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STRATEGIC HIGHWAY RESEARCH PROGRAM

SPECIFIC PAVEMENT STUDIES
MATERIALS SAMPLING AND TESTING REQUIREMENTS
FOR EXPERIMENT SPS-5
REHABILITATION OF ASPHALT CONCRETE PAVEMENTS

STRATEGIC HIGHWAY RESEARCH PROGRAM
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PREFACE

This report contains guidelines for the development and implementation of a material sampling and testing program for each test site included in the Specific pavement Studies' experiment SPS-5, Rehabilitation of Asphalt Concrete Pavements. These guidelines will help the SHRP regional office develop recommendations for a material sampling and testing plan tailored for the individual test site. The SHRP regional office and the participating highway agency must coordinate the activities associated with the development and implementation of the recommended field sampling and testing plan to ensure compliance with the plan objectives and thus achieve the study's goals.

This report should be used in conjunction with the SHRP Guide for Field Material Sampling, Testing and Handling to perform the field material drilling and sampling work. Copies of these guidelines should be available during the on-site sampling and testing operations. All persons involved in the field sampling and testing operations for the SPS-5 experiment must be familiar with its content, particularly the types and numbers of samples to be obtained from the different test sections and pavement layers.

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1. INTRODUCTION

1.1 OVERVIEW

This report provides guidelines for the development and implementation of a material sampling and testing program for each of the test sites included in the Specific Pavement Studies' experiment SPS-5, Rehabilitation of Asphalt Concrete Pavements. These guidelines will be used by the SHRP regional office to develop recommendations for a material sampling and testing plan tailored to the individual test site.

The SPS-5 experiment, Rehabilitation of Asphalt Concrete Pavements, requires the construction of multiple test sections with similar details and materials at each of sixteen sites equally distributed in the four climatic regions. The experimental design and construction considerations for this experiment are described in the document, "Specific Pavement Studies: Experimental Design and Research Plan for Experiment SPS-5, Rahabilitation of Asphalt Concrete Pavements, April 1989. Construction features and details for this experiment are described in the document, "Specific Pavement Studies: Construction Guidelines for Experiment SPS-5, Rehabilitation of Asphalt Concrete Pavements," June 1990. Inspite of attempts to control uniformity in construction, some variation between sites will exist. Therefore, it is important to develop and implement a sampling and testing plan that will provide the information necessary to evaluate such variations and their effect on performance.

To obtain materials characterization required for the SPS-5 experiment, the following steps are required:

1. Review of project site layout and soil profile logs.

2. Formulation of a field sampling plan. This plan should take into account site conditions and the laboratory material testing requirements. An adequate number of samples must be obtained in the field to assure that all laboratory material characterization tests can be performed.

3. Development of a field sampling plan report. This report should specify sampling area locations, type and number of samples from each location and material, and a tracking table that specifies the tests to be performed on each sample.

4. Field sampling and testing of materials. In reporting this activity, adjustments made in the field to the sampling and testing plan must be recorded.

5. Testing of material samples in the laboratory.

6. Compilation and storage of data. This will include compilation of field sampling, field testing and laboratory material test data and entry of this data into the National Pavement Performance Database.

The SPS-5 experiment was developed to investigate the performance of selected asphalt concrete (AC) rehabilitation treatment factors. These include overlay mix type (recycled, virgin), overlay thickness and milling of the existing AC pavement surface. Characterization of the material properties and the variations in these properties between and within the test sections is required to evaluate cause of performance differences between test sections and provide a basis for improving current rehabilitation strategies and methods. Materials characterization include those parameters used in current pavement design models and mechanistic analysis models (layer theory), and the engineering properties generally required to assess the characteristics and behavior of materials.

1.2 MINIMUM REQUIREMENTS

The material sampling and testing plan must be tailored to the specific features encountered on each project. Also, participating highway agency may construct supplemental test sections at the site in addition to those required for the SPS-5 experiment. Therefore, the material sampling and testing plan will vary from one site to another. For illustration, an example of the material sampling and testing requirements together with a conceptual site plan are presented in this report for a hypothetical "ideal" test site.

The site used for this illustration consists of the nine test sections required for the experiment. These sections include a control section and eight experimental sections, as shown in Figure 1. The rehabilitation treatments for these sections are as follows:

Section 1 - Routine maintenance, no overlay.
Section 2 - Minimum surface preparation, 2 inch recycled AC overlay.
Section 3 - Minimum surface preparation, 5 inch recycled AC overlay.
Section 4 - Minimum surface preparation, 5 inch virgin AC overlay.
Section 5 - Minimum surface preparation, 2 inch virgin AC overlay.
Section 6 - Intensive surface preparation, 2 inch virgin AC overlay.
Section 7 - Intensive surface preparation, 5 inch virgin AC overlay.
Section 8 - Intensive surface preparation, 5 inch recycled AC overlay.
Section 9 - Intensive surface preparation, 2 inch recycled AC overlay.

The hypothetical "ideal" SPS-5 test site shown in Figure 1 will be used to illustrate the minimum materials sampling and testing requirements. For this site, the test sections, 500-feet long each, are spaced 300 feet apart. Since the material sampling and testing methods are destructive, the sampling areas must be located outside the test section. The material sampling areas are located adjacent to the ends of the test sections and are consequently numbered as illustrated in Figure 1. Sampling prior to overlay placement (locations 1 through 18) is intended to characterize the properties of the existing pavement and subgrade. This sampling allows the cores and test pits to be covered with the overlay to minimize distress progression at these locations. Sampling after overlay placement (locations 19 through 34) is intended to characterize the as-placed overlay material. "Pre-construction" and "post-construction" are used in this report to refer to prior to and after overlay placement, respectively.

The guidelines for formulating field materials sampling and laboratory testing plans for the SPS-5 experiment have been developed based on the experience gained from the materials testing program developed for the General Pavement Studies and the need for better characterization of the engineering properties of the materials within the test sites. The field material sampling plan should adequately address the laboratory testing needs. Therefore, a sufficient number of samples must be obtained from each test site to enable adequate characterization of the pavement materials by laboratory tests.

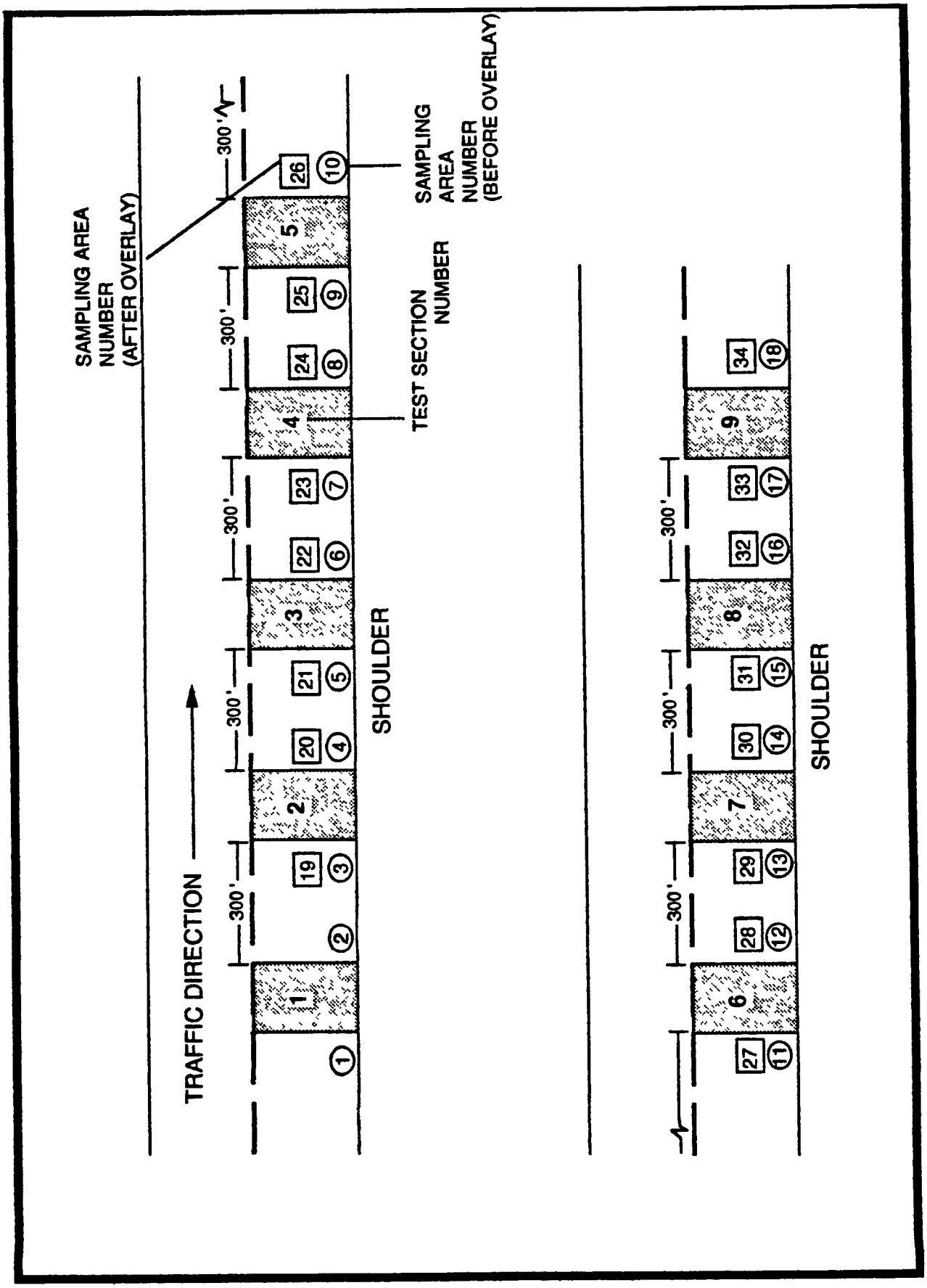


Figure 1. Example of Site Layout and Sampling Locations

2. DEVELOPMENT OF SAMPLING AND TESTING PLANS

2.1 GENERAL

The details of the sampling plan for each SPS-5 site will differ depending on variability and constraints of each specific project. The sampling plan must be tailored for the specific site conditions to account for the distance between test sections, project length, subgrade variability and other conditions unique to the site. The following guidelines are presented to help samplify the process of developing an appropriate field sampling plan for the experiment.

The pre-construction and post-construction sampling plans should be prepared in a coordinated manner to ensure consistency. Participating highway agency input should be sought when appropriate during plan preparation. In addition, the following documents must be reviewed prior to plan preparation:

1. Project plan and profile sheets.
2. Soil profile sheets.
3. Laboratory and field material testing requirements described in this document.
4. Other documents or information related to the project. For example, review of field verification reports would help determining pavement structure cross-sections and subgrade variability along the site.

Criteria for selecting test section locations require that all test sections at each site should have the same structural cross section and constructed of the same materials under the same contract. To accommodate likely deviations from this and other established criteria, the test plan must be devised so that all known or suspected variations can be characterized. Generally, variability of the subgrade will be determined during the site selection process and should be a prime consideration in development of the final sampling and testing plan for the site. Plan and profile sheets will help determine the location of cut/fill sections and the possible variability in subgrade materials. The constraints imposed on location of test sections to avoid cut/fill transitions, bridges, culverts, substructures and side hill fills and the inclusion of supplemental test sections desired by the participating

agency increase the potential for variability of the subgrade soils along the site. Bulk sampling should be performed at a minimum of three locations per site. However, the actual number of sampling locations should be based on the total site length and known variations.

Table 1 lists the minimum number of material samples and sample types required for an SPS-5 site. A code is assigned to each sample to designate sample type (core, test pit or auger), core size and sample location number. For each sample type, material samples are obtained from the different pavement layers. The number of material samples listed in Table 1 are those required for each material layer.

Different types of samples of the pavement structure are required at each site, as follows:

- Four-inch outer diameter cores of asphaltic concrete surface and binder courses only. These are designated on the sampling plans as C-Type cores and are identified with small shaded circles.
- Four-inch outer diameter cores of asphaltic concrete surface and binder courses, bound base layers and treated subbase layers. These are designated on the sampling plans as C-Type sampling areas and are identified with small unshaded circles.
- Six-inch outer diameter cores of asphaltic concrete surface and binder courses, bound base layers and treated subbase layers; augering of unstabilized base and subbase layers; thin-walled tube and/or splitspoon sampling of subgrade layers to 4 inch below the top of the untreated subgrade. These are designated on the sampling plans as A-Type samples and are identified with medium-sized unshaded circles
- Twelve-inch outer diameter cores of asphaltic concrete surface and binder courses, bound base layers and treated subbase layers; augering of unstabilized base, subbase and subgrade to 12 inch below the top of the untreated subgrade for bulk sample retrieval. These are designated on the sampling plans as BA-Type samples and are identified with large-sized unshaded circles with a single diagonal line crossing the circle.

Table 1. Program Scope for Field Material Sampling and Field Testing for the SPS-5 Experiment.

MATERIAL AND SAMPLE DESCRIPTION	NUMBER OF MATERIAL SAMPLES	SAMPLE TYPE DESIGNATION
PRE-CONSTRUCTION SAMPLING		
1. Asphalt Concrete (original layer)		
Coring - 4" diam. cores	26	C1-C26
Coring - 6" diam. cores	3	A1-A3
Coring - 12" diam. cores	6	BA1-BA6
Bulk Sampling (12" by 12" slab)	2	TP1
2. Unbound Base/Subbase Layers (per layer)		
Augering 6" diam. holes	3	A1-A3
Bulk sampling in 12" diam. holes	6	BA1-BA6
Bulk sampling in test pit	1	TP1
In situ density and moisture content (nuclear gauge)	1	TP1
Moisture content samples	8	TP1,BA1-BA6
3. Bound Base/Subbase Layers (per layer)		
Coring - 4" diam. cores	6	C4,C5,C15,C16,C23,C24
Coring - 6" diam. cores	3	A1-A3
Coring - 12" diam. cores	6	BA1-BA6
4. Subgrade		
Splitspoon sampling	6*	A1-A3
Thin-walled tube sampling (* 2 tubes or 2 spoons or combination per hole)	6*	A1-A3
Bulk sampling in 12" diam. holes	6	BA1-BA6
Bulk sampling in test pit	1	TP1
In situ density and moisture content (nuclear gauge)	1	TP1
Moisture content samples	8	BA1-BA6,TP1
5. Shoulder Auger Probes	3	S1-S3
POST - CONSTRUCTION SAMPLING		
1. Asphaltic Concrete (overlay)		
Coring - 4" diam. cores	40	C27-C66

- Six feet by four feet test pit to a depth of 12 inch below the top of the untreated subgrade for collection of pavement slabs, bulk sampling of unstabilized layers and subgrade materials and for nuclear density and moisture measurements on unstabilized pavement layers and subgrade material. These are designated on the sampling plans as TP-Type samples and are identified with unshaded squares.

- Six-inch shoulder auger probes to a depth of 20 feet through the shoulder to determine the location of a rigid layer. These are designated on sampling plans as S-Type sampling locations and are identified with medium-sized unshaded circles with a bisecting "X". The purpose of the shoulder auger probe is to determine if bedrock or other significantly dense layers exist within 20 feet of the pavement surface. This information is extremely important for the analysis of deflection measurements. However, shallow auger probes would not be warranted at locations where rock is known to exist at very deep depths. Therefore, maps from the U.S. Geological Survey and the U.S. Department of Agriculture, county soil surveys, and other information from soil borings for nearby bridges or other structures should be used to assess the need for this auger probe.

- Bulk samples of the finished uncompacted AC mixtures (recycled and virgin) used in the surface and binder courses.

Bulk sampling requirements of the asphalt cement, aggregates and uncompacted asphalt concrete mixes to be collected during construction are shown in Table 2. Table 2A lists material required for test site evaluation and SPS purposes. Table 2B lists the material to be shipped to the SHRP Reference Materials Library for testing as part of the SHRP Asphalt Research Program.

The laboratory material testing program corresponding to the sampling plan shown in Tables 1 and 2 is shown in Table 3. This table shows the SHRP test designation, SHRP material testing protocol, the number of tests for each layer of material and the material source/sample type designation which corresponds to the codes shown in Tables 1 and 2. The site specific field material sampling and laboratory testing plan for each SPS-5 site should include the following elements:

ıble 2. Bulk material sampling during construction.

A. Materials to be tested as part of LTPP.

MATERIAL AND SAMPLE DESCRIPTION	NUMBER OF MATERIAL SAMPLES	SAMPLE LOCATION
1. Virginia Asphalt Concrete Mix	100 lbs	Mix Plant
2. Recycled Asphalt Concrete Mix	100 lbs	Mix Plant

B. Materials to be shipped to the SHRP asphalt reference library.

MATERIAL AND SAMPLE DESCRIPTION	NUMBER OF MATERIAL SAMPLES	SAMPLE LOCATION
1. Asphalt Cement (virgin mix)	11	Mix Plant
5 gallon containers		
2. Asphalt Cement (recycled mix)	11	Mix Plant
5 gallon containers		
3. Aggregate		
Used in virgin mix (55 gal. drums)	1000 lbs	Mix Plant
Used in recycled mix (55 gal. drums)	1000 lbs	Mix Plant
4. Recycled Asphaltic Concrete (prior to remixing)	1000 lbs	Mix Plant
5. Finished Asphaltic Concrete Mix		
Virgin AC mix	200 lbs	Mix Plant
Recycled AC mix	200 lbs	Mix Plant

Table 3. SPS-5 Laboratory Testing Plans (Pre-Construction)

Material Type and Properties	SHRP Test Designation	SHRP Protocol	No. of Tests per Layer	Material Source/ Sample Type Designation
PRE-CONSTRUCTION				
I. ASPHALT CONCRETE				
A. ASPHALTIC CONCRETE:				
Core Examination/Thickness	AC01	P01	26	ALL C-TYPE CORES
Bulk Specific Gravity	AC02	P02	9	[C3 C4 C5], [C13 C14 C15], [C22 C23 C24] (see note 3)
Maximum Specific Gravity	AC03	P03	3	[BA1-3], [TP], [BA4-6]
Asphalt Content (Extraction)	AC04	P04	3	[BA1-3], [TP], [BA4-6]
Creep Compliance	AC06	P06	3	C2, C9, C20 (see note 1)
Resilient Modulus	AC07	P07	6	[C4 C5], [C14 C15], [C23 C24]
Tensile Strength	AC07	P07	9	[C3 C4 C5], [C13 C14 C15], [C22 C23 C24]
Field Moisture Damage	AC08	P08	3	A1, A2, A3
B. EXTRACTED AGGREGATE:				
Type and Classification:				
Coarse Aggregate	AG03	P13	3	[BA1-3] [TP] [BA4-6]
Fine Aggregate	AG03	P13	3	[BA1-3] [TP] [BA4-6]
Gradation of Aggregate	AG04	P14	3	[BA1-3] [TP] [BA4-6]
NAA Test for Fine Aggregate Particle Shape	AG05	P14A (note 2)	3	[BA1-3] [TP] [BA4-6]
C. ASPHALT CEMENT:				
Abson Recovery	AE01	P21	3	[BA1-3] [TP] [BA4-6]
Penetration at 77 and 115° F	AE02	P22	3	[BA1-3] [TP] [BA4-6]
Specific Gravity (60F)	AE03	P23	3	[BA1-3] [TP] [BA4-6]
Viscosity at 77F	AE04	P24	3	[BA1-3] [TP] [BA4-6]
Viscosity at 140F,275F	AE05	P25	3	[BA1-3] [TP] [BA4-6]

NOTES:
1. Creep compliance will be performed when suitable procedures are developed -- cores will be stored.
2. National Aggregate Association will perform tests at no cost to the State.
3. Cores within brackets are from the same sampling area.

Table 3. SPS-5 Laboratory Testing Plans (Pre-Construction) continued.

Material Type and Properties	SHRP Test Designation	SHRP Protocol	No. of Tests per Layer	Material Source/ Sample Type Designation
II. BOUND (TREATED) BASE AND SUBBASE				
Type and Classification of Material and Treatment	TB01	P31	3	[C4 C5] [C15 C16] [C23 C24]
Pozzolanic/Cementitious: Compressive Strength	TB02	P32	3	[C4 C5] [C15 C16] [C23 C24]
Asphalt treated: Dynamic Modulus (77F)	TB03	P33	3	[C4 C5] [C15 C16] [C23 C24]
HMAC: Resilient Modulus	AC07	P07	3	[C4 C5] [C15 C16] [C23 C24]
III. UNBOUND GRANULAR BASE AND SUBBASE				
Particle Size Analysis	UG01	P41	3	[BA1-3] [TP] [BA4-6]
Sieve Analysis (washed)	UG02	P41	3	[BA1-3] [TP] [BA4-6]
Atterberg Limits	UG04	P43	3	[BA1-3] [TP] [BA4-6]
Moisture-Density Relations	UG05	P44	3	[BA1-3] [TP] [BA4-6]
Resilient Modulus	UG07	P46	3	[BA1-3] [TP] [BA4-6]
Classification	UG08	P47	3	[BA1-3] [TP] [BA4-6]
Permeability	UG09	P48	3	[BA1-3] [TP] [BA4-6]
Natural Moisture Content	UG10	P49	3	[BA1-3] [TP] [BA4-6]
IV. SUBGRADE				
Sieve Analysis	SS01	P51	3	[BA1-3] [TP] [BA4-6]
Hydrometer to 0.001mm	SS02	P42	3	[BA1-3] [TP] [BA4-6]
Atterberg Limits	SS03	P43	3	[BA1-3] [TP] [BA4-6]
Classification	SS04	P52	3	[BA1-3] [TP] [BA4-6]
Moisture-Density Relations	SS05	P55	3	[BA1-3] [TP] [BA4-6]
Resilient Modulus	SS07	P46	3	A1 A2 A3 or [BA1-3] [TP] [BA4-6]
Unit Weight	SS08	P56	3	[BA1-3] [TP] [BA4-6]
Natural Moisture Content	SS09	P49	3	[BA1-3] [TP] [BA4-6]
Depth to Rigid Layer			3	S1 S2 S3

Table 3. SPS-5 Laboratory Testing Plans (Post-Construction)

Material Type and Properties	SHRP Test Designation	SHRP Protocol	No. of Tests per Layer	Material Source/ Sample Type Designation
A. ASPHALTIC CONCRETE:				
Core Examination/Thickness	AC01	P01	40	ALL CORES
Bulk Specific Gravity	AC02	P02	40	ALL CORES
Maximum Specific Gravity	AC03	P03	6	BV1, BV2, BV3, BR1, BR2, BR3
Asphalt Content (Extraction)	AC04	P04	6	BV1, BV2, BV3, BR1, BR2, BR3
Moisture Susceptibility	AC05	P05	6	BV1, BV2, BV3, BR1, BR2, BR3
Creep Compliance	AC06	P06	2	[C51 C52 C53], [C57 C58 C59] (see note 1)
Resilient Modulus	AC07	P07	6	[C32 C33] [C35 C36] [C38 C39] [C41 C42] [C55 C56] [C61 C62]
Tensile Strength	AC07	P07	18	[C31 C32 C33] [C34 C35 C36] [C37 C38 C39] [C40 C41 C42] [C54 C55 C56] [C60 C61 C62]
B. EXTRACTED AGGREGATE:				
Bulk Specific Gravity:				
Coarse Aggregate	AG01	P11	6	BV1, BV2, BV3, BR1, BR2, BR3
Fine Aggregate	AG02	P12	6	BV1, BV2, BV3, BR1, BR2, BR3
Type and Classification:				
Coarse Aggregate	AG03	P13	6	BV1, BV2, BV3, BR1, BR2, BR3
Fine Aggregate	AG03	P13	6	BV1, BV2, BV3, BR1, BR2, BR3
Gradation of Aggregate	AG04	P14	6	BV1, BV2, BV3, BR1, BR2, BR3
NAA Test for Fine Aggregate Particle Shape	AG05	P14A (note 2)	6	BV1, BV2, BV3, BR1, BR2, BR3
C. ASPHALT CEMENT:				
Abson Recovery	AE01	P21	6	BV1, BV2, BV3, BR1, BR2, BR3
Penetration at 77 and 115 °F	AE02	P22	6	BV1, BV2, BV3, BR1, BR2, BR3
Specific Gravity (60F)	AE03	P23	6	BV1, BV2, BV3, BR1, BR2, BR3
Viscosity at 77F	AE04	P24	6	BV1, BV2, BV3, BR1, BR2, BR3
Viscosity at 140F,275F	AE05	P25	6	BV1, BV2, BV3, BR1, BR2, BR3

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

- Overall sampling location layout plan (based on Figure 1).
- Detailed pre-construction sampling layout.
- Detailed post-construction sampling layout.
- Pre-construction laboratory testing plan.
- Post-construction laboratory testing plan.

Other items which may be included with the sampling and testing plan are soil profile logs, plan and profile sheets and other information specific to the project which are pertinent to the field sampling and laboratory testing plans. The recommended plan should be compiled and submitted for review and approval by SHRP prior to implementation.

The following sections provide details for each element of the SPS-5 site specific field material sampling and laboratory testing plan.

2.2 OVERALL SAMPLING LOCATION LAYOUT PLAN

The overall sampling layout plan is used to identify the location of sampling areas relative to the test sections for sampling activities before and after overlay construction. The approximate transition lengths between test sections should be indicated on the plan. Figure 1 illustrates an example of an overall sampling plan.

Since the material sampling and testing methods are destructive, the sampling areas should be located outside the test sections. However, the sampling areas should be located relatively close the test section ends so that samples obtained represent the materials and conditions encountered within the section but they should not be located too close to the section ends to contribute to the development of distress in the test sections. As a guideline, sampling areas should be located at least 40 feet from the start or end of a section. However, when test sections are separated by short transition areas, sampling areas may be located less than 40 ft. from section ends.

The sampling areas are designated with a code SA followed by a two digit number. The numbers are assigned consecutively starting with pre-construction sampling areas and the first area encountered on the test site in the direction of traffic. Post-construction sampling areas should be numbered consecutively

following the number assigned to the last pre-construction sampling area and also starting with the first area encountered at the test site in the direction of traffic, as illustrated in Figure 1.

Locations of the sampling areas are specified relative to the end of the nearest adjacent test section. A test section relative station number should be used to reference the location as illustrated in Figure 2. Further explanation is provided in Appendix C.

2.3 PRE-CONSTRUCTION SAMPLING PLAN

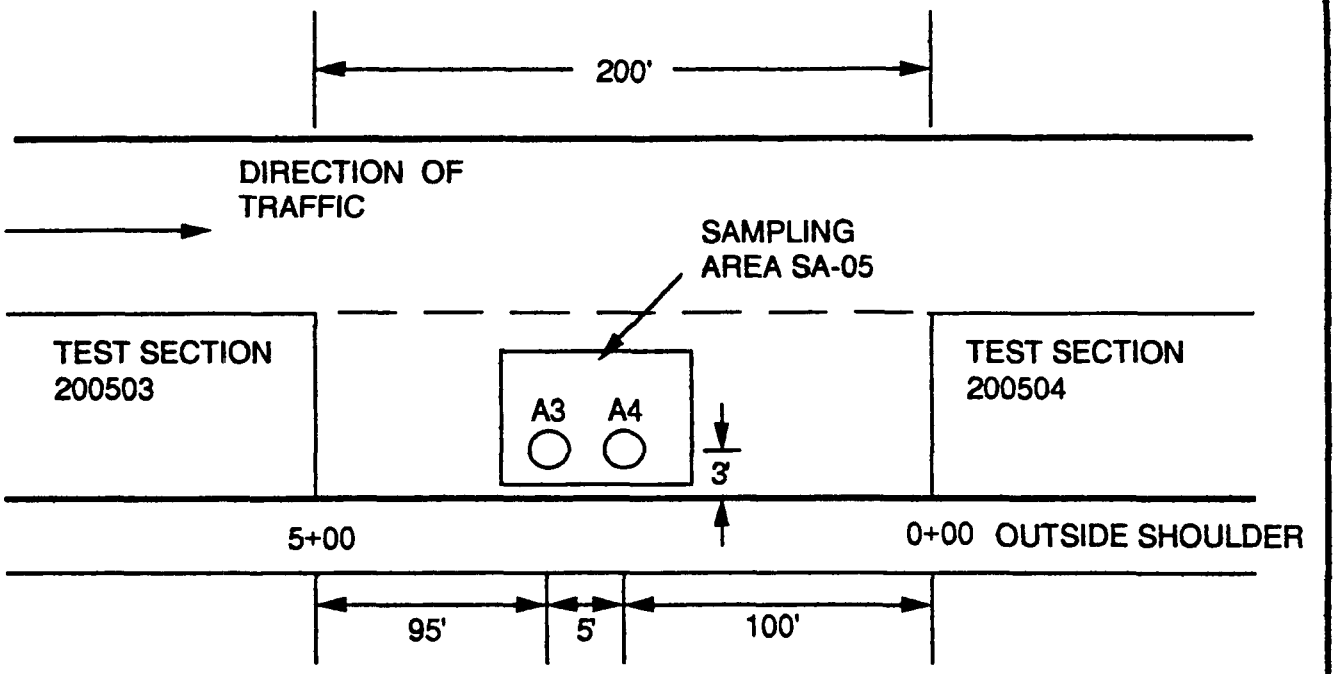
When laying out the detailed pre-construction sampling plan, the following principles should be applied:

- In tailoring sampling plans to site specific conditions, the tests to be performed on each sample must be considered since materials testing and characterization is the primary objective of the sampling plan.

- At least one, preferably two, C-Type 4-inch diameter cores of the AC surface and AC binder course should be placed before and after each pavement test section to help quantify the AC layer thickness. The cores should be located three and six feet from the pavement edge.

- The generic field sampling plan described in this report includes two BA-Type core locations and test pit for sampling of unbound materials. Test pits are preferred over BA-Type sampling areas since they allow measurements of the in-place moisture content and density of all unbound materials using nuclear methods. If test pits are not possible, three BA-Type boreholes should be used for bulk sampling.

- Test pit and BA-Type sampling should be performed at a minimum of three points on the test site. Ideally, these sampling areas should be placed between the first and second test sections, in the middle of the site, and between the last two test sections.



	Alternative 1 Location referenced to test section 200503	Alternative 2 Location referenced to test section 200504
CORE A3 LOCATION		
STATE CODE	20	20
SPS PROJECT CODE	05	05
TEST SECTION NO	03	04
STATION	5+95	-1-05
OFFSET	03	03
CORE A4 LOCATION		
STATE CODE	20	20
SPS PROJECT CODE	05	05
TEST SECTION NO	03	04
STATION	6+00	-1-00
OFFSET	03	03

In this example of the location referencing system, designated sampling area SA-05 is situated between sections 200503 and 200504. In SA-05, two 6" A-type cores are specified, A-3 and A-4, to be 5 feet apart and three feet from the edge of the lane. The location of these two cores can be specified relative to either test section 200503 (alternative 1) or test section 200504 (alternative 2). In alternative 1, the station number of core A-3 is 5+95 since it is 95 feet past the end of section 200504. Core A-4 is at staion 6+00. In alternative 2, the station number of core A-3 is -1+05 and A-4 is -1+00 since they occur in advance of test section 200504. Thus, when specifying the sampling locations on the field data form, the station number written on the form must correspond to the test section indicated on the form.

Figure 2. Illustration of location referencing system for material samples from SPS projects using relative test section station numbers.

- BA-Type boreholes or test pits should not be placed directly before or directly after the entire SPS test site. These bulk sampling areas should always be located between two test sections unless extenuating circumstances prevail.

- In general, bulk sampling areas should always consist of a combination of one test pit (or three BA-Type boreholes), one A-Type borehole and three C-type coreholes. Two of the C-Type coreholes should involve sampling of the AC surface layer, the AC binder course and any treated layers. These cores are used for the resilient modulus tests. Where a change in subgrade condition requires additional bulk sampling, these two C-Type cores may be omitted.

- Sampling locations, especially an A-Type, should not be located in cut and fill transition areas. A-Type sampling locations must always be located completely in either a cut or fill.

- In general, bulk or A-Type sampling locations should not be located over culverts or dried-up streams, lakes, etc. (as shown on as-built plans) or other unnatural or non-uniform areas. Sampling of such areas may be desirable in exceptions cases e.g, when a test section is located over a drained lake or bog.

- Sampling areas should not be located in areas which are considered non-representative of the test section, such as patched areas or areas with isolated distress occurrences.

- Bulk sampling areas (areas which include test pits or BA-Type sampling areas) should always be located adjacent to a test section in areas that will receive a rehabilitation treatment and be covered with the AC overlay.

- For a test section that is placed more than one mile away from another test section or group of test sections, sampling should include at least two C-Type cores (AC surface and binder courses only) located on one end and a bulk sampling area (test pit or BA-Type samples, A-Type and three C-Type cores) located on the other end.

- If a group of test sections is located more than a mile away from another localized group of test sections, each group may be treated separately and a complete set of tests performed for each group.

- Sampling for supplemental test sections, such as those representing the agency's rehabilitation practice, should be incorporated in the sampling and testing plan following the overall criteria established for the SPS experiment.

Generally, the sampling plan should reflect the variation of the materials at a specific site. If there is a high degree of variability at the site, the number of bulk sampling and A-Type sampling locations should be increased. Similarly, if the subgrade soil is relatively consistent, less bulk and A-Type samples would be required. The primary purpose of the plan is to characterize, as closely as possible, the integrity, physical properties and engineering behavior of the pavement and subgrade materials at the test site.

Detailed sampling plan layouts should be prepared for use in the field following the format shown in Appendix A. The location and type of each sample should be illustrated relative to the beginning and end of each test section.

2.4 POST-CONSTRUCTION SAMPLING PLAN

The purpose of the post-construction sampling is to characterize the as-placed properties of the asphalt concrete overlay materials. This includes determination of thickness, resilient modulus, specific gravity, creep compliance and tensile strength. Tests on the extracted aggregates and asphalt cements will be performed on the uncompacted bulk samples obtained from the mix plant.

The two types of asphalt concrete mixes used in this experiment, virgin and recycled, must be treated separately when developing the post-construction sampling plan. The required number of resilient modulus, creep compliance and thickness tests will control the number of post-construction cores. All post-construction cores must be 4 inch outer diameter cores.

- Resilient modulus. Three resilient modulus tests should be performed on cores from each type of mixture. Three cores obtained from the same approximate location (adjacent to each other) are required for each resilient modulus test. These samples should be taken from the 5-inch thick overlay sections.

- Creep compliance. One creep compliance test should be performed on each mix type. Three cores obtained from the same approximate location are required for each test. These samples should be taken from the 5-inch thick overlay sections that were milled.

- Thickness. Two cores taken from locations adjacent to both ends of each test section are needed to quantify the as-placed thickness. These cores should be taken along the same transverse line 3 feet and 6 feet from the shoulder joint.

Since no overlay will be placed on the control section (Section 1), no post-construction sampling is required adjacent to this section. Testing on any supplemental sections may be done at the direction of the participating agency. The rationale for testing of the SHRP test sections may form the basis for the testing plan for these supplemental sections.

Care must be taken to insure that the post construction sampling areas are located in portions of the pavement that were constructed with the same materials, layer thicknesses, and preparation as on the adjacent test sections and thus are representative of the test section. Areas with varying layer thicknesses or material types must be avoided.

An example post-construction sampling plan for a hypothetical "ideal" SPS-5 test site is shown in Appendix B.

SECTION 3: FIELD MATERIALS SAMPLING

3.1 GENERAL

This section describes procedures and guidelines for field material sampling, field testing and handling of cores and other material samples in the field and during transfer to the laboratory for testing. These procedures should be followed as close as possible to minimize the variability of material properties attributable to differences in sampling and handling techniques.

Throughout this document, base and subbase materials are referred to by such terms as "bound", "treated", "untreated", etc. The terms "bound", "treated", and "stabilized" are used interchangeably and refer to base and subbase layers containing a cementing agent such as asphalt or portland cement. The terms "unbound", "untreated", and "unstabilized" are used interchangeably and refer to granular base and subbase layers containing no additional materials. Subgrade soils are classified as fine-grained or coarse-grained soils and refer to the materials beneath a base or subbase layer that have not been disturbed or placed as fill material.

The field material sampling and field testing activities will provide pavement material samples for laboratory testing and will yield in situ density and moisture test data and visual pavement layer information for each test site. This information will be included in the National Pavement Performance Data Base. Field sampling and field testing will be performed in three phases, pre-construction, during construction and post-construction. The pre-construction phase is intended to fully characterize the existing pavement structure and thus provide a baseline to compare the different rehabilitation techniques. The construction phase will provide samples to help verify the mix design and characterize the virgin and recycled asphalt concrete materials. The post-construction sampling and testing phase will help determine material properties of the as-built test sections. This information will be used in evaluating the effectiveness and long-term performance of the different rehabilitation techniques. Requirements and details of field material sampling activities for each of these three construction phases are presented in the following sections of the report.

The spacing and length of the test sections will help limit the variations in material properties along the sections. However, accurate characterization of the materials in the existing pavement is required to evaluate their effect on the performance of the rehabilitated pavement. Sampling of the existing pavement structure will include the following types of samples:

- Four-inch outer diameter cores of asphaltic concrete surface and binder course.

- Four-inch outer diameter cores of asphaltic concrete surface, binder courses, bound base layers and treated subbase layers.

- Six-inch outer diameter cores of asphaltic concrete surface and binder courses, bound base layers and treated subbase layers; augering of unstabilized base and subbase layers; thin-walled tube and/or splitspoon sampling of subgrade layers to four feet below the top of the untreated subgrade.

- Twelve-inch diameter cores of asphaltic concrete surface and binder courses, bound base layers and treated subbase layers; augering of unstabilized base, subbase and subgrade to twelve inches below the top of the untreated subgrade for bulk sample retrieval.

- Six foot by four foot test pits to twelve inches below the top of the untreated subgrade soil, collection of pavements slabs, nuclear density and moisture measurements on stabilized pavement layers and subgrade material; bulk sampling of unstabilized layers and the subgrade.

- Six-inch shoulder auger probes.

The Field Set Number "1" has been assigned to designate all sampling operations performed prior to overlay construction. Therefore, the number "1" shall be used when completing the material sampling and field testing forms for sampling prior to construction activities.

During overlay construction, asphaltic concrete materials used in the test sections will be sampled and collected. All sampling and collection of materials during construction will occur at the mix plant to avoid interruptions to the construction activities. These samples will be obtained for research purposes only and will not be a part of any contractual quality control programs by the participating highway agency. The following materials will be collected:

- 55 gallons of asphalt cement used in the virgin asphalt concrete mix. This material should be collected in eleven 5-gallon pails provided by SHRP from the asphalt concrete mix plant after the asphalt has been heated for mixing.

- 55 gallons of asphalt cement used in the recycled asphalt concrete mix. This material should be collected in eleven 5-gallon pails provided by SHRP from the asphalt plant after the asphalt has been heated for mixing. If this asphalt cement comes froms the same source and is of the same grade as that used for the virgin asphalt concrete mix, duplicate sampling is not required.

- 1000 lbs of the finished aggregate product (combined coarse and fine aggregate) to be used in the virgin asphalt concrete mix. This material shall be sampled in conformance with applicable portions of AASHTO Designation T2. This material should be collected in two 55-gallon drums to be furnished by SHRP. For drum plants, the aggregate should be obtained from the charging (inclined) conveyor using bypass chute, if possible. Otherwise, the sample should be taken from the belt on the charging conveyor. For batch plants, the aggregates can be sampled from the inclined converyor at the dryer.

- 1000 lbs of the finished aggregate product to be mixed with the recycled asphalt concrete material. This material shall be sampled in conformance with applicable portions of AASHTO Designation T2. SHRP will provide 55-gallon drums for shipment and storage of the material.

- 1000 lbs of the recycled asphalt concrete product prior to mixing with the virgin asphalt cement and aggregates. This material shall be

sampled following the procedures used for other aggregates. SHRP will provide 55-gallon drums for shipment and storage of the material.

- 200 lbs of each mix of the finished virgin and recycled asphalt concrete mix used in the construction of test sections. These materials shall be sampled at the plant or from haul trucks in accordance with applicable sections of AASHTO T168. SHRP will provide 5-gallon containers for shipment and storage of the finished asphaltic concrete.

The containers furnished by SHRP for these materials are of a special manufacture to accommodate long-term storage. It is necessary that scheduling information be furnished to the A-001 contractor as soon as possible along with a shipping address and name and telephone number of the person designated to receive the shipment of these containers.

A diagram of the pavement cross section which clearly identifies all of the layers in the pavement structure should be forwarded to the offices of SHRP A-001 contractor several weeks before the start of construction. Detailed project plan sheets are not necessary. A simple drawing indicating the required information and dimensions is all that is required. The SHRP A-001 contractor will then determine which layers of the pavement structure should be sampled. The requested information and materials should be forwarded to the following address:

SHRP-Asphalt Research Program
The University of Texas at Austin
8701 North Mopac Blvd., Suite 450
Austin, TX 78759
Attn: James S. Moulthrop
Tel: (512) 471-8585
Fax: (512) 471-0909

A copy of Field Operations Information Form 1 (Appendix C) should be completed and included with the shipment to the SHRP A-001 contractor and another copy of the form should be mailed separately. This will allow a trace of the shipment if it does not arrive in a timely manner. Containers should be shipped by a suitable means as agreed upon by the SHRP Regional Engineer and the participating agency. SHRP will bear the cost of shipping all materials collected for the SHRP asphalt research effort.

In addition to the 200 lbs of each of the finished virgin and finished recycled asphaltic concrete mix that are obtained for the SHRP Asphalt Research Program another 100 lbs of each mix shall be obtained in the same manner at the plant for SPS research purposes. These materials shall be stored in a suitable container and shipped to the laboratory designated by the participating highway agency for testing. The laboratory tests to be conducted on these uncompacted samples are listed in Table 3.

Table 2 summarizes the of field material sampling required during the construction of each SPS-5 test site.

Characterization of the AC overlay (post-construction sampling) materials is essential for evaluating performance of the rehabilitated pavement. In-place material sampling of the AC overlay consists of retrieving 4 inch outer diameter cores of the overlay as indicated in Table 1. These sample areas will be illustrated on the sampling plans, with a shaded small circle. No other type of sampling will be required after overlay placement.

The Field Set Number "2" has been assigned to designate sampling operations performed during and after overlay placement. Therefore, the number "2" shall be used when completing the material sampling and field testing forms for those sampling activities performed during and after construction.

3.2 FIELD OPERATIONS

This section outlines procedures for field sampling, field testing and handling of material retrieved from the SPS-5 test site. Field operations for each site will include the following activities:

1. SHRP regional office should coordinate with the participating highway agency the field activities involved in the drilling and sampling operations. With concurrence of the participating highway agency, the SHRP Regional Engineer shall designate a representative to assist the participating highway agency and contractors in ensuring that the field operations are performed in accordance with the approved field sampling and testing plan.

2. After arriving at the test site and establishing traffic control, the responsible personnel shall lay out the initial sample locations and perform the sampling and testing operations in the following sequence:

   a) sawing and removal of AC pavement at the test pit location(s).

   b) coring and boring of BA-Type boreholes.

   c) bulk sampling and moisture/density testing in the test pit(s) as layers are removed.

   d) boring and augering of C-Type core holes and A-Type auger holes.

   e) shelby tube undisturbed sampling of subgrade material. If unable to obtain Shelby tube samples, the SHRP Representative may direct the use of splitspoon sampling to obtain subgrade material samples.

   f) auger probes in the shoulder.

   g) patching, cleanup and removal of traffic control.

When appropriate, a different sequence of activities may be used to improve the efficiency of the operations. However, special consideration must be given to the test pit location(s) because of their complexity and the substantial time and effort they require. Core or auger locations that are considered unacceptable should be replaced with alternate locations and marked on the as-sampled layout plan.

3. SHRP field representative shall record and report problems encountered during the field operations to the SHRP Regional Engineer and obtain recommendations for resolution.

4. Test samples shall be prepared for shipping together with complete logs and other records.

3.2.1 Coring of Pavement Surface and Bound (Treated) Layers

This activity will involve coring of the asphaltic concrete pavement surface and other treated base and subbase layers of pavements at the locations shown on the field material sampling plan. Exploration logs must be prepared using Sampling Data Sheets 1 and 2 in Appendix C. This coring will occur at two times: prior to construction (4-inch, 6-inch and 12-inch diameter cores) and after construction (4-inch diameter cores). The coring operations shall be carried out in accordance with AASHTO T24-B6, "Obtaining and Testing Drilled Cores and Sawed Beams of Concrete", using the equipment and methods specified in the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing.

It is essential for laboratory material testing that the direction of traffic be indicated on the test cores. Therefore, all cores of pavement surfaces shall be marked on the top with an arrow to show the direction of traffic. This marking should be made prior to removal of the cores from the pavement using a waterproof marking material and in a manner that will ensure visibility after coring operations. Plugs shall not be inserted in cores intended for laboratory testing. Suction cups or wire pulls have been sucessfully used for core extraction.

3.2.2 Coring - Prior to Construction

Core locations shall be as shown on the sampling plan figures developed for the specific test site. It is especially important that the 4-inch and 6-inch diameter cores be taken perpendicular to the pavement surface, i.e. at a 90 degree angle to the surface, to ensure the recovery of straight, intact, smooth-surfaced specimens suitable for laboratory testing. Details on tolerances and quality control of the coring operations are included in Section 4 of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing. All cores shall be dried before packaging.

Special care must be taken during the coring operations of treated materials. The bit type, rate of penetration and cooling medium shall be varied as necessary to minimize tearing and breakage. If 4-inch diameter cores suitable for testing cannot be recovered from the designated C-Type sampling locations due to the nature or condition of the material, chunks or pieces of the treated

materials from these layers shall be obtained from the test pit area or the respective BA-Type sampling locations. These chunk and piece samples shall then be coded, packaged, and shipped as bulk material.

Asphalt concrete that are extracted with an adhering treated layer shall not be split at the layer interface in the field. These samples should be wrapped and shipped as a single core to the testing laboratory.

3.2.3 Coring - After Construction

Core locations shall be as shown on the construction field sampling plan figures developed for the test site. Only 4-inch diameter C-Type cores are required of the overlay. All coring specifications described previously shall be followed. If it is not possible to obtain cores of the overlay only, cores of the full depth of the AC pavement shall be taken, packaged and shipped to the laboratory for sawing at the AC overlay layer interface.

3.2.4 Augering of Subsurface Layers for Bulk Sampling

This activity is required only before overlay placement and involves pavement coring, augering and sampling of untreated base/subbase and augering and sampling of subgrade layers of pavements at BA-Type locations to obtain bulk samples. These operations shall be performed in accordance with AASHTO T203, "Soil Investigation and Sampling by Auger Borings" and AASHTO M146, "Terms Relating to Subgrade, Soil-Aggregate and Fill Materials".

The pavement surface layer and any treated materials shall be cored with a 12-inch diameter bit at the BA-Type bulk sampling augering locations. All 12-inch diameter cores shall be removed and shipped to the laboratory. All 12-inch diameter cores of treated base and subbase materials or portions thereof shall be discarded unless intact cores of these materials were not recovered at the C-Type locations. All untreated base and subbase layers shall be augered separately to obtain uncontaminated samples of each layer. The material raised by the auger from the layer immediately below the cored pavement surface or bound layer should be discarded due to possible contamination by water or fines from the coring operations. As augering of the unbound layer proceeds, the operator must observe the presence of material from the underlying layer. If

materials from the two layers are mixed together, the sample should be discarded. The uncontaminated material from each layer shall be separately retained as large bulk samples.

Bulk sample quantities required for packaging and shipping are shown in Table 4. A small bag or jar sample shall be obtained from each layer of each BA-Type borehole for laboratory moisture testing.

At the undisturbed sample locations (A1, A2, A3, etc.), the pavement surface layer and any treated materials shall be cored with a 6-inch diameter bit and all cores removed. Undisturbed samples of the natural subgrade or fill material directly beneath the base and/or subbase layers at A-Type locations shall be obtained to a depth of 4 feet below the top of the subgrade or fill using Shelby (thinwall) tube sampling. If Shelby tube samples can not be obtained, splitspoon samples may be obtained if approved by the SHRP representative. Shelby (thinwall) tube sampling shall be obtained in accordance with AASHTO T207. Splitspoon sampling shall be obtained following Section 3.4.5 of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing. If rock, boulders or other forms of dense material are encountered within four feet of the top of natural subgrade or fill, another attempt for sampling the subgrade shall be made at a different location with a longitudinal offset 5 to 10 feet. If rock, boulders or refusal is encountered at the second location, sampling shall be terminated.

3.2.5 Test Pit Excavation and Sampling

Test pits shall be excavated and sampled in accordance with Section 3.5 of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing. However, two 12 inch by 12 inch block samples of the asphalt concrete pavement shall be recovered and retained for shipping. The bulk sample quantities are listed in Table 4.

3.2.6 Uncompacted Mix Sampling Procedures

The sampling of the uncompacted AC mix (both virgin and recycled) shall be performed at the mix plant to avoid interruptions to the construction activities. These samples shall be obtained in accordance with AASHTO T168

Table 4. Weight Requirements for Bulk Samples of Unbound Base, Subbase and Subgrade Layers

Layer	Bulk Samples from 3-12" Auger Holes (BA1, BA2, and BA3)	Bulk Samples from Test Pit
Unbound Base	Maximum 200 lbs. (100 lbs. Minimum)	200 lbs.
Unbound Subbase	Maximum 200 lbs. (100 lbs. Minimum)	200 lbs.
Subgrade		
• Coarse Grain	200 lbs.	200 lbs.
• Fine Grain	150 lbs.	150 lbs.

and shipped to the laboratory in containers provided by SHRP. In addition to the material samples obtained for the SHRP Asphalt Program purposes, at least one hundred pounds of each type of AC mix (recycled and virgin) shall be sampled and sent to the laboratory designated by the participating highway agency. Where sampling at the mix plant is not feasible, the AC material sample should be obtained from the hauling vehicle at the test site. If concerns about the uniformity of the AC mix arise during construction, at least two samples of one houndred pounds each shall be obtained for each type of asphalt concrete.

3.2.7 Collection of Samples, Marking, Packaging, and Shipping

All samples retrieved during the sampling and testing process shall be carefully marked, packaged and shipped to the laboratory designated by the participating highway agency (unless the highway agency authorizes other arrangements). The samples shall be packaged and preserved in accordance with ASTM D4220-B3 (Group B), "Preparing and Transporting Soil Samples". Extreme care must be taken in packaging and shipping of test samples to eliminate damage to the samples or influence their properties.

3.2.8 Logs and Reports

Accurate and detailed record keeping is essential for the materials sampling and testing program. During the field sampling operations, two types of forms must be completed. These are the Field Operations Information Forms and the Sampling Data Sheets. Field Operations Information Forms are used to record general information concerning the pavement test sections and the materials samples. Sampling Data Sheets are used to record the actual information for each sampling area or sampling location. A person should be designated to record data at each site on the appropriate data sheets, insure the accuracy and integrity of the collected data and forward the data sheets to the appropriate personnel. This person should have a thorough understanding of the content of the data sheets and the procedures for completing the sheets. If these forms are completed by a person other than the SHRP representative, the data sheets must be reviewed by the SHRP representative prior to forwarding the sheets to the appropriate personnel.

3.2.8.1 Core Holes - A separate log shall be completed for each core hole. The depth of penetration of each coring operation and the average length of the recovered core shall be recorded to the nearest 0.1 inch. Data sheets for these logs are included in Appendix C. Sampling Data Sheet 1 shall be used to record cores obtained from A- and BA-Type sampling areas. Sampling Data Sheet 2 shall be used to record pavement cores from C-Type sampling areas. These logs shall show the general type of material in accordance with terminology described in Appendix C of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing. The general code 700 shall be used to identify asphalt cement concrete and no attempt should be made in the field to classify the AC in more detail. Remarks shall include the type of cooling medium, difficulties encountered in coring, defects observed in this core (such as cracks, voids and disintegration), and other pertinent observations.

3.2.8.2 Auger Holes - Data for each A-Type augering hole shall be recorded on Sampling Data Sheet 4. This data should include layer thicknesses and descriptions of the unbound layers, depth of shelby tube or splitspoon samples, and other related data. Data for the asphalt concrete layers shall not be recorded on this sheet. Data to be recorded on this form should include the following:

1. Material type and description for each layer of untreated materials and soils in accordance with Table C.2. of the SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling.

2. Thickness of each layer as measured in the hole to the nearest 0.1 inch.

3. Presence and levels of any water encountered.

4. Sample numbers.

The data for each BA-Type bore hole shall be recorded on Sampling Data Sheet 5, in a similar manner to that described for A-Type cores.

3.2.8.3 Test Pits - Test pits data shall be logged as excavation progresses and reported on Sampling Data Sheets 6 and 7. The record shall include description of each layer in accordance with the layer designations provided on the preliminary data sheets, thickness of each layer to the nearest 0.1 inch, sample numbers and number of bags per sample, test numbers, any water seepage, sloughing, voids and other pertinent items. The layer thicknesses shall be measured at least at two points on each exposed face for a total of eight measurements. Additional measurements shall be made if thickness measurement vary by more than 0.3 inch for surface or treated layers of by more than 1.0 inch for untreated layers. Measurements shall also be made of the shoulder surface and base/subbase layers. All measurements shall be recorded on the logs and a transverse profile (cross section) of the pavement shall be included.

Good quality color print photographs of the test pit profile shall be taken at and keyed to the locations described on the Sampling Data Sheet 6 test pit log. The photographs shall be taken with the sun behind the photographer (if possible to avoid shadows) to provide a total view of the test pit and close-up views of the pavement profiles. If voids or discontinuities exist in the pavement structure, multiple close-up pictures should be taken. The photographs should be sent to the SHRP regional office for processing and filing for archival purposes.

3.2.8.4 Shoulder Auger Probes - Data for shoulder auger probes shall be reported using Sampling Data Sheet 9.

Table 5 lists the forms that should be included in the field data packet for each sampling phase (i.e., pre-construction, during construction and post-construction).

3.2.9 Sample Code Number

Each sample (core, block, bulk, moisture, Shelby tube, splitspoon, chunks) shall be assigned a four digit number that must be recorded on the data forms. The sample code number will consist of two letters on the left side and two numbers on the right side.

Table 5. Forms to be Completed During Each Phase of Field Material Sampling, Handling and Testing.

Pre-construction - (Field Set Number 1)

Field Operations Information Form 1

Field Operations Information Form 2

Sampling Data Sheet 1

Sampling Data Sheet 2

Sampling Data Sheet 3

Sampling Data Sheet 4

Sampling Data Sheet 5

Sampling Data Sheet 6

Sampling Data Sheet 7

Sampling Data Sheet 8

Sampling Data Sheet 9

During Construction - (Field Set Number 2)

Field Operations Information Form 1

Field Operations Information Form 2

Sampling Data Sheet 10

Post-construction - (Field Set Number 2)

Field Operations Information Form 1

Field Operations Information Form 2

Sampling Data Sheet 2

The first letter on the left identifies the sample type in one of the following categories:

C - core sample
K - block sample
B - bulk sample
M - moisture sample
T - Shelby tube sample
J - splitspoon sample
P - broken pieces or chunks

The second letter from the left identifies the material type of the sample in one of the following categories:

A - asphalt concrete
P - portland cement concrete
T - treated, bound, or stabilized base/subbase
G - untreated, unbound granular base/subbase
S - subgrade soil or fill material

The numbers on the right will designate the sample number. The numbers shall be assigned consecutively for each sample type. For example, samples taken from C-Type locations shall be designated C1, C2, C3, etc. Samples taken from A-Type locations shall be designated A1, A2, A3, etc. and samples taken from BA-Type locations shall be designated BA1, BA2, BA3, etc. If a bulk sample of one layer is contained in more than one bag, then the number of bags and the same bulk sample number should be recorded on each bag.

The following is a list of valid combinations of letters and numbers making up sample code numbers:

CA24 Asphaltic concrete cores.

CT24 Treated base or subbase cores.

KA02 Asphaltic concrete block samples (blocks of 1 ft x 1 ft size from the test pit).

BA01 Bulk samples of finished asphalt concrete mix (BA01 for virgin mix and BA02 for recycled mix, etc.)

KT02 A treated base/subbase block sample from the test pit (if retrieved).

PA02 Pieces of asphalt concrete, if blocks could not be taken (up to two bags from the test pit).

PT02 Pieces of treated base or subbase (up to two bags from the test pit area or from 12 inch diameter BA-type bore holes. These types of samples must be taken if good cores could not be obtained from the treated layer.

BG01 Bulk samples from granular base or subbase material (from BA-Type bore holes and from the test pit). For example, assign BG01 (for base) and BG02 (for subbase) for samples of granular layers from auger hole BA1; BG03 and BG04 for BA2 samples; and BG05 and BG06 for samples from auger hole BA3.

BS01 Bulk samples of subgrade material 01-54 from different BA-Type bore holes and 55 and higher numbers for samples from the test pit).

MG01 Granular base/subbase samples for moisture content (from BA1, BA2, BA3, A1 and A2 Type auger holes, and from the test pit).

MS01 Subgrade samples for moisture content (from BA-Type and A-Type auger holes and from the test pit).

TS04 Shelby tube samples from subgrade (two Shelby tubes from each A-Type location.

JS01 Jar samples of subgrade from splitspoon sampler (two splitspoons from each A-Type location).

3.2.10 Labels and Tags

Requirements regarding labels and tags shall be as specified in Section 3.6.5.(d) of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing. However, as a minimum, the following information shall be included on tags and labels:

STATE CODE
SPS PROJECT CODE
TEST SECTION NO.
CORE/SAMPLE LOCATION (as marked on sample layout plans)
SAMPLE NUMBER (four digit code)
DATE (mm-dd-yy, sampling date)
FIELD SET (one digit number which will be 1 for the first round of sampling [pre-construction] and 2 during the second round of sampling [during and after construction], etc.)

3.2.11 Packaging

Packaging shall be as specified in Section 3.6.5(e) of the SHRP-LTPP Guide for Field Material Sampling, Handling and Testing. In addition, Field Operations Information Sheets 1 and 2 shall be sent with each shipment of materials samples.

3.2.12 Samples

All samples should be shipped within 5 days to the laboratory designated by the participating highway agency. Each box shall be labeled to include the State Code, SPS Project Code, type(s) of samples, box number (for each series of boxes for the specific project to each delivery point). The boxes should be labeled "Handle with Care" or similar wording. Samples shall be protected against freezing and overheating.

3.2.13 Field Testing

3.2.13.1 In-situ Density and Moisture Measurements - The in-situ nuclear testing shall be performed in accordance with Section 3.7 of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing. Sampling Data Sheet 8 shall be used to record the results of the nuclear density/moisture tests.

In addition to the nuclear density gauge tests, visual field determination of moisture damage of asphaltic concrete cores shall be completed for AC core speciments retrieved from A-Type sampling areas in accordance with SHRP Protocol P08 which is included in Appendix D. The results of this test shall be recorded on Sampling Data Sheet 3.

3.2.13.2 Auger Probe - Auger probes shall be carried out in accordance with Section 3.8 of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing at the locations designated on the sampling plans prepared for the test site.

3.2.14 Assembly of Data Sheets and Transmittal

The following is a description of the format that should be used for the assembly of the data sheets from each SPS-5 test site. The forms will appear in the final assembled data packet in the order illustrated in Figures 3, 4 and 5 for pre-construction, during construction and post-construction activities, respectively. The title page will be the first (top) sheet of the data packet and it will include the following information:

1 - SHRP Region
2 - State
3 - State Code
4 - SPS Project Code
5 - Experiment Name
6 - Highway Number
7 - Date(s) of Field Material Sampling and Field Testing
8 - Submitting Contractor/Agency
9 - Total Sheets, including the Title Page.

To determine the number of sheets (item 9 above) all of the pages in the packet should be counted. The pages should then be numbered starting with the title page. For example, if there are 100 pages in the packet, the title page would be "page 1 of 100" followed by "page 2 of 100" and so forth until the last page would read: "page 100 of 100". This will insure that any lost sheets can be quickly identified and found.

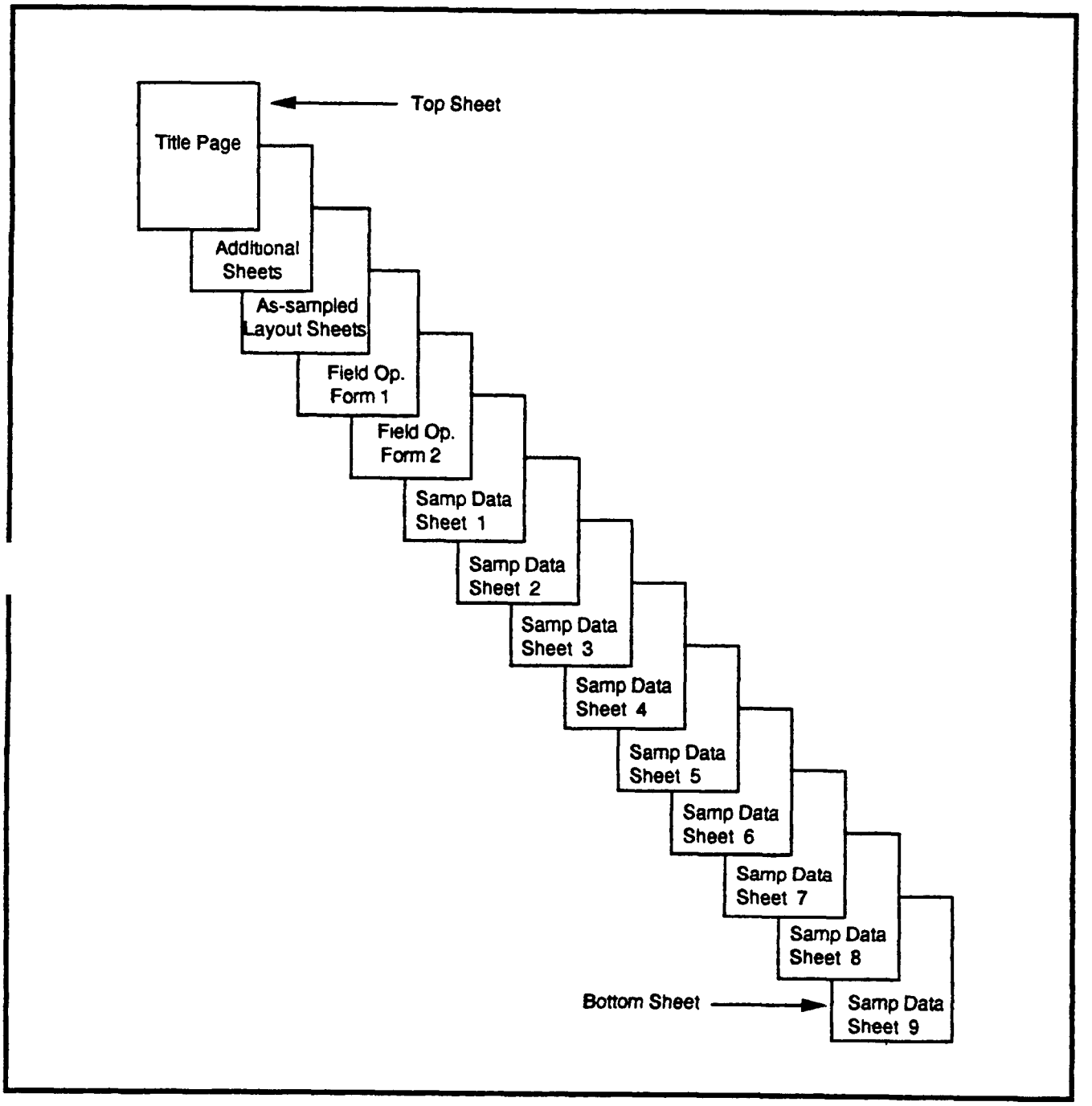


Figure 3. Assembly of "Pre-Construction"Sampling and Testing Forms

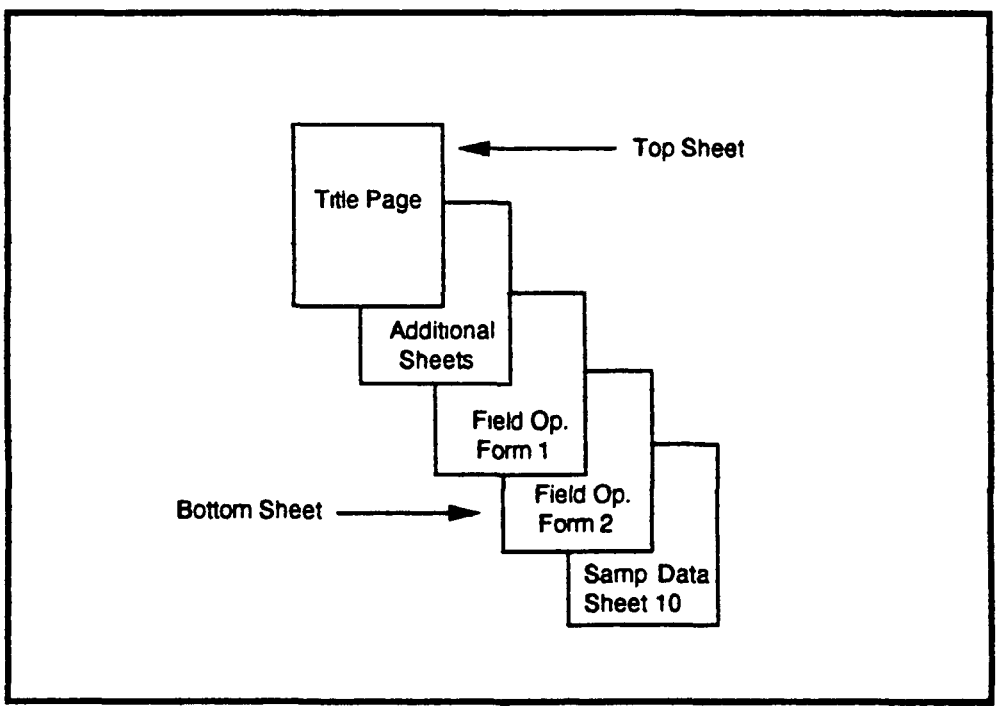


Figure 4. Assembly of "During Construction" Sampling and Testing Forms.

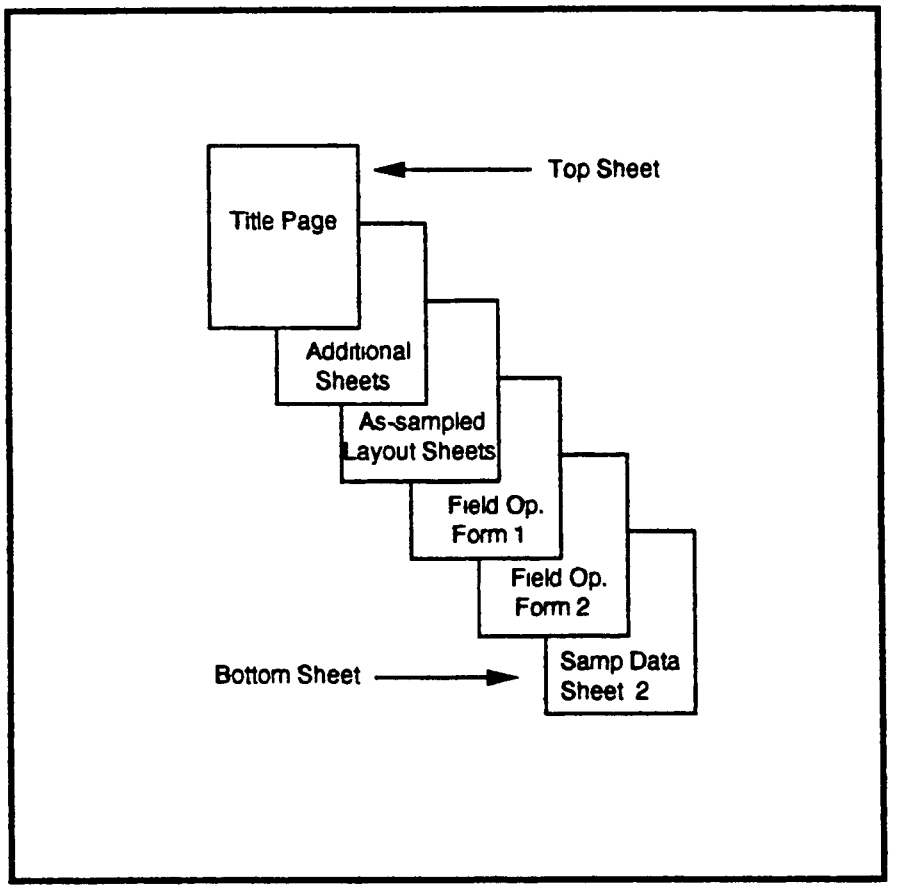


Figure 5. Assembly of "Post-Construction" Sampling and Testing Forms.

After the packet has been assembled and numbered, the original and appropriate number of duplicates should be made. The orginal and one copy should be forwarded to the SHRP regional office. Also, copies should forwarded to the participating highway agency and those laboratories designated by the agency to perform the laboratory tests on the samples.

4. LABORATORY MATERIALS TESTING

Table 6 lists the laboratory test procedures which will be used to characterize the materials obtained from each SPS-5 test site. When implementing the sampling plan for an SPS-5 site, it is imperative that a sufficient type and amount of samples be retrieved to ensure completion of all tests. Therefore, a laboratory testing plan, similar to that shown in Table 3 shall always be developed in conjunction with the field material drilling and sampling plan. The plan shall list the tests to be performed and the samples to be used for each test. The laboratory testing plan summarized in Table 3 is an example of a plan that includes the minimum laboratory tests required to characterize the materials at an SPS-5 test site.

Table 6. SHRP SPS-5 Laboratory Material Testing Procedures.

MATERIAL TEST	SHRP TEST DESIGNATION	SHRP PROTOCOL
I. ASPHALT CONCRETE		
A. ASPHALTIC CONCRETE:		
Core Examination/Thickness	AC01	P01
Bulk Specific Gravity	AC02	P02
Maximum Specific Gravity	AC03	P03
Asphalt Content (Extraction)	AC04	P04
Moisture Susceptibility	AC05	P05
Creep Compliance	AC06	P06
Resilient Modulus	AC07	P07
Tensile Strength	AC07	P07
Field Moisture Damage	AC08	P08
B. EXTRACTED AGGREGATE:		
Type and Classification:		
Coarse Aggregate	AG03	P13
Fine Aggregate	AG03	P13
Gradation of Aggregate	AG04	P14
NAA Test for Fine Aggregate Particle Shape	AG05	P14A
C. ASPHALT CEMENT:		
Abson Recovery	AE01	P21
Penetration at 77 and 115° F	AE02	P22
Specific Gravity (60F)	AE03	P23
Viscosity at 77F	AE04	P24
Viscosity at 140F,275F	AE05	P25
II. BOUND (TREATED) BASE AND SUBBASE		
Type and Classification of Material and Treatment	TB01	P31
Pozzolanic/Cementitious: Compressive Strength	TB02	P32
Asphalt treated: Dynamic Modulus (77F)	TB03	P33
HMAC: Resilient Modulus	AC07	P07
III. UNBOUND GRANULAR BASE AND SUBBASE		
Particle Size Analysis	UG01	P41
Sieve Analysis (washed)	UG02	P41
Atterberg Limits	UG04	P43
Moisture-Density Relations	UG05	P44
Resilient Modulus	UG07	P46
Classification	UG08	P47
Permeability	UG09	P48
Natural Moisture Content	UG10	P49
IV. SUBGRADE		
Sieve Analysis	SS01	P51
Hydrometer to 0.001mm	SS02	P42
Atterberg Limits	SS03	P43
Classification	SS04	P52
Moisture-Density Relations	SS05	P55
Resilient Modulus	SS07	P46
Unit Weight	SS08	P56
Natural Moisture Content	SS09	P49

APPENDIX A - EXAMPLE OF PRE-CONSTRUCTION SAMPLING PLAN

This appendix contains an example of pre-construction field sampling layout plan for an SPS-5 test site which provides the minimum requirements for materials characterization considered essential for the experiment. The plan should be adjusted with consideration to the condition and details of the specific test site.

A schematic layout of a test site illustrating the location of the test sections and sampling areas is shown in Figure A.1. An example of pre-construction sampling plan for an "ideal" test site is illustrated in Figures A.2 through A.10 for Test Sections 1 through 9, respectively.

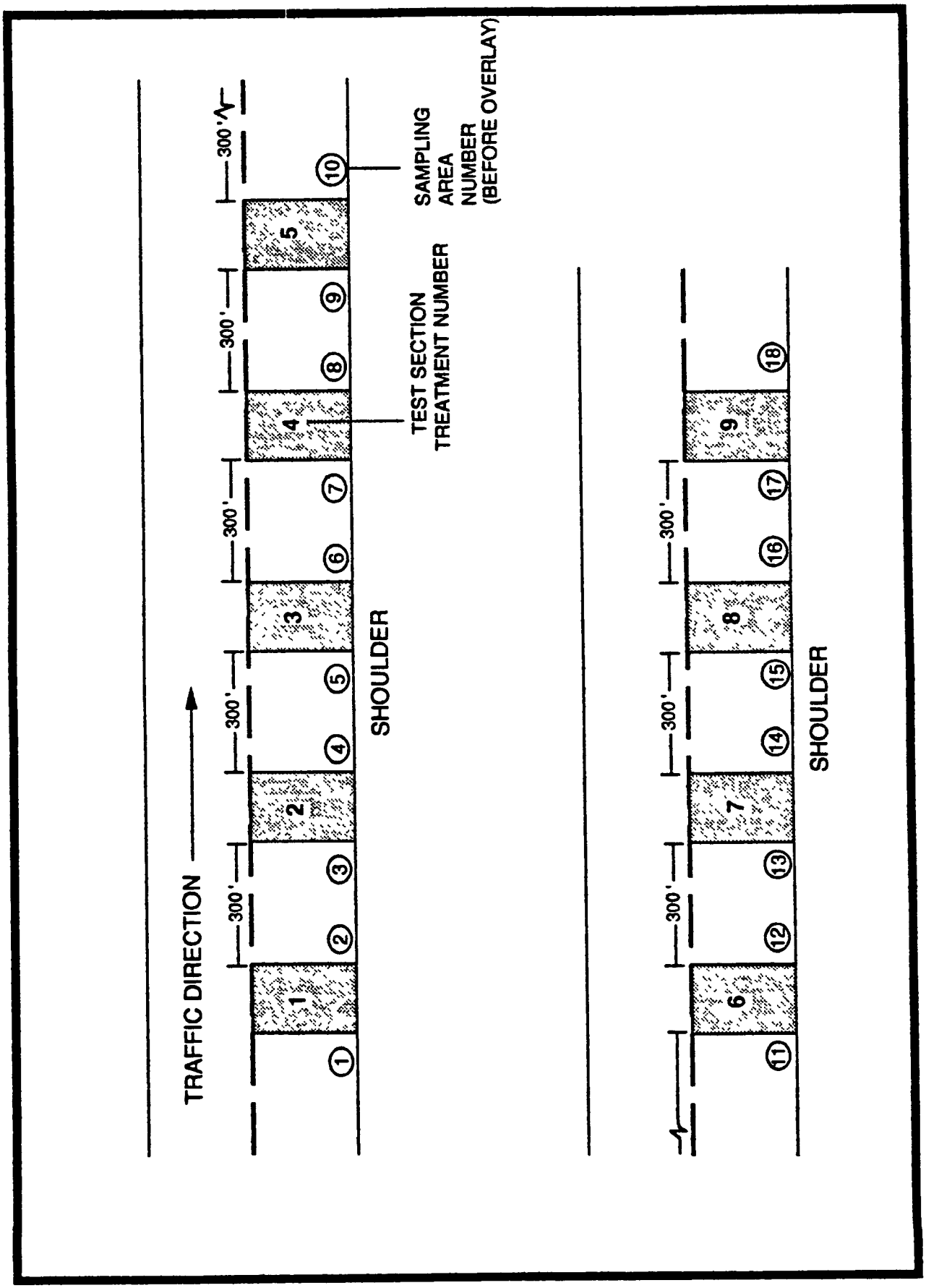


Figure A.1. Example of "Pre-Construction" Sampling Area Plan

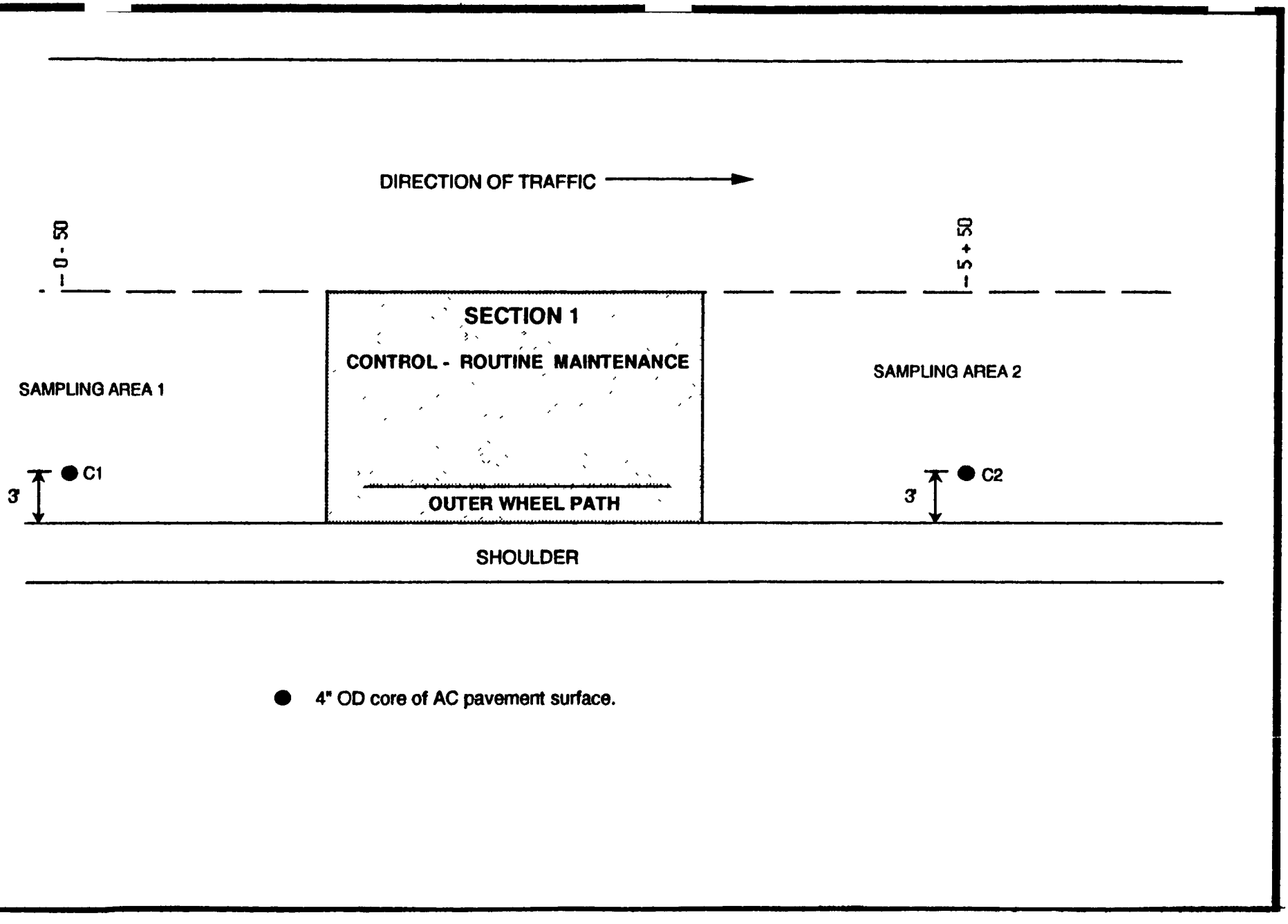


Figure A.2. Example of "Pre-Construction" Sampling Plan for Section 1.

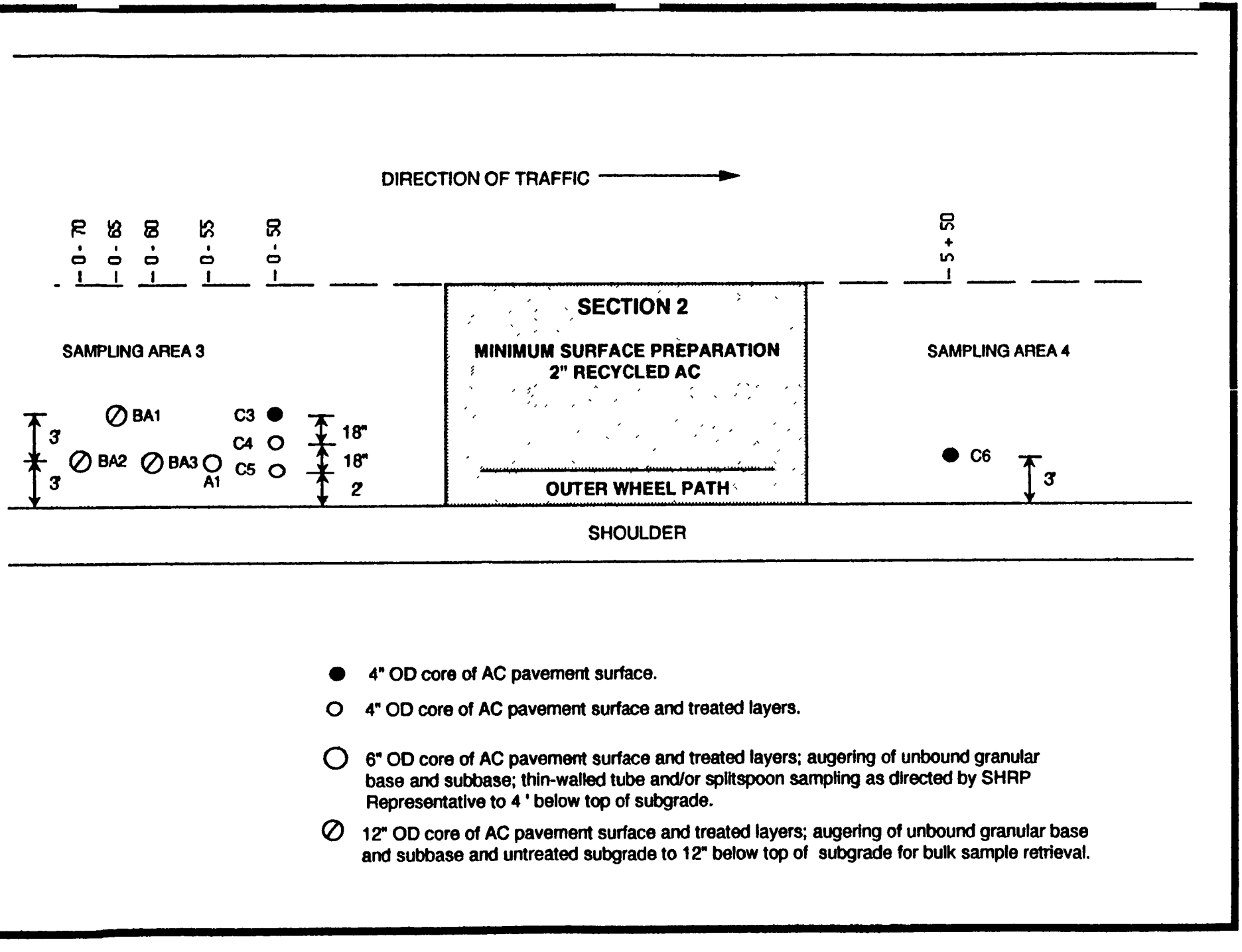


Figure A.3. Example of "Pre-Construction" Sampling Plan for Section 2.

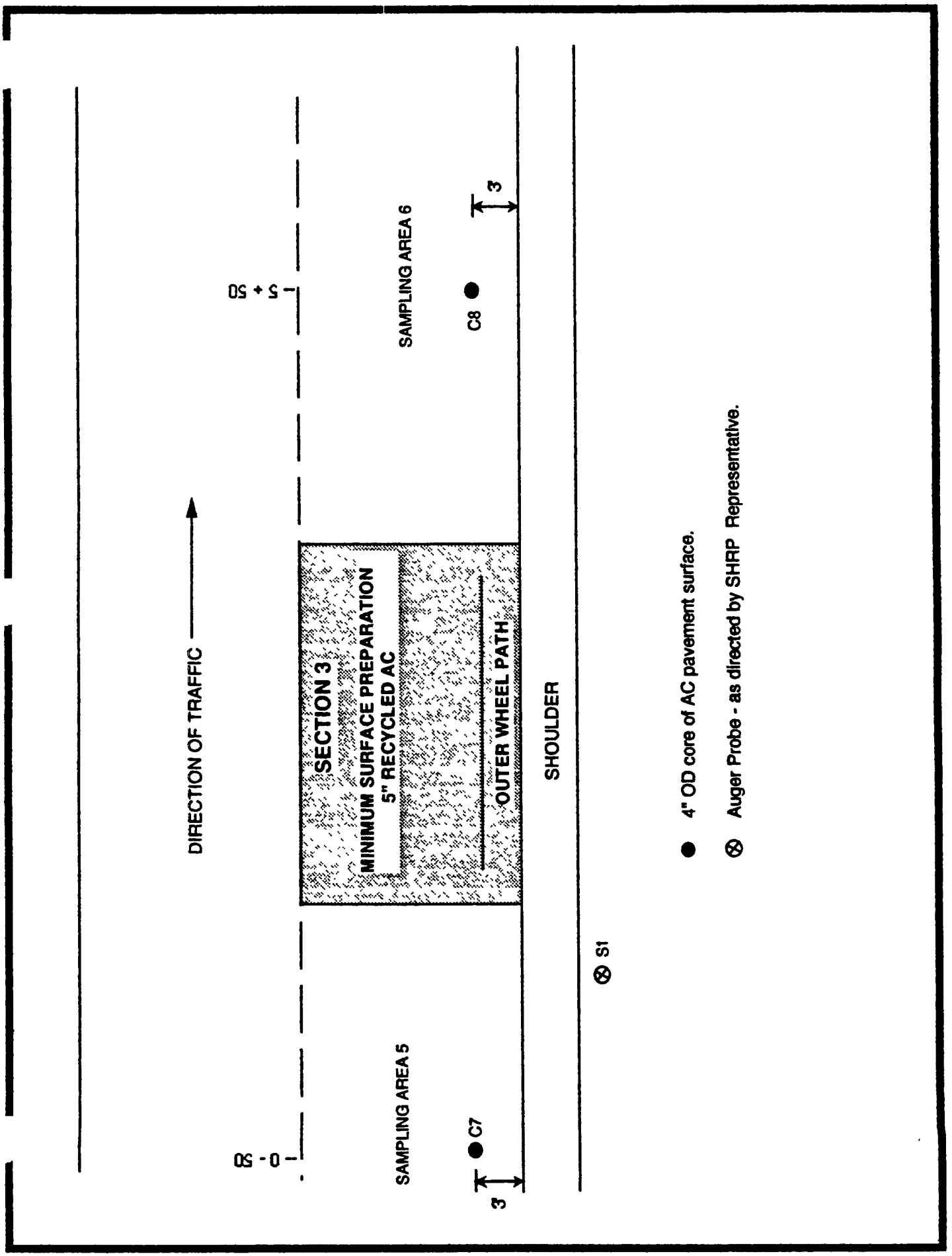


Figure A.4. Example of "Pre-Construction" Sampling Plan for Section 3.

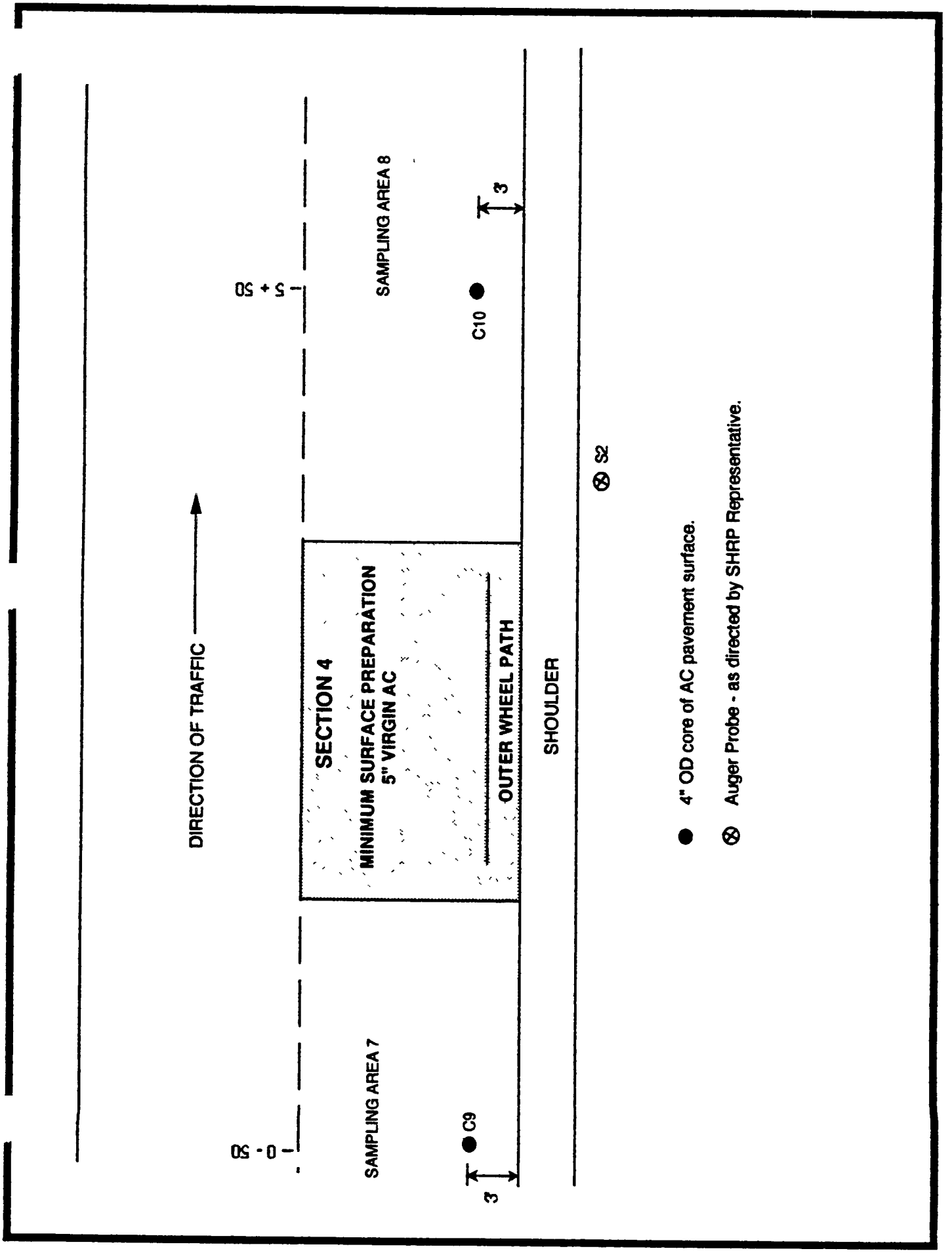


Figure A.5. Example of "Pre-Construction' Sampling Plan for Section 4.

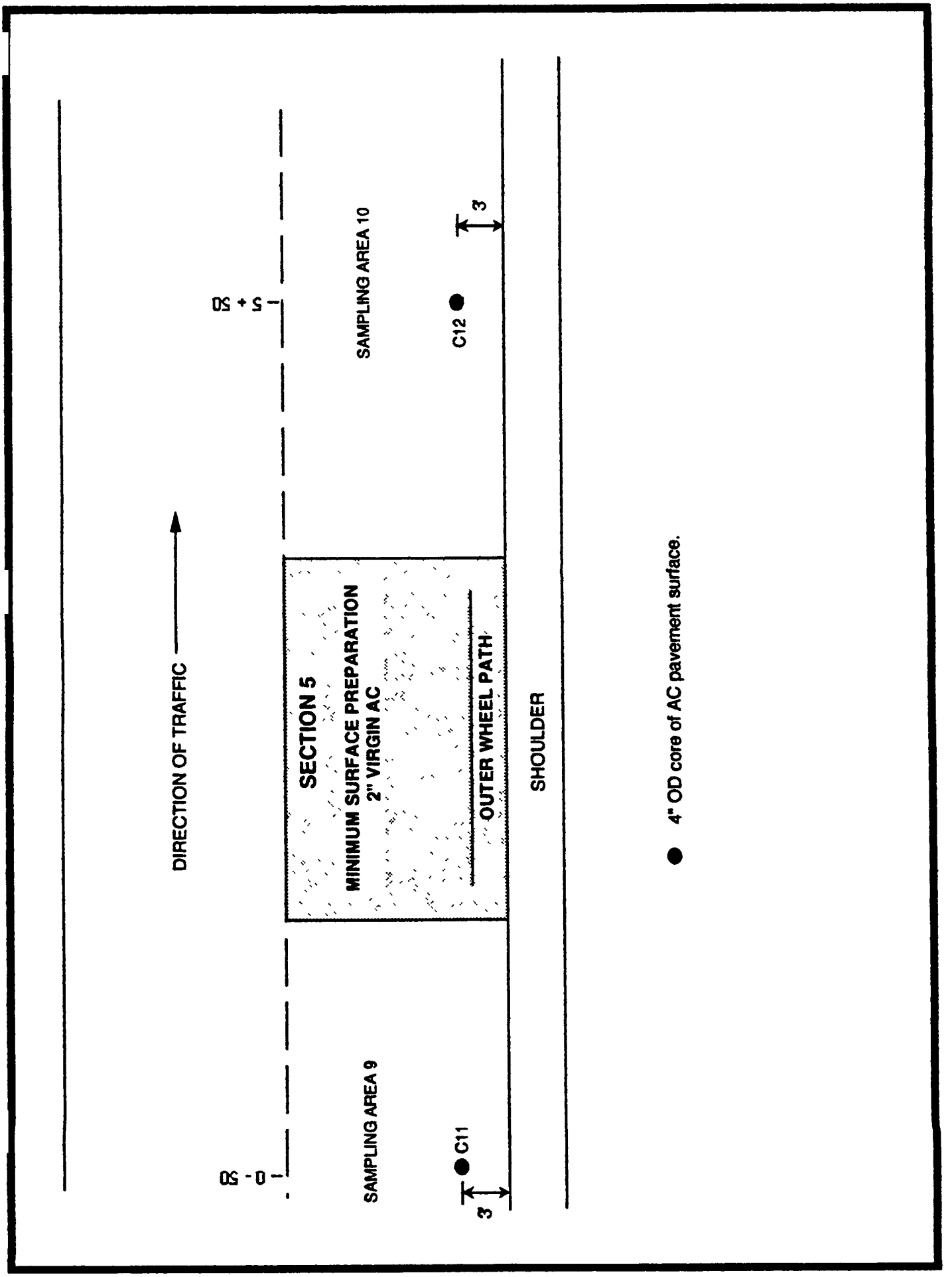


Figure A.6. Example of "Pre-Construction" Sampling Plan for Section 5.

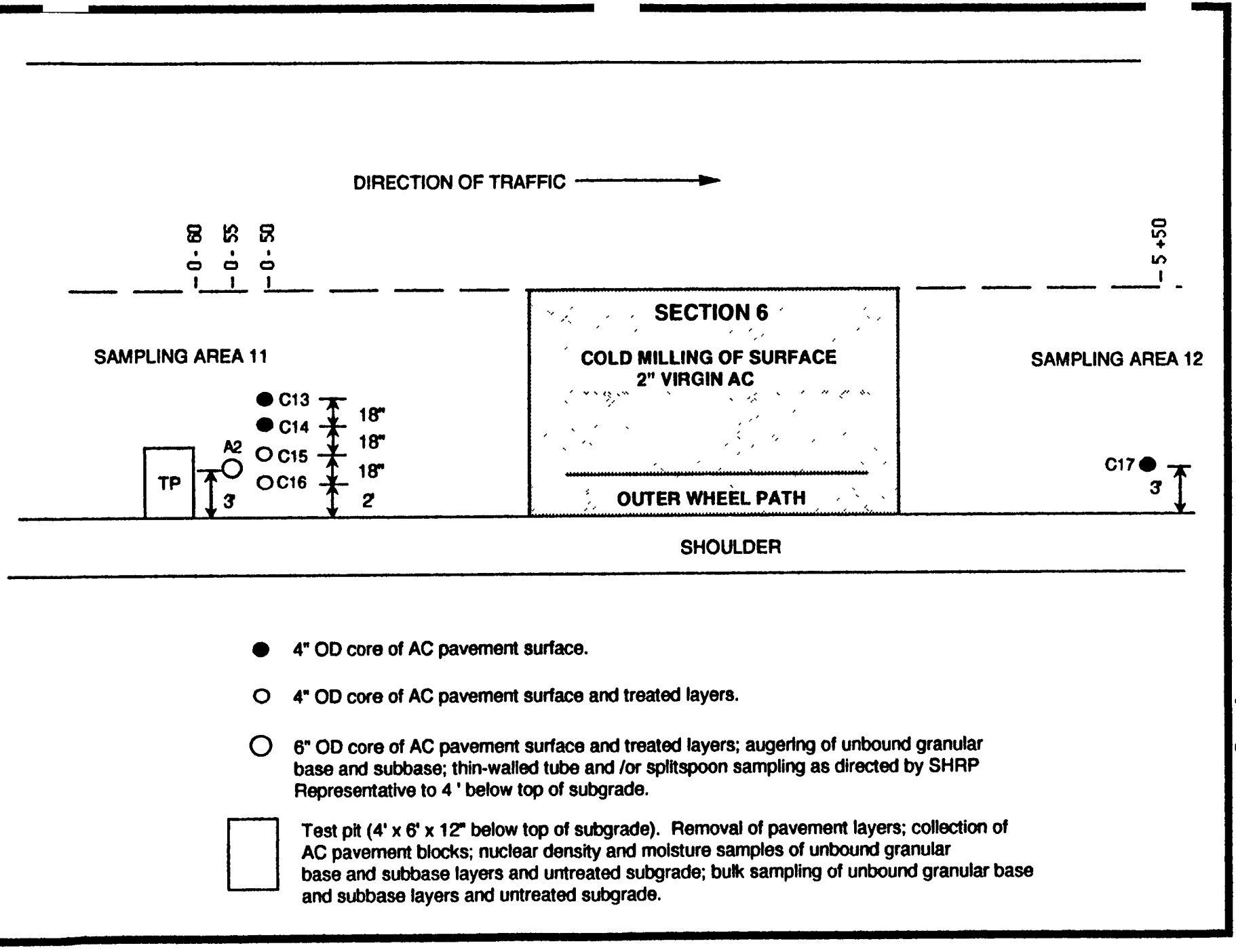


Figure A.7. Example of "Pre-Construction" Sampling Plan for Section 6.

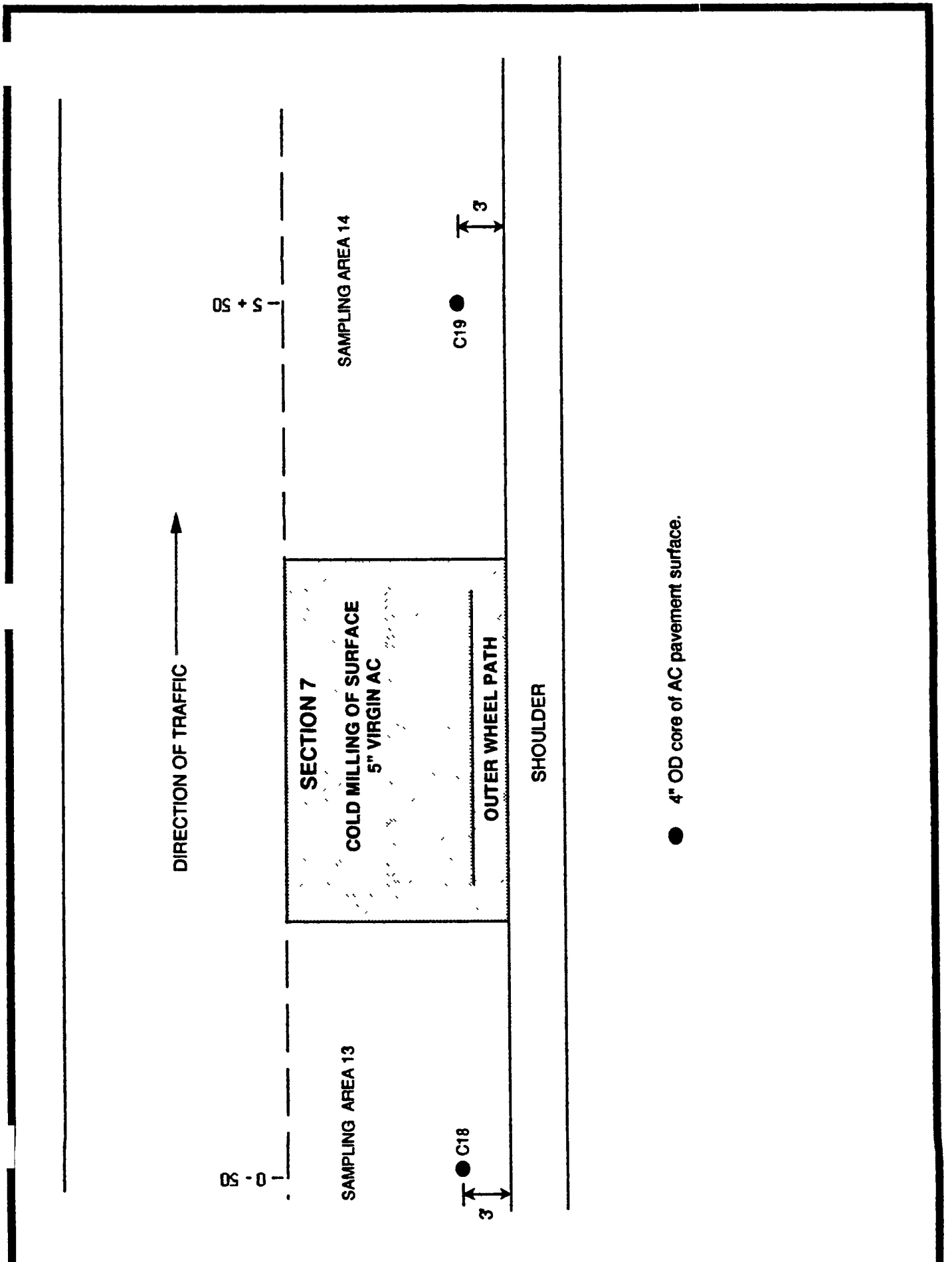
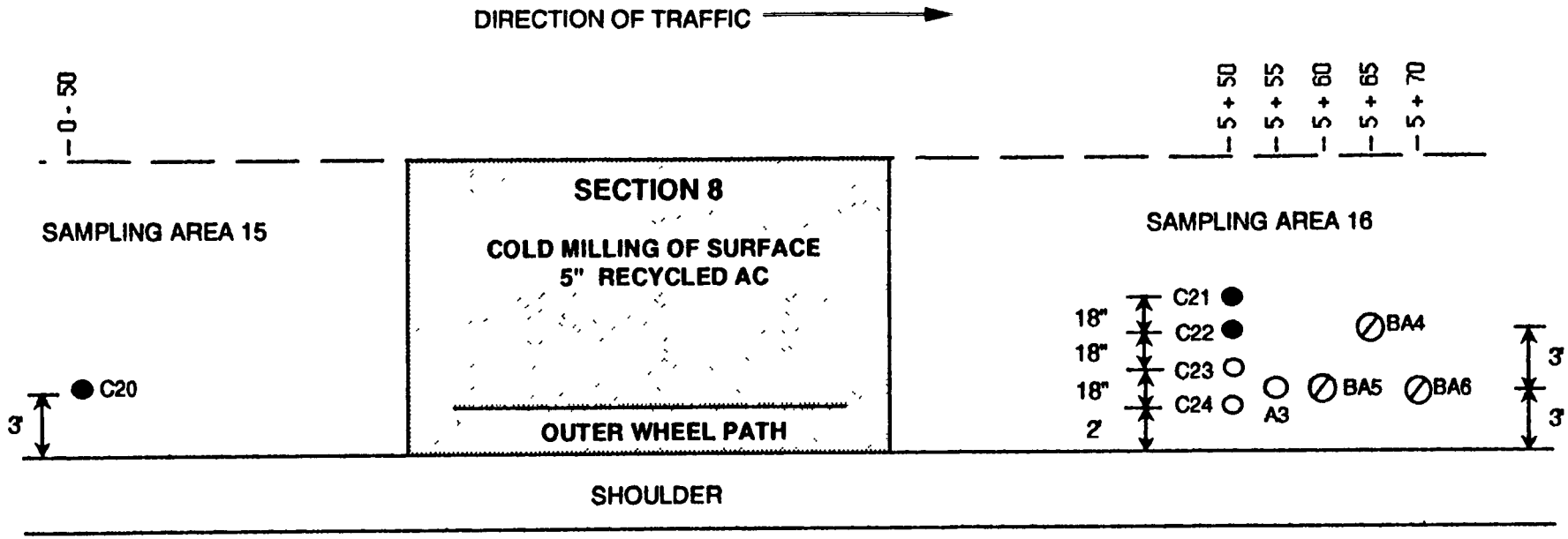


Figure A.8. Example of "Pre-Construction"Sampling Plan for Section 7.



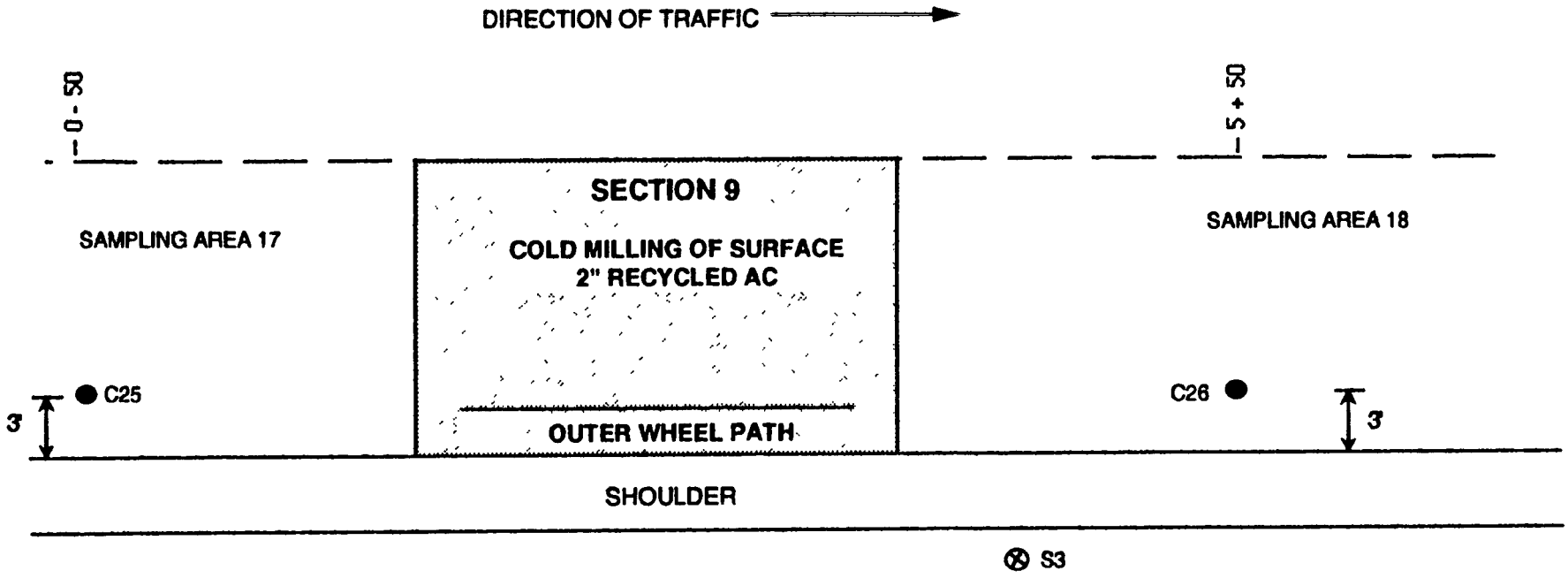
● 4" OD core of AC pavement surface.

○ 4" OD core of AC pavement surface and treated layers.

○ 6" OD core of AC pavement surface and treated layers; augering of unbound granular base and subbase; thin-walled tube and/or splitspoon sampling as directed by SHRP Representative to 4 ' below top of subgrade.

⊘ 12" OD core of AC pavement surface and treated layers; augering of unbound granular base and subbase and untreated subgrade to 12" below top of subgrade for bulk sample retrieval.

Figure A.9. Example of "Pre-Construction" Sampling Plan for Section 8.



● 4" OD core of AC pavement surface.

⊗ Auger Probe - as directed by SHRP Representative.

Figure A.10. Example of "Pre-Construction" Sampling Plan for Section 9.

APPENDIX B - EXAMPLE OF POST-CONSTRUCTION SAMPLING PLAN

This appendix contains an example of post-construction field sampling layout plan for an SPS-5 test site which provides the minimum requirements for materials characterization considered essential for the experiment. This plan should be adjusted with consideration to the condition and details of the specific test site.

A schematic layout of a test site illustrating the location of the test sections and sampling areas is shown in Figure B.1. An example of post-construction sampling plan for an "ideal" test site is illustrated in Figures B.2 through B.11 for Test Sections 1 through 9, respectively.

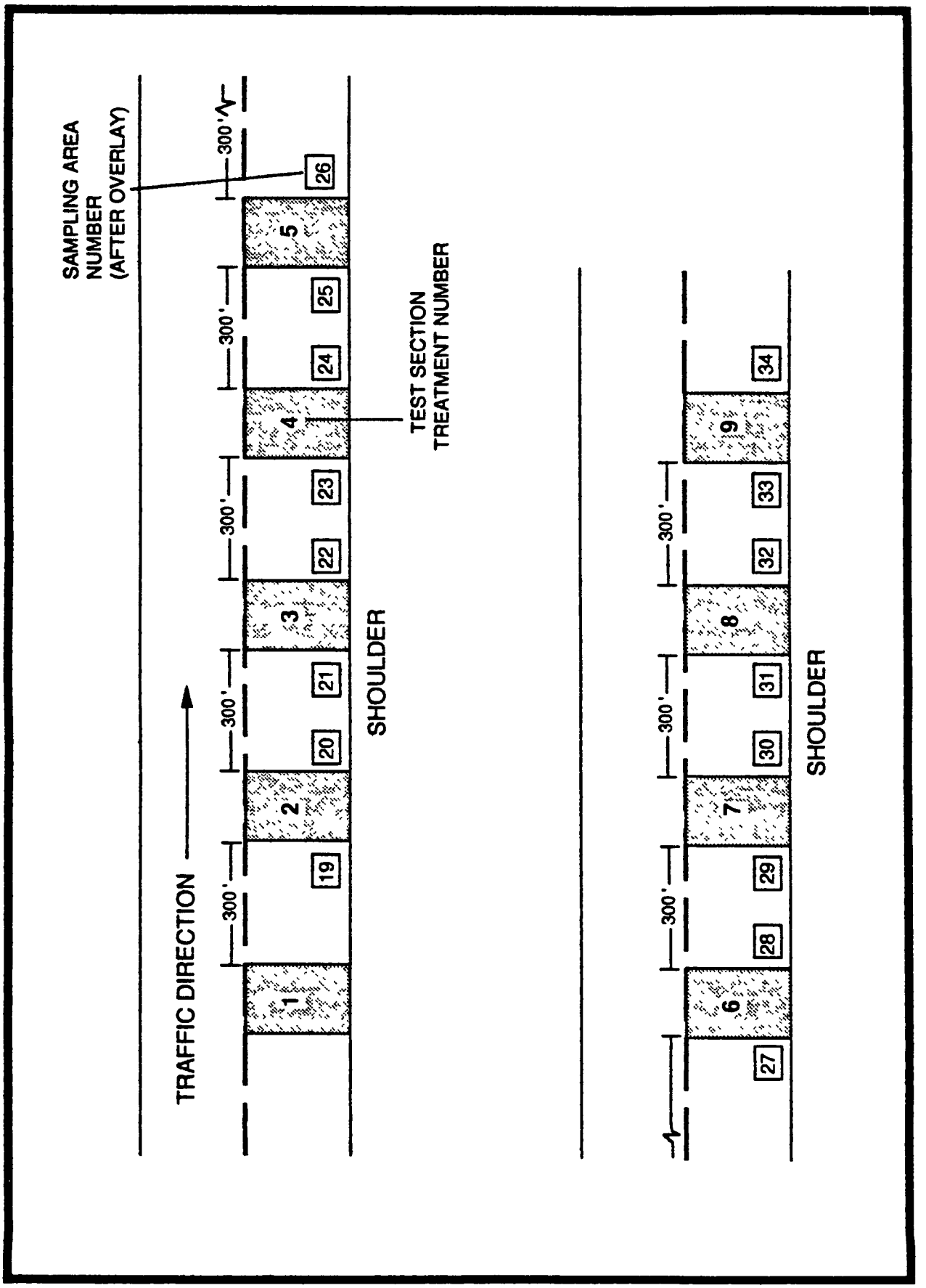


Figure B.1. Example of "Post-Construction" Sampling Area Plan.

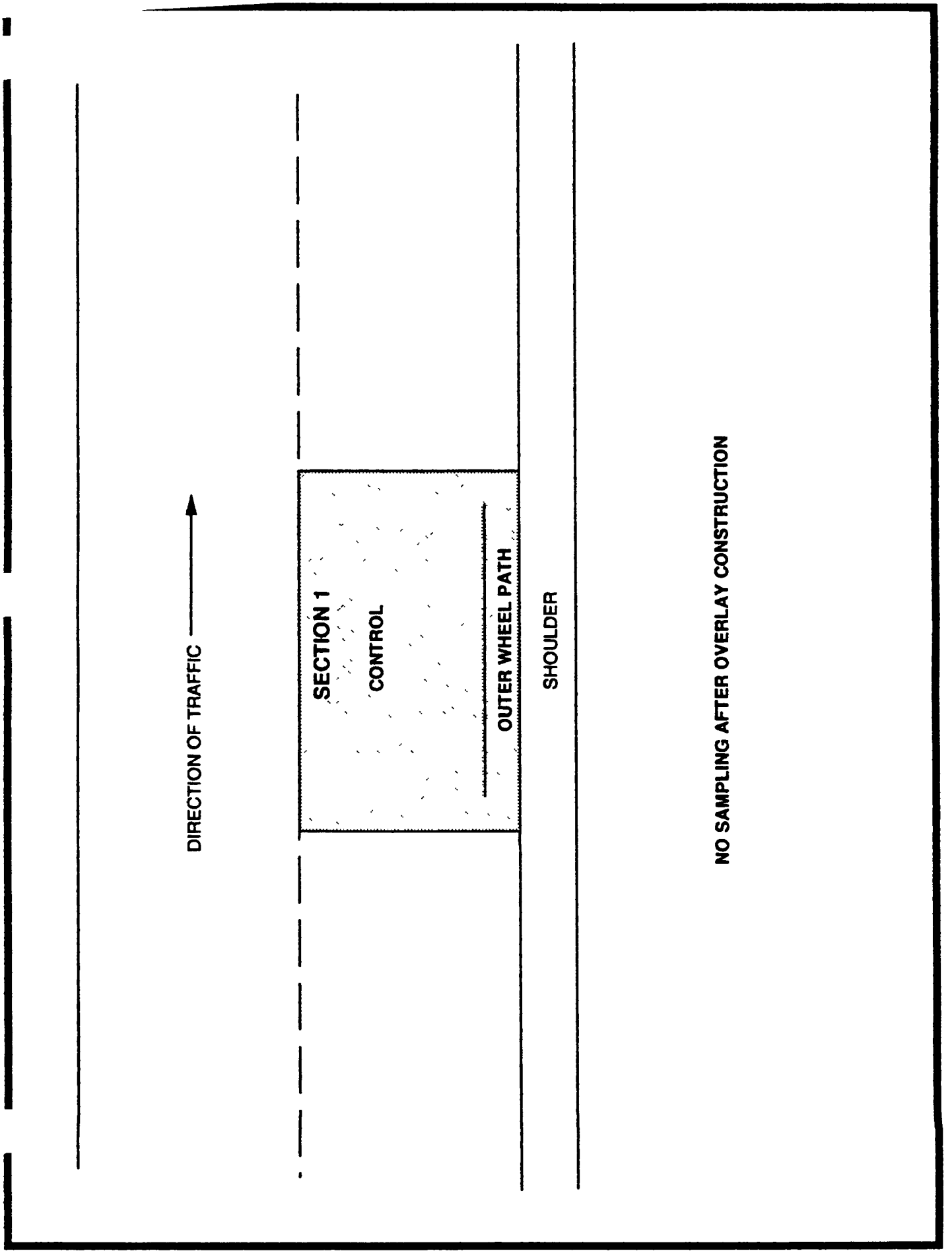


Figure B.2. Example of "Post-Construction" Sampling Plan for Sction 1

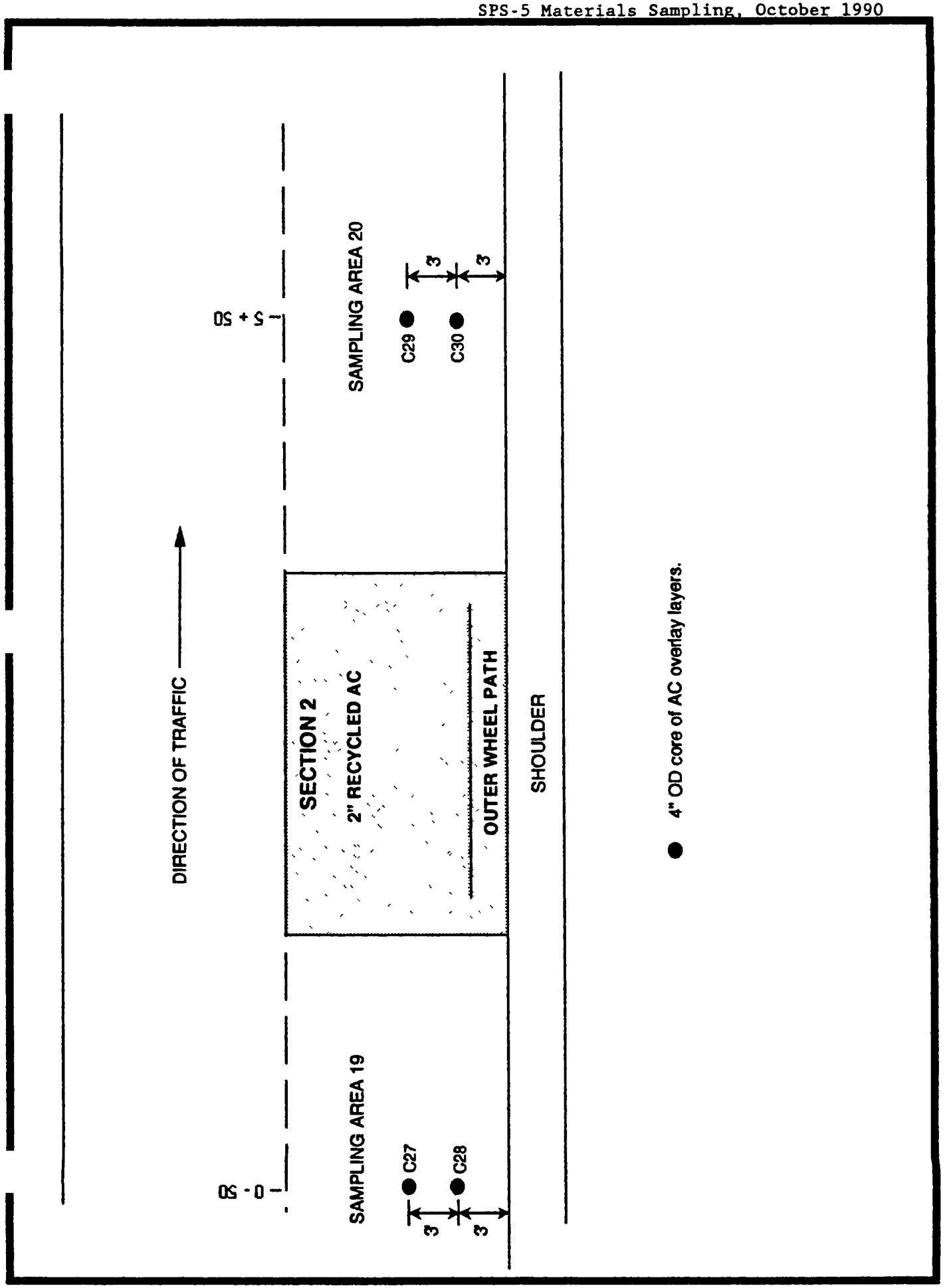


Figure B.3. Example of "Post-Construction" Sampling Plan for Section 2.

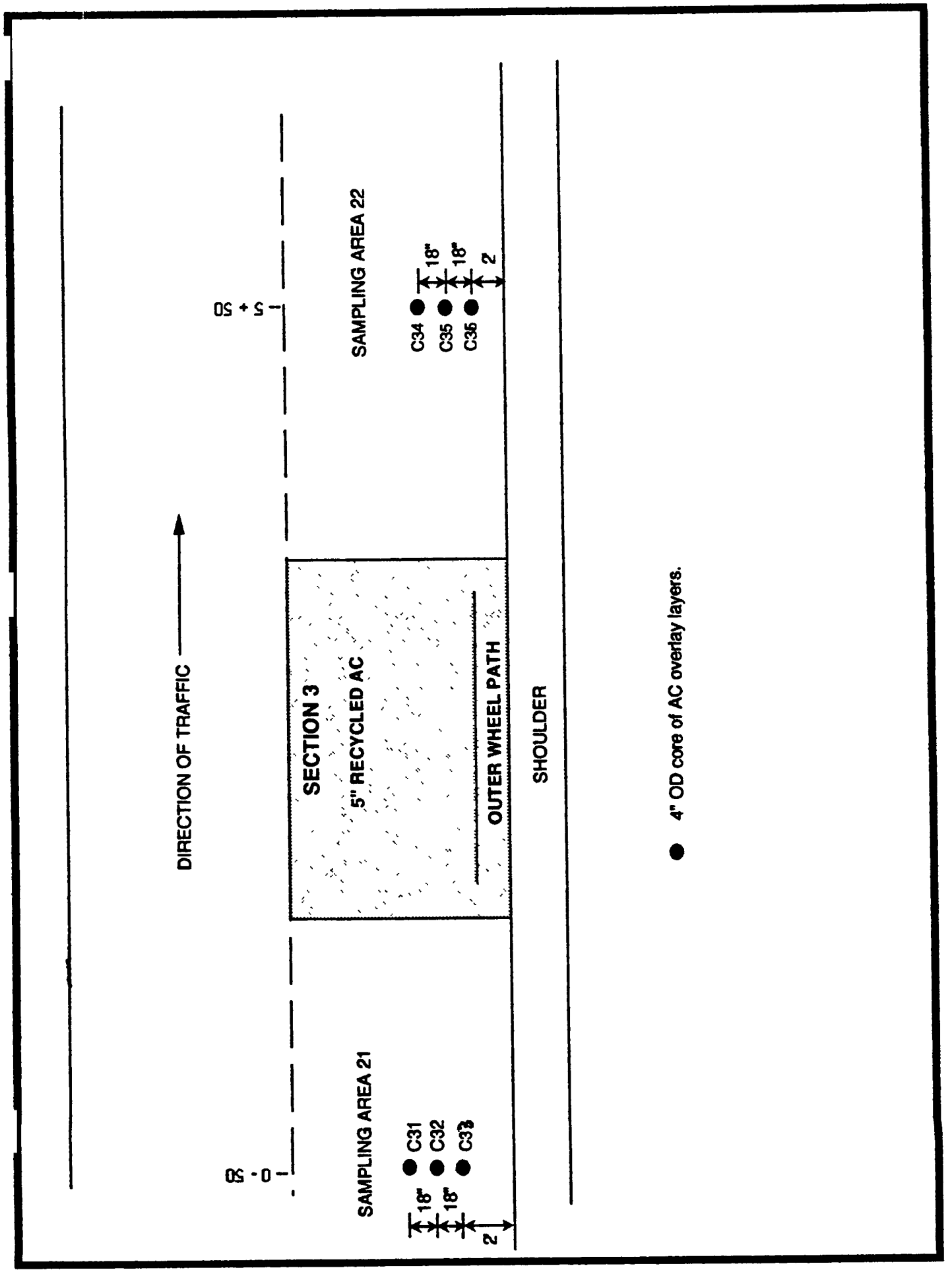


Figure B.4. Example of "Post-Construction" Sampling Plan for Section 3.

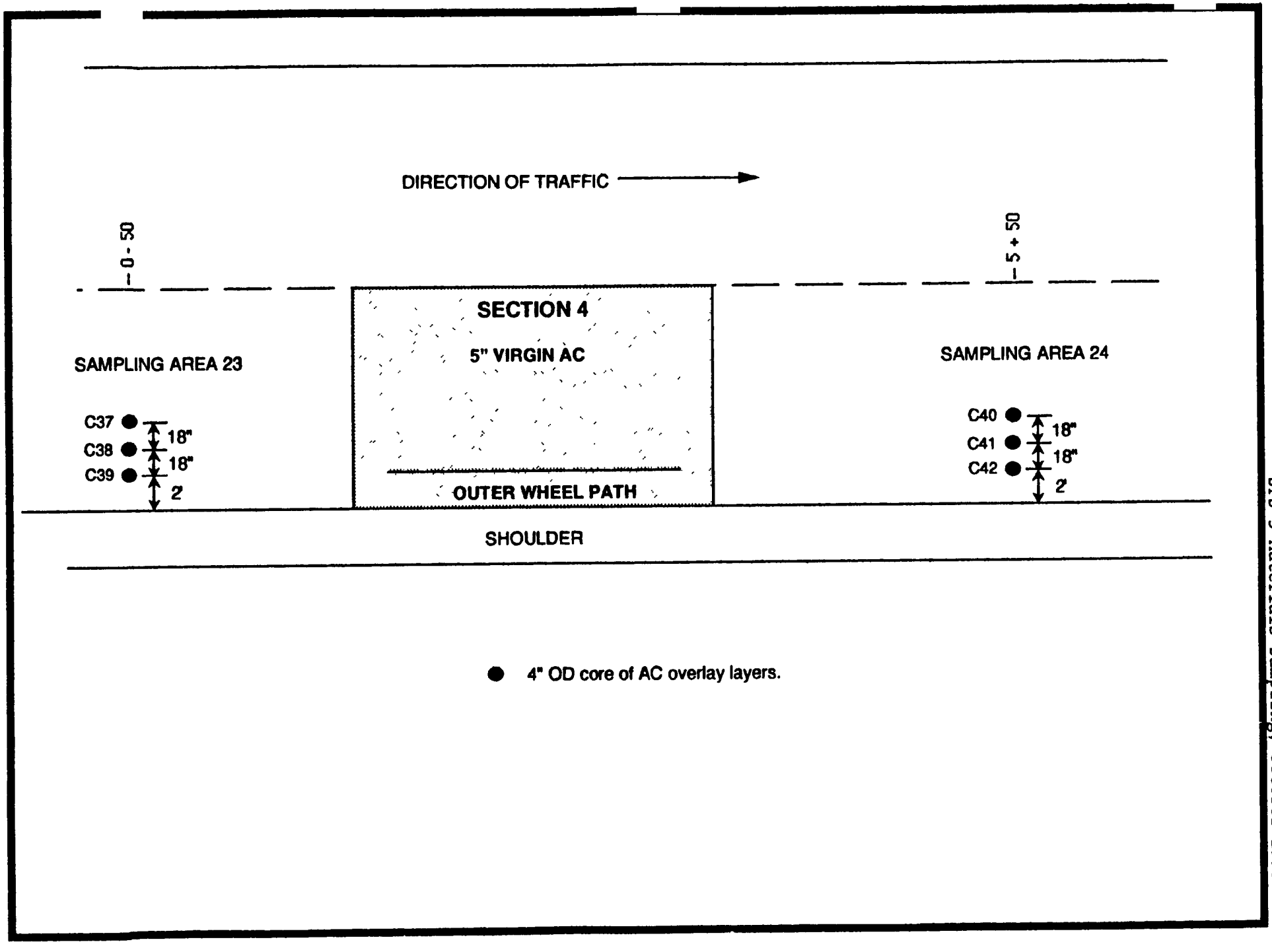


Figure B.5. Eample of "Post-Construction" Sampling Plan for Section 4.

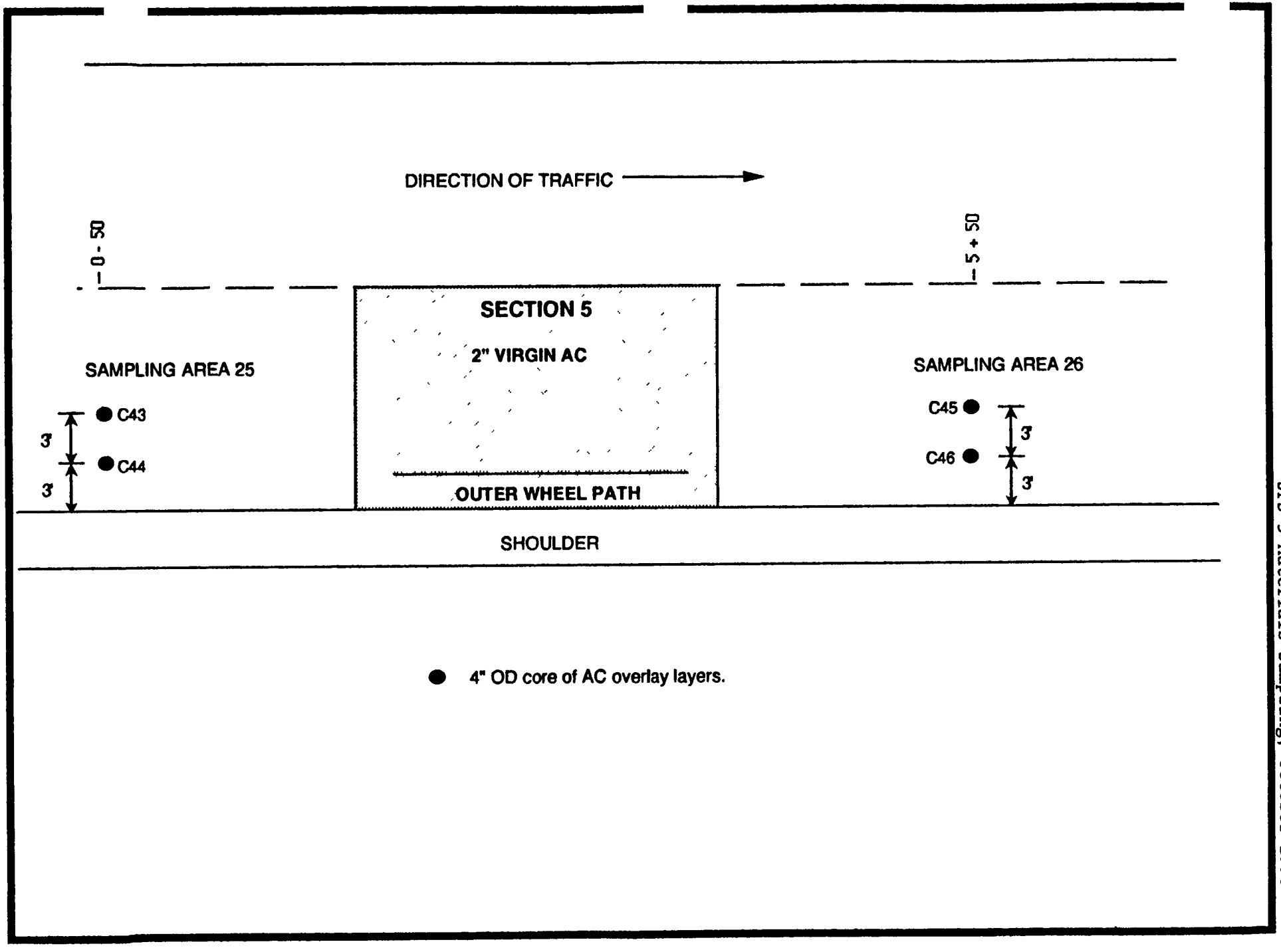


Figure B.6. Example of "Post-Construction" Sampling Plan for Section 5.

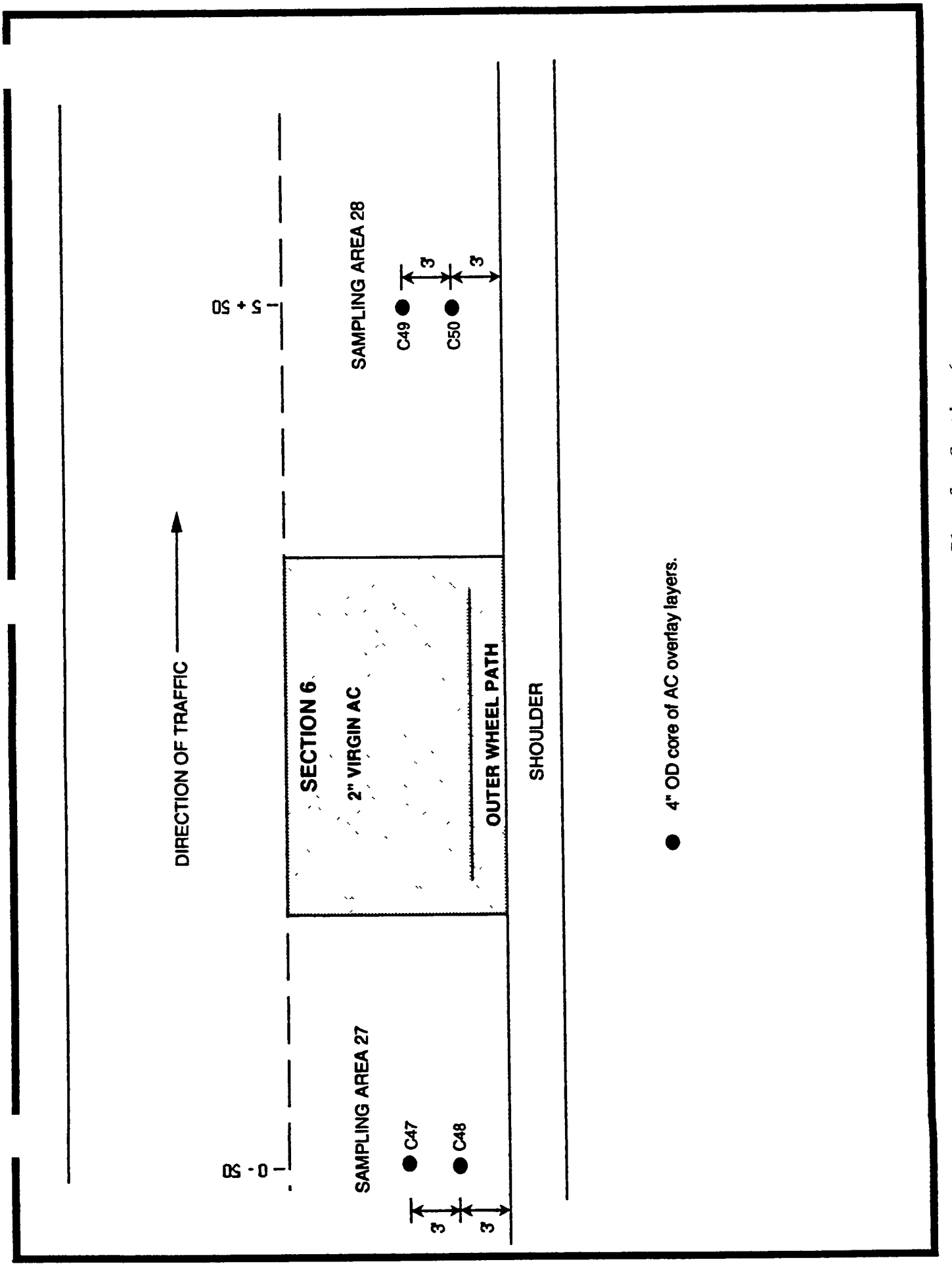


Figure B.7. Example of "Post-Construction" Sampling Plan for Section 6.

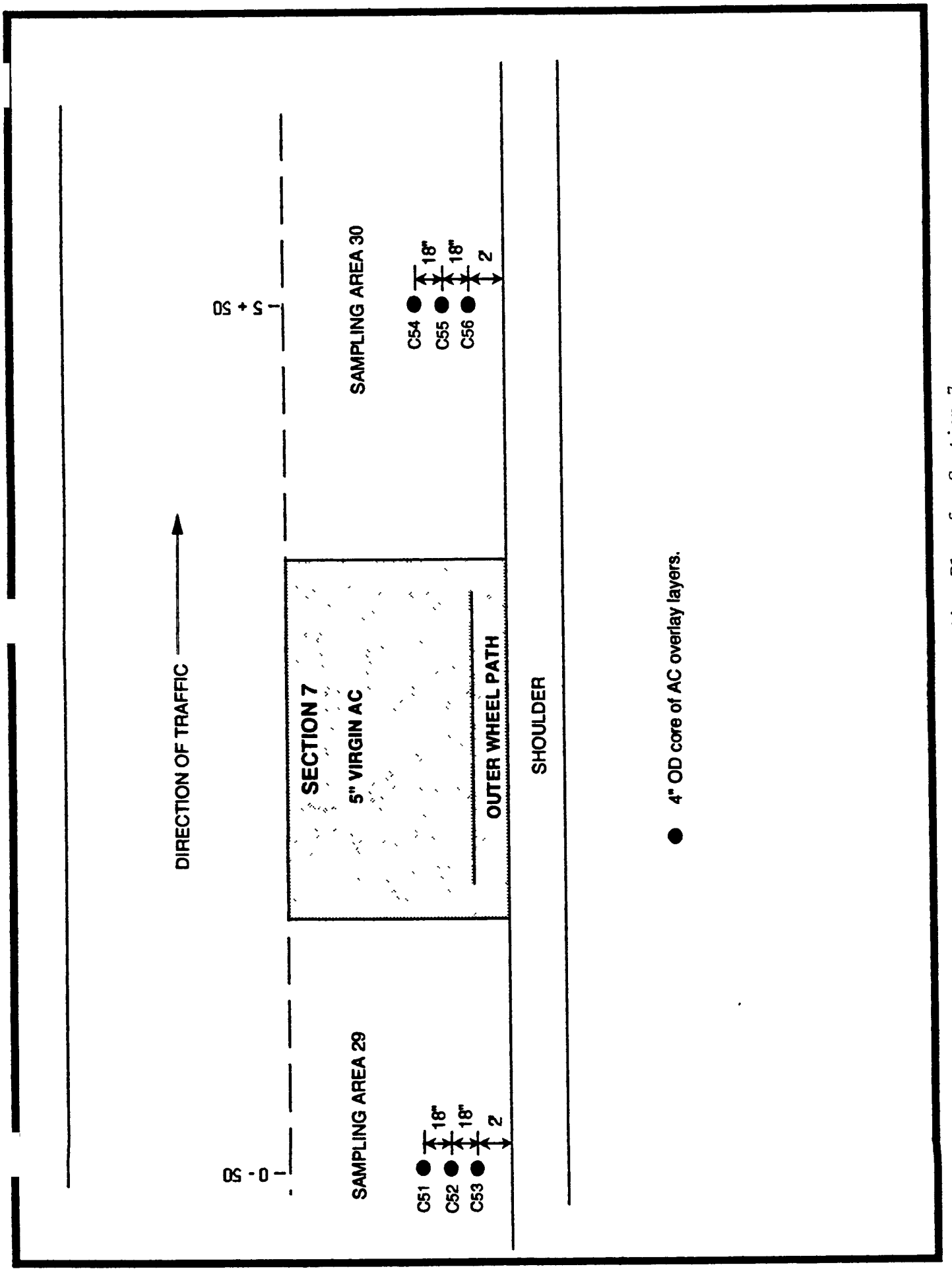


Figure B.8. Example of "Post-Construction" Sampling Plan for Section 7.

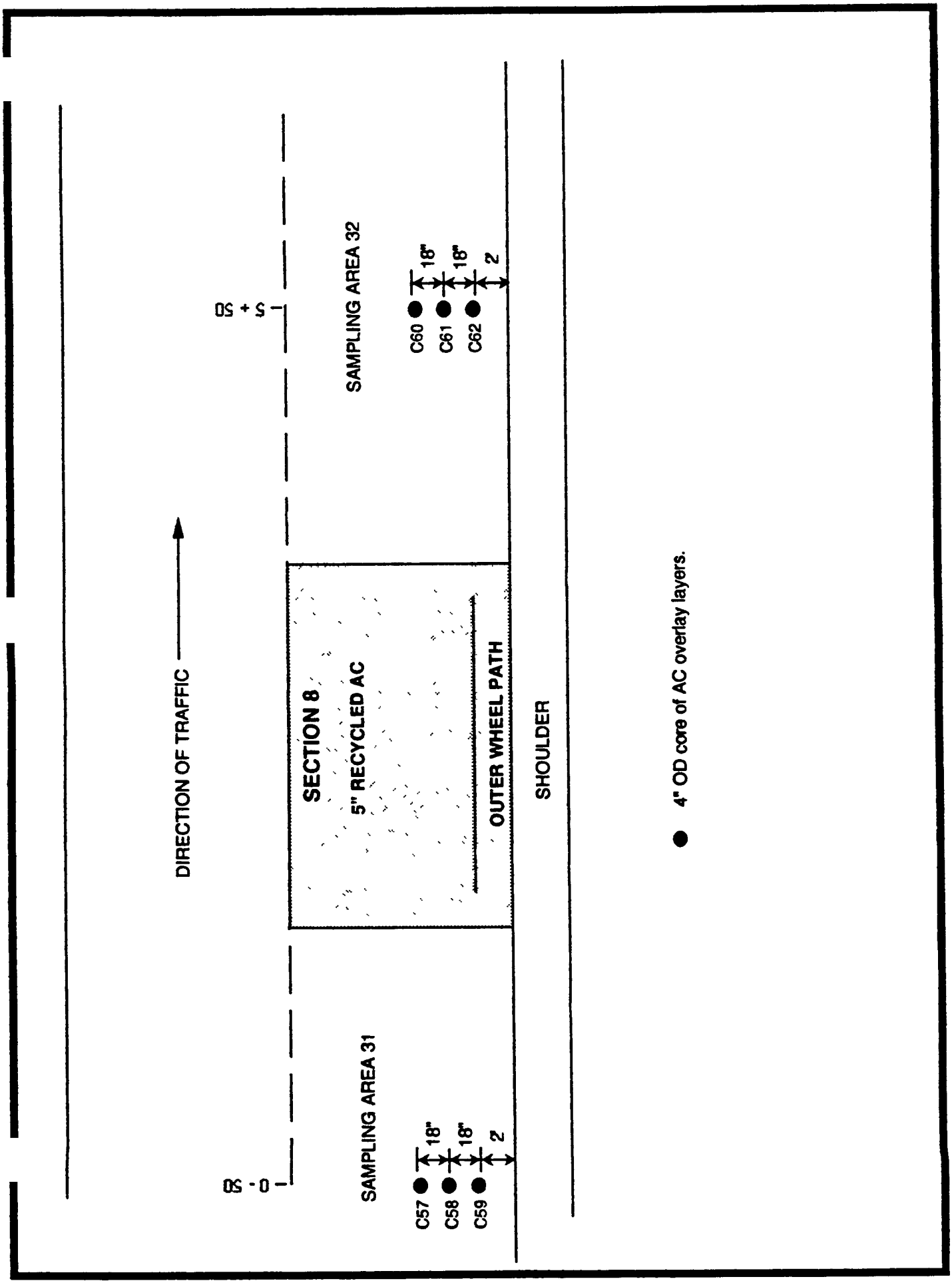


Figure B.9. Example of "Post-Construction" Sampling Plan for Section 8.

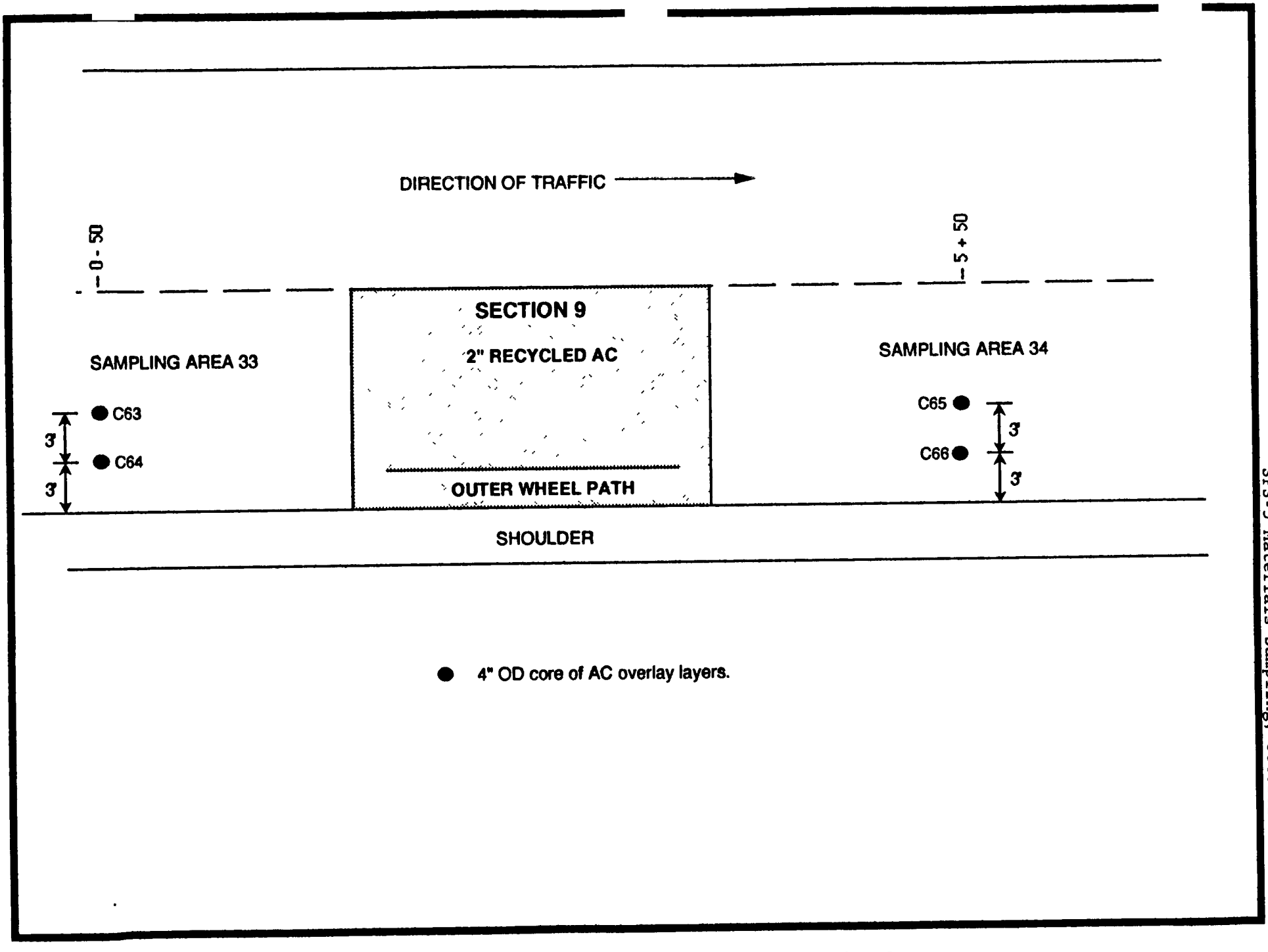


Figure B.10. Example of "Post-Construction" Sampling Plan for Section 9.

APPENDIX C. FIELD MATERIALS SAMPLING AND TESTING DATA FORMS

In general, the field materials sampling and testing for the SPS-5 test sites should be performed following the guidelines described in Operational Guide No. SHRP-LTPP-OG-006, "SHRP-LTPP Guide for Field Materials Sampling, Testing, and Handling", May 1990. However, field data forms have been revised, a procedure for visual determination of asphalt concrete moisture-related damage has been added, and data sheets have been included to report bulk asphalt concrete materials sampled during construction. These changes and/or additions have been made to accommodate SPS-5 needs.

REVISED FIELD DATA FORMS

Due to differences between the sampling requirements for GPS and SPS projects, the field materials sampling and testing data forms used in the GPS program were modified. The primary changes common to each form relate to test section number, sample location referencing, and sampling area number.

Test Section Number. The six digit test section identification numbers on the data forms have been subdivided into three, two digit fields representing the state code, SPS project code, and test section number. The structure of this number is described under SPS Test Section Numbering Scheme in this document.

Sample Location Reference System. All material sampling and field testing data forms which reference the location of a sample or test use a station, offset and sampling area number. The sampling area number is a two digit number used to reference all of the samples taken from one area of the project. The sampling numbers are developed as part of the materials sampling plan for test site, and should run in sequential order in the direction of traffic.

The station to be specified on these data forms is referenced from either the beginning or end of the test sections adjacent to the sampling area. For expediency in the field, the station number designated on the form is relative to the test section number designated on the data form. Thus, if the sampling area occurs after the referenced test section, the station number should be

greater than 5+00. If the sampling area occurs in front of the designated test section, the station number should be negative. The offset distance is measured from the interface of the outside edge of the test section lane and the outside shoulder to the core location (measured from the outside edge of the pavement edge stripe).

Figure 2 illustrates the location referencing system to be used for SPS material samples. In this example, designated sampling area SA-05 is situated between sections 200503 and 200504. In SA-05, two 6" A-type cores are specified, A-3 and A-4, to be 5 feet apart and three feet from the edge of the lane. The location of these two cores can be specified relative to either test section 200503 (alternative 1) or test section 200504 (alternative 2). In alternative 1, the station number of core A-3 is 5+95 since it is 95 feet past the end of section 200504. Core A-4 is at station 6+00. In alternative 2, the station number of core A3 is -1-05 and A4 is -1-00 since they occur in advance of test section 200504. Thus when specifying the sampling locations on the field data form, the station number written on the form must correspond to the test section indicated on the form.

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING DATA SHEETS

Common Data Elements

Most of the LTPP-SPS Material Sampling and Field Testing data sheets use the same top block of information related to the test section and project.

SHEET NUMBER. Since multiple data sheets will be required for the samples and tests from the multiple sampling areas on the project, room is provided on all data forms to sequentially order the data sheets. The first field is the sequential number of the data sheet and the second field is the total number of data sheets submitted.

SHRP REGION. Indicate which SHRP-LTPP region the state or province is located, North Atlantic, North Central, Southern, or Western.

STATE. Indicate the name of the state, District of Columbia, Puerto Rico, or the Canadian Province the project is located in. Alternatively, use the two

letter abbreviation as shown in Table C.1 of the SHRP-LTPP Guide for Field Material Sampling, Testing and Handling.

STATE CODE. Enter the two-digit numeric code corresponding to the state or province as shown in Table C.1 of the SHRP-LTPP Guide for Field Material Sampling, Testing and Handling.

SPS PROJECT CODE. The two digit SPS project code. The first digit (from the left) of this code should either be a 0 (zero), for the first project constructed in a state, or a letter starting with A, B, etc. for the second, third, etc. projects of the same SPS experiment constructed in the same state. The second digit corresponds to the SPS experiment number.

TEST SECTION NO. The two digit number assigned to the test section. If a GPS section is co-located on the SPS project and these data sheets are used for the material sampling and field testing, the four digit SHRP SECTION ID should be divided into two-two digit fields and the first two digits (from the left) should be entered as the SPS PROJECT CODE and the last two digits entered as the TEST SECTION NO. Enter the test section number marked on the project in the field.

SPS EXPERIMENT NO. The SPS experiment number for the project. This should be SPS-5 for projects in the SPS-5 experiment "Rehabilitation of Asphalt Concrete Pavements".

ROUTE/HIGHWAY. Record the signed designation for the route or highway the project is located upon.

Lane. Record a "1" if sampling occurs on the outside lane and a "2" if sampling occurs on the inside lane. Drilling and sampling shall always occur on the outside lane for the SPS program.

Direction. Record the direction of travel at the project site. Use the following abbreviations:

E for eastbound traffic direction
W for westbound traffic direction
N for northbound traffic direction
S for southbound traffic direction
NE for a northeastern bound traffic direction
SE for a southeastern bound traffic direction
SW for a southwestern bound traffic direction
NW for a northwestern bound traffic direction.

SAMPLE/TEST LOCATION. Check "Before Section" if the sampling location is before the beginning of the test section indicated under TEST SECTION NUMBER on the form (station 0-). Check "After Section" if the sampling location is after the end of the test section indicated on the form (station 5+).

FIELD SET NO. The field set number is a sequentially assigned number to indicate the different time periods in which material samples and field testing were conducted on the project. These time periods usually refer to different stages in the pavement life, such as prior to overlay construction, after overlay construction, end of test, etc. A field set number can apply to more than one day since sampling of SPS test sections usually requires more than one day. As a general rule, the same field set number should be applied to all material samples and field tests conducted in a continuous 30 day period, unless a construction event occurs between the two sampling sessions. Enter 1 for the first time that material sampling and field testing are conducted on the project. On SPS-5 projects the first sampling should occur prior to overlay construction. Enter 2, 3, etc. for the second, third and subsequent sampling and field testing on this project.

SAMPLING DATA SHEET 1. LOG OF PAVEMENT CORE AT BOREHOLE LOCATIONS

This form is similar to Form S01 used for GPS test sections. This data sheet is used to log pavement cores taken at the borehole locations (either A-type 6" cores or BA-Type 12" cores). Use the core sample coding system given in the sampling plan developed for the project to designate the core number requested on the data forms. Depth should be measured from the pavement surface

to the bottom of the core of each layer and recorded to the nearest tenth of an inch.

OPERATOR. Record the coring equipment operators name.

EQUIPMENT USED. Indicate the generic type of the core equipment used.

CORING DATE. Record the month, date, and year the core was taken.

SAMPLING AREA NO. The sampling area number is a two digit number used to reference all of the samples taken from one area of the project. It has the form SA-##. This number is developed by the SHRP Regional Office and is specified in the materials sampling plan for the project.

LOCATION: STATION. This is the station number of the core, relative to the test section specified under TEST SECTION NO. on the form. This number should be greater than 5+00 for sampling locations that occur after the test section specified, and less than 0+00 for sampling locations which occur before the test section specified. (See discussion under Sample Location Reference System in this document.)

LOCATION: OFFSET. This is the distance from the interface of the pavement lane and the outside shoulder to the core location (measured from the outside edge of the pavement edge stripe). This distance should be indicated to the nearest tenth of a foot.

CORE HOLE NO. Enter the core hole sample code number following the sample coding system specified in the material sampling plan developed for the project. Core hole numbers designated with either an A- or a BA- should be used with this sheet.

CORE BARREL SIZE. Record the rated inside diameter of the core barrel to the nearest tenth of an inch.

COOLING MEDIUM. Record the material used for cooling during the coring operation.

DEPTH. Under the depth column, draw horizontal lines to designate the approximate depths of changes in the bound materials. Also write the depths in this column to the nearest tenth of an inch. All depths should be referenced from the pavement surface. The total depth cored should be indicated in this column even if a useable sample was not recovered.

CORE RECOVERED. Record the thickness of the recovered core. This should be the thickness of the testable (intact) portion of the core. This thickness may be less than the depth recorded in the depth column due to breakage of the material. On pavement sections with bound base layers, the thicknesses of the base layers in the core should be indicated separate of the HMAC surface layers. The approximate average thickness of the core, or portion of the core, to the nearest tenth of an inch should be recorded.

CORE SAMPLE NO. Record the core sample number for the recovered core. Separate sample numbers should be assigned to HMAC and bound base layers from the same core, even if the bound base adheres to the HMAC surface layer.

MATERIAL DESCRIPTION. Enter the appropriate material description based on the generic material type. These material descriptions are contained in Table C.2, Appendix C, of the SHRP-LTPP Guide For Field Materials Sampling, Testing and Handling.

MATERIAL CODE. Enter the appropriate material code number from Table C.2 in the SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling corresponding to described type of material.

SAMPLING DATA SHEET 2. PAVEMENT CORE LOG AT C-TYPE CORE LOCATIONS

This is similar to Form S01A used for GPS test sections. It is used to log 4 inch and 6 inch diameter pavement cores extracted from C-type core locations.

Each sheet can be used to record cores taken from six different core hole locations from one sampling area. Separate sheets should be used be used for cores from each sampling area. Space is provided in each column to record cores for up to 4 layers from one core hole. The pavement surface layer core should

be recorded first, followed by other layers in the column. The first column from the left should always start with the lowest numbered core hole in the sampling area.

OPERATOR. Record the coring equipment operators name.

EQUIPMENT USED. Indicate the generic type of the core equipment used.

CORING DATE. Record the month, date, and year the core was taken.

SAMPLING AREA NO. The sampling area number is a two digit number used to reference all of the samples taken from one area of the project. It has the form SA-##. This number is developed by the SHRP RCOC and is specified in the materials sampling plan for the project.

CORE BARREL SIZE. Record the rated inside diameter of the core barrel to the nearest tenth of an inch.

COOLING MEDIUM. Record the material used for cooling during the coring operation.

CORE HOLE NO. Enter the core hole sample code number following the sample coding system as specified in the materials sampling plan developed for the project.

LOCATION: STATION. This is the station number of the core, relative to the test section specified under TEST SECTION NO. on the form. This number should be greater than 5+00 for sampling locations that occur after the test section specified, and less than 0+00 for sampling locations which occur before the test section specified. (See discussion under Sample Location Reference System in this document.)

LOCATION: OFFSET. This is the distance from the interface of the pavement lane and the outside shoulder to the core location (generally measured from the outside edge of the white pavement edge stripe). This distance should be indicated to the nearest tenth of a foot.

CORE RECOVERED. Circle the appropriate response to indicate if an intact and suitable core was recovered from the indicated core hole.

REPLACEMENT CORE HOLE NO. Record the sample number of the core that will replace a core which was deemed unacceptable during field sampling operations. This entry should only be used when a "No" was recorded in the "Core Recovered" data entry space of this form.

CORE SAMPLE NO. Record the core sample number for the recovered core. Separate sample numbers should be assigned to HMAC and bound base layers from the same core hole, even if the bound base adheres to the HMAC surface layer.

DEPTH. Depth should be measured from the pavement surface to the bottom of the material interface in the core and expressed to the nearest tenth of an inch.

MATERIAL DESCRIPTION. Enter the appropriate material description based on the generic material type. These material descriptions are contained in Table C.2, Appendix C, of the SHRP-LTPP Guide for Field Material Sampling, Handling and Testing.

MATERIAL CODE. Enter the appropriate material code number from Table C.2 in the SHRP-LTPP Guide for Field Material Sampling, Handling and Testing corresponding to the described type of material.

SAMPLING DATA SHEET 3. VISUAL DETERMINATION OF AC MOISTURE RELATED DAMAGE

The visual determination of moisture related damage in asphalt concrete is a test procedure that was not included in the GPS field work. This test should be conducted in accordance with SHRP testing protocol P08, "Visual Field Determination of Moisture Damage of Asphaltic Concrete Cores" for the SHRP-LTPP Specific Pavement Studies (SPS) Program.

TECHNICIAN. Record the name of the technician or engineer who conducts the visual examination.

AFFILIATION. Indicate the name of the agency or company which employs the person who performed the visual examination.

TEST DATE. Record the month, date, and year the examination was performed.

SAMPLING AREA NO. The sampling area number is a two digit number used to reference all of the samples taken from one area of the project. It has the form SA-##. This number is developed by the SHRP RCOC and is specified in the materials sampling plan for the project.

LOCATION: STATION. This is the station number of the core, relative to the test section specified under TEST SECTION NO. on the form. This number should be greater than 5+00 for sampling locations that occur after the test section specified, and less than 0+00 for sampling locations which occur before the test section specified. (See discussion under Sample Location Reference System in this document.)

LOCATION: OFFSET. This is the distance from the interface of the pavement lane and the outside shoulder to the core location (generally measured from the outside edge of the white pavement edge stripe). This distance should be indicated to the nearest tenth of a foot.

BORE HOLE/CORE NO. Enter the bore hole or core hole code number following the sample coding system specified in the material sampling plan developed for the project.

CORE SAMPLE NUMBER. Enter the core sample code number following the scheme specified in the materials sampling plan developed for the project.

1. CORE THICKNESS. Record the thickness of the entire AC core to the nearest tenth of an inch.

2. CORE DIAMETER. Record the diameter of the core to the nearest tenth of an inch.

3. LAYER DEPTHS. Indicate the number and depth (thickness) of each distinct AC layer which can be identified in the core. A layer is defined as that part of the pavement produced with similar material and placed with similar equipment and techniques. Multiple lifts of the same material should be treated as one layer. Enter the approximate average depth, to the nearest tenth of an inch, from the pavement surface to the bottom of the interface between each AC layer in the core. The number of depths recorded indicate the number of AC layers in the core. Layer 1 is the layer corresponding to the top of the pavement surface.

4. VISIBLE MOISTURE IN THE CORE. Enter "yes" if moisture is visible inside the core after it has been broken or "no" if the inside of the core is dry. This will be evident if the surface of the aggregate changes color when exposed to air.

5. APPEARANCE OF ASPHALT. Describe the appearance of the asphalt cement on the open face of the core. Some common descriptors would be glossy (live), dull, brown (oxidized), etc..

6. HEIGHT OF STRIPPING PENETRATION. Record the height in the core that has experienced stripping. This should be measured from the bottom of the core to the nearest tenth of an inch.

7. PERCENT COARSE AGGREGATE STRIPPED. Record the estimated percentage of the coarse aggregate for the entire core that has experienced stripping.

8. PERCENT FINE AGGREGATE STRIPPED. Record the estimated percentage of the fine aggregate for the entire core that has experienced stripping.

9. VALUE OF P. Record the value of P from Worksheet "A" contained in SHRP Protocol P08.

10. VALUE OF C. Record the value of C from Worksheet "A" contained in SHRP Protocol P08.

11. VALUE OF F. Record the value of F from Worksheet "A" contained in SHRP Protocol P08.

12. STRIPPING RATING. Record the value of the stripping rating from Worksheet "A" in SHRP Protocol P08.

13. COMMENTS. Any other comments that are relevant should be recorded including any information concerning the condition of the pavement around the sampling area that is non-representative of the entire SPS project. This would include extensive cracking or patching in the sampling area or standing water in the general vicinity, etc. Conditions which would characterize the sampling location or sampling process as non-representative of the entire project should be indicated. An expansion of the description of the asphalt can be included on these lines as appropriate.

GENERAL REMARKS. Record any other general remarks.

SAMPLING DATA SHEET 4. A-TYPE BORE HOLE LOG

This form is similar to Form S02A used for GPS test sections. It is designed to record logs of A-type bore holes and any other similar type sampling areas. The following data is recorded on this form.

OPERATOR. Record the boring equipment operators name.

EQUIPMENT USED. Indicate the generic type of the drill equipment used.

BORING DATE. Record the month, date, and year the operation was performed.

SAMPLING AREA NO. The sampling area number is a two digit number used to reference all of the samples taken from one area of the project. It has the form SA-##. This number is developed by the SHRP RCOC and is specified in the materials sampling plan for the project.

LOCATION; STATION. This is the station number of the bore, relative to the test section specified under TEST SECTION NO. on the form. This number should be greater than 5+00 for sampling locations that occur after the test section specified, and less than 0+00 for sampling locations which occur before the test section specified. (See discussion under Sample Location Reference System in this document.)

LOCATION: OFFSET. This is the distance from the interface of the pavement lane and the outside shoulder to the bore location (generally measured from the outside edge of the white pavement edge stripe). This distance should be indicated to the nearest tenth of a foot.

BORE HOLE NO. Enter the core hole sample code number following the sample coding system specified in the material sampling plan developed for the project.

BORE HOLE SIZE. Record the borehole size (diameter) in inches to the nearest inch.

STRATA CHANGE. Record the depth of strata changes to the nearest tenth of an inch. The depth of strata changes should always be measured from the top of the pavement surface. Draw a horizontal line across the form which indicates the depth of each strata change.

Also, record the depth of sampling for each sample taken. For example, if a thin-walled tube sample was obtained at a depth from 18 inches to 36 inches, a line should be drawn at the 18 inch mark and the 36 inch mark along with the appropriate sample code number, material description, etc. See example data sheets in the SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling for further understanding.

SAMPLE NUMBER. Record the sample number for splitspoon or thin-walled tube samples obtained from the subgrade.

BLOWS. **The next four columns (*# Blows, Refusal?, DLR (Driving Length to refusal, IOP (Inches of Penetration)*) shall be used only if a splitspoon sample recovery was attempted.** Standard practice for recording the blow count for splitspoon samples requires the following format: A - B - C, where:

A = number of blows for first 6 inches of penetration by the splitspoon sampler. This is considered a seating drive.

B = number of blows for second 6 inches of penetration by the splitspoon sampler.

C - number of blows for third 6 inches of penetration by the splitspoon sampler.

Record the blow count from the first 6 inches of seating penetration by the splitspoon sampler in the left most column under number of blows. ("A" from above example of blow count record). Record the blow count from the second 6 inches of penetration by the splitspoon sampler in the middle column under number of blows ("B" from above example of blow count record). Record the blow count from the third 6 inches of penetration by the splitspoon sampler in the right most column under number of blows. ("C" from above example of blow count record).

Refusal of the splitspoon sampler is defined as having advanced less than one inch with 100 blows (or no observed advance of the sampler during the application of 10 blows) or the test is aborted at the discretion of the SHRP Representative to avoid damage to the splitspoon sampler.

If the splitspoon sampler is "refused" in the first 6 inches indicate the blow count to refusal in the left most column, place a "Y" in the ***Refusal?*** column and indicate in the ***DLR*** (Driving Length to Refusal) column, the distance, measured to the nearest tenth of an inch, from the top of the pavement surface to refusal. Also, record the penetration depth of the splitspoon sampler in the ***IOP*** column (distance penetrated in "A").

If the splitspoon is refused during the second 6 inches of penetration, indicate the blow count to refusal in the middle column, place a "Y" in the ***Refusal?*** column and indicate in the ***DLR*** column the distance, measured to the nearest tenth of an inch, from the top of the pavement surface to refusal. Also, record the penetration depth of the splitspoon sampler in the ***IOP*** column (distance penetrated in "A" + "B").

If the total blow count ("A" + "B") reaches 100 before penetrating deeper than 12 inches, the splitspoon sampling procedure should be stopped and the blow count for the second 6 inch increment should be recorded in the middle column and the total depth of penetration recorded under the ***IOP*** column (the depth of penetration shall be measured from the beginning of penetration of the splitspoon sampler.)

In the case of refusal during the third 6 inch increment, the same instructions outlined previously for the left and middle columns will be followed. The penetration depth of the splitspoon sampler will be recorded in the *IOP* column (distance penetrated in "B" + "C").

If the second and third 6 inch increment blow count ("B" + "C" only) reaches 100 before prior to penetrating 18 inches, the splitspoon sampling procedure should be stopped and the blow count for the third 6 inch increment recorded in under number of blows. The total depth of penetration ("B" + "C" only) should be recorded under the *IOP* column (measured from the beginning of penetration of the splitspoon sampler minus the 6 inch seating drive).

(REF)USAL. Record a "Y" if splitspoon sampler is refused (see explanation under *# Blows* above). Record a "N" if the full 18 inch sample is recovered and the splitspoon is not refused. This column is only used if a splitspoon sampler is utilized.

Refusal is defined as occurring when the splitspoon sampler advances less than one inch in 100 blows (or no observed advance of the sampler during the application of 10 blows) or when the test is aborted at the discretion of the SHRP Representative to avoid damage to the splitspoon sampler.

DLR. Driving Length to Refusal - Record the penetration of the splitspoon sampler to refusal to the nearest tenth of an inch. This value is measured from the top of the pavement surface. This column is only used if a splitspoon sampler is utilized and refused. In the case of refusal, an entry is made in the *DLR* and *IOP* columns.

IOP. Inches of Penetration - Record the distance of penetration of the splitspoon sampler after 100 blows is reached in the first 6 inches ("A"), the first and second 6 inches of penetration ("A" and "B") or the second and third 6 inches of penetration ("B" and "C") (See explanation under # Blows above). This column is only used if a splitspoon sampler is utilized.

MATERIAL DESCRIPTION. Enter the appropriate material description for each strata based on the generic material type. These material descriptions are

contained in Table C.2, Appendix C, of the SHRP-LTPP Guide for Field Material Sampling, Testing and Handling.

MATERIAL CODE. Enter the appropriate material code number for each strata from Table C.2 in the SHRP-LTPP Guide for Field Material Sampling, Testing and Handling corresponding to the described type of material.

SAMPLING DATA SHEET 5. BA-TYPE BORE HOLE LOG

This form is similar to S02B used for GPS test sections. It is designed to record logs of BA-type bore holes and any other similar type sampling areas. The following information is recorded on this form:

OPERATOR. Record the boring equipment operators name.

EQUIPMENT USED. Indicate the generic type of the drill equipment used.

BORING DATE. Record the month, date, and year the operation was performed.

SAMPLING AREA NO. The sampling area number is a two digit number used to reference all of the samples taken from one area of the project. It has the form SA-##. This number is developed by the SHRP RCOC and is specified in the materials sampling plan for the project.

LOCATION; STATION. This is the station number of the bore, relative to the test section specified under TEST SECTION NO. on the form. This number should be greater than 5+00 for sampling locations that occur after the test section specified, and less than 0+00 for sampling locations which occur before the test section specified. (See discussion under Sample Location Reference System in this document.)

LOCATION; OFFSET. This is the distance from the edge of the pavement lane and the outside shoulder to the bore location (generally measured from the outside edge of the white pavement edge stripe). This distance should be indicated to the nearest tenth of a foot.

BORE HOLE NO. Enter the bore hole sample code number following the sample coding system specified in the material sampling plan developed for the project.

BORE HOLE SIZE. Record the bore hole size (diameter) in inches to the nearest inch.

STRATA CHANGE. Record the depth of strata changes to the nearest tenth of an inch. The depth of strata changes should always be measured from the top of the pavement surface. Draw a horizontal line across the form which indicates the depth of each strata change.

SAMPLE NUMBER. Record the sample number for the bulk samples obtained from unbound layers.

MOISTURE SAMPLE NUMBER. Record sample numbers for samples taken from unbound base, subbase and subgrade for moisture content testing.

MATERIAL DESCRIPTION. Enter the appropriate material description for each strata based on the generic material type. These material descriptions are contained in Table C.2, Appendix C, of the SHRP-LTPP Guide for Field Material Sampling, Handling and Testing.

MATERIAL CODE. Enter the appropriate material code number for each strata from Table C.2 in the SHRP-LTPP Guide for Field Material Sampling, Handling and Testing corresponding to the described type of material.

SAMPLING DATA SHEET 6. TEST PIT LOG

This form is similar to Form S03 used for GPS test sections. It is designed to record data from the field sampling and field testing from test pits. The following data is recorded on this form:

TECHNICIAN. Record the name of the technician who captures the samples and records the information on the data form.

EQUIPMENT USED. Indicate the generic type of the equipment used to cut and excavate the test pit.

EXPLORATION DATE. Record the month, date, and year the operation was performed.

SAMPLING AREA NO. The sampling area number is a two digit number used to reference all of the samples taken from one area of the project. It has the form SA-##. This number is developed by the SHRP RCOC and is specified in the materials sampling plan for the project.

LOCATION: STATION. This is the station number of the test pit, relative to the test section specified under TEST SECTION NO. on the form. This number should be greater than 5+00 for sampling locations that occur after the test section specified, and less than 0+00 for sampling locations which occur before the test section specified. (See discussion under Sample Location Reference System in this document.)

LOCATION: OFFSET. This is the distance from the edge of the pavement lane and the outside shoulder to the outside edge of the test pit (Generally measured from the outside edge of the white pavement edge stripe). This distance should be indicated to the nearest tenth of a foot.

TEST PIT NUMBER. Enter the test pit code number shown in the sample coding system specified in the material sampling plan developed for the project.

TEST PIT SIZE. Record the length and width of test pit to the nearest half foot.

STRATA CHANGE. Record the depth of strata changes to the nearest tenth of an inch. The depth of strata changes should always be measured from the top of the pavement surface. Draw a line across the form to indicate strata changes.

MOISTURE SAMPLE NUMBER. Record sample numbers for samples taken from unbound base, subbase and subgrade for moisture content testing.

BULK SAMPLE NUMBER. Record the sample number for bulk samples taken from the unbound pavement layers and the subgrade.

MATERIAL DESCRIPTION. Enter the appropriate material description for each strata based on the generic material type. These material descriptions are contained in Table C.2, Appendix C, of the SHRP-LTPP Guide for Field Material Sampling, Handling and Testing.

MATERIAL CODE. Enter the appropriate material code number for each strata from Table C.2 in the SHRP-LTPP Guide for Field Material Sampling, Handling and Testing corresponding to the described type of material.

SAMPLING DATA SHEET 7. TEST PIT SKETCH

The sheet is similar to Form S03A used for GPS test sections. It is designed to allow the field sampling personnel a proper form to record any sketches of the excavation of the test pit that may be appropriate. This sketch should at least include: (a) dimensions of the test pit; (b) depth of each layer in the test pit; (c) material type of each layer and (d) the direction of traffic. All of the other information requested on this form is the same as that provided on Sampling Data Sheet 6. See the example completed field data packet contained in Appendix E of the SHRP-LTPP Guide for Field Material Sampling, Handling and Testing for an example of how to complete this form.

SAMPLING DATA SHEET 8. IN SITU DENSITY AND MOISTURE TESTS

This sheet is similar to Form S04 used for GPS test sections. It is designed to record data from the in situ density and moisture tests performed on all unbound layers in the test pits with a nuclear moisture and density gauge. The following data is recorded on this form.

OPERATOR. Record nuclear density gauge operators name.

NUCLEAR DENSITY GAUGE I.D.. Record the identification number of the nuclear density gauge.

TEST DATE. Record the month, date, and year the test was performed.

SAMPLING AREA NO. The sampling area number is a two digit number used to reference all of the samples taken from one area of the project. It has the form SA-##. This number is developed by the SHRP RCOC and is specified in the materials sampling plan for the project.

LOCATION; STATION. This is the station number of the test pit, relative to the test section specified under TEST SECTION NO. on the form. This number should be greater than 5+00 for sampling locations that occur after the test section specified, and less than 0+00 for sampling locations which occur before the test section specified. (See discussion under Sample Location Reference System in this document.)

LOCATION; OFFSET. This is the distance from the edge of the pavement lane and the outside shoulder to the location the test was performed (generally measured from the edge of the white pavement edge stripe). This distance should be indicated to the nearest tenth of a foot.

TEST PIT NUMBER. Enter the test pit code number shown in the sample coding system specified in the material sampling plan developed for the project.

DATE OF LAST MAJOR CALIBRATION. Record the date of the last major calibration of the nuclear density gauge. All dates should be recorded as mm-dd-yy. A major calibration is defined as that calibration/verification performed as directed in Section 4 of the SHRP-LTPP Guide for Field Material Sampling, Handling and Testing. Daily calibrations performed in the field do not constitute a major calibration.

DEPTH FROM SURFACE TO THE TOP OF THE LAYER. This information is obtained from Sampling Data Sheet 5 for each unbound granular layer. Record to the nearest tenth of an inch and measure from the top of the pavement surface for each test performed.

LAYER DESCRIPTION. Write in the generic description of the type of layer tested, such as BASE, SUBBASE, or SUBGRADE.

MATERIAL TYPE. Report a "G" if the material is unbound (granular); record "T" if the material is other than unbound (treated). In practice, all entries should be a "G" since nuclear density testing is not required on bound materials.

IN SITU DENSITY. For each unbound layer, record four nuclear density gauge results. These measurements should be taken at the top of each unbound layer using the direct transmission test method if possible. Record to one decimal place in pounds per cubic foot (pcf).

AVERAGE. Calculate and record the average in situ densities for each unbound layer. Record to one decimal place.

METHOD (A,B,or C). Record the test method used to perform the in situ density test as per AASHTO T238-86, "A" - Backscatter, "B" - Direct Transmission, or "C" - Air Gap. The direct transmission method ("B") should almost always be used. However, there may be some extenuating circumstances necessitating the use of methods "A" or "C".

ROD DEPTH. Record the depth of the nuclear density gauge probe to the nearest tenth of an inch.

IN SITU MOISTURE CONTENT. For each unbound layer, record four in situ moisture content test results. These tests should be conducted at the top of each layer. Record as a percentage moisture content to one decimal place. The backscatter method should always be used for this measurement.

AVERAGE. Calculate and record the average of the four in situ moisture content test results for each unbound layer. Record to one decimal place.

SAMPLING DATA SHEET 9. SHOULDER PROBE LOG

This data sheet is similar to Form S05 used for the GPS test sections. It is used to record the results of the shoulder auger probe to determine the depth to a rigid layer.

OPERATOR. Record the auger equipment operators name.

EQUIPMENT USED. Indicate the generic type of the auguring equipment used.

AUGURING DATE. Record the month, date, and year the operation was performed.

SAMPLING AREA NO. The sampling area number is a two digit number used to reference all of the samples taken from one area of the project. It has the form SA-##. This number is developed by the SHRP RCOC and is specified in the materials sampling plan for the project.

LOCATION: STATION. This is the station number of the bore, relative to the test section specified under TEST SECTION NO. on the form. This number should be greater than 5+00 for sampling locations that occur after the test section specified, and less than 0+00 for sampling locations which occur before the test section specified. (See discussion under Sample Location Reference System in this document.)

LOCATION: OFFSET. This is the distance from the edge of the pavement lane and the outside shoulder to the auger location (generally measured form the outside edge of the white pavement edge stripe. For shoulder probes, this distance will be measured toward the outside edge of the shoulder. This distance should be indicated to the nearest tenth of a foot.

AUGER PROBE NUMBER. Record the auger probe number; an S1 for the first auger and increasing numbers for subsequent auger probes.

TOP OF ROCK BASED ON. Enter "Auger Refusal" if auger is refused. If the top of rock is based on some other observation, indicate the type of observation.

DEPTH FROM SURFACE. Record the depths of strata changes to the nearest tenth of a foot.

MATERIAL DESCRIPTION. Enter the appropriate material description for each strata based on the generic material type. These material descriptions are contained in Table C.2, Appendix C, of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing.

MATERIAL CODE. Enter the appropriate material code number for each strata from Table C.2 in the SHRP-LTPP Guide for Field Material Sampling, Handling and Testing corresponding to described type of material.

REFUSAL WITHIN 20 FEET (Y/N). Record a "yes" or a "no" as appropriate to indicate if a rigid layer was encountered within 20 feet from the pavement surface.

DEPTH TO REFUSAL. Record the depth to refusal to the nearest tenth of a foot if the auger refused.

SAMPLING DATA SHEET 10. SAMPLING UNCOMPACTED BITUMINOUS PAVING MIXTURES

This data sheet is used to record information concerning sampling of uncompacted bituminous paving mixtures (asphalt concrete) for LTPP material testing purposes. Sampling shall be performed according to AASHTO T-168, except that a 100 lb sample size should be used.

Due to the difficulty of determining corresponding test sections the plant sampled material was used on, in most cases a 00 should be entered as the test section number. If the test section the material is used on is known, this number should be indicated on the form.

PERSON PERFORMING SAMPLING. Record the name, title and employer of the person performing the sampling.

PLANT NAME. Record the common name or operator of the mix plant facility which produced the sampled material.

PLANT LOCATION. Record the location of the mix plant, including street address, town, and state.

PLANT TYPE. Indicate the general type of mix plant used to produce the mix. If a plant other than a batch or drum plant was used, indicate other and provide a description of the plant on the next line.

DESCRIPTION OF MIX PLANT. Provide a brief description of the type of mix plant noting any special features of traditional types of batch or drum plants, or a description of other mix plant types.

MANUFACTURER OF MIX PLANT. Enter the name of the mix plant manufacturer.

MODEL NUMBER. Enter the model number or model designation of the mix plant.

BATCH SIZE. Record the size of the batch the sample from which the sample was obtained.

SAMPLING LOCATION. Enter the code number shown on the data form corresponding to the location from which the sample was taken. If the sample was taken from the roadway prior to compaction, indicate the station and offset of the sample and the respective test section number.

MIX TYPE. Enter the code number corresponding to the generic type of material (all virgin material, or containing recycled material).

LAYER TYPE. Enter the code number, as shown on the form, which corresponds to the type of layer in which the material is used.

SAMPLE TYPE DESIGNATOR. Enter the sample type designation for the sample. This is a 4 digit code which signifies the generic type of material, virgin or recycled, and a sequential number for each sample of each material type obtained. For materials incorporating all virgin materials, the sample type designation shall begin with the letters BV (Bulk Virgin). For materials incorporating recycled materials, the designator shall begin with BR (Bulk Recycled). These letter designations are followed with a two digit number sequentially assigned to each sample, for each type of material.

SAMPLE NUMBER. This is a 4 digit code starting with the letters BA (Bulk Asphalt Concrete) and followed with a sequentially assigned two digit number, which uniquely designates each bulk asphalt concrete sample.

APPROXIMATE SAMPLE SIZE. Enter the approximate weight of the sample obtained, to the nearest pound.

DATE SAMPLED. Enter the date the material sample was obtained.

LOCATION SAMPLE SHIPPED TO. Record the location the sample was shipped to from the field. In many cases this should be the laboratory which will perform the testing.

DATE SHIPPED. Enter the date the material was shipped to the location indicated on the form.

GENERAL REMARKS. Provide any general remarks concerning the representativeness of the obtained sample, comments concerning the quality or uniformity of the mix, or any other pertinent miscellaneous comments.

FIELD OPERATION INFORMATION FORM 1. LABORATORY SHIPMENT SAMPLES INVENTORY

Since this form is not a data form, no information from this form will be included in the data base, it has been titled as a Field Operations Information Form. This form provides SHRP with necessary information on where each sample was shipped for testing. This form is similar to Form S06 used for GPS test sections. It is used to provide a detailed inventory of material samples shipped to each materials testing laboratory. At least one form should be completed for each sampling area on the project. The inventory should be made in the following sequence of sample location numbers, starting from the pavement surface layer in each case.

1. Samples from C-type locations, starting from cores of pavement surface layers.
2. Samples from A-type bore holes and any additional similar bore holes.
3. Samples from BA-type bore holes and any additional similar bore holes.
4. Samples from the test pit.

Sample location numbers, sample numbers and sampling area numbers should be obtained from the appropriate Sampling Data Sheets. "Sample size" should be used to record the number of bags of bulk samples or the number of jar samples bearing a single sample number in each case. The bulk sample from one layer can be placed in more than one bag, if necessary. However, the sample number should be the same on all of these bags with an indication of the number of bags on the labels and in the column of the "Sample size." For core samples, record only diameter of the core in the "Sample size" column in inches.

Enter core, bulk, moisture, tube or splitspoon in the "Sample type" column as appropriate. Enter AC, PCC, Base, Subbase or Subgrade in the "Sample material" column as appropriate. The "Sample condition" should indicate a brief description as to the overall quality of the sample - cores: good, poor, fractured; bulk samples: satisfactory, wet, insufficient quantity, contaminated.

Since more than one laboratory may be used to test samples in the SPS program, room is provided on this form to indicate up to three laboratories samples from each sampling area are sent for testing. Enter a laboratory number, defined at the bottom of the form, each sample is sent to under the LAB column.

Typically, samples will include:

- All AC cores from C-type, A-type, and BA-type locations.
- All treated base/subbase cores (including ATB, CTB and econocrete) of 4 inch diameter from C-type locations.
- Block samples of AC layer and treated material as applicable.
- Bulk samples and jar samples of granular (untreated) layers and subgrade from BA-type locations and test pits.
- Thin-walled tube samples and splitspoon samples from the

FIELD OPERATION INFORMATION FORM 2. SUMMARY OF MATERIAL SAMPLES SENT TO EACH LABORATORY

This form provides a summary of the information provided on Field Operations Information Form 1 by testing laboratory. It is similar to Form S06A used for GPS test sections. A separate form should be completed for each set of samples sent to each separate laboratory.

This form requires the samples to aggregated into layers designated with a layer number. The layer number is assigned from the bottom (subgrade) to the pavement surface. Enter the layer number in the left hand column, starting with layer number 1 for the subgrade and increasing each layer number with the next layer. The last layer number should be assigned to the pavement surface layer. A description of the pavement layer material and sample type is provided in the next column on the right, followed by the total number of samples by sample type.

OTHER GPS DATA FORMS

Other Field Materials Sampling and Testing data forms used for GPS test sections but not referenced in this report should not be completed for the SPS activity. These forms include S07, S08, S09, S10, S11, S12, S13, S14A, S14B, S15A, S15B, S16A, and S16B.

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING
PAVEMENT CORE LOG AT BOREHOLE LOCATIONS
SAMPLING DATA SHEET 1

SHEET NUMBER _____ OF_____

HRP REGION _____ STATE _____ *STATE CODE* __ __
SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __
ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __
SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* __

OPERATOR_____ EQUIPMENT USED_____ *CORING DATE*___-___-___
SAMPLING AREA NO. SA-_____ *LOCATION: STATION*_____ *OFFSET*_____*feet from °/s*
CORE HOLE NUMBER _____ *CORE BARREL SIZE*_____(in. Inside Diam.) Cooling Medium_____

Scale (Inches)	*Depth (Inches)*	Core Recov. (Inches)	*Core Sample No.*	*Material Description*	*Material Code*
0					
5					
10					
15					
20					
25					

Note: "Depth" should be measured from the top of the pavement surface to the bottom of the cores of each layer and recorded to the nearest tenth of an inch.

GENERAL REMARKS:_____

CERTIFIED VERIFIED AND APPROVED DATE

_____ _____ __ __-__ __-19__ __
eld Crew Chief SHRP Representative Month- Day - Year
Affiliation:_____ Affiliation:_____

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING
PAVEMENT CORE LOG AT C-TYPE CORE LOCATIONS
SAMPLING DATA SHEET 2

SHEET NUMBER _____ OF _____

IRP REGION _____ STATE _____ *STATE CODE* __ __
SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __
ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __
SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* __

OPERATOR_____ EQUIPMENT USED_____ *CORING DATE* ___-___-___

SAMPLING AREA NO SA-_____ CORE BARREL: Tip Type_____ Cooling Medium_____

Note: Record information for all cores extracted from each core hole in one column in the table below. Use a separate sheet for each sampling area. "Depth" should be measured from the pavement surface to the bottom of the core and recorded to the nearest tenth of an inch.

CORE HOLE NUMBER						
LOCATION: (a) STATION						
(b) OFFSET (Feet, O/S)						
Core Recovered?	*YES/NO*	*YES/NO*	*YES/NO*	*YES/NO*	*YES/NO*	*YES/NO*
Replacement Core Hole No.						
Core Size (inch Diam.)	*4/6*	*4/6*	*4/6*	*4/6*	*4/6*	*4/6*
Core Sample No.						
Depth (Inches)						
Material Description						
Material Code						
Core Size (inch Diam)	*4/6*	*4/6*	*4/6*	*4/6*	*4/6*	*4/6*
Core Sample No.						
Depth (Inches)						
Material Description						
Material Code						
Core Size (inch Diam.)	*4/6*	*4/6*	*4/6*	*4/6*	*4/6*	*4/6*
Core Sample No.						
Depth (Inches)						
Material Description						
Material Code						
Core Size (inch Diam.)	*4/6*	*4/6*	*4/6*	*4/6*	*4/6*	*4/6*
Core Sample No.						
Depth (Inches)						
Material Description						
Material Code						
Remarks						

GENERAL REMARKS: _____

CERTIFIED VERIFIED AND APPROVED DATE

_____ _____ _____-_____-19___

ield Crew Chief SHRP Representative Month- Day- Year
ffiliation:_____ Affiliation:_____

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____
VISUAL DETERMINATION OF AC MOISTURE RELATED DAMAGE
SAMPLING DATA SHEET 3

SHRP REGION _____ STATE _____ *STATE CODE* __ __
SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __
ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __
SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* __

TECHNICIAN_____ AFFILIATION_____ *TEST DATE* ___-___-___
SAMPLING AREA NO: SA-__ __ *LOCATION: STATION*__ __ __ __ + __ __ *OFFSET*__ __*feet from* °/*s*
BORE HOLE/CORE NUMBER __ __ __ *SHRP SAMPLE NUMBER* __ __ __ __

1. *CORE THICKNESS (INCHES)* __ __.__
2. *CORE DIAMETER (INCHES)* __ __.__
3. *LAYER DEPTHS (measured from TOP of core, INCHES)* *A.* __ __.__
   B. __ __.__
   C. __ __.__
   D. __ __.__
4. *VISIBLE MOISTURE IN THE CORE? (YES/NO)* __

   APPEARANCE OF ASPHALT _____
6. *HEIGHT OF STRIPPING PENETRATION (measured from BOTTOM of core, INCHES)* __ __.__
6. *PERCENT COARSE AGGREGATE STRIPPED* __ __ __.
7. *PERCENT FINE AGGREGATE STRIPPED* __ __ __.
8. *STRIPPING PENETRATION RATING VALUE (P)* ___
9. *COARSE AGGREGATE STRIPPING RATING VALUE (C)* ___
10. *FINE AGGREGATE STRIPPING RATING VALUE (F)* ___
11. *STRIPPING RATING (P+C+F)* __ __
12. *COMMENTS:* _____

_____

_____

GENERAL REMARKS: _____

_____

ERTIFIED VERIFIED AND APPROVED DATE

_____ _____ _____-____-19___

Field Crew Chief SHRP Representative Month- Day- Year
Affiliation:_____ Affiliation:_____

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____
A-TYPE BORE HOLE LOG
SAMPLING DATA SHEET 4

RP REGION _____ STATE _____ *STATE CODE* __ __
SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __
ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __
SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* __

OPERATOR_____ EQUIPMENT USED_____ *BORING DATE*___-___-___
SAMPLING AREA NO: SA-_____ *LOCATION: STATION*_____ *OFFSET*_____ *feet from* ^{o}/s
*BORE HOLE NUMBER:*_____ *BORE HOLE SIZE:* _____ (inch Diam.)

Scale (Inches)	*Strata Change (Inches)*	*Sample Number* (1)	*#Blows*(2) 6"	6"	6"	*Ref? Y/N* (3)	*DLR (Inches)* (4)	*IOP* (5)	*Material Description*	*Material Code*
10.0										
20.0										
30.0										
40.0										
50.0										
60.0										
70.0										
80.0										
90.0										
100.0										

1. Record sample numbers for splitspoon/thin-walled tube samples taken from the subgrade.
2. For splitspoon samples, record the number of blows for the first, second and third 6 inches of penetration.
3 *Refused* - If the splitspoon is refused, place a Y in the *REFUSAL* column and complete *Driving Length To Refusal* column. Refusal is defined as less than 1 inch of penetration with 100 blows.
4 *Driving Length To Refusal* - Record penetration to refusal of splitspoon from the top of the pavement surface.
5. *Inches Of Penetration* - Record from start of splitspoon sampling procedure if 100 blows is reached before one foot of penetration. If penetration exceeds 12 inches before 100 blows is reached, enter middle 6 inches plus depth of penetration into the last 6 inches when 100 blows was reached (not including seating drive); record to nearest tenth of an inch.

GENERAL REMARKS:_____

CERTIFIED _____ VERIFIED AND APPROVED _____ DATE _____-____-19___
d Crew Chief SHRP Representative Month- Day- Year
liation:_____ Affiliation:_____

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____
BA-TYPE BORE HOLE LOG
SAMPLING DATA SHEET 5

HRP REGION _____ STATE _____ *STATE CODE* __ __
SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __
ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __
SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* __

OPERATOR_____ EQUIPMENT USED_____ *BORING DATE*___-___-___
SAMPLING AREA NO: SA-_____ *LOCATION: STATION*_____ *OFFSET*_____ *feet from °/s*
*BORE HOLE NUMBER:*_____ *BORE HOLE SIZE:* _____ (inch Diam.)

Scale (Inches)	*Strata Change (Inches)*	*Sample Number* (1)	*Moisture Sample Number* (2)	*Material Description*	*Material Code*
_____					
_10.0__					
_____					
_20.0__					
_____					
_30.0__					
_____					
_40.0__					
_____					
_50.0__					
_____					
_60.0__					
_____					
_70.0__					
_____					
_80.0__					
_____					
_90.0__					
_____					
_100.0_					

1. Record sample numbers for bulk samples taken from unbound layers and the subgrade.
2. Record sample numbers for samples taken from unbound base, subbase and subgrade for moisture content testing.

GENERAL REMARKS:_____

_____

CERTIFIED VERIFIED AND APPROVED DATE

_____ _____ _____-____-19___

Field Crew Chief SHRP Representative Month- Day- Year

.liation:_____ Affiliation:_____

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING
TEST PIT LOG
SAMPLING DATA SHEET 6

SHEET NUMBER _____ OF _____

SHRP REGION _____ STATE _____ *STATE CODE* __ __
SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __
ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __
SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* __

TECHNICIAN_____ EQUIPMENT _____ *EXPLORATION DATE*___-___-___
SAMPLING AREA NO: SA-_____ *LOCATION: STATION*_____ *OFFSET*_____*feet from °/s*
*TEST PIT NUMBER*_____ *PIT SIZE:* (a) *Length*_____feet (b) *Width*_____feet

Scale (Inches)	*Strata Change (Inches)*	*Moisture Sample No.*	*Bulk Sample No.*	*Material Description*	*Material Code*
4					
8					
12					
16					
)					
24					
28					
32					
36					
40					
44					
48					

GENERAL REMARKS:_____

CERTIFIED _____
Field Crew Chief
Affiliation:_____

VERIFIED AND APPROVED _____
SHRP Representative
Affiliation:_____

DATE
_____-____-19___
Month- Day- Year

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____
TEST PIT SKETCH
SAMPLING DATA SHEET 7

HRP REGION _____ STATE _____ *STATE CODE* __ __
SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __
ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __
SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* __

TECHNICIAN_____ EQUIPMENT _____ *EXPLORATION DATE*___-___-___
SAMPLING AREA NO: SA-_____ *LOCATION: STATION*_____ *OFFSET*_____*feet from* °/*s*
*TEST PIT NUMBER*_____ *PIT SIZE:* (a) *Length*_____feet (b) *Width*_____feet

This form is to be used to sketch the test pit as it was sampled. Show the dimensions of the test pit, the depth of each layer and the material type for each layer. Sketch the direction of traffic on the test pit illustration with an arrow in the direction of traffic.

GENERALREMARKS:_____

CERTIFIED _____
Field Crew Chief
Affiliation:_____

VERIFIED AND APPROVED _____
SHRP Representative
Affiliation:_____

DATE
_____-____-19___
Month- Day- Year

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING
IN SITU DENSITY AND MOISTURE TESTS
SAMPLING DATA SHEET 8

SHEET NUMBER _____ OF _____

IRP REGION _____ STATE _____ *STATE CODE* __ __
SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __
ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __
SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* __

OPERATOR_____ *NUCLEAR DENSITY GAUGE I.D.*_____ *TEST DATE*___-___-____
SAMPLING AREA NO: SA-_____ *LOCATION: STATION*_____ *OFFSET*_____*feet from °/s*
*TEST PIT NO:*_____ DATE OF LAST MAJOR CALIBRATION___-___-___
Note: Use additional sheets if necessary

DEPTH FROM SURFACE TO THE TOP OF THE LAYER, INCHES (See Sheet 5)						
LAYER DESCRIPTION						
MATERIAL TYPE: (Unbound=G Other=T)						
IN SITU DENSITY, pcf (AASHTO T238-86) 1						
2						
3						
4						
AVERAGE						
Method (A,B,or C)						
Rod Depth, inches						
IN SITU MOISTURE CONTENT, % (AASHTO T239-86) 1						
2						
3						
4						
AVERAGE						

GENERAL REMARKS:_____

CERTIFIED _____
Field Crew Chief
ffiliation:_____

VERIFIED AND APPROVED _____
SHRP Representative
Affiliation:_____

DATE _____-____-19___
Month- Day- Year

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____
SHOULDER PROBE LOG
SAMPLING DATA SHEET 9

SHRP REGION _____ STATE _____ *STATE CODE* __ __
S EXPERIMENT NO _____ *SPS PROJECT CODE* __ __
ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __
SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* __

OPERATOR_____ EQUIPMENT USED_____ *AUGERING DATE*___-____-____
*AUGER PROBE NUMBER*_____ *LOCATION STATION*:_____ *OFFSET*:_____*feet from °/s*
TOP OF ROCK BASED ON:_____

Scale (feet)	*Depth from Surface (Feet)*	*Material Description*	*Material Code*
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

REFUSAL WITHIN 20 FEET (Y/N):_____ *DEPTH TO REFUSAL*:_____*(FEET)*

GENERAL REMARKS:_____

CERTIFIED VERIFIED AND APPROVED DATE

_____ _____ ____-____-19___

Field Crew Chief SHRP Representative Month- Day- Year

Affiliation:_____ Affiliation:_____

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING
SAMPLING UNCOMPACTED BITUMINOUS PAVING MIXTURES
SAMPLING DATA SHEET 10

SHEET NUMBER _____ OF _____

HRP REGION _____ STATE _____ *STATE CODE* __ __
SPS EXPERIMENT NUMBER _____ *SPS PROJECT CODE* __ __
ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __
FIELD SET NO. __

PERSON PERFORMING SAMPLING

NAME _____ EMPLOYER _____

TITLE _____

MIX PLANT

PLANT NAME _____

PLANT LOCATION _____

PLANT TYPE Batch..... 1 Drum..... 2 Other (Specify)..... 3 [__]

DESCRIPTION OF MIX PLANT _____

MANUFACTURER OF ASPHALT PLANT _____

MODEL NUMBER _____

BATCH SIZE _____

SAMPLING LOCATION [___]

Conveyor Belt..... 1 Stockpile..... 2 Haul Truck..... 3 Funnel Device..... 4
Roadway Prior to Compaction ..... 5 Station __ + __ __ Offset ____ (feet from O/S)
Other..... 6 (specify) _____

MIX TYPE "Virgin" Asphalt Concrete ..... 1 Recycled Asphalt Concrete..... 2 [___]

LAYER TYPE [___]

Rut Level-Up..... 1 Mill Replacement..... 2 Binder Course..... 3
Surface Course..... 4 Surface Friction Layer..... 5

SAMPLE TYPE DESIGNATION [___ ___ ___ ___]

SAMPLE NUMBER [___ ___ ___ ___]

APPROXIMATE SAMPLE SIZE (lbs) ___ ___ ___

DATE SAMPLED (Month - Day - Year) [__ __ - __ __ - __ __]

LOCATION SAMPLE SHIPPED TO _____

DATE SHIPPED (Month-Day-Year) [__ __ - __ __ - __ __]

GENERAL REMARKS:_____

_____

_____

CERTIFIED VERIFIED AND APPROVED DATE

_____ _____ _____-____-19___

Field Crew Chief SHRP Representative Month- Day- Year
Affiliation:_____ Affiliation:_____

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING
LABORATORY SHIPMENT SAMPLES INVENTORY
FIELD OPERATIONS INFORMATION FORM 1

SHEET NUMBER _____ OF _____

HRP REGION _____ STATE _____ *STATE CODE* __ __
SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __
ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __
SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* __

SAMPLING AREA No: SA- _____ FIELD WORK COMPLETED ON ____-____-____

Note: Use a separate form for each sampling area. Use additional sheets if necessary. Include summary information (Field Operations Information Form 2) and "as actual" sampling location plan sheets with this material samples inventory.

SAMPLE LOCATION	SAMPLE NUMBER	SAMPLE SIZE	SAMPLE TYPE	SAMPLE MATERIAL	SAMPLE CONDITION	LAB*

* Enter number of laboratory, as specified below, each sample was sent to:

Lab No.(1) _____
Lab No.(2) _____
Lab No.(3) _____

GENERAL REMARKS: _____

CERTIFIED _____
Field Crew Chief
Affiliation: _____

VERIFIED AND APPROVED _____
SHRP Representative
Affiliation: _____

DATE ____-____-19___
Month- Day- Year

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____
SUMMARY OF MATERIAL SAMPLES SENT TO EACH LABORATORY
FIELD OPERATIONS INFORMATION FORM 2

IRP REGION _____ STATE _____ *STATE CODE* __ __
SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __
ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __
SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* __

LABORATORY _____ WORK COMPLETED ON ____-____-____

NOTE: This is a summary of material samples sent to each laboratory based on the information from Field Operations Information Form 1. Complete one form for each laboratory that material samples were sent.

LAYER NO. (From Subgrade)	MATERIAL/SAMPLE TYPE			TOTAL NUMBER OF SAMPLES
_____	AC CORES:	4" Diameter_____	6" Diameter_____	12" Diameter_____
		AC Cores with Bound Base/Subbase		_____
		AC Cores with PCC		_____
		AC Cores with PCC and Bound Base/Subbase		_____
		PCC Cores with Bound Base/Subbase		_____
_____	AC MIX BULK SAMPLES:	Fifty Pound Samples - Virgin		_____
		Recycled		_____
_____	PCC CORES:	4" Diameter_____	6" Diameter_____	
_____	PCC BEAMS:			_____
_____	BOUND BASE CORES:	4" Diameter_____		
_____	UNBOUND BASE SAMPLES:	(a) BAGS (BULK)_____	(b) JARS (MOISTURE)_____	
_____	BOUND SUBBASE CORES:	4" Diameter_____		
_____	UNBOUND SUBBASE SAMPLES:	(a) BAGS (BULK)_____	(b) JARS (MOISTURE)_____	
1	SUBGRADE SAMPLES:	(a) BAGS (BULK)_____	(b) JARS (MOISTURE)_____	
		(c) THIN-WALLED TUBES_____	(d) SPLITSPOON _____ JARS	

GENERAL REMARKS:_____

_____

_____

_____

CERTIFIED VERIFIED AND APPROVED DATE

_____ _____ _____-____-19___
Field Crew Chief SHRP Representative Month- Day- Year
Affiliation:_____ Affiliation:_____

APPENDIX D: SHRP PROTOCOL P08

This appendix contains SHRP Protocol P08, "Visual Field Determination of Moisture Damage of Asphaltic Concrete Cores". This protocol shall be used during the field material sampling and testing activities for the SPS-5 experiment. Sampling Data Sheet 3 shall be completed for this test and submitted with the field sampling data packet.

SPS EXPERIMENTS
SHRP PROTOCOL: P08
FOR SHRP TEST DESIGNATION: AC08
VISUAL FIELD DETERMINATION OF MOISTURE DAMAGE OF ASPHALTIC CONCRETE CORES

This SHRP protocol covers the visual field examination and determination of the moisture damage present in asphalt (bituminous) concrete cores extracted from SPS test sections.

This test shall be conducted in conjunction with the drilling and sampling operations on cores retrieved from locations A1, A2, and A3. The samples must be examined as soon as possible (preferably within 30 minutes) after removal from the pavement and Field Data Sheet 1 completed before this test is conducted. The following definitions will be used throughout this protocol.

a) Core: An intact cylindrical specimen of the pavement material which is removed from the pavement by drilling at the designated location. A core can consist of, or include, one, two or more different layers. In this protocol, the use of the term core implies the entire length of the core.

b) Stripping: The breaking of the bond between the asphalt cement and the aggregate surfaces resulting in exposed aggregate surfaces with minimal or no asphalt cement coating. In this method the extent of stripping is established on a 6" core split in half.

c) Layer: That part of the pavement structure produced from similar material and placed with similar equipment and techniques. The material within a particular layer is assumed to be homogeneous. The layer thickness can be equal to or less than the core thickness or length. Two or more lifts of the same AC material are considered one layer.

1. SCOPE

This method covers the visual field determination of the moisture damage to asphaltic concrete cores.

2. APPARATUS

2.1 (1) 3" stone cutter's chisel, or (2) standard cold chisel, or (3) large screwdriver; and a heavy broad faced hammer; or available hydraulic press with a maximum load capacity of 10,000 lbs.

2.2 A steel ruler marked with clear, definite, accurately spaced graduations. The spacing of the graduations shall be 0.1 inch (2.54 mm) or a decimal part thereof.

3. PROCEDURE

3.1 The area from which the sample (locations A1, A2 and A3) is to be obtained must be 3 feet away from any crack in the pavement. This separation is important since water entering the crack could cause severe stripping in the cracked area and results which would not be representative of conditions prevailing elsewhere in the area.

3.2 Core the specimen from the A1, A2 and A3 locations as per the specifications in the SHRP-LTPP Guide for Field Material Sampling, Handling and Testing to the full depth of the AC component of the pavement. Remove the sample and clean all dust or other foreign particles from the core.

3.3 Examine, identify and mark layer interface(s).

3.4 Measure layer thicknesses and record the results on Field Data Sheet 3.

3.5 Using the cold chisel (or 3" stone cutter's chisel or large screw driver), break the core vertically into two pieces so the entire interior length of the core is exposed.

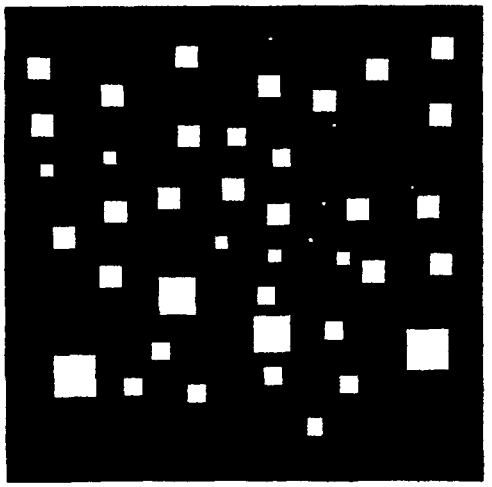
Alternate: Place the core in the hydraulic press and apply a vertical load along a diametral plane until the specimen splits into two halves.

Note: If a core is greater than 4 inches thick, separate the core into sections approximately 4 inches to 6 inches long at the nearest layer interface. This is the maximum length suitable to obtain a clean fractured face after the chisel is applied. Then, break the separated core pieces into two vertical parts and follow the remaining steps outlined below.

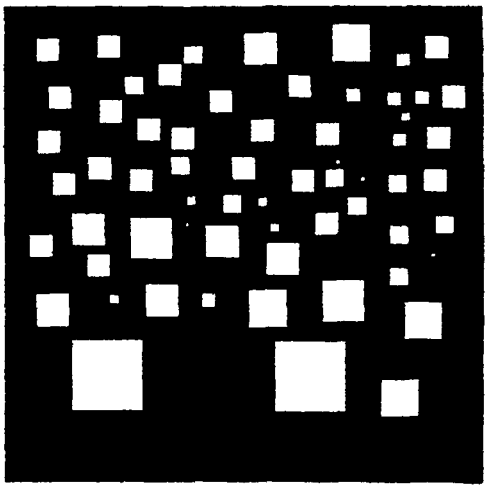
3.6 Wipe the entire surface of core and allow to air dry.

3.7 Examine the broken face of the core and, if stripping is evident, note how deep it has progressed. Measure from the bottom of the sample (moisture damage commonly occurs from the bottom to top of pavements) and record the extent of stripping. Estimate (within 10 percent) how much of the coarse aggregate (that material retained on the No. 4 sieve - pieces larger than approximately 1/4") in the broken face of the sample has been stripped. Similarly, estimate the amount of fine aggregate (that material passing the No. 4 sieve - pieces smaller than approximately 1/4") that has been stripped. Figure 1 shall then be used to estimate the relative stripping percentages for the fine and coarse aggregate.

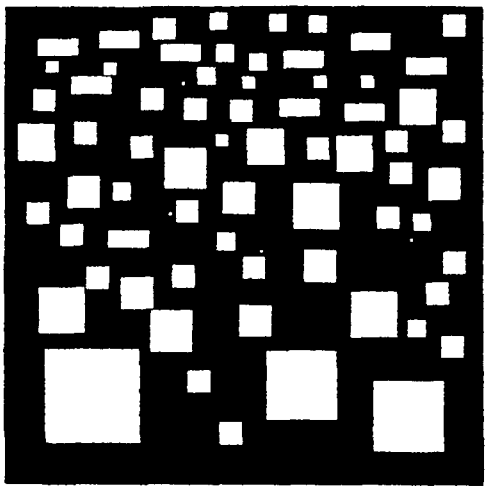
3.8 The core may be disposed of at the conclusion of the visual examination using appropriate procedures.



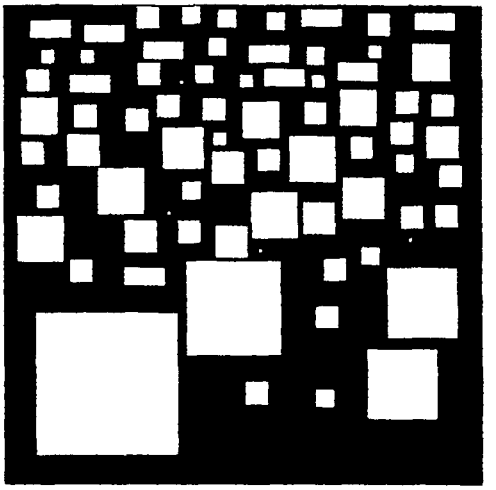
10%



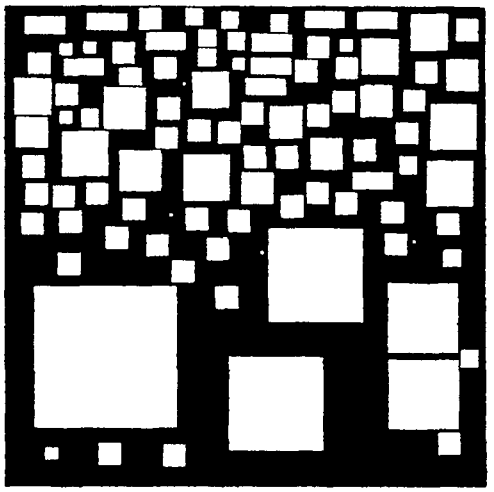
20%



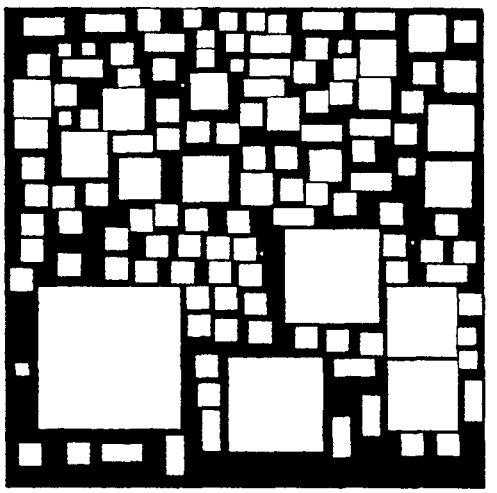
30%



40%



50%



60%

Figure 1. Chart for visual percentage estimation.

note: white areas are areas representative of "stripped" aggregate. The black areas are areas of unstripped aggregate. This table should only be used as an approximate guide for judging the percentage of aggregate stripped for an asphaltic concrete core.

4. CALCULATION

Calculate the stripping rating "S", using Worksheet A.

5. REPORT

Record the following information on Field Data Sheet 3:

5.1 Sample identification shall include: SHRP Region, State, State Code, SPS Project Code, Test Section Number, Field Set Number, SHRP Sample Number, Sampling Area Number and Borehole/Core Number.

5.2 Test Results

5.2.1. Thickness of core (to the nearest tenth of an inch).

5.2.2. Core diameter (to the nearest tenth of an inch).

5.2.3. Numbers of layers present in the core.

5.2.4. Layer depths to the nearest tenth of an inch. Measure from the top of the core. Layer 1 is the top of the pavement surface.

5.2.5. Presence of visible moisture in the sample. (Surface of aggregate changes color when exposed to air).

5.2.6. Appearance of asphalt - glossy (live), dull, brown (oxidized), etc.

5.2.7. Height of stripping penetration (measured from the bottom of the core).

5.2.8. Percent stripping, coarse aggregate.

5.2.9. Percent stripping, fine aggregate.

5.2.10. Value of "P" from Worksheet A.

5.2.11. Value of "C" from Worksheet A.

5.2.12. Value of "F" from Worksheet A.

5.2.13. Stripping rating from Worksheet A.

5.2.14. Comments.

5.3 General Remarks should include any additional comments deemed necessary by the examining technician.

Note: This protocol is based on procedures developed in the report, "The Incidence of Stripping and Cracking of Bituminous Pavements in Ontario," by H.J. Fromm, W.A. Phang and M. Noga, D.H.O Report 109, November 1965.

(1) Depth of Stripping Penetration (measured from bottom of core)

___ ___ . ___ inches

(2) Assign Value

VALUES FOR P	
P	Stripping Penetration
1	0 inches
2	< .5 inches
3	.5 to 1 inch
4	1 to 3 inches
5	> 3 inches

(3) P = ____

(4) % Coarse Aggregate Stripped

___ ___ ___ . %

(5)

VALUES OF C	
C	% Coarse Aggregate Stripped
0	< 10%
1	10 to 30%
2	31 to 60%
3	> 60%

(6) C = ____

(7) % Fine Aggregate Stripped

___ ___ ___ . %

(8)

VALUES OF F	
F	% Fine Aggregate Stripped
0	< 10%
1	10 to 30%
2	> 30%

(9) F = ____

(10) Stripping Rating (S) = P + C + F = ____

Worksheet A for Form T08/September 1990

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING September 1990
VISUAL DETERMINATION OF AC MOISTURE RELATED DAMAGE
SAMPLING DATA SHEET 3 SHEET NUMBER _____ OF _____

RP REGION _____ STATE _____ *STATE CODE* __ __
SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __
ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __
SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* __

TECHNICIAN_____ AFFILIATION_____ *TEST DATE* ___-___-___
SAMPLING AREA NO: SA-__ __ *LOCATION: STATION* __ __ __ __ + __ __ *OFFSET* __ __ feet from °/s
BORE HOLE/CORE NUMBER __ __ __ *SHRP SAMPLE NUMBER* __ __ __ __

1. *CORE THICKNESS (INCHES)* __ __.__
2. *CORE DIAMETER (INCHES)* __ __.__
3. *LAYER DEPTHS (measured from TOP of core, INCHES)*
   A. __ __.__
   B. __ __.__
   C. __ __.__
   D. __ __.__
4. *VISIBLE MOISTURE IN THE CORE? (YES/NO)* __
5. *APPEARANCE OF ASPHALT* _____

   HEIGHT OF STRIPPING PENETRATION (measured from BOTTOM of core, INCHES) __ __.__
6. *PERCENT COARSE AGGREGATE STRIPPED* __ __ __.
7. *PERCENT FINE AGGREGATE STRIPPED* __ __ __.
8. *STRIPPING PENETRATION RATING VALUE (P)* __
9. *COARSE AGGREGATE STRIPPING RATING VALUE (C)* __
10. *FINE AGGREGATE STRIPPING RATING VALUE (F)* __
11. *STRIPPING RATING (P+C+F)* __ __
12. *COMMENTS:* _____

_____

_____

GENERAL REMARKS: _____

_____

CERTIFIED VERIFIED AND APPROVED DATE

_____ _____ _____-_____-19___

Field Crew Chief SHRP Representative Month- Day- Year
Affiliation:_____ Affiliation:_____