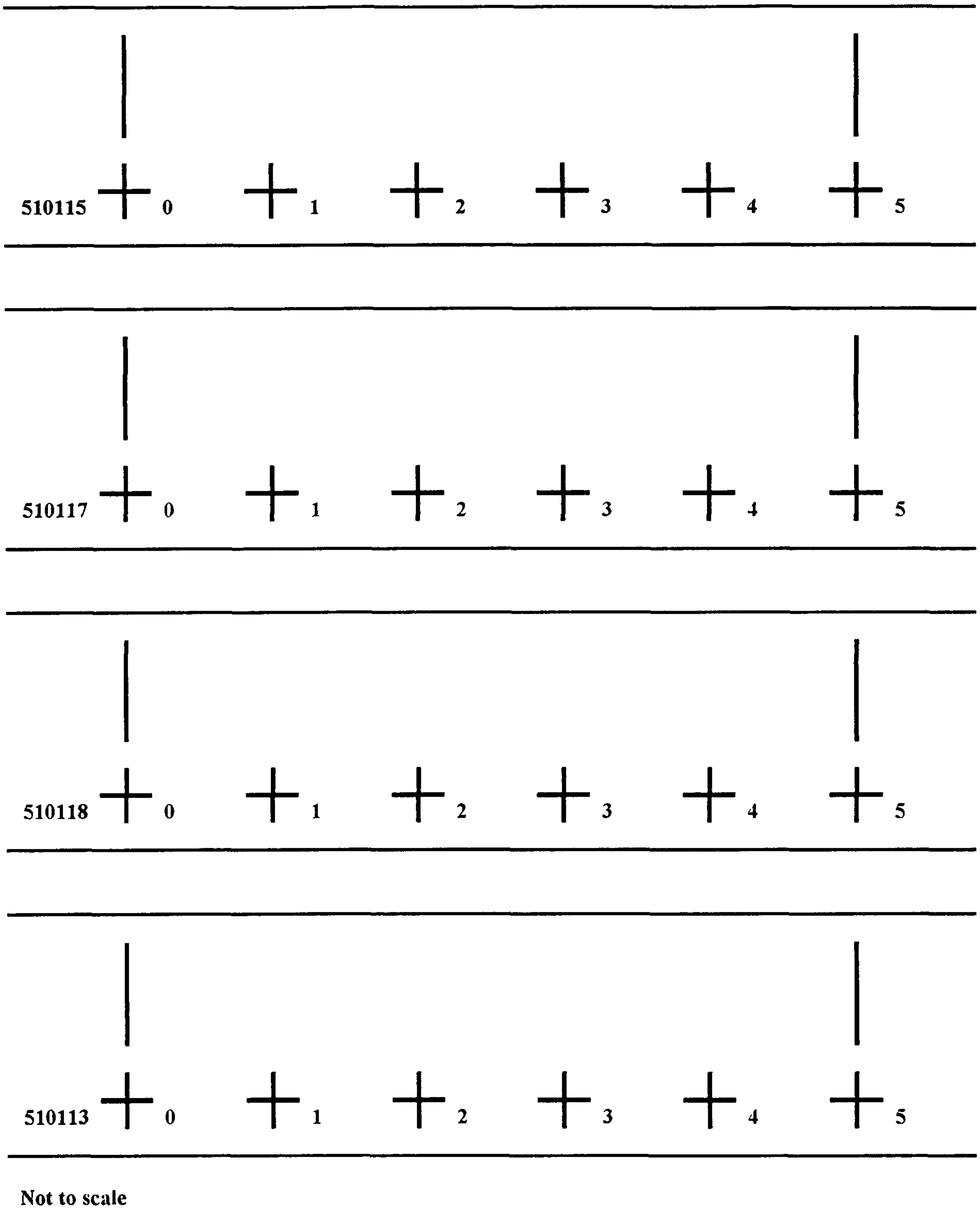


Figure 12(Cont) Site Marking Plan After Construction

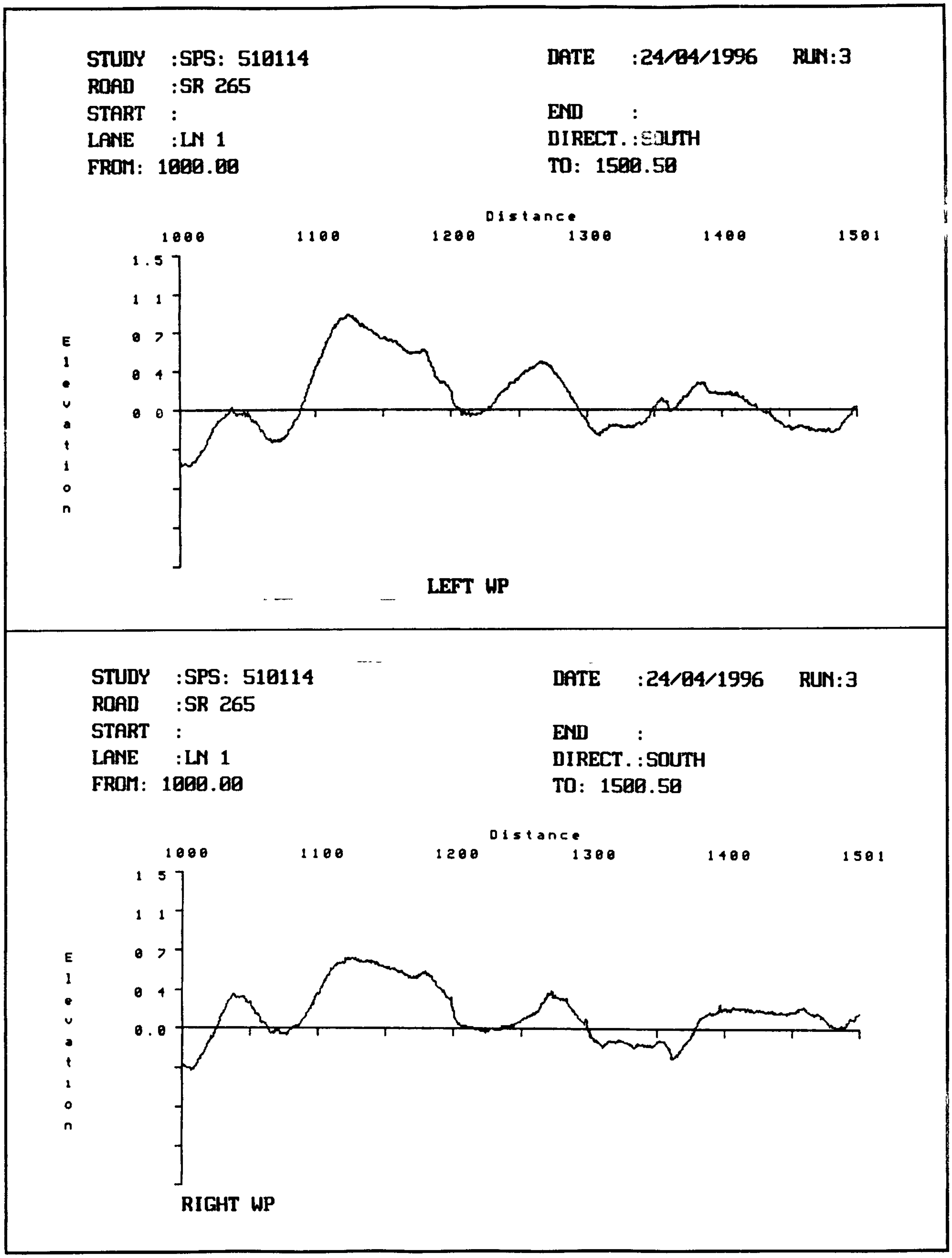


Figure 13. Elevation Measurements, Section 510114, as Collected with the Profilometer

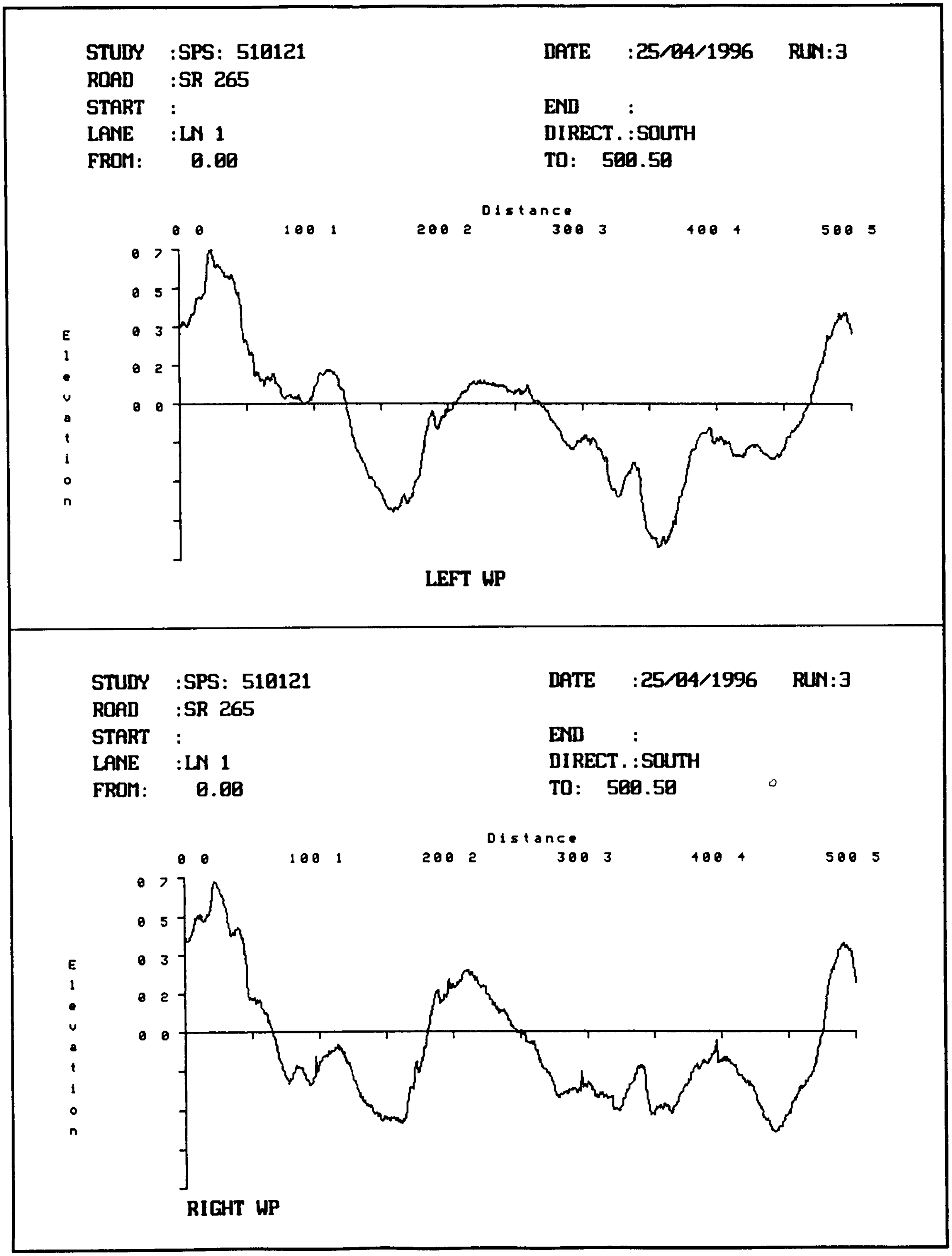


Figure 14 Elevation Measurements, Section 510121, as Collected with the Profilometer

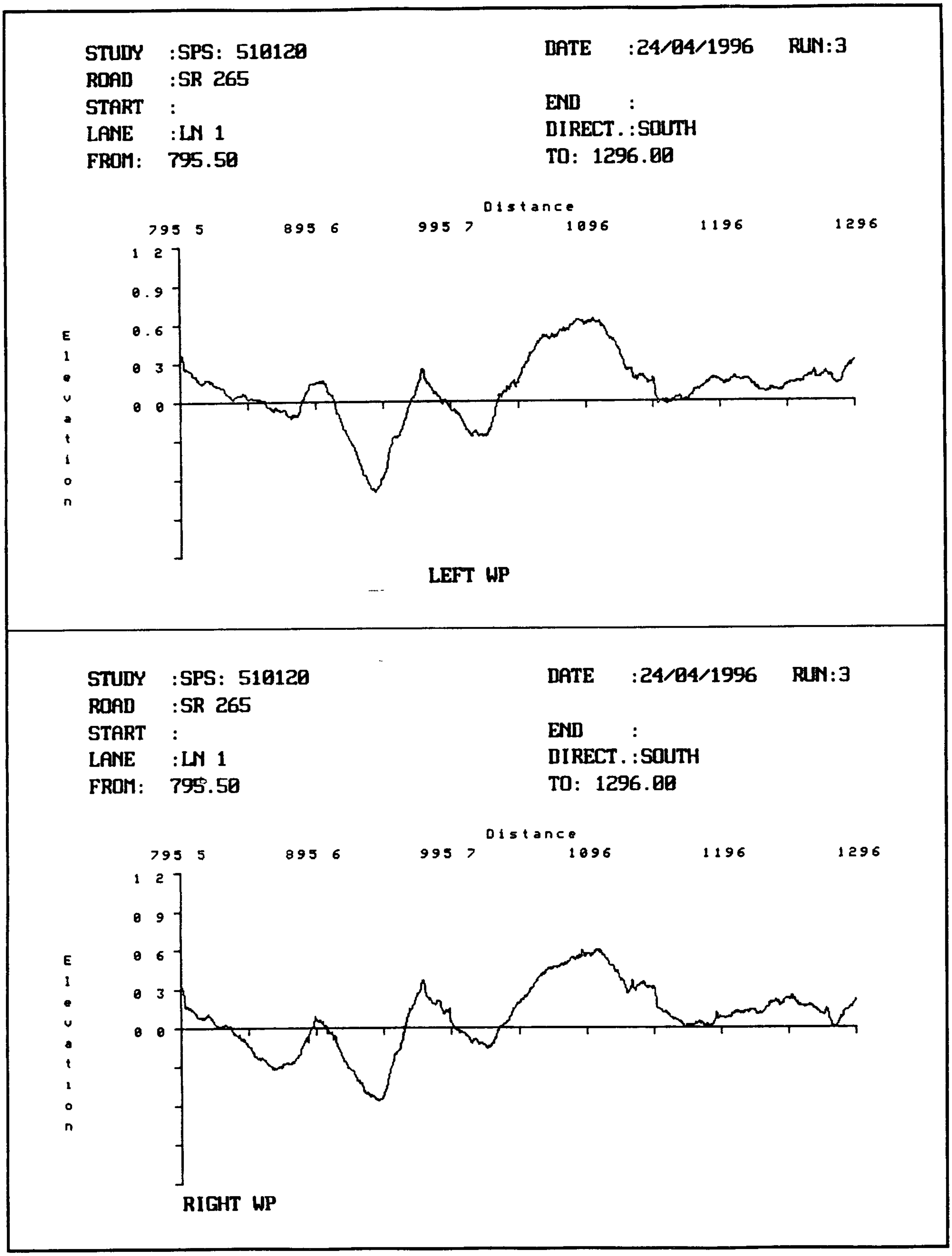


Figure 15 Elevation Measurements, Section 510120, as Collected with the Profilometer

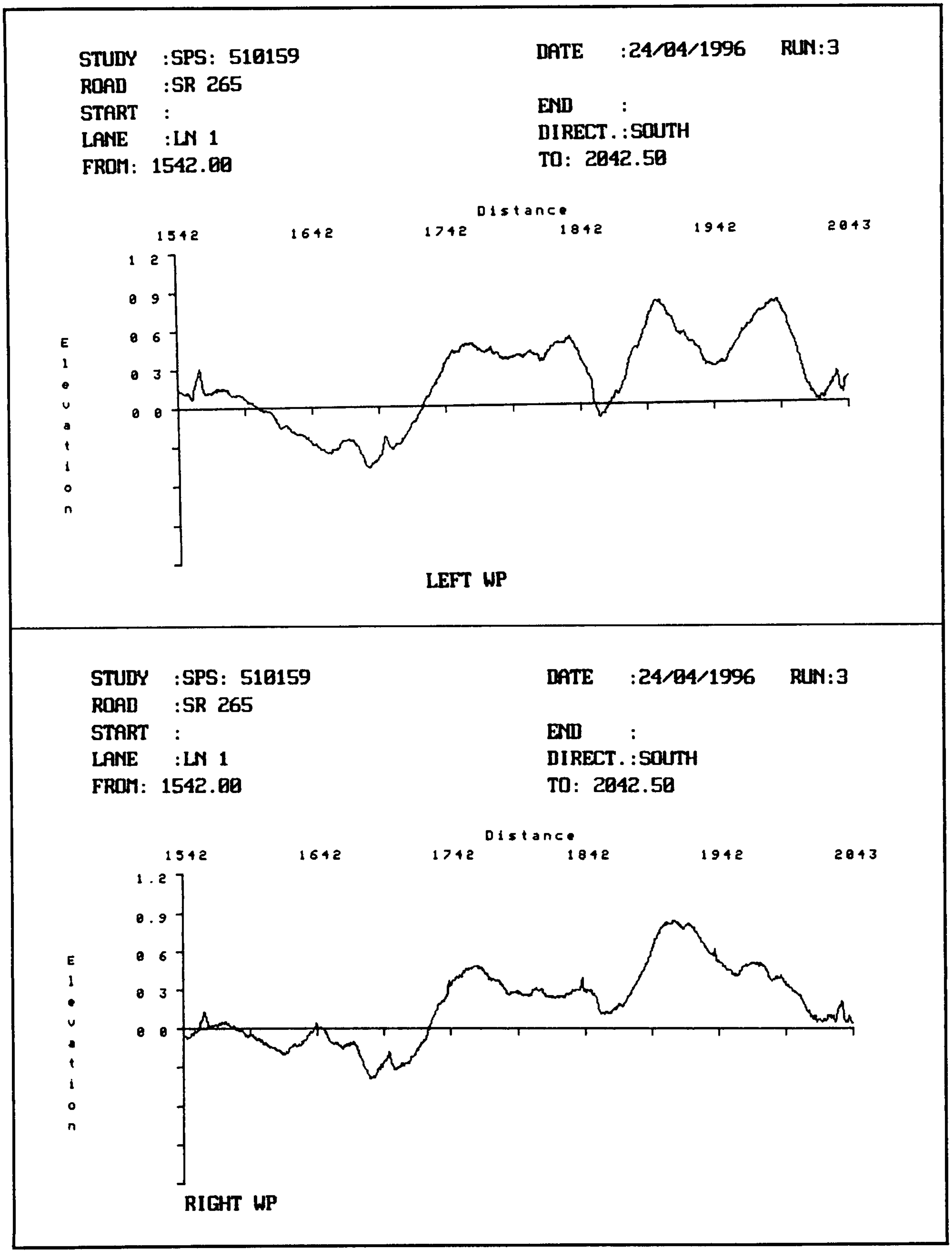


Figure 16 Elevation Measurements, Section 510159, as Collected with the Profilometer

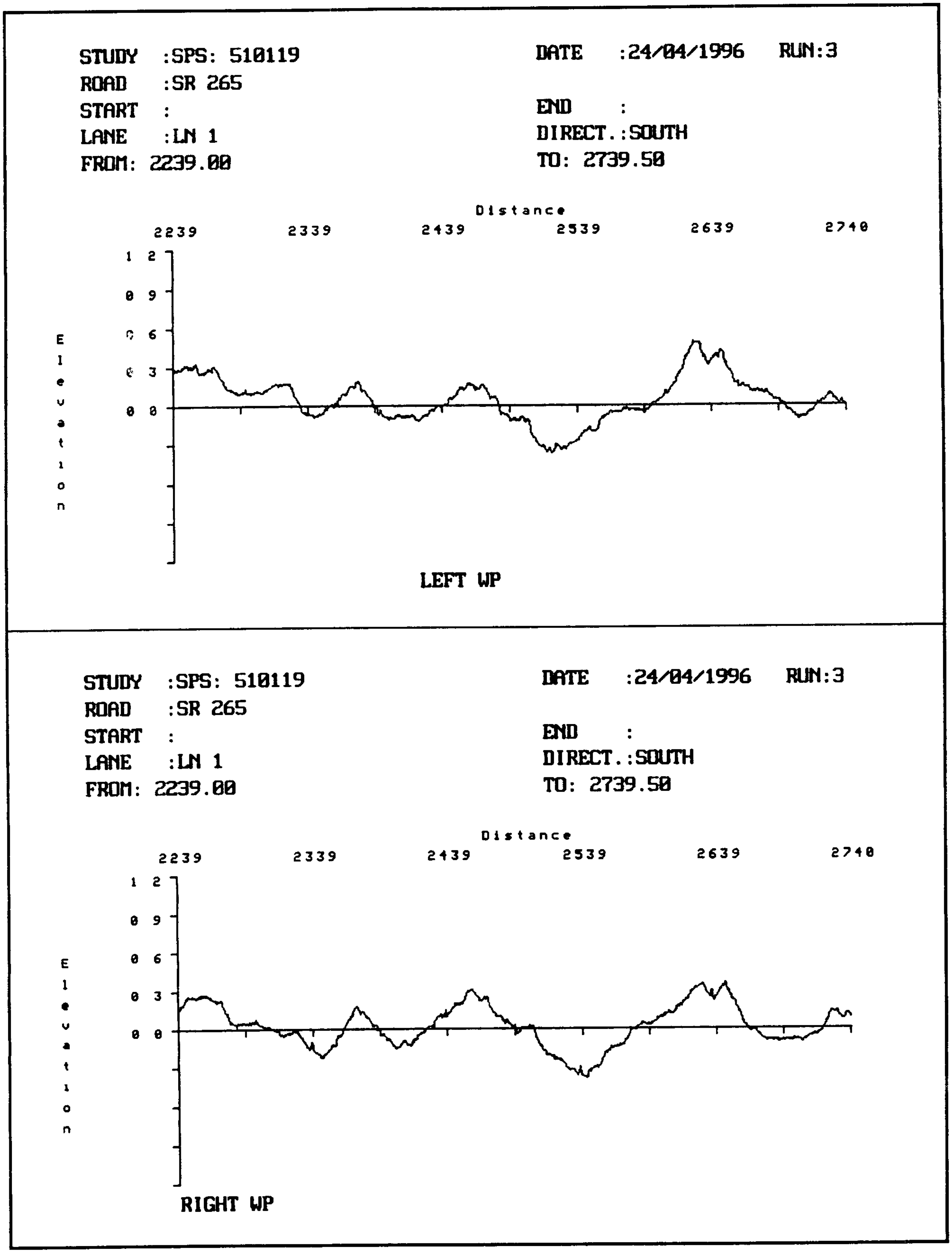


Figure 17 Elevation Measurements, Section 510119 as Collected with the Profilometer

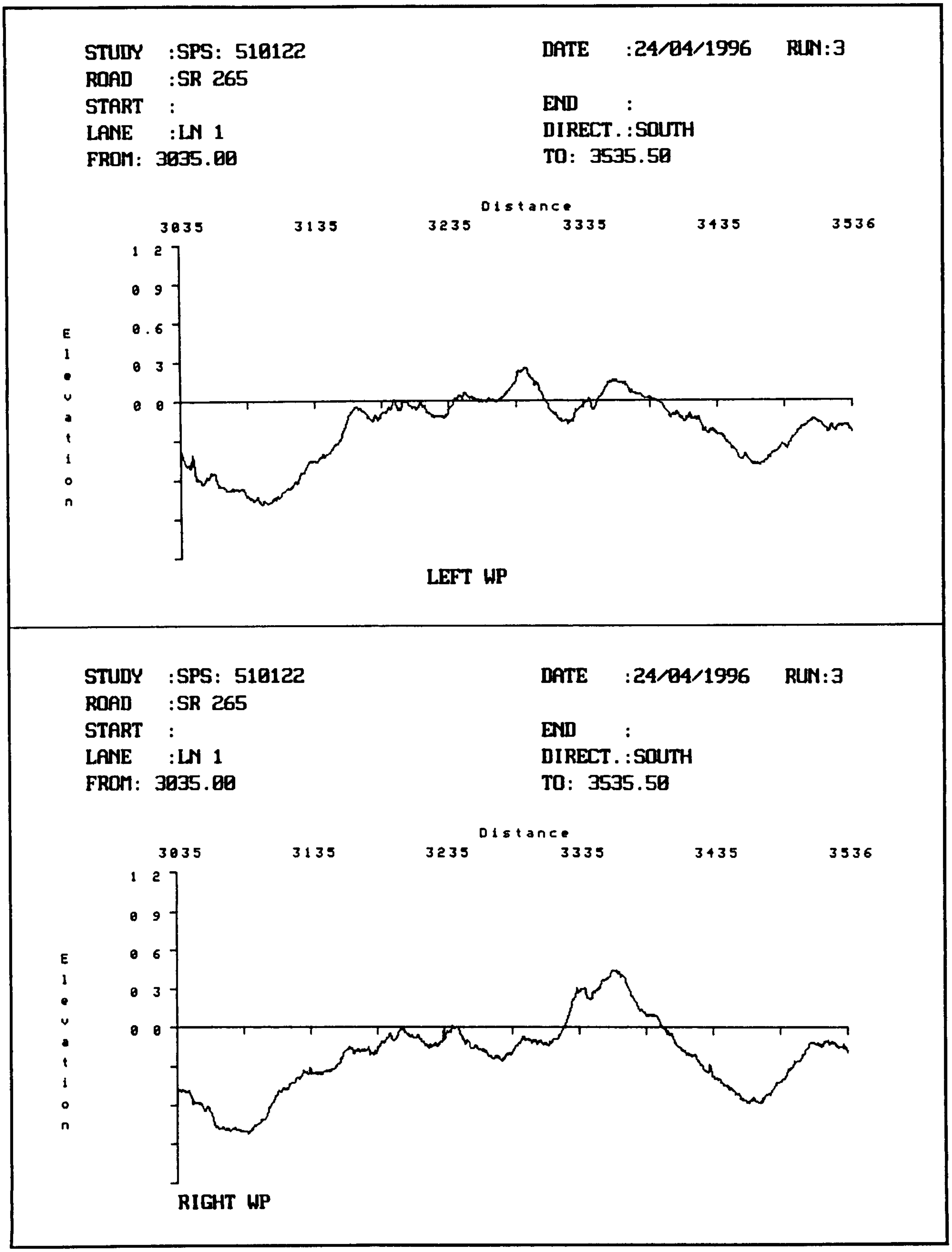


Figure 18 Elevation Measurements, Section 510122, as Collected with the Profilometer

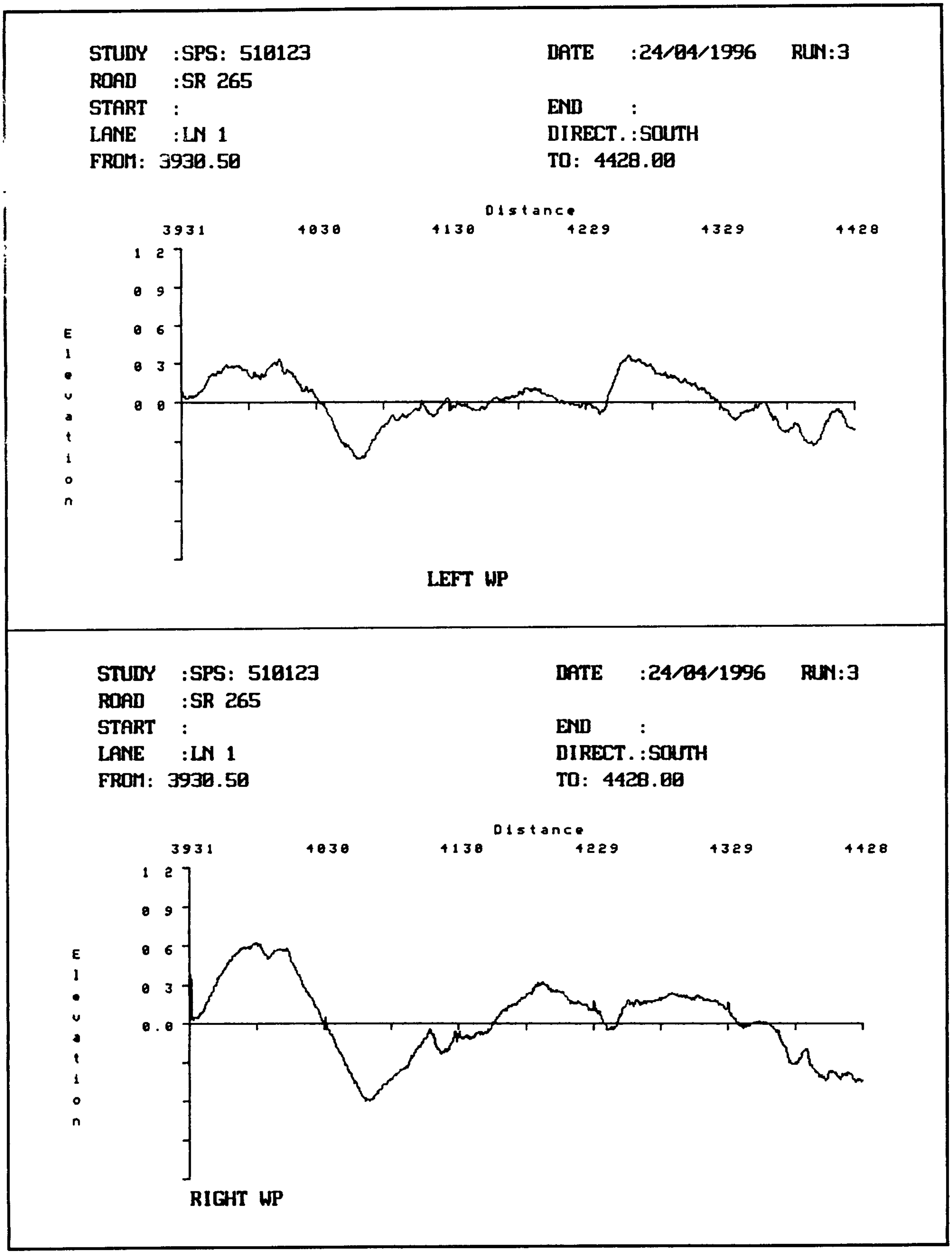


Figure 19 Elevation Measurements, Section 510123, as Collected with the Profilometer

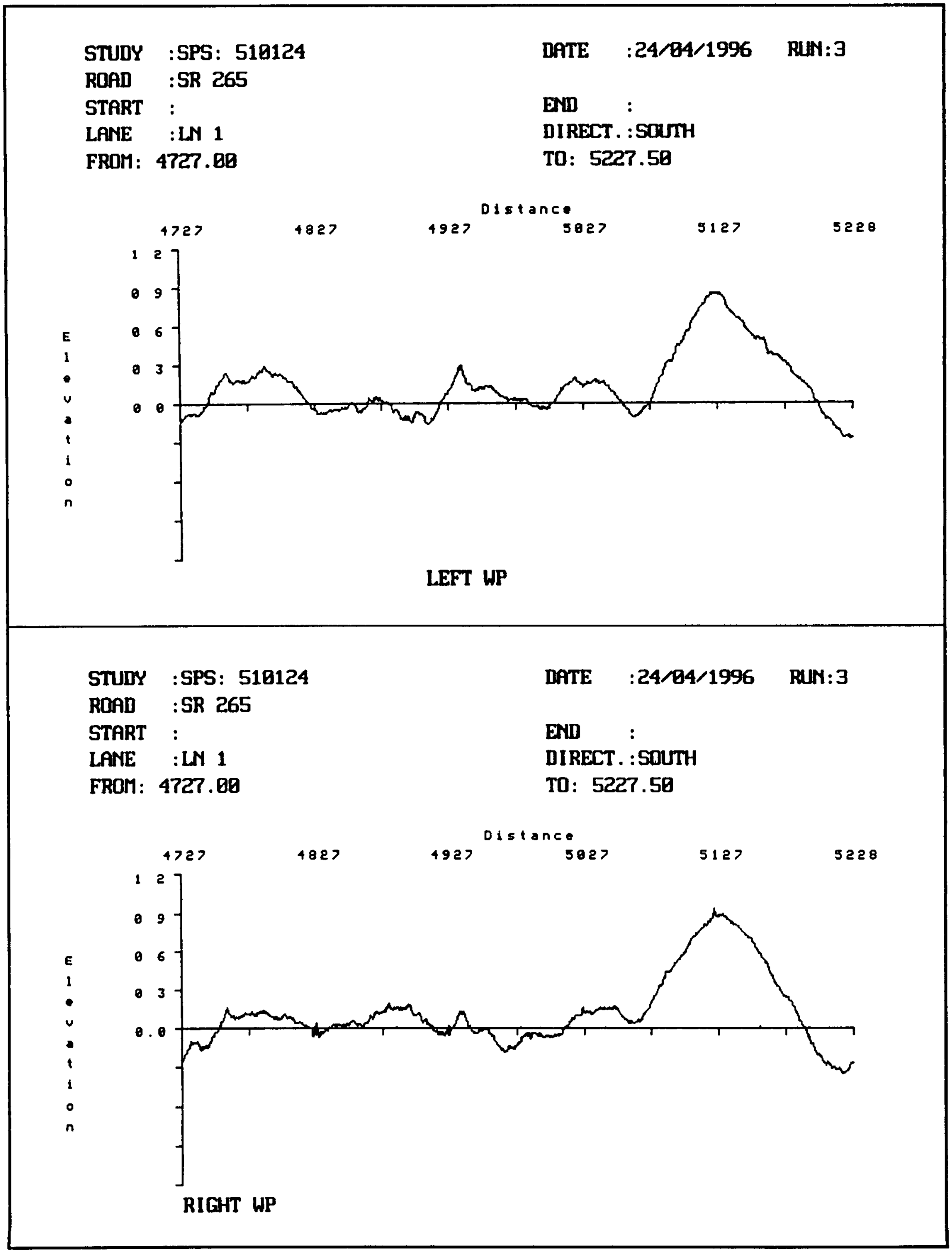


Figure 20 Elevation Measurements, Section 510124, as Collected with the Profilometer

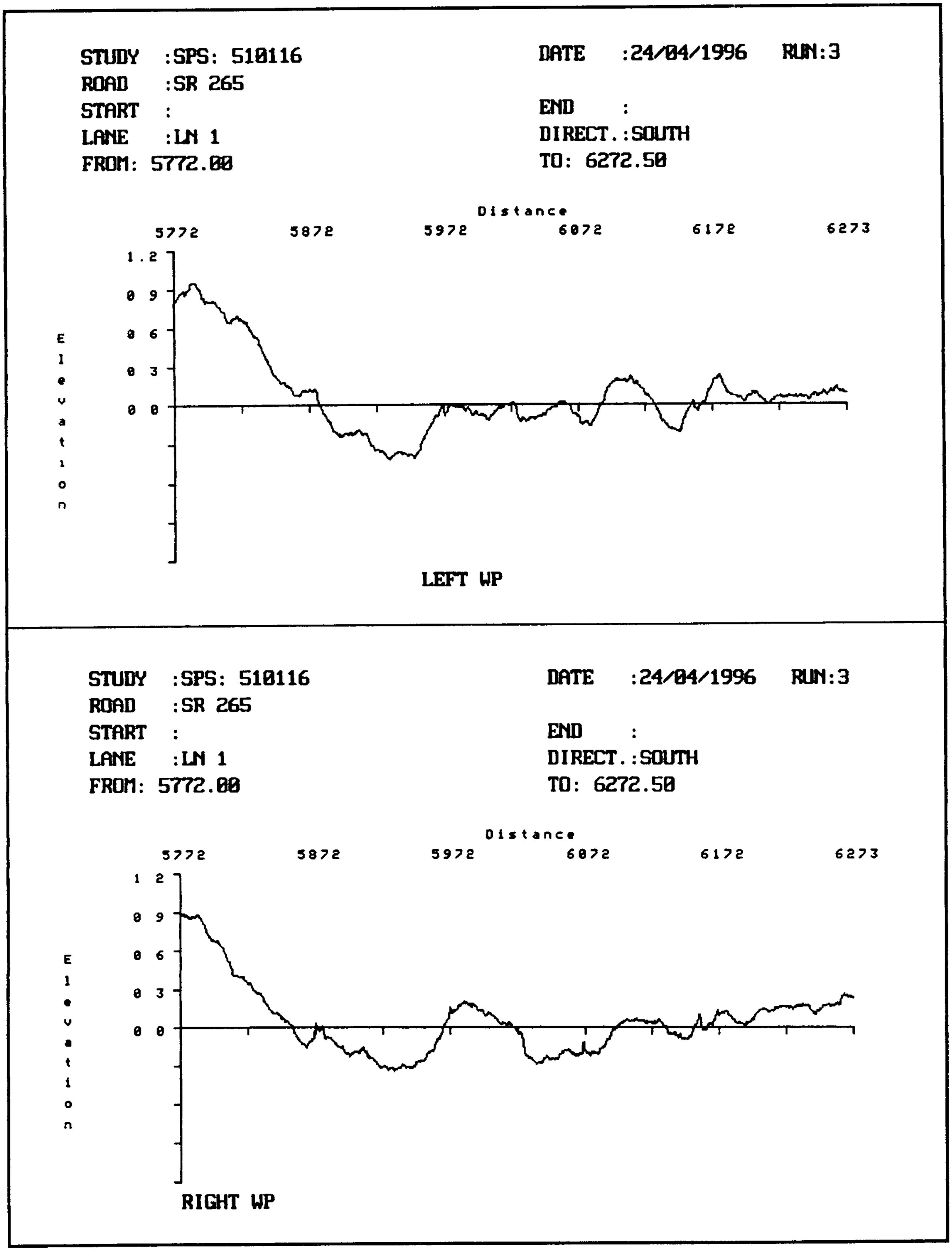


Figure 21 Elevation Measurements, Section 510116 as Collected with the Profilometer

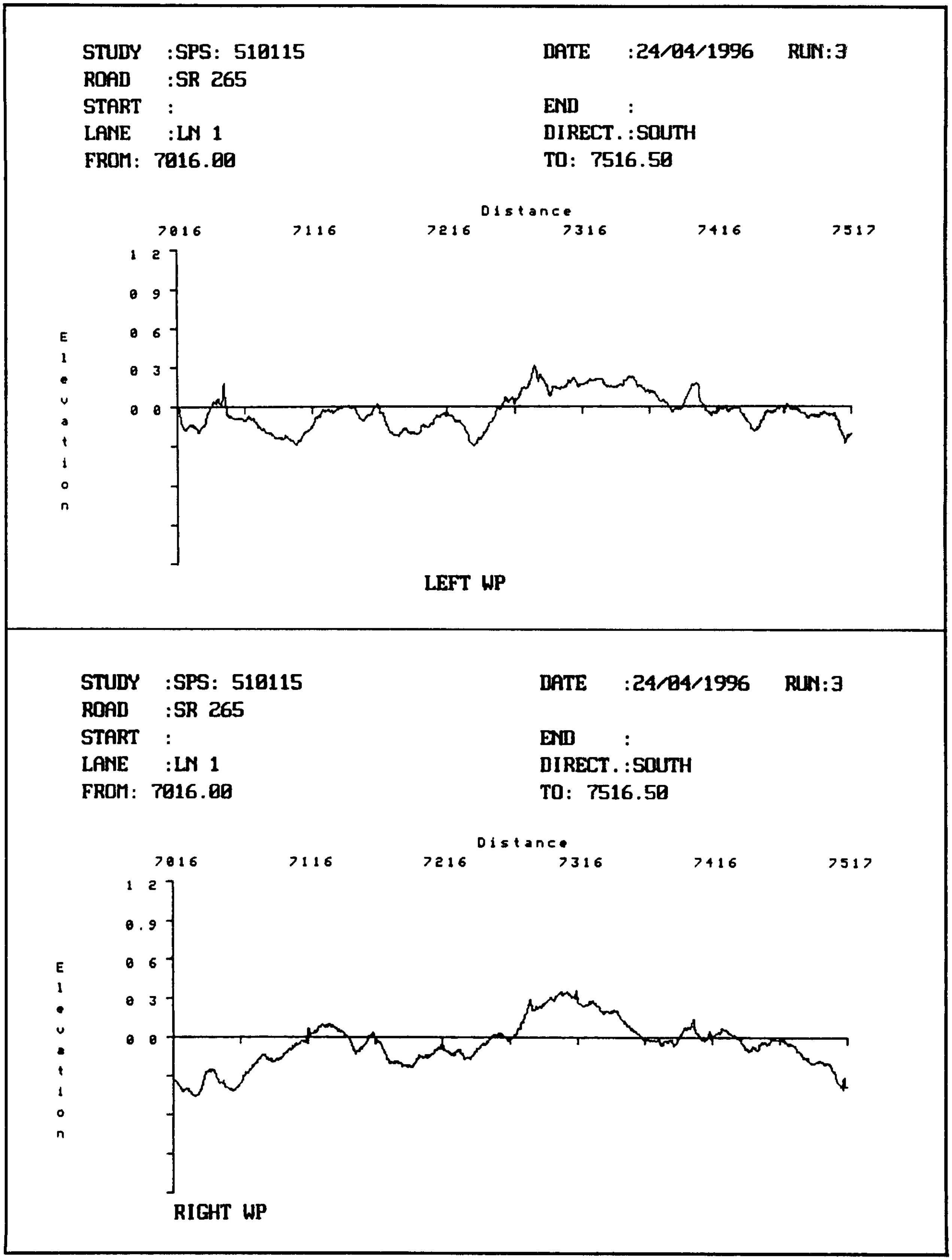


Figure 22 Elevation Measurements, Section 510115, as Collected with the Profilometer

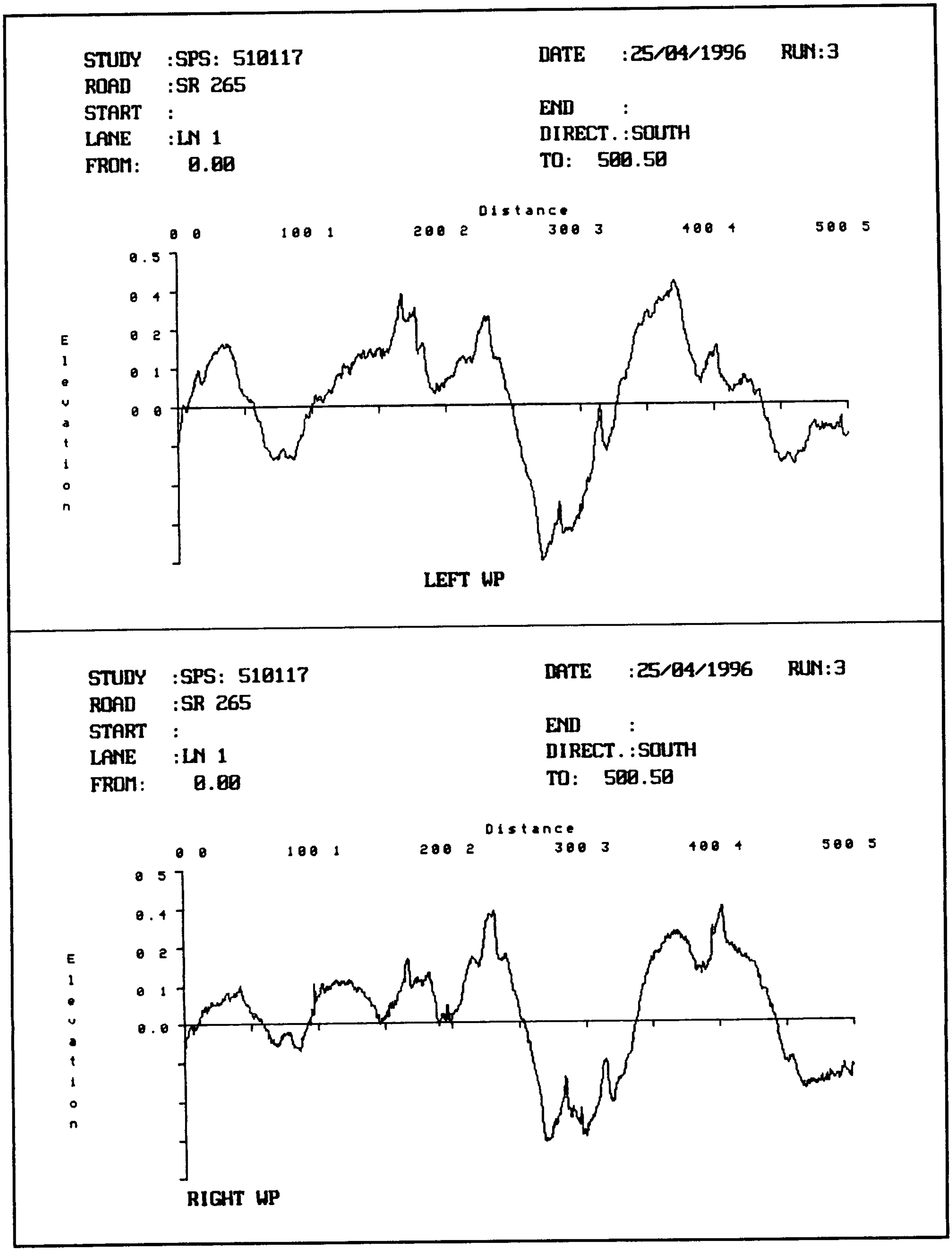


Figure 23 Elevation Measurements, Section 510117, as Collected with the Profilometer

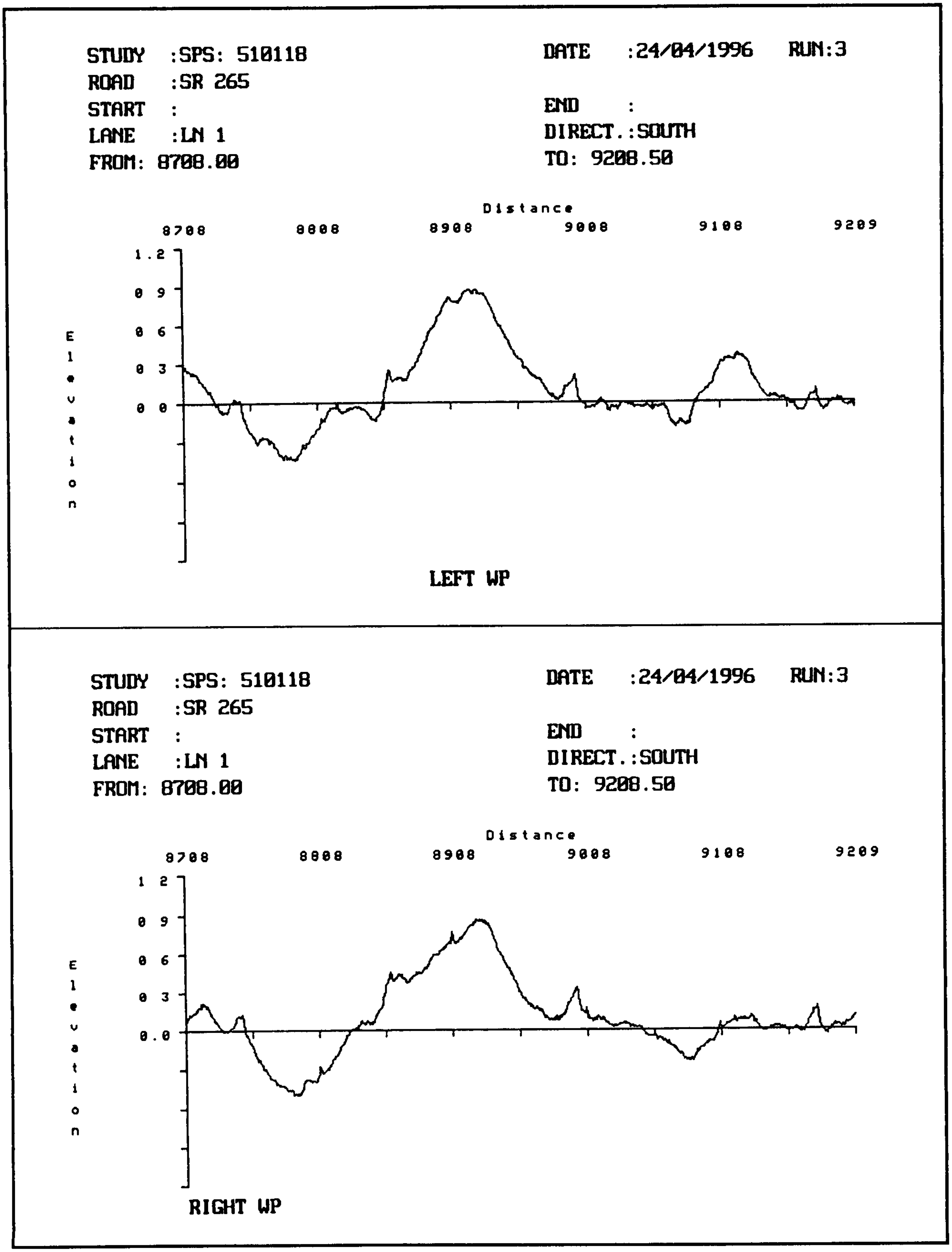


Figure 24 Elevation Measurements, Section 510118, as Collected with the Profilometer

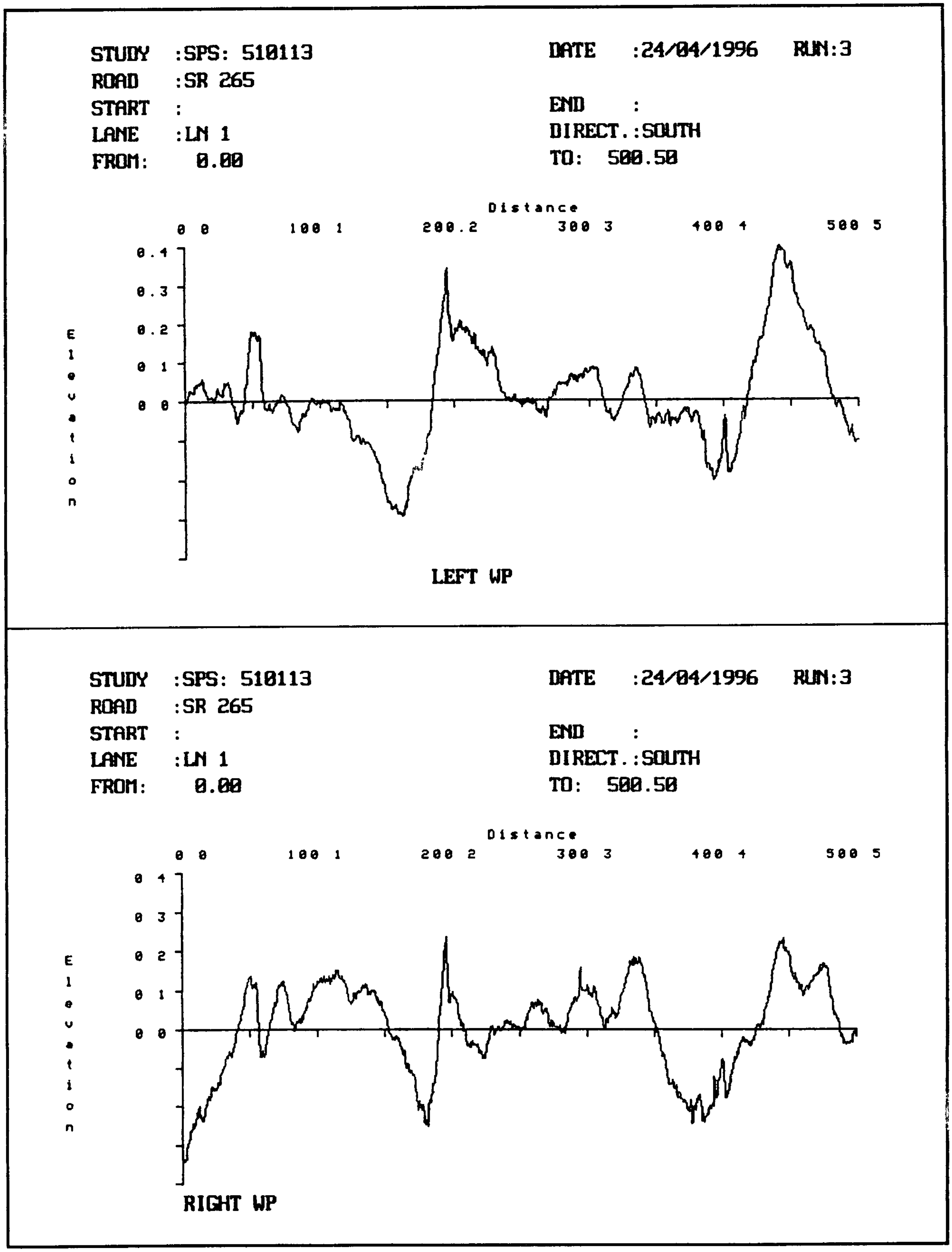


Figure 25 Elevation Measurements, Section 510113, as Collected with the Profilometer

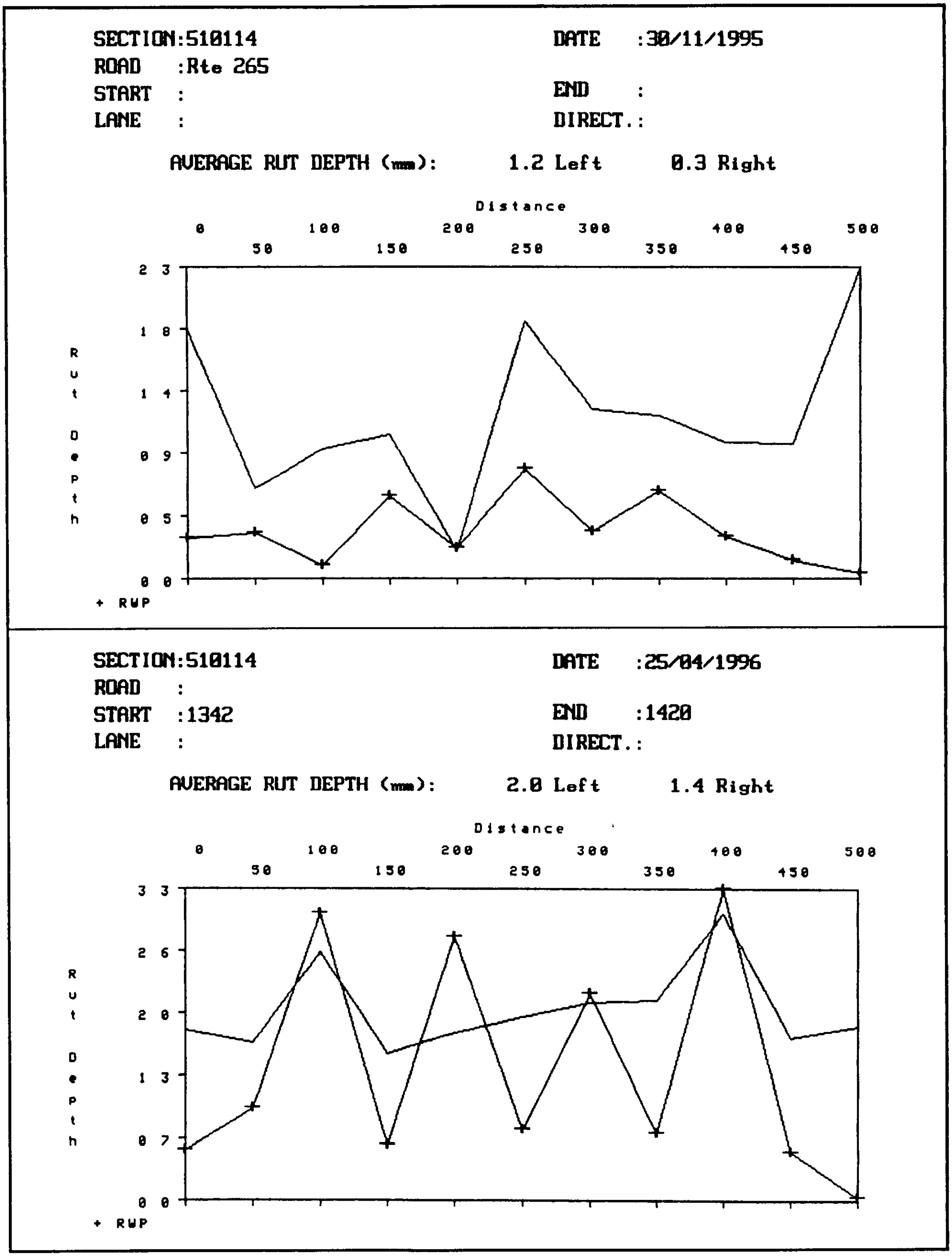
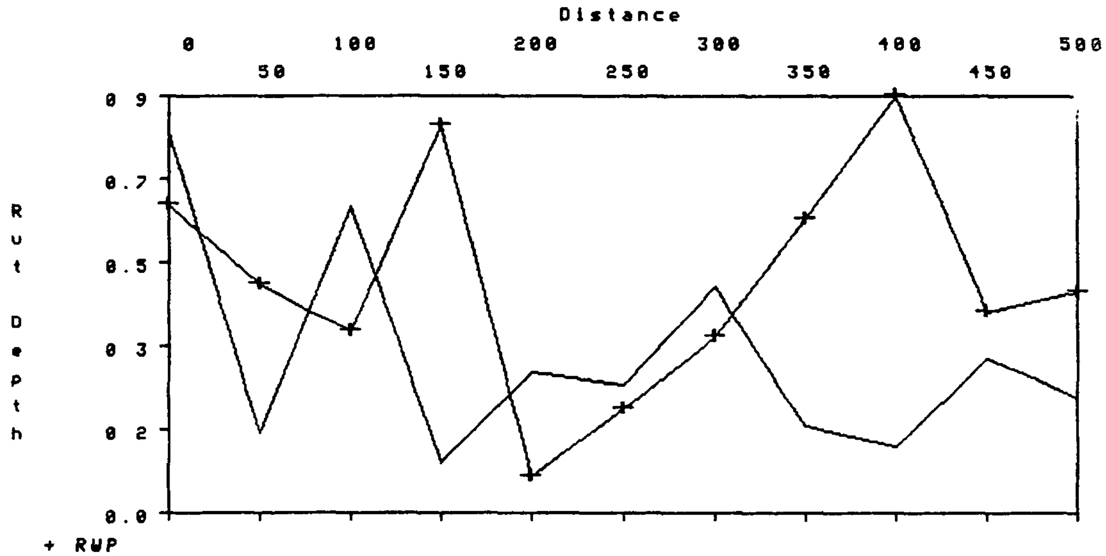


Figure 26 Rut Depth, Section 510114, as Measured by the Dipstick

SECTION:510121 DATE :30/11/1995
ROAD :Rte 265
START : END :
LANE : DIRECT.:

AVERAGE RUT DEPTH (mm): 0.3 Left 0.5 Right



SECTION:510120 DATE :30/11/1995
ROAD :Rte 265
START : END :
LANE : DIRECT.:

AVERAGE RUT DEPTH (mm): 0.7 Left 0.4 Right

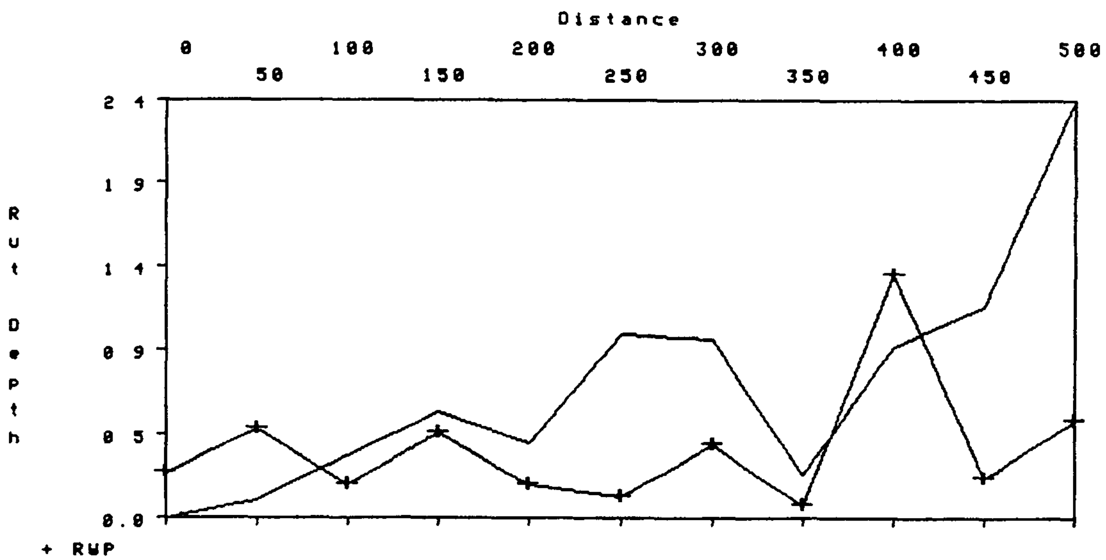
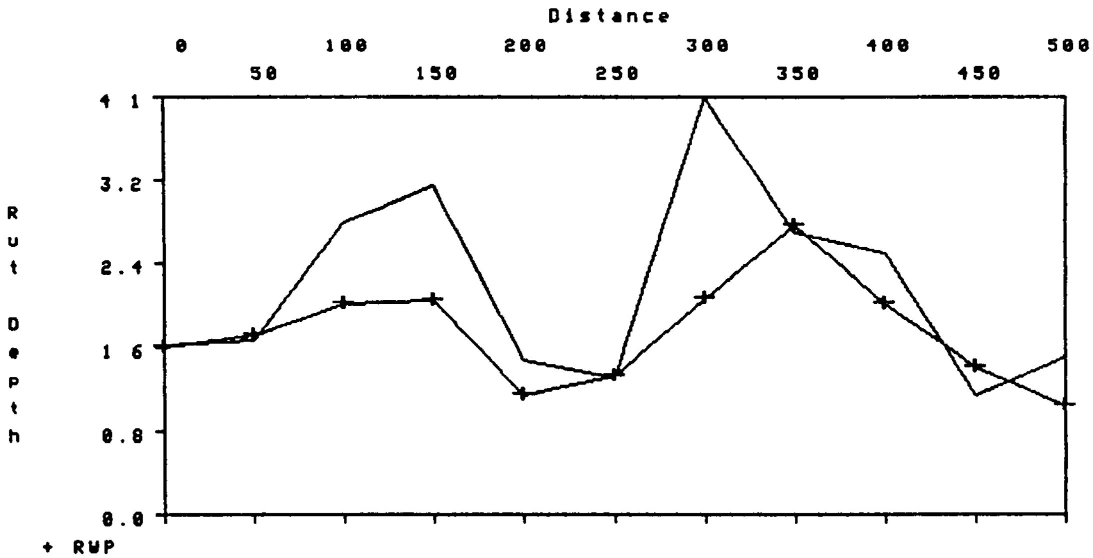


Figure 27 Rut Depth, Sections 510121 and 510120, as Measured by the Dipstick

SECTION:510159 DATE :28/11/1995
ROAD :Rte 265
START : END :
LANE : DIRECT.:

AVERAGE RUT DEPTH (mm): 2.2 Left 1.8 Right



SECTION:510119 DATE :28/11/1995
ROAD :Rte 265
START : END :
LANE : DIRECT.:

AVERAGE RUT DEPTH (mm): 1.2 Left 0.7 Right

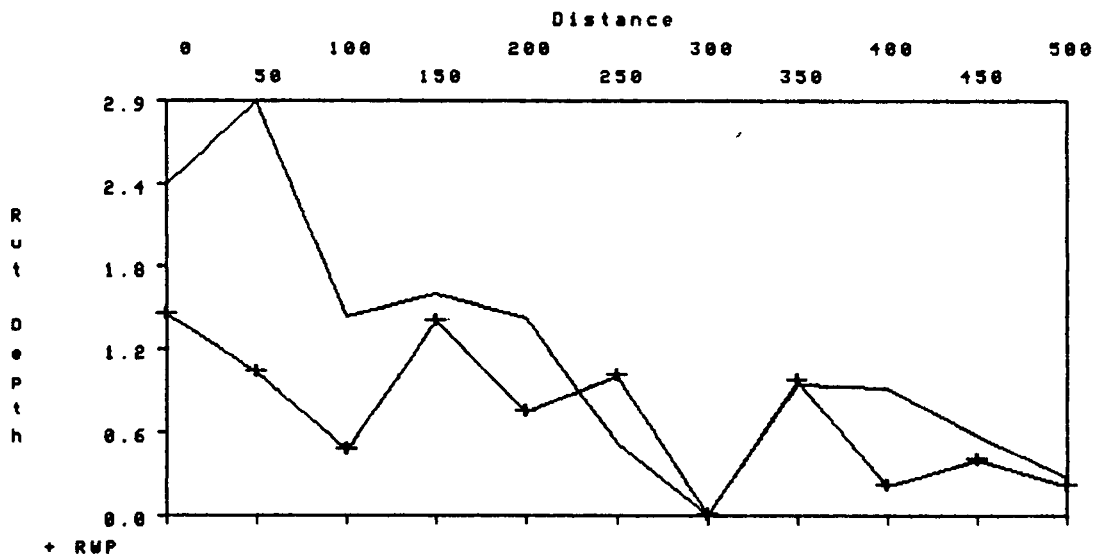


Figure 28. Rut Depth, Sections 510159 and 510119, as Measured by the Dipstick

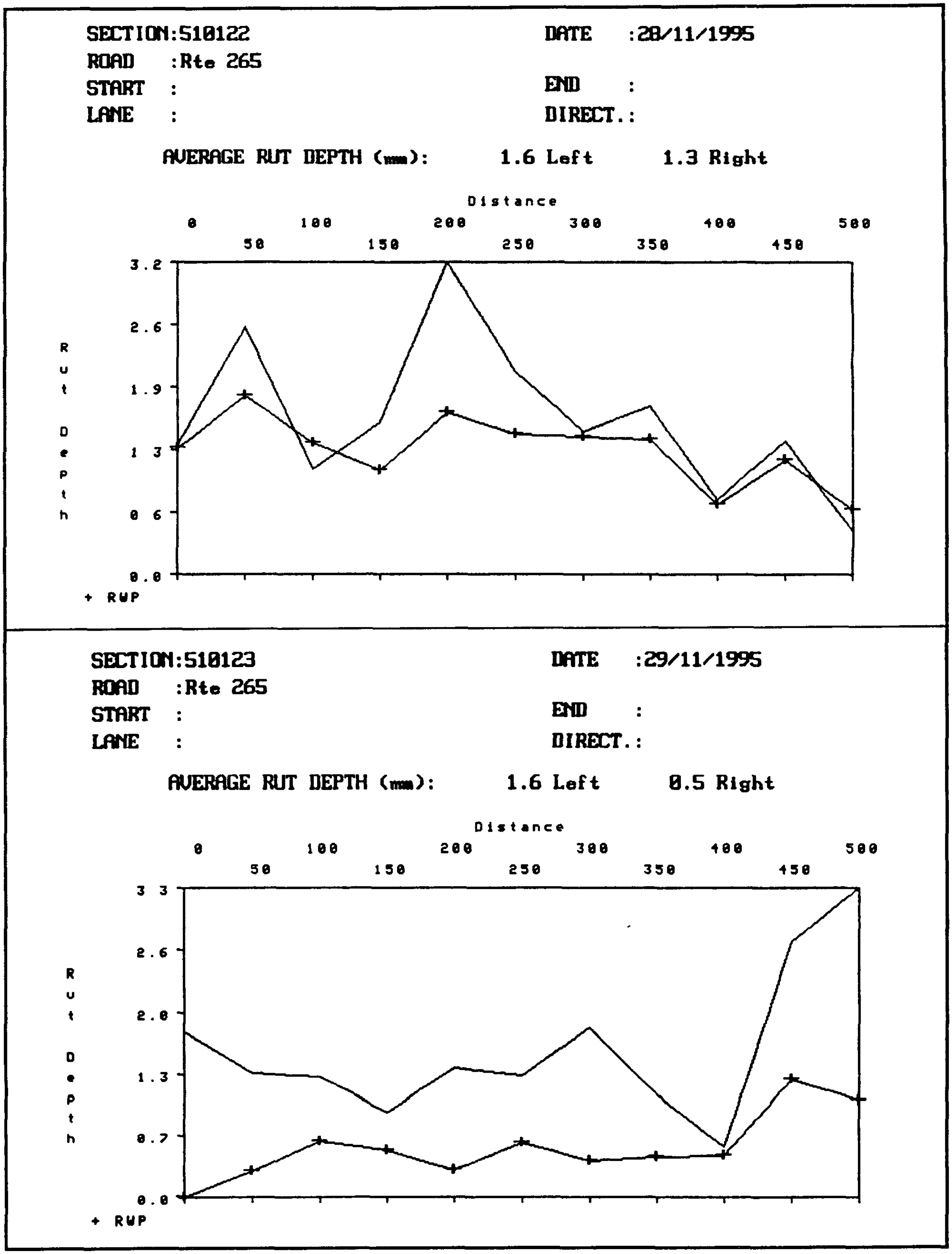


Figure 29. Rut Depth, Sections 510122 and 510123, as Measured by the Dipstick

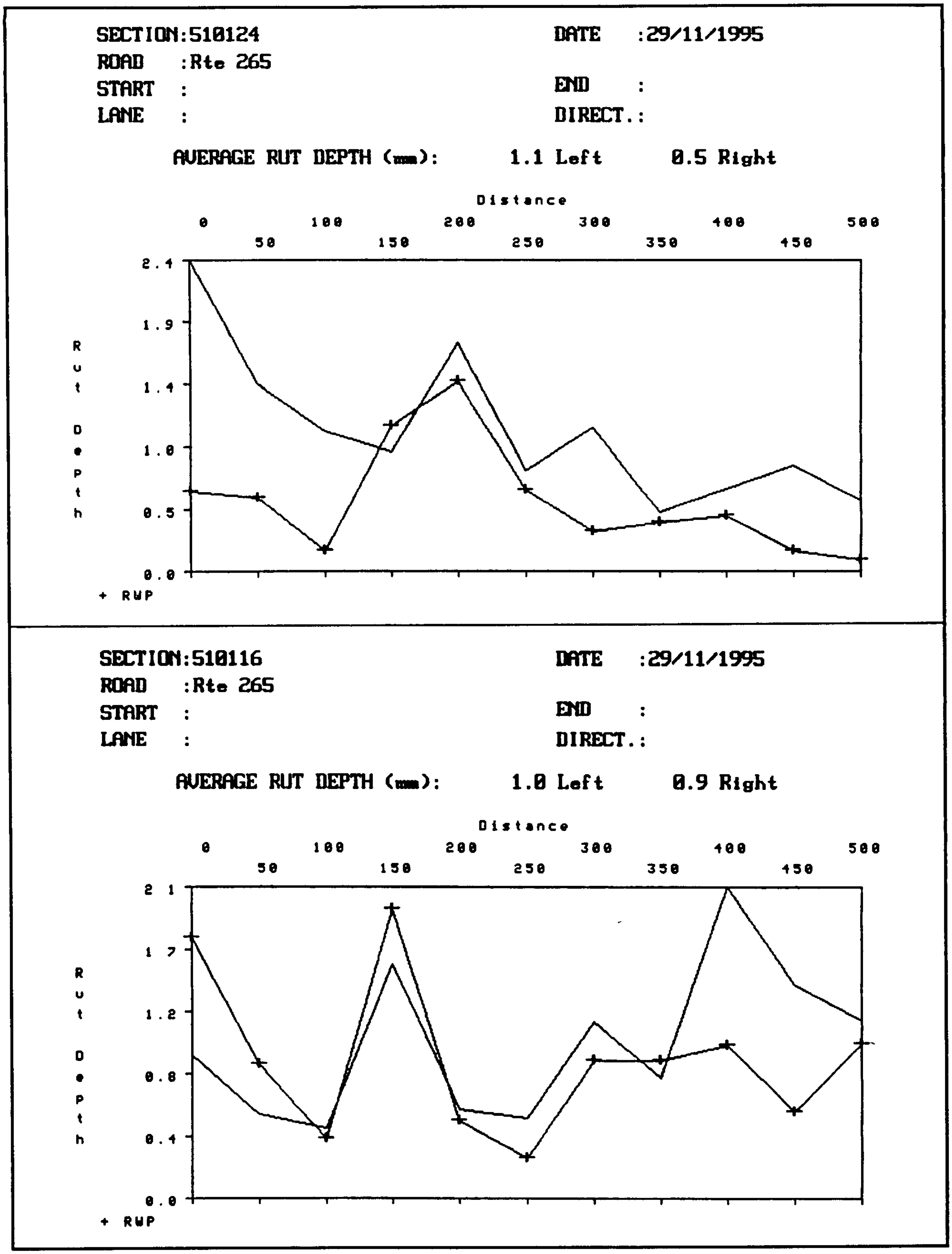


Figure 30 Rut Depth, Sections 510124 and 510116, as Measured by the Dipstick

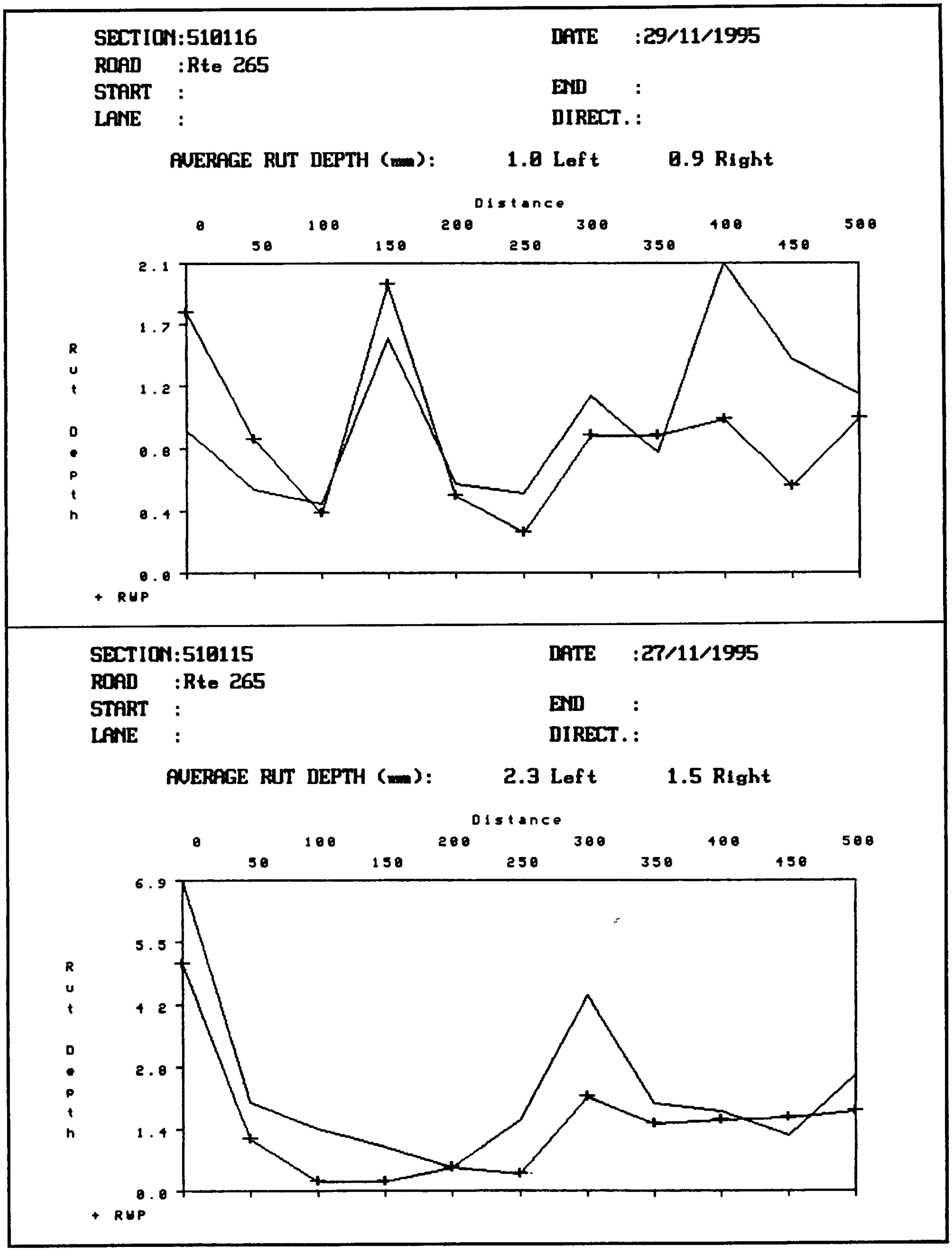
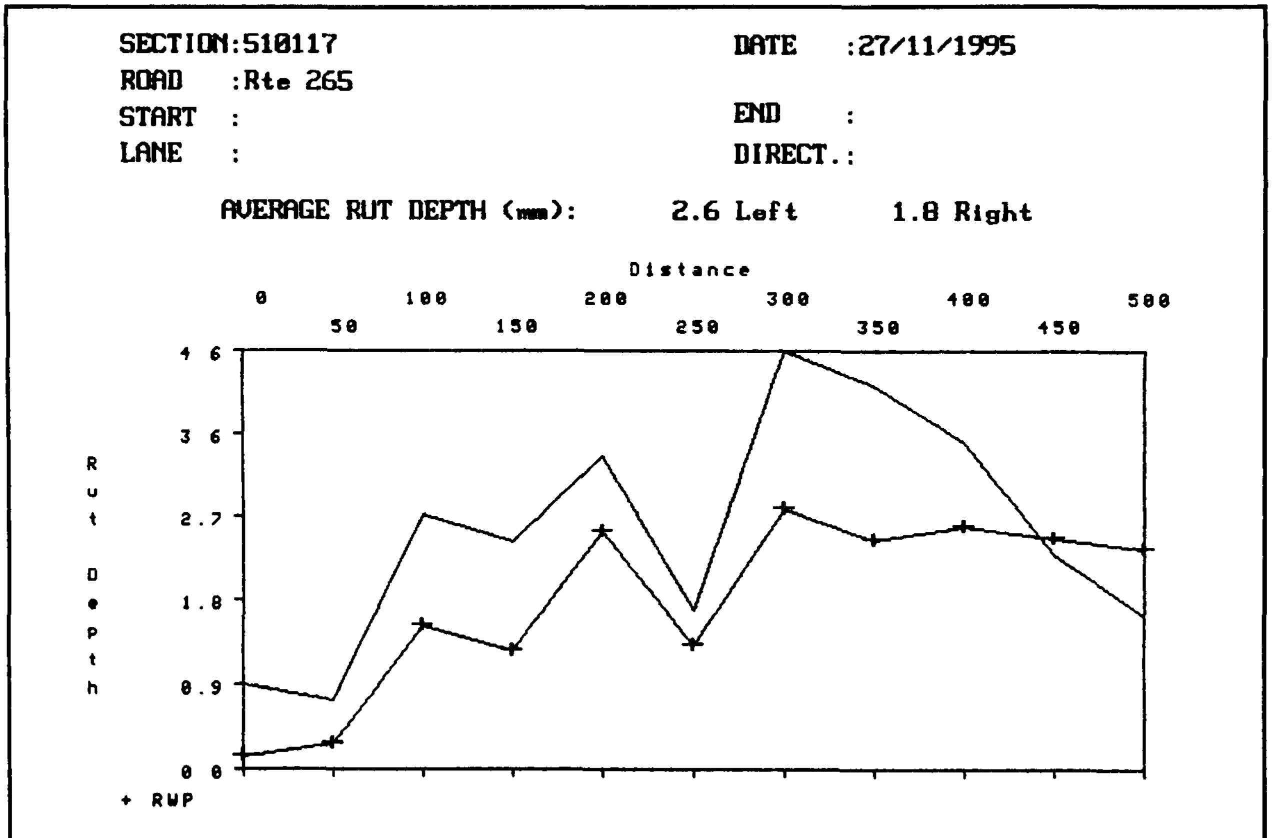


Figure 31. Rut Depth, Sections 510116 and 510115, as Measured by the Dipstick



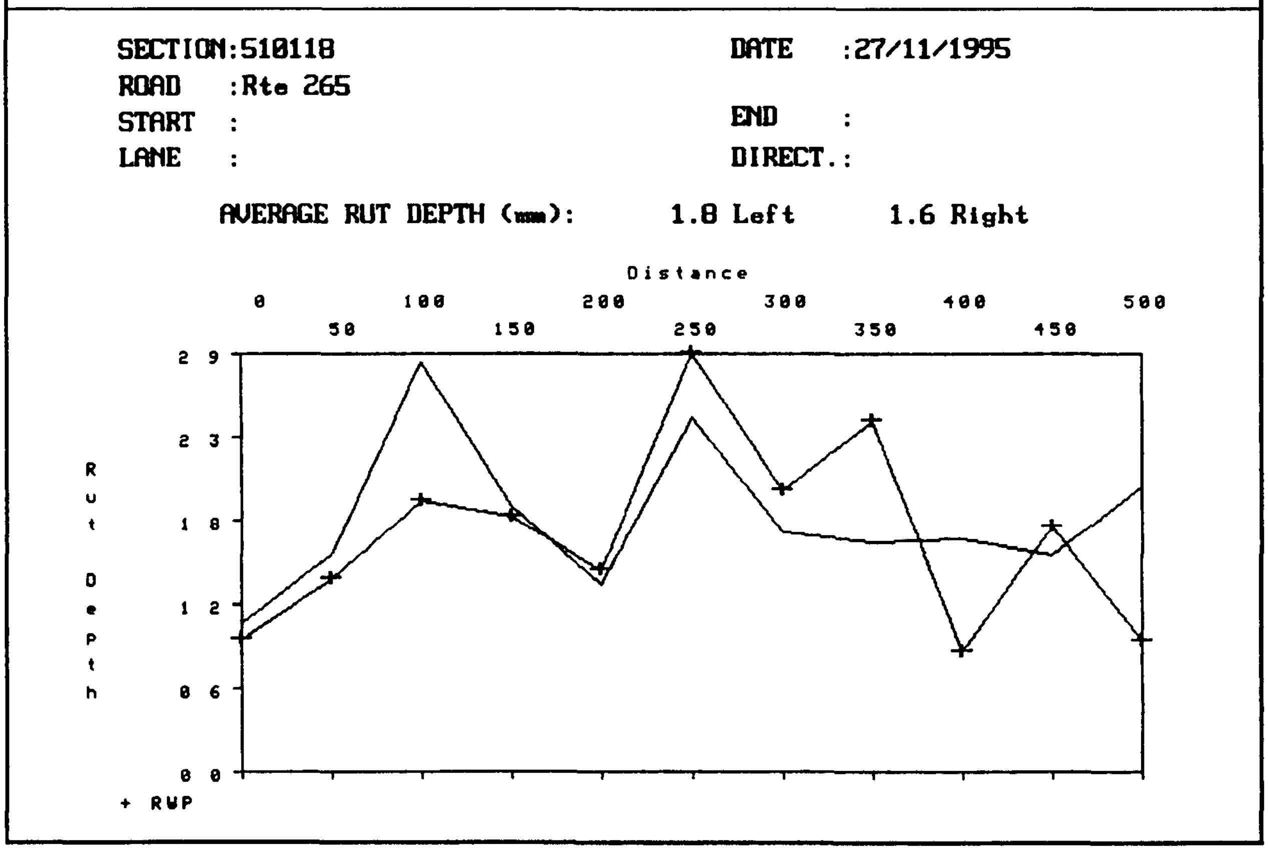
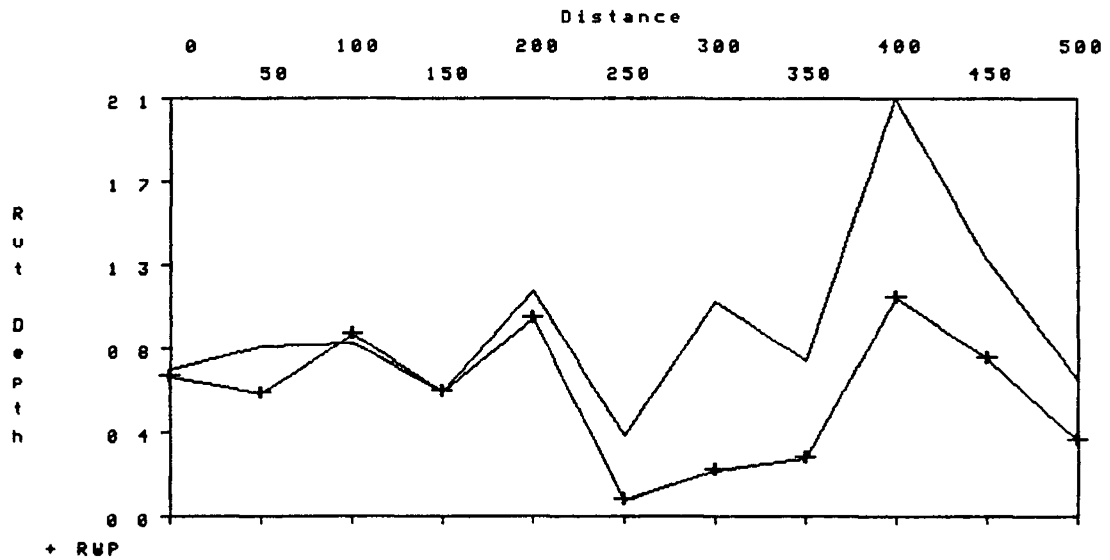


Figure 32. Rut Depth, Sections 510117 and 510118, as Measured by the Dipstick

SECTION:510113 DATE :27/11/1995
ROAD :Rte 265
START : END :
LANE : DIRECT.:

AVERAGE RUT DEPTH (mm): 1.0 Left 0.6 Right



SECTION:510113 DATE :24/04/1996
ROAD :
START :1030 END :
LANE : DIRECT.:

AVERAGE RUT DEPTH (mm): 1.6 Left 1.2 Right

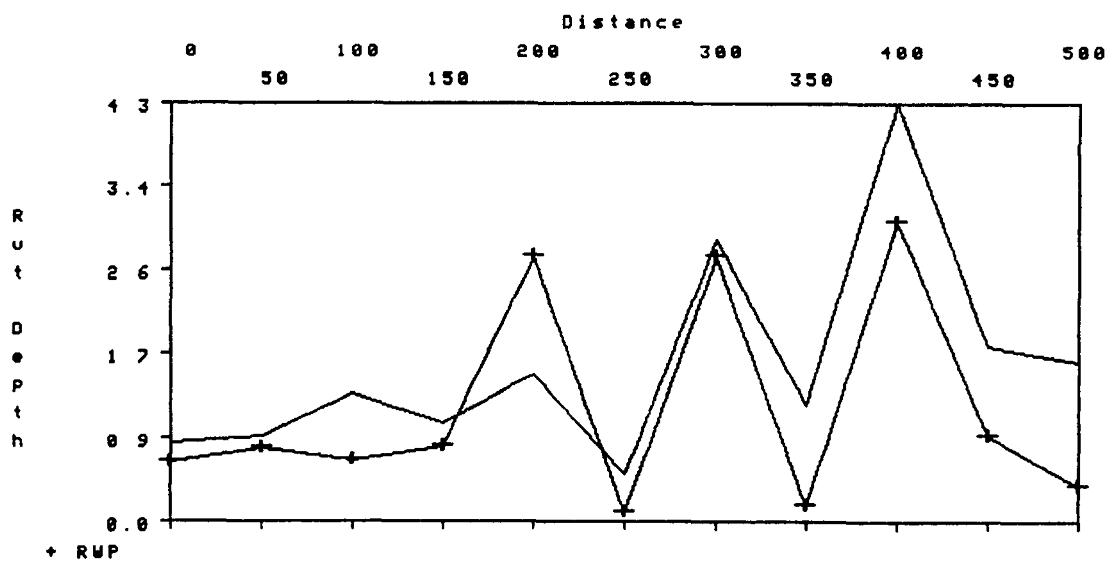


Figure 33 Rut Depth, Section 510113, as Measured by the Dipstick

APPENDIX A

Correspondence, Contract Agreements, Job Mix Formulas, FWD Survey

PAVEMENT
MANAGEMENT
SYSTEMS

January 9, 1995
50451010-13.19.1

Mr. Thomas E. Freeman
Virginia Transportation Research Council
530 Edgemont Road
Charlottesville, Virginia 22903

Dear Mr. Freeman:

The LTPP program is preparing to recruit the second round of seasonal site nominations. In accordance with your previous discussions with Dennis Morian and Basel Abukhater of our staff, it was indicated that there may be interest in including a seasonal site at the SPS-1 project. We are very interested in including a seasonal site from this project, as we are limited in the number of candidates available in the wet-freeze and no-freeze areas with fine subgrade soils. In particular we would be interested in either site 500113 or 500114.

For your information we have enclosed a "Seasonal Monitoring Program Guideline" as well as a sample of one of our existing installation reports.

Page III-24 of the "Seasonal Monitoring Program Guidelines" provides a list of the data collection activities with the level of effort required. Data is collected monthly with the exception in a wet-freeze environment, this is increased to bi-weekly during the thaw period, for a total of 14 site visits during the annual cycle. This will be the frequency of traffic control needed. A minimum of 2 cycles over a 3 year period is required for the core experiment, with the objective of obtaining up to 5 cycles over the life of the program.

In general, the seasonal instrumentation consists of moisture, temperature, water table depth, and frost depth measurements beneath the pavement. Along with this are climatic measurements of air temperature and precipitation. Pages II-27-28 of the Guidelines" indicate areas of responsibility for the FHWA, RCOC, and agency.

General items required of the agency for installation are a drill rig with the capability to drill 6" diameter hole to a 15' depth for installation of a piezometer. In addition, the cover for the observation hole, bentonite, and filter sand to fill the hole are to be provided by the agency. The agency is also to provide coring and auguring equipment for holes 10" to 12" in diameter up to a maximum depth of 7'. In addition, a concrete pavement saw must be provided to cut a trench from the observation hole to the pavement edge. This trench will carry the instrumentation cabling to the equipment cabinet adjacent to the roadway.

415 LAWRENCE BELL DRIVE
UNIT #3
AMHERST, N.Y. 14221
TEL. (716) 632-0804
FAX (716) 632-4808

The agency will also be responsible for traffic control for collecting the monthly data. This will require a lane closure approximately 300' in length at the instrument hole, for essentially one day each month.

The addition of the seasonal monitoring data, at different geographical locations promises to significantly enhance the LTPP database, and increase the potential analysis of the data.

Thank you for your consideration of supporting a seasonal data site.

Yours Sincerely,

Brandt Henderson
Manager, Field and Data Operations
Pavement Management Systems Limited

BH/tf

enclosure

C.C. I.J. Pecnik, RE, w/o enclosure
W.A. Phang, NARO, w/o enclosure

COPY

VIRGINIA
VTRC
TRANSPORTATION RESEARCH COUNCIL

APR 10 1995
FILE # 13.19.1

Virginia Department of Transportation
VDOT

COMMONWEALTH of VIRGINIA

VIRGINIA DEPARTMENT OF TRANSPORTATION
DAVID R. GEHR, COMMISSIONER

TRANSPORTATION RESEARCH COUNCIL
GARY R. ALLEN, PH.D., DIRECTOR

TRANSPORTATION RESEARCH COUNCIL
530 EDGEMONT ROAD
CHARLOTTESVILLE, VA 22903

UNIVERSITY OF VIRGINIA
JOHN T. CASTEEN, PRESIDENT

DEPARTMENT OF CIVIL ENGINEERING
FURMAN W. BARTON, CHAIRMAN

File No. 11-10-3

April 3, 1995

Mr. Brandt Henderson
Manager, Field and Data Operations
Pavement Management Services Limited
415 Lawrence Bell Drive
Unit #3
Amherst, New York 14221

Subject: Seasonal Site at the SPS-1 Project
Route 265 Danville Bypass

Dear Mr. Henderson:

I have discussed with my associates the possibility of including a seasonal site in our SPS-1 project, and we have decided that we can support this effort. We appreciate the limitations in the number of available candidates in the wet-freeze areas with fine subgrade soils, and therefore recognize the value to the LTPP program of including such a site in this project.

We understand that VDOT will be responsible for installing a piezometer (6-in. diameter hole to a depth of 15 ft) for water table depth monitoring. Additionally, we will provide a cover for the observation hole as well as bentonite and filter sand to be used as backfill material. We will also provide coring and auguring equipment to accomodate your installation of the instrumentation. VDOT will be responsible for sawing a trench through the pavement from the observation hole to the pavement edge for placement of equipment cables. We will provide traffic control to enable you to collect seasonal monitoring data. We understand that this will require the closing of one lane for a period of one day approximately once per month.

TELEPHONE (804) 293-1900 ——— FAX (804) 293-1990

VDOT is ready to move forward with the inclusion of a seasonal site at your direction. We expect to begin construction of the SPS-1 project during the first part of May, so we look forward in the near future to your input with regard to scheduling this work.

Very truly yours,

Thomas E. Freeman

Thomas E. Freeman, P.E.
Senior Research Scientist

TEF/tef

cc: Mr. J.S. Hodge
Dr. G.R. Allen
Mr. W.T. McKeel
Mr. R.J. Gibson
Mr. D.H. Grigg, Jr.
Mr. T.A. Wiles, IV
Mr. G.W. Maupin

VIRGINIA VTRC TRANSPORTATION RESEARCH COUNCIL

Virginia Department of Transportation VDOT

COMMONWEALTH of VIRGINIA

VIRGINIA DEPARTMENT OF TRANSPORTATION
DAVID R. GEHR, COMMISSIONER

TRANSPORTATION RESEARCH COUNCIL
GARY R. ALLEN, PH.D., DIRECTOR

TRANSPORTATION RESEARCH COUNCIL
530 EDGEMONT ROAD
CHARLOTTESVILLE, VA 22903

UNIVERSITY OF VIRGINIA
JOHN T. CASTEEN, PRESIDENT

DEPARTMENT OF CIVIL ENGINEERING
FURMAN W. BARTON, CHAIRMAN

11.10.3

April 3, 1995

Mr. Ivan J. Pecnik, P.E.
NARO Regional Engineer
Pavement Management Systems Limited
415 Lawrence Bell Drive
Unit# 3
Amherst, N.Y. 14221

Subject: VDOT SPS-1 Proposed Automated Weather Station (AWS) Site
Route 265 Danville Bypass

Dear Mr. Pecnik:

Enclosed please find VDOT's completed AWS site application form for your approval. Mr. Basel Abukhater of your office and our Resident Engineer, Mr. T.A. Wiles, IV visited the proposed site and concluded that it would likely be suitable for installation of the AWS. I have also enclosed a partial site plan that graphically illustrates the proposed location.

We look forward to your positive response. Please let me know if you need additional information.

Very truly yours,

Thomas E. Freeman

Thomas E. Freeman, P.E.
Senior Research Scientist

TEF/tef
enclosures

cc: Dr. G.R. Allen (without enclosures)
Mr. W.T. McKeel, Jr. (without enclosures)
Mr. G.W. Maupin (without enclosures)
Mr. D.H. Grigg, Jr.
Mr. T.A. Wiles, IV
Mr. Basel Abukhater

TELEPHONE (804) 293-1900 —— FAX (804) 293-1990

LTPP CLIMATIC DATA
SPS AUTOMATED WEATHER STATIONS
DATA SHEET SPS_AWS_2

STATE CODE [_ _]

LTPP SECTION ID [_ _ _ _]

PROPOSED AWS SITE LOCATION SPS - 1

Location: ROUTE 265 DANVILLE BYPASS - APPROX 35 M EAST OF FUTURE NBL ℄ AT STA 694+00 (SEE ATTACHMENT)

Distance from Project (Km): 0. (WITHIN ROW)

Latitude: __ . __ ' __ . _ "

Elevation (m): 198 M (650 FT)

Longitude: __ . __ ' __ . _ "

Estimated Installation Date (dd/mm/yyyy): 01/01/1995

Required Hardware Delivery Date (dd/mm/yyyy): __/__/____

Agency Contact Name: THOMAS E. FREEMAN
VDOT - RESEARCH COUNCIL

Shipping Address: VDOT - CHATHAM RESIDENCY
P.O. BOX 309
CHATHAM, VA 24531

Is heated rain gage required? (Y/N): Y

SITE CONDITIONS

Are there any obstructions or large paved areas within 35 m of the proposed AWS location? (Y/N): Y (circled)

If YES, explain: FUTURE NBL EDGE OF PAVEMENT WILL BE CONSTRUCTED APPROX. 25 M FROM AWS SITE.

Is the proposed AWS site on level terrain? (Y/N): Y (circled)

If NO, explain:

Is proposed AWS site subject to standing water (flooding), snow drift, and/or erosion? (Y/N): N (circled)

If YES, explain:

Is the proposed site on soft ground (swampy area) or full of vegetation that would make access to the AWS difficult? (Y/N): N (circled)

If YES, explain:

Is the proposed AWS site likely to be shaded? (Y/N): N (circled)

If YES, explain:

Is the proposed AWS site secure from theft and/or vandalism? (Y/N): Y (circled)

If NO, explain: AWS SITE WILL BE LOCATED WITHIN ROW FENCING.

[2] Use additional data sheets if more than one weather station is available

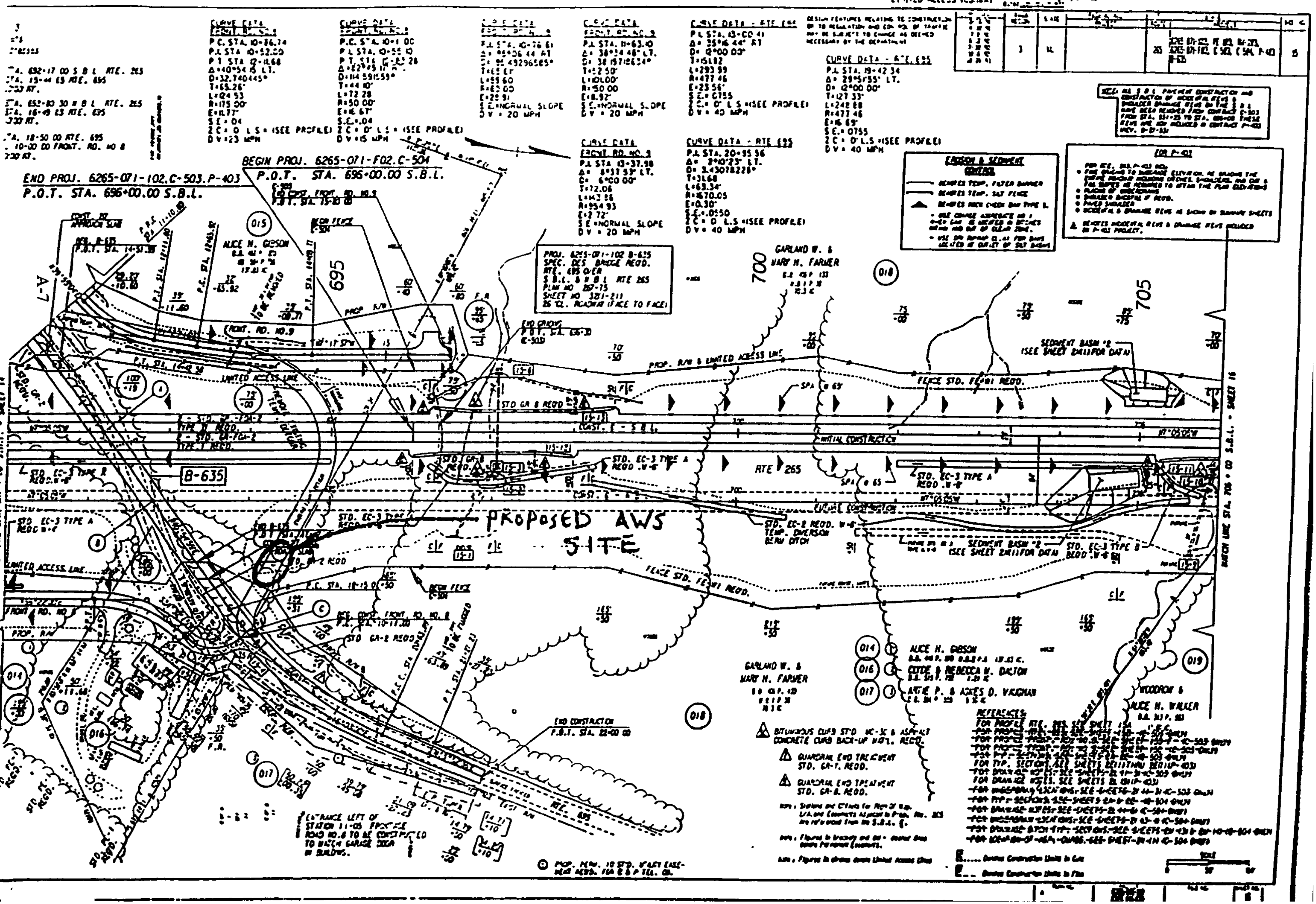
Note: the AWS site within the fence perimeter shall be covered by short grass or where grass does not grow, the natural earth surface. If grass cover is used, then the grass shall be mowed regularly.

RCOC RECOMMENDATION: It is our opinion that the proposed AWS site is the best possible location for the SPS project.

SUBMITTED BY: ________________

DATE (dd/mm/yyyy): __/__/____

S1 1 [redacted] DANVI[redacted]E YP[redacted]S [redacted]34



PMS PAVEMENT MANAGEMENT SYSTEMS

MEMORANDUM

TO	Ivan Pecnik	**DATE**	April 19, 1995
FROM	Brandt Henderson	**PROJECT**	50451027
SUBJECT	A.W.S. Site Location for Virginia SPS-1	**FILE**	13.19.1

In review of the proposed A.W.S. site information provided by Tom Freeman and discussion with Basel Abukhater, I have the following comments on the submission:

The proposed site meets all requirements with the exception of being within 35m of a large paved area (A.W.S. site will be approximately 25m from northbound lane pavement edge). As the weather station will be elevated from the roadway, I do not believe this should be a problem. The other aspects of the selected location make it an ideal spot for the A.W.S. Attached are two general vicinity pictures showing the location of the power source (hydro pole) from which power will be accessed for the A.W.S. I recommend that we accept this site location for the SPS-1 A.W.S.

If you have any questions or need further information, please let me know.

CC: B. Abukhater, w/o photos
G. Cimini, w/o photos
W.A. Phang, w/o photos

415 Lawrence Bell Drive - Suite 3, Amherst, New York, 14221 (716) 632-0804 Fax.(716) 632-4808

INTEROFFICE MEMORANDUM

Date Sent: 11-Sep-1995 10:30am DST
From: Thomas Freeman
FREEMAN_TE
Title:
Dept:
Tel No:

TO: See Below

Subject: Planning Meeting
SPS Seasonal Site Installation
Route 265 Danville Bypass

Please be advised that the subject meeting will be held at 10:00 a.m. on Thursday September 21, 1995 at the Lynchburg District Office, Materials Building.

The purpose of the meeting will be to discuss arrangements for the installation of the seasonal site. Attendance by you or a designated representative would be appreciated.

Distribution:

TO:	Bill Phang	(PAPER MAIL)
TO:	Brandt Henderson	(PAPER MAIL)
	Grigg_DH	(GRIGG_DH AT A1 AT LYNCH)
	Buddy Wood	(WOOD_LE)
TO:	Basel Abukhater	(PAPER MAIL)
TO:	T.A. WILES, IV	(WILES_TA AT A1 AT LYNCH)
TO:	Randy L. Hamilton	(HAMILTON_RL AT A1 AT LYNCH)
TO:	LARRY D. BAKER	(BAKER_LD @ A1 @ LYNCH)
CC:	Wallace T. McKeel	(MCKEEL_WT)

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 1

To BILL PHANG	From TOM FREEMAN
Co. PMS	Co. VTRC
Dept.	Phone # 804-293-1957
Fax # 716-632-4808	Fax # 804-293-1990

PMS

FAX TRANSMITTAL

FAXED 30/95

To:	Virginia DOT, Lynchburg	**Fax No.**	1-804-947-2190
Attention:	Dale Grigg	**Date:**	30 October 1995
Reference:	**AUTOMATED WEATHER STATION** **FILE: 5-045-11-27**	1 page(s) total including cover sheet. Original will **NOT** follow by mail.	
Sender:	Brandt Henderson, PMSL		

MESSAGE:

The Automated Weather Station (AWS) installation was completed prior to the fence being totally erected. A "Masters" combination lock was purchased for the gate. The lock was installed on the AWS cabinet; it should be used to secure the gate. The combination for this lock is 7747. The use of the combination lock will allow access by State, Federal and contract employees. Could you arrange to have the lock transferred to the gate. If there are any problems please let me know.

Thank you for your assistance.

Brandt Henderson
Manager, Field Data Operations

Pavement Management Systems Limited 152 Main Street Cambridge ON N1R 6R1
Ph: (519) 622-3005 Fax: (519) 622-2580

MAT'LS-[redacted]

FORM C-20
REV. 1/1/87

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF TRANSPORTATION

NOTICE TO PROCEED

Date: April 4, 1995

District: Lynchburg

County: Pittsylvania

Route: 265

Federal Project: AC-DPS-0028(003);AC-DPS-0028(00

State Project: 6265-071-F02,P402,P403

CERTIFIED

W. C. English, Inc.
(Name of Firm)

P. O. Box P 7000
(Address)

Lynchburg, VA 24505
(City) (State) (Zip Code)

The contract for construction of the subject project has been duly executed and you are hereby officially notified to proceed with the work on TUES., April 4, 1995 (Date). Unless otherwise approved, work shall begin within 10 days of such date.

Finish Dec. 1, 1995

Contract time will be charged as set forth in section 108.02 of the specifications.

Bruce Burnette/Edmund Giles (Name) have been assigned as the representative of the Department.

Yours truly,

For: District Engineer

NOTE: RESIDENT ENGINEER HAS WAIVED
3 - DAY REQUIREMENT (SEC.108.02)

CC:
Construction Engineer
Environmental Quality Engineer
Materials Engineer
Right of Way Engineer
~~Secondary Roads Engineer (Secondary Projects only)~~
~~Maintenance Engineer (Maintenance contracts only)~~
Fiscal Manager
~~Research Engineer~~
Resident Engineer — CHATHAM
Inspector —
~~Division Administrator, FHWA, P. O. Box 10045, Richmond, VA 23240~~
~~State Water Control Board, P. O. Box 11143, Richmond, VA 23230~~

DISTRICT:
L&D
EO
TE
ENVIRONMENTAL
MATERIALS
B.M. LINDSAY

C-31 Rev. 11/94

Commonwealth of Virginia
Department of Transportation

Date May 31, 1995 Route 265 ~~City~~/Co. Pittsylvania Sublet No. 7 (Dept. Use Only)

Project 6265-071-F02,P402,P403

FHWA AC-DPS-0028(003);AC-DPS-0028(004) Contract ~~Job Des.~~ No. 950025A5 ~~25-95A~~

Prime Contractor W. C. ENGLISH, Incorporated Vendor No. E009

Proposed Subcontractor APAC-VIRGINIA, INC. Vendor No. A-079

Contract Items and Amounts Proposed to be Sublet

Item No.	Item Description	Quantity	Unit Price*	$ Amount
10061-24	Stab. Open-Graded Material	15,008 TON	14.50*	$ 217,616.00
10416-27	Liquid Asphalt	12,107 GAL	0.20*	2,421.40
10424-28	Blotted Seal Coat Ty. D	2,231 SY	2.65	5,912.15
10577-29	Asphalt Concrete Ty. SM-2A (SHRP)	349 TON	19.35*	6,753.15
10578-30	Asphalt Concrete Ty. SM-2C (SHRP)	6,929 TON	18.60*	128,879.40
10579-31	Asphalt Concrete Ty. IM-1A (SHRP)	2,675 TON	18.75*	50,156.25
10580-32	Asphalt Concrete Ty. IM-1B (SHRP)	10,146 TON	17.90*	181,613.40
10581-33	Asphalt Concrete Base Course BM-3 (SHRP)	20,371 TON	16.85*	343,251.35
10583-34	Asphalt Concrete Ty. SM-2 A	7,558 TON	17.50*	132,265.00
15092-35	Asphalt Concrete Base Course BM-2	18,316 TON	14.10*	258,255.60
12322-36	Asphalt Concrete Curb Ty. MC-3B	1,540 LF	5.87	9,039.80
12323-37	Asphalt Concrete Curb Ty. MC-3C	17,212 LF	4.60	79,175.20
12505-38	Asphalt Concrete, Curb Backup Material	956 TON	26.00*	24,856.00
			TOTAL	$1,440,194.70

PARTIAL — English furnishing stone, asphalt cement and liquid asphalt.

A-12

* Total quantities and/or the unit price being sublet can not exceed the contract quantity and/or the contract unit price. An explanation shall be provided if the unit price shown is less than the contract unit price.

RECEIVED JUN 05 1995 CONTRACT ADMIN. LYNCHBURG DISTRICT

D,M/WBE Credit Requested $

Specialty Items $ -0-

Page Total $ 1,440,194.70

Supplemental Page(s) $ 0.00

No. of Pages 1

Total Requested $ 1,440,194.70

Commonwealth of Virginia
Department of Transportation

C-31 Rev. 11/94

Date May 8, 1995 Route 265 ~~City~~/Co. Pittsylvania Sublet No. 6 (Dept. Use Only)

Project 6265-071-F02,P402,P403

FHWA AC-DPS-0028(003);AC-DPS-0028(004) ~~Job Des.~~ CONTRACT No. 950025A5 ~~25-95A~~

Prime Contractor W. C. ENGLISH, Incorporated Vendor No. E009

Proposed Subcontractor SITE PREP, INC. OF NC Vendor No. S833

Contract Items and Amounts Proposed to be Sublet

Item No.	Item Description	Quantity	Unit Price*	$ Amount
10011-10	Hydraulic Cement	1,589 TON	10.26*	$ 16,303.14
10026-13	Manipulation 6"	75,137 SY	1.65	123,976.05
			TOTAL	$140,279.19

*PARTIAL - Handling and spreading only.

RECEIVED
MAY 12 1995
CONTRACT ADMIN.
LYNCHBURG DISTRICT

A-13

Total quantities and/or the unit price being sublet can not exceed the contract quantity and/or the contract unit price. An explanation shall be provided if the unit price shown is less than the contract unit price..

D,M/WBE Credit Requested $ ____ Page Total $ 140,279.19

Specialty Items $ ____ Supplemental Page(s) $ 0.00

No. of Pages 1

Commonwealth of Virginia
Department of Transportation

C-31 Rev. 11/94

Date May 2, 1995 Route 265 ~~City~~/Co. Pittsylvania Sublet No. 1 (Dept. Use Only)

Project 6265-071-F02,P402,P403

FHWA AC-DPS-0028(003);AC-DPS-0028(004) Contract ~~Job Des.~~ No. ~~25-95A~~ 95002SA5

Prime Contractor W. C. ENGLISH, Incorporated Vendor No. E009

Proposed Subcontractor GREENSCAPE SEEDING, INC. Vendor No. G198

Contract Items and Amounts Proposed to be Sublet

Item No.	Item Description	Quantity	Unit Price*	$ Amount
580-7	Underdrain UD-1	1,570 LF	4.60	$ 7,222.00
588-8	Underdrain UD-4	34,194 LF	3.47	118,653.18
592-9	Comb. Underdrain CD-1&2	2,569 LF	6.20	15,927.80
596-10	Endwall EW-12	110 EA	215.00	23,650.00
			TOTAL	$165,452.98

'95 APR 17 AM 8 41 RECEIVED

RECEIVED
MAY 08 1995
CONTRACT ADMIN.
LYNCHBURG DISTRICT

A-14

* Total quantities and/or the unit price being sublet can not exceed the contract quantity and/or the contract unit price. An explanation shall be provided if the unit price shown is less than the contract unit price.

D,M/WBE Credit Requested $ 165,452.98
Specialty Items $

Page Total $ 165,452.98
Supplemental Page(s) $ 0.00
No. of Pages 1
Total Requested $ 165,452.98

Commonwealth of Virginia
Department of Transportation

C-31 Rev. 11/94

ate May 2, 1995 Route 265 ~~City~~/Co. Pittsylvania Sublet No. 3
Dept. Use Only

Project 6265-071-F02,P402,P403

HWA AC-DPS-0028(003);AC-DPS-0028(004) CONTRACT ~~Job Des~~. No. ~~25-95A~~ 950025A5

rime Contractor W. C. ENGLISH, Incorporated Vendor No. E009

Proposed Subcontractor T & H ELECTRICAL CORP. Vendor No. T142

Contract Items and Amounts Proposed to be Sublet

Item No.	Item Description	Quantity	Unit Price*	$ Amount
13812-46	Weigh-in-Motion Data Collection System	Lump Sum	L.S.	$84,000.00
			TOTAL	$84,000.00

RECEIVED
MAY 08 1995
CONTRACT ADMIN.
LYNCHBURG DISTRICT

* Total quantities and/or the unit price being sublet can not exceed the contract quantity and/or the contract unit price. An explanation shall be provided if the unit price shown is less than the contract unit price.

D,M/WBE Credit Requested $ ____
Specialty Items $ ____

Page Total $ 84,000.00
Supplemental Page(s) $ 0.00
No. of Pages 1
Total Requested $ 84,000.00

VIRGINIA DEPARTMENT OF HIGHWAYS AND TRANSPORTATION
MATERIALS DIVISION

STATEMENT OF BITUMINOUS CONCRETE OR CENTRAL-MIX AGGREGATE JOB-MIX FORMULA

Submit to the District Engineer, Virginia Department of Highways and Transportation. Approval must be received by the contractor from the Materials Division before work is begun. This job-mix design is approved for all projects of the Department for the mix shown; calendar year 1995. Mix Design No. 3-CM-9522.

Project or Schedule: All Va. State Projects

Date 12-9-94 Route ____ County ____ Tonnage ____ Tons ____ (Mg)

Type Mix/Size Aggregate: aggregate Base Type I #21B

Producer Name & Plant Location: Vulcan Materials Co. Danville Va. Phone ~~387-5613~~

MATERIALS		Kind	Source
Stone	85 %	Granite	Shelton quarry Danville Va
Sand	%		
Screenings	15 %	Granite	Shelton quarry Danville Va.
Asphalt Cement			
Asphalt Prime/Tack			
Additives:			
	%		
	%		
	%		

Statistical Specifications X Conventional Specifications ____

JOB-MIX Sieves	Total % Passing	Tolerance %, + or −	Acceptance Range	Design/Specification Range
2"	100	0	100	100
1"	95.0	5	90-100	85-95
3/8	59.0	9.5	49.5-68.5	50-69
#10	30.0	7	23.0-37.0	20-36
#40	19.0	4	15.0-23.0	9-19
#200	7.0	2	5.0-9.0	4-7
L.L.			Max - 23	Max 23
P.I			Max - 2	Max 2

Asphalt ____ % ____ %

Temperature ____ °F (°C) ±20°F (±11°C)

Contractor: Vulcan Materials Co. Danville Va. By Lee H. Jones Jr.

Producer Technician's Certification Number 225-56-9448

MATERIALS DIVISION USE ONLY

Remarks: PLANT I.D. 309 SIZE MATL CODE 82
JOB MIX ID 9522 TYPE MATL CODE 79

Copies: State Materials Engineer
District Materials Engineer
Project Inspector
Plant Inspector
Sub-Contractor and/or Producer

Checked By L. E. Johnson

Approved tentatively subject to the production of material meeting all other applicable requirements of the specifications

Approved By [signature]
District Materials Engineer

TERIALS DIVISION
Statement of Asphalt Concrete or Central-Mix Aggregate Job-Mix Formula

ıbmit to the District Administrator, Virginia Department of Transportation. Approval must be received by th tractor from the Materials Division before work is begun. This job-mix design is approved for all projects of th epartment for the type of mix and the calendar year shown below.

Contractor Design Mix No. ______ Design Lab No. L-1

e 5-5-95 Job Mix ID No. 3BC95-44 Calendar Yr. 95

e Mix/Size Aggregate TYPE I DRAINAGE LAYER (PATB) TSR Test No. ______

ducer Name & Plant Location APAC VA. INC. - SHELTON N.C. Phone 388-2340

TERIALS	%	Kind	Source
Aggregate	80 %	# 603's	VULCAN MAT. - SHELTON N.C.
gregate	20 %	# 8's	VULCAN MAT. - SHELTON N.C.
	%		
Sand	%		
ening	%		
e	1 %	HYDRATED	VA. LIME CO. - RIPPLEMEAD, VA.
*Asphalt Cement		AC-30	CHEVRON - RICHMOND, VA.
*sphalt Prime/Tack			
dditives:			
	%		
	%		

JOB-MIX Sieves	Total % Passing	Tolerance % + or -	Acceptance Range Average of ___ Test(s)	Design/Spec. Range
1½	100			100
1	92			90-100
½	43			34-52
4	6			MAX-10
8	3			MAX-5
200	2			MAX-5

*Only asphaltic materials tested and certified according to the VDOT A.A.P. will be used in this mix.

sphalt	2.5 %	± .5 %	2.0 - 3.0	
emperature	250 °F	+ 20° (+11 °C)	210 - 280	MAX - 280

orrection Factor for Field Marshall 230 - 270

roducer Technician's Certification Number 22427714C6

MATERIALS DIVISION USE ONLY

Remarks ______

Nominal Max Size Aggr. ______ Application Rate: Min. ______ Max. ______

mpacted unit weight of the mix, at the job mix asphalt content ______ VTM ______ Max. Sp. Gr. ______

Checked By [signature]

Approved tentatively subject to the production of material meeting all other applicable requirements of th specification.

Copies:
State Materials Engineer
District Materials Engineer
Project Inspector

Mix Design No. 3BC95-44

Approved By [signature] 5/8/95
District Materials Engineer

VIRGINIA DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION
Statement of Asphalt Concrete or Central-Mix Aggregate Job-Mix Formula

Submit to the District Administrator, Virginia Department of Transportation. Approval must be received by the contractor from the Materials Division before work is begun. This job-mix design is approved for all projects of the Department for the type of mix and the calendar year shown below.

Contractor Design Mix No. ________ Design Lab No. L-1

Date 1-26-95 Job Mix ID No. 3BC95-02 Calendar Yr. 95

Type Mix/Size Aggregate BM-3 (ATB) TSR Test No. ________

Producer Name & Plant Location APAC Va. Inc - Shelton, N.C. Phone 388-2340

MATERIALS		Kind	Source
Aggregate	45 %	#357's	Vulcan Mat. - Shelton, N.C.
Aggregate	15 %	# 68's	Vulcan Mat. - Shelton, N.C.
Rap	%		
Sand	20 %	Local	Dan River - McCarty Sand
Screening	20 %	#10's Reg.	Vulcan Mat. - Shelton N.C.
Lime	%		
*Asphalt Cement		AC-20	Coastal - APEX, N.C.
*Asphalt Prime/Tack		CRS-1	Central Oil - Greensboro N.C.
Additives:			
Add-Here	.5 %	HP-Plus	Arr-Maz Products - Vanceboro N.C.
	%		

JOB-MIX Sieves	Total % Passing	Tolerance % + or -	Acceptance Range Average of ___ Test(s)	Design/Spec. Range
2	100	0	100	100
1 1/2	96	4	92-100	90-100
1	80	4	76-84	70-86
1/2	52	4	48-56	46-64
4	41	4	37-45	26-44
30	16	3	13-19	8-18
200	4	1	3-5	2-5

*Only asphaltic materials tested and certified according to the VDOT A.A.P will be used.

Asphalt	4.5 %	± .3 %	4.2 - 4.8	
Temperature	290 °F	± 20° (±11°C)	220 - 310	

Correction Factor for Field Marshall .004

Producer Technician's Certification Number 558-72-0659

MATERIALS DIVISION USE ONLY

Remarks ________

Nominal Max Size Aggr. 1.5 Inch Application Rate: Min. 300 Lbs.Yd.^{2} Max. 460 Lbs.Yd.^{2}

Compacted unit weight of the mix, at the job mix asphalt content 145.0 lbs/cu.ft. VTM 4.7% Max. Sp. Gr. Rice= 2.439 Bulk= 2.324

Checked By [signature]

Approved tentatively subject to the production of material meeting all other applicable requirements of the specification.

Copies:
State Materials Engineer
District Materials Engineer
Project Inspector

Mix Design No. 3BC95-02

A-18

Approved By [signature] 3/3/95

orm TL-127 (Rev. 11/90)

VIRGINIA DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION
Statement of Asphalt Concrete or Central-Mix Aggregate Job-Mix Formula

ubmit to the District Administrator, Virginia Department of Transportation. Approval must be received by the contractor from the Materials Division before work is begun. This job-mix design is approved for all projects of the Department for the type of mix and the calendar year shown below.

Contractor Design Mix No. ______ Design Lab No. L-1

ate 7-17-95 Job Mix ID No. 3BC95-59 Calendar Yr. ______

Type Mix/Size Aggregate IM-1A AC Binder TSR Test No. ______

roducer Name & ant Location APAC VA. INC. SHELTON N.C. Phone (910) 388-2340

MATERIALS		Kind	Source
ggregate	50 %	= 68's	VULCAN MAT. - SHELTON N.C.
Aggregate	10 %	= 8's	VULCAN MAT. - SHELTON N.C.
Rap	%		
Sand	15 %	LOCAL	McCARTY SAND - DAN RIVER.
Screening	25 %	= 10's	VULCAN MAT. - SHELTON N.C.
ime	%		
sphalt Cement			
Asphalt Prime/Tack			
Additives:			
ARR-MAZ	.5 %	HP-PLUS	ARR MAZ PRODUCTS - VANCEBORO NC.
	%		

JOB-MIX Sieves	Total % Passing	Tolerance % + or -	Acceptance Range Average of ___ Test(s)	Design/Spec. Range
1	100	0	100	100
3/4	97	4	93 - 100	97 - 100
1/2	80	4	76 - 84	72 - 86
4	45	4	41 - 49	40 - 58
30	18	3	15 - 21	14 - 24
200	5	1	4 - 6	3 - 6

*Only asphaltic materials tested and certified according to the VDOT A.A.P will be used.

Asphalt 5.30 % .3 % 5.0 - 5.3

Temperature 290 °F + 20° (+11 °C) 270 - 320 MAX 325

Correction Factor for Field Marshall 0.018

Producer Technician's Certification Number 224-27-7146

MATERIALS DIVISION USE ONLY

Remarks ______

Nominal Max Size Aggr. 3/4 Inch Application Rate: Min. 200 Lbs.Yd.^{2} Max. 345 Lbs.Yd.^{2}

Compacted unit weight of the mix, VTM 4.1% Max. Sp. Gr. Rice= 2.416 Bulk= 2.318

at the job mix asphalt content 144.6 lbs/cu.ft.

Checked By [signature]

Approved tentatively subject to the production of material meeting all other applicable requirements of the specification.

A-19

Copies:
State Materials Engineer
District Materials Engineer
Project Inspector

Mix Design No. 3BC95-59

Approved By [signature] 7/18/95
District Materials Engineer

VIRGINIA DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION
Statement of Asphalt Concrete or Central-Mix Aggregate Job-Mix Formula

Submit to the District Administrator, Virginia Department of Transportation. Approval must be received by the contractor from the Materials Division before work is begun. This job-mix design is approved for all projects of the Department for the type of mix and the calendar year shown below.

Contractor Design Mix No. ______ Design Lab No. ______

Date 7-18-95 Job Mix ID No. 3BC95-60 Calendar Yr. ______

Type Mix/Size Aggregate IM-1B AC Binder TSR Test No. ______

Producer Name & Plant Location APAC VA, INC. SHELTON N.C. Phone (910) 388-2340

MATERIALS	%	Kind	Source
Aggregate	50 %	#68's	VULCAN MAT. - SHELTON N.C.
Aggregate	10 %	#8's	VULCAN MAT. - SHELTON N.C.
Rap	%		
Sand	15 %	LOCAL	McCARTY SAND - DAN RIVER
Screening	25 %	#10's	VULCAN MAT. - SHELTON N.C.
Lime	%		
Asphalt Cement			
Asphalt Prime/Tack			
Additives:			
ARR MAZ	.5 %	HP PLUS	ARR MAZ PRODUCTS - VANCEBORO N.C.
	%		

JOB-MIX Sieves	Total % Passing	Tolerance % + or -	Acceptance Range Average of ___ Test(s)	Design/Spec. Range
1	100	0	100	100
3/4	97	4	93 - 100	97 - 100
1/2	80	4	76 - 84	72 - 86
4	45	4	41 - 49	40 - 58
30	18	3	15 - 21	14 - 24
200	5	1	4 - 5	3 - 6

*Only asphaltic materials tested and certified according to the VDOT A.A.P will be used.

Asphalt 5.1 % ± .3 % 4.8 - 5.4

Temperature 290 °F + 20° (+11 °C) 270 - 310

Correction Factor for Field Marshall 0.003

Producer Technician's Certification Number 224277146

MATERIALS DIVISION USE ONLY

Remarks ______

Nominal Max Size Aggr. 3/4 Inch Application Rate: Min. 200 Lbs.Yd.^{2} Max. 345 Lbs.Yd.^{2}

Compacted unit weight of the mix, at the job mix asphalt content 144.1 lbs/cu.ft. VTM 4.2% Max. Sp. Gr. Rice= 2.411 Bulk= 2.31

Checked By [signature]

Approved tentatively subject to the production of material meeting all other applicable requirements of the specification.

Copies:
State Materials Engineer
District Materials Engineer
Project Inspector
Sub-Contractor

Mix Design No. 3BC95-60

Approved By [signature] 7/19/95

MATERIALS DIVISION
Statement of Asphalt Concrete or Central-Mix Aggregate Job-Mix Formula

Submit to the District Administrator, Virginia Department of Transportation. Approval must be received by the contractor from the Materials Division before work is begun. This job-mix design is approved for all projects of the Department for the type of mix and the calendar year shown below.

Contractor Design Mix No. ______ Design Lab No. 2-1

Date 9-5-95 Job Mix ID No. 3BC95-67 Calendar Yr. 95

Type Mix/Size Aggregate SM-2B AC Surface TSR Test No. ______

Producer Name & Plant Location APAC VA. INC. SHELTON N.C. Phone (910) 387-2340

MATERIALS		Kind	Source
Aggregate	40 %	#8's	VULCAN MAT. - SHELTON N.C.
Aggregate	20 %	#78's	VULCAN MAT. - SHELTON N.C.
Rap	%		
Sand	10 %	LOCAL	McCARTY SAND DAN RIVER - DANVILLE VA.
Screening	30 %	10's	VULCAN MAT. - SHELTON N.C.
Lime	%		
*Asphalt Cement		AC-20	COASTAL FUEL - APEX N.C.
Asphalt Prime/Tack		CRS-1	CENTRAL OIL - GREENSBORO N.C.
Additives: ARR MAZ	.5 %	HP PLUS	ARR MAZ PRODUCTS - VANCEBORO N.C.
	%		

JOB-MIX Sieves	Total % Passing	Tolerance % + or -	Acceptance Range Average of ___ Test(s)	Design/Spec. Range
3/4	100	0	100	100
1/2	97	4	93 - 100	97 - 100
3/8	90	4	86 - 94	82 - 94
4	54	4	50 - 58	48 - 62
30	20	3	17 - 23	18 - 24
200	5.0	1	4 - 6	4 - 7

*Only asphaltic materials tested and certified according to the VDOT A.A.P. will be used in this mix.

Asphalt 5.6 % ± .3 % 5.3 - 5.9

Temperature ______ °F + 20° (+11°C) 325°F MAX

Correction Factor for Field Marshall 0.012

Producer Technician's Certification Number 294277146

MATERIALS DIVISION USE ONLY

Remarks ______

Nominal Max Size Aggr. 1/2 Inch Application Rate: Min. 150 Lbs.Yd.^{2} Max. 230 Lbs.Yd.^{2}

Compacted unit weight of the mix, at the job mix asphalt content 143 lbs/cu.ft. VTM 4.6% Max. Sp. Gr. Rice= 2.402 Bulk=2.2

Checked By [signature]

Approved tentatively subject to the production of material meeting all other applicable requirements of the specification.

Copies:
State Materials Engineer
District Materials Engineer
Project Inspector

Mix Design No. 3BC95-67

Approved By [signature] 9/6/95
Dist. Materials Engineer

I l-LT
PMSL-NARO

F[redacted]G W IT D :TO R D
COLLECTION AND PROCESSING SUMMARY

STATE / PROVINCE: VA / 510100
Name / Code No

FLEXIBLE PAVEMENTS 22-MAR-96

SHRP ID	SURVEY DATE mm/dd/yy	MEAN VALUES FOR DROP HT 2 (mils)				TEMPERATURE		EFFECTIVE SN	SN STD DEV	SUBGRADE MODULUS psi	MODULUS STD DEV psi	COMMENT NUMBER
		S1	S1 STD DEV	S7	S7 STD DEV	(mean) D1	(min/max) D1					
510113	11/28/95	18 87	3 48	2 63	0 78	61	59/64	3 26 3 03	0 22 0.15	17121 13202	2406 3855	1
510114	11/30/95	9 05	0 61	2 30	0 18	48	43/52	6 60	0 17	17098	1355	
510115	11/30/95	2 88	0 31	1 40	0 15	61	58/64	10 52 10 04	0 31 0.51	30882 26561	2298 2211	2
510116	11/30/95	2 45	0 18	1 24	0 12	55	51/58	19 42 19.54	0 65 0.25	9963 12091	528 507	3
510117	11/30/95	6 85	0 52	2 72	0 32	67	67/68	20 05	0 00	1636	97	
510118	11/27/95	4 89	0 44	1 80	0 21	68	66/69	8 04 8.28	0 20 0 12	20744 24998	1641 454	4
510119	11/29/95	6 21	0 41	2 25	0 18	46	45/47	7 16	0 17	17967	1386	
510120	11/28/95	9 56	1 12	1.91	0 32	69	68/69	5.72	0 22	21200	3463	
510121	11/28/95	9 19	0.73	1 33	0 35	68	68/69	9 39	0.50	6241	1571	
510122	11/29/95	5 81	0 89	2 51	0 74	48	47/49	7 35	0 31	17352	4621	
510123	11/29/95	3 27	0 37	1 64	0 36	54	52/57	18 43	1 14	8286	1968	
510124	11/29/95	2.22	0.11	1 04	0 12	56	55/56	13 20	0 24	39183	4004	
510159	11/28/95	7 05	0.42	3 13	0 34	66	65/67	8 57	0 24	12770	1539	

COMMENTS.
1. Subsection boundary at 215 ft
2 Subsection boundary at 330 ft
3. Subsection boundary at 175 ft
4 Subsection boundary at 295 ft

APPENDIX B

Photographs

Figure B-1. Shoulder Auger Probe at Location S9, Station 2+50 of Section 510116, Fill Area, Performed on May 12, 1995

Figure B-2. Shelby Tube Sampling at Location A17, Station 2+50 of Section 510118, Top 0.6 m of the Subgrade, Performed on June 8, 1995

Figure B-3. Nuclear Density/Moisture Measurements at Location T135, Station 5+50 of Section 510118, at Bulk Sample Location B6, Performed on June 8, 1995

Figure B-4. Subgrade Bulk Sampling at Location B5, Station 4+75 of Section 510115, Performed on June 9, 1995

Figure B-5. Mixer and Sheepsfoot Roller Dry Mixing the Soil Cement in the Treated Subgrade Layer of Section 510124, August 21, 1995

Figure B-6. Fine Grading Machine and Checking the Depth of the Treated Subgrade Layer of Section 510116, August 21, 1995

Figure B-7. FHWA and VDOT FWDs Measuring the Deflections on the Treated Subgrade Layer of Section 510113, August 21, 1995

Figure B-8. Rod and Level Elevation Measurements on the DGAB layer of Section 510117, August 25, 1995

Figure B-9. Connecting End of Edge Drain to Outlet Pipe at End of Transition Area After Section 510124, August 29, 1995

Figure B-10. Spreading Geotextile Fabric on the Treated Subgrade Layer of Section 510122 Before Paving the PATB layer, August 29, 1995

Figure B-11. Paver Getting Ready to Start Laying PATB Layer on the Geotextile Fabric on Section 510124, August 29, 1995

Figure B-12. Collecting ATB Bulk Sample BT20 from the Paver Hopper while at Location B13, Station 2+50 of Section 510124, 3 Buckets for MRL and 8 Bags for VDOT, August 30, 1995

Figure B-13. A 200-liter Barrel with Combined Aggregate of the ATB Mix as Sampled from the Asphalt Plant to go to MRL, August 30, 1995

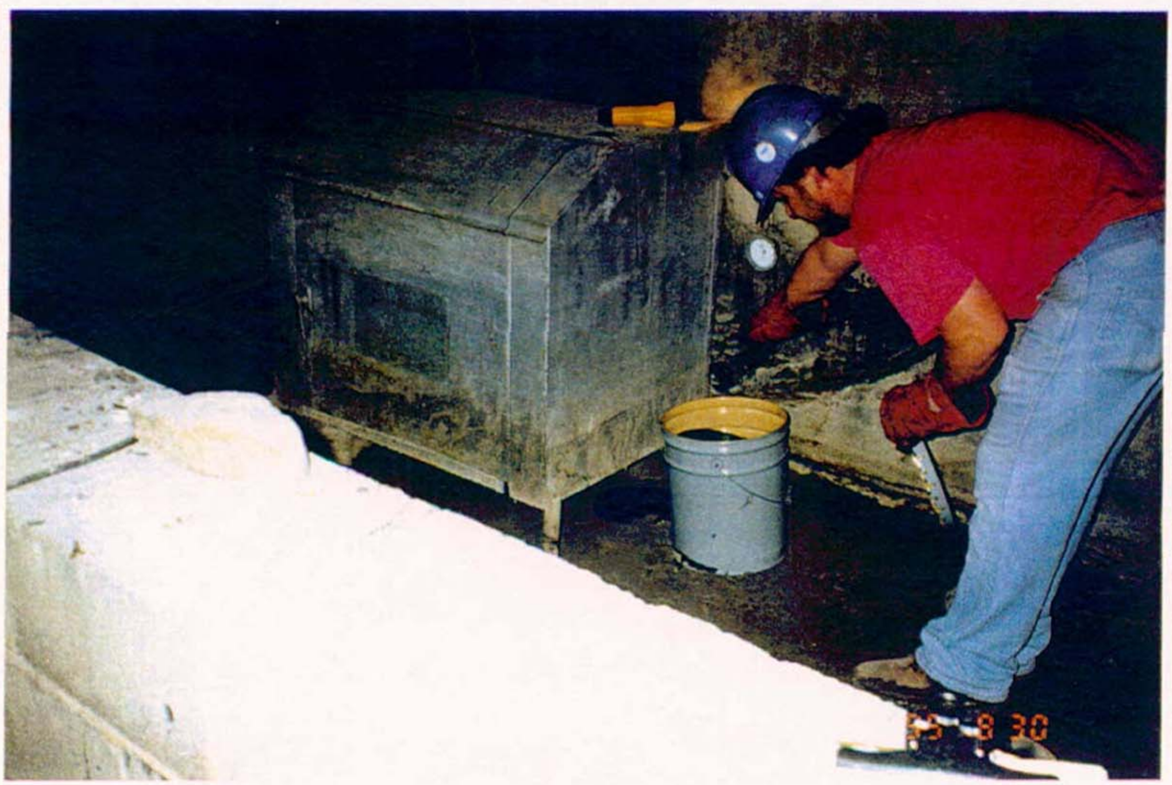


Figure B-14. Collecting AC-20 Liquid Cement Sample from the Asphalt Plant to go to MRL, August 30, 1995

Figure B-15. Collecting 102 mm Diameter Cores From the ATB Layer of Section 510124, September 7, 1995

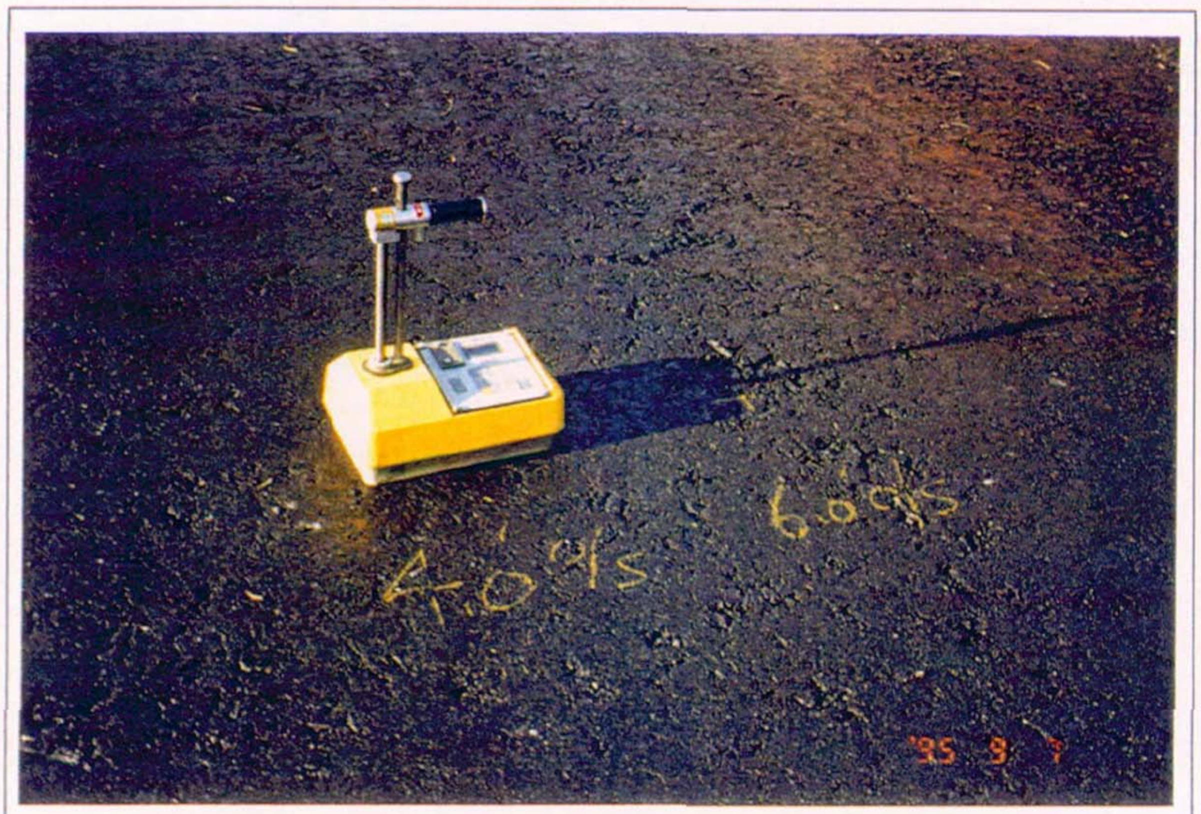


Figure B-16. Collecting Density Measurements on the ATB Layer at Location T93, Station 2+50 and Offset 1.2 m of Section 510118, Showing the Voids From the Segregation at Offset 1.8 m, Sep. 7, 1995

Figure B-17. Collecting 102 mm Diameter Core on the Final Surface Layer of Section 510120 at Location C9, Station 0-25 and Offset 2.3 m, October 23, 1995

Figure B-18. All 86 102 mm Diameter Cores as Labeled and Wrapped and Ready to be shipped to the VDOT Lab and the FHWA Contractor Lab, October 26, 1995

Figure B-19. Installing Seasonal Instrumentation at the 0- Side of Section 510113, October 24, 1995

Figure B-20. Installing Automated Weather Station Close to the North End of the Project, October 26, 1995

Figure B-21. Sign Identifying Start of Section 510116 and White Stripe on Pavement at the 0+00 Location, March 20, 1996

Figure B-22. White Stripe on the Pavement Surface at the 5+00 Station of Section 510115, Showing the Crosses at the 4+00, 3+00, 2+00, etc. Locations, March 20, 1996

Figure B-23. APAC ASTEC Two Silo Batch Asphalt Plant Located at Shelton North Carolina, September 11, 1995

Figure B-24. APAC ASTEC Two Silo Batch Asphalt Plant Located at Shelton North Carolina, September 11, 1995