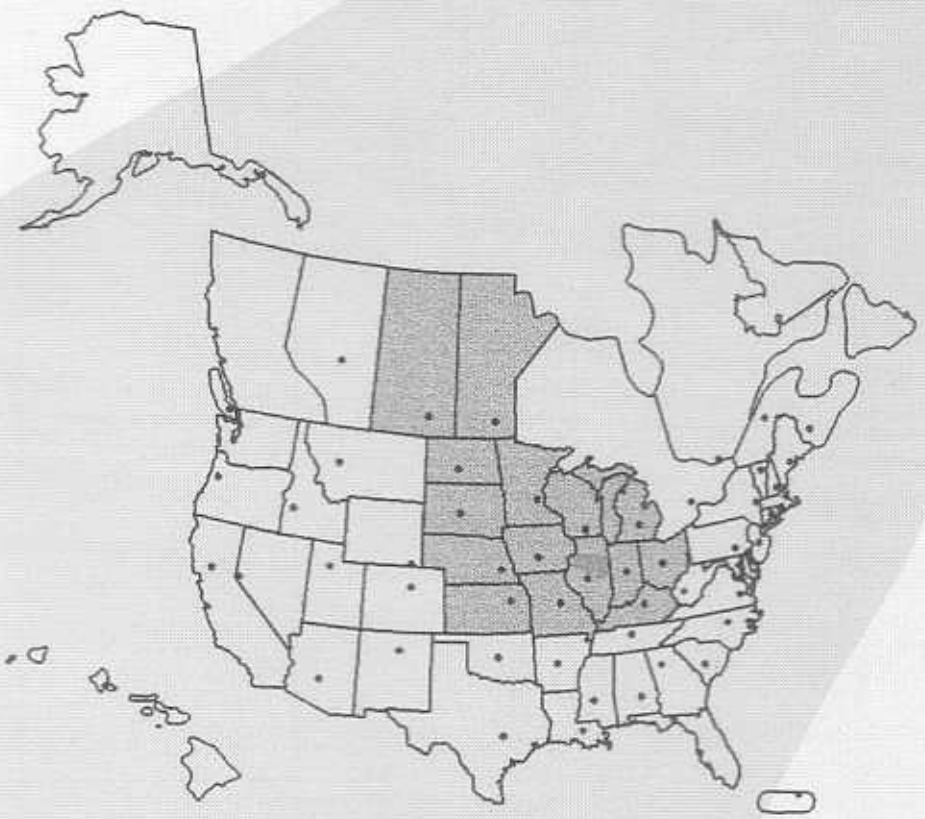
LTPP Seasonal Monitoring Program

Site Installation Report for SPS Section 390204 (39A) Delaware, Ohio

DTFH61-01-C-00085



November 15, 2001

LTPP

Submitted by

ERES CONSULTANTS

A Division of Applied Research Associates, Inc.

LTPP Seasonal Monitoring Program

Site Installation Report for SPS Section 390204 (39A) Delaware, Ohio

FHWA Contract No. DTFH61-01-C-00085 **November 2001**

LTPP Seasonal Monitoring Program

Site Installation Report for SPS Section 390204 (39A) Delaware, Ohio

FHWA CONTRACT No. DTFH61-01-C-00085

Prepared by

ERES Consultants
A Division of Applied Research Associates, Inc
505 West University Avenue
Champaign, IL 61820

Prepared for

Federal Highway Administration
LTPP Division, HRDI-13
Turner-Fairbanks Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101-2296

November 2001

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA-		

4. Title and Subtitle	5. Report Date
LTPP Seasonal Monitoring Program **Site Installation Report for SPS Section 390204(39A)** **Delaware, Ohio**	**November 15, 2001** 6. Performing Organization Code
7. Author(s) **Haiming Huang**	8. Performing Organization Report No.
9. Performing Organization Name and Address **ERES Consultants** **A Division of Applied Research Associates, Inc.** **505 West University Avenue** **Champaign, Illinois 61820-3915**	11. Contract or Grant No. **DTFH61-01-C-00085**
12. Sponsoring Agency Name and Address **Federal Highway Administration** **LTPP Division, HRDI-13** **Turner-Fairbanks Highway Research Center** **6300 Georgetown Pike** **McLean, Virginia 22101-2296**	13. Type of Report and Period Covered **Final Report** **June 1995 – February 1996** 14. Sponsoring Agency Code

15. Supplementary Notes

FHWA LTPP Technical Representative - Jack Springer, HRDI-13

16. Abstract

This report contains instrumentation installation details and data collection summaries for SPS test section 390204, which is part of the core Seasonal Monitoring Program (SMP). This rigid concrete pavement section is located on the northbound outside lane of U.S. 23, approximately 5 miles north of Delaware, Ohio. This is an SPS-2 section in the "wet-freeze" climatic zone, meeting the requirements of SMP cell number 28.

The SMP instrument installation was carried out in accordance with the LTPP SMP installation guidelines with few deviations. The equipment installed included MRC thermistor probes, TDR probes, CRREL resistivity probes, rain gauge tipping bucket, air temperature probe, and piezometer.

The construction of the pavement sections started in the spring of 1995. The SMP instrument was installed in July 1995 and the surface layer was placed in August 1995. The Ohio Department of Transportation started regular data collection on Feb 12, 1996, and the North Central Regional Support Contractor reported herein started regular data collection on May 13, 1998.

17. Keyword	18. Distribution Statement
Long Term Pavement Performance, LTPP, Seasonal Monitoring Program, SMP, Pavement Instrumentation, Time Domain Reflectometry, TDR, Piezometer, Resistance, Frost, Thaw, Temperature, Thermistor, Water Table, Falling Weight Deflectometer, FWD	**No restrictions. This document is available to the public from the sponsoring agency.**

19. Security Classification (of this report)	Security Classification (of this page)	21. No. of Pages	22. Price
Unclassified	**Unclassified**		

Table of Content

LTPP Seasonal Monitoring Program
Site Installation Report for SPS Section 390204 (39A)
Delaware, Ohio

I. Introduction

The Strategic Highway Research Program (SHRP) initiated a series of General Pavement Studies (GPS) and Specific Pavement Studies (SPS) to evaluate several key performance parameters of highway pavement. As part of the national effort, the Ohio Department of Transportation (ODOT) constructed a series of pavement test sections on U.S. 23 in Delaware County. Four SPS experiments are included, SPS-1, SPS-2, SPS-8, and SPS-9. The test sections were instrumented by ODOT and six contracted universities in the state of Ohio. The instrumentation plan is more comprehensive but includes all instrumentation proposed under the Long Term Pavement Performance (LTPP).

Under the request of the Federal Highway Administration (FHWA) LTPP Division, the North Central Regional Support Contractor (NCRSC) put together installation reports for two Seasonal Monitoring Program (SMP) sites based on available information gathered from ODOT and participating universities. This report contains information specific to instrument installation and monitoring data collection for the LTPP SPS section 390204, which is part of the core SMP under the FHWA LTPP Division.

A. Test Site Location

SPS section 390204 is located on northbound outside lane of U.S. 23, approximately 5 miles north of Delaware, Ohio. The beginning of the section is at station 275+50. The detailed site location is shown in the maps included in appendix A. The information includes the following:

- SMP location map
- Detailed section location map

B. Test Section Information

The pavement in the test section is a Portland cement concrete (PCC) pavement and consists of the following pavement layers:

- 275 mm (11in) PCC surface
- 150 mm (6 in) Dense Graded Aggregate Base (DGAB)

Other pertinent information includes:

- Target PCC layer strength: 900psi
- Drainage: No
- Lane width: 3.6 m (12 ft)

Construction of the subgrade was completed on June 26, 1995. The instrument was installed in July 1995 and construction of the PCC surface layer was completed on August 25, 1995. Actual layer thickness and additional background information about the section are also shown in appendix A. The information includes the following:

- Actual layer thickness and material type
- Base and subgrade moisture data

The geographic location and existing pavement structure place this section in cell 28 of the SMP experiment, which is defined by the following parameters:

- Rigid jointed reinforced concrete
- Fine-grained subgrade
- Freezing environment
- Wet environment

II. Instrumentation Installation

A. Pre-Installation Activities

The pre-installation activities include selections of sensors, installation procedures, and location of instrumentation. Two workshops held in Columbus, Ohio, in 1993 brought together experts in instrumentation from the FHWA, universities, several state Departments of Transportation, and the U.S. Army Corps of Engineers. During these workshops, experiences obtained from Mn/Road, North Carolina Test pavement, I-80 in Iowa, Denver Airport, U.S. 33 and S.R. 2 in Ohio, and the Alberta Research Council were shared and discussed. These discussions provided information and background for planning this project.

Sensors for environmental factors at SMP sites were selected in consultation with FHWA personnel charged with coordination of the LTPP program for SHRP. The following sensors were selected for the installation of SMP instrument at this section:

- MRC thermistor probes to monitor pavement layer temperature
- TDR probes to monitor volumetric water content
- CRREL resistivity probes to monitor frost depth
- Rain gauge tipping bucket to monitor rain volume
- Air temperature probe to measure air temperature
- Piezometer to monitor ground water table

Instrumentation checks/calibrations were performed before the installation. The results from instrumentation checks/calibration are included in appendix B using the following forms:

- Data Sheet SMP-C01: TDR Probe Check
- Data Sheet SMP-C02: Thermistor and Air Temperature Probe Check
- Data Sheet SMP-C03: Electrical Resistivity Probe Check

Other pre-installation monitoring activities, such as FWD testing and manual distress surveys, were not conducted because of the new pavement construction at this site.

B. Installation Activities

After the construction of subgrade and DGAB, an instrumentation hole (300 mm in diameter and 1.75 m deep) was drilled at a specified location in July 1995. Seasonal instruments (MRC Thermistor, TDR, and DRREL Resistivity probes) were placed in the hole, and the hole was backfilled by the university team. Upon completion of the paving process, a 51-mm diameter core was drilled in the surface layer. Thermistor probes were epoxied to the cores, and then the core was reinserted and resealed.

An underground concrete cell was constructed to house the data acquisition equipment. It is located in the grass median, approximately 35 ft from the edge of the traffic lane where the instrumentation hole resides. Other seasonal instrumentation installed includes a rain gauge, an air temperature probe, and a piezometer. For safety reasons, the post that holds the rain gauge and air temperature probe is located about 90 ft from the edge of traffic lane.

Some deviations from the April 1994 *LTPP Seasonal Monitoring Program: Instrumentation and Data Collection Guidelines* were observed. The followings are the major deviations observed at this site:

- Air temperature probe and rain gauge were 60 ft away from instead of next to the data acquisition system.
- The underground cell was constructed to house the data acquisition equipment, instead of using a roadside cabinet for this purpose.
  No instrumentation hole was drilled from the pavement surface because the probes were buried in the lower pavement layer before the surface layer placement.

The installation was completed by the Ohio DOT and several participating universities within Ohio. Dr Andrew Heydinger from the University of Toledo can be contacted for further information regarding the installation. The other people involved with the installation are listed on "Data Sheet SMP–I01: list of Installed Instrumentation," which is included in appendix C, along with the following other SMP installation forms:

- Data Sheet SMP-I02: Instrumentation Locations
- Data Sheet SMP-I03: Log of Piezometer Hole
- Data Sheet SMP-I04: Log of Instrumentation Hole
- Data Sheet SMP-I05: Field Gravimetric Moisture Contents
- Data Sheet SMP-I06: TDR Moisture content

Appendix C also contains some photographs of instrumentation installation. It should be noted that these photographs are not particularly from the section 390204. However, they are from other sections at the same site and would be very similar to the installation done on the section 390204.

III. SMP Data Collection

A. Initial SMP Data Collection

Data readings were not taken until several months after the completed installation. ODOT started the seasonal data collection on February 12, 1996. NCRSC started the seasonal data collection in March 1998. The NCRSC collected its first set of FWD data at this section on May 13, 1998, along with SMP onsite and manual data. The manual data collected includes resistivity, elevation, water table, joint opening, and joint faulting (see appendix D for the following):

- Data Sheet SMP-D10: SMP Field Activity Report
- Data Sheet SMP-C06: Resistivity Calibration Block Check
- Data Sheet SMP-D03: Contact Resistance Measurements
- Data Sheet SMP-D04: Four-Point Resistivity Measurements
- Data Sheet SMP-D05: Ground Water Table Measurements
- Data Sheet SMP-D06: Joint Opening Measurement
- Data Sheet SMP-D07: Joint Faulting Measurement
- Data Sheet SMP-D09: Surface Elevation Measurements – PCC Pavements

B. Routine SMP Data Collection

The NCRSC collected routing data at this SMP site from May 1998 to May 1999 on a monthly basis. Detailed data collection activities are summarized in the table in appendix D. In addition, the ODOT and participating universities collect SMP data regularly. For more detailed information on these data collection activities, contact Mr. Issam Khoury from Ohio University.

IV. Summary

The Ohio Department of Transportation constructed a series of pavement test sections on U.S. 23 in Delaware County. The test sections were instrumented by ODOT and six contracted universities in the state of Ohio.

This report contains information specific to the SMP instrument installation and monitoring data collection for the LTPP SPS section 390204, which is part of the core SMP program under the FHWA LTPP Division. The following equipment was installed at the site:

- MRC thermistor probes to monitor pavement layer temperature
- TDR probes to monitor volumetric water content
- CRREL resistivity probes to monitor frost depth
- Rain gauge tipping bucket to monitor rain volume
- Air temperature probe to measure air temperature
- Piezometer to monitor ground water table

The SMP instrument installation was carried out in accordance with the LTPP SMP installation guidelines with few deviations. The followings are the major deviations observed at this site:

- Air temperature probe and rain gauge were 60 ft away from instead of next to the data acquisition system.
- The underground cell was constructed to house the data acquisition equipment, instead of using a roadside cabinet for this purpose.
- No instrumentation hole was drilled from the pavement surface because the probes were buried in the lower pavement layer before the surface layer placement.

The construction of the pavement sections started in the spring of 1995. The SMP instrument was installed in July 1995 and the surface layer was placed in August 1995. ODOT started regular data collection on February 12, 1996. North Central Regional Support Contractor started regular data collection on May13, 1998.

References

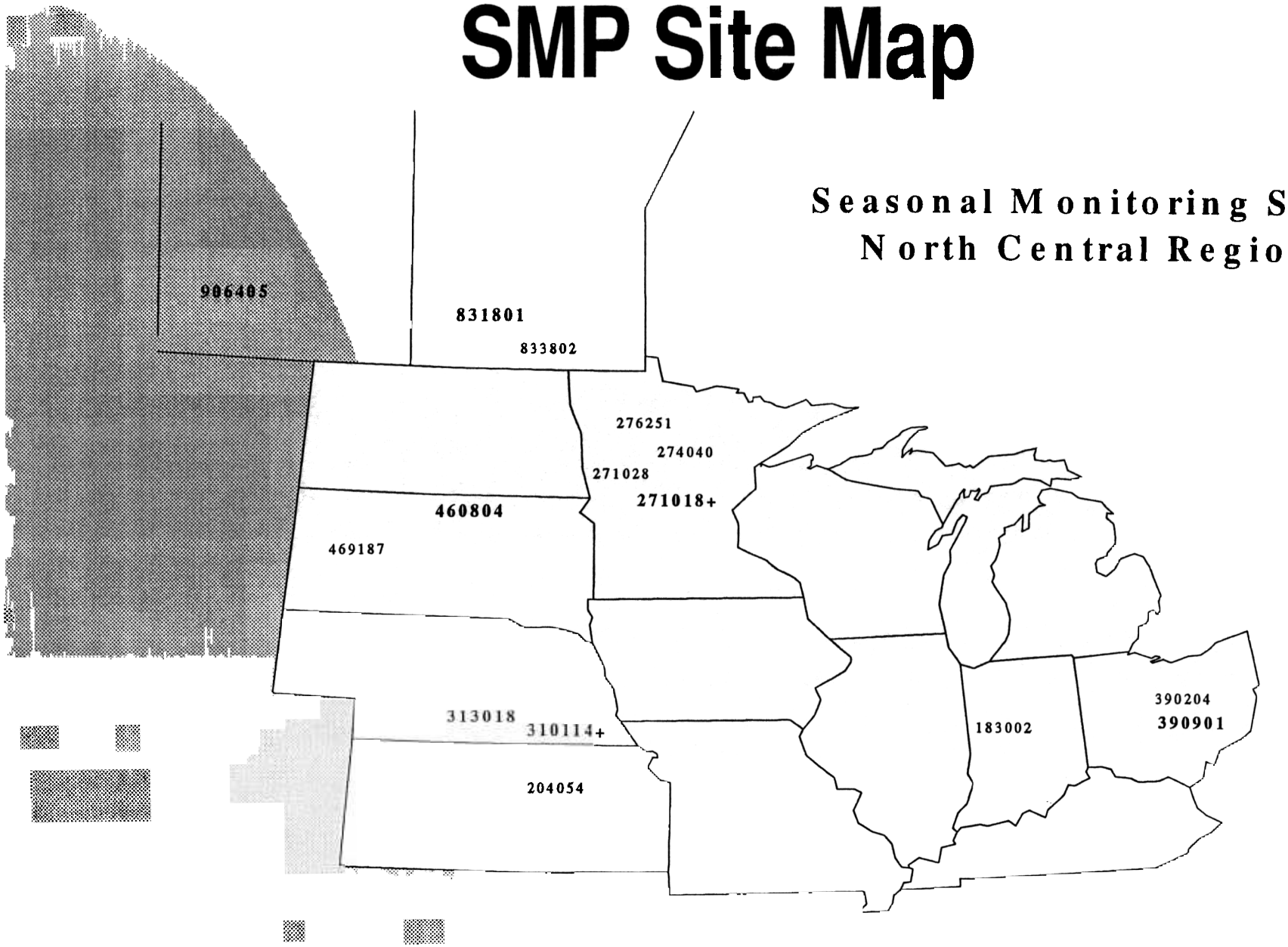
1. Center for Geotechnical and Environmental Research, Civil Engineering Department, Ohio University. *Instrumentation Plan for the Ohio SPS Test Pavement (DEL-23-17.48),* Draft final report for Ohio Department of Transportation and Federal Highway Administration. July 1994.

2. Turner-Fairbank Highway Research Center, Federal Highway Administration. *LTPP Seasonal Monitoring Program: Instrumentation Installation and Data Collection Guidelines.* April 1994.

Appendix A Test Section Background Information

1. SMP location map
2. Detailed section location map
3. Layer thickness and material type
4. Base and subgrade moisture data

SMP Site Map


Seasonal Monitoring Sites
North Central Region
906405
831801
833802
276251
274040
271028
271018+
460804
469187
313018
310114+
204054
183002
390204
390901

Ohio Department of TRANSPORTATION

District Map

District 1
1885 North McCullough St.
Lima, Ohio 45801-0040
419-222-9055
fax: 419-222-0438

District 2
317 East Poe Rd.
Bowling Green, Ohio
43402
419-353-8131
fax: 419-353-1468

District 3
906 North Clark St.
Ashland, Ohio
44805-1989
800-276-4188
fax: 419-281-0874

District 4
705 Oakwood St.
Ravenna, Ohio 44266
330-297-0801
fax: 330-297-1769

District 5
960 Jacksontown Rd., S.E.
Jacksontown, Ohio
43030-0306
740-323-4400
fax: 740-323-3715

District 6
400 East William St.
Delaware, Ohio 43015
800-372-7714
fax: 740-369-7437

District 7
1001 St. Mary's Ave.
SR 29 PO Box 969
Sidney, Ohio 45365-0969
937-492-1141
fax: 937-497-9734

District 8
505 South SR 741
Lebanon, Ohio 45036-9518
800-831-2142
fax: 513-932-7651

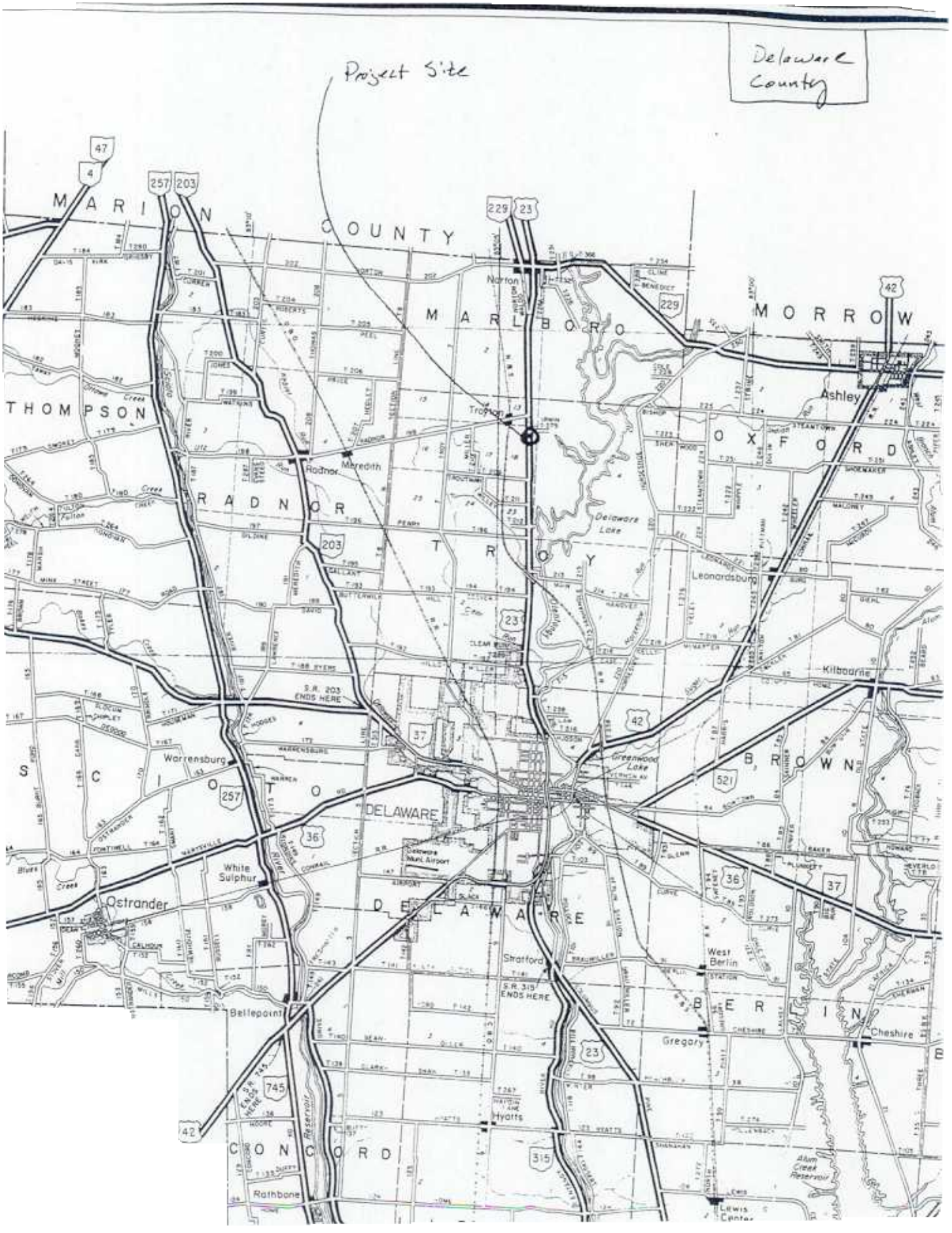
Central Office
PO Box 0899
Columbus, Ohio 43216-0899
614-466-7170
fax: 614-644-8662
ODOT Web Site: http://www.dot.state.oh.us

District 9
650 Eastern Ave.
Chillicothe, Ohio 45601
740-773-2691
fax: 740-775-4889

District 10
Box 658 Muskingum Drive
Marietta, Ohio 45750
800-845-0226
fax: 740-373-7317

District 11
2201 Reiser Ave.
New Philadelphia, Ohio
44663-3333
330-339-6633
fax: 330-308-3942

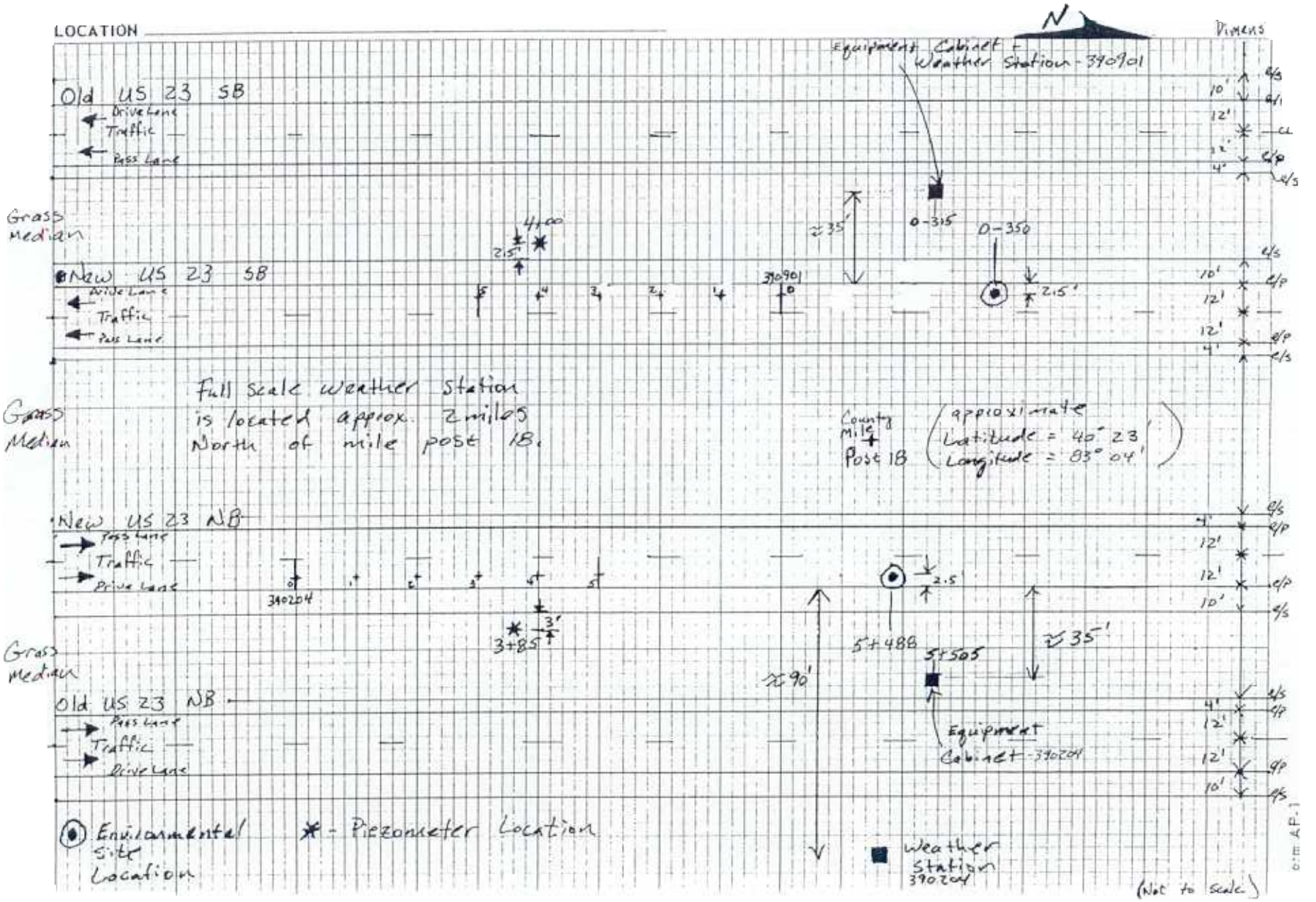
District 12
5500 Transportation Blvd.
Garfield Heights, OH
44125-5396
216-581-2100
fax: 216-587-1730


Project Site
Delaware County
MARION COUNTY
MARLBORO
MORROW
THOMPSON
RADNOR
TROY
OXFORD
BROWN
SCIOTO
DELAWARE
BERLIN
CONCORD
Norton
Ashley
Thompson
Radnor
Meredith
Delaware Lake
Leonardsburg
Kilbourne
S.R. 203 ENDS HERE
Warrensburg
Greenwood Lake
White Sulphur
Ostrander
Delaware Mun. Airport
Stratford
S.R. 315 ENDS HERE
West Berlin
Bellepoint
S.R. 745 ENDS HERE
Gregory
Cheshire
Hyatts
Rathbone
Alum Creek Reservoir
Lewis Center
47
4
257
203
229
23
42
36
37
521
745
315

NC. _____ SU [redacted] EM [redacted]

EM RO. DEL-23 [redacted]

LOCATION



EVATION AI D 'HI SS

Station 280+50
State 39
SPS # 02
Test Sec. 04

hot ged
plan = plan elevation

			ELEVATIONS (9__.__ ft.)								LAYER THICKNESS (in.)	
Project Sta.	SHRP Sta.	Offset from c/l (in.)	Subgrade shot	Subgrade plan	6" DGAB shot	6" DGAB plan	11" PCC shot	11" PCC plan			6"DGAB	11"PCC
275+25	0-25	0										
		36										
		72										
		108										
		144										
275+50	0+00	0	53.02	53.02	53.48	53.52	54.70	54.40			5.52	12.24
		36	53.00	52.97	53.45	53.50	54.45	54.37			5.40	12
		72	52.96	52.92	53.41	53.46	54.37	54.33			5.40	11.52
		108	52.91	52.87	53.39	53.41	54.32	54.31			5.76	11.16
		144	52.87	52.82	53.30	53.37	54.23	54.22			5.16	11.16
276+00	0+50	0	53.37	53.38	53.83	53.87	54.66	54.75			5.52	11.88
		36	53.34	53.33	53.83	53.84	54.75	54.75			5.88	11.04
		72	53.29	53.28	53.79	53.79	54.68	54.71			6.00	10.68
		108	53.24	53.23	53.73	53.74	54.63	54.65			5.88	10.8
		144	53.19	53.18	53.69	53.69	54.58	54.61			6.00	10.44
276+50	1+00	0	53.70	53.71	54.18	54.20	55.14	55.10			5.76	11.52
		36	53.66	53.66	54.14	54.16	55.07	55.06			5.76	11.16
		72	53.62	53.61	54.11	54.12	55.02	55.03			5.88	10.92
		108	53.56	53.56	54.05	54.06	54.96	54.97			5.88	10.92
		144	53.53	53.51	53.99	54.03	54.90	54.91			5.52	10.92
277+00	1+50	0	53.94	53.97	54.42	54.44	55.38	55.34			5.76	11.52
		36	53.92	53.92	54.41	54.42	55.32	55.33			5.88	10.92
		72	53.87	53.87	54.35	54.37	55.27	55.27			5.76	11.04
		108	53.83	53.82	54.30	54.33	55.22	55.22			5.64	11.04
		144	53.79	53.77	54.25	54.29	55.16	55.16			5.40	11.04
277+50	2+00	0	54.15	54.17	54.62	54.65	55.58	55.54			5.64	11.64
		36	54.11	54.12	54.62	54.61	55.54	55.54			6.12	11.04
		72	54.08	54.07	54.57	54.58	55.48	55.49			5.88	10.92
		108	54.02	54.02	54.52	54.52	55.43	55.44			6.00	10.92
		144	53.97	53.97	54.47	54.47	55.37	55.39			6.00	10.8
278+00	2+50	0	54.26	54.30	54.77	54.76	55.71	55.69			6.12	11.28
		36	54.25	54.25	54.73	54.75	55.66	55.65			5.76	11.16
		72	54.21	54.20	54.70	54.71	55.60	55.62			5.88	10.8
		108	54.17	54.15	54.64	54.67	55.56	55.56			5.64	11.04
		144	54.13	54.10	54.6	54.63	55.52	55.49			5.28	11.4
278+50	3+00	0	54.37	54.37	54.83	54.87	55.78	55.75			5.52	11.4
		36	54.34	54.32	54.81	54.84	55.72	55.73			5.64	10.92
		72	54.30	54.27	54.76	54.80	55.67	55.68			5.52	10.92
		108	54.25	54.22	54.72	54.75	55.62	55.64			5.64	10.8
		144	54.21	54.17	54.6	54.71	55.57	55.57			5.28	11.04
279+00	3+50	0	54.35	54.37	54.82	54.85	55.80	55.74			5.64	11.76
		36	54.31	54.32	54.79	54.81	55.74	55.71			5.76	11.4
		72	54.26	54.27	54.75	54.76	55.68	55.67			5.88	11.16
		108	54.22	54.22	54.70	54.72	55.63	55.62			5.76	11.16
		144	54.17	54.17	54.64	54.67	55.56	55.56			5.64	11.04
279+50	4+00	0	54.28	54.31	54.78	54.78	55.74	55.70			6.00	11.52
		36	54.24	54.26	54.74	54.74	55.67	55.66			6.00	11.16
		72	54.19	54.21	54.70	54.69	55.62	55.62			6.12	11.04
		108	54.14	54.16	54.63	54.64	55.56	55.55			5.88	11.16
		144	54.10	54.11	54.59	54.60	55.51	55.51			5.88	11.04
280+00	4+50	0	54.17	54.18	54.64	54.67	55.58	55.56			5.64	11.28
		36	54.15	54.13	54.62	54.60	55.53	55.54			5.64	10.92
		72	54.09	54.08	54.59	54.59	55.48	55.51			6.00	10.68
		108	54.03	54.03	54.53	54.53	55.43	55.45			6.00	10.8
		144	53.99	53.98	54.48	54.49	55.38	55.40			5.88	10.8
280+50	5+00	0	54.02	54.02	54.51	54.52	55.41	55.43			5.88	10.8
		36	53.99	53.97	54.48	54.49	55.36	55.40			5.88	10.56
		72	53.94	53.92	54.44	54.44	55.32	55.36			6.00	10.56
		108	53.90	53.87	54.39	54.40	55.28	55.31			5.88	10.68
		144	53.84	53.82	54.34	54.34	55.23	55.26			6.00	10.68
280+75	5+25	0	53.90	53.94	54.39	54.40	55.31	55.31			5.88	11.04
		36	53.87	53.89	54.35	54.37	55.27	55.27			5.76	11.04
		72	53.82	53.84	54.32	54.32	55.23	55.24			6.00	10.92
		108	53.77	53.79	54.28	54.27	55.19	55.20			6.12	10.92
		144	53.74	53.74	54.21	54.24	55.14	55.13			5.64	11.16
											6"DGAB	11"PCC
											5.79	11.09
											0.22	0.35
											6.12	12.24
											5.16	10.44

NOT WITHIN TOLERANCE

E ple

g.
d a/d

* note: tolerance in the subg lers plan
in othe layers plan thickne

DGI Graded Aggr
PC P. tland Cement Con te

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING

IN SITU DENSITY AND MOISTURE TESTS

SAMPLING DATA SHEET 8-1

SHEET NUMBER 12 OF 19

SHRP REGION NC STATE OH

SPS EXPERIMENT NO 2

ROUTE/HIGHWAY US 23 Lane 1 Direction N

SAMPLE/TEST LOCATION: ☐ Before Section ☒ After Section ☐ Within Section

STATE CODE 39

SPS PROJECT CODE 02

TEST SECTION NO. 04

FIELD SET NO. 1

OPERATOR Brad Young NUCLEAR DENSITY GAUGE I.D. Model 3440 Serial 23964 TEST DATE 6-22-95

SAMPLING AREA NO: SA- 4 LOCATION: STATION 5+50 (281+00) OFFSET 6 feet from ℄/s

LOCATION NO: T73 DATE OF LAST MAJOR CALIBRATION 10-14-94

Note: Use additional sheets if necessary

DEPTH FROM SURFACE TO THE TOP OF THE LAYER, INCHES (From Plans)	17					
LAYER NUMBER	2					
MATERIAL TYPE: (Unbound=G Other=T)	G					
IN SITU DENSITY, pcf Dry Unit Wt (AASHTO T238-86) 1	130.0					
2	129.2					
3	130.0					
4	130.5					
AVERAGE	129.9					
Method (A,B,or C)	B	B	B			
Rod Depth, inches	8					
IN SITU MOISTURE CONTENT, % (AASHTO T239-86) 1	7.4					
2	7.5					
3	7.6					
4	6.9					
AVERAGE	7.4					

GENERAL REMARKS: The density on original subgrade were missed last year. T7 and ~ were not taken. This test was done on embankment material (approx. 1.5') and was the location for bulk sample B10

CERTIFIED Brad Young
Field Crew Chief
Affiliation: ODOT

VERIFIED AND APPROVED
SHRP Representative
Affiliation:

DATE 6-22-19 95
Month- Day- Year

Soil

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING

IN SITU DENSITY AND MOISTURE TESTS

SAMPLING DATA SHEET 8-1

SHEET NUMBER 14 OF 19

SHRP REGION NC STATE OH

STATE CODE 39

SPS EXPERIMENT NO 02

SPS PROJECT CODE 02

ROUTE/HIGHWAY US 23 Lane 1 Direction N

TEST SECTION NO. 04

SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section ☒ Within Section

FIELD SET NO. 1

OPERATOR Brad Young NUCLEAR DENSITY GAUGE I.D. Model 3440 Serial 23964 TEST DATE 6-26-95

SAMPLING AREA NO: SA-54 LOCATION: STATION 1+00 / 2+50 / 4+00 OFFSET 6 feet from ℄/s

LOCATION NO: DATE OF LAST MAJOR CALIBRATION 10-14-94

Note: Use additional sheets if necessary

		T70 (1+00)	T71 (2+50)	T72 (4+00)			
DEPTH FROM SURFACE TO THE TOP OF THE LAYER, INCHES (From Plans)		17	17	17			
LAYER NUMBER		2	2	2			
MATERIAL TYPE: (Unbound=G Other=T)		G	G	G			
IN SITU DENSITY, pcf Dry Unit Wt (AASHTO T238-86)	1	120.1	123.7	130.2			
	2	121.3	122.7	126.6			
	3	123.2	121.9	127.8			
	4	119.0	128.2	129.2			
AVERAGE		120.9	124.1	128.5			
Method (A,B,or C)		B	B	B			
Rod Depth, inches		8	8	8			
IN SITU MOISTURE CONTENT, % (AASHTO T239-86)	1	11.0	9.9	9.0			
	2	11.2	9.3	9.3			
	3	9.9	9.5	9.4			
	4	10.5	9.0	8.7			
AVERAGE		10.7	9.5	9.1			

GENERAL REMARKS: The density tests on original subgrade were missed last year T4, T5, T6 and T7. ~~tests above~~ were done on Embankment material (approx 1.5'

CERTIFIED Brad Young
Field Crew Chief
Affiliation: ODOT

VERIFIED AND APPROVED
SHRP Representative
Affiliation:

DATE -19 95
Month- Day- Year

Proj Sta - T70 - 276+50
T71 - 278+00
T72 - 279+50

(Soil test)

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING

IN SITU DENSITY AND MOISTURE TESTS

SAMPLING DATA SHEET 8-1

SHRP REGION NC STATE OH

SPS EXPERIMENT NO 02

ROUTE/HIGHWAY US 23 Lane 1 Direction N

SAMPLE/TEST LOCATION: ☒ Before Section ☐ After Section ☒ Within Section

STATE CODE 39

SPS PROJECT CODE 02

TEST SECTION NO. 04

FIELD SET NO. 1

OPERATOR Brad Young NUCLEAR DENSITY GAUGE I.D. Model 3440 Serial 23964 TEST DATE 8-16-95

SAMPLING AREA NO: SA- 54 LOCATION: STATION 1+00 / 2+50 / 4+00 / 0-50 OFFSET 6 feet from ℄/s

LOCATION NO: DATE OF LAST MAJOR CALIBRATION 10-14-94

Note: Use additional sheets if necessary

		T137	T138	T139			T136 (0-50)
DEPTH FROM SURFACE TO THE TOP OF THE LAYER, INCHES (From Plans)		11	11	11		Bulk Sample B19 SA# = 3	11
LAYER NUMBER		3	3	3		Before Section	3
MATERIAL TYPE: (Unbound=G Other=T)		G	G	G			G
IN SITU DENSITY, pcf Dry Unit Wt (AASHTO T238-86)	1	130.5	120.5	128.1			124.5
	2	128.2	123.8	128.3			123.2
	3	128.2	122.1	125.4			123.4
	4	126.8	120.0	127.9			124.3
AVERAGE		128.4	121.6	127.4			123.9
Method (A,B,or C)		B	B	B			B
Rod Depth, inches		6	6	6			6
IN SITU MOISTURE CONTENT, % (AASHTO T239-86)	1	3.5	3.8	3.7			4.0
	2	3.7	3.6	3.8			3.4
	3	3.8	3.5	3.9			3.9
	4	3.8	3.5	3.6			3.9
AVERAGE		3.7	3.6	3.8			3.8

GENERAL REMARKS: 6" 304 agg base material Dense Graded Agg. Base

CERTIFIED Brad Young
Field Crew Chief
Affiliation: ODOT

VERIFIED AND APPROVED
SHRP Representative
Affiliation:

DATE 8-16-1995
Month- Day- Year

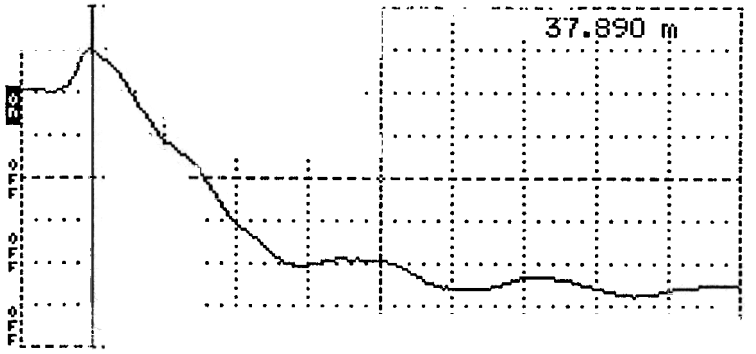
Project Station
T136 – 275+00
T137 – 276+50
T138 – 278+00
T139 – 279+50

Appendix B Pre-installation Equipment Checks/Calibration Information

1. Data Sheet SMP-C01: TDR Probe Check
2. Data Sheet SMP-C02: Thermistor and Air Temperature Probe Check
3. Data Sheet SMP-C03: Electrical Resistivity Probe Check

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [39] LTPP Section ID [____]

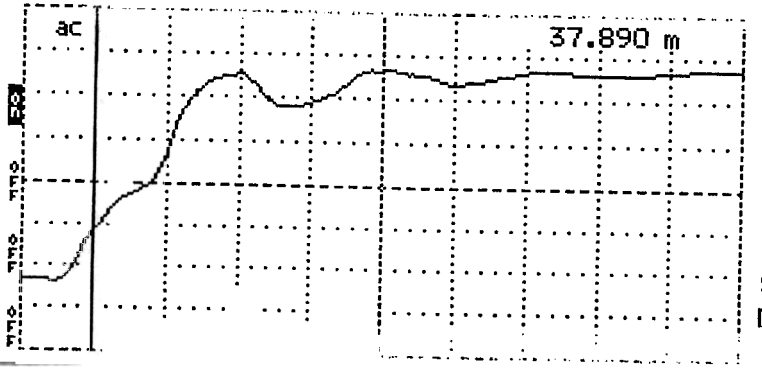
Cursor ..... 37.890 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-01
Notes Shorted
TOLEDO
Input Trace
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	__.__	___.__

Cursor ..... 37.890 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac

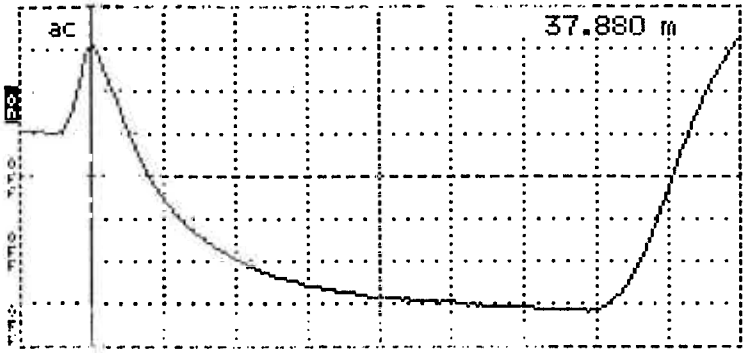


Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-01
Notes AIR
TOLEDO
Input Trace
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	__.__	___.__

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [39] LTPP Section ID [_ _ _ _]

Cursor ..... 37.880 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-01
Notes WATER
69.4°F
UTOLEDO
Input Trace .
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"		_ _ . _ _

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: _ _ _ _ _ _ TDR Probe Length, L: 0.203 m Length of Coax Cable: 30.5 m

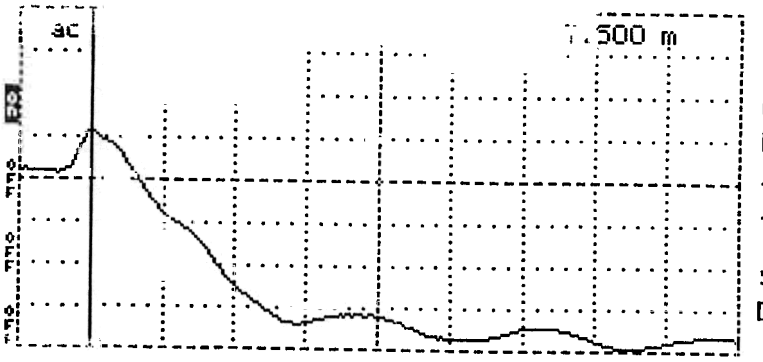
Comments: _____

Prepared by: Andreas Heydinger Employer: U TOLEDO

Date (dd/mm/yy): _ _ / _ _ / _ _

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [39] LTPP Section ID [____]

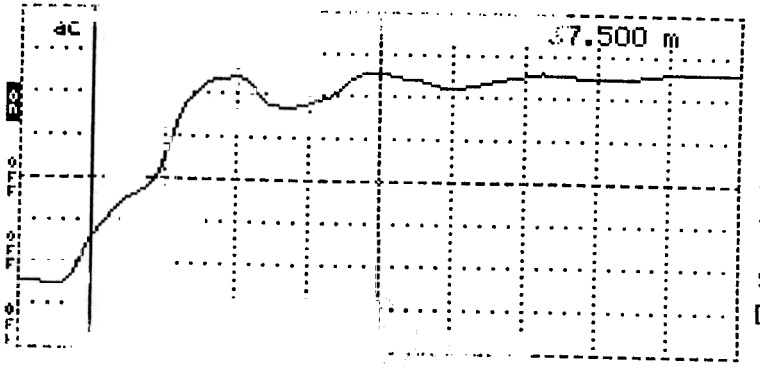
Cursor ..... 37.500 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39C704-02
Notes Shorted
TOLEDO
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	__.__	___.__

Cursor ..... 37.500 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac

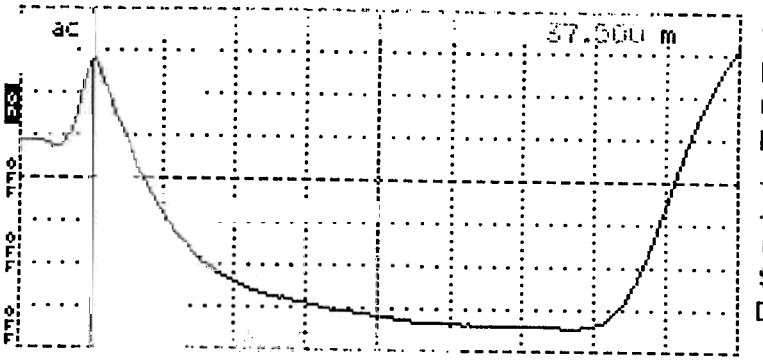


Tektronix 1502B TDR
Date 4/10/95
Cable 39C9-C704-02
Notes AIR
TOLEDO
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	__.__	___.__

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [39] LTPP Section ID [____]

Cursor ..... . 37.500 m
Distance/Div... . .25 m/div
Vertical Scale.. . 74.8 mρ/div
Vp 0.99
Noise Filter.... . 1 avg
Power..... . ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-02
Notes WATER
69.8°F
AUTOLEVEL
Input Trace .
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	__.__	___.__

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: TDR Probe Length, L: m Length of Coax Cable: __ m

Comments: _____

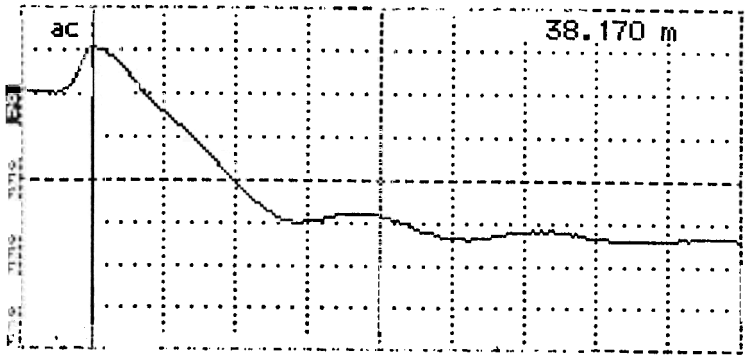
_____

Prepared by: _____ Employer: _____

Date (dd/mm/yy): __ __ / __ __ / __ __

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [ ] LTPP Section ID [ ]

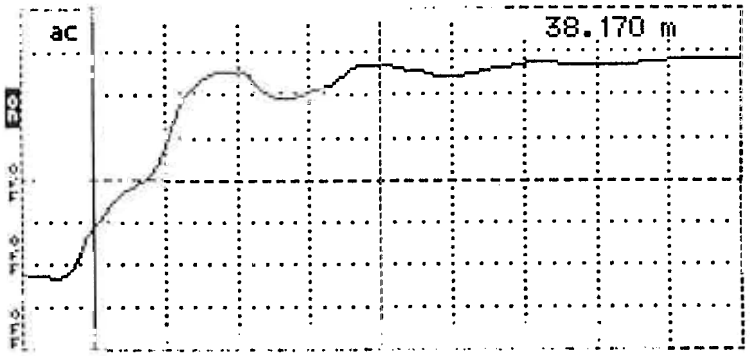
Cursor ..... 38.170 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39C.T04-03
Notes AIR
UTOLEDO
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	__.__	__.__

Cursor ..... 38.170 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac

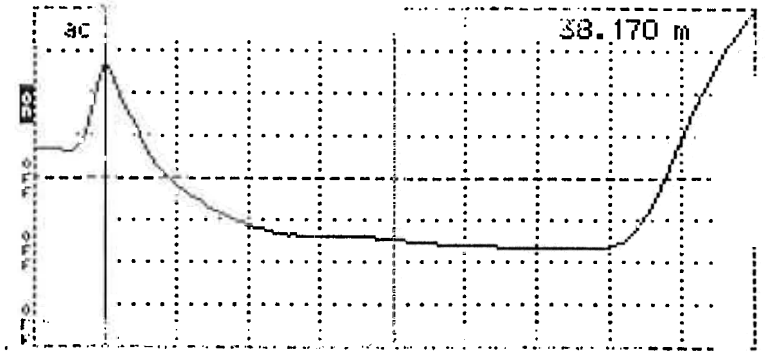


Tektronix 1502B TDR
Date 4/10/95
Cable 39C.T04-03
Notes AIR
UTOLEDO
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	__.__	

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [39] LTPP Section ID [____]

Cursor ..... . 38.170 m
Distance/Div... . .25 m/div
Vertical Scale.. . 74.8 mρ/div
Vp 0.99
Noise Filter.... . 1 avg
Power..... . ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-03
Notes Water
76.2°F
UTOLEDO
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	__.__	___.__

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: _____ TDR Probe Length, L: m Length of Coax Cable: __ m

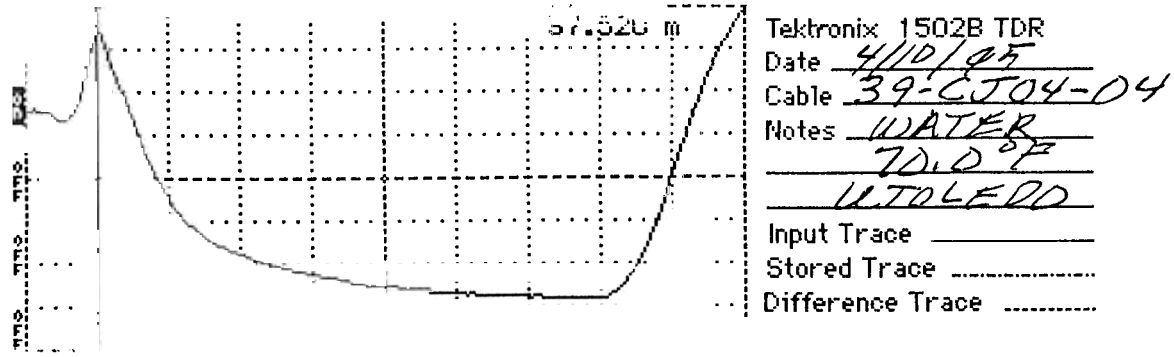
Comments: _____

_____

Prepared by: _____ Employer: _____

Date (dd/mm/yy):

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [39] LTPP Section ID [_ _ _ _]



TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	_ . _ _	_ _ . _ _

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: _ _ _ _ _ _ TDR Probe Length, L: _ . _ _ _ m Length of Coax Cable: m

Comments: _____

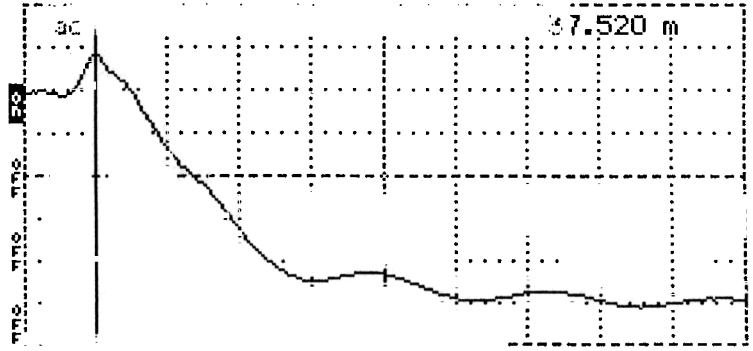
_____

Prepared by: _____ Employer: _____

Date (dd/mm/yy): _ _ / _ _ / _ _

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [__] LTPP Section ID [____]

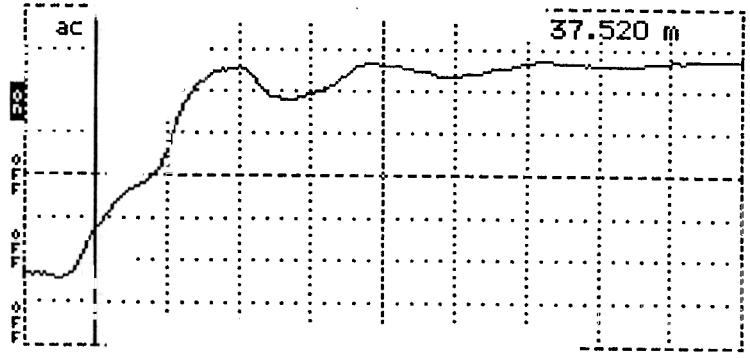
Cursor ..... 37.520 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-04
Notes Shorted
TOLEDO
Input Trace .
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	__.__	___.__

Cursor ..... 37.520 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac

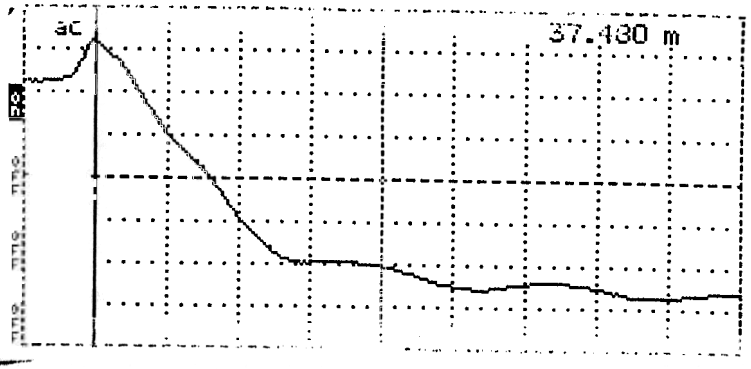


Tektronix 1502B TDR
Date 4/10/95
Cable AIR 39-CJ04-04
Notes AIR
TOLEDO
Input Trace _____
Stored Trace .....
Difference Trace .

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	__.__	___.__

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [39] LTPP Section ID [____]

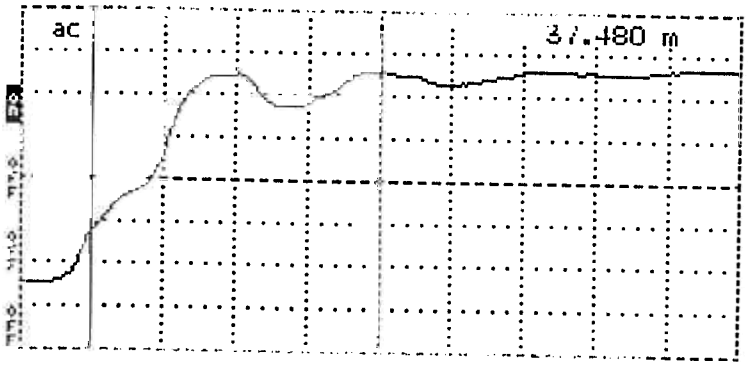
Cursor ..... 37.480 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-05
Notes Shorted
UTOLEDO
Input Trace
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	__.__	__.__

Cursor ..... 37.480 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



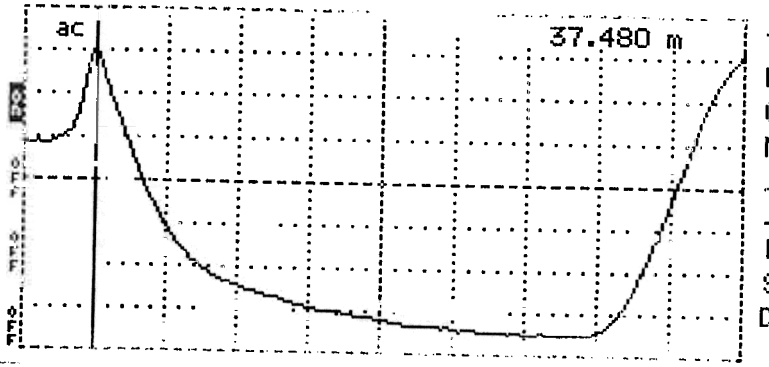
Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-05
Notes AIR
UTOLEDO
Input Trace
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	__.__	__.__

Data Sheet SMP-C01: TDR Probe Check

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [__] LTPP Section ID [____]

Cursor ..... 37.480 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... . ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-05
Notes WATER 70.2°F

UTOLEDO

Input Trace .
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	__.__	___.__

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: _____ TDR Probe Length, L: m Length of Coax Cable: m

Comments: _____

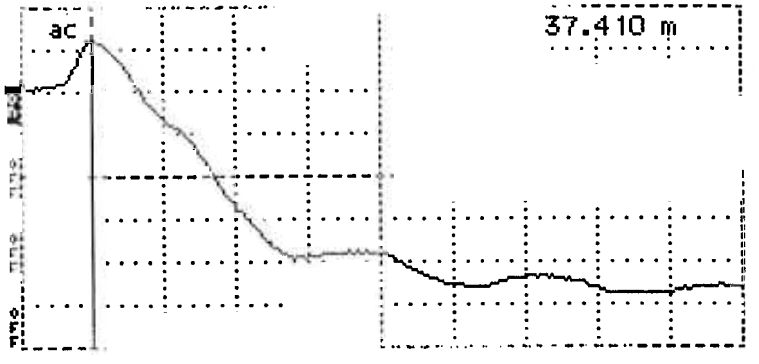
_____

Prepared by: _____ Employer: _____

Date (dd/mm/yy): __ __ / __ __ /

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [39] LTPP Section ID [____]

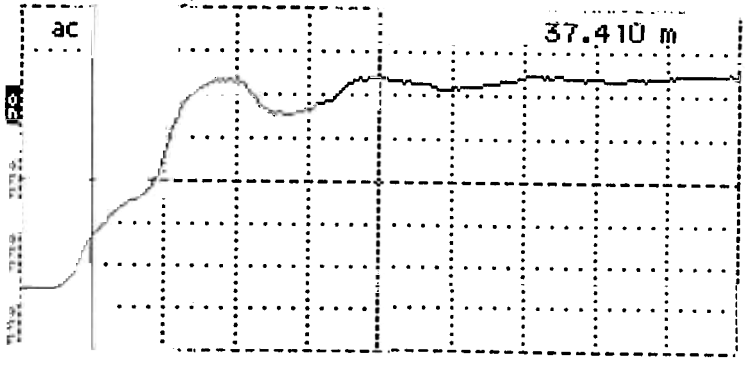
Cursor ..... 37.410 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-06
Notes Shorted
UTOLEDO
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	__.__	___.__

Cursor ..... 37.410 m
Distance/Div.. .. .25 m/div
Vertical Scale. .. 172 mρ/div
Vp 0.99
Noise Filter... .. 1 avg
Power..... .. ac

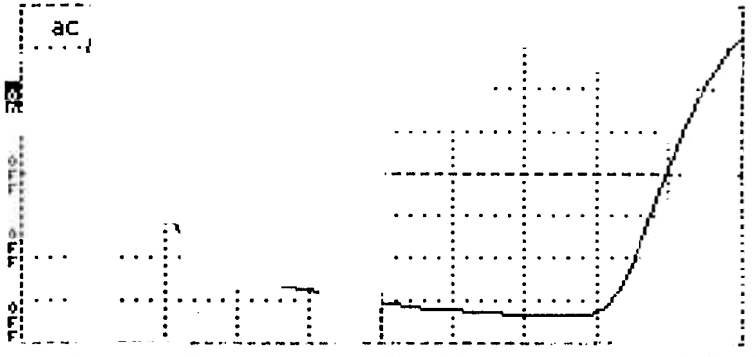


Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-06
Notes AIR
UTOLEDO
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	__.__	___.__

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [39] LTPP Section ID [_ _ _ _]

Cursor ..... . 37.400 m
Distance/Div... . .25 m/div
Vertical Scale.. . 74.8 mρ/div
Vp 0.99
Noise Filter.... . 1 avg
Power ..... . ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-06
Notes WATER
70.2°F
UTOLEDO
Input Trace _____
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	_ . _ _	_ _ . _ _

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 \quad \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: _ _ _ _ _ _ TDR Probe Length, L: _ _ _ m Length of Coax Cable: m

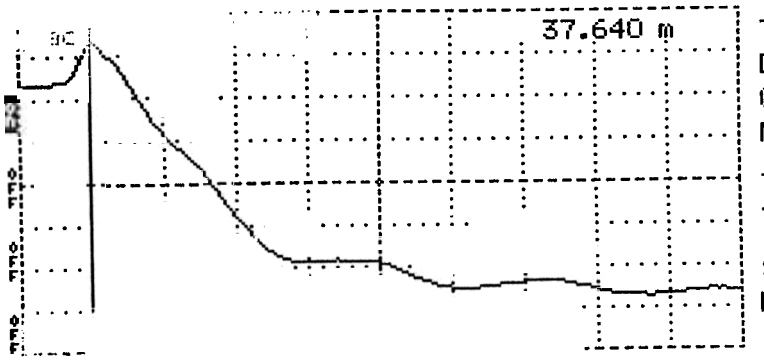
Comments:

Prepared by: _____ Employer: _____

Date (dd/mm/yy): _ _ /

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [39] LTPP Section ID [____]

Cursor ..... 37.640 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



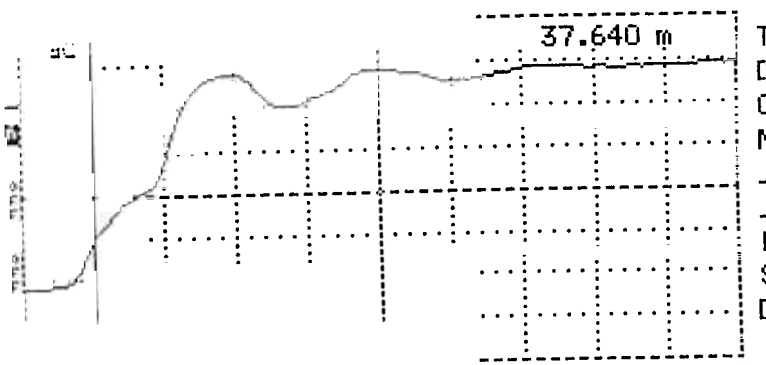
Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-07
Notes Shorted

U Toledo

Input Trace ____
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	__.__	__.__

Cursor ..... 37.640 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-07
Notes Air

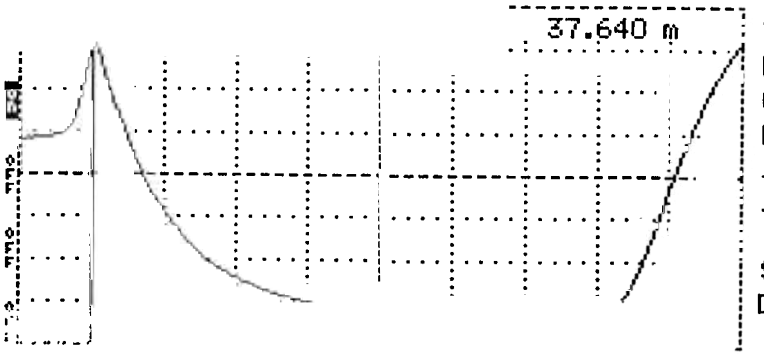
U Toledo

Input Trace ____
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	__.__	__.__

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [39] LTPP Section ID [_ _ _ _]

Cursor ..... . 37.640 m
Distance/Div.... . .25 m/div
Vertical Scale.. . 74.8 mρ/div
Vp 0.99
Noise Filter.... . 1 avg
Power..... . ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-07
Notes water 70.2°F
U Tokeb
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	_ . _ _	_ _ . _ _

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: TDR Probe Length, L: m Length of Coax Cable: m

Comments: _____

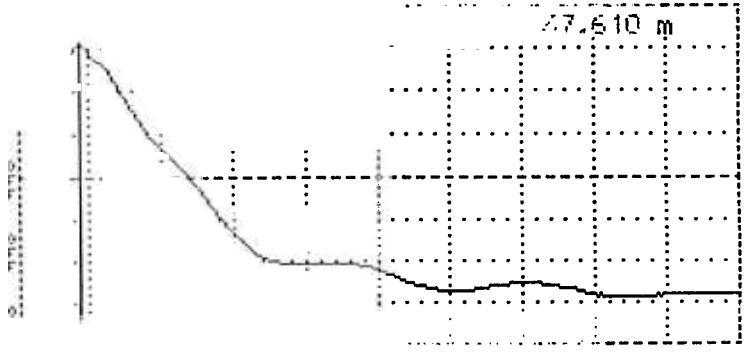
_____

Prepared by: _____ Employer: _____

Date (dd/mm/yy): _ _ / _ _ / _ _

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [39] LTPP Section ID [_ _ _ _]

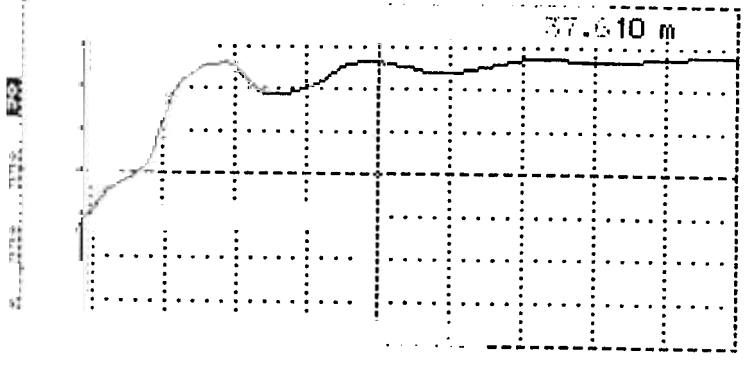
Cursor .... 37.610 m
Distance/Div.. .. .25 m/div
Vertical Scale. .. 172 mρ/div
Vp 0.99
Noise Filter... .. 1 avg
Power..... .. ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-08
Notes Shorted
U Toledo
Input Trace .
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	_ . _ _	_ _ . _ _

Cursor .... 37.610 m
Distance/Div.. .. .25 m/div
Vertical Scale. .. 172 mρ/div
Vp 0.99
Noise Filter... .. 1 avg
Power..... .. ac

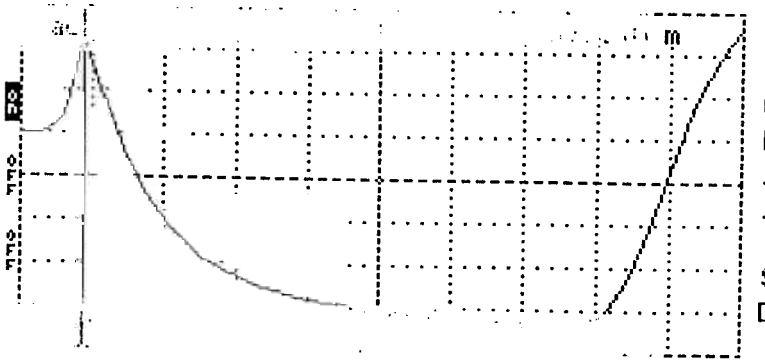


Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-08
Notes Air
U Toledo
Input Trace _____
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	_ . _ _	_ _ . _ _

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [39] LTPP Section ID [____]

Cursor ..... 37.610 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-08
Notes Water 70.2°F
UToledo
Input Trace
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	__.__	__ __.__

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 \quad \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: _ _ _ _ _ _ TDR Probe Length, L: m Length of Coax Cable: m

Comments: _____

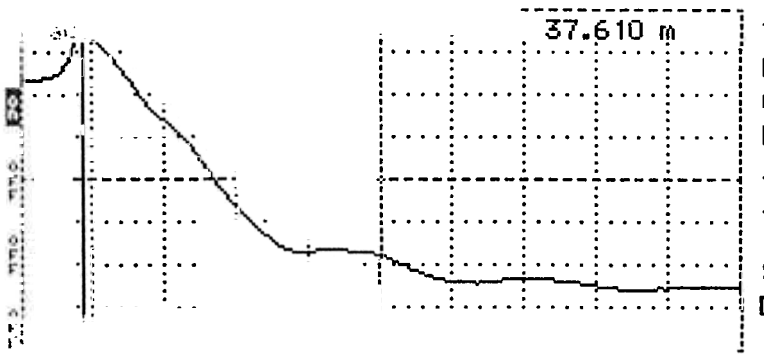
_____

Prepared by: _____ Employer: _____

Date (dd/mm/yy): __ __ / __ __ /

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [39] LTPP Section ID [_ _ _ _]

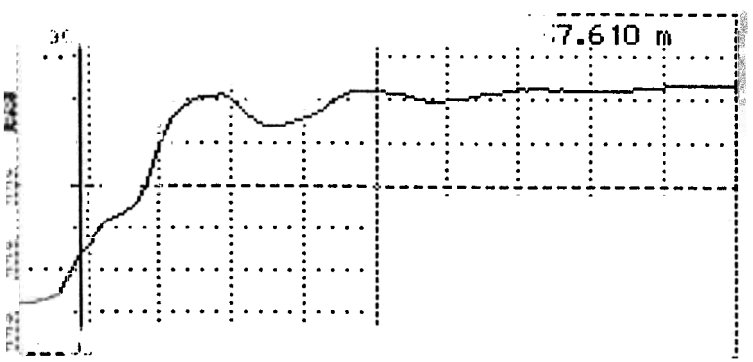
Cursor ..... 37.610 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-09
Notes Shorted
U Toledo
Input Trace ____
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	_._ _	_ _ _._ _

Cursor ..... 37.610 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-09
Notes Air
U Toledo
Input Trace ____
Stored Trace .....
Difference Trace .....

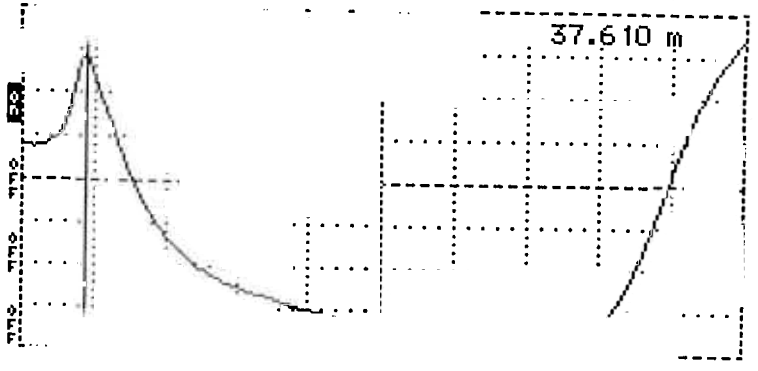
TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	_._ _	_ _ _._ _

LTPP Seasonal Monitoring Program
Data Sheet SMP-C01 (Page 2)
TDR Probe Check

Agency Code [39]

LTPP Section ID [_ _ _ _]

Cursor ..... 37.610 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-09
Notes Water 70.2°F
U Toledo
Input Trace .
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	_ . _ _	_ _ . _ _

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: _ _ TDR Probe Length, L: _ . _ _ _ m Length of Coax Cable: m

Comments: _____

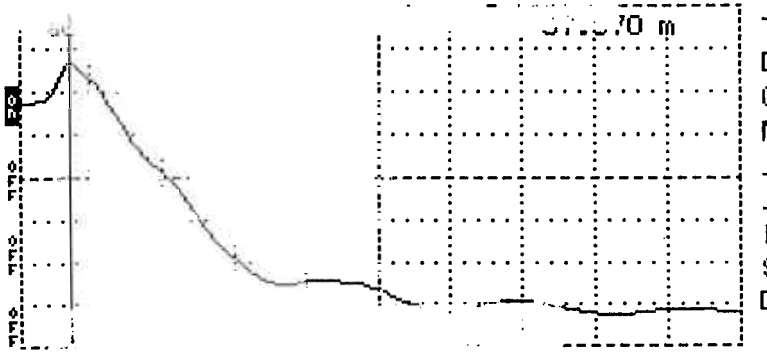
_____

Prepared by: _____ Employer: _____

Date (dd/mm/yy): _ _ / _ _ / _ _

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [39] LTPP Section ID [____]

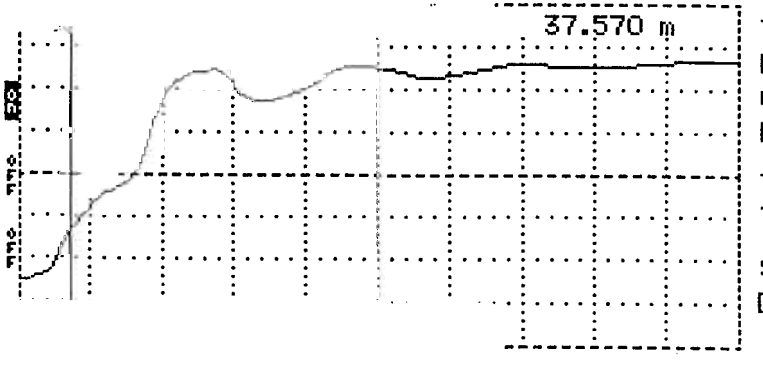
Cursor ..... 37.570 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-10
Notes Shorted
U Toledo
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	__.__	___.__

Cursor ..... 37.570 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac

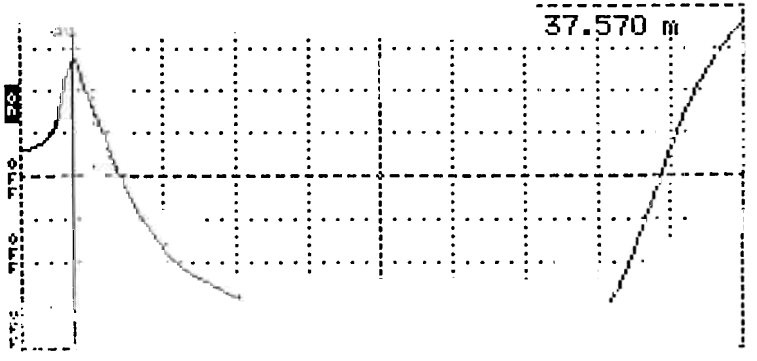


Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-10
Notes Air
U Toledo
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	__.__	___.__

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [39] LTPP Section ID [_ _ _ _]

Cursor ..... 37.570 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/10/95
Cable 39-CJ04-10
Notes Water 70.1°F
U Toledo
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	_ . _ _	_ _ . _ _

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: TDR Probe Length, L: m Length of Coax Cable: m

Comments: _____

_____

Prepared by: _____ Employer: _____

Date (dd/mm/yy): _ _ / _ _ / _ _

LTPP Seasonal Monitoring Program Data Sheet SMP-C02 Thermistor Probe Check	Agency Code [39] ✓ LTPP Section ID [0204]

Thermistor Probe Assigned Serial Number : [375 F T]

Air Temperature Probe Assigned Serial Number: [___ A T]

Thermistor Number	Distance from Top (m)	Temperature (°C) – Calibration in: Ice-Bath; T = 1.5 °C	Other Air; T = 27.5 °C	Comments
1	0.000	0.3	26.3	
2	.____	0.5	26.2	
3	0.295	0.6	26.4	
4	0.020	4.3	26.8	Black Cable effects temp
5	0.095	2.0	26.7	
6	0.172	1.7	26.7	
7	0.248	1.8	26.6	
8	0.324	1.8	26.5	
9	0.425			
	0.627		26.5	
11	0.7__		26.5	
12	0.932	1.6	26.6	
13	1.084	0.8	26.6	
14	1.236	0.8	26.9	
15	1.390	0.9	26.9	
16	1.543	1.1	27.0	
17	1.695	1.2	26.7	
18	1.850	1.6	26.7	
End	1.858	n/a	n/a	
Air Probe	n/a	____.__	____.__	

Comments: Measurement From top of probe
Length of Iron rod 0.795 m

Prepared by: LP Employer: UTOLEDO

Date (dd/mm/yy): 17/04/95

LTPP Seasonal Monitoring Program Data Sheet SMP-C03 Resistivity Probe Check	Agency Code [39] LTPP Section ID [0204]

R J4(SMS2)

DB37 Connector Pin Number	Electrode Number	Distance from Top (m)			Continuity ✓	Spacing (m)	Comments
		Line 1	Line 2	Avg			
1 36	1	0.023	0.024	0.023	✓	0.023	
20 35	2	0.073	0.075	0.074	✓	0.051	
2 34	3	0.124	0.126	0.125	✓	0.051	
21 33	4	0.175	0.177	0.176	✓	0.051	
3 32	5	0.225	0.227	0.226	✓	0.050	
22 31	6	0.276	0.278	0.277	✓	0.051	
4 30	7	0.328	0.330	0.329	✓	0.052	
23 29	8	0.379	0.381	0.380	✓	0.051	
5 28	9	0.430	0.431	0.430	✓	0.050	
24 27	10	0.480	0.482	0.481	✓	0.051	
6 26	11	0.531	0.533	0.532	✓	0.051	
25 25	12	0.582	0.583	0.582	✓	0.050	
7 24	13	0.633	0.635	0.634	✓	0.052	
26 23	14	0.682	0.685	0.684	✓	0.050	
8 22	15	0.735	0.736	0.735	✓	0.051	
27 21	16	0.784	0.786	0.785	✓	0.050	
9 20	17	0.836	0.837	0.836	✓	0.051	
23 19	18	0.887	0.889	0.888	✓	0.052	
10 18	19	0.936	0.938	0.937	✓	0.049	
24 17	20	0.988	0.990	0.989	✓	0.052	
11 16	21	1.037	1.039	1.038	✓	0.049	
30 15	22	1.089	1.091	1.090	✓	0.052	
12 14	23	1.141	1.142	1.141	✓	0.051	
31 13	24	1.190	1.192	1.191	✓	0.050	
13 12	25	1.241	1.243	1.241	✓	0.050	
32 11	26	1.292	1.294	1.293	✓	0.052	
14 10	27	1.343	1.345	1.344	✓	0.051	
33 9	28	1.394	1.396	1.395	✓	0.051	
15 8	29	1.444	1.445	1.444	✓	0.049	
34 7	30	1.495	1.497	1.496	✓	0.052	
16 6	31	1.545	1.547	1.546	✓	0.050	
35 5	32	1.597	1.599	1.598	✓	0.052	
17 4	33	1.647	1.649	1.648	✓	0.050	
36 3	34	1.698	1.699	1.698	✓	0.050	
18 2	35	1.750	1.751	1.750	✓	0.052	
37 1	36	1.798	1.800	1.799	✓	0.049	
NOTHING 19	Bottom	1.847	1.847	1.847	n/a	n/a	

Comments: _____

Prepared by: BL UTOL Employer: UTOLEDO

Date (dd/mm/yy): 13/04/95

Appendix C Instrumentation Installation Information

1. Data Sheet SMP-I01: List of Installed Instrumentation
2. Data Sheet SMP-I02: Instrumentation Locations
3. Data Sheet SMP-I03: Log of Piezometer Hole
4. Data Sheet SMP-I04: Log of Instrumentation Hole
5. Data Sheet SMP-I05: Field Gravimetric Moisture Contents
6. Data Sheet SMP-I06: TDR Moisture content
7. TDR Traces
8. Installation Photographs

LTPP Seasonal Monitoring Program Data Sheet SMP-I01 Instrumentation Installed and Participants	Agency Code [39] LTPP Section ID [0204]

List of Equipment:

Equipment	Quantity	Serial Number(s)
Instrument Hole:		
Thermistor Probe	01	375F T
Resistivity Probe	01	____ R
TDR Sensors	10	____ 01 to ____ 10
Equipment Cabinet:		
Campbell Scientific CR10 Datalogger	__	______
Battery Package	__	______
Weather Station:		
Rain Gauge	__	______
Air Temperature Probe	__	____ A T
Radiation Shield	__	______
Observation Piezometer/Bench Mark:	__	n/a

List of Participants:

Name of Participant	Agency/Employer
Andrew Heydinger	Univ. of Toledo
Brian Randolph	
Bradley Lowery	
Ludwig Figueroa	CWR. Univ.
Damon	Ohio Univ

Prepared by: _____ Employer: U. of Toledo

Date (dd/mm/yy): 20/07/95

Data Sheet SMP-I01: List of Installed Instrumentation

LTPP Seasonal Monitoring Program Data Sheet SMP-I02 Installed Instrument Location	Agency Code [39] LTPP Section ID [0204]

Longitudinal and Transverse Location of Instrumentation:

Instrument	Station (Customary Units)		Offset (m)[1]	
	Planned	Actual	Planned	Actual
Instrumentation Hole	_____	5+488	0.76	0.76
Observation Piezometer	_____	3+85	___.___	-4.00
Equipment Cabinet	_____	5+505	___.___	-11.0
Weather Station	_____	≈5+488	___.___	≈-27.0

[1] Transverse distance in meters from pavement edge (see LTTP Manual for FWD Testing) with (+) values toward mid-lane and (-) towards shoulder

Depth Location of Instrumentation:

Instrument		Depth from Pavement Surface to Top of Probe (m)		Comments
		Planned	Actual	
Thermistor Probe	Metal Top	_.____	_.____	
	Metal Bottom	_.____	_.____	
	PVC Top	0.33	0.48	
Resistivity Probe		0.33	0.48	

TDR Number	Depth from Pavement Surface to Probe (m)		Comments
	Planned Location	Actual Location	
1	0.36	0.36	Upside down
2	0.51	0.51	Upside down
3	0.66	0.66	
4	0.81	0.81	
5	0.97	0.97	
6	1.12	1.12	
7	1.27	1.27	
8	1.42	1.42	
9	1.73	1.73	
10	2.03	2.03	

ATTACH TOP-VIEW SKETCH OF INSTRUMENTATION HOLE SHOWING DIRECTION OF TRAFFIC AND LOCATION OF THERMISTOR AND RESISTIVITY PROBES. LABEL PROBES "T" AND "R", RESPECTIVELY

Prepared by: A. Heydinger Employer: U. of Toledo

Date (dd/mm/yy): 20/07/95

Data Sheet SMP-I02: Instrumentation Location

LTPP Seasonal Monitoring Program Data Sheet SMP-I03 Log of Piezometer Hole	Agency Code [37] LTPP Section ID [0204]

Operator: _____ Equipment Used: Drill Rig

Location: Station: 3+85 Offset: 4.0 / 0.91 m (from lane edge) from shoulder edge

Bore Hole Diameter: 150 . mm Auger Type: solid Flight

Scale (m)	Depth from Surface[1] (m)	Material Description	Material Code[2]
0.5			
1.0			
1.5			
2.0			
2.5			
3.0			
3.5			
4.0			
4.5			
5.0			

[1] Format: m; [2] Format:

Prepared by: Brad Young Employer: Ohio DoT

Date (dd/mm/yy): 24/07/96

Data Sheet SMP-I03: Log of Piezometer Hole

LTPP Seasonal Monitoring Program Data Sheet SMP-I04 Log of Instrumentation Hole	Agency Code [39] LTPP Section ID [0204]

Operator: _____ Equipment Used: Drill Rig

Location: Station: 3+85 Offset: 0.91 m (from lane edge) - edge of shoulder
4.0 0 m from edge of white line (pavement edge)

Bore Hole Diameter: 300. mm (12")

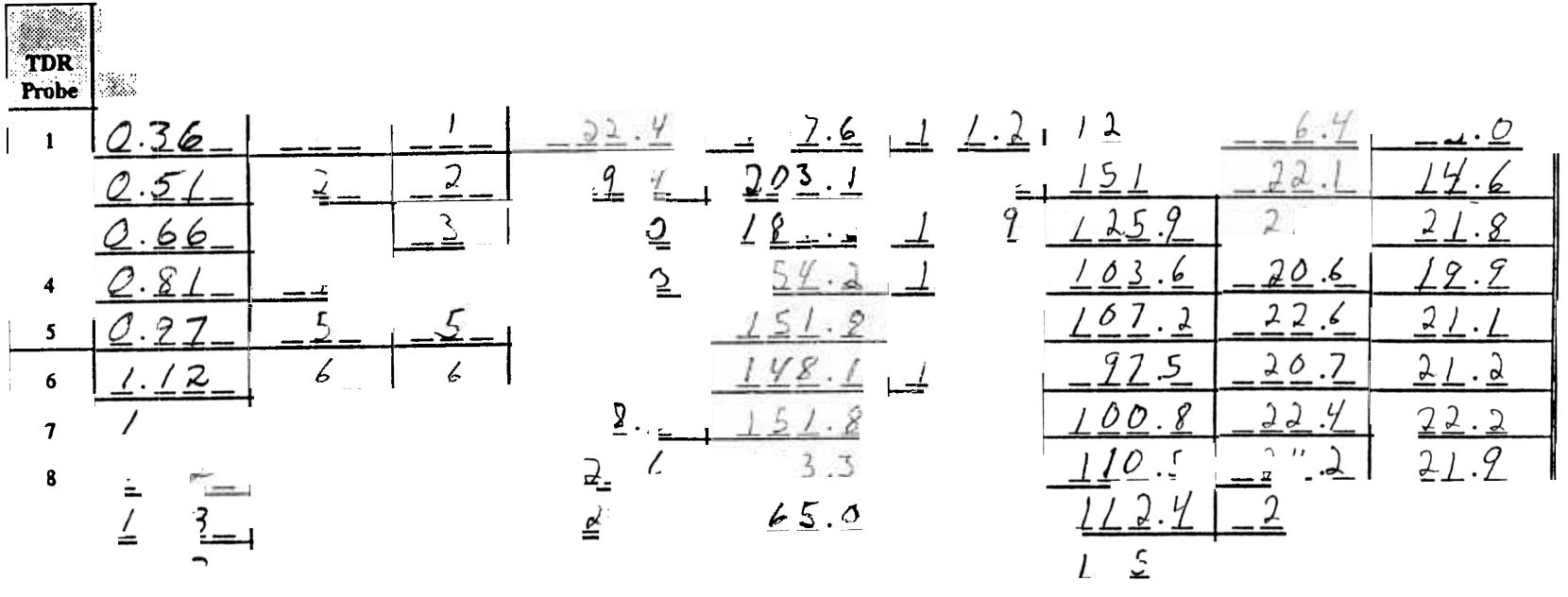
Scale (m)	Strata Change[1] (m)	Material Description	Material Code[2]
0.10	0.15	Base, coarse aggregate	
0.20		Brown silty Clay	
0.30			
0.40			
0.50	0.60	Redish brown clay	
0.60			
0.70			
0.80			
0.90			
1.00			
1.10			
1.20			
1.30			
1.40			
1.50			
1.60			
1.70	1.75	Bottom of hole	
1.80			
1.90			
2.00			
2.10			
2.20			
2.30			
2.40			
2.50			

[1] Format: m; [2] Format:

Prepared by: A. Heydinger Employer: U. of Toledo

Date (dd/mm/yy): 20/07/95

LTPP Seasonal Monitoring Program Data Sheet SMP-I05 Field Gravimetric Moisture Content	Agency Code [39] LTPP Section ID [0204]



TDR Probe											
1	0.36		1	22.4	7.6	1	1.2	12	6.4	2.0
	0.51	2	2	9 4	203.1			151	22.1	14.6
	0.66		3	0	18	1	9	125.9	2	21.8
4	0.81			2	54.2	1		103.6	20.6	19.9
5	0.27	5	5		151.9			107.2	22.6	21.1
6	1.12	6	6		148.1	1		97.5	20.7	21.2
7	1			2	151.8			100.8	22.4	22.2
8				1	3.3			110.5	2	21.9
	1	3		2	65.0			112.4	2	
								1 5		

Prepared by: BL

Date (dd/mm/yy): 24/07/95

Data Sheet SMP-I05: Field Gravimetric Moisture Contents

LTPP Seasonal Monitoring Program Data Sheet SMP-I06 TDR Moisture Content	Agency Code [39] LTPP Section ID [02 04]

Required Settings:

Dist./Division: 0.25 m
Phase Velocity: 0.99
Noise Filter: 1 average

Probe Number	Probe Depth[1] (m)	Time (military)	Apparent Length (m)	Dielectric Constant[2]	Comments
1	0.36	930	0.60	8.9	
2	0.51	1000	0.47	4.4	
3	0.66	1030	0.82	16.6	
4	0.81	1100	0.87	18.7	
5	0.97	1130	0.90	20.1	
6	1.12	1200	0.90	20.1	
7	1.27	1230	0.88	19.2	
8	1.42	1300	0.88	19.2	
9	1.73	1330	0.86	18.3	
10	2.03	1400	0.78	15.1	

[1] Distance in meters from pavement surface to TDR probe
[2] Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

ATTACH TDR TRACES TO THIS DATA SHEET.

Comments: _____

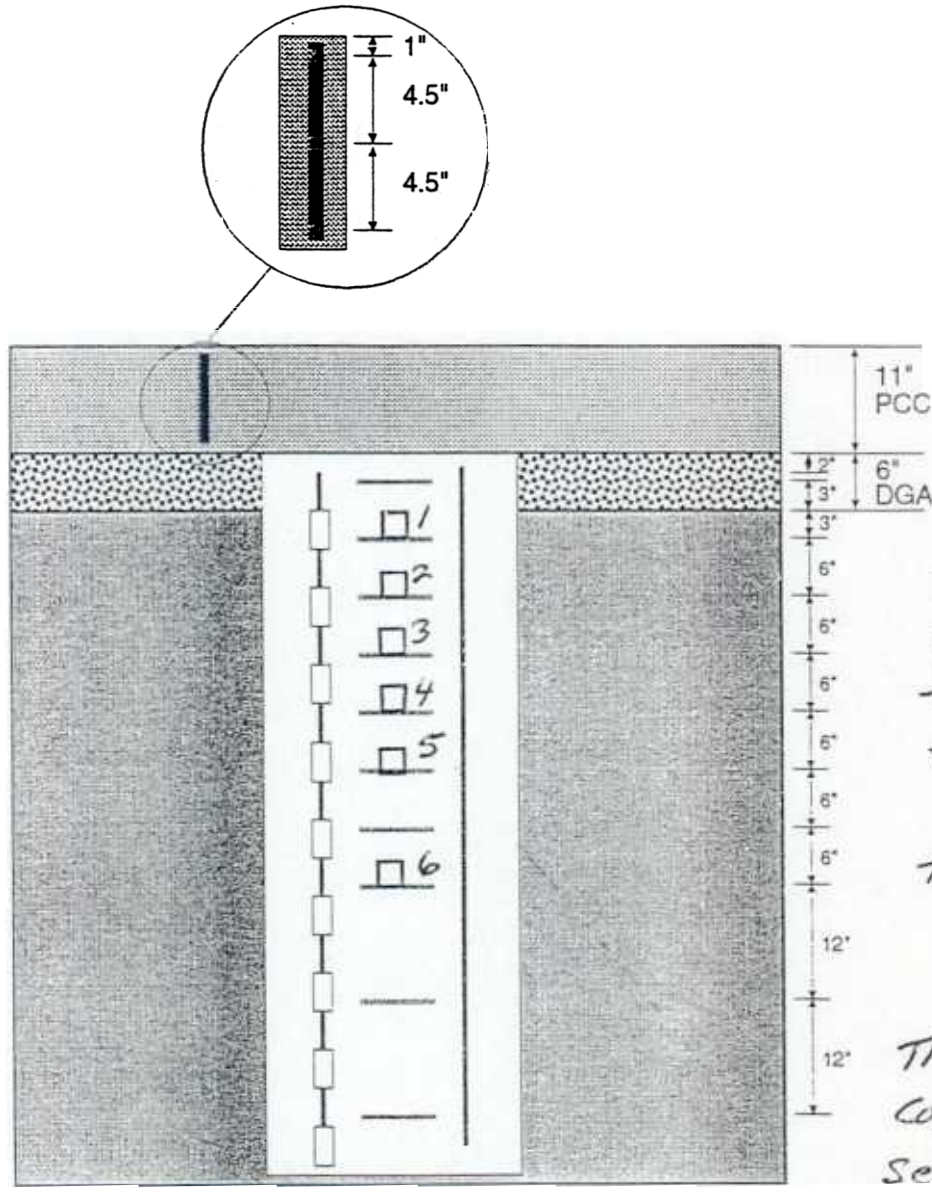
_____

_____

Prepared by: A. Heybinger Employer: U TOLEDO

Date (dd/mm/yy): 20/07/95

Data Sheet SMP-I06: TDR Moisture Content



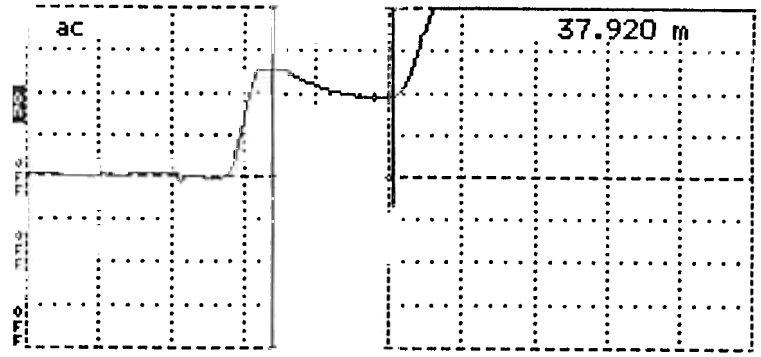
TCS #1 - 950
TCS #2 - 951
TCS #3 - 951
TCS #4 - 950
TCS #5 - 950
TCS #6 - 950

Thermal conductivity sensors (TCS) calibrated for soil matric suction

F Section J3 and J4 (SPS2 Se nal Instrumentation

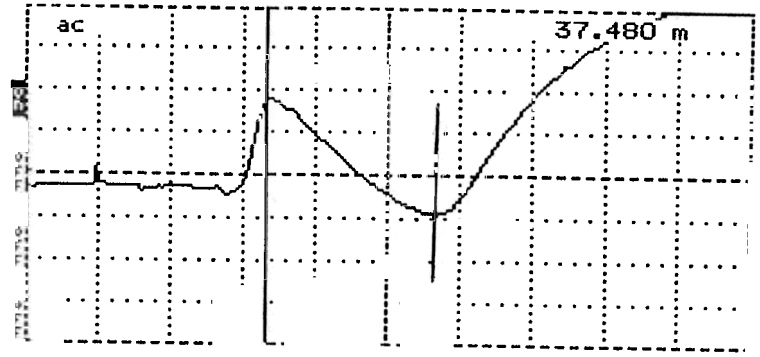
390204

Cursor ..... 37.920 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mΩ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



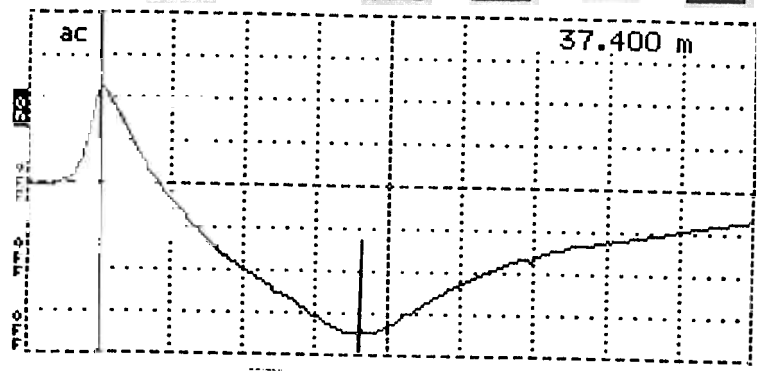
Tektronix 1502B TDR
Date 20 July 1995
Cable TDR #1 SPS2-J4
Notes During Install
-Dry Base
Input Trace
Stored Trace
Difference Trace

Cursor ..... 37.480 m
Distance/Div... . .25 m/div
Vertical Scale.. . 74.8 mΩ/div
VP 0.99
Noise Filter.... . 1 avg
Power..... . ac



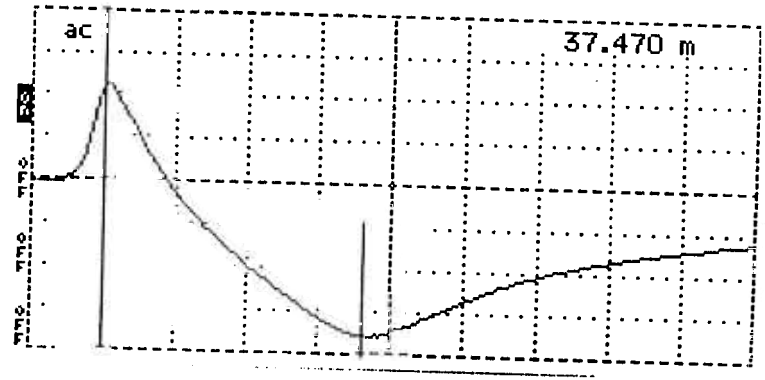
Tektronix 1502B TDR
Date 20 July 1995
Cable TDR #2 SPS2-J4
Notes During Install
Input Trace
Stored Trace
Difference Trace

Cursor .... 37.400 m
Distance/Div.. .. .25 m/div
Vertical Scale. .. 74.8 mΩ/div
VP 0.99
Noise Filter... .. 1 avg
Power..... .. ac



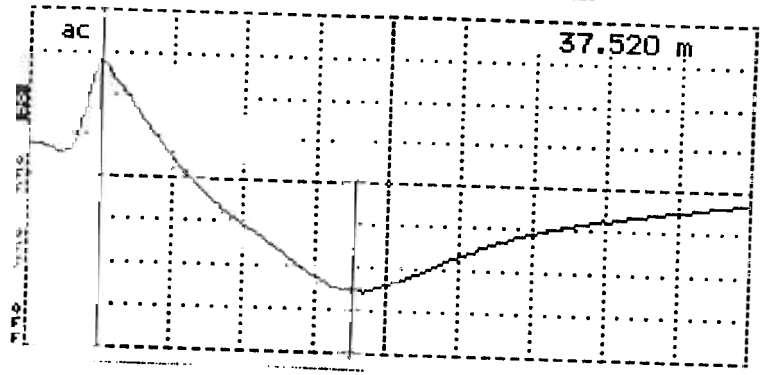
Tektronix 1502B TDR
Date 20 July 1995
Cable TDR #6 SPS2 - J4
Notes During Install
Input Trace
Stored Trace
Difference Trace

Cursor ..... 37.470 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mΩ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



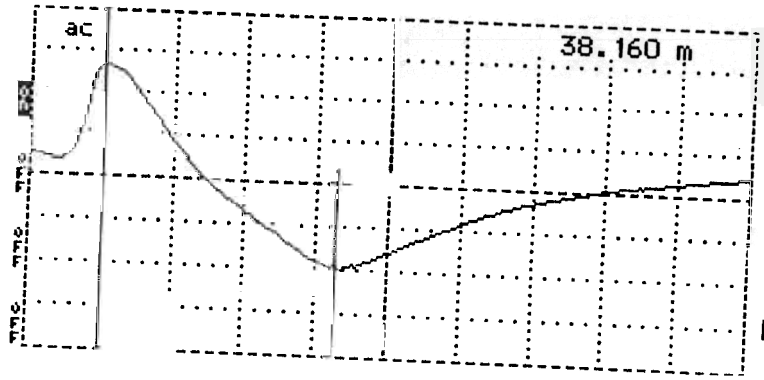
Tektronix 1502B TDR
Date 20 July 95
Cable TDR #6 SPS2 - J4
Notes During Install
Input Trace
Stored Trace
Difference Trace

Cursor ..... 37.520 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mΩ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



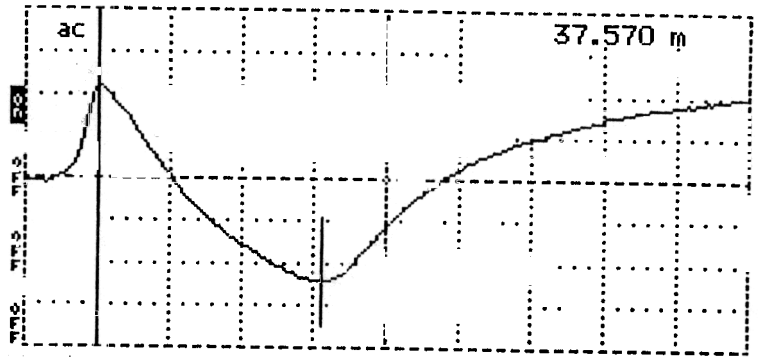
Tektronix 1502B TDR
Date 20 July 95
Cable TDR # 4 SPS2 - J4
Notes During Install
Input Trace
Stored Trace
Difference Trace

Cursor ..... 38.160 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mΩ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



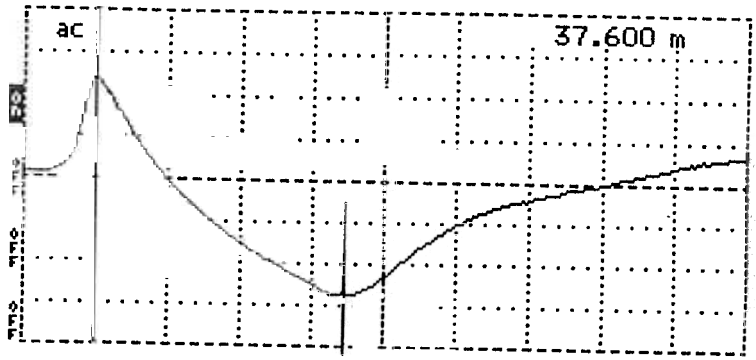
Tektronix 1502B TDR
Date 20 July 1995
Cable TDR #3 SPS2 - J4
Notes During Install
Input Trace
Stored Trace
Difference Trace

Cursor ..... 37.570 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mΩ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



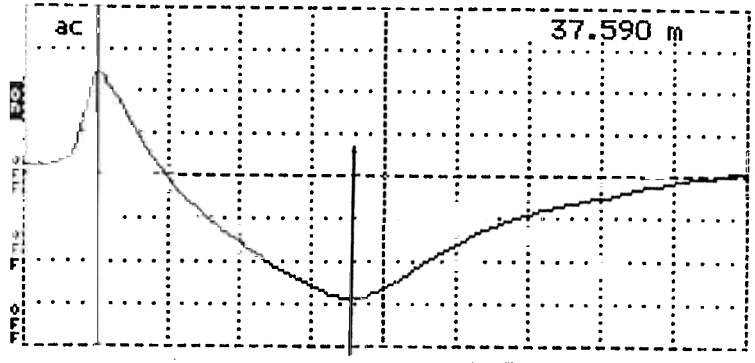
Tektronix 1502B TDR
Date 20 July '95
Cable TDR#10 SPS-2 J4
Notes During install
Input Trace
Stored Trace
Difference Trace

Cursor ..... 37.600 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mΩ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



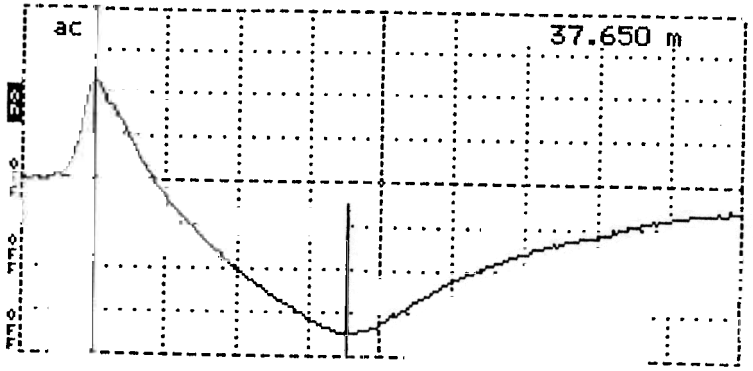
Tektronix 1502B TDR
Date 20 July 1995
Cable TDR#9 SPS2 - J4
Notes During Install
Input Trace
Stored Trace
Difference Trace

Cursor ..... 37.590 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mΩ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 20 July 1995
Cable TDR #8 SPS2-J4
Notes During Install
Input Trace
Stored Trace
Difference Trace

Cursor ..... 37.650 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mΩ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 20 July 1995
Cable TDR #7 SPS2-J4
Notes During Install.
Input Trace
Stored Trace
Difference Trace

Photo 1 Instrumentation Hole at SMP site

Photo 2 Compaction of backfill soil at Instrumentation Hole

Appendix D Initial and Regular SMP Monitoring Data Collection

1. Data Sheet SMP-D10: SMP Field Activity Report
2. Data Sheet SMP-C06: Resistivity Calibration Block Check
3. Data Sheet SMP-D03: Contact Resistance Measurements
4. Data Sheet SMP-D04: Four-Point Resistivity Measurements
5. Data Sheet SMP-D05: Ground Water Table Measurements
6. Data Sheet SMP-D06: Joint Opening Measurement
7. Data Sheet SMP-D07: Joint Faulting Measurement
8. Data Sheet SMP-D09: Surface Elevation Measurements – PCC Pavements
9. Summary of regular data collection activities

LTPP Seasonal Monitoring Program Data Sheet SMP-D10 SMP Field Activity Report		Agency Code [3 9] LTPP Section ID [0 2 0 4]
Onsite Datalogger and Instrumentation		
File Name - *.ONS	395A98CE	Comments: All OK
Battery Replace	Yes - (No)	Voltages 12.5
Repairs/Calib.		
Other:		
Mobile Datalogger		
File Name - *.MOB		Comments:
TDR/Resistance Voltages	Sets (0 2)	
Other:		
Manual Data Collection		
Piezometer	(Yes) - No	Comments:
Resistance 2 pt.	Sets (0 1)	
Resistivity 4 pt.	Sets (0 1)	
Elevations	Sets (0 1)	
Distress Survey	Yes - (No)	
Long. Dipstick Profile	Yes - (No)	
Photos or Video	Yes - (No)	
Other:		
FWD and Associated Data		
FWD Testing	Sets (0 2)	Operator: GFE
JCP - Snap Rings	Sets (0 2)	
JCP - Faulting	Sets (0 2)	
Other:		

IF REQUIRED, ATTACH SKETCHES TO THIS DATA SHEET

Comments: _____

Prepared by: GFE Employer: ERES/NCR

Date (dd/mmm/yy): 13/MAY/98 Daylight Savings Time (Y) or N): Y

LTPP Seasonal Monitoring Program Data Sheet SMP-C06 Resistivity Calibration Block Check	Agency Code [25] LTPP Section ID [0204]

Test Position	Switch Box Settings		Voltage		Current		Resistance
	I1 V1	I2 V2	Setting	Reading	Setting	Reading	Calculated (Ω)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	1	2	4mV	152.4	4mA	152.7	
2	2	3		139.0		138.9	
3	3	4		153.2		154.1	
4	4	5		151.7		152.0	
5	5	6		153.7		153.6	
6	6	7		153.4		154.0	
7	7	8		152.7		153.2	
8	8	9		9.1		9.1	
9	9	10		148.9		145.6	
10	10	11		155.6		152.1	
11	11	12		153.1		154.2	
12	12	13		153.3		154.0	
13	13	14		153.1		154.1	
14	14	15		152.3		153.0	
15	15	16		153.2		153.8	
16	16	17		153.1		152.6	
17	17	18		~~334.7~~		~~0.1~~	153.8 / 152.6
18	18	19		~~334.7~~		~~0.1~~	135.5 / 135.9
19	19	20		153.3		154.1	
20	20	21		153.3		154.1	
21	21	22		2.6		2.6	
22	22	23		2.9		2.9	
23	23	24		153.1		153.2	
24	24	25		153.4		154.1	
25	25	26		[illegible]		154.0	
26	26	27				153.6	
27	27	28				152.0	
28	28	29		[illegible]		153.6	
29	29	30		[illegible]		153.7	
30	30	31		[illegible]		153.3	
31	31	32		[illegible]		153.9	
32	32	33		[illegible]		154.1	
33	33	34		[illegible]		[illegible]	
34	34	35		[illegible]		[illegible]	
35		1		[illegible]			

LTPP Seasonal Monitoring Program Data Sheet SMP-D03 Contact Resistance Measurements	Agency Code [39] LTPP Section ID [10104]

Start Time (military): 1510

Test Position	Switch Settings		Voltage (ACV)		Current (ACA)		Comments
	I1 V1	I2 V2	Range Setting	Reading	Range Setting	Reading	
1	1	2	2.11	57.0	2.12	230.1	
2	2	3		43.1		207.7	
3	3	4		48.1		240.6	
4	4	5		45.7		237.9	
5	5	6		41.9		245.8	
6	6	7		42.1		245.8	
7	7	8		44.7		241.4	
8	8	9		0.1		0.1	
9	9	10		41.2 ~~33.3~~		221.9 ~~0.7~~	
10	10	11		45.1		243.7	
11	11	12		~~39.0~~		~~249.1~~	
12	12	13		41.8		246.7	
13	13	14		40.3		247.9	
14	14	15		42.4		243.2	
15	15	16		45.2		243.9	
16	16	17		56.5		232.7	
17	17	18		332.2		0.1	Bad channel
18	18	19		332.3		0.1	
19	19	20		67.1		225.6	
20	20	21		58.0		233.4	
21	21	22		0.1		0.1	
22	22	23		0.2		0.6	
23	23	24		46.3		238.9	
24	24	25		44.5		245.1	
25	25	26		46.2		243.4	
26	26	27		46.4		243.3	
27	27	28		40.2		243.4	
28	28	29		39.3		248.4	
29	29	30		39.8		248.4	
30	30	31		36.5		246.7	
31	31	32		38.9		249.7	
32	32	33		37.4		251.1	
33	33	34		35.1		252.1	
34	34	35		43.0		246.8	
35	35	36		61.8		230.5	
36	36	37		0.3		280.1	R1 =
37	37	38		26.2		260.9	R2 =
38	38	39		153.2		152.9	R3 =
39	39	00		332.5		0.3	R4 =

Note: R = V/I, in ohms; measured resistances should be compared with known values.

Comments: ~~AC~~

Prepared by: GFE Employer: ERES/NCR

Date (dd/mmm/yy): 13/MAY/98

Data Sheet SMP-D03: Contact Resistance Measurements

LTPP Seasonal Monitoring Program Data Sheet SMP-D04 Four-Point Resistivity Measurements		[3 8]
	LTPP Section ID	[0 2 0 4]

Start Time (military): 0 3 2 9

Test Position	Switch Settings				Voltage (ACV)		Current (ACA)		Comments
	I1	V1	V2	I2	Range Setting	Reading (Volts)	Range Setting	Reading (Amps)	
1	1	2	3	4	milli	3.4	micro	229.5	
2	2	3	4	5		3.2		205.5	
3	3	4	5	6		3.5		242.8	
4	4	5	6	7		3.6		234.6	
5	5	6	7	8		~~2.9~~ 3.0		242.1	
6	6	7	8	9		2.9		247.4	
7	7	8	9	10		3.1		238.6	
8	8	9	10	11		0.1		0.1	
9	9	10	11	12		2.8		230.3	
10	10	11	12	13		2.4		240.0	
11	11	12	13	14		2.6		248.4	
12	12	13	14	15		2.3		243.6	
13	13	14	15	16		2.4		242.9	
14	14	15	16	17		2.2		232.7	
15	15	16	17	18		0.1		0.1	
16	16	17	18	19		22.7		230.9	
17	17	18	19	20		6.8		184.6	
18	18	19	20	21		0.1		0.1	
19	19	20	21	22		3.7		230.8	
20	20	21	22	23		3.4		228.9	
21	21	22	23	24		0.1		6	
22	22	23	24	25		0.1		3.7	
23	23	24	25	26		3.2		237.4	
24	24	25	26	27		2.8		242.6	
25	25	26	27	28		3.2		245.4	
26	26	27	28	29		2.8		241.8	
27	27	28	29	30		2.9		240.2	
28	28	29	30	31		2.7		248.3	
29	29	30	31	32		2.5		244.9	
30	30	31	32	33		2.4		247.6	
31	31	32	33	34		2.4		247.8	
32	32	33	34	35		2.1		241.4	
33	33	34	35	36		2.5		232.7	
36	36	36	37	37		0.3		281.3	R1 =
37	37	37	38	38		26.2		260.4	R2 =
38	38	38	39	39		153.3		157.0	R3 =
39	39	39	00	00		333.6		8.3	R4 =

Note: R = V/I, in ohms; measured resistances should be compared with known values.

Comments: Probe connector is rusty.

Prepared by: GFE Employer: ERES/NCR

Date (dd/mmm/yy): 12/MAY/98

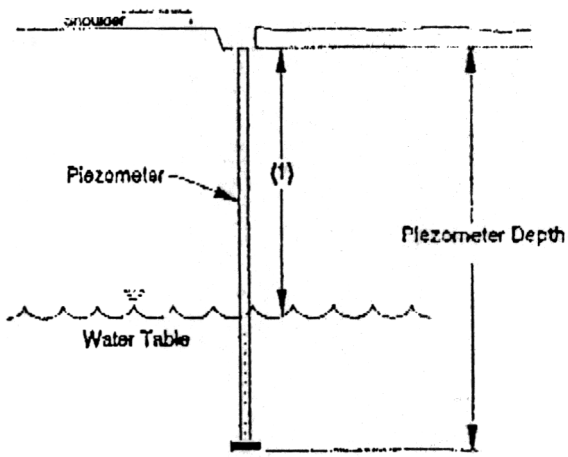
LTPP Seasonal Monitoring Program Data Sheet SMP-D05 Ground Water Table Measurement	Agency Code	[0 9]
	LTPP Section ID	[0 2 0 4]

Piezometer Depth (m): 4.67

Measurement Number	Time (military)	Depth to Water[1,2] (m)	Comments
1	0830	2.36	
2	1550	2.36	

[1] Distance from top of piezometer pipe to top of ground water table; to an accuracy of ±10 mm (0.4 in)

[2] If piezometer pipe is dry or frozen, enter "time" when observation was made, leave "depth to water" field blank, and enter "pipe is dry" or "pipe is frozen" under comments column.



(1) = 7.75 ft

Depth = 15.0 ft

Comments: _____

Prepared by: GFE Employer: ERES/NCR

Date (dd/mmm/yy): 13/MAY/98

Station	Time (military)	Joint Opening (mm) Offset (PE): 0.30 m	Offset (ML): 7.87 m	Offset (ILE): 5.35 m	Joint Width (mm)
0+10	1042	116.73	117.43	115.96	
		.72	.43	.95	12
3.0		.73	.43	.97	
	1308	116.54	117.23	115.76	
0+25	1046	115.41	116.38	116.59	
		.42	.38	.61	12.
7.6		.41	.39	.59	
	1314	115.36	116.34	116.38	
0+40	1052	116.28	116.45	116.[illegible]	13
		.28	.44	.[illegible]	13 10.
12.2		.27	.45	.[illegible]	12
	1320	116.06	.24	116.12	
0+55	1057	117.58	116.66	116.57	
		.58	.67	.56	14.
16.8		.59	.65	.58	
	1325	116.96	116.45	116.40	
0+70	1104	116.72	116.94	116.64	
		.72	.93	.64	11.
21.6		.71	.94	.64	
	1331	116.62	116.54	116.50	
0+85	1113	117.10		116.58	
		.11		.51	11.
25.9		.10	.78	.58	
	1339	116.94	115.63	116.44	

Comments: _____

Prepared by: GFE Employer: ERES/NCR

Date (dd/mmm/yy): 13/MAY/96

LTPP Seasonal Monitoring Program Data Sheet SMP-D07 Joint Faulting Measurement	Agency Code [37]
	LTPP Section ID [0204]

Station	Time (military)	Joint Faulting (mm)		
		Offset (OWP): 0.76 m	Offset (ML): 1.83 m	Offset (IWP): 2.90 m
0+10 3.0	1044	1.	0.	0.
	1311	0.	0.	0.
		.	.	.
0+25 7.6	1048	1.	0.	0.
	1317	0.	0.	0.
		.	.	.
0+40 12.2	1054	1.	2.	0.
	1322	0.	0.	0.
		.	.	.
0+55 16.8	1059	1.	0.	0.
	1328	1.	0.	1.
		.	.	.
0+70 21.6	1106	0.	0.	0.
	1324	0.	1.	2.
		.	.	.
0+85 25.9	1114	0.	0.	0.
	1341	0.	0.	0.
		.	.	.

Comments: _____

_____

_____

Prepared by: GFE Employer: ERES/NCR

Date (dd/mmm/yy): 13/MAY/98

LTPP Seasonal Monitoring Program Data Sheet SMP-D09 Elevation Measurements - PCC	Agency Code [38] LTPP Section ID [0204]

Type of Instrument: NA 2 m

Start Time (military): 1240

BM	Station	BS	HI	IFS	FS	ELEV	CLOSE
Piez.	4+00	1.5340					1.5333
Other							

Station	Offset (PE): 0.30 m	Offset (ML): 1.80 m	Offset (ILE): 2.35 m	Comments
0+10	1.5915	1.5593	1.5241	AJ
0+17	1.5777	1.5468	1.5110	MP
0+25	1.5624	1.5311	1.4974	BJ
0+25	1.5615	1.5306	1.4972	AJ
0+32	1.5455	1.5156	1.4795	MP
0+40	1.5315	~~1.5021~~	1.4673	BJ ML = 1.500
0+40	1.5311	1.5006	1.4667	AJ
0+47	1.5610	1.4881	1.4543	MP
0+55	1.5026	1.4737	1.4410	BJ
0+58	1.5017	1.4732	1.4400	AJ
0+62	1.4860	1.4571	1.4232	MP
0+70	1.4714	1.4427	1.4102	BJ
0+70	1.4707	1.4415	1.4094	AJ
0+77	1.4558	1.4264	1.3936	MP
0+85	1.4407	1.4121	1.3808	BJ

Comments: Closure off by .0007. Barely w/i specs.

Prepared by: OFE Employer: ERES/NCR

Date (dd/mmm/yy): 13/MAY/98

39SA-390204, US-23 NB LANES, 5 MI N OF DELAWARE, OH

		ONSITE Data			MOBILE Data		Manual Data								FWD Data				Distress		Profile		Comments
Date dd/mmm/yy	Visit ID	Pvmt. Temp.	Air Temp.	Rain	TDR	Frost Volts	Backup TDR	Backup TDR	Frost 2-Pt.	Frost 4-Pt.	Water Table	Pvmt. Elev.	Joint Open.	Joint Fault	Man. Temp.	OWP	ML	PE	M	P	P	D	
18-Mar-98	98A	P	P	P	P	P																	Reduced data collection due to weather
14-Apr-98	98B	P	P	P	P	P																	Reduced data collect; FWD malf.
13-May-98	98C	P	P	P	P	P			P	P	P	P	P	P	X	2	2	2					First full data collection at site
17-Jun-98	98D	P	P	P	P	P			P	P	P		P	P	X	3	3	3					AT probe malf; replace and check: OK
30-Jul-98	98E	P	P	P	P	P					P	P	P	P	X	2	2	2					2nd AT probe malf, no spare
29-Sep-98	98F	P	P	P	P	P					P	P	P	P	X	3	3	3	P				
29-Oct-98	98G	P	P	P	P	P					P		P	P	X	2	2	2					Took manual TDR data
23-Nov-98	98H	P	P	P	P	P			P	P	P		P	P	X	2	2	2					
22-Dec-98	98I	P	P	P	P	P			P	P					X	2	2	2					
26-Jan-99	99A	P	P	P	P	P			P	P	P												No traffic control due to weather
16-Feb-99	99B	P	P	P	P	P			P	P	P	P	P	P	X	3	3	3					Need corrected TDR cable lengths
23-Mar-99	99C	P	P	P	P	P			P	P	P	P	P	P	X	3	3	3	P				Took manual TDR data
13-Apr-99	99D	P	P	P	P	P			P	P	P		P	P	X	1	1	1					Took manual TDR data
18-May-99	99E	P	P	P							P		P	P	X	3	3	3					Cable reader under repair
10-Jun-99	99F	P	P	P	P	P																	Mobile unit fixed, cable lengths OK
26-Aug-99	99H	P	P	P																			
16-Sep-99	99I	P	P	P																			
14-Oct-99	99J	P	P	P																			

Notes
P Denotes data collected and processed by ERES Consultants, Inc
X Denotes data collected by ERES Consultants, Inc.

Updated April 18, 2000

Submitted to

Mr. Jack Springer
Federal Highway Administration
LTPP Division, HRDI-13
Turner-Fairbanks Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101-2296

Submitted by

ERES CONSULTANTS
A Division of Applied Research Associates, Inc.

505 West University Avenue
Champaign, IL 61820-3915
Phone: (217) 356-4500
Fax: (217) 356-3088
http://www.eresconsultants.com

ERES Project No. 0634