LTPP Seasonal Monitoring Program

Site Installation Report for GPS Section 271028 (27B) Detroit Lakes, Minnesota

Report No. FHWA-

January 1996

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Site Installation Report for GPS Section 271028 (27B) Detroit Lakes, Minnesota

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Report No. FHWA-

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Prepared for

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McLean, Virginia 22101-2296

January 1996

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 GPS Section 271028 (27B) Detroit Lakes, Minnesota	January 1996
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Robert J. Van Sambeek and Ronald R. Urbach	DBNX92700-B6-27B

9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
Braun Intertec Corporation 6875 Washington Avenue South, P.O. Box 39108 Minneapolis, Minnesota 55439-0108	11. Contract or Grant No. DTFH61-92-C-00009

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
Federal Highway Administration LTPP-Division, HNR-40 Turner-Fairbanks Highway Research Center 6300 Georgetown Pike McLean, Virginia 22101-2296	Final Report September 1993 - June 1995
	14. Sponsoring Agency Code

15. Supplementary Notes
Contracting Officer's Technical Representative - Aramis Lopez, HNR-40

16. Abstract

This report contains instrumentation installation details and data collection summaries for GPS test section 271028, which is a core section in the LTPP Seasonal Monitoring Program. This asphalt concrete pavement section on U.S. Highway 10 southeast of Detroit Lakes, Minnesota, was instrumented September 8, 1993. Instrumentation included time domain reflectometry (TDR) probes to estimate moisture content in unbound pavement layers, thermistor probes to measure pavement structure thermal gradients and air temperature, electrical resistivity probe to predict frost/thaw conditions, piezometer to measure water table depth below the pavement surface, and tipping-bucket rain gauge to measure precipitation.

Monitoring data was collected the day after instrument installation and roughly on a monthly basis from September 1993 to June 1995. In addition to temperature and precipitation data that were collected continuously by a datalogger at the site, monitoring data each month usually included Falling Weight Deflectometer data, TDR probe readings, frost/thaw readings, and piezometer readings. On a less regular basis, longitudinal profile data, pavement surface elevation data, and manual distress data were collected as required by FHWA guidelines. A summary of data collected is included in the report.

17. Key Words	18. Distribution Statement
Long Term Pavement Performance, LTPP, Pavement Instrumentation, Seasonal Monitoring Program, SMP, Time Domain Reflectometry, TDR, Resistance, Frost, Thaw, Temperature, Thermistor, Water Table, Piezometer, Falling Weight Deflectometer, FWD	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price

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LTPP Seasonal Monitoring Program
Site Installation Report for GPS Section 271028 (27B)
Detroit Lakes, Minnesota

I. Introduction

This report contains information specific to instrument installation and monitoring data collection for the Long Term Pavement Performance (LTPP) General Pavement Study (GPS) section 271028, which is part of the core Seasonal Monitoring Program (SMP) under the Federal Highway Administration (FHWA) LTPP Division. This pavement section was instrumented on September 8, 1993, and had regular data collection through June 14, 1995. The section will be monitored every other year under the LTPP Study for a ten-year period or until it is removed from the study.

A. Test Site Location

GPS section 271028 is located in west-central Minnesota on the eastbound driving lane of U.S. Highway 10 about 13 miles southeast of Detroit Lakes at milepost 58.3.

B. General Test Section Information

This four-lane divided highway had the original 245-mm thick asphaltic concrete surface placed in 1972 on a coarse-grain subgrade. Additional background information about the section is located in Appendix A-1. This information includes, but is not limited to, the following items:

- SMP location map;
- Detailed section location map;
- SHRP Inventory Data Sheet - traffic, design factors, and layer information;
- SHRP Section Field Verification Form;
- IMS L05A and L05B tables - layer thickness and material type; and
- LTPP Form S04 - base and subgrade moisture data.

Relevant pre-installation monitoring data for the section located in Appendix A-2 includes the following:

- Pre-installation pavement distress data;
- Pre-installation FWD data (includes tests outside the section limits); and
- FWDCHECK program uniformity analysis results.

C. SMP Test Section Information

The geographic location and existing pavement structure place this section in Cell 16 of the SMP experiment, which is defined by the following parameters:

- Thick asphaltic concrete pavement (more than 127-mm thick);
- Coarse-grain subgrade;
- Freezing environment; and
- Wet environment.

This was the second SMP installation in the LTPP North Central Region, and highlights of the installation are summarized in Section IV of this report. The people involved with the installation are listed on "Data Sheet SMP-I01: List of Installed Instrumentation," which is included in Appendix C-1 along with other SMP installation forms.

Data for this 1993 installation were transferred to forms from the LTPP Seasonal Monitoring Program: Instrumentation and Data Collection Guidelines, April 1994. The 1994 forms were used to keep all installation reports uniform and to facilitate data entry into the IMS database. Data transfer included conversion from English to metric units with some rounding error. On some forms, data are not available regarding procedure modifications adopted in 1994. On these forms the cells are usually blank, and a comment is included on the form to explain the missing data.

II. Instrumentation Installation

A. Pre-Installation Activities

The Minnesota Department of Transportation (MnDOT) routinely monitors seasonal changes on pavement structures, especially regarding frost/thaw conditions for posting spring load restrictions. In this respect, MnDOT was very willing to participate in the SMP, and GPS sections 271018, 271028, 274040, and 276251 were included in the core SMP study.

Mr. Fred Maurer of MnDOT was initially contacted regarding potential sections for the core experiment in Minnesota. Mr. Maurer worked with district offices to evaluate potential sections with the requirement to defer rehabilitation at least five years. This is the minimum period required to get three years of monitoring data that is collected every other year.

Minnesota GPS sections 271023, 271028, 271029, 271087, and 276251 are all in SMP Cell 16, and sections 271028 and 276251 were approved for the core SMP experiment. With respect to GPS section 271028, MnDOT agreed to defer any rehabilitation at least long enough to get the minimum number of monitoring cycles, as long as pavement conditions were not a safety concern. However, MnDOT district staff predicted crack maintenance would be performed. Section 271028 is the control section for the SPS-3 sections at this location.

On July 15, 1993, Regional Coordination Office (RCO) staff met with MnDOT staff at the Materials and Research facility in Maplewood, Minnesota. This meeting was held to coordinate support from MnDOT's Geotechnical and Foundations Division regarding a drill rig and various materials that the Materials and Research facility would supply for the four installations in Minnesota. At this meeting, tentative installation dates were discussed for all four installations to enable MnDOT staff to verify availability of equipment and materials. Also, the RCO was looking at a very tight schedule to complete seven SMP installations in the region before winter weather conditions would prevent any additional installations. At this meeting, an August 12, 1993 date was set for a group pre-installation meeting for all MnDOT and RCO staff involved with the four installations. The agenda and notes from the meeting in Maplewood are included in Appendix B-1.

On August 12, 1993, the group pre-installation meeting was held in Baxter, Minnesota. The meeting agenda, list of participants, and notes from the meeting are included in Appendix B-1.

On the way to the group pre-installation meeting in Baxter, RCO staff stopped at GPS section 271018 to identify any installation concerns with the site and to select which end of the section to monitor. After the group meeting, RCO staff visited GPS sections 271028, 276251, and 274040. Field notes from the site visit for section 271028 are included in Appendix B-1.

At the RCO, pre-installation activities included performing instrumentation checks/calibrations, and incorporating improvements to the installation process based on field notes from the first installation. Improvements to the installation process are listed in Section IV of this report, and results from instrumentation checks/calibration are included in Appendix B-2. The checks were performed according to 1993 guidelines, but the results are reported using 1994 forms, as discussed earlier. The forms include the following:

- 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;
- Data Sheet SMP-C04: Function Generator, Multi-meter, and Switch Box Checks; and
- Data Sheet SMP-C05: Tipping-Bucket Rain Gauge Calibration.

With respect to instrument checks on the resistivity probe, Data Sheet SMP-C03 requires "distance from top of probe" for each electrode. However, procedures in 1993 recorded "spacing between electrodes" on two separate lines about 180 degrees apart on the probe. As a consequence, cumulative errors from adding the 35 "spacings" had to be accounted for to transfer the data to the 1994 form. Adjustments were performed as described below to estimate "distance from top of probe" within ± 5 mm:

1. Obtained average values for probes checked in 1994 and 1995 for the following:
   - Electrode No. 1 assigned 29 mm (± 2 mm) if not measured;
   - Electrode No. 17 in the range 840 mm $\pm$ 3 mm as a check; and
   - Electrode No. 36 assigned at 1,805 mm from the top of the probe.
   - Average electrode spacing is (1805 - 29)/35, which is 50.74 mm.

2. Added the 35 "spacings" measured for the first line, divided the value by 35 to get the average, subtracted 50.74 mm to get adjustment value, and subtracted adjustment value from each "spacing."

3. Repeated Step 2 for the second line.

4. Added two adjusted "spacings" and divided by two to get "adjusted average spacing."

5. Recorded Electrode No. 1 at 29 mm and cumulated "adjusted average spacings" to get "distance from top of probe" for the remaining 35 electrodes.

6. Checked "distance from top of probe" for Electrode No. 17 in the range 840 mm $\pm$ 3 mm and Electrode No. 36 in the range 1,805 mm $\pm$ 2 mm.

For the air temperature probe, no readout device was available while the thermistor probe was checked. Therefore, the only check possible was to compare thermistor and air temperature probe readings obtained overnight with both probes connected to the datalogger. The air temperature probe was within ± 1.0 °C of the average reading on the thermistor probe.

For the resistivity probe, loose electrode wraps were tightened by twisting the lead with a needle-nose pliers, and lead wires sticking out of the potting material for the probe were covered with silicon sealant for protection during installation. Excess potting material was scrapped off the electrodes for better contact with the soil.

Pre-installation activities also required selection of the instrumentation location. From field observations during the August 12, 1993 site visit and FWDCHECK program analysis for the section, Station 0-30 to Station 2+00 was selected for monitoring, and instrumentation would be placed at Station 0-15, based on the following items:

- More uniform pavement strength indicated by FWDCHECK program analysis;
- Less pavement distress at the test locations; and
- Power pole at Station 1+50 to use as a second benchmark.

B. Installation Activities

Instrumentation installation was completed on September 8, 1993. Some final installation activities continued on the following day. The following installation forms are included in Appendix C-1 along with field notes and photographs of the installation:

- Data Sheet SMP-I01: List of Installed Instrumentation;
- 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-I05(A): Lab Gravimetric Moisture Contents;
- Data Sheet SMP-I05(B): Gravimetric Moisture Comparison;
- Data Sheet SMP-I06: TDR Moisture Content; and
- Data Sheet SMP-I07: Representative Dry Density.

Piezometer installation was complicated by the coarse-grain subgrade caving in at a depth of 3.0 m. Several unsuccessful attempts were made to get the required depth, and the piezometer assembly was eventually pushed in to the required depth using the drill rig. A 0.6-m long access tube was set in concrete just below the existing shoulder material to protect the top of the piezometer and provide easy access for measurements. A 3.0-m long grease sleeve was used on this piezometer to isolate the piezometer from frost heave. The grease sleeve extends about 0.2 m up into the access tube and the space between the two is filled with sand. Additional field notes on piezometer installation are included in Appendix C-1.

A 460-mm square for the instrumentation hole and a 125-mm wide trench for the conduit were marked on the pavement surface at Station 0-15 using the lane edge stripe as a transverse reference, and FWD testing was done prior to cutting the pavement.

The pavement surface above the instrumentation location was lifted out using anchors tapped into the pavement, and it was set aside for later replacement. The drill rig was moved into position over the hole and material was put into buckets as it was removed from the hole in 0.15-m lifts.

LTPP Seasonal Monitoring Program: Instrumentation Installation and Data Collection Guidelines, June 1993 did not specify where to place TDR probe 1 on pavement structures without a base layer, and on this installation the probe was placed 65 mm below the asphaltic concrete layer. This depth provided sufficient protection from any settlement of the instrumentation hole pavement repair. Depths for the other nine probes were done according to guidelines.

For installation reports from the LTPP North Central RCO, "Data Sheet SMP-I05(A): Lab Gravimetric Moisture Contents," is used to report DOT lab moisture results. Also, "Data Sheet SMP-I05(B): Gravimetric Moisture Comparison" was created to summarize moisture data obtained from field moisture tests, laboratory moisture tests, and interpretation of TDR probe data. These

forms are included in Appendix C-1, and the following assumptions and conclusions were made regarding the moisture data:

- LTPP Directive Number: SM-13 "TDR Trace Interpretation Method for Calibration and Function Checks" dated August 17, 1995 was used to interpret the apparent length of each TDR trace obtained during installation for estimating moisture results. This method was specified for "calibration and function checks," but no other method had been distributed by FHWA LTPP staff. The interpreted apparent lengths are reported on "Data Sheet SMP-I06: TDR Moisture Content" in Appendix C-1.

- Equations on pages II-2 and II-5 of the LTPP Seasonal Monitoring Program: Instrumentation Installation and Data Collection Guidelines, April 1994 were used to convert apparent lengths to gravimetric moisture estimates for the base and subgrade materials, and the results are included on "Data Sheet SMP-I05(B): Gravimetric Moisture Comparison," located in Appendix C-1.

- For TDR probe 10, moisture estimate from TDR data was not possible because the first inflection point on the trace was not captured. For the remaining probes, noise on the traces, caused by the inverter used to power the TDR cable reader, may cause small errors in determining apparent length of the probes for moisture estimates.

- For TDR probes other than probes 8 and 10, moisture estimates from TDR traces are about 1.5 percentage points greater than the field and laboratory percentages. For TDR probe 8, the field and laboratory percentages differ by 2.0 percentage points compared to the average difference of 0.3 percentage points for the other probes.

- Answers to the following questions could help explain the differences seen, but they are beyond the scope of this report:

    1. Are the equations used appropriate for coarse-grain subgrade?
    2. Does noise from the inverter used to power the TDR cable reader influence the apparent length of the trace?
    3. How much influence does compaction have on the results?

"Data Sheet SMP-I07: Representative Dry Density," was not used in 1993, but it is included in Appendix C-1 to keep the report complete and uniform with other installation reports.

Several items were changed regarding installation of the datalogger cabinet and weather pole as follows:

- RCO staff were not able to get the 9.1-m offset from the lane edge specified on page II-23 and Figure II-12 of the LTPP Seasonal Monitoring Program: Instrumentation Installation and Data Collection Guidelines, April 1994 because the TDR cables provided were too short. The cabinet at this site is offset about 7.6 m and the weather pole is offset about 7.9 m. This places the obstructions inside the normal 9.15-m safety zone for highways. However, FHWA LTPP Division staff approved the two obstructions as break-away objects (page II-32 of manual) for placement inside the safety zone.

- The bottom of the front panel on the datalogger cabinet was notched about 0.1 m so the conduit buried about 0.3 m below the shoulder was easier to get into the cabinet, and it also slightly increased the distance the cabinet could be placed from the roadway.

- The conduit for the air temperature probe and tipping-bucket rain gauge signal wires was cut into the back of the cabinet above ground instead of running the conduit underground as shown in the guidelines. If the cables were run underground, the air temperature probe signal cable would have to be extended using special wire and resistors to compensate for increased lead resistance. Also, a union coupler was used on the weather pole about 0.3 m above ground to make pole installation easier.

For pavement repairs, the block was placed in the hole and seated by driving a truck over the hole several times. When the block was level with the pavement surface, W.R. Meadows "REZI-WELD 1000" multi-purpose construction epoxy was poured into the saw cuts to bond the pavement thermistor probe and original pavement surface material in place. This medium-viscosity epoxy was poured into the saw cuts, and the 45-minute pot life was sufficient to continue adding material as the epoxy settled. The saw cuts were filled to within about 15 mm of the pavement surface, and Dow Corning 890-SL was used to fill any remaining saw cuts the following day. The trench for the conduit was patched with hot-mix asphalt.

On September 9, 1993, final wiring of the datalogger in the cabinet was completed and MnDOT installed a level-one benchmark at Station 0+00 and offset -15.2 m from the driving lane. This benchmark is expected to be more stable then the piezometer as a reference for monitoring pavement surface elevation changes.

Additional observations about the pavement repair at the instrumentation hole up to the completion of this installation report include the following:

- No repairs have been required on the block or trench other than crack sealant added November 18, 1993. The maximum trench settlement recorded is 16 mm on April 18, 1995.

- A low severity transverse crack extending across the lane from the left side of the block was first recorded on May 10, 1994. The crack was sealed on March 21, 1995.

III. SMP Data Collection

A. Initial SMP Data Collection

On September 9, 1993, reference locations were established, and the first set of SMP data was collected. The reference locations for FWD testing and elevation data were established using the outside edge of the lane stripe. PK nails were placed at transverse offsets of 0.16 m and 3.66 m.

Four cycles of FWD data were collected, as well as elevation data and piezometer data. The RCO had not received a switch box for manual readings on the resistivity probe, and manual readings were not taken until November 11, 1993. The November resistivity probe readings along with manual data collected September 9, 1993 are included in Appendix D-1 as follows:

- One set of contact resistance data;
- One set of four-point resistivity data;
- One ground water table measurement; and
- One set of elevation data, which included shots on the MnDOT benchmark.

Computer data files obtained from automated data collection using the dataloggers included the following:

- One set of TDR traces and CRREL voltages; and
- Temperature and precipitation data collected from the datalogger to verify operation overnight.

Temperature data from the thermistor probe should not be entered into the IMS database because of heat given off by epoxy used to repair the pavement and disturbance of material around the probe. In addition, temperature data up to several days after instrument installation will have to be reviewed to determine when the disturbed materials came back to thermal equilibrium. Data affected by the installation will have to be edited from the computer files.

B. Routine SMP Data Collection

Routine data collection was done on the site from September 9, 1993 through June 14, 1995, and MnDOT has continued to collect temperature and frost data from the site. LTPP's standard data tracking log, which summarizes the data collected on the site, is included in Appendix D-2.

Two events that influenced the data collection and that will influence data interpretation for the site include the following:

- On November 18, 1993, a relay was added to the datalogger at the site, which included a change in the data format for subsequent files.

- On November 18, 1993, reference locations for the inside lane edge (ILE), which were placed at 3.66 m were shifted to 3.51 m. This only affects the elevation data collected September 9, 1993.

Instrumentation and equipment problems at the site include the following:

- Low moisture content in the sand subgrade produces short apparent lengths for the TDR data, and changes in moisture will be difficult to estimate. Also, the second inflection point on the TDR traces cannot be extrapolated by the intersection of a zero slope line through the minimum and a line drawn tangent to the signal out the end of the probe, because the signal slope through the probe remains positive. Screen prints of the TDR data are included in Appendix D-2.

- Pin 9 on the resistivity probe plug was repaired May 9, 1995.

- It was difficult to remove frozen material around the piezometer access tube during winter visits, and the access tube cover was damaged by a pickax. The cover was replaced March 21, 1995.

- Elevation difference between the piezometer and MnDOT benchmark changed about 5.0 mm during the first frost/thaw cycle after installation as shown on the plot in Appendix D-2. The benchmark movement will complicate elevation data analysis for estimating frost heave.

Other problems experienced at the site include failures with switch boxes used to collect manual resistance and resistivity data and failures of the CRREL multiplexer for automated resistance data collection. Print screens showing the failure modes for the CRREL multiplexer are included in Appendix D-2.

IV. Summary, Conclusions, and Recommendations

A. Instrumentation Installation Highlights

The following items are identified by the authors as unique or particular items of interest regarding this section in the SMP:

- This was the second SMP installation in the LTPP North Central Region, and experience gained on the first installation decreased the installation time and people required.
- Data for this 1993 installation were transferred to forms from the LTPP Seasonal Monitoring Program: Instrumentation and Data Collection Guidelines, April 1994.

B. Recommendations for Improving Installations

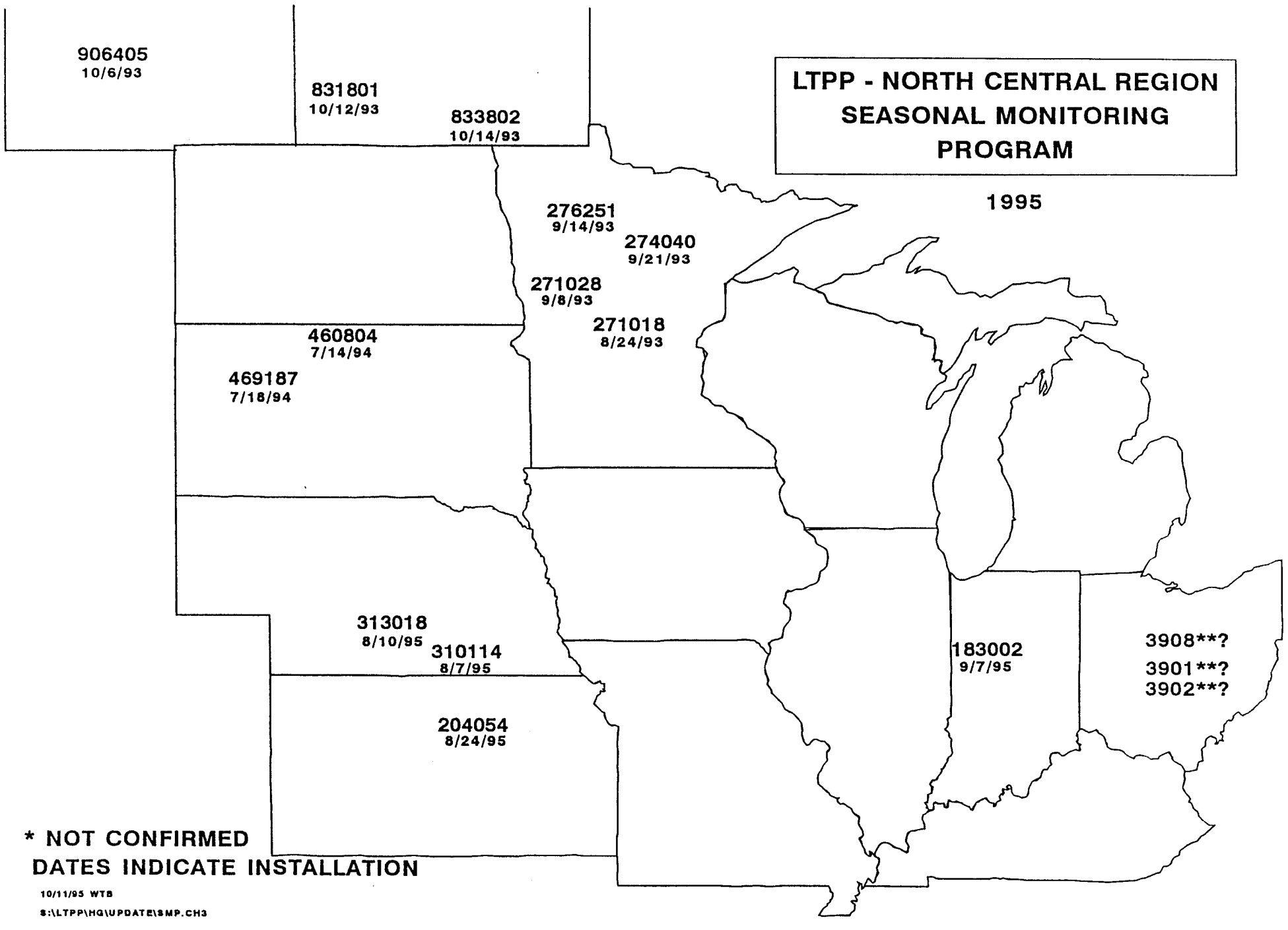
In addition to previous modifications from other installations, the following procedure and equipment changes from protocol were used during this installation:

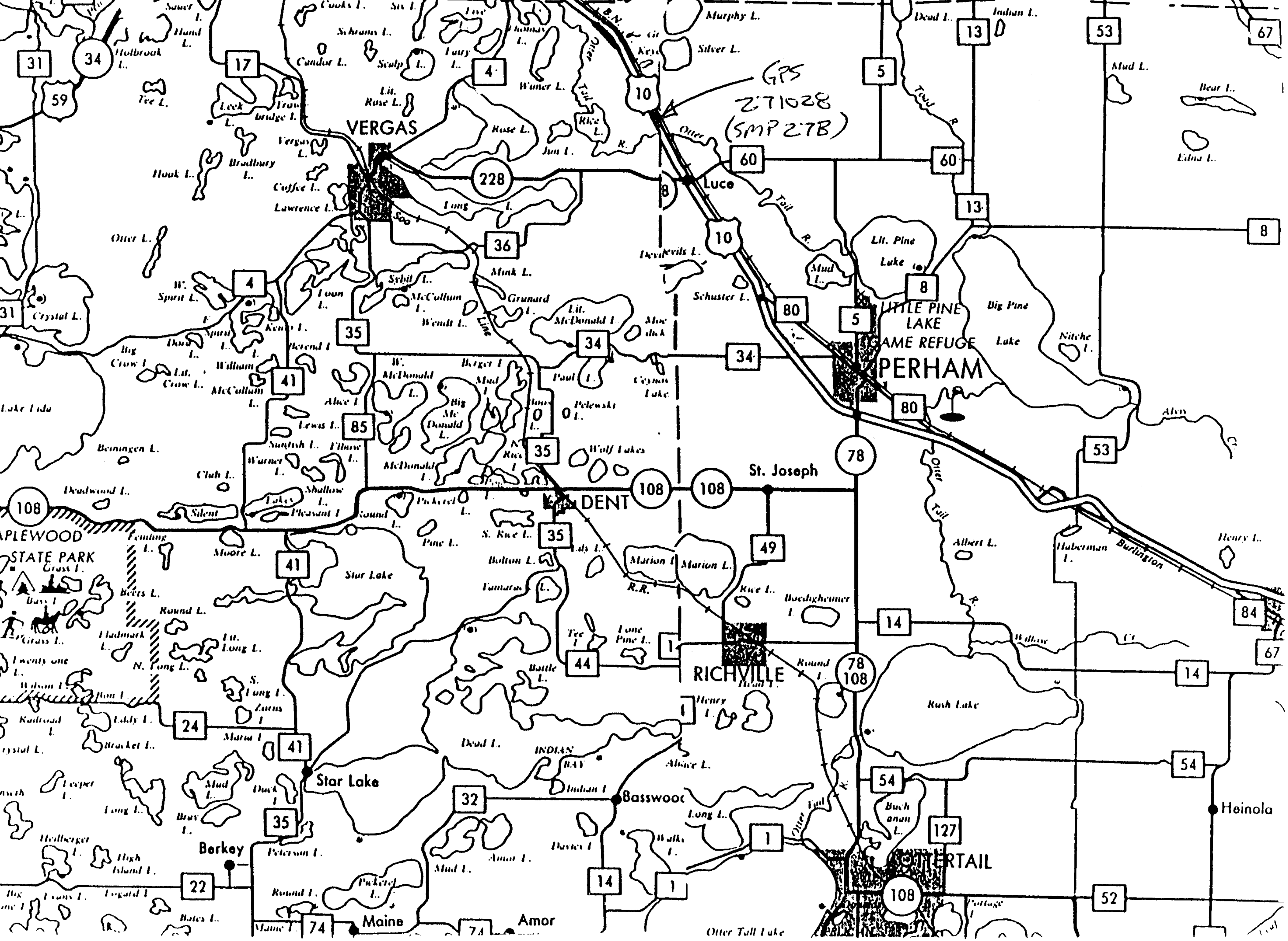
- Welded lugs to the piezometer access tube to help anchor it in concrete placed around the tube.
- Modified data forms to put all ten field moistures on one sheet.
- Installed two hooks inside the datalogger cabinet to hold TDR and resistivity probe cables between site visits. The hooks keep the cables away from the datalogger and wiring panel, and also keep the cable connectors suspended upside down so they stay clean and dry.

Appendix A-1: Test Section Background Information

Appendix A-1 contains the following test section background information:

- SMP location map;
- Detailed section location map;
- SHRP Inventory Data Sheet - traffic, design factors, and layer information;
- SHRP Section Field Verification Form;
- IMS L05A and L05B tables - layer thickness and material type; and
- LTPP Form S04 - base and subgrade moisture data.


906405
10/6/93
831801
10/12/93
833802
10/14/93
LTPP - NORTH CENTRAL REGION
SEASONAL MONITORING
PROGRAM
1995
276251
9/14/93
274040
9/21/93
271028
9/8/93
271018
8/24/93
460804
7/14/94
469187
7/18/94
313018
8/10/95
310114
8/7/95
204054
8/24/95
183002
9/7/95
3908**?
3901**?
3902**?
* NOT CONFIRMED
DATES INDICATE INSTALLATION
10/11/95 WTB
S:\LTPP\HQ\UPDATE\SMP.CH3


VERGAS
PERHAM
LITTLE PINE LAKE GAME REFUGE
Luce
DENT
St. Joseph
RICHVILLE
Star Lake
Basswood
Berkey
Maine
Amor
Heinola
OTTERTAIL
MAPLEWOOD STATE PARK
GPS 271028 (SMP 27B)
Lit. Pine Lake
Big Pine Lake
Rush Lake
Star Lake
Otter Tail R.
Burlington
Soo Line
Otter Tail Lake

STRATEGIC HIGHWAY RESEARCH PROGRAM
GENERAL PAVEMENT STUDIES
Long-Term Pavement Performance Monitoring
Project Information Sheet
March, 1988

REGION: North Central
STATE: Minnesota

EXPERIMENT: AC on Granular Base

SHRP Assigned ID:	271028	District:	4	Year Open:	1972
State Assigned ID:	1015	Highway:	U.S.- 10	Year Traffic:	1984
Expmnt Design Cell:	1- 45	Length:	7.0 miles	AADT:	3996
Status:	Selected	Lanes:	2	Trucks:	15.8 %

DESIGN FACTORS: Moisture - Wet
Temperature - Freeze
Subgrade - 57 = Sand
Traffic - 90 KESAL/Yr
AC Thickness - 9.5 in.
Base Thickness - .0 in.
AC Stiffness - 394 kpsi

Coarse
High (85)
High (3.0, 8.0)
Low (10.0)
Low (650)

MISCELLANEOUS: Base Type - Granular
AC Voids - 10.3
Structural No. - 2.7

LAYER CONFIGURATION

LAYER NO.	LAYER DESCRIPTION	LAYER THICKNESS	LAYER MATERIAL TYPE
4	3 = Orig Surface	1.5	1 = Asphalt Concrete
3	4 = HMAC Below Surf	2.0	28 = Hot Mix Asphalt Concrete ok
2	4 = HMAC Below Surf	6.0	28 = Hot Mix Asphalt Concrete
1	7 = Subgrade	.0	57 = Sand

PAVEMENT LAYER INFORMATION

LAY NUM.	-- GRADE --- VISC	PENETR	AC CONT	AC DENS	ACVIS S	ACVIS 140	ACVIS 275	PEN 77	AC TRBF	AC VOID	AGG SPGR	AC STIFF
				ASPHALT CONCRETE LAYERS								
4	0	90	6.4	144	3	0	0	0	.0	6.0	.000	514
3	0	90	5.0	142	3	0	0	0	.0	10.4	.000	390
2	0	135	4.6	136	3	0	0	0	.0	11.4	.000	365

NCED 61-205

SECTION FIELD VERIFICATION FORM

Date 9-8-88

Rater Marti

State Project Code 1 C 1 5
State Code 2 7
SHRP Section I.D. 1 C 2 5

Project and Section Identification

State District No. 0 4
County or Parish Otter Tail 2

Route Signing (Numeric Code)
Interstate 1
Primary 2
State 3
Other 4

Route Number 1 0
LTPP Experiment Code 1
Number of Through Lanes (One Direction) 2
Direction of Travel 1

Eastbound 1
Westbound 2
Northbound 3
Southbound 4

Available Project Length (Without Discontinuities) 900'

	Start Point	End Point
Test Section Milepoints	5 8 2 8	5 8 3 7

Additional Section Location Information*:
0' is 700' South (East since EB lane) of intersection with county C
0' is @ STA 582+36.7

* Include distances from two landmarks (refer to specific procedures outlined in the Initial State Visit Guidelines).

Location of monument: 1' North (east) of South (west) edge of Bit. Shoulder

Geometric Information

Lane Width (Feet) 1 2. 1
Lane (By Number) Included in Monitoring Section
(Lane 1 is Outside Lane, Lane 2 is Next to Lane 1, etc.)

Shoulder Data:	Outside Shoulder	Inside Shoulder
Total Width (Feet)	1 0.	0 4.
Paved Width (Feet)	1 0.	0 4.
Surface Type		3

Surface Type
Turf 1
Granular 2
Asphalt Concrete ... 3
Concrete 4
Surface Treatment 5
Other 6

Additional Data for PCC Shoulders:

Average Joint Spacing (Feet)	___.	___.
Skewness of Joints (Feet)	___.___ N/A	___.___
Joints Match Pavement Joints? (Yes - 1; No - 2)	___	___

SHRP/LTPP LAYER THICKNESS

L05A - L05B TABLES

10-AUG-93

	L05A								L05 B REPRESENTATIVE					
	CON	LAYER	DESC	TYPE	STA 0 THICK	STA 0 MATL	STA 5 THICK	STA 5 MATL	LAYER	DESC	TYPE	THICK	MATL	INVENTORY
7 1028	1	1	7	SS		204		203	1	7	SS		204	1
	1	2	4	AC	6.1	1	5.9	1	2	4	AC	6	1	3
	1	3	4	AC	1.9	1	2.1	1	3	4	AC	2	1	4
	1	4	3	AC	1.6	1	1.6	1	4	3	AC	1.6	1	5

9.6

SHRP-LTPP
FIELD MATERIAL SAMPLING
AND FIELD TESTING

STATE CODE 37

ECTION NC
VA N

SHRP ASSIGNED ID 371059

P EXPERIMENT 6P51 ROUTE/HIGHWAY US 70 Lane 2 Direction E
PLE/TEST: (a) Before Section _____ (b) After Section U FIELD SET NO. 1

IN SITU DENSITY AND MOISTURE TESTS

DCG SHEET: 24

RATOR NJ Damaraca NUCLEAR DENSITY GAUGE I.D. 573 SHEET NUMBER 15 OF 23
T DATE 6-29-89 LOCATION: STATION 462 TEST PIT NUMBER TP1
E OF LAST MAJOR CALIBRATION 4-1-89 OFFSET 3 feet from O/S
e: Use additional sheets if necessary

TH FROM SURFACE TO THE OF THE LAYER, FEET (SEE S03)					10" below top of bituminous
ST PE	PAVEMENT SURFACE (AC) Test Pit O.W.P.	PAVEMENT SURFACE (AC) Between Wheelpath	BASE COURSE TOP Result, pcf Wet Dry	SUBBASE TOP Result, pcf Wet Dry	SUBGRADE TOP Result, pcf Wet Dry
1					133.0 126.5
SITU 2					130.6 124.3
SITY cf) 3					131.3 125.3
4					133.4 127.2
ERAGE					132.2 125.9
HTO T238-86 Method (A,B,C)					
Depth, inches					12"
1					4.8
IN SITU 2					5.1
MOISTURE 3					5.2
CONTENT,% 4					4.9
ERAGE					5.0
ASHTO T239-86) ERIAL TYPE: (Unbound-G, Treated-AT, Other-T)					

ERAL REMARKS: _____

TIFIED
[signature]
w Chief, Contractor
liation: [illegible]

VERIFIED AND APPROVED
Ronald R Ulrich
SHRP Representative
Affiliation: [illegible]

MONTH-DAY-YEAR
6 - 29 - 1989
Date

Appendix A-2: Pre-Installation Monitoring Data and FWDCHECK Results

Appendix A-2 contains the following pre-installation monitoring data and FWDCHECK analysis results:

- Pre-installation pavement distress data;
- Pre-installation FWD data; and
- FWDCHECK program uniformity analysis results.

Revised December 1, 1992

SHEET 1

DISTRESS SURVEY

LTPP PROGRAM

STATE ASSIGNED ID ____

STATE CODE 27

SHRP SECTION ID 1028

DISTRESS SURVEY FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES

DATE OF DISTRESS SURVEY (MONTH/DAY/YEAR) 07/27/93

SURVEYORS: B K N, ____ PHOTOS, VIDEO, OR BOTH WITH SURVEY (P, V, B) B
PAVEMENT SURFACE TEMP - BEFORE __26°C; AFTER __34°C

DISTRESS TYPE	SEVERITY LEVEL LOW	MODERATE	HIGH
CRACKING			
1. FATIGUE CRACKING (Square Meters)	____.0	____.0	____.0
2. BLOCK CRACKING (Square Meters)	____.0	____.0	____.0
3. EDGE CRACKING (Meters)	____.0	____.0	____.0
4. LONGITUDINAL CRACKING (Meters)			
4a. Wheel Path	____.0	____.0	____.0
Length Sealed (Meters)	____.0	____.0	____.0
4b. Non-Wheel Path	____.0	152.5	149.8
Length Sealed (Meters)	____.0	____.0	____.0
5. REFLECTION CRACKING AT JOINTS			
Number of Transverse Cracks	__0	__0	__0
Transverse Cracking (Meters)	____.0	____.0	____.0
Length Sealed (Meters)	____.0	____.0	____.0
Longitudinal Cracking (Meters)	____.0	____.0	____.0
Length Sealed (Meters)	____.0	____.0	____.0
6. TRANSVERSE CRACKING			
Number of Cracks	__9	_22	__2
Length (Meters)	_16.8	_80.6	__7.2
Length Sealed (Meters)	____.0	____.0	____.0
PATCHING AND POTHOLES			
7. PATCH/PATCH DETERIORATION			
(Number)	__0	__0	__0
(Square Meters)	____.0	____.0	____.0
8. Potholes			
(Number)	__0	__0	__0
(Square Meters)	____.0	____.0	____.0

Revised December 1, 1992

SHEET 2

DISTRESS SURVEY

LTPP PROGRAM

STATE ASSIGNED ID _ _ _ _

STATE CODE 27

SHRP SECTION ID 1028

DATE OF DISTRESS SURVEY (MONTH/DAY/YEAR) 07/27/93

SURVEYORS: BKN, _ _ _

DISTRESS SURVEY FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES (CONTINUED)

DISTRESS TYPE	SEVERITY LEVEL LOW	MODERATE	HIGH
SURFACE DEFORMATION			
9. RUTTING - REFER TO SHEET 3 FOR SPS-3 OR Form S1 from Dipstick Manual			
10. SHOVING (Number)			0
(Square Meters)			0
SURFACE DEFECTS			
11. BLEEDING (Square Meters)	0	0	0
12. POLISHED AGGREGATE (Square Meters)			0
13. RAVELING (Square Meters)	0	0	0
MISCELLANEOUS DISTRESSES			
14. LANE-TO-SHOULDER DROPOFF - REFER TO SHEET 3			
15. WATER BLEEDING AND PUMPING (Number)			0
Length of Affected Pavement (Meters)			0

Comments

16. ~~OTHER~~ (Describe) DISTRESS ON 0-50 & 5+50 SECTIONS, NOT INCLUDED IN DISTRESS SUMMARY.

Revised May 29, 1992

SHEET 3

DISTRESS SURVEY

LTPP PROGRAM

STATE ASSIGNED ID _ _ _ _

STATE CODE 27

SHRP SECTION ID 1028

DATE OF DISTRESS SURVEY (MONTH/DAY/YEAR) 07/27/93

SURVEYORS: BKN, _ _ _

DISTRESS SURVEY FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES (CONTINUED)

9. RUTTING (FOR SPS-3 SITE SURVEYS)

INNER WHEEL PATH			OUTER WHEEL PATH		
Point No.	Point Distance[1] (Meters)	Rut Depth (mm)	Point No.	Point Distance[1] (Meters)	Rut Depth (mm)
1	0.	_ _ _.	1	0.	_ _ _.
2	15.25	_ _ _.	2	15.25	_ _ _.
3	30.5	_ _ _.	3	30.5	_ _ _.
4	45.75	_ _ _.	4	45.75	_ _ _.
5	61.	_ _ _.	5	61.	_ _ _.
6	76.25	_ _ _.	6	76.25	_ _ _.
7	91.5	_ _ _.	7	91.5	_ _ _.
8	106.75	_ _ _.	8	106.75	_ _ _.
9	122.	_ _ _.	9	122.	_ _ _.
10	137.25	_ _ _.	10	137.25	_ _ _.
11	152.5	_ _ _.	11	152.5	_ _ _.

14. LANE-TO-SHOULDER DROPOFF

Point No.	Point Distance[1] Meters	Lane-to-Shoulder Dropoff (mm)
1	0.	_ _ 0.
2	15.25	_ _ 0.
3	30.5	_ _ 0.
4	45.75	_ _ 0.
5	61.	_ _ 0.
6	76.25	_ _ 0.
7	91.5	_ _ 0.
8	106.75	_ _ 0.
9	122.	_ _ 0.
10	137.25	_ _ 0.
11	152.5	_ _ 0.

Note 1: "Point Distance" is the distance in meters from the start of the test section to the point where the measurement was made. The values shown are SI equivalents of the 50 ft spacing used in previous surveys.

MANUAL DIPSTICK DATA COLLECTION FORM
(Transverse Profile)

TEST SITE: 271028 DATE: 7/27/93 WEATHER: _____

OPERATOR: BKN RECORDER: _____

DIPSTICK SERIAL NUMBER: _____

START TIME: _____ STOP TIME: _____

TRANSVERSE LINES: _____

LINE: [redacted] 0-50 LINE: 0+00 LINE: 0+50

Distance (ft.)	Elevation (in.)		Distance (ft.)	Elevation (in.)		Distance (ft.)	Elevation (in.)	
	Pass 1	Pass 2		Pass 1	Pass 2		Pass 1	Pass 2
1	170	-177	1	164	-161	1	119	-119
2	013	-013	2	040	-041	2	041	-041
3	189	-188	3	166	-164	3	180	-181
4	308	-311	4	336	-331	4	315	-323
5	330	-330	5	307	-310	5	329	-326
6	263	-271	6	259	-262	6	251	-251
7	016	-015	7	042	-039	7	047	-047
8	-005	+004	8	012	-012	8	021	-019
9	169	-165	9	199	-199	9	236	-235
10	346	-351	10	415	-416	10	423	-424
11	264	-264	11	321	-321	11	280	-280
12			12			12		
13			13			13		
14			14			14		
15			15			15		
16			16			16		
TOTALS	2.063	-2.081	[redacted]	2.261	-2.256	[redacted]	2.242	-2.246

COMMENTS: -0.018 0.005 -0.004

MANUAL DIPSTICK DATA COLLECTION FORM
(Transverse Profile)

TEST SITE: 271023 DATE: 7/27/93 WEATHER: _____

OPERATOR: BKN RECORDER: _____

DIPSTICK SERIAL NUMBER: _____

START TIME: _____ STOP TIME: _____

TRANSVERSE LINES: _____

LINE: 1+00 LINE: 1+50 LINE: 2+00

Distance (ft.)	Elevation (in.)		Distance (ft.)	Elevation (in.)		Distance (ft.)	Elevation (in.)	
	Pass 1	Pass 2		Pass 1	Pass 2		Pass 1	Pass 2
1	158	-158	1	141	-150	1	079	-082
2	016	-022	2	039	-031	2	042	-044
3	195	-198	3	182	-187	3	250	-249
4	316	-321	4	322	-317	4	369	-368
5	310	-307	5	336	-334	5	327	-331
6	253	-254	6	242	-245	6	209	-211
7	076	-075	7	046	-050	7	048	-046
8	008	-010	8	005	+001	8	011	-015
9	219	-223	9	215	-205	9	225	-227
10	383	-382	10	397	-399	10	420	-425
11	334	-334	11	317	-317	11	323	-323
12			12			12		
13			13			13		
14			14			14		
15			15			15		
16			16			16		
TOTALS								

COMMENTS: _____

MANUAL DIPSTICK DATA COLLECTION FORM
(Transverse Profile)

TEST SITE: 271028 DATE: 7/27/93 WEATHER: _____

OPERATOR: BKN RECORDER: _____

DIPSTICK SERIAL NUMBER: _____

START TIME: _____ STOP TIME: _____

TRANSVERSE LINES: _____

LINE: 2+50 LINE: 3+00 LINE: 3+50

Distance (ft.)	Elevation (in.)		Distance (ft.)	Elevation (in.)		Distance (ft.)	Elevation (in.)	
	Pass 1	Pass 2		Pass 1	Pass 2		Pass 1	Pass 2
1	102	-101	1	136	-138	1	124	-130
2	050	-047	2	070	-069	2	075	-067
3	198	-198	3	219	-220	3	226	-228
4	327	-330	4	317	-317	4	329	-326
5	322	-322	5	318	-317	5	300	-301
6	222	-224	6	239	-241	6	239	-242
7	046	-048	7	040	-039	7	045	-042
8	034	-033	8	043	-043	8	029	-023
9	243	-250	9	223	-223	9	225	-225
10	378	-371	10	373	-367	10	366	-365
11	313	-313	11	290	-290	11	298	-298
12			12			12		
13			13			13		
14			14			14		
15			15			15		
16			16			16		
TOTALS								

COMMENTS: _____

MANUAL DIPSTICK DATA COLLECTION FORM
(Transverse Profile)

TEST SITE: 271028 DATE: 7/27/93 WEATHER: _____

OPERATOR: BKJ RECORDER: _____

DIPSTICK SERIAL NUMBER: _____

START TIME: _____ STOP TIME: _____

TRANSVERSE LINES: _____

LINE: 4+00 LINE: 4+50 LINE: 5+00

Distance (ft.)	Elevation (in.)		Distance (ft.)	Elevation (in.)		Distance (ft.)	Elevation (in.)	
	Pass 1	Pass 2		Pass 1	Pass 2		Pass 1	Pass 2
1	158	-159	1	039	-035	1	037	-038
2	066	-066	2	046	-041	2	142	-138
3	201	-200	3	279	-276	3	232	-232
4	293	-292	4	370	-365	4	360	-357
5	301	-300	5	317	-321	5	350	-353
6	240	-243	6	226	-229	6	229	-227
7	032	-035	7	-001	+005	7	-067	+067
8	054	-048	8	-021	+014	8	005	-008
9	233	-235	9	180	-180	9	215	-216
10	396	-399	10	434	-440	10	434	-436
11	300	-300	11	309	-309	11	311	-311
12			12			12		
13			13			13		
14			14			14		
15			15			15		
16			16			16		
TOTALS								

COMMENTS: _____

MANUAL DIPSTICK DATA COLLECTION FORM
(Transverse Profile)

TEST SITE: 271028 DATE: 7/27/93 WEATHER: _____

OPERATOR: BKN RECORDER: _____

DIPSTICK SERIAL NUMBER: _____

START TIME: _____ STOP TIME: _____

TRANSVERSE LINES: _____

LINE: 5+50 LINE: — LINE: —

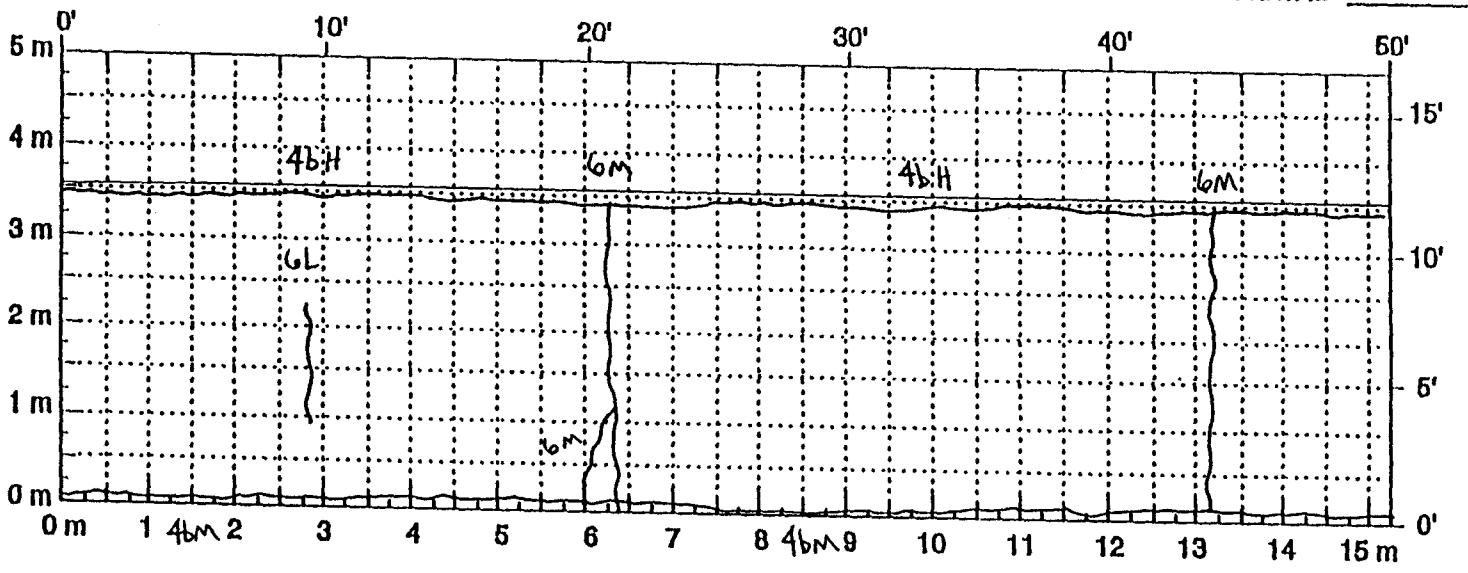
Distance (ft.)	Elevation (in.)		Distance (ft.)	Elevation (in.)		Distance (ft.)	Elevation (in.)	
	Pass 1	Pass 2		Pass 1	Pass 2		Pass 1	Pass 2
1	091	-093	1			1		
2	091	-089	2			2		
3	217	-214	3			3		
4	288	-286	4			4		
5	329	-332	5			5		
6	228	-219	6			6		
7	038	-041	7			7		
8	023	-023	8			8		
9	231	-232	9			9		
10	402	-403	10			10		
11	283	-283	11			11		
12			12			12		
13			13			13		
14			14			14		
15			15			15		
16			16			16		
TOTALS								

COMMENTS: _____

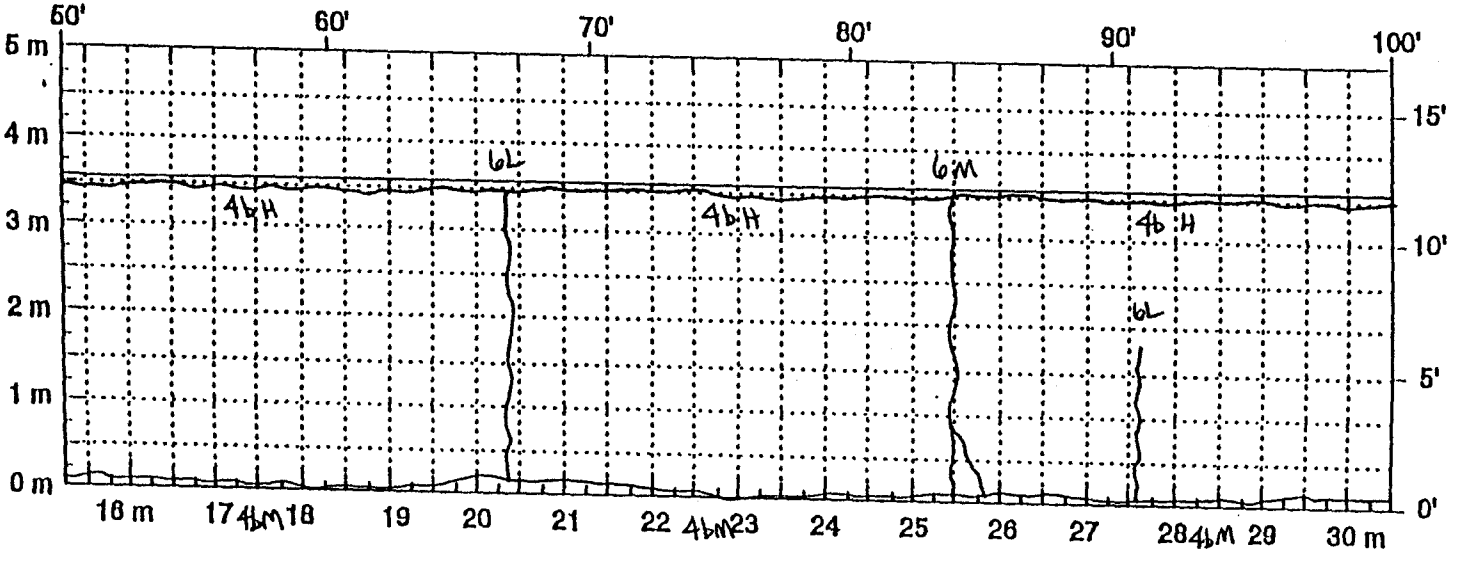
State Assigned ID _____

State Code 27

SHRP Section ID 1028



Comments: _____

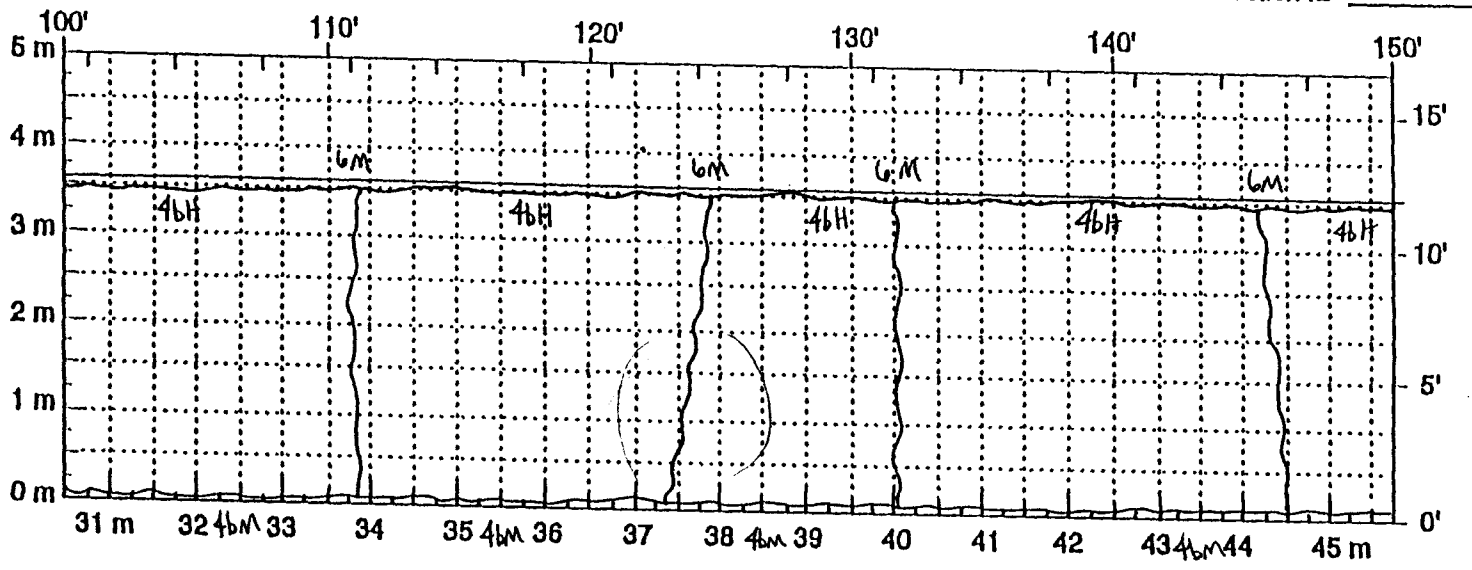


Comments: _____

State Assigned ID _____

State Code 27

SHRP Section ID 1028



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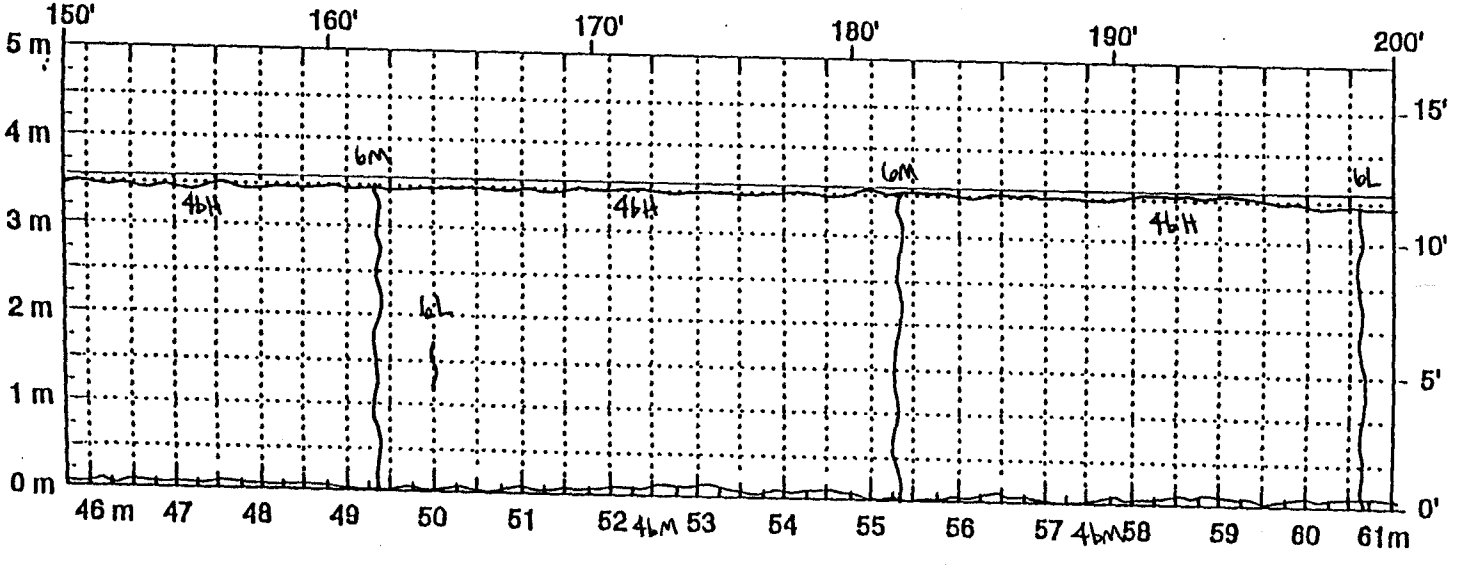
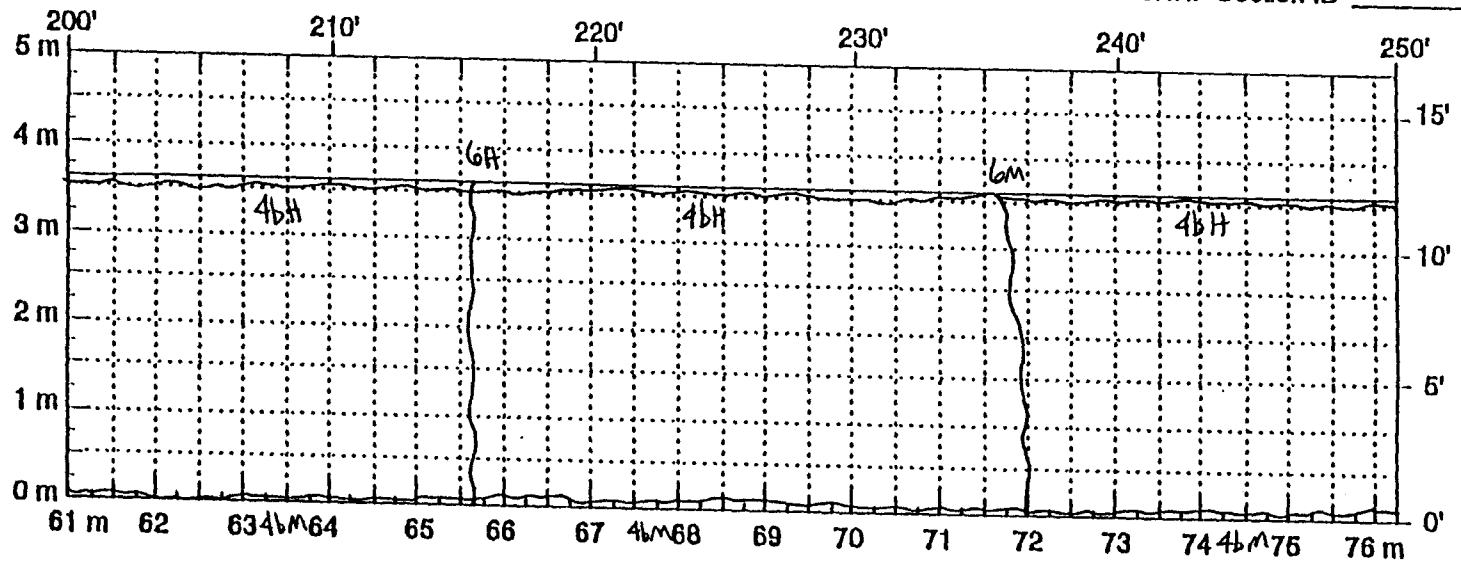


Comments: _____

State Code 27

SHRP Section ID 1028



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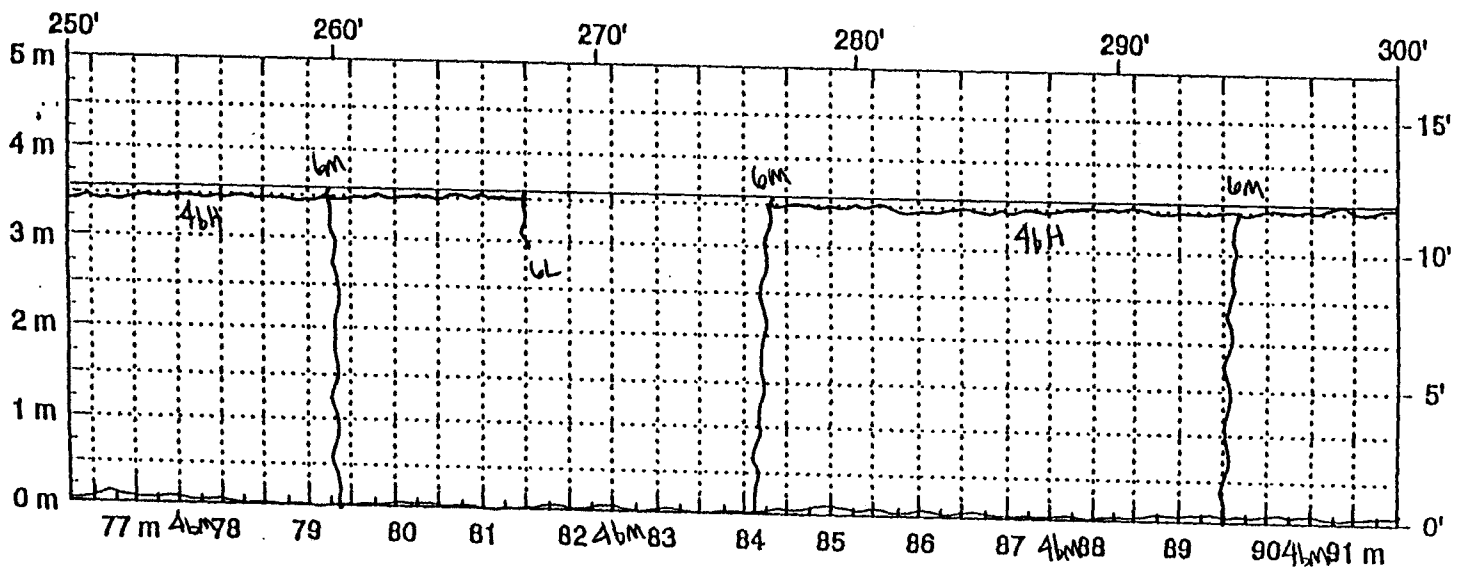
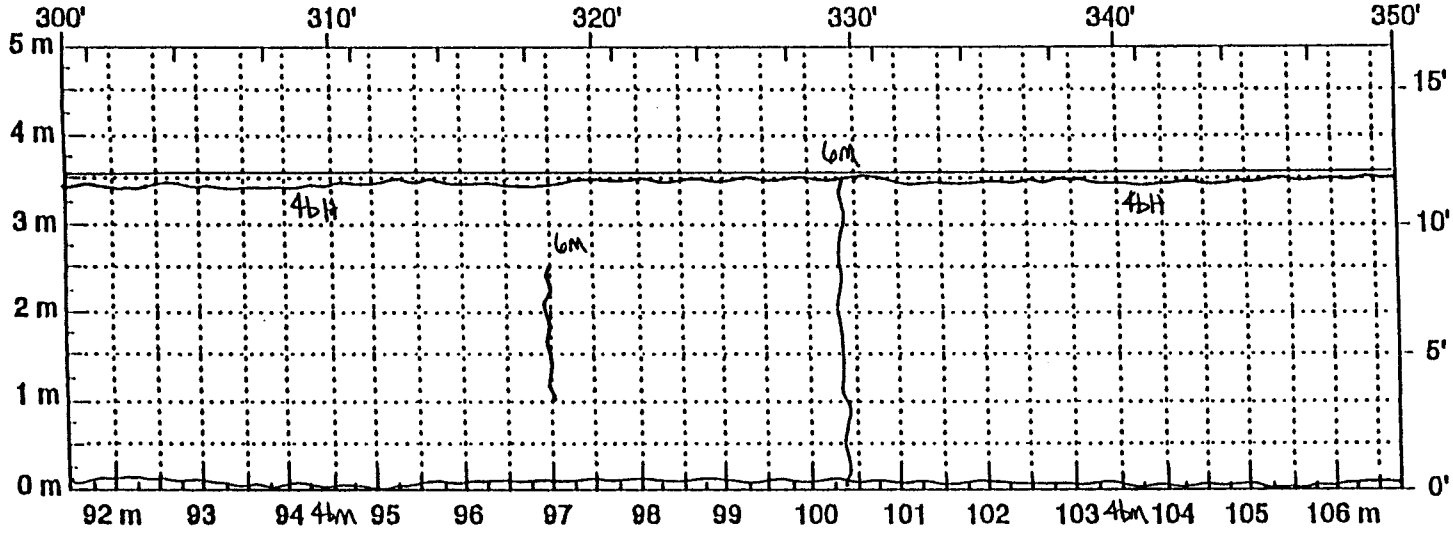


Comments: _____

State Assigned ID _____

State Code 27

SHRP Section ID 1028



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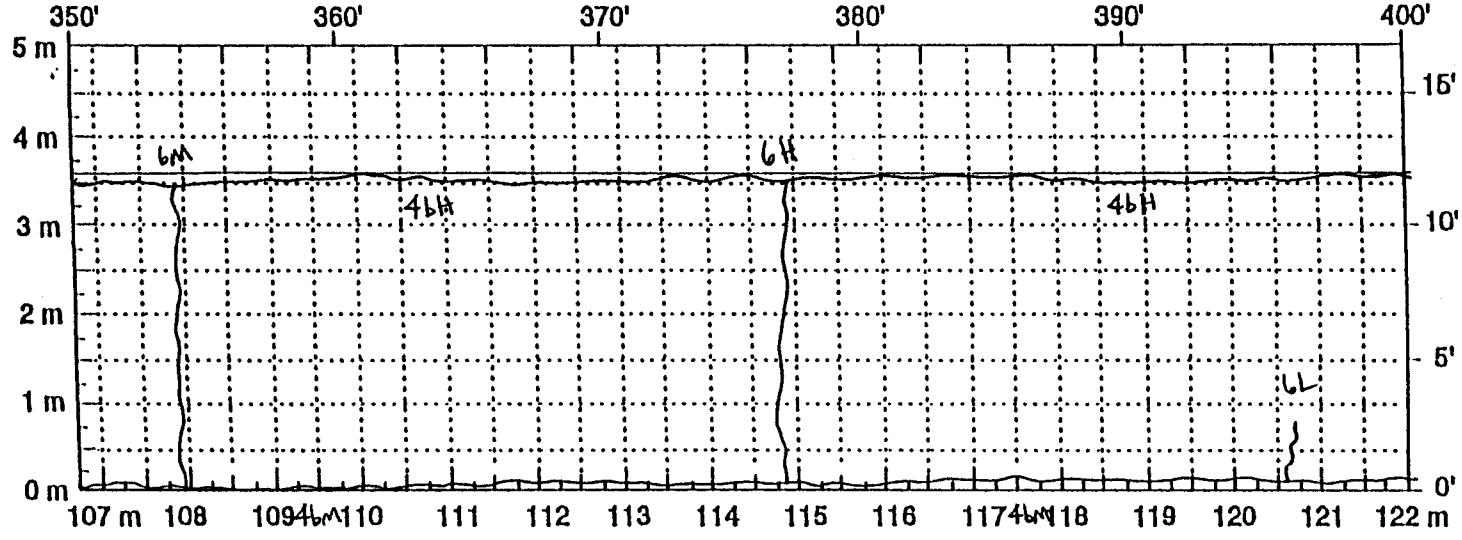
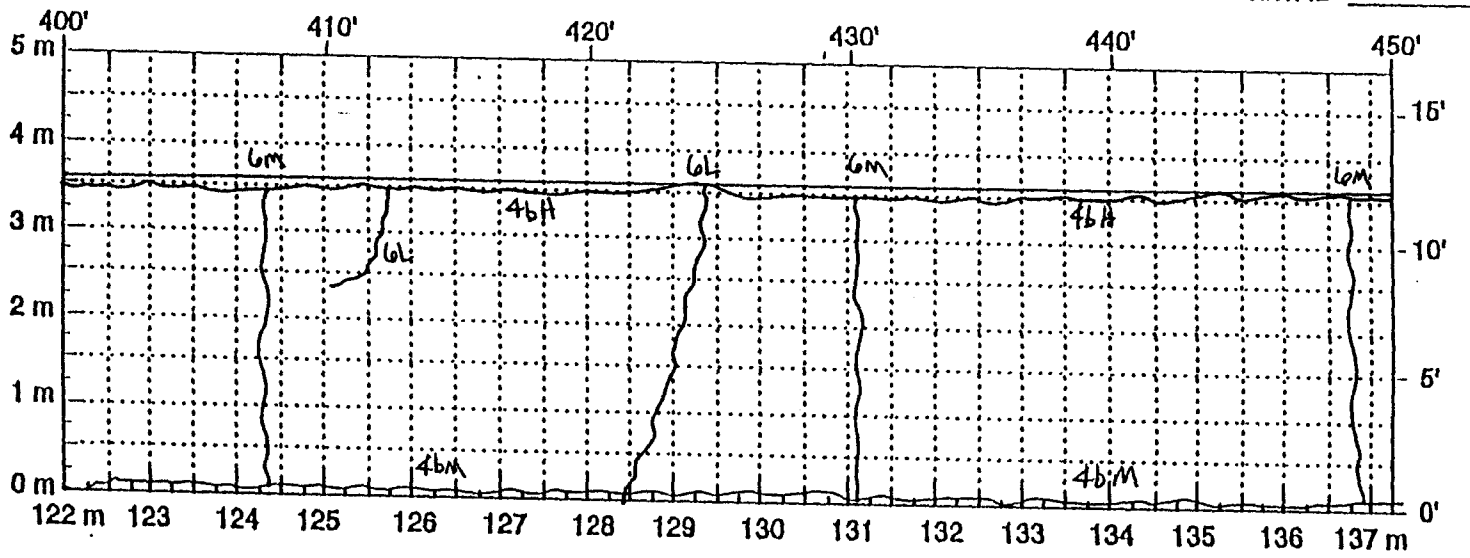


Comments: _____

State Assigned ID _____

State Code 27

SHRP Section ID 1028



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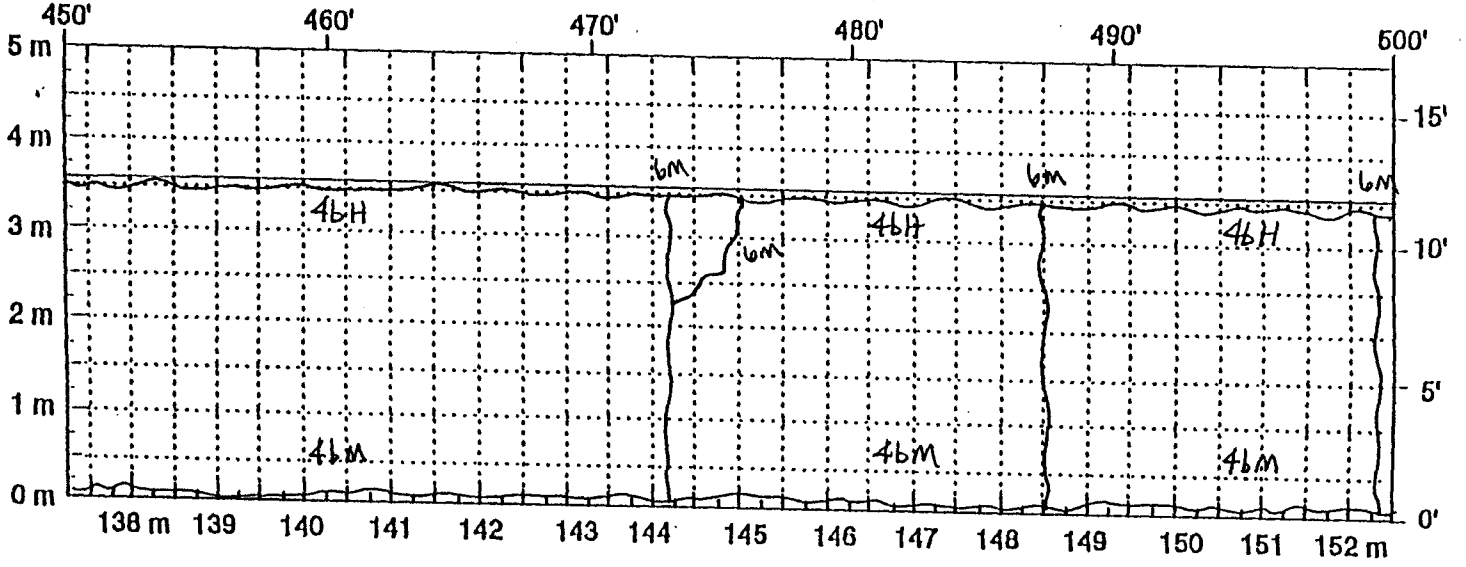

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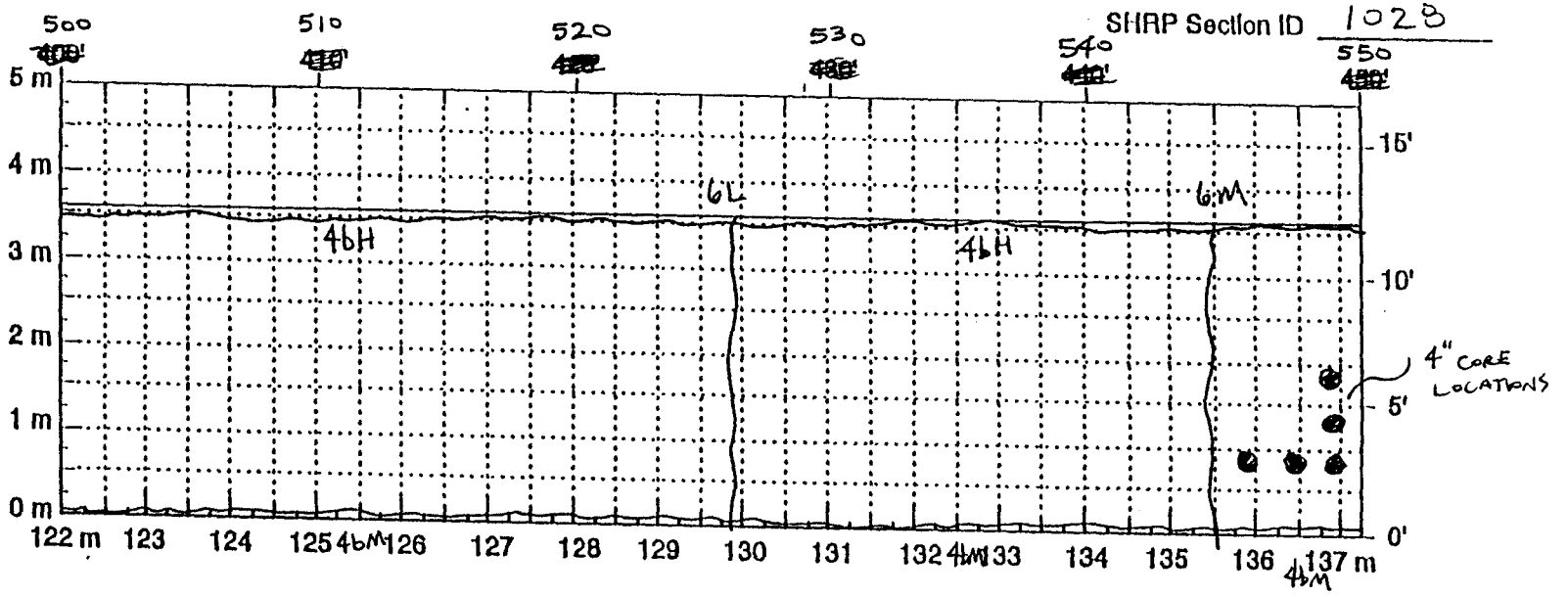
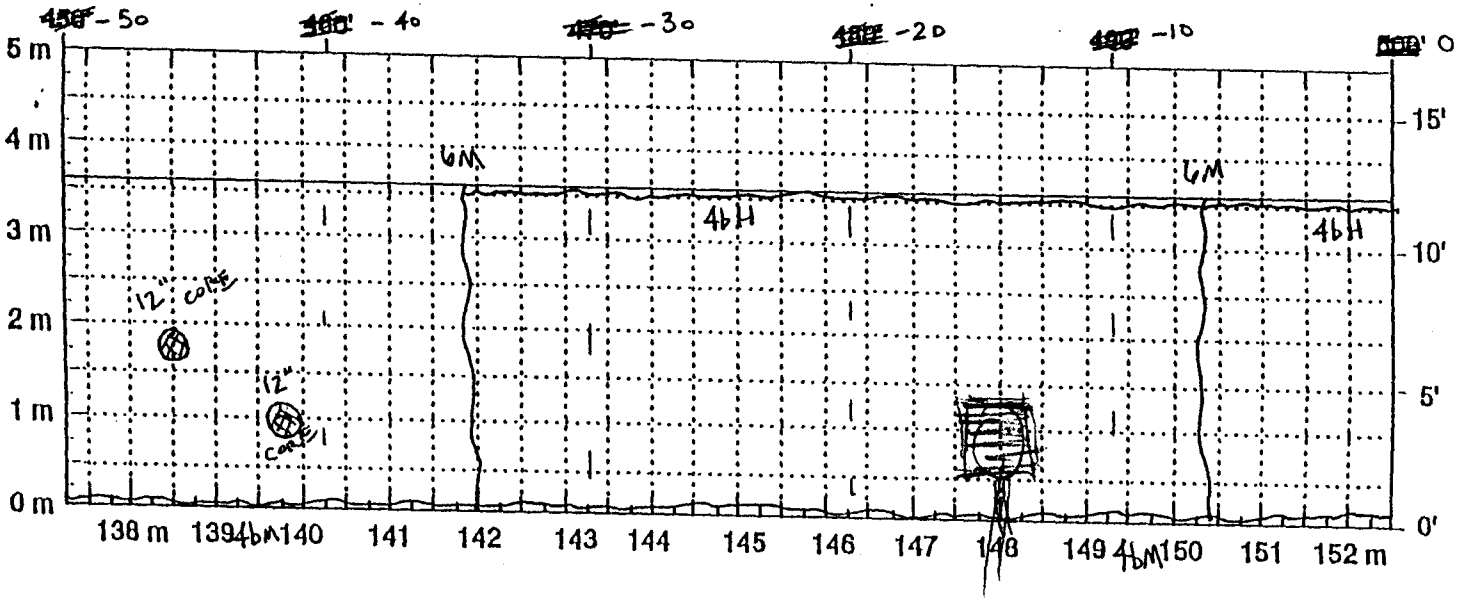
State Assigned ID _____

State Code 27

SHRP Section ID 1028



Comments: _____



Comments: _____

FHWA/SHRP-LTPP GPS TEMPERATURE FORM

SHRP NORTH CENTRAL REGION

SHRP SECTION I.D. # 271023

AGENCY MINNESOTA

TESTING GPS (SPS-3)

ROUTE/HIGHWAY # US-10

FIELD SET # E

TESTING DATE 7/27/93

SHEET # ____ OF ____

LOCATION 1 STATION 0-03

DEPTH MILTIME	D1 = 1.3	D2 = 4.7	D3 = 8.6	D4 = —	D5 = —	WEATHER CONDITIONS
0900	74.9	75.6	77.1			C
1018	78.9	76.8	77.3			C
1110	85.5	78.2	77.8			S

COMMENTS

LOCATION 2 STATION 5+03

DEPTH MILTIME	D1 = 1.3	D2 = 5.5	D3 = 8.9	D4 = —	D5 = —	WEATHER CONDITIONS
0930	76.4	77.3	79.6			C
1038	81.4	78.9	79.7			PC
1146	90.6	80.7	79.4			PC

COMMENTS

NOTE: USE ONLY THESE WEATHER TERMS; (S)SUNNY, (PC)PARTLY CLOUDY, (C)CLOUDY, (R)RAIN

TESTING COMPLETED BY:
BRAUN INTERTEC PAVEMENT INC.
FWD S/N 8002-063 (Braun FWD)

BJP
FWD OPERATOR

7/27/93
DATE

08:37 930727

File: C:\FWD\DATA\271028E1.FWD
Road: US-10 EASTBOUND LANES, 13 MILES EAST OF DETROIT LAKES, MN.
Subsection: 271028

FWD S/N : 8002-063
Operator ID : PELKEY, BRUCE J.

Stationing...: Feet

Diameter of Plate: 11.8
Deflector distances : 8 12 18 24 36 60

Test: from -30 to 0 and 500 to 530 are for SMP

SHRP TESTING - FLEXIBLE - BASIN TEST (F0,F1,F3)
Sequence: CCC1111222233334444

Stn: -20 Lane:F1 Temp: J/C: Air: 76 PvT: 79 08:40

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.5	12440	7.58	6.55	5.87	5.11	4.40	3.29	2.00
	C	114.3	12536	7.62	6.59	5.91	5.11	4.40	3.34	2.00
	C	114.5	12560	7.62	6.64	5.91	5.11	4.44	3.29	2.00
*	1	59.7	6536	3.90	3.40	3.04	2.62	2.27	1.69	1.04
*	1	59.7	6536	3.90	3.36	3.00	2.58	2.22	1.60	1.04
*	1	59.6	6528	3.85	3.32	3.00	2.58	2.22	1.65	1.04
*	1	59.6	6528	3.85	3.32	3.00	2.58	2.22	1.65	1.00
*	2	86.4	9480	5.70	4.96	4.46	3.84	3.33	2.47	1.47
*	2	87.1	9552	5.74	4.96	4.46	3.84	3.29	2.47	1.47
*	2	86.7	9496	5.78	5.04	4.54	3.93	3.38	2.56	1.56
*	2	86.8	9520	5.74	4.96	4.46	3.88	3.33	2.47	1.47
*	3	114.2	12512	7.62	6.64	5.91	5.11	4.44	3.34	2.00
*	3	114.5	12560	7.62	6.59	5.96	5.15	4.44	3.29	2.00
*	3	114.3	12536	7.67	6.68	6.00	5.15	4.49	3.38	2.08
*	3	114.8	12584	7.62	6.64	5.96	5.15	4.44	3.29	2.00
*	4	145.1	15912	9.72	8.40	7.54	6.54	5.64	4.29	2.60
*	4	145.5	15960	9.76	8.45	7.63	6.63	5.73	4.33	2.69
*	4	145.2	15928	9.72	8.40	7.58	6.54	5.64	4.29	2.65
*	4	145.5	15944	9.80	8.49	7.63	6.59	5.73	4.38	2.69

Stn: 0 Lane:F1 Temp: J/C: Air: 76 PvT: 80 08:43

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.9	12496	8.25	7.11	6.43	5.53	4.80	3.60	2.13
	C	114.3	12536	8.09	6.94	6.26	5.40	4.67	3.47	2.17
	C	114.3	12536	8.09	6.89	6.21	5.40	4.62	3.47	2.08
*	1	59.1	6488	4.06	3.49	3.13	2.70	2.36	1.73	1.04
*	1	59.3	6504	4.06	3.49	3.17	2.74	2.31	1.73	1.04
*	1	59.1	6488	4.02	3.49	3.13	2.70	2.36	1.73	1.04
*	1	59.3	6504	4.06	3.49	3.13	2.70	2.40	1.73	1.08
*	2	87.0	9528	5.99	5.13	4.71	4.05	3.42	2.60	1.56
*	2	86.5	9480	6.03	5.21	4.67	4.09	3.56	2.64	1.65
*	2	86.5	9480	5.99	5.13	4.67	4.01	3.42	2.60	1.56
*	2	86.4	9472	5.99	5.13	4.63	4.05	3.47	2.60	1.52
*	3	114.1	12512	8.00	6.85	6.17	5.32	4.58	3.47	2.08
*	3	114.2	12520	7.96	6.81	6.13	5.32	4.58	3.42	2.08
*	3	114.2	12528	8.00	6.85	6.21	5.36	4.62	3.51	2.13
*	3	114.2	12520	7.96	6.81	6.17	5.32	4.58	3.42	2.08
*	4	145.1	15904	10.14	8.66	7.84	6.80	5.87	4.42	2.65
*	4	144.8	15872	10.10	8.66	7.84	6.80	5.91	4.46	2.73
*	4	144.8	15872	10.10	8.66	7.80	6.80	5.91	4.42	2.73
*	4	144.9	15896	10.14	8.70	7.88	6.84	5.87	4.51	2.78

Stn: 25 Lane:F1 Temp: J/C: Air: 77 PvT: 78 08:46

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.9	12496	8.09	6.98	6.38	5.57	4.84	3.60	2.17
	C	114.3	12528	7.92	6.85	6.21	5.40	4.71	3.55	2.17
	C	114.2	12520	7.88	6.81	6.17	5.36	4.62	3.51	2.13
*	1	58.7	6440	3.81	3.40	3.13	2.70	2.36	1.73	1.04V
*	1	58.7	6440	3.90	3.53	3.21	2.79	2.44	1.82	1.17
*	1	59.1	6488	3.98	3.49	3.21	2.79	2.40	1.82	1.13
*	1	59.4	6512	3.98	3.49	3.17	2.79	2.40	1.82	1.13
*	2	86.5	9480	5.91	5.08	4.63	4.05	3.51	2.69	1.60
*	2	86.4	9472	5.91	5.17	4.71	4.05	3.56	2.69	1.65
*	2	86.5	9480	5.95	5.13	4.63	4.09	3.56	2.69	1.60
*	2	86.4	9464	5.91	5.08	4.67	4.05	3.51	2.64	1.60
*	3	114.1	12504	7.83	6.76	6.13	5.36	4.67	3.51	2.17
*	3	114.2	12528	7.83	6.81	6.13	5.36	4.67	3.55	2.17

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*	3	114.2	12520	7.88	6.81	6.17	5.40	4.71	3.55	2.21
*	3	114.2	12528	7.79	6.72	6.13	5.32	4.62	3.51	2.13
*	4	144.8	15880	9.89	8.57	7.84	6.84	5.96	4.55	2.78
*	4	144.9	15888	9.89	8.57	7.84	6.84	5.96	4.55	2.78
*	4	145.1	15912	9.89	8.57	7.84	6.84	5.96	4.55	2.78
*	4	145.1	15912	9.89	8.53	7.80	6.80	5.96	4.51	2.78

'DATA ACCEPTED WITH VARIATION

Stn: 50 Lane:F1 Temp: J/C: Air: 77 PvT: 78 08:49

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.9	12488	8.25	7.28	6.60	5.74	4.98	3.73	2.17
	C	113.9	12488	8.09	7.20	6.47	5.61	4.89	3.73	2.21
	C	114.1	12504	8.00	7.07	6.38	5.57	4.80	3.64	2.17
*	1	59.7	6544	4.11	3.66	3.30	2.87	2.49	1.91	1.21
*	1	59.6	6536	4.11	3.66	3.34	2.87	2.49	1.91	1.21
*	1	59.6	6528	4.06	3.62	3.26	2.83	2.44	1.86	1.13
*	1	59.6	6528	4.06	3.62	3.30	2.83	2.49	1.86	1.13
*	2	86.4	9464	5.99	5.30	4.84	4.26	3.64	2.82	1.73
*	2	86.2	9448	5.95	5.26	4.80	4.22	3.60	2.77	1.69
*	2	86.4	9464	5.99	5.30	4.80	4.22	3.60	2.73	1.65
*	2	86.5	9480	5.99	5.30	4.84	4.22	3.64	2.77	1.69
*	3	113.8	12480	7.96	7.02	6.34	5.53	4.80	3.64	2.17
*	3	114.3	12528	7.96	7.02	6.38	5.57	4.84	3.64	2.21
*	3	114.2	12512	8.00	7.11	6.43	5.61	4.89	3.73	2.26
*	3	114.2	12512	7.96	7.02	6.34	5.53	4.80	3.68	2.21
*	4	144.9	15888	10.18	9.01	8.18	7.13	6.22	4.81	2.91
*	4	144.8	15880	10.14	8.96	8.14	7.09	6.22	4.77	2.91
*	4	144.8	15880	10.14	8.96	8.14	7.09	6.22	4.77	2.91
*	4	144.6	15864	10.14	8.96	8.14	7.09	6.22	4.77	2.91

Stn: 75 Lane:F1 Temp: J/C: Air: 77 PvT: 78 08:54

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.9	12488	8.46	7.28	6.68	5.83	5.16	3.94	2.34
	C	114.1	12504	8.50	7.33	6.77	5.87	5.16	3.99	2.43
	C	114.2	12512	8.46	7.33	6.73	5.91	5.16	3.99	2.43
*	1	59.1	6480	4.15	3.75	3.43	2.95	2.62	1.99	1.21
*	1	58.6	6424	4.19	3.75	3.47	2.95	2.62	1.99	1.21
*	1	59.0	6472	4.15	3.75	3.43	3.00	2.62	1.99	1.21
*	1	58.8	6456	4.11	3.79	3.47	3.04	2.67	2.04	1.26
*	2	85.2	9352	6.16	5.43	5.01	4.35	3.82	2.90	1.73
*	2	85.7	9392	6.20	5.52	5.06	4.39	3.87	2.95	1.78
*	2	85.5	9368	6.24	5.47	5.06	4.39	3.82	2.95	1.73
*	2	85.5	9368	6.20	5.52	5.06	4.39	3.82	2.95	1.73
*	3	113.6	12456	8.42	7.28	6.68	5.83	5.16	3.94	2.39
*	3	114.2	12520	8.46	7.33	6.73	5.83	5.16	3.94	2.39
*	3	114.1	12504	8.38	7.28	6.73	5.87	5.16	3.94	2.39
*	3	113.9	12488	8.42	7.28	6.73	5.87	5.16	3.94	2.34
*	4	145.9	16000	10.56	9.35	8.61	7.56	6.62	5.11	3.12
*	4	154.3V	16920V	10.68V	9.44V	8.65V	7.60V	6.62V	5.11V	3.08V
*	4	146.7	16072	10.56	9.31	8.57	7.47	6.58	5.07	3.08
*	4	145.7	15968	10.60	9.31	8.53	7.51	6.58	5.07	3.08

Stn: 100 Lane:F1 Temp: J/C: Air: 78 PvT: 78 08:57

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.9	12488	8.21	7.24	6.68	5.87	5.16	3.94	2.39
	C	114.3	12528	8.00	7.02	6.47	5.66	4.98	3.81	2.30
	C	114.5	12552	7.92	6.98	6.43	5.61	4.93	3.77	2.30
*	1	59.3	6488	3.90	3.58	3.30	2.87	2.49	1.91	1.21
*	1	59.0	6464	3.94	3.58	3.26	2.83	2.49	1.91	1.17
*	1	59.3	6496	3.94	3.53	3.26	2.79	2.44	1.86	1.13
*	1	58.8	6448	3.94	3.53	3.26	2.79	2.44	1.91	1.17
*	2	85.8	9408	5.74	5.21	4.80	4.18	3.64	2.82	1.73
*	2	86.2	9456	5.78	5.21	4.84	4.22	3.64	2.77	1.73
*	2	85.9	9424	5.78	5.21	4.84	4.18	3.64	2.82	1.73
*	2	85.8	9408	5.78	5.21	4.84	4.22	3.69	2.82	1.73
*	3	113.9	12488	7.83	6.89	6.38	5.61	4.93	3.77	2.30
*	3	114.3	12528	7.86	6.94	6.38	5.61	4.93	3.77	2.30
*	3	113.8	12472	7.86	6.94	6.38	5.61	4.93	3.77	2.30
*	3	113.9	12488	7.83	6.94	6.38	5.61	4.93	3.81	2.34

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*	4	145.7	15976	9.93	8.83	8.14	7.18	6.31	4.90	2.99
*	4	145.7	15960	9.89	8.83	8.14	7.18	6.31	4.90	3.04
*	4	145.7	15960	10.01	8.92	8.27	7.35	6.49V	5.03	3.21V
*	4	145.2	15920	9.89	8.79	8.10	7.18	6.31	4.85	2.99

Stn: 125 Lane:F1 Temp: J/C: Air: 79 PvT: 79 09:00

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.8	12360	9.93	8.14	7.15	6.12	5.20	3.81	2.08
	C	113.2	12408	9.68	7.93	6.98	5.99	5.16	3.77	2.17
	C	113.2	12400	9.51	7.80	6.90	5.91	5.07	3.73	2.13
*	1	58.3	6384	4.90	4.09	3.51	3.00	2.58	1.86	1.08
*	1	58.6	6416	4.90	4.09	3.56	3.04	2.58	1.91	1.13
*	1	58.1	6368	4.86	4.09	3.51	3.04	2.58	1.86	1.08
*	1	58.4	6400	4.82	4.05	3.56	3.04	2.58	1.91	1.13
*	2	84.9	9312	7.12	5.86	5.18	4.43	3.78	2.77	1.60
*	2	85.1	9320	7.12	5.90	5.18	4.43	3.78	2.77	1.56
*	2	85.2	9336	7.12	5.90	5.18	4.47	3.82	2.77	1.60
*	2	85.2	9336	7.21	5.99	5.23	4.52	3.87	2.86	1.65
*	3	112.8	12360	9.43	7.76	6.81	5.87	5.02	3.73	2.13
*	3	112.9	12376	9.43	7.71	6.86	5.87	5.02	3.73	2.17
*	3	113.0	12400	9.34	7.67	6.77	5.83	5.02	3.73	2.17
*	3	113.0	12392	9.43	7.76	6.90	5.91	5.11	3.77	2.21
*	4	144.1	15792	11.77	9.78	8.65	7.43	6.40	4.77	2.73
*	4	144.2	15816	11.77	9.74	8.65	7.47	6.44	4.81	2.78
*	4	144.3	15832	11.73	9.69	8.61	7.43	6.36	4.77	2.73
*	4	144.2	15808	11.73	9.69	8.65	7.43	6.40	4.81	2.73

Stn: 150 Lane:F1 Temp: J/C: Air: 79 PvT: 79 09:03

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.0	12400	8.63	7.41	6.73	5.87	5.07	3.81	2.34
	C	113.2	12416	8.42	7.24	6.51	5.70	4.93	3.73	2.21
	C	113.2	12408	8.42	7.24	6.56	5.74	4.98	3.77	2.30
*	1	57.7	6328	3.94	3.62	3.26	2.83	2.44	1.86	1.13
*	1	58.3	6384	4.19V	3.71	3.34	2.91	2.53	1.91	1.26
*	1	58.4	6400	4.02	3.62	3.26	2.87	2.44	1.82	1.13
*	1	58.4	6400	4.06	3.66	3.26	2.87	2.44	1.82	1.13
*	2	85.2	9336	6.03	5.39	4.93	4.26	3.69	2.82	1.73
*	2	85.4	9352	6.07	5.39	4.88	4.26	3.69	2.77	1.73
*	2	85.4	9352	6.03	5.34	4.84	4.22	3.64	2.77	1.69
*	2	85.1	9328	5.99	5.34	4.84	4.22	3.64	2.77	1.69
*	3	112.8	12360	8.30	7.11	6.43	5.61	4.89	3.68	2.21
*	3	113.2	12408	8.42	7.20	6.56	5.70	4.93	3.77	2.34
*	3	113.0	12400	8.34	7.15	6.47	5.66	4.89	3.68	2.26
*	3	113.2	12416	8.30	7.11	6.47	5.66	4.89	3.73	2.26
*	4	144.3	15824	10.22	9.09	8.27	7.26	6.31	4.85	2.95
*	4	144.8	15864	10.35	9.09	8.27	7.22	6.31	4.81	2.95
*	4	144.5	15840	10.26	9.09	8.27	7.22	6.27	4.81	2.95
*	4	144.6	15856	10.56V	9.09	8.27	7.26	6.31	4.85	2.99

Stn: 175 Lane:F1 Temp: J/C: Air: 79 PvT: 79 09:06

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.6	12344	8.63	7.33	6.56	5.66	4.84	3.60	2.08
	C	113.0	12384	8.50	7.15	6.38	5.49	4.71	3.51	2.08
	C	112.9	12376	8.55	7.15	6.43	5.53	4.71	3.55	2.13
*	1	58.0	6352	4.19	3.62	3.26	2.74	2.31	1.78	1.13
*	1	58.3	6392	4.15	3.62	3.21	2.74	2.31	1.73	1.08
*	1	58.1	6368	4.11	3.62	3.26	2.74	2.31	1.78	1.08
*	1	58.0	6352	4.11	3.62	3.26	2.79	2.36	1.78	1.13
*	2	84.5	9264	6.07	5.34	4.84	4.14	3.51	2.69	1.60
*	2	84.8	9296	6.12	5.39	4.84	4.14	3.51	2.64	1.56
*	2	84.8	9304	6.12	5.30	4.80	4.09	3.51	2.64	1.56
*	2	84.9	9304	6.03	5.34	4.80	4.09	3.51	2.64	1.56
*	3	111.7	12256	8.34	7.02	6.30	5.45	4.67	3.51	2.13
*	3	112.3	12320	8.38	7.07	6.34	5.45	4.71	3.51	2.13
*	3	112.2	12296	8.34	7.02	6.34	5.40	4.67	3.47	2.13
*	3	112.2	12296	8.30	7.07	6.34	5.49	4.71	3.55	2.17
*	4	144.1	15792	10.31	9.01	8.10	7.01	6.09	4.55	2.73
*	4	144.1	15792	10.31	8.96	8.10	6.97	6.04	4.55	2.73
*	4	143.9	15776	10.26	9.01	8.14	7.01	6.09	4.59	2.82
*	4	143.6	15752	10.35	9.01	8.10	7.01	6.09	4.59	2.78

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Stn: 200 Lane:F1 Temp: J/C: Air: 79 PvT: 79 09:09

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.2	12296	10.26	8.36	7.37	6.12	5.11	3.64	2.13
	C	112.5	12328	9.97	8.10	7.15	5.95	4.98	3.55	2.08
	C	112.8	12360	9.93	8.06	7.11	5.95	4.93	3.55	2.13
*	1	57.1	6264	5.11	4.18	3.64	3.04	2.49	1.73	1.04
*	1	57.7	6320	5.15	4.27	3.73	3.08	2.58	1.86	1.13
*	1	57.7	6328	5.11	4.18	3.64	3.04	2.49	1.78	1.04
*	1	57.8	6336	5.19	4.27	3.77	3.12	2.58	1.86	1.13
*	2	84.1	9216	7.46	6.08	5.31	4.39	3.64	2.60	1.52
*	2	84.3	9248	7.50	6.08	5.31	4.43	3.69	2.64	1.52
*	2	84.2	9224	7.54	6.08	5.31	4.43	3.69	2.69	1.56
*	2	84.3	9240	7.50	6.03	5.31	4.39	3.69	2.64	1.56
*	3	112.3	12320	9.68	7.89	6.94	5.78	4.84	3.47	2.04
*	3	112.8	12360	9.72	7.93	6.98	5.83	4.84	3.47	2.04
*	3	112.6	12352	9.76	7.93	7.03	5.87	4.89	3.51	2.13
*	3	113.0	12392	9.76	7.97	7.03	5.87	4.93	3.55	2.13
*	4	144.8	15872	12.28	10.00	8.78	7.39	6.18	4.46	2.65
*	4	144.3	15832	12.32	10.00	8.83	7.43	6.22	4.51	2.73
*	4	144.6	15864	12.28	9.95	8.78	7.39	6.18	4.51	2.69
*	4	144.2	15816	12.28	9.95	8.83	7.39	6.22	4.55	2.78

Stn: 225 Lane:F1 Temp: J/C: Air: 79 PvT: 80 09:16

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.0	12400	7.92	6.94	6.34	5.53	4.76	3.60	2.13
	C	113.3	12424	7.75	6.81	6.17	5.40	4.71	3.51	2.13
	C	113.0	12400	7.71	6.76	6.13	5.36	4.62	3.51	2.13
*	1	58.6	6424	3.85	3.40	3.08	2.70	2.31	1.73	1.08
*	1	58.3	6384	3.90	3.49	3.13	2.74	2.40	1.82	1.13
*	1	58.3	6392	3.85	3.45	3.08	2.70	2.31	1.78	1.08
*	1	58.6	6424	3.90	3.49	3.17	2.79	2.40	1.82	1.13
*	2	85.4	9368	5.74	5.08	4.58	4.05	3.47	2.64	1.60
*	2	85.5	9376	5.74	5.08	4.58	4.05	3.47	2.64	1.60
*	2	85.1	9320	5.78	5.08	4.58	4.05	3.51	2.64	1.60
*	2	85.7	9392	5.82	5.13	4.67	4.09	3.56	2.69	1.65
*	3	113.2	12408	7.67	6.72	6.13	5.36	4.67	3.55	2.17
*	3	113.3	12424	7.67	6.72	6.13	5.36	4.67	3.51	2.13
*	3	113.3	12432	7.71	6.76	6.17	5.40	4.71	3.55	2.21
*	3	113.2	12408	7.67	6.72	6.13	5.36	4.67	3.51	2.17
*	4	144.3	15824	9.72	8.53	7.80	6.80	5.96	4.51	2.73
*	4	144.1	15800	9.76	8.57	7.84	6.88	6.00	4.59	2.82
*	4	143.9	15776	9.80	8.53	7.80	6.84	6.00	4.55	2.78
*	4	143.8	15760	9.76	8.53	7.80	6.80	5.96	4.55	2.73

Stn: 250 Lane:F1 Temp: J/C: Air: 79 PvT: 80 09:19

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.8	12368	7.75	6.85	6.21	5.40	4.76	3.55	2.13
	C	112.3	12320	7.54	6.72	6.08	5.23	4.62	3.55	2.13
	C	112.2	12304	7.54	6.59	6.04	5.19	4.58	3.51	2.13
*	1	57.2	6272	3.77	3.40	3.04	2.62	2.31	1.73	1.04
*	1	57.4	6288	3.81	3.40	3.08	2.58	2.31	1.73	1.04
*	1	57.4	6296	3.85	3.40	3.08	2.62	2.36	1.78	1.08
*	1	57.2	6272	3.81	3.40	3.04	2.62	2.31	1.73	1.04
*	2	83.9	9192	5.70	5.04	4.58	3.97	3.47	2.69	1.65
*	2	83.5	9152	5.66	5.00	4.54	3.93	3.47	2.64	1.65
*	2	83.9	9192	5.70	5.00	4.54	3.93	3.42	2.60	1.56
*	2	83.6	9168	5.70	5.00	4.54	3.97	3.47	2.64	1.60
*	3	111.7	12256	7.50	6.59	6.00	5.19	4.62	3.51	2.13
*	3	111.6	12232	7.46	6.59	6.00	5.19	4.58	3.51	2.13
*	3	112.0	12288	7.50	6.59	5.96	5.19	4.58	3.47	2.13
*	3	112.0	12280	7.54	6.59	6.04	5.28	4.62	3.51	2.21
*	4	142.2	15592	9.55	8.40	7.67	6.75	5.87	4.55	2.82
*	4	142.2	15584	9.47	8.40	7.67	6.67	5.87	4.55	2.82
*	4	142.9	15664	9.43	8.36	7.63	6.63	5.87	4.55	2.78
*	4	142.6	15632	9.47	8.40	7.67	6.63	5.87	4.55	2.78

Stn: 275 Lane:F1 Temp: J/C: Air: 79 PvT: 80 09:26

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.9	12048	12.48	9.87	8.18	6.50	5.29	3.64	2.04
	C	110.9	12152	12.07	9.48	7.93	6.29	5.11	3.51	2.04
	C	110.9	12160	11.94	9.39	7.84	6.25	5.07	3.51	2.04

File: C:\FWD\DATA\271028E1.FWD
Road: US-10 EASTBOUND LANES, 13 MILES EAST OF DETROIT LAKES, MN.
Subsection: 271028

*	1	57.8	6344	6.24	5.00	4.16	3.29	2.67	1.82	1.00
*	1	58.4	6392	6.24	5.04	4.20	3.29	2.67	1.82	1.08
*	1	58.0	6360	6.24	5.00	4.20	3.29	2.67	1.82	1.08
*	1	58.7	6440	6.24	5.08	4.24	3.38	2.76	1.86	1.08
*	2	85.1	9328	8.97	7.15	6.00	4.77	3.82	2.69	1.56
*	2	85.4	9352	9.05	7.15	5.96	4.73	3.82	2.60	1.47
*	2	85.2	9344	9.01	7.11	5.96	4.73	3.82	2.60	1.43
*	2	85.2	9344	9.17	7.20	6.04	4.81	3.91	2.73	1.52
*	3	110.7	12144	11.56	9.22	7.75	6.16	5.02	3.47	2.00
*	3	111.0	12168	11.56	9.31	7.80	6.29	5.11	3.60	2.04
*	3	110.9	12160	11.44	9.26	7.75	6.21	5.02	3.51	2.00
*	3	110.9	12160	11.48	9.31	7.80	6.21	5.07	3.55	2.04
*	4	143.8	15760	14.24	11.50	9.73	7.77	6.40	4.55	2.60
*	4	143.2	15704	14.12	11.38	9.60	7.68	6.27	4.46	2.56
*	4	143.3	15712	14.12	11.38	9.55	7.68	6.27	4.46	2.52
*	4	143.6	15744	14.29	11.38	9.55	7.68	6.27	4.46	2.52

'L/TRANS AT LOAD PLATE

Stn: 300 Lane:F1 Temp: J/C: Air: 80 PvT: 80 09:30

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.5	12336	7.62	6.72	6.08	5.28	4.58	3.34	2.00
	C	112.9	12376	7.58	6.64	6.04	5.23	4.53	3.38	2.00
	C	112.9	12384	7.54	6.64	6.00	5.23	4.53	3.38	2.04
*	1	58.0	6360	3.69	3.40	3.08	2.66	2.31	1.69	1.13
*	1	57.7	6328	3.69	3.32	3.00	2.62	2.27	1.65	1.04
*	1	57.5	6312	3.73	3.40	3.04	2.66	2.31	1.73	1.13
*	1	57.8	6344	3.69	3.36	3.00	2.62	2.27	1.69	1.08
*	2	84.6	9280	5.57	4.87	4.37	3.84	3.33	2.47	1.43
*	2	84.8	9288	5.61	4.91	4.41	3.84	3.33	2.47	1.43
*	2	84.6	9280	5.70	4.96	4.50	3.88	3.38	2.56	1.56V
*	2	84.8	9296	5.61	4.91	4.41	3.84	3.33	2.47	1.47
*	3	112.3	12320	7.50	6.55	5.91	5.15	4.49	3.25	2.04
*	3	112.6	12352	7.54	6.59	5.96	5.19	4.49	3.34	2.04
*	3	112.5	12328	7.54	6.55	5.91	5.15	4.49	3.34	2.00
*	3	112.3	12320	7.50	6.51	5.91	5.15	4.44	3.29	1.95
*	4	143.6	15744	9.55	8.36	7.63	6.63	5.73	4.29	2.56
*	4	143.2	15696	9.59	8.40	7.63	6.63	5.78	4.38	2.60
*	4	142.9	15672	9.51	8.32	7.54	6.59	5.69	4.29	2.56
*	4	143.0	15688	9.43	8.32	7.54	6.59	5.69	4.29	2.52

'DATA ACCEPTED WITH VARATION

Stn: 325 Lane:F1 Temp: J/C: Air: 80 PvT: 81 09:33

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.2	12296	8.17	7.20	6.68	5.83	5.11	3.86	1.82
	C	112.3	12320	8.00	7.07	6.47	5.66	4.93	3.68	1.82
	C	112.3	12320	8.00	7.11	6.47	5.66	4.93	3.73	1.87
*	1	57.8	6344	4.02	3.66	3.34	2.95	2.44	1.95	0.95
*	1	57.7	6328	3.98	3.58	3.26	2.87	2.44	1.86	0.91
*	1	58.0	6360	4.02	3.66	3.30	2.91	2.44	1.91	0.91
*	1	57.8	6336	4.06	3.66	3.34	2.91	2.49	1.91	0.95
*	2	84.5	9264	5.91	5.26	4.84	4.22	3.64	2.77	1.34
*	2	84.6	9272	5.91	5.26	4.84	4.22	3.60	2.77	1.26
*	2	84.5	9264	5.91	5.26	4.80	4.22	3.60	2.73	1.26
*	2	84.5	9264	5.91	5.26	4.84	4.22	3.64	2.77	1.30
*	3	112.3	12320	7.92	7.02	6.47	5.66	4.93	3.77	1.91
*	3	112.9	12376	7.92	7.02	6.43	5.61	4.89	3.68	1.78
*	3	112.3	12320	7.92	7.02	6.38	5.61	4.84	3.73	1.82
*	3	112.5	12328	7.92	6.98	6.38	5.61	4.89	3.73	1.87
*	4	143.8	15768	10.10	8.92	8.23	7.18	6.27	4.81	2.43
*	4	143.2	15704	10.01	8.83	8.10	7.05	6.27	4.72	2.43
*	4	142.9	15664	10.01	8.79	8.10	7.09	6.31	4.77	2.43
*	4	143.0	15680	10.05	8.79	8.14	7.13	6.36	4.81	2.47

'M\TRANS CR BETWEEN DF6-DF7

Stn: 350 Lane:F1 Temp: J/C: Air: 81 PvT: 81 09:39

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.3	12320	8.13	7.15	6.51	5.70	4.93	3.64	1.82
	C	112.9	12384	8.04	7.07	6.38	5.61	4.84	3.60	1.91

File: C:\FWD\DATA\271028E1.FWD
Road: US-10 EASTBOUND LANES, 13 MILES EAST OF DETROIT LAKES, MN.
Subsection: 271028

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
		C	112.9	12376	7.96	6.94	6.34	5.53	4.80	3.55	1.87
*		1	58.1	6376	4.06	3.58	3.26	2.79	2.44	1.78	0.91
*		1	58.4	6400	4.06	3.62	3.26	2.83	2.44	1.82	1.00
*		1	58.4	6400	4.06	3.62	3.30	2.87	2.49	1.86	1.04
*		1	58.6	6424	4.06	3.58	3.30	2.83	2.49	1.86	1.00
*		2	84.5	9264	5.91	5.17	4.71	4.09	3.56	2.64	1.34
*		2	84.8	9296	5.95	5.21	4.76	4.14	3.56	2.69	1.39
*		2	84.8	9296	5.95	5.17	4.76	4.09	3.56	2.64	1.34
*		2	85.2	9344	5.95	5.26	4.80	4.18	3.64	2.73	1.47
*		3	112.6	12344	7.88	6.94	6.34	5.53	4.76	3.60	1.95
*		3	113.3	12432	7.88	6.89	6.30	5.49	4.76	3.55	1.87
*		3	113.2	12400	7.83	6.89	6.30	5.45	4.76	3.55	1.87
*		3	113.2	12400	7.88	6.89	6.30	5.49	4.76	3.55	1.91
*		4	144.3	15824	10.05	8.83	8.05	7.01	6.09	4.59	2.47
*		4	143.6	15752	9.93	8.79	7.97	7.01	6.09	4.55	2.43
*		4	143.5	15736	9.97	8.79	7.93	6.97	6.04	4.55	2.43
*		4	143.8	15760	10.01	8.83	8.05	7.05	6.13	4.64	2.52

'M\TRANS CR BETWEEN DF6-DF7

Stn: 375 Lane:F1 Temp: J/C: Air: 81 PvT: 81 09:45

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
		C	112.8	12360	8.80	7.76	7.15	6.29	5.56	4.33	1.87
		C	113.3	12424	8.55	7.58	6.98	6.16	5.38	4.20	1.95
		C	113.5	12440	8.46	7.54	6.94	6.12	5.38	4.16	1.91
*		1	57.7	6328	4.36	3.88	3.51	3.12	2.76	2.12	1.00
*		1	58.4	6400	4.40	3.92	3.56	3.12	2.76	2.12	0.95
*		1	58.3	6384	4.40	3.96	3.60	3.17	2.80	2.17	1.04
*		1	58.0	6360	4.27	3.92	3.56	3.12	2.76	2.08	0.95
*		2	84.5	9272	6.24	5.60	5.18	4.52	4.00	3.08	1.39
*		2	84.9	9312	6.16	5.64	5.18	4.56	4.00	3.12	1.39
*		2	84.5	9272	6.16	5.64	5.18	4.56	4.04	3.12	1.43
*		2	84.2	9224	6.16	5.64	5.18	4.60	4.04	3.12	1.47
*		3	113.5	12432	8.34	7.41	6.86	6.04	5.29	4.12	1.91
*		3	113.5	12432	8.50	7.50	6.90	6.08	5.38	4.20	1.95
*		3	113.5	12432	8.46	7.45	6.86	6.08	5.38	4.20	1.95
*		3	113.3	12424	8.42	7.45	6.86	6.04	5.33	4.16	1.91
*		4	145.4	15944	10.68	9.48	8.74	7.77	6.80	5.33	2.52
*		4	145.2	15920	10.60	9.44	8.70	7.68	6.76	5.37	2.52
*		4	145.1	15912	10.60	9.39	8.65	7.64	6.76	5.33	2.47
*		4	145.2	15920	10.56	9.39	8.65	7.64	6.71	5.29	2.47

'L\TRANS CR AT DF6

Stn: 400 Lane:F1 Temp: J/C: Air: 82 PvT: 81 09:49

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
		C	112.5	12336	8.17	7.15	6.56	5.66	4.89	3.64	2.08
		C	112.9	12384	7.96	6.98	6.34	5.45	4.67	3.51	2.00
		C	112.9	12376	7.96	6.98	6.38	5.49	4.71	3.55	2.08
*		1	57.5	6312	4.02	3.58	3.26	2.79	2.36	1.78	1.08
*		1	58.3	6384	4.02	3.58	3.26	2.74	2.31	1.78	1.04
*		1	58.3	6384	4.02	3.53	3.26	2.79	2.36	1.73	1.04
*		1	58.0	6352	3.98	3.58	3.26	2.74	2.36	1.78	1.04
*		2	84.9	9312	5.82	5.17	4.71	4.05	3.47	2.60	1.47
*		2	85.1	9328	5.87	5.21	4.80	4.09	3.51	2.64	1.52
*		2	85.1	9328	5.87	5.17	4.76	4.09	3.47	2.60	1.47
*		2	84.8	9296	5.87	5.21	4.76	4.09	3.51	2.60	1.52
*		3	112.9	12376	7.88	6.89	6.30	5.45	4.62	3.47	2.04
*		3	113.0	12392	7.88	6.94	6.34	5.45	4.62	3.51	2.04
*		3	112.9	12376	7.88	6.89	6.30	5.40	4.62	3.51	2.04
*		3	112.9	12376	7.88	6.89	6.34	5.45	4.62	3.51	2.04
*		4	144.3	15824	9.89	8.79	7.93	6.92	6.04	4.51	2.60
*		4	144.2	15808	9.89	8.70	7.93	6.92	6.00	4.46	2.60
*		4	144.1	15792	9.93	8.75	7.97	6.97	6.04	4.51	2.65
*		4	143.9	15784	9.89	8.70	7.93	6.88	6.00	4.46	2.60

Stn: 425 Lane:F1 Temp: J/C: Air: 81 PvT: 82 09:53

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
		C	112.0	12280	8.97	8.01	7.28	6.37	5.56	4.12	2.08
		C	112.3	12320	8.80	7.84	7.11	6.25	5.42	4.03	2.17
		C	112.2	12296	8.71	7.80	7.07	6.21	5.38	3.99	2.13

File: C:\FWD\DATA\271028E1.FWD
Road: US-10 EASTBOUND LANES, 13 MILES EAST OF DETROIT LAKES, MN.
Subsection: 271028

*	1	57.4	6288	4.44	4.05	3.60	3.17	2.76	2.08	1.08
*	1	57.2	6272	4.44	4.01	3.60	3.17	2.80	2.08	1.08
*	1	58.0	6360	4.44	4.01	3.60	3.17	2.76	2.04	1.04
*	1	57.7	6328	4.44	4.05	3.60	3.17	2.76	2.08	1.08
*	2	84.5	9256	6.49	5.86	5.27	4.64	4.04	2.99	1.56
*	2	84.5	9272	6.49	5.86	5.27	4.64	4.09	3.03	1.56
*	2	84.5	9272	6.45	5.86	5.27	4.64	4.04	2.99	1.56
*	2	84.5	9272	6.49	5.86	5.27	4.64	4.09	3.03	1.52
*	3	112.2	12296	8.71	7.76	7.07	6.21	5.38	4.07	2.21
*	3	112.3	12320	8.76	7.76	7.07	6.21	5.42	4.07	2.17
*	3	112.3	12320	8.67	7.71	7.03	6.16	5.33	4.03	2.13
*	3	112.3	12320	8.67	7.71	7.03	6.12	5.33	3.99	2.13
*	4	143.3	15712	10.93	9.78	8.95	7.85	6.85	5.16	2.73
*	4	143.0	15688	10.93	9.82	8.91	7.81	6.85	5.16	2.78
*	4	142.8	15648	10.89	9.74	8.87	7.81	6.76	5.16	2.78
*	4	142.8	15656	10.89	9.74	8.91	7.81	6.80	5.11	2.78

'L\TRANS CR BETWEEN DF6-DF7

Stn: 450 Lane:F1 Temp: J/C: Air: 81 PvT: 82 09:58

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.2	12296	9.38	8.10	7.24	6.29	5.33	3.90	2.17
	C	113.0	12384	9.26	8.01	7.15	6.21	5.29	3.90	2.21
	C	112.9	12384	9.17	7.89	7.07	6.12	5.20	3.77	2.13
*	1	57.7	6328	4.73	4.14	3.64	3.17	2.67	1.95	1.17
*	1	57.7	6320	4.78	4.18	3.73	3.25	2.76	2.04V	1.26V
*	1	57.5	6304	4.65	4.05	3.56	3.08	2.58	1.82V	1.04V
*	1	57.5	6304	4.69	4.14	3.64	3.17	2.67	1.91	1.13
*	2	84.3	9240	6.83	5.95	5.27	4.56	3.91	2.82	1.60
*	2	84.2	9240	6.83	5.95	5.31	4.60	3.87	2.82	1.56
*	2	84.1	9216	6.83	5.95	5.31	4.56	3.91	2.82	1.56
*	2	84.3	9240	6.87	5.95	5.36	4.60	3.91	2.82	1.60
*	3	112.5	12328	9.09	7.84	7.03	6.04	5.16	3.73	2.13
*	3	112.6	12352	9.09	7.80	7.03	6.04	5.16	3.73	2.13
*	3	112.8	12368	9.09	7.80	7.03	6.08	5.16	3.77	2.17
*	3	112.5	12328	9.13	7.89	7.07	6.12	5.24	3.81	2.26
*	4	144.3	15832	11.52	9.82	8.95	7.73	6.67	4.85	2.82
*	4	144.2	15816	11.48	9.95	8.91	7.77	6.62	4.90	2.82
*	4	143.8	15760	11.40	9.87	8.87	7.73	6.58	4.85	2.78
*	4	143.9	15784	11.44	9.91	8.87	7.73	6.62	4.90	2.86

'ACCEPTED TEST WITH VARATION

Stn: 475 Lane:F1 Temp: J/C: Air: 81 PvT: 83 10:01

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.2	12408	8.46	7.50	6.81	5.91	5.07	3.77	2.17
	C	113.3	12424	8.34	7.37	6.68	5.78	4.93	3.68	2.21
	C	113.3	12424	8.30	7.28	6.64	5.74	4.93	3.60	2.08
*	1	57.0	6240	4.15	3.66	3.34	2.87	2.44	1.82	1.08
*	1	57.4	6296	4.19	3.75	3.43	2.95	2.53	1.91	1.17
*	1	57.7	6328	4.19	3.71	3.38	2.91	2.53	1.82	1.08
*	1	57.8	6336	4.19	3.71	3.34	2.91	2.49	1.82	1.08
*	2	84.1	9224	6.16	5.47	4.97	4.31	3.69	2.77	1.65
*	2	83.9	9208	6.24	5.47	5.01	4.31	3.69	2.77	1.69
*	2	84.1	9224	6.24	5.47	5.01	4.35	3.73	2.77	1.69
*	2	84.1	9224	6.20	5.43	4.97	4.31	3.69	2.73	1.65
*	3	113.3	12424	8.17	7.24	6.60	5.70	4.93	3.64	2.17
*	3	113.3	12424	8.25	7.24	6.60	5.70	4.89	3.64	2.17
*	3	113.3	12424	8.25	7.24	6.60	5.74	4.93	3.64	2.17
*	3	113.3	12424	8.25	7.24	6.60	5.70	4.93	3.64	2.17
*	4	145.7	15960	10.47	9.22	8.40	7.30	6.31	4.72	2.82
*	4	145.7	15968	10.39	9.18	8.40	7.30	6.27	4.72	2.82
*	4	145.4	15944	10.39	9.18	8.35	7.26	6.27	4.72	2.82
*	4	145.2	15928	10.39	9.22	8.40	7.30	6.31	4.77	2.86

Stn: 500 Lane:F1 Temp: J/C: Air: 81 PvT: 83 10:04

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.0	12288	9.89	8.23	7.41	6.33	5.38	3.99	2.26
	C	112.3	12320	9.68	8.10	7.28	6.21	5.29	3.90	2.30
	C	112.5	12336	9.59	7.97	7.15	6.12	5.24	3.81	2.26
*	1	57.0	6240	5.11	4.31	3.86	3.29	2.80	2.08	1.34

File: C:\FWD\DATA\271028E1.FWD
Road: US-10 EASTBOUND LANES, 13 MILES EAST OF DETROIT LAKES, MN.
Subsection: 271028

*	1	56.8	6232	5.11	4.31	3.86	3.29	2.84	2.08	1.30
*	1	56.4	6184	5.03	4.22	3.77	3.21	2.76	2.04	1.26
*	1	56.7	6216	5.03	4.22	3.77	3.21	2.76	1.99	1.30
*	2	83.5	9144	7.29	6.03	5.40	4.60	3.96	2.86	1.65
*	2	83.0	9096	7.33	6.08	5.44	4.69	4.00	2.90	1.78
*	2	83.3	9144	7.37	6.08	5.48	4.69	4.04	2.90	1.78
*	2	83.2	9128	7.29	6.08	5.44	4.64	3.96	2.90	1.73
*	3	112.5	12336	9.51	7.97	7.15	6.12	5.24	3.86	2.26
*	3	112.8	12360	9.51	7.97	7.15	6.08	5.20	3.86	2.21
*	3	112.6	12336	9.51	7.89	7.11	6.04	5.20	3.77	2.21
*	3	112.5	12328	9.47	7.97	7.11	6.08	5.24	3.86	2.26
*	4	145.1	15912	12.15	10.13	9.08	7.81	6.71	4.94	2.95
*	4	145.4	15944	12.07	10.08	9.04	7.81	6.71	4.94	2.95
*	4	145.2	15928	12.07	10.08	9.04	7.77	6.71	4.98	2.95
*	4	144.9	15896	12.07	10.04	9.04	7.73	6.62	4.90	2.91

Stn: 520 Lane:F1 Temp: J/C: Air: 82 PvT: 84 10:07

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.8	12368	8.04	7.11	6.60	5.78	5.07	3.86	2.17
	C	112.9	12384	7.96	7.02	6.47	5.70	4.98	3.81	2.26
	C	113.0	12392	7.96	7.02	6.47	5.70	4.98	3.86	2.26
*	1	57.1	6264	3.94	3.49	3.21	2.79	2.44	1.82	1.08
*	1	57.8	6336	4.02	3.53	3.30	2.87	2.49	1.91	1.17
*	1	57.4	6296	3.94	3.45	3.21	2.83	2.44	1.82	1.08
*	1	57.7	6320	3.94	3.45	3.21	2.79	2.44	1.82	1.08
*	2	83.9	9208	5.91	5.21	4.80	4.26	3.73	2.86	1.69
*	2	84.1	9224	5.87	5.21	4.80	4.22	3.69	2.82	1.65
*	2	83.8	9176	5.87	5.21	4.80	4.26	3.69	2.82	1.65
*	2	83.9	9200	5.87	5.26	4.84	4.31	3.73	2.86	1.69
*	3	112.6	12344	7.83	6.94	6.34	5.61	4.93	3.77	2.21
*	3	112.8	12360	7.88	6.94	6.38	5.61	4.93	3.81	2.21
*	3	112.8	12360	7.83	6.89	6.34	5.61	4.93	3.73	2.17
*	3	112.8	12360	7.92	7.02	6.43	5.70	5.07	3.90	2.34
*	4	144.6	15864	10.14	8.92	8.23	7.35	6.44	5.03	2.95
*	4	144.5	15848	10.01	8.88	8.14	7.22	6.36	4.90	2.86
*	4	144.3	15832	9.97	8.88	8.14	7.22	6.36	4.90	2.91
*	4	144.6	15848	9.97	8.92	8.14	7.22	6.36	4.90	2.91

Mileage:-.004 -> .098

File: C:\FWD\DATA\271028E3.FWD
Road: US-10 EASTBOUND LANES, 13 MILES EAST OF DETROIT LAKES, MN.
Subsection: 271028

FWD S/N : 8002-063
Operator ID : PELKEY, BRUCE J.

Stationing...: Feet

Diameter of Plate: 11.8
Deflector distances : 8 12 16 24 36 60

SHRP TESTING - FLEXIBLE - BASIN TEST (F0,F1,F3)
Sequence: CCC11112222333344444

Stn: -30 Lane:F3 Temp: J/C: Air: 83 PvT: 83 10:16

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.9	12264	8.92	7.71	6.94	5.95	5.07	3.60	2.00
	C	112.0	12288	8.80	7.58	6.81	5.87	4.98	3.60	2.08
	C	112.2	12296	8.71	7.50	6.81	5.83	4.93	3.55	2.04
*	1	57.7	6328	4.57	3.96	3.60	3.08	2.58	1.86	1.08
*	1	58.3	6392	4.61	3.96	3.60	3.04	2.53	1.82	1.04
*	1	58.4	6400	4.57	3.92	3.60	3.04	2.53	1.82	1.04
*	1	58.3	6384	4.57	3.96	3.60	3.04	2.53	1.82	1.04
*	2	84.1	9216	6.54	5.64	5.14	4.39	3.69	2.69	1.52
*	2	84.6	9272	6.54	5.69	5.18	4.43	3.69	2.69	1.56
*	2	84.3	9256	6.54	5.69	5.14	4.39	3.69	2.69	1.52
*	2	84.5	9264	6.54	5.69	5.18	4.39	3.69	2.69	1.52
*	3	112.0	12280	8.71	7.50	6.81	5.83	4.89	3.60	2.08
*	3	112.3	12312	8.76	7.50	6.86	5.87	4.93	3.60	2.08
*	3	112.5	12336	8.71	7.50	6.86	5.83	4.89	3.60	2.08
*	3	112.3	12312	8.63	7.50	6.81	5.83	4.89	3.55	2.04
*	4	143.8	15760	10.93	9.44	8.57	7.35	6.22	4.55	2.65
*	4	143.2	15704	10.85	9.35	8.44	7.26	6.18	4.51	2.60
*	4	143.3	15712	10.85	9.39	8.44	7.26	6.22	4.51	2.65
*	4	143.2	15696	10.85	9.35	8.44	7.26	6.22	4.51	2.60

Stn: -25 Lane:F3 Temp: J/C: Air: 83 PvT: 84 10:19

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.5	12328	8.50	7.41	6.77	5.78	4.93	3.55	2.04
	C	112.9	12376	8.25	7.20	6.56	5.61	4.80	3.51	2.04
	C	112.9	12376	8.25	7.20	6.56	5.61	4.76	3.47	2.04
*	1	58.3	6384	4.32	3.75	3.47	2.91	2.49	1.82	1.08
*	1	58.4	6400	4.27	3.75	3.43	2.91	2.49	1.82	1.04
*	1	58.4	6400	4.32	3.79	3.47	2.95	2.53	1.82	1.08
*	1	58.3	6392	4.32	3.75	3.47	2.95	2.49	1.82	1.08
*	2	84.6	9272	6.20	5.43	4.97	4.26	3.60	2.64	1.56
*	2	84.5	9264	6.16	5.43	4.97	4.22	3.60	2.60	1.52
*	2	84.3	9248	6.20	5.43	4.97	4.22	3.60	2.60	1.52
*	2	84.6	9280	6.16	5.43	4.97	4.22	3.60	2.60	1.52
*	3	112.6	12344	8.17	7.15	6.47	5.57	4.76	3.42	2.04
*	3	112.8	12360	8.21	7.20	6.51	5.57	4.76	3.51	2.04
*	3	112.9	12376	8.17	7.15	6.47	5.53	4.76	3.47	2.04
*	3	112.8	12360	8.13	7.15	6.47	5.53	4.71	3.47	2.00
*	4	144.9	15888	10.35	9.01	8.18	7.05	6.09	4.46	2.65
*	4	145.1	15904	10.26	8.96	8.14	7.01	6.00	4.42	2.60
*	4	144.9	15888	10.31	9.01	8.18	7.05	6.04	4.46	2.69
*	4	144.9	15888	10.26	8.96	8.10	7.01	6.00	4.42	2.60

Stn: -20 Lane:F3 Temp: J/C: Air: 84 PvT: 84 10:22

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.8	12360	8.55	7.37	6.73	5.78	4.93	3.60	2.08
	C	113.2	12416	8.30	7.15	6.51	5.57	4.76	3.47	2.04
	C	112.9	12384	8.25	7.15	6.47	5.57	4.80	3.51	2.08
*	1	58.3	6392	4.32	3.75	3.38	2.91	2.49	1.82	1.08
*	1	58.1	6368	4.23	3.75	3.38	2.91	2.49	1.82	1.13
*	1	58.4	6400	4.15	3.71	3.34	2.87	2.44	1.78	1.04
*	1	58.3	6384	4.23	3.75	3.38	2.91	2.49	1.82	1.08
*	2	84.5	9264	6.12	5.39	4.88	4.22	3.60	2.60	1.52
*	2	84.5	9264	6.16	5.39	4.88	4.22	3.60	2.64	1.52
*	2	84.6	9280	6.12	5.34	4.88	4.22	3.56	2.60	1.52
*	2	84.6	9280	6.16	5.39	4.88	4.22	3.56	2.60	1.52
*	3	113.3	12424	8.21	7.11	6.43	5.53	4.71	3.47	2.04
*	3	113.2	12408	8.21	7.11	6.43	5.57	4.76	3.51	2.08

File: C:\FWD\DATA\271028E3.FWD
Road: US-10 EASTBOUND LANES, 13 MILES EAST OF DETROIT LAKES, MN.
Subsection: 271028

*	3	113.3	12424	8.30	7.15	6.47	5.61	4.76	3.51	2.08
*	3	113.3	12424	8.25	7.07	6.47	5.57	4.76	3.51	2.08
*	4	145.9	16008	10.31	9.01	8.18	7.09	6.09	4.55	2.69
*	4	145.4	15936	10.10	8.92	8.10	7.01	6.04	4.46	2.65
*	4	145.1	15912	10.18	8.92	8.14	7.05	6.09	4.51	2.69
*	4	145.2	15920	10.18	8.92	8.14	7.05	6.09	4.51	2.69

Stn: -15 Lane:F3 Temp: J/C: Air: 85 PvT: 84 10:25

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.8	12360	8.88	7.76	6.98	6.04	5.07	3.73	2.13
	C	112.9	12376	8.67	7.50	6.73	5.83	4.89	3.55	2.04
	C	112.8	12368	8.63	7.50	6.73	5.83	4.89	3.55	2.04
*	1	57.7	6328	4.44	3.92	3.43	3.04	2.49	1.82	1.04
*	1	57.8	6336	4.44	3.92	3.43	3.00	2.49	1.78	1.04
*	1	58.1	6376	4.44	3.92	3.43	3.04	2.49	1.78	1.04
*	1	58.0	6352	4.48	3.92	3.47	3.00	2.49	1.82	1.04
*	2	83.9	9200	6.45	5.64	5.06	4.39	3.64	2.69	1.52
*	2	84.3	9248	6.45	5.64	5.06	4.39	3.69	2.69	1.52
*	2	84.6	9272	6.49	5.69	5.10	4.43	3.69	2.73	1.52
*	2	84.1	9216	6.49	5.69	5.14	4.47	3.73	2.77	1.60
*	3	113.2	12416	8.63	7.50	6.77	5.83	4.98	3.64	2.13
*	3	112.9	12376	8.63	7.50	6.77	5.87	4.93	3.64	2.13
*	3	113.0	12384	8.59	7.41	6.73	5.78	4.89	3.60	2.08
*	3	113.0	12392	8.63	7.50	6.77	5.87	4.98	3.64	2.13
*	4	145.8	15984	10.85	9.44	8.48	7.35	6.27	4.64	2.69
*	4	145.2	15928	10.81	9.31	8.48	7.26	6.22	4.59	2.69
*	4	145.4	15936	10.85	9.39	8.53	7.35	6.27	4.64	2.73
*	4	145.4	15928	10.81	9.31	8.48	7.26	6.22	4.59	2.65

Stn: -10 Lane:F3 Temp: J/C: Air: 84 PvT: 85 10:30

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.6	12352	8.71	7.58	6.94	5.95	5.11	3.64	2.04
	C	113.0	12392	8.71	7.63	6.98	5.99	5.16	3.73	2.04
	C	112.8	12360	8.67	7.58	6.94	5.95	5.07	3.64	2.00
*	1	57.5	6304	4.40	3.92	3.60	3.08	2.62	1.82	1.00
*	1	57.8	6336	4.48	4.01	3.64	3.17	2.67	1.91	1.08
*	1	57.5	6312	4.44	3.92	3.56	3.08	2.62	1.82	1.00
*	1	57.5	6312	4.40	3.92	3.60	3.08	2.62	1.86	1.00
*	2	83.9	9200	6.49	5.77	5.27	4.56	3.87	2.77	1.56
*	2	84.2	9232	6.54	5.77	5.27	4.52	3.87	2.73	1.52
*	2	84.2	9240	6.58	5.73	5.23	4.52	3.82	2.73	1.47
*	2	83.9	9200	6.58	5.73	5.27	4.56	3.87	2.77	1.52
*	3	113.2	12408	8.63	7.54	6.90	5.95	5.07	3.64	2.00
*	3	112.8	12368	8.67	7.58	6.90	5.95	5.07	3.64	1.95
*	3	112.8	12360	8.67	7.63	6.94	5.99	5.11	3.73	2.00
*	3	113.0	12400	8.59	7.58	6.94	5.95	5.07	3.64	1.95
*	4	145.4	15944	11.02	9.65	8.78	7.60	6.53	4.77	2.60
*	4	145.4	15936	10.98	9.65	8.74	7.60	6.49	4.77	2.65
*	4	145.2	15928	10.93	9.61	8.70	7.56	6.49	4.77	2.69
*	4	144.9	15896	10.89	9.57	8.70	7.51	6.44	4.72	2.60

CMMNT.
L TRANS CR Between D6 - D7

Stn: -5 Lane:F3 Temp: J/C: Air: 85 PvT: 84 10:33

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.9	12272	10.47	8.62	7.58	6.33	5.29	3.77	2.04
	C	112.3	12312	10.14	8.36	7.37	6.16	5.16	3.68	2.04
	C	111.9	12264	10.05	8.23	7.24	6.08	5.07	3.60	2.00
*	1	57.0	6240	5.45	4.44	3.90	3.25	2.67	1.91	1.08
*	1	57.2	6260	5.49	4.48	3.90	3.21	2.67	1.91	1.08
*	1	57.0	6248	5.40	4.40	3.86	3.21	2.62	1.86	1.04
*	1	57.2	6280	5.45	4.40	3.86	3.17	2.62	1.86	1.04
*	2	83.2	9128	7.75	6.33	5.57	4.64	3.87	2.77	1.56
*	2	83.6	9168	7.75	6.29	5.53	4.64	3.82	2.73	1.52
*	2	83.6	9168	7.75	6.33	5.53	4.64	3.87	2.77	1.52
*	2	83.8	9176	7.79	6.33	5.61	4.69	3.87	2.82	1.60
*	3	111.9	12272	9.93	8.19	7.20	6.04	5.02	3.60	2.00
*	3	112.0	12288	9.97	8.19	7.20	6.04	5.02	3.60	2.00
*	3	112.3	12312	9.97	8.19	7.24	6.08	5.11	3.60	1.95
*	3	112.8	12352	9.97	8.19	7.24	6.04	5.02	3.60	2.00
*	4	144.3	15824	12.48	10.21	9.04	7.60	6.40	4.59	2.56
*	4	144.3	15832	12.48	10.30	9.13	7.68	6.53	4.59	2.60

File: C:\FWD\DATA\27102SE3.FWD
Road: US-10 EASTBOUND LANES, 13 MILES EAST OF DETROIT LAKES, MN.
Subsection: 271028

*	4	144.1	15792	12.48	10.26	9.13	7.68	6.53	4.55	2.56
*	4	143.5	15728	12.48	10.26	9.08	7.68	6.58	4.55	2.60

Stn: 0 Lane:F3 Temp: J/C: Air: 86 PvT: 84 10:38

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.2	12416	8.80	7.63	6.94	5.99	5.16	3.77	2.21
	C	113.3	12416	8.63	7.45	6.77	5.83	4.98	3.64	2.13
	C	113.3	12416	8.63	7.41	6.73	5.83	4.98	3.68	2.21
*	1	57.7	6320	4.32	3.75	3.34	2.87	2.44	1.78	1.00
*	1	58.0	6360	4.40	3.79	3.43	2.91	2.49	1.82	1.04
*	1	57.7	6328	4.32	3.75	3.38	2.87	2.44	1.78	1.00
*	1	57.7	6328	4.44	3.83	3.47	3.00	2.58	1.91	1.17V
*	2	83.9	9200	6.33	5.56	5.06	4.31	3.69	2.73	1.56
*	2	84.5	9256	6.37	5.56	5.06	4.35	3.69	2.73	1.56
*	2	84.3	9248	6.33	5.56	5.06	4.31	3.69	2.69	1.56
*	2	84.3	9248	6.33	5.56	5.06	4.35	3.73	2.73	1.56
*	3	112.9	12384	8.46	7.33	6.60	5.70	4.89	3.60	2.13
*	3	113.3	12424	8.38	7.33	6.60	5.70	4.89	3.60	2.08
*	3	113.5	12440	8.55	7.37	6.68	5.74	4.93	3.60	2.13
*	3	113.5	12440	8.55	7.33	6.64	5.74	4.93	3.64	2.13
*	4	146.2	16032	10.77	9.26	8.40	7.26	6.22	4.64	2.69
*	4	145.7	15968	10.64	9.22	8.35	7.22	6.22	4.64	2.69
*	4	145.8	15976	10.77	9.31	8.44	7.30	6.27	4.68	2.78
*	4	145.5	15960	10.68	9.22	8.35	7.26	6.27	4.64	2.73

'ACCEPTED TEST WITH VARATION

Stn: 25 Lane:F3 Temp: J/C: Air: 87 PvT: 87 10:41

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.8	12368	8.00	7.11	6.47	5.57	4.84	3.55	2.13
	C	113.2	12408	7.92	6.98	6.34	5.49	4.76	3.55	2.17
	C	113.0	12392	7.92	6.94	6.34	5.49	4.76	3.55	2.17
*	1	58.0	6360	3.98	3.53	3.21	2.74	2.36	1.73	1.08
*	1	58.4	6400	4.06	3.58	3.21	2.79	2.40	1.73	1.08
*	1	58.3	6392	4.02	3.53	3.21	2.79	2.40	1.73	1.08
*	1	57.8	6336	4.06	3.62	3.30	2.83	2.44	1.82	1.17
*	2	84.8	9288	5.91	5.21	4.76	4.14	3.56	2.64	1.60
*	2	84.3	9248	5.95	5.26	4.80	4.18	3.60	2.64	1.65
*	2	84.5	9264	5.95	5.26	4.76	4.14	3.60	2.64	1.60
*	2	84.6	9272	5.91	5.26	4.76	4.14	3.56	2.64	1.60
*	3	113.5	12440	7.83	6.89	6.26	5.45	4.71	3.47	2.13
*	3	113.3	12424	7.88	6.98	6.30	5.49	4.80	3.55	2.21
*	3	113.3	12424	7.83	6.98	6.30	5.53	4.80	3.55	2.21
*	3	113.3	12424	7.88	6.98	6.30	5.49	4.80	3.55	2.17
*	4	145.9	15992	10.05	8.83	8.05	7.01	6.13	4.59	2.82
*	4	145.8	15984	10.01	8.75	7.97	6.92	6.04	4.51	2.78
*	4	146.1	16008	9.97	8.75	7.97	6.92	6.04	4.51	2.73
*	4	145.5	15960	9.97	8.79	7.97	6.97	6.04	4.55	2.82

Stn: 50 Lane:F3 Temp: J/C: Air: 88 PvT: 88 10:44

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.9	12384	8.38	7.41	6.77	5.87	5.02	3.73	2.17
	C	112.9	12384	8.25	7.28	6.64	5.78	5.02	3.73	2.21
	C	113.0	12400	8.30	7.33	6.68	5.78	4.98	3.73	2.21
*	1	57.1	6264	4.15	3.66	3.34	2.91	2.49	1.82	1.08
*	1	57.8	6344	4.15	3.66	3.34	2.91	2.44	1.82	1.08
*	1	57.7	6320	4.15	3.66	3.38	2.91	2.44	1.86	1.13
*	1	58.7	6432	4.19	3.71	3.34	2.95	2.49	1.82	1.08
*	2	84.5	9264	6.12	5.43	4.97	4.35	3.64	2.77	1.60
*	2	84.5	9264	6.12	5.43	4.97	4.31	3.69	2.73	1.60
*	2	84.3	9248	6.16	5.43	4.97	4.35	3.69	2.77	1.65
*	2	84.3	9248	6.16	5.43	4.97	4.35	3.69	2.77	1.60
*	3	112.8	12368	8.17	7.24	6.64	5.74	4.98	3.73	2.21
*	3	113.8	12472	8.21	7.28	6.64	5.74	4.98	3.73	2.21
*	3	113.6	12456	8.21	7.24	6.60	5.78	4.93	3.68	2.17
*	3	113.9	12480	8.21	7.28	6.64	5.83	4.98	3.73	2.21
*	4	145.7	15968	10.47	9.22	8.44	7.35	6.36	4.77	2.82
*	4	146.1	16024	10.47	9.22	8.44	7.30	6.36	4.81	2.82
*	4	145.8	15992	10.52	9.26	8.44	7.30	6.36	4.81	2.86
*	4	145.5	15960	10.47	9.22	8.40	7.30	6.36	4.77	2.82

File: C:\FWD\DATA\271028E3.FWD
Road: US-10 EASTBOUND LANES, 13 MILES EAST OF DETROIT LAKES, MN.
Subsection: 271028

Stn: 75		Lane:F3	Temp:		J/C:		Air: 90	PvT: 90		10:47
Sto	Hgt psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7	
	C 114.3	12544	8.97	8.06	7.37	6.46	5.60	4.20	2.43	
	C 113.5	12448	8.71	7.89	7.15	6.29	5.47	4.12	2.39	
	C 113.6	12456	8.67	7.80	7.07	6.25	5.42	4.03	2.34	
*	1 57.8	6344	4.40	3.96	3.60	3.17	2.76	2.08	1.30	
*	1 57.5	6304	4.36	3.88	3.56	3.12	2.71	2.04	1.21	
*	1 58.3	6384	4.40	4.01	3.60	3.21	2.76	2.04	1.21	
*	1 58.3	6384	4.32	3.96	3.60	3.21	2.76	2.08	1.21	
*	2 84.5	9256	6.41	5.82	5.31	4.64	4.00	2.99	1.69	
*	2 84.5	9264	6.54	5.90	5.40	4.73	4.13	3.08	1.82	
*	2 84.3	9248	6.45	5.82	5.31	4.64	4.04	2.99	1.73	
*	2 84.5	9264	6.49	5.82	5.31	4.69	4.04	3.03	1.73	
*	3 113.6	12464	8.59	7.71	7.03	6.16	5.38	4.03	2.34	
*	3 113.6	12448	8.63	7.76	7.07	6.25	5.42	4.07	2.39	
*	3 113.8	12480	8.59	7.71	7.03	6.21	5.38	4.03	2.34	
*	3 113.6	12464	8.67	7.80	7.11	6.25	5.42	4.12	2.43	
*	4 146.2	16040	10.93	9.78	8.95	7.85	6.85	5.16	3.04	
*	4 146.7	16080	10.98	9.82	8.95	7.89	6.89	5.20	3.08	
*	4 146.1	16024	10.93	9.74	8.91	7.85	6.85	5.16	3.04	
*	4 146.8	16104	10.93	9.78	8.91	7.89	6.89	5.16	3.04	

Stn: 100		Lane:F3	Temp:		J/C:		Air: 91	PvT: 90		10:49
Sto	Hgt psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7	
	C 113.9	12488	8.84	7.84	7.15	6.21	5.38	3.99	2.30	
	C 113.5	12448	8.63	7.63	6.98	6.04	5.20	3.86	2.30	
	C 113.6	12456	8.63	7.58	6.94	6.04	5.20	3.86	2.30	
*	1 58.3	6392	4.36	3.92	3.56	3.08	2.62	1.95	1.21	
*	1 58.4	6400	4.32	3.88	3.51	3.08	2.62	1.95	1.17	
*	1 58.0	6360	4.40	3.96	3.60	3.12	2.71	1.99	1.26	
*	1 58.4	6408	4.44	3.96	3.60	3.12	2.71	1.99	1.26	
*	2 84.2	9224	6.41	5.69	5.18	4.47	3.87	2.86	1.69	
*	2 84.8	9288	6.54	5.77	5.31	4.60	3.96	2.95	1.78	
*	2 84.5	9264	6.45	5.69	5.23	4.56	3.91	2.90	1.73	
*	2 84.6	9280	6.45	5.73	5.27	4.56	3.91	2.90	1.73	
*	3 113.2	12416	8.55	7.54	6.90	5.99	5.16	3.86	2.26	
*	3 113.9	12488	8.63	7.63	7.03	6.08	5.29	3.94	2.39	
*	3 113.6	12456	8.55	7.54	6.94	5.99	5.20	3.86	2.30	
*	3 113.8	12480	8.63	7.58	6.98	6.08	5.24	3.90	2.34	
*	4 146.1	16016	10.89	9.57	8.78	7.64	6.62	4.98	2.95	
*	4 146.4	16056	10.89	9.61	8.83	7.68	6.67	5.03	2.99	
*	4 146.2	16040	10.85	9.57	8.74	7.64	6.67	4.98	2.99	
*	4 146.2	16032	10.93	9.65	8.83	7.73	6.71	5.07	3.08	

Stn: 125		Lane:F3	Temp:		J/C:		Air: 91	PvT: 90		10:52
Sto	Hgt psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7	
	C 113.3	12424	9.85	8.36	7.50	6.42	5.38	3.94	2.26	
	C 113.5	12448	9.55	8.06	7.24	6.21	5.24	3.86	2.17	
	C 113.3	12432	9.55	8.10	7.28	6.21	5.29	3.86	2.21	
*	1 57.5	6312	4.94	4.18	3.73	3.17	2.62	1.95	1.17	
*	1 57.4	6304	4.94	4.18	3.73	3.17	2.62	1.99	1.17	
*	1 57.4	6304	4.94	4.18	3.73	3.17	2.67	1.95	1.13	
*	1 57.4	6288	4.94	4.18	3.73	3.17	2.67	1.95	1.13	
*	2 83.5	9152	7.12	6.03	5.40	4.60	3.87	2.82	1.60	
*	2 83.9	9200	7.25	6.16	5.53	4.73	3.96	2.95	1.69	
*	2 83.8	9192	7.21	6.08	5.40	4.64	3.91	2.86	1.60	
*	2 84.1	9216	7.25	6.16	5.53	4.73	4.04	2.90	1.73	
*	3 112.9	12376	9.43	8.01	7.20	6.16	5.24	3.81	2.17	
*	3 113.3	12432	9.43	8.01	7.20	6.16	5.29	3.86	2.17	
*	3 113.5	12440	9.47	8.06	7.24	6.16	5.29	3.90	2.26	
*	3 113.3	12432	9.43	7.97	7.15	6.12	5.16	3.81	2.17	
*	4 146.2	16040	11.90	10.08	9.04	7.81	6.71	4.94	2.82	
*	4 147.0	16120	11.90	10.08	9.08	7.81	6.71	4.90	2.82	
*	4 146.7	16072	11.86	10.04	9.04	7.77	6.67	4.90	2.82	
*	4 146.7	16080	11.90	10.04	9.08	7.81	6.71	4.94	2.82	

Stn: 150		Lane:F3	Temp:		J/C:		Air: 93	PvT: 93		10:55
Sto	Hgt psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7	
	C 113.2	12408	8.71	7.80	7.11	6.16	5.24	3.90	2.26	
	C 112.9	12376	8.63	7.63	6.94	6.04	5.16	3.81	2.26	
	C 112.2	12296	8.55	7.54	6.86	5.95	5.07	3.77	2.21	

File: C:\FWD\DATA\271028E3.FWD
Road: US-10 EASTBOUND LANES, 13 MILES EAST OF DETROIT LAKES, MN.
Subsection: 271028

*	1	57.4	6288	4.36	3.88	3.47	3.00	2.53	1.86	1.08
*	1	57.5	6304	4.36	3.88	3.51	3.04	2.58	1.91	1.08
*	1	57.0	6240	4.44	3.92	3.56	3.08	2.62	1.95	1.21V
*	1	57.2	6280	4.36	3.88	3.51	3.04	2.53	1.91	1.08
*	2	83.5	9160	6.37	5.77	5.23	4.56	3.87	2.90	1.69
*	2	84.1	9208	6.41	5.69	5.18	4.52	3.82	2.86	1.60
*	2	83.9	9192	6.41	5.73	5.18	4.52	3.78	2.82	1.60
*	2	83.9	9192	6.45	5.77	5.23	4.52	3.82	2.86	1.65
*	3	112.3	12320	8.59	7.58	6.86	5.99	5.11	3.81	2.26
*	3	113.2	12416	8.63	7.58	6.90	5.99	5.11	3.81	2.21
*	3	113.2	12408	8.67	7.67	6.98	6.08	5.20	3.90	2.30
*	3	112.9	12384	8.63	7.63	6.94	6.04	5.11	3.86	2.21
*	4	145.9	16000	10.81	9.65	8.74	7.64	6.53	4.94	2.91
*	4	146.7	16072	10.89	9.74	8.87	7.73	6.67	4.98	2.99
*	4	146.2	16040	10.85	9.65	8.78	7.68	6.62	4.94	2.95
*	4	146.4	16056	10.89	9.69	8.87	7.77	6.62	4.98	2.99

'ACCEPTED TEST WITH VARATION

Stn: 175 Lane:F3 Temp: J/C: Air: 94 PvT: 93 10:58

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.0	12400	9.05	7.93	7.11	6.08	5.16	3.68	2.08
	C	113.0	12392	8.88	7.80	6.98	5.95	5.02	3.64	2.13
	C	113.3	12432	8.88	7.80	6.94	5.95	5.02	3.64	2.08
*	1	57.2	6272	4.57	4.01	3.56	3.04	2.53	1.82	1.08
*	1	57.8	6336	4.61	4.01	3.51	3.04	2.53	1.82	1.08
*	1	57.5	6304	4.52	4.01	3.56	3.04	2.53	1.86	1.17
*	1	58.0	6352	4.52	4.01	3.56	3.08	2.58	1.91	1.17
*	2	83.9	9200	6.58	5.77	5.18	4.43	3.69	2.69	1.56
*	2	84.1	9208	6.62	5.82	5.23	4.47	3.78	2.73	1.56
*	2	84.2	9232	6.62	5.82	5.23	4.47	3.73	2.73	1.56
*	2	84.3	9248	6.62	5.86	5.27	4.47	3.78	2.73	1.60
*	3	112.8	12360	8.76	7.67	6.86	5.91	4.98	3.60	2.08
*	3	113.3	12432	8.84	7.71	6.90	5.91	4.98	3.60	2.13
*	3	113.2	12408	8.80	7.71	6.90	5.95	5.02	3.64	2.13
*	3	113.6	12456	8.88	7.71	6.94	5.95	5.02	3.68	2.17
*	4	146.1	16016	11.10	9.61	8.70	7.43	6.44	4.59	2.65
*	4	146.2	16032	11.14	9.69	8.78	7.51	6.44	4.68	2.73
*	4	145.8	15992	11.10	9.65	8.70	7.43	6.40	4.59	2.69
*	4	145.9	16008	11.06	9.61	8.74	7.43	6.44	4.64	2.69

Stn: 200 Lane:F3 Temp: J/C: Air: 96 PvT: 94 11:01

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.2	12296	11.14	8.96	7.88	6.46	5.29	3.60	2.04
	C	112.2	12296	10.93	8.75	7.71	6.29	5.24	3.55	2.08
	C	112.2	12304	10.81	8.66	7.63	6.25	5.16	3.55	2.04
*	1	57.2	6272	5.91	4.74	4.11	3.33	2.71	1.86	1.08
*	1	57.0	6240	5.87	4.70	4.11	3.29	2.67	1.82	1.04
*	1	56.8	6232	5.91	4.74	4.11	3.33	2.71	1.86	1.08
*	1	56.7	6208	5.87	4.70	4.07	3.29	2.67	1.82	1.04
*	2	82.9	9088	8.34	6.64	5.83	4.73	3.91	2.69	1.52
*	2	83.0	9096	8.42	6.68	5.87	4.81	3.96	2.73	1.56
*	2	83.0	9112	8.38	6.64	5.83	4.77	3.91	2.64	1.47
*	2	83.3	9136	8.38	6.68	5.83	4.77	3.91	2.64	1.52
*	3	112.3	12312	10.73	8.57	7.54	6.16	5.07	3.55	2.00
*	3	112.9	12376	10.77	8.57	7.58	6.21	5.11	3.55	2.04
*	3	112.6	12344	10.73	8.57	7.58	6.21	5.11	3.55	2.04
*	3	112.6	12344	10.77	8.62	7.63	6.25	5.20	3.60	2.08
*	4	146.1	16016	13.32	10.69	9.47	7.81	6.49	4.55	2.69
*	4	145.4	15944	13.20	10.60	9.34	7.73	6.40	4.51	2.60
*	4	145.4	15936	13.24	10.64	9.38	7.81	6.49	4.55	2.69
*	4	145.7	15976	13.20	10.56	9.30	7.73	6.44	4.46	2.56

Stn: 225 Lane:F3 Temp: J/C: Air: 97 PvT: 96 11:08

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.5	12336	8.80	7.76	6.94	5.99	5.11	3.64	2.08
	C	112.8	12360	8.76	7.63	6.90	5.95	5.07	3.68	2.17
	C	112.8	12368	8.67	7.54	6.81	5.87	5.02	3.60	2.13
*	1	58.4	6408	4.40	3.92	3.51	3.04	2.58	1.82	1.08
*	1	58.3	6384	4.44	3.96	3.51	3.04	2.58	1.86	1.08
*	1	58.7	6440	4.57	4.01	3.60	3.12	2.67	1.91	1.13

File: C:\FWD\DATA\271028E3.FWD
Road: US-10 EASTBOUND LANES, 13 MILES EAST OF DETROIT LAKES, MN.
Subsection: 271028

*	1	58.4	6408	4.52	3.96	3.56	3.08	2.58	1.86	1.08
*	2	84.2	9232	6.49	5.82	5.23	4.52	3.87	2.77	1.65
*	2	84.5	9264	6.49	5.77	5.23	4.52	3.82	2.77	1.60
*	2	84.5	9264	6.58	5.82	5.23	4.52	3.82	2.77	1.60
*	2	84.5	9264	6.58	5.77	5.23	4.52	3.82	2.77	1.60
*	3	112.8	12360	8.63	7.54	6.86	5.91	5.07	3.64	2.17
*	3	113.6	12456	8.67	7.58	6.86	5.91	5.07	3.68	2.17
*	3	112.9	12384	8.59	7.54	6.81	5.91	5.02	3.64	2.17
*	3	113.2	12416	8.63	7.58	6.86	5.91	5.11	3.68	2.21
*	4	146.5	16072	10.73	9.44	8.61	7.43	6.36	4.64	2.73
*	4	146.2	16032	10.68	9.48	8.57	7.43	6.36	4.68	2.73
*	4	146.2	16032	10.64	9.48	8.61	7.43	6.36	4.68	2.78
*	4	146.4	16056	10.73	9.48	8.61	7.43	6.40	4.68	2.78

Stn: 250 Lane:F3 Temp: J/C: Air: 96 PvT: 96 11:10

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.9	12376	8.76	7.58	6.86	5.87	5.02	3.64	2.13
	C	113.2	12416	8.55	7.45	6.68	5.74	4.93	3.60	2.13
	C	112.8	12360	8.55	7.45	6.77	5.78	4.98	3.68	2.21
*	1	58.1	6376	4.32	3.83	3.43	2.95	2.58	1.86	1.08
*	1	58.3	6384	4.32	3.83	3.43	2.95	2.53	1.82	1.08
*	1	58.3	6384	4.36	3.88	3.47	2.95	2.58	1.86	1.06
*	1	58.6	6416	4.44	3.88	3.47	3.00	2.58	1.86	1.08
*	2	83.9	9192	6.28	5.60	5.10	4.39	3.73	2.77	1.60
*	2	84.2	9240	6.41	5.69	5.14	4.43	3.82	2.77	1.65
*	2	84.2	9240	6.45	5.69	5.18	4.47	3.82	2.82	1.69
*	2	84.2	9232	6.41	5.64	5.10	4.39	3.78	2.77	1.60
*	3	112.8	12368	8.55	7.37	6.68	5.74	4.93	3.68	2.17
*	3	112.6	12344	8.50	7.37	6.68	5.78	4.93	3.64	2.17
*	3	113.0	12400	8.50	7.37	6.68	5.74	4.93	3.64	2.17
*	3	113.3	12432	8.59	7.45	6.73	5.83	5.02	3.73	2.26
*	4	146.5	16064	10.52	9.26	8.44	7.30	6.36	4.68	2.73
*	4	145.9	16000	10.52	9.35	8.48	7.35	6.31	4.68	2.82
*	4	146.1	16016	10.52	9.26	8.40	7.30	6.31	4.72	2.78
*	4	145.9	16000	10.52	9.35	8.44	7.35	6.40	4.77	2.82

Stn: 275 Lane:F3 Temp: J/C: Air: 96 PvT: 96 11:14

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.7	12256	11.10	7.76	7.11	5.78	4.58	3.16	1.91
	C	111.9	12272	11.19	7.84	7.20	5.91	4.62	3.21	2.00
	C	111.6	12232	11.14	7.80	7.11	5.83	4.58	3.16	1.91
*	1	56.4	6176	5.87	4.14	3.77	3.04	2.44	1.65	1.04
*	1	56.5	6200	5.95	4.22	3.77	3.04	2.44	1.69	1.04
*	1	56.5	6200	6.03	4.22	3.81	3.08	2.49	1.78	1.08
*	1	56.5	6192	5.99	4.22	3.77	3.04	2.44	1.65	1.04
*	2	82.9	9096	9.22V	5.99	5.44	4.39	3.56	2.47	1.47
*	2	83.5	9160	9.64	6.12	5.53	4.52	3.69	2.51	1.56
*	2	83.2	9128	9.55	6.08	5.48	4.43	3.60	2.51	1.56
*	2	83.6	9160	9.47	6.03	5.48	4.43	3.60	2.47	1.47
*	3	111.4	12224	11.48V	7.89	7.15	5.83	4.67	3.25	2.00
*	3	111.6	12232	11.19	7.89	7.15	5.78	4.58	3.25	1.95
*	3	111.9	12272	11.10	7.93	7.15	5.78	4.62	3.29	2.00
*	3	112.0	12288	11.06	7.89	7.15	5.78	4.67	3.25	1.95
*	4	143.3	15712	14.83	9.87	8.95	7.22	5.87	4.20	2.56
*	4	143.2	15696	14.75	9.82	8.91	7.30	5.87	4.20	2.52
*	4	142.9	15664	14.75	9.74	8.91	7.30	5.82	4.20	2.52
*	4	142.9	15672	14.75	9.69	8.87	7.30	5.82	3.99V	2.47

'ACCEPTED TEST WITH VARATION

'L\TRANS CR BETWEEN DF1-DF2

Stn: 300 Lane:F3 Temp: J/C: Air: 95 PvT: 98 11:18

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.6	12344	8.38	7.37	6.68	5.74	4.89	3.51	2.00
	C	112.8	12352	8.17	7.24	6.69	5.81	4.76	3.42	1.95
	C	112.5	12328	8.13	7.20	6.51	5.57	4.76	3.42	1.95
*	1	56.8	6240	4.32	3.79	3.38	2.95	2.53	1.82	1.04
*	1	57.1	6256	4.23	3.79	3.38	2.91	2.53	1.82	1.04
*	1	57.4	6288	4.19	3.71	3.38	2.87	2.44	1.73	1.00

File: C:\FWD\DATA\271028E3.FWD
Road: US-10 EASTBOUND LANES, 13 MILES EAST OF DETROIT LAKES, MN.
Subsection: 271028

*	1	57.0	6248	4.23	3.79	3.43	2.95	2.53	1.82	1.08
*	2	83.8	9184	6.20	5.52	5.01	4.31	3.69	2.64	1.52
*	2	83.8	9184	6.24	5.52	4.97	4.26	3.64	2.60	1.47
*	2	83.9	9200	6.28	5.56	5.06	4.35	3.69	2.69	1.52
*	2	83.2	9128	6.20	5.52	5.01	4.31	3.64	2.64	1.52
*	3	112.3	12312	8.21	7.24	6.56	5.66	4.80	3.51	2.04
*	3	112.2	12304	8.21	7.24	6.60	5.66	4.76	3.51	2.04
*	3	112.0	12288	8.25	7.24	6.56	5.66	4.80	3.51	2.04
*	3	112.2	12296	8.25	7.20	6.51	5.61	4.76	3.47	2.00
*	4	144.8	15880	10.39	9.13	8.35	7.18	6.13	4.46	2.60
*	4	144.6	15856	10.26	9.16	8.31	7.22	6.18	4.55	2.65
*	4	145.5	15944	10.47	9.22	8.40	7.22	6.18	4.51	2.65
*	4	144.6	15864	10.26	9.13	8.31	7.18	6.09	4.46	2.56

Stn: 325 Lane:F3 Temp: J/C: Air: 96 PvT: 98 11:20

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.8	12360	8.42	7.58	6.94	5.99	5.11	3.60	1.73
	C	112.8	12368	8.21	7.45	6.81	5.87	5.02	3.55	1.82
	C	112.6	12344	8.21	7.41	6.73	5.83	5.02	3.55	1.82
*	1	57.5	6312	4.27	3.88	3.51	3.04	2.58	1.82	0.95
*	1	57.8	6344	4.32	3.92	3.60	3.08	2.62	1.86	1.00
*	1	57.5	6304	4.27	3.88	3.51	3.04	2.58	1.82	0.95
*	1	57.7	6328	4.27	3.92	3.56	3.08	2.62	1.86	1.00
*	2	83.2	9128	6.24	5.64	5.18	4.47	3.82	2.73	1.43
*	2	83.9	9200	6.33	5.69	5.23	4.56	3.87	2.77	1.43
*	2	82.9	9080	6.24	5.69	5.23	4.52	3.82	2.73	1.43
*	2	83.5	9144	6.28	5.69	5.18	4.52	3.82	2.77	1.43
*	3	112.9	12376	8.25	7.37	6.73	5.87	5.02	3.55	1.82
*	3	112.3	12312	8.21	7.41	6.73	5.83	4.98	3.55	1.87
*	3	112.5	12336	8.21	7.37	6.77	5.83	4.98	3.55	1.82
*	3	112.6	12344	8.25	7.41	6.77	5.87	4.98	3.55	1.87
*	4	146.4	16048	10.52	9.35	8.57	7.43	6.40	4.55	2.43
*	4	147.4	16160	10.56	9.48	8.65	7.51	6.40	4.64	2.47
*	4	147.0	16120	10.52	9.44	8.61	7.43	6.31	4.55	2.39
*	4	146.5	16072	10.43	9.39	8.57	7.39	6.31	4.55	2.39

'L\TRANS CR BETWEEN DF6-DF7

Stn: 350 Lane:F3 Temp: J/C: Air: 97 PvT: 98 11:23

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.6	12344	9.05	7.97	7.20	6.16	5.16	3.60	1.87
	C	112.6	12344	8.88	7.80	7.07	6.08	5.07	3.55	1.91
	C	112.8	12360	8.88	7.76	7.03	5.99	5.02	3.55	1.91
*	1	57.4	6296	4.44	4.05	3.68	3.17	2.62	1.82	1.04
*	1	57.5	6304	4.44	4.05	3.64	3.12	2.62	1.82	0.95
*	1	57.4	6296	4.44	4.05	3.64	3.12	2.62	1.82	0.95
*	1	57.5	6312	4.44	4.05	3.68	3.17	2.62	1.82	1.00
*	2	83.5	9160	6.66	5.90	5.40	4.60	3.87	2.73	1.52
*	2	83.5	9152	6.45	5.95	5.40	4.60	3.87	2.73	1.47
*	2	82.6	9056	6.45	5.86	5.36	4.56	3.87	2.69	1.47
*	2	82.9	9096	6.45	5.86	5.31	4.56	3.82	2.64	1.43
*	3	112.8	12368	8.88	7.76	7.07	6.04	5.11	3.60	2.00
*	3	112.2	12304	8.84	7.67	6.98	5.99	5.02	3.55	1.91
*	3	112.5	12336	8.76	7.63	6.98	5.95	5.02	3.55	1.91
*	3	112.2	12296	8.76	7.67	6.98	5.99	5.02	3.55	1.95
*	4	146.5	16072	11.10	9.82	8.91	7.64	6.49	4.59	2.60
*	4	146.1	16016	10.93	9.65	8.83	7.56	6.36	4.55	2.52
*	4	145.9	16008	10.93	9.65	8.83	7.56	6.36	4.55	2.52
*	4	146.1	16016	10.98	9.69	8.87	7.60	6.44	4.59	2.60

Stn: 375 Lane:F3 Temp: J/C: Air: 96 PvT: 99 11:26

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.6	12344	9.55	8.79	8.18	7.26	6.31	3.29	1.95
	C	113.0	12400	9.38	8.62	8.01	7.05	6.13	3.38	2.00
	C	112.8	12368	9.30	8.53	7.93	7.01	6.04	3.34	1.95
*	1	57.4	6288	4.90	4.57	4.24	3.76	3.20	1.73	1.04
*	1	57.2	6280	4.90	4.52	4.20	3.71	3.16	1.69	1.00
*	1	57.4	6288	4.90	4.57	4.20	3.71	3.16	1.69	1.04
*	1	57.2	6280	4.90	4.52	4.16	3.67	3.16	1.69	1.00
*	2	82.9	9080	7.00	6.46	6.00	5.32	4.58	2.47	1.43
*	2	83.6	9176	7.08	6.51	6.04	5.38	4.62	2.51	1.47

File: C:\FWD\DATA\271028E3.FWD
Road: US-10 EASTBOUND LANES, 13 MILES EAST OF DETROIT LAKES, MN.
Subsection: 271028

*	2	83.6	9160	7.08	6.55	6.04	5.36	4.62	2.51	1.47
*	2	83.5	9152	7.08	6.51	6.04	5.36	4.62	2.51	1.47
*	3	112.9	12376	9.26	8.45	7.88	6.97	6.04	3.34	2.00
*	3	112.8	12360	9.22	8.40	7.84	6.92	6.00	3.29	1.95
*	3	112.8	12368	9.26	8.45	7.88	6.97	6.04	3.34	2.00
*	3	112.9	12376	9.22	8.40	7.80	6.92	6.04	3.29	1.95
*	4	147.0	16120	11.77	10.69	9.90	8.78	7.69	4.38	2.60
*	4	147.8	16208	11.73	10.69	9.90	8.74	7.65	4.33	2.56
*	4	146.7	16080	11.73	10.64	9.85	8.78	7.65	4.29	2.56
*	4	147.2	16144	11.81	10.73	9.98	8.82	7.73	4.42	2.65

'L\TRANS CR BETWEEN DF5-DF6

Stn: 400 Lane:F3 Temp: J/C: Air: 93 PvT: 98 11:31

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.2	12296	8.92	7.76	7.07	5.99	5.11	3.73	2.00
	C	112.5	12328	8.80	7.67	6.98	5.95	5.07	3.64	2.00
	C	112.9	12376	8.84	7.71	7.03	5.99	5.11	3.68	2.08
*	1	57.5	6312	4.52	4.05	3.64	3.08	2.62	1.82	1.00
*	1	57.7	6328	4.52	4.05	3.68	3.08	2.62	1.86	1.00
*	1	57.2	6272	4.52	4.01	3.64	3.04	2.58	1.82	1.00
*	1	58.0	6360	4.61	4.05	3.64	3.08	2.62	1.86	1.04
*	2	83.9	9192	6.54	5.77	5.27	4.47	3.78	2.73	1.47
*	2	83.9	9192	6.54	5.82	5.31	4.47	3.82	2.77	1.52
*	2	83.8	9184	6.58	5.86	5.36	4.60	3.87	2.86	1.56
*	2	84.2	9240	6.54	5.82	5.31	4.52	3.82	2.77	1.52
*	3	112.6	12352	8.84	7.67	6.98	5.95	5.07	3.68	2.08
*	3	112.6	12344	8.88	7.63	6.98	5.95	5.07	3.68	2.04
*	3	112.9	12376	8.80	7.63	6.98	5.91	5.02	3.68	2.00
*	3	112.8	12360	8.84	7.71	6.98	5.99	5.11	3.73	2.08
*	4	145.9	16008	10.93	9.61	8.74	7.51	6.40	4.64	2.56
*	4	145.7	15960	10.89	9.65	8.78	7.56	6.44	4.59	2.60
*	4	145.8	15984	10.89	9.61	8.74	7.51	6.40	4.59	2.60
*	4	145.2	15920	10.89	9.61	8.70	7.51	6.36	4.55	2.60

Stn: 425 Lane:F3 Temp: J/C: Air: 91 PvT: 99 11:34

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.6	12352	9.89	8.83	8.10	6.97	5.96	4.20	2.13
	C	109.3	11992	9.47	8.45	7.75	6.71	5.69	4.03	2.08
	C	109.7	12024	9.55	8.49	7.80	6.71	5.69	4.12	2.17
*	1	54.9	6016	4.65	4.35	3.98	3.42	2.84	2.04	1.04
*	1	55.2	6048	4.65	4.31	3.98	3.38	2.84	2.04	1.08
*	1	54.8	6008	4.65	4.31	3.94	3.33	2.84	1.99	1.04
*	1	54.5	5968	4.61	4.31	3.94	3.33	2.84	1.99	1.04
*	2	80.6	8832	7.08	6.33	5.78	4.98	4.22	2.99	1.56
*	2	81.0	8888	7.25	6.42	5.87	5.07	4.31	3.08	1.60
*	2	80.1	8792	7.12	6.33	5.83	5.02	4.27	3.03	1.58
*	2	80.3	8800	7.16	6.33	5.83	5.02	4.27	3.03	1.56
*	3	109.4	11992	9.51	8.36	7.71	6.67	5.64	4.07	2.13
*	3	108.3	11872	9.38	8.32	7.63	6.54	5.60	3.99	2.08
*	3	108.4	11880	9.43	8.32	7.63	6.59	5.60	4.03	2.08
*	3	108.1	11864	9.38	8.32	7.63	6.59	5.56	4.03	2.08
*	4	142.0	15568	12.07	10.60	9.73	8.40	7.20	5.20	2.78
*	4	142.0	15568	11.98	10.51	9.73	8.40	7.25	5.20	2.73
*	4	142.6	15640	12.19	10.73	9.68	8.48	7.38	5.29	2.86
*	4	142.3	15600	12.19	10.73	9.55	8.44	7.29	5.24	2.73

'L\TRANS CR BETWEEN DF6-DF7

Stn: 450 Lane:F3 Temp: J/C: Air: 90 PvT: 98 11:40

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.6	12344	10.39	8.88	7.97	6.71	5.60	3.90	2.13
	C	112.8	12344	10.26	8.88	7.97	6.75	5.64	3.99	2.21
	C	112.8	12344	10.22	8.79	7.93	6.71	5.60	3.94	2.17
*	1	57.2	6272	5.28	4.70	4.20	3.50	2.93	2.08	1.13
*	1	57.0	6240	5.32	4.61	4.11	3.46	2.84	1.99	1.08
*	1	57.1	6264	5.40	4.65	4.16	3.50	2.93	2.04	1.13
*	1	56.7	6216	5.32	4.57	4.11	3.46	2.89	1.99	1.08
*	2	82.9	9096	7.79	6.64	6.00	5.07	4.27	2.95	1.56

File: C:\FWD\DATA\271028E3.FWD
Road: US-10 EASTBOUND LANES, 13 MILES EAST OF DETROIT LAKES, MN.
Subsection: 271028

*	2	82.9	9096	7.71	6.72	6.04	5.11	4.27	2.95	1.56
*	2	83.0	9104	7.88	6.81	6.08	5.15	4.31	3.03	1.65
*	2	82.9	9096	7.79	6.76	6.08	5.19	4.36	3.03	1.65
*	3	112.6	12344	10.22	8.79	7.93	6.71	5.64	3.99	2.21
*	3	112.5	12336	10.18	8.83	7.93	6.75	5.69	3.99	2.21
*	3	112.3	12312	10.18	8.75	7.88	6.71	5.64	3.94	2.17
*	3	112.3	12312	10.22	8.75	7.88	6.71	5.60	3.99	2.17
*	4	147.1	16128	12.90	11.03	9.98	8.48	7.16	5.07	2.82
*	4	146.8	16096	12.90	11.07	9.98	8.53	7.16	5.11	2.82
*	4	146.7	16080	12.86	11.03	9.98	8.48	7.16	5.11	2.86
*	4	146.7	16080	12.82	11.03	9.94	8.48	7.11	5.07	2.86

Stn: 475 Lane:F3 Temp: J/C: Air: 89 PvT: 97 11:46

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.4	12104	8.67	8.27	7.03	6.08	5.16	3.73	2.34
	C	110.9	12160	8.71	8.19	7.15	6.12	5.20	3.77	2.21
	C	111.7	12248	8.71	8.10	7.11	6.12	5.24	3.77	2.21
*	1	55.1	6032	4.52	4.22V	3.64	3.08	2.71	1.91	1.08
*	1	55.2	6056	4.44	3.96	3.68	3.08	2.67	1.91	1.13
*	1	54.9	6016	4.44	3.92	3.77	3.12	2.76	1.95	1.17
*	1	54.8	6008	4.44	3.96	3.68	3.08	2.67	1.91	1.08
*	2	80.9	8864	6.54	6.33	5.31	4.60	3.87	2.82	1.73
*	2	81.3	8920	6.54	6.59	5.36	4.60	3.82	2.77	1.65
*	2	79.9	8752	6.45	6.38	5.23	4.56	3.87	2.77	1.69
*	2	81.0	8888	6.54	6.55	5.40	4.60	3.96	2.77	1.69
*	3	110.7	12144	8.71	8.23	7.11	6.08	5.20	3.77	2.21
*	3	111.3	12200	8.76	8.23	7.20	6.12	5.24	3.81	2.21
*	3	111.7	12256	8.71	8.49	7.15	6.08	5.29	3.77	2.17
*	3	111.9	12256	8.71	8.45	7.20	6.12	5.24	3.77	2.21
*	4	144.8	15872	10.93V	10.00	9.08	7.68	6.58	4.81	2.73V
*	4	144.9	15880	9.43V	10.47V	9.00	7.77	6.76	4.85	2.95
*	4	144.8	15872	10.81V	9.78V	8.95	7.68	6.62	4.81	2.78
*	4	144.8	15872	11.02V	9.91	9.04	7.73	6.67	4.85	2.95

'ACCEPTED TEST WITH NON-DECREASE DEFL. AND VARATIONS

Stn: 500 Lane:F3 Temp: J/C: Air: 88 PvT: 96 11:51

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.6	12352	10.05	8.40	7.54	6.42	5.38	3.86	2.17
	C	113.0	12392	10.05	8.45	7.58	6.42	5.42	3.86	2.21
	C	113.0	12392	10.05	8.45	7.58	6.42	5.42	3.86	2.21
*	1	56.7	6216	5.24	4.44	3.94	3.33	2.80	1.99	1.13
*	1	57.0	6240	5.32	4.48	4.03	3.42	2.84	2.04	1.17
*	1	56.7	6216	5.32	4.44	3.98	3.33	2.80	1.95	1.13
*	1	56.7	6216	5.32	4.44	3.98	3.33	2.80	1.99	1.17
*	2	82.9	9080	7.67	6.42	5.78	4.90	4.13	2.95	1.69
*	2	83.0	9112	7.75	6.46	5.78	4.94	4.13	2.95	1.65
*	2	82.8	9080	7.75	6.46	5.74	4.94	4.13	2.90	1.65
*	2	82.9	9080	7.71	6.46	5.78	4.90	4.13	2.90	1.60
*	3	112.3	12320	10.01	8.36	7.50	6.37	5.38	3.81	2.17
*	3	112.6	12352	10.05	8.45	7.58	6.37	5.38	3.86	2.17
*	3	112.6	12352	10.05	8.45	7.58	6.42	5.42	3.90	2.21
*	3	112.8	12360	10.01	8.40	7.54	6.33	5.38	3.81	2.17
*	4	147.8	16200	12.74	10.64	9.51	8.15	6.89	5.03	2.86
*	4	147.4	16160	12.65	10.60	9.47	8.15	6.89	4.94	2.78
*	4	148.0	16216	12.69	10.60	9.47	8.10	6.85	4.98	2.86
*	4	147.7	16192	12.69	10.64	9.51	8.15	6.89	4.98	2.86

Stn: 505 Lane:F3 Temp: J/C: Air: 87 PvT: 96 11:55

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.8	12472	8.34	7.58	6.86	5.95	5.11	3.86	2.21
	C	113.8	12472	8.34	7.50	6.86	5.91	5.11	3.86	2.30
	C	113.3	12432	8.25	7.45	6.81	5.91	5.07	3.86	2.26
*	1	57.4	6288	4.02	3.79	3.47	3.00	2.53	1.91	1.13
*	1	57.5	6312	4.23	3.92	3.56	3.08	2.67	1.99	1.26
*	1	57.8	6344	4.15	3.83	3.51	3.04	2.58	1.95	1.13
*	1	58.0	6360	4.19	3.83	3.51	3.04	2.62	1.95	1.17

File: C:\FWD\DATA\271028E3.FWD
Road: US-10 EASTBOUND LANES, 13 MILES EAST OF DETROIT LAKES, MN.
Subsection: 271028

*	2	82.9	9080	6.33	5.60	5.14	4.43	3.82	2.86	1.69
*	2	84.1	9208	6.41	5.60	5.14	4.52	3.87	2.90	1.69
*	2	83.9	9200	6.45	5.64	5.18	4.52	3.87	2.90	1.73
*	2	83.6	9168	6.41	5.69	5.14	4.43	3.82	2.90	1.65
*	3	113.3	12432	8.17	7.37	6.73	5.87	5.07	3.81	2.26
*	3	113.5	12448	8.25	7.41	6.81	5.91	5.07	3.86	2.26
*	3	113.2	12416	8.25	7.41	6.77	5.91	5.11	3.86	2.26
*	3	113.5	12448	8.30	7.50	6.81	5.95	5.11	3.94	2.30
*	4	148.1	16232	10.60	9.48	8.65	7.51	6.49	4.94	2.95
*	4	147.4	16160	10.47	9.35	8.57	7.51	6.49	4.90	2.95
*	4	147.8	16208	10.56	9.44	8.61	7.51	6.49	4.98	2.99
*	4	148.3	16264	10.64	9.39	8.65	7.64	6.71	4.94	3.08

Stn: 510 Lane:F3 Temp: J/C: Air: 87 PvT: 96 11:58

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.2	12416	8.38	7.50	6.86	5.99	5.20	3.86	2.30
	C	113.5	12448	8.25	7.37	6.73	5.87	5.11	3.81	2.21
	C	113.5	12448	8.38	7.41	6.77	5.95	5.16	3.90	2.34
*	1	57.4	6304	4.15	3.83	3.43	3.00	2.58	1.95	1.13
*	1	57.2	6272	4.15	3.88	3.51	3.08	2.67	2.08	1.21
*	1	57.4	6288	4.19	3.83	3.47	3.04	2.62	2.04	1.17
*	1	57.7	6320	4.19	3.88	3.43	3.00	2.58	1.99	1.13
*	2	83.5	9152	6.20	5.60	5.10	4.43	3.82	2.90	1.69
*	2	83.5	9152	6.24	5.64	5.14	4.47	3.87	2.90	1.73
*	2	83.8	9184	6.24	5.64	5.14	4.47	3.91	2.95	1.73
*	2	83.8	9192	6.24	5.64	5.14	4.47	3.87	2.86	1.69
*	3	113.3	12432	8.34	7.37	6.73	5.91	5.16	3.90	2.34
*	3	113.6	12456	8.34	7.37	6.73	5.91	5.16	3.86	2.30
*	3	113.9	12488	8.30	7.37	6.73	5.87	5.11	3.86	2.30
*	3	113.8	12472	8.38	7.41	6.77	5.95	5.16	3.86	2.34
*	4	147.7	16192	10.47	9.26	8.53	7.43	6.49	4.90	2.95
*	4	148.3	16256	10.47	9.31	8.53	7.47	6.53	4.94	2.99
*	4	148.4	16272	10.52	9.35	8.53	7.51	6.58	4.98	3.04
*	4	147.4	16160	10.43	9.26	8.53	7.51	6.53	4.98	2.99

Stn: 515 Lane:F3 Temp: J/C: Air: 87 PvT: 95 12:01

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.5	12448	8.38	7.50	6.90	6.04	5.24	3.86	2.26
	C	113.3	12424	8.21	7.33	6.77	5.95	5.11	3.81	2.30
	C	113.2	12416	8.21	7.33	6.77	5.91	5.11	3.81	2.30
*	1	57.4	6288	4.15	3.83	3.51	3.04	2.67	1.95	1.21
*	1	57.4	6288	4.15	3.83	3.47	3.04	2.62	1.95	1.21
*	1	57.1	6264	4.11	3.79	3.43	3.00	2.58	1.91	1.17
*	1	57.4	6304	4.19	3.83	3.51	3.04	2.67	1.95	1.21
*	2	83.2	9128	6.24	5.52	5.10	4.43	3.87	2.86	1.73
*	2	83.5	9152	6.33	5.64	5.14	4.52	3.91	2.86	1.73
*	2	83.2	9128	6.28	5.60	5.10	4.47	3.87	2.86	1.78
*	2	83.3	9136	6.28	5.60	5.14	4.52	3.91	2.86	1.73
*	3	113.0	12392	8.13	7.37	6.73	5.95	5.16	3.86	2.34
*	3	113.5	12448	8.17	7.37	6.77	5.91	5.16	3.81	2.30
*	3	113.2	12416	8.13	7.33	6.73	5.95	5.16	3.86	2.34
*	3	113.6	12456	8.17	7.33	6.77	5.91	5.16	3.81	2.30
*	4	148.1	16248	10.56	9.39	8.61	7.56	6.58	4.98	3.04
*	4	149.0	16328	10.52	9.35	8.61	7.56	6.58	4.98	3.04
*	4	148.8	16312	10.60	9.39	8.61	7.64	6.62	5.03	3.08
*	4	148.6	16288	10.60	9.39	8.65	7.64	6.62	5.03	3.08

Stn: 520 Lane:F3 Temp: J/C: Air: 87 PvT: 94 12:04

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.2	12408	8.59	7.71	7.07	6.16	5.38	4.03	2.26
	C	113.6	12464	8.55	7.67	7.07	6.12	5.38	3.99	2.21
	C	113.3	12424	8.59	7.67	7.07	6.16	5.38	3.99	2.26
*	1	57.0	6256	4.36	3.88	3.60	3.17	2.58	1.95	1.17
*	1	57.2	6280	4.36	3.92	3.64	3.17	2.67	1.99	1.13
*	1	57.2	6280	4.40	3.92	3.64	3.21	2.62	1.99	1.13
*	1	57.0	6256	4.36	3.92	3.64	3.17	2.58	1.95	1.13
*	2	82.8	9072	6.54	5.82	5.36	4.69	4.00	2.99	1.73
*	2	83.5	9160	6.58	5.82	5.36	4.69	4.04	2.99	1.69
*	2	82.9	9096	6.62	5.86	5.40	4.73	4.00	3.03	1.73
*	2	83.2	9128	6.58	5.82	5.36	4.69	4.04	2.99	1.69

File: C:\FWD\DATA\271028E3.FWD
Road: US-10 EASTBOUND LANES, 13 MILES EAST OF DETROIT LAKES, MN.
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*	3	112.9	12376	8.59	7.67	7.03	6.21	5.33	3.99	2.26
*	3	113.2	12416	8.55	7.67	7.07	6.16	5.29	3.94	2.26
*	3	113.5	12448	8.59	7.71	7.07	6.16	5.33	4.03	2.26
*	3	113.5	12432	8.59	7.67	7.07	6.16	5.33	3.99	2.26
*	4	148.7	16304	11.02	9.74	8.95	7.81	6.85	5.11	2.91
*	4	149.1	16352	11.06	9.78	9.00	7.89	6.89	5.20	2.99
*	4	148.8	16328	11.02	9.74	8.91	7.81	6.93	5.16	2.95
*	4	148.8	16312	11.06	9.74	9.00	7.89	6.85	5.16	2.99

Stn: 525 Lane:F3 Temp: J/C: Air: 88 PvT: 94 12:06

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.0	12392	11.02	10.77	7.58	6.21	5.16	3.73	2.17
	C	111.7	12248	10.31	10.17	7.15	5.91	4.98	3.64	2.13
	C	111.0	12176	10.35	10.08	7.11	5.91	4.93	3.60	2.17
*	1	55.1	6032	5.40	5.39	3.56	2.95	2.44	1.78	1.04
*	1	54.8	6000	5.45	5.47	3.64	3.04	2.58	1.86	1.13
*	1	55.2	6064	5.45	5.39	3.60	3.00	2.49	1.78	1.04
*	1	55.2	6064	5.28	5.39	3.64	3.00	2.53	1.82	1.08
*	2	81.3	8904	7.92	7.63	5.27	4.39	3.64	2.64	1.56
*	2	81.4	8928	8.00	7.71	5.40	4.43	3.69	2.69	1.56
*	2	81.3	8904	7.96	7.71	5.36	4.43	3.69	2.69	1.56
*	2	81.4	8928	8.00	7.76	5.44	4.52	3.78	2.73	1.65
*	3	111.4	12216	10.22	10.00	7.20	5.91	4.98	3.64	2.21
*	3	110.4	12104	10.18	9.95	7.11	5.91	4.98	3.64	2.21
*	3	110.9	12160	10.14	9.95	7.07	5.87	4.93	3.60	2.17
*	3	110.3	12096	10.10	9.91	7.03	5.87	4.93	3.60	2.17
*	4	144.5	15840	12.95	12.45	9.04	7.56	6.31	4.64	2.78
*	4	145.4	15936	13.07	12.50	9.04	7.56	6.40	4.68	2.82
*	4	145.4	15944	12.86	12.45	8.95	7.51	6.31	4.64	2.78
*	4	145.4	15944	12.86	12.45	8.95	7.51	6.31	4.64	2.78

'L/TRANS CR AT DF3

Stn: 530 Lane:F3 Temp: J/C: Air: 87 PvT: 94 12:09

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	113.2	12416	8.97	8.01	7.28	6.29	5.38	3.90	2.26
	C	113.2	12400	8.88	7.84	7.07	6.12	5.24	3.77	2.21
	C	113.2	12416	8.84	7.84	7.11	6.16	5.24	3.81	2.21
*	1	57.7	6328	4.65	4.09	3.68	3.17	2.76	1.99	1.21
*	1	57.5	6312	4.52	4.05	3.64	3.12	2.67	1.91	1.08
*	1	57.4	6288	4.48	4.01	3.64	3.12	2.67	1.91	1.13
*	1	57.5	6312	4.48	4.01	3.64	3.12	2.67	1.91	1.08
*	2	83.2	9128	6.62	5.86	5.31	4.56	3.91	2.82	1.65
*	2	83.5	9152	6.75	5.95	5.40	4.69	4.00	2.90	1.73
*	2	83.6	9184	6.70	5.90	5.40	4.64	3.96	2.86	1.65
*	2	83.2	9128	6.70	5.90	5.36	4.60	3.96	2.86	1.65
*	3	112.9	12376	8.80	7.80	7.11	6.16	5.24	3.81	2.26
*	3	113.0	12392	8.76	7.71	6.98	6.04	5.16	3.73	2.17
*	3	113.2	12400	8.76	7.80	7.07	6.12	5.20	3.77	2.21
*	3	112.6	12352	8.80	7.76	7.07	6.16	5.20	3.81	2.26
*	4	147.7	16192	11.27	9.95	9.00	7.81	6.76	4.94	2.95
*	4	147.7	16192	11.23	9.91	8.95	7.77	6.71	4.90	2.91
*	4	148.1	16240	11.23	9.91	8.95	7.77	6.67	4.90	2.91
*	4	148.0	16224	11.23	9.87	8.95	7.81	6.67	4.94	2.91

Mileage:-.006 -> .1

Summary of Data for section 271028E
Analyzed by: JOEL RECTOR on 08-11-1993

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	0.7343	0.6467	0.5774	0.4936	0.4172	0.2987	0.1736
	2	0.7413	0.6474	0.5801	0.4979	0.4220	0.3034	0.1740
	3	0.7215	0.6293	0.5653	0.4855	0.4134	0.2991	0.1729
	4	0.7032	0.6114	0.5507	0.4749	0.4072	0.2962	0.1726

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	0.0865	0.0664	0.0426	0.0325	0.0266	0.0161	0.0102
	2	0.0881	0.0608	0.0380	0.0313	0.0268	0.0165	0.0097
	3	0.0687	0.0522	0.0339	0.0273	0.0239	0.0160	0.0098
	4	0.0697	0.0464	0.0297	0.0250	0.0225	0.0152	0.0095

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	11.78%	10.26%	7.37%	6.59%	6.37%	5.39%	5.89%
	2	11.89%	9.39%	6.56%	6.28%	6.34%	5.42%	5.59%
	3	9.52%	8.29%	5.99%	5.63%	5.78%	5.34%	5.68%
	4	9.91%	7.59%	5.40%	5.26%	5.52%	5.13%	5.52%

Flexible Pavement Deflection Statistics - 271028E
Subsection 1
Subsection begins at station 0
Subsection ends at station 260

Mean Values (mils/kip)

Test Loc.	Drop Ht	CORRECTED Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	0.6868	0.6105	0.5511	0.4739	0.4015	0.2925	0.1721
	2	0.6869	0.6100	0.5537	0.4770	0.4051	0.2970	0.1716
	3	0.6787	0.6005	0.5443	0.4696	0.4013	0.2951	0.1719
	4	0.6661	0.5888	0.5341	0.4619	0.3980	0.2942	0.1725

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	0.0609	0.0384	0.0297	0.0223	0.0176	0.0139	0.0108
	2	0.0534	0.0333	0.0259	0.0202	0.0171	0.0136	0.0087
	3	0.0446	0.0286	0.0236	0.0187	0.0158	0.0135	0.0098
	4	0.0424	0.0276	0.0223	0.0183	0.0160	0.0131	0.0089

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	8.87%	6.29%	5.39%	4.71%	4.39%	4.74%	6.29%
	2	7.78%	5.46%	4.67%	4.22%	4.23%	4.57%	5.05%
	3	6.58%	4.77%	4.33%	3.97%	3.93%	4.56%	5.70%
	4	6.37%	4.68%	4.17%	3.97%	4.02%	4.45%	5.15%

Flexible Pavement Deflection Statistics - 271028E
Subsection 2
Subsection begins at station 260
Subsection ends at station 500

Mean Values (mils/kip)

Test Loc.	Drop Ht	CORRECTED Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	0.7358	0.6649	0.5905	0.5034	0.4251	0.3018	0.1743
	2	0.7459	0.6662	0.5933	0.5083	0.4304	0.3065	0.1752
	3	0.7210	0.6437	0.5758	0.4935	0.4195	0.3011	0.1734
	4	0.7004	0.6227	0.5589	0.4814	0.4117	0.2972	0.1727

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	0.0907	0.0705	0.0424	0.0327	0.0271	0.0165	0.0101
	2	0.0928	0.0633	0.0366	0.0309	0.0270	0.0171	0.0102
	3	0.0722	0.0557	0.0337	0.0278	0.0252	0.0170	0.0100
	4	0.0758	0.0502	0.0299	0.0257	0.0242	0.0163	0.0100

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	12.32%	10.61%	7.18%	6.50%	6.37%	5.47%	5.78%
	2	12.44%	9.50%	6.17%	6.08%	6.28%	5.58%	5.82%
	3	10.01%	8.66%	5.86%	5.63%	6.02%	5.66%	5.78%
	4	10.83%	8.06%	5.36%	5.34%	5.87%	5.50%	5.81%

Outlier Statistics - 271028E

Subsection 1

Station	Height	Sensor	Number of Std. Dev.
-5	1	1	2.78
-5	1	2	2.52
-5	1	3	2.31
-5	2	1	2.74
-5	2	2	2.40
-5	2	3	2.06
-5	3	1	2.63
-5	3	2	2.27
-5	4	1	2.62
-5	4	2	2.20
75	1	6	2.29
75	1	7	2.02
75	2	6	2.17
75	3	5	2.02
75	3	6	2.29
75	4	6	2.11

Subsection 2

Station	Height	Sensor	Number of Std. Dev.
200	1	1	2.11
275	1	1	2.27
275	2	1	2.89
275	3	1	2.41
275	3	6	-2.06
275	4	1	2.92
275	4	6	-2.01
325	3	7	-2.38
325	4	7	-2.23
375	1	4	2.67
375	1	5	2.93
375	2	4	2.49
375	2	5	2.74
375	3	4	2.44
375	3	5	2.69
375	4	4	2.44
375	4	5	2.66
425	1	6	2.03
425	2	6	2.16
425	3	4	2.19
425	3	5	2.02
425	3	6	2.20
425	4	3	2.05
425	4	4	2.31
425	4	5	2.28
425	4	6	2.35

Outlier Statistics - 271028E

Station	Height	Sensor	Number of Std. Dev.
450	4	3	2.02
525	1	2	3.27
525	2	2	3.12
525	3	2	3.16
525	4	2	3.19

Pavement Construction Information - 271028E

Material Code	Material Name	Layer Thickness
700	Asphaltic Concrete	1.6
700	Asphaltic Concrete	8.0

Depth to rigid foundation: 100.0 ft.

FLEXIBLE Pavement Thickness Data - 271028E
(comparison of each calculation to the expected value)

Minimum expected SN value: 3.36
Maximum expected SN value: 4.32

Height	Station	Effective SN
1	-30	4.55
2	-30	4.60
3	-30	4.65
4	-30	4.70
1	-25	4.85
2	-25	4.85
3	-25	4.85
4	-25	5.00
1	-20	4.95
2	-20	4.85
3	-20	4.90
4	-20	5.05
1	-15	4.60
2	-15	4.65
3	-15	4.75
4	-15	4.80
1	-10	4.60
2	-10	4.60
3	-10	4.60
4	-10	4.70
1	0	4.70
2	0	4.80
3	0	4.85
4	0	4.90
1	25	5.20
2	25	5.15
3	25	5.25
4	25	5.30
1	50	5.05
2	50	5.00
3	50	5.10
4	50	5.10

FLEXIBLE Pavement Thickness Data - 271028E

Height	Station	Effective SN
1	75	5.15
2	75	5.00
3	75	5.05
4	75	5.10
1	100	5.10
2	100	4.95
3	100	5.00
4	100	5.10
1	125	4.45
2	125	4.40
3	125	4.50
4	125	4.55
1	150	4.85
2	150	4.85
3	150	4.90
4	150	5.05
1	175	4.70
2	175	4.65
3	175	4.70
4	175	4.75
1	225	4.75
2	225	4.75
3	225	4.85
4	225	4.95
1	250	4.85
2	250	4.90
3	250	4.90
4	250	5.05
2	275	3.35
1	300	4.80
2	300	4.80
3	300	4.85
4	300	4.95
1	325	4.65
2	325	4.70
3	325	4.70
4	325	4.75
1	350	4.50
2	350	4.55
3	350	4.50
4	350	4.70
1	375	4.50
2	375	4.55
3	375	4.60
4	375	4.60
1	400	4.50
2	400	4.60
3	400	4.60
4	400	4.75

FLEXIBLE Pavement Thickness Data - 271028E

Height	Station	Effective SN
1	425	4.45
2	425	4.35
3	425	4.40
4	425	4.45
1	475	4.70
2	475	4.80
3	475	4.80
4	475	5.10
4	500	4.35
1	505	5.25
2	505	4.95
3	505	5.15
4	505	5.30
1	510	5.20
2	510	5.10
3	510	5.20
4	510	5.30
1	515	5.30
2	515	5.10
3	515	5.30
4	515	5.35
1	520	4.95
2	520	4.85
3	520	5.00
4	520	5.05
1	530	4.75
2	530	4.75
3	530	4.85
4	530	4.95

FLEXIBLE Pavement Thickness Statistics - 271028E

Drop height 1

Subsection	Station	Subgrade Modulus	Effective SN
No test pit data found, therefore no results exist...			
1	-30	25940	4.55
	-25	25550	4.85
	-20	25242	4.95
	-15	26067	4.60
	-10	26422	4.60
	-5	25276	3.90
	0	25721	4.70
	25	24759	5.20
	50	24854	5.05
	75	22230	5.15
	100	22477	5.10
2	125	23547	4.45
	150	24208	4.85
	175	24091	4.70
	200	25184	3.65
	225	25113	4.75
	250	25312	4.85
	275	25234	3.60
	300	25718	4.80
	325	27547	4.65
	350	27249	4.50
	375	23322	4.50
	400	26677	4.50
	425	23969	4.45
	450	24253	4.10
	475	23248	4.70
	500	23265	4.20
	505	23204	5.25
	510	23335	5.20
	515	22567	5.30
	520	23621	4.95
	525	24161	3.95
	530	24069	4.75
Subsection 1 Overall Mean:		24958	4.79
Standard Deviation:		1382	0.38
Coeff Of Variation:		5.54%	7.87%
Subsection 2 Overall Mean:		24495	4.57
Standard Deviation:		1362	0.46
Coeff Of Variation:		5.56%	10.03%

FLEXIBLE Pavement Thickness Statistics - 271028E

Drop height 2

Subsection	Station	Subgrade Modulus	Effective SN
No test pit data found, therefore no results exist...			
1	-30	25838	4.60
	-25	25875	4.85
	-20	26051	4.85
	-15	25633	4.65
	-10	25948	4.60
	-5	25284	4.00
	0	25333	4.80
	25	24630	5.15
	50	24600	5.00
	75	22870	5.00
	100	23009	4.95
2	125	23842	4.40
	150	24112	4.85
	175	25140	4.65
	200	25656	3.70
	225	24600	4.75
	250	24206	4.90
	275	25771	3.35
	300	25993	4.80
	325	26656	4.70
	350	26417	4.55
	375	23331	4.55
	400	25906	4.60
	425	23404	4.35
	450	24310	4.05
	475	22574	4.80
	500	23694	4.15
	505	23314	4.95
	510	23071	5.10
	515	22586	5.10
	520	22938	4.85
	525	24171	3.95
	530	23538	4.75
Subsection 1 Overall Mean:		25006	4.77
Standard Deviation:		1134	0.31
Coeff Of Variation:		4.54%	6.50%
Subsection 2 Overall Mean:		24329	4.54
Standard Deviation:		1262	0.45
Coeff Of Variation:		5.19%	9.97%

FLEXIBLE Pavement Thickness Statistics - 271028E

Drop height 3

Subsection	Station	Subgrade Modulus	Effective SN
No test pit data found, therefore no results exist...			
1	-30	25434	4.65
	-25	26006	4.85
	-20	25648	4.90
	-15	25052	4.75
	-10	26737	4.60
	-5	26420	4.05
	0	25109	4.85
	25	24441	5.25
	50	24261	5.10
	75	22606	5.05
	100	23081	5.00
2	125	24295	4.50
	150	23690	4.90
	175	24983	4.70
	200	25854	3.85
	225	24397	4.85
	250	24232	4.90
	275	26472	3.70
	300	25887	4.85
	325	27869	4.70
	350	27038	4.50
	375	24198	4.60
	400	25762	4.60
	425	23738	4.40
	450	24148	4.20
	475	23838	4.80
	500	24289	4.25
	505	23541	5.15
	510	23107	5.20
	515	23048	5.30
	520	23607	5.00
	525	23811	4.20
	530	23887	4.85
Subsection 1 Overall Mean:		24981	4.82
Standard Deviation:		1301	0.32
Coeff Of Variation:		5.21%	6.66%
Subsection 2 Overall Mean:		24622	4.64
Standard Deviation:		1302	0.41
Coeff Of Variation:		5.29%	8.91%

FLEXIBLE Pavement Thickness Statistics - 271028E

Drop height 4

Subsection	Station	Subgrade Modulus	Effective SN
No test pit data found, therefore no results exist...			
1	-30	25599	4.70
	-25	25774	5.00
	-20	25444	5.05
	-15	25355	4.80
	-10	25826	4.70
	-5	26139	4.15
	0	25128	4.90
	25	24578	5.30
	50	24230	5.10
	75	22680	5.10
	100	22983	5.10
2	125	24443	4.55
	150	23302	5.05
	175	25457	4.75
	200	25890	4.05
	225	24943	4.95
	250	24628	5.05
	275	26578	3.60
	300	25950	4.95
	325	28219	4.75
	350	26699	4.70
	375	24832	4.60
	400	26314	4.75
	425	23950	4.45
	450	24306	4.30
	475	23891	5.10
	500	24443	4.35
	505	23299	5.30
	510	23305	5.30
	515	22918	5.35
	520	23688	5.05
	525	24456	4.25
	530	23839	4.95
Subsection 1 Overall Mean:		24885	4.90
Standard Deviation:		1155	0.31
Coeff Of Variation:		4.64%	6.34%
Subsection 2 Overall Mean:		24789	4.73
Standard Deviation:		1351	0.44
Coeff Of Variation:		5.45%	9.28%

UBSECTION AT STA. 260 WITH EQUAL VARIANCE AND UNEQUAL MEAN

Summary of Results

Section uniformity:
  Subsections were identified within the section.
    Subsection 1 boundaries occur at   0 ft. and 260 ft.
    Subsection 2 boundaries occur at 260 ft. and 500 ft.

  Comparing subsections:
    Subsections 1 and 2: UNEQUAL means and EQUAL variances.

Outliers - Test pits: 28 combinations at each test pit
  NO Test pit data was present.

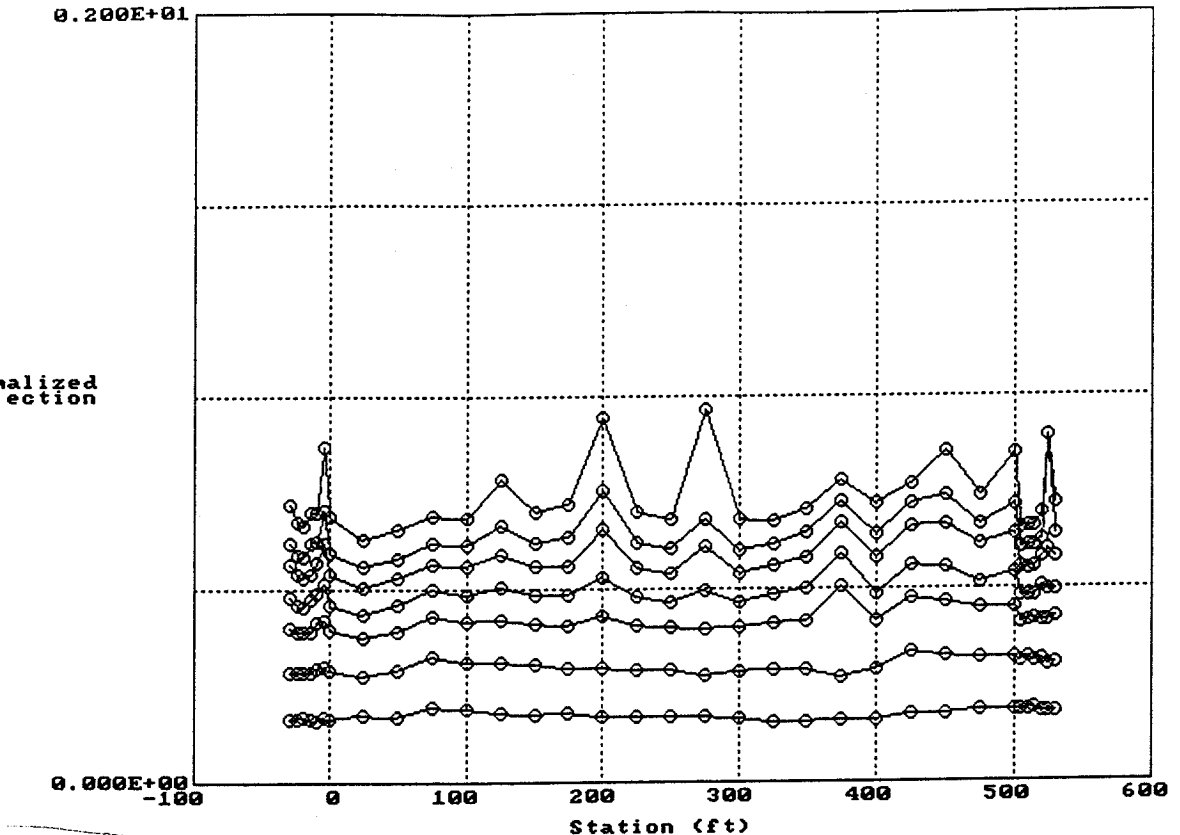
Outliers - Section data: 924 total combinations within the section
   16 height/sensor/station combinations are data outliers in subsection 1.
   31 height/sensor/station combinations are data outliers in subsection 2.

Structural capacity - Test pits: 4 combinations at each test pit
  All results for TP 1 are within the range of expected values.
  All results for TP 2 are within the range of expected values.

Structural capacity - Section data: 132 total combinations within the section
  %110 height/station combinations are NOT within the range of expected values

Subgrade response:
  132 height/station combinations exhibit linear response.

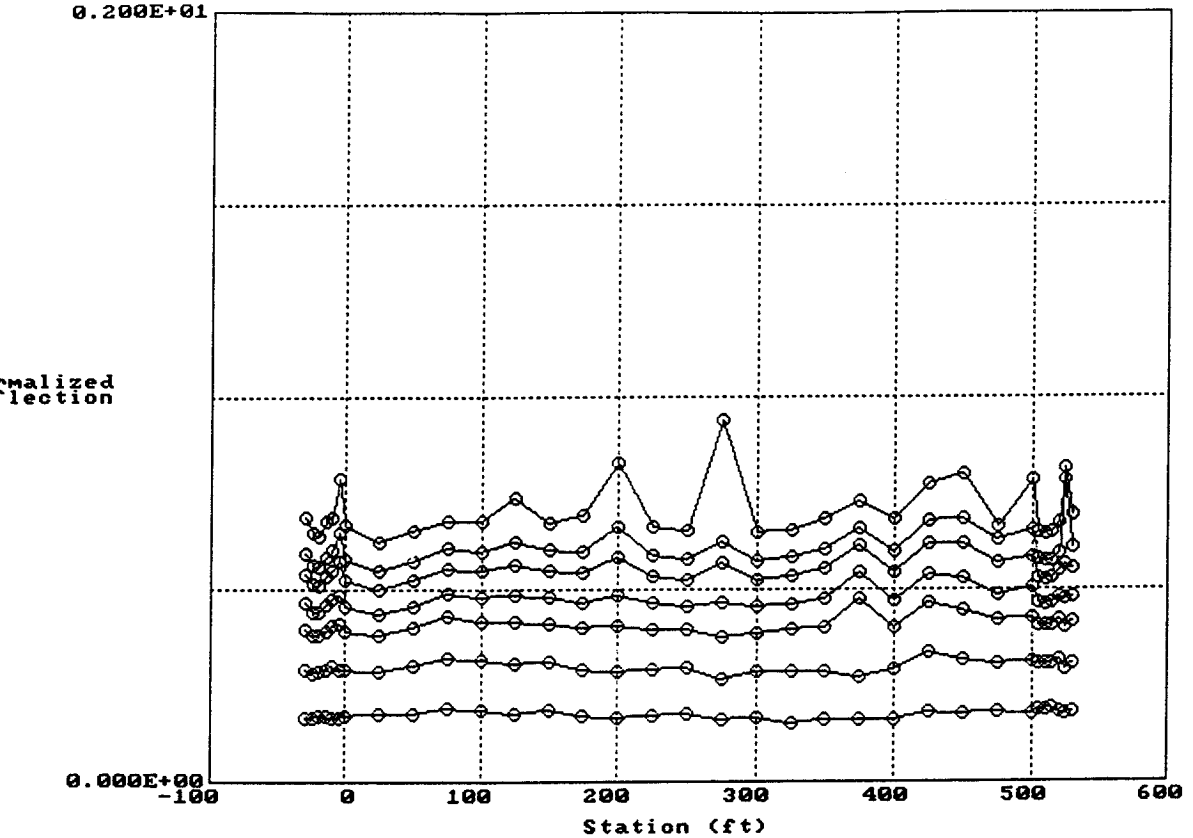
Deflection Data for Section: 271028E



Location 3 Drop Height 1 Sensors 1, 2, 3, 4, 5, 6, 7

F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc

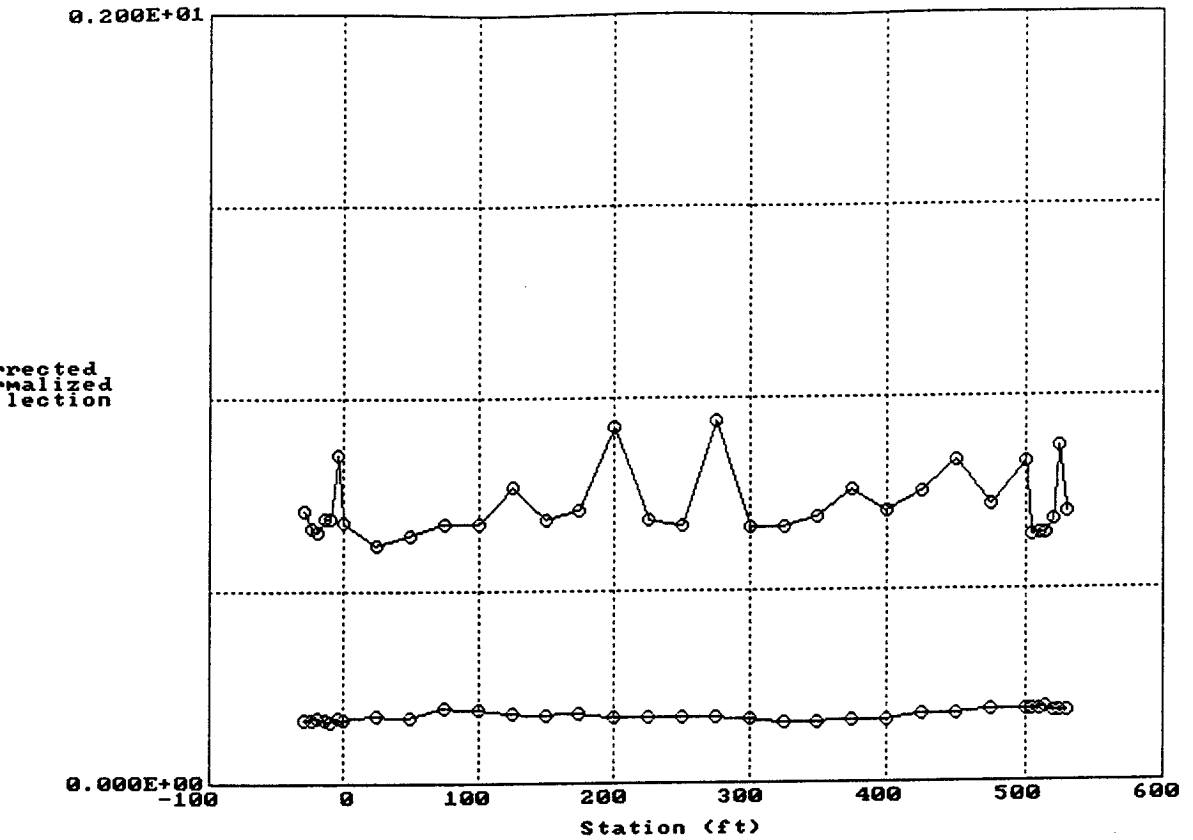
Deflection Data for Section: 271028E



Location 3 Drop Height 4 Sensors 1, 2, 3, 4, 5, 6, 7

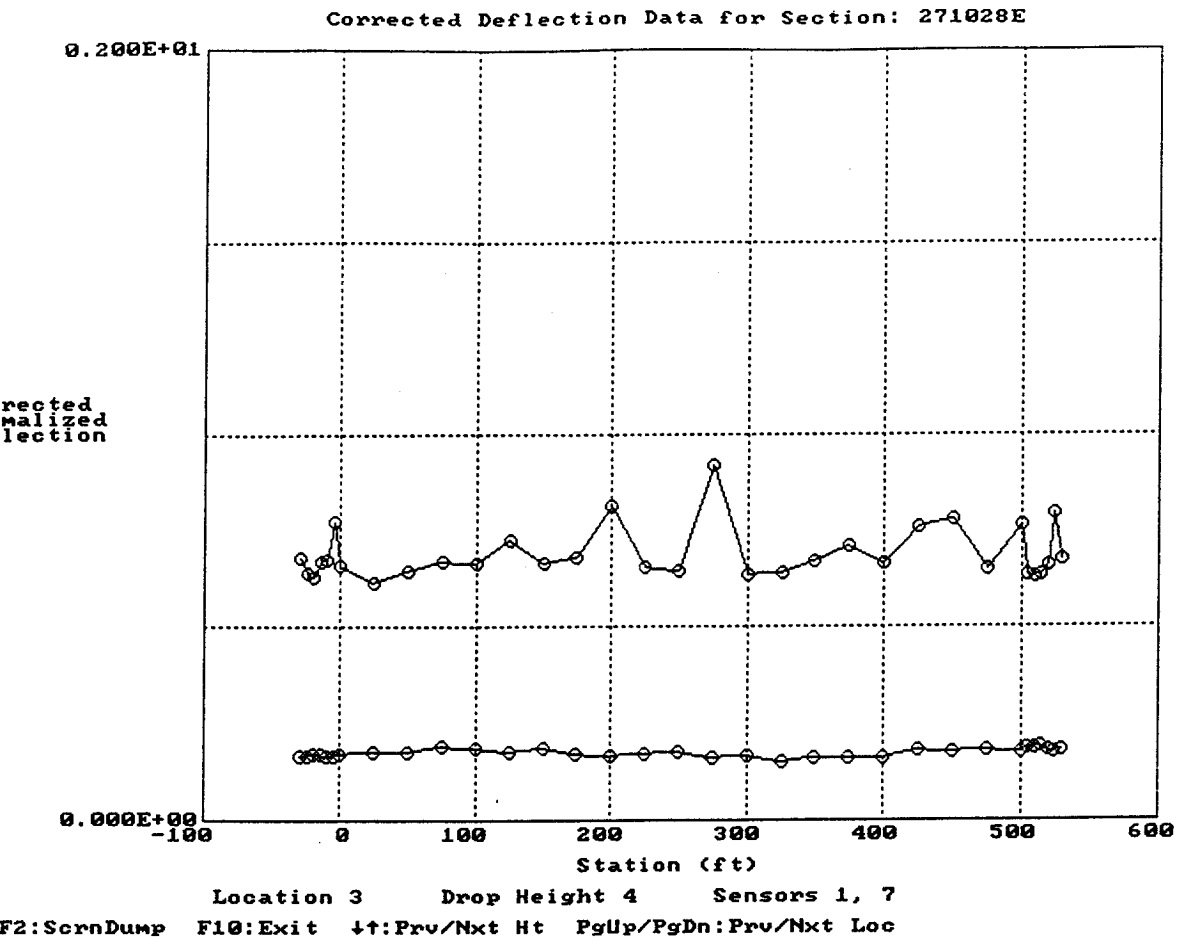
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc

Corrected Deflection Data for Section: 271028E



Location 3 Drop Height 1 Sensors 1, 7

F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc


Corrected Deflection Data for Section: 271028E
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500
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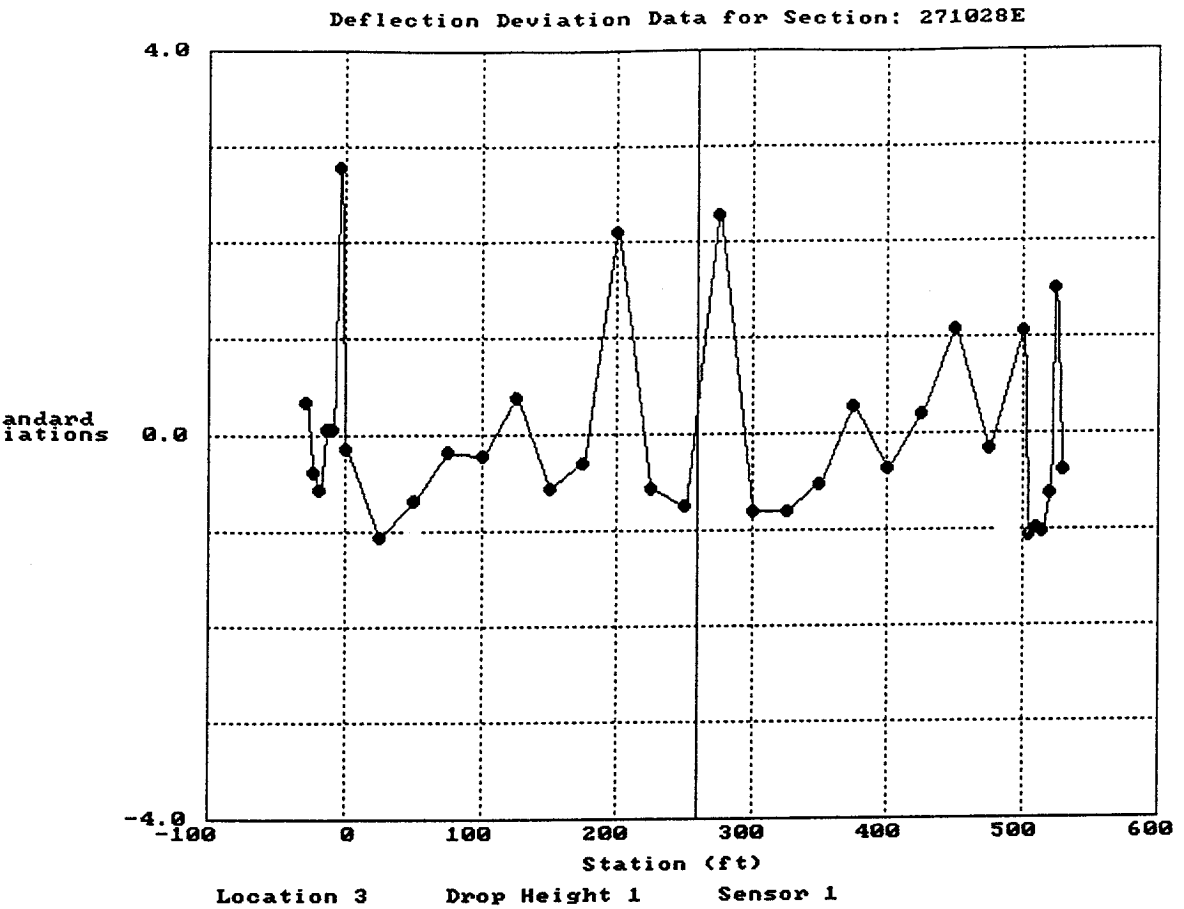
Station (ft)
Location 3
Drop Height 4
Sensors 1, 7
F2:ScrnDump
F10:Exit
↓↑:Prv/Nxt Ht
PgUp/PgDn:Prv/Nxt Loc


Deflection Deviation Data for Section: 271028E
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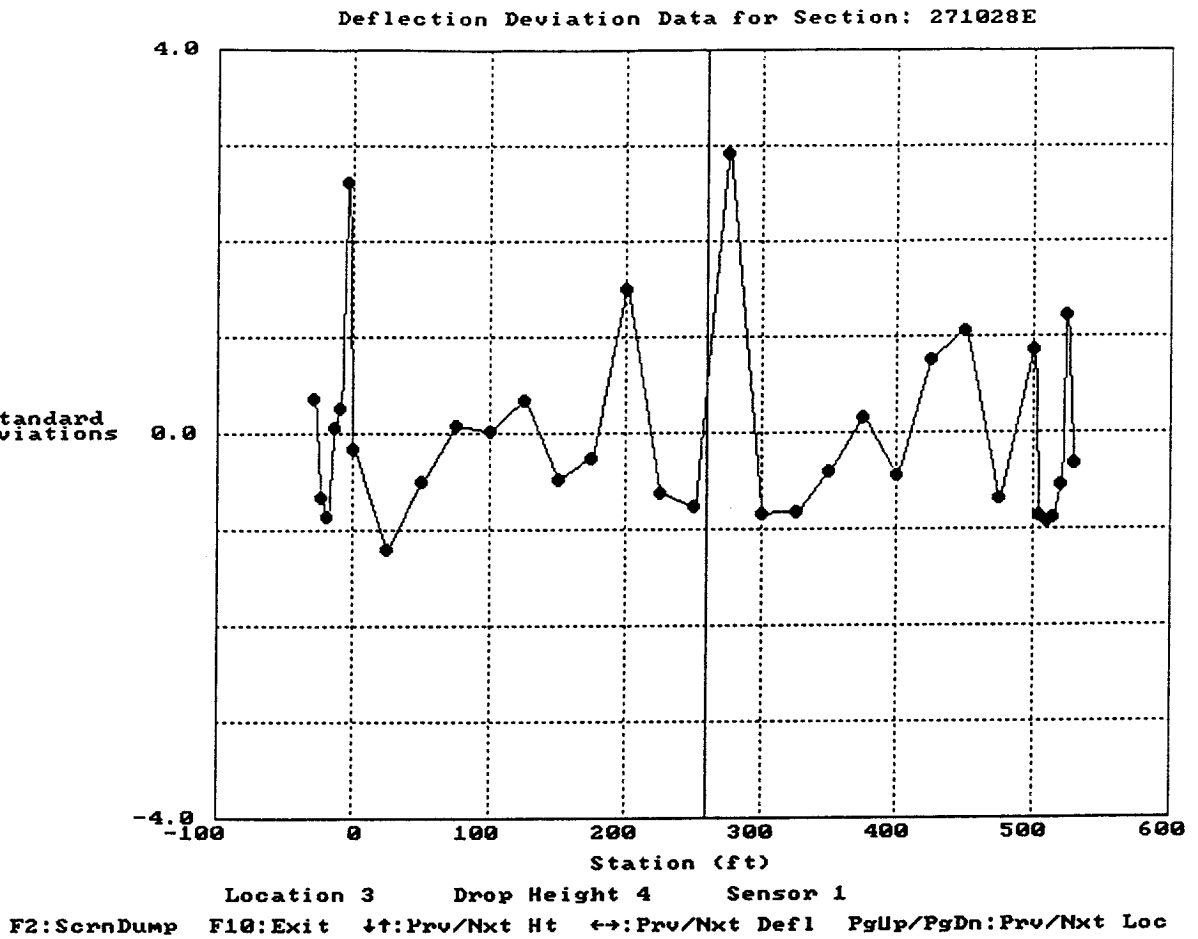
100
200
300
400
500
600
Station (ft)
Location 3
Drop Height 1
Sensor 1
F2:ScrnDump
F10:Exit
↓↑:Prv/Nxt Ht
↔:Prv/Nxt Defl
PgUp/PgDn:Prv/Nxt Loc


Deflection Deviation Data for Section: 271028E
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Station (ft)
Location 3
Drop Height 4
Sensor 1
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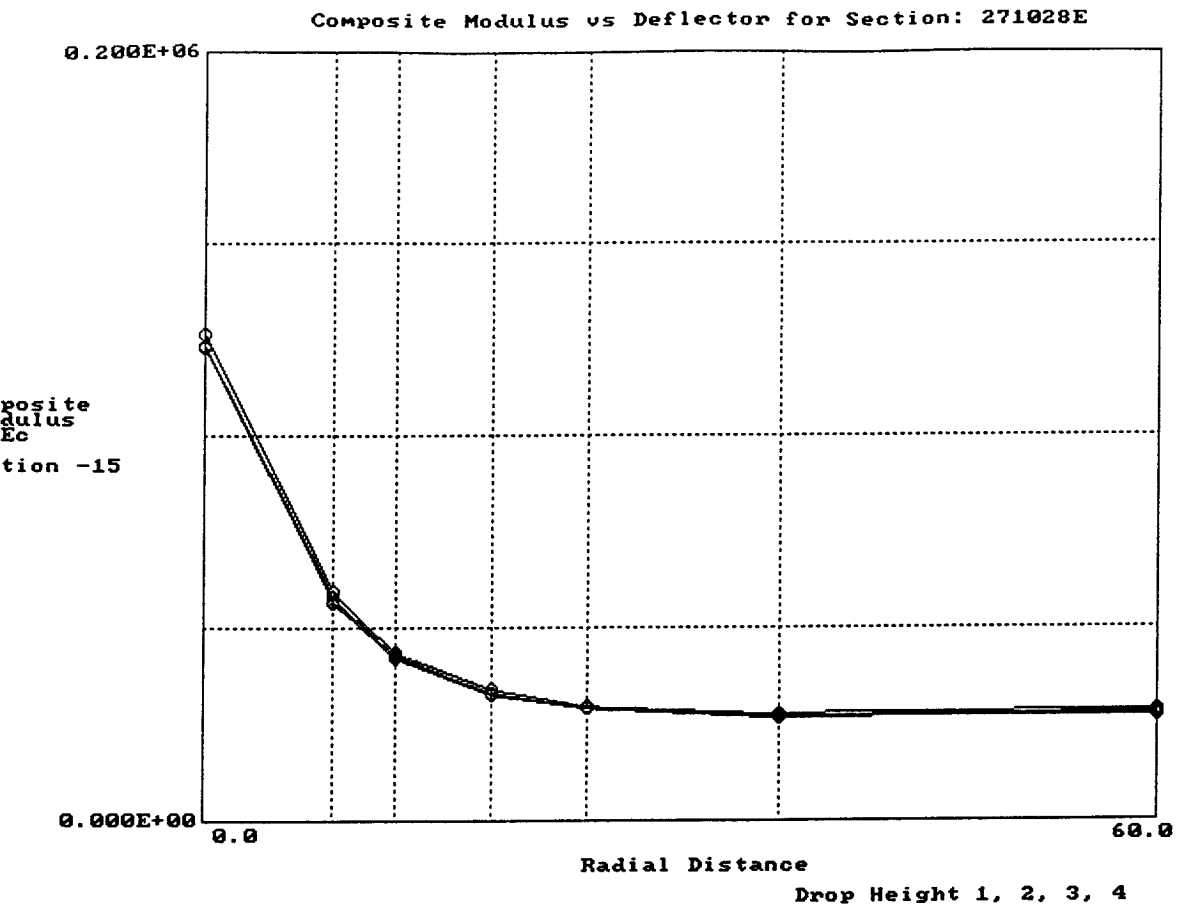
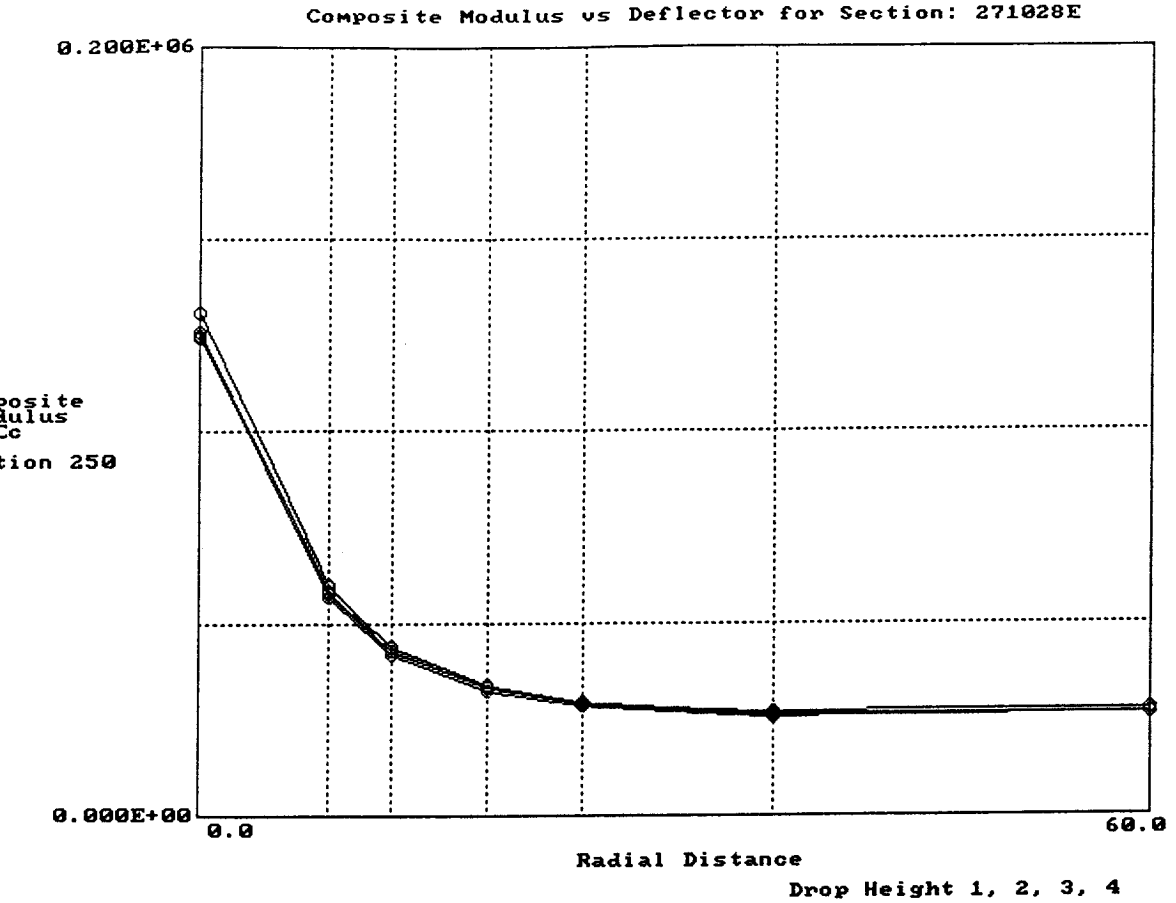
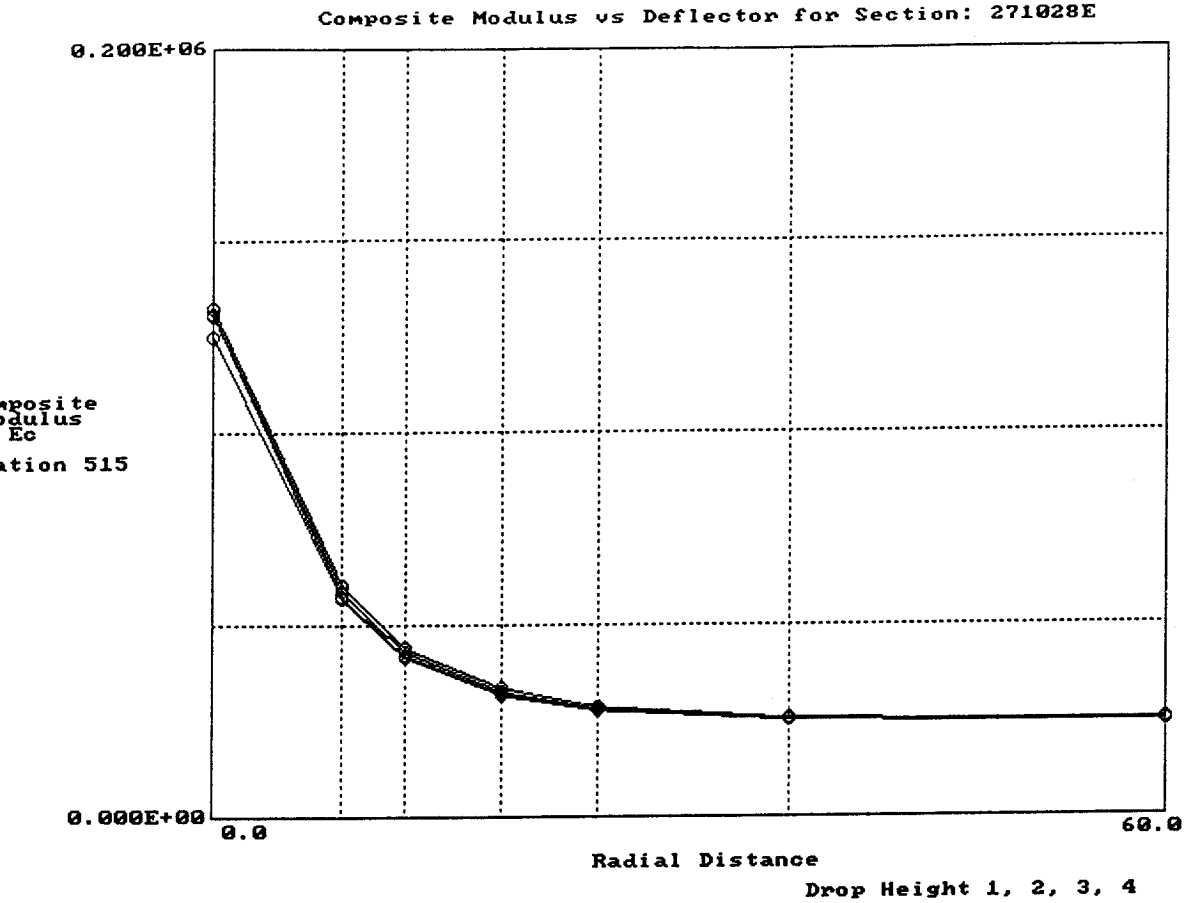


Actual
Potential Instrumentation Location.

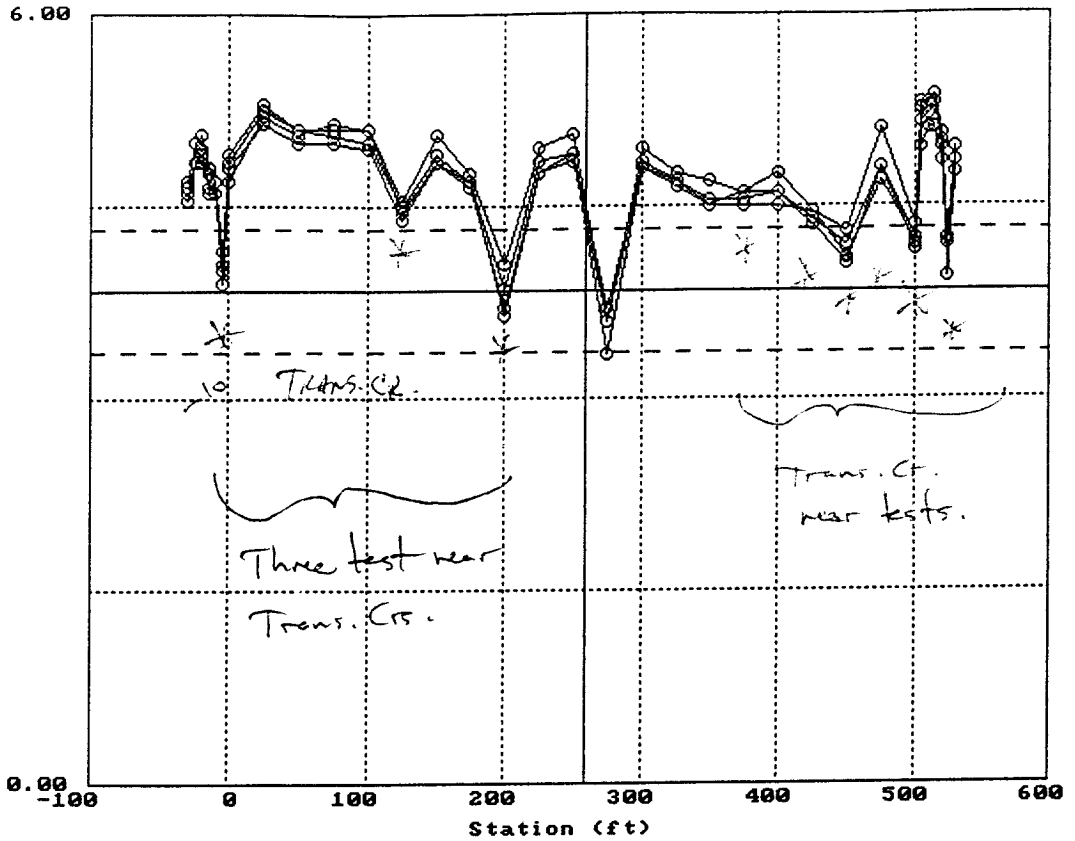


F10:ExitPlots Home End PgUp PgDn



Potential Instrumentation location.

Equivalent Structural Number for Section: 271028E



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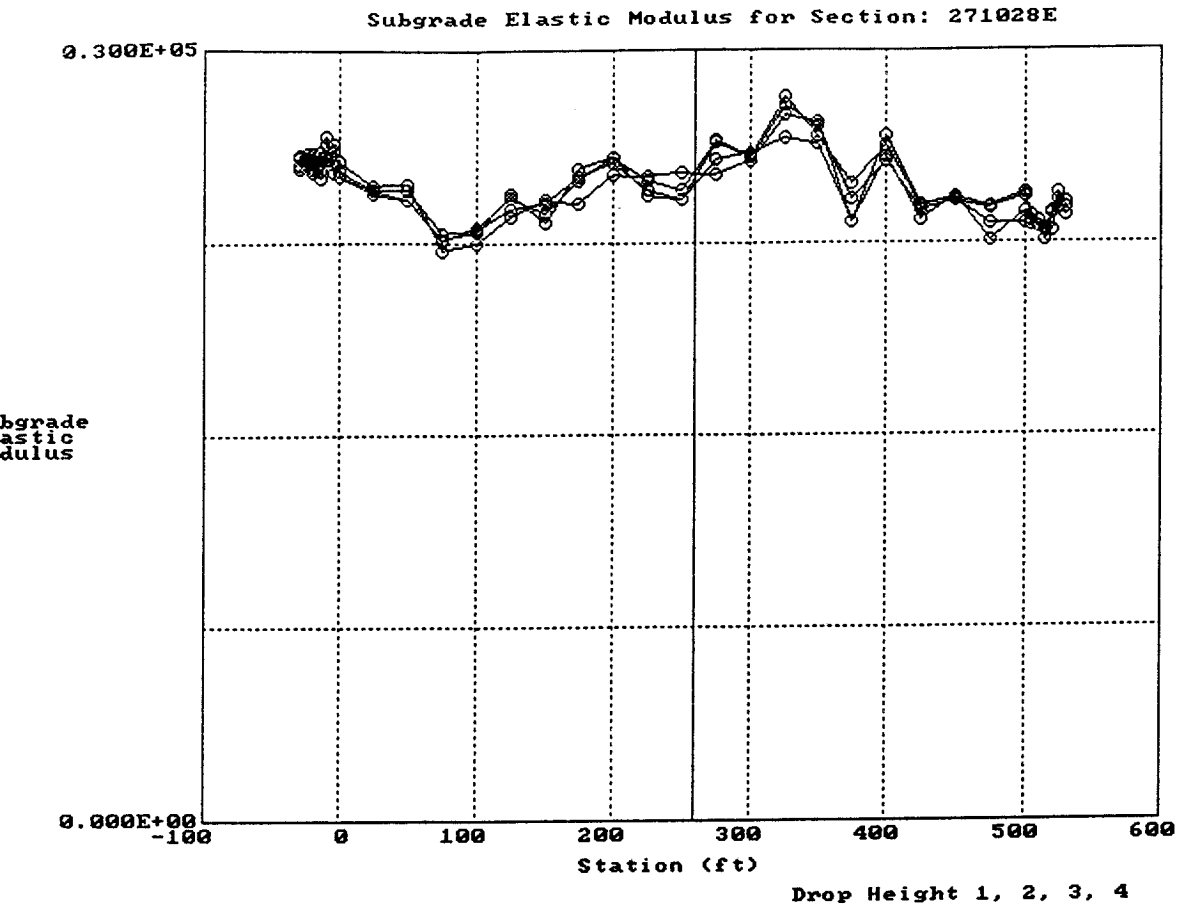
F10:ExitPlots



F10:ExitPlots

Appendix B-1: Pre-Installation Site Recruitment and Coordination Information

Appendix B-1 contains the following pre-installation site recruitment and coordination information:

- SMP site recruitment notes;
- MnDOT Materials and Research meeting agenda and notes;
- Site visit field notes; and
- Pre-installation meeting agenda and notes.

MN DOT

271022

BRAUN INTERTEC

Description: SEASONAL - MN

Project No: DBLx92700

Date: 3/4/93 By: RV

FRED MAURER - 779-5568

ACC - 274040 → Dist. 1 ⊛ okay with this section for traffic control and no scheduled maintenance
US-2 - Grand Rapids

AC - 271020 → ⊛ Fergus Falls (Detroit Lakes) Dist. is willing to delay any work on the section as long as condition is not a safety concern.
US-10

AC - 271018 → ⊛ Little Falls/RANDALL — Dist. going to look @ section on 3/17
— 3/24/93 - Can use section - maybe repairing trans. cracks.
— Engineer indicated two sections laid out?

- 273003 → ⊛ still checking on - Steve O.
ST 15 Okay, very interested in participating!
~2147 ADT — one lane

- 276251 → ⊛ — Dist. is willing to make exception to defer any rehab.
US 2 (WB)

GRAIG GILBERTSON 218/755-3807

- 271016 → ⊛ already delayed work on section in 92
US-71 58 — tough stripe

— out
— will look @ overlay when SP-3 ends.

BRAUN[SM]
INTERTEC

Braun Intertec Pavement, Inc.
1983 Sloan Place
St. Paul, Minnesota 55117-2004
612-776-7522 Fax: 776-7201

Engineers and Scientists Serving the Built and Natural Environments

(1/2)

Memorandum

Date: July 15, 1993

To: Fred Maurer

From: Robert J. Van Sambeek RV

Re: Discussion Topics for July 15, 1993 Meeting

Dale Rib

The specific sites in Minnesota for the Seasonal Monitoring Program sponsored by FHWA-LTPP Division are listed below along with tentative dates for the installations.

- GPS 271018 on US-10 two miles northwest of Little Falls, AC, 8/24 and 8/25 — Ken Wasme — Dist 3 — 218-847-1566
- GPS 271028 on US-10 ten miles east of Detroit Lakes, AC, 9/8 and 9/9 — Bud Wyborny — 218-847-1566
- GPS 276251 on US-2 bypass in Bemidji, AC, 9/14 and 9/15 — Greg Gilbertson — Equip
- GPS 274040 on US-2 five miles west of Grand Rapids, PCC, 9/21 and 9/22 — 218-755-3807

The dates listed above are dependant on FHWA-LTPP Division office having someone available for each installation, and Mn D.O.T. having personnel and equipment available.

Items that need to be addressed prior to installation activities are listed on the attached sheet. For some of the items only a contact name and phone number is needed at this time. For other items, several people will need to be involved regarding schedules and equipment availability.

Phone # list.

Dick Rudd 779-1110 — Dist 9

FRED MAURER 612-779-5568 — LTPP CONTACT

KELVIN HOWTESON 218-828-2240 (Dist. 3 Soils Eng.)

Jerry Dempsey 612-779-5700

BLAKE 612-779-5579

Meet w/ Blake + Jerry 7/23/93

ITEMS TO ADDRESS PRIOR TO SITE INSTALLATIONS

- Set date for meeting centrally located for all people involved in the four installations.
  - Brainard area?
    - Kelvin Howieson (Soils Engineer with District 3) help organize?
    - August 10th or 11th?
    - Maybe visit four sites after meeting?
  - Include following personnel?
    - LTPP contact?
    - Maintenance supervisor?
    - Drill rig operator?
    - FHWA Division personnel?
    - Other?
- Option for highway agency to establish permanent bench mark at each site.
- Equipment requirements.
  - Drill rig
    - 12 inch core?
    - 10 inch minimum diameter hole required (solid stem auger?).
    - 6 inch diameter hole located about 30 feet off roadway.
    -
    -
  - Pavement saw.
    - 10 inch cut depth maximum required for all four sites.
    -
- Supplies
  - See listings from installation guide.
  -
- SHIFT SITES 1 TO MONDAY ? — Jerry decide
-
-
-

FRED MAURER - 612-779-5568
JOE KORZILIUS - 779-5565 (INSTR.)
DAVE BULLOCK - 779-5542

MN CONTACTS

— DRILL RIG

WARREN O. PLADSEN, P.E.
Aggregate Engineer
Geotechnical Engineering Sect.

Materials & Research Laboratory
1400 Gervais Avenue
Maplewood, MN 55109

612-779-5612
FAX 612-779-5616

JERRY L. DEMPSEY
Field Operations Supervisor
Foundation Unit

Blake Nelson - 5599

Materials & Research Laboratory
1400 Gervais Avenue
Maplewood, MN 55109

612-779-5600
FAX 612-779-5616

— Filter Sand
— Piezometer caps
— Bentonite pellets

Quality Service Through Individual Commitment

KELVIN D. HOWIESON, P.E.
District Soils Engineer

For District Three
1991 Industrial Pk. Rd.
Baxter, MN 56401

(218) 828-2240
Fax (218) 828-2210

SURVEY IN BM? — DAVE GORG.

DICK RUDD - DIST 9 - 779-1110

BRAUN SM
INTERTEC

BOB V

7-22-93 2:50 PM

KEN WASNIE SAID OK FOR THE MEETING ON AUG 12 FOR SEASONAL.

IT WILL IN THE DOT BLDG.

LIBRARY CONFERENCE ROOM
1991 INDUSTRIAL PARK RR. ROAD
BAXTER MN 56401

SUBURB OF BRAINERD

ABOUT 1/4 MILE ~~NORTH~~ South OF PAUL BUNYAN

WILL HAVE TO SET TIME FOR MEETING.

ROOM CAN HANDLE 20+

RRG

9/27/93
- set time for 9:30 to ≈ 12:00
- get check into availability of coffee.
- people bring rolls?
-

BRAUN INTERTEC

Braun Intertec Pavement, Inc.
1983 Sloan Place
St. Paul, Minnesota 55117-2004
612-776-7522 Fax: 776-7201

Engineers and Scientists Serving the Built and Natural Environments

July 29, 1993

Mr. Fred Maurer
Mn/DOT Materials and Research Laboratory
1400 Gervais Avenue
Maplewood, MN 55109

Dear Mr. Maurer:

Re: Group Meeting Announcement for Activities in FHWA's Seasonal Monitoring Program in Minnesota

A tentative meeting agenda and list of who should attend the meeting is attached. The same information, along with a cover letter, was sent to the four District Materials Engineers involved. The meeting objectives as stated in the cover letter include;

* Inform involved parties about the Seasonal Monitoring Program
* Assign and coordinate responsibilities for installation and monitoring
* Finalize schedules for equipment and traffic control requirements, and
* Address any questions or concerns about the Seasonal Monitoring Program.

Please make arrangements for people from the Materials & Research Laboratory to attend. Some names, other than yourself, that have come up in previous meetings include;

Richard Sullivan - SHRP Representative
Warren Pladsen - in charge of drilling operations on the four sections,
Blake Nelson - initial planning of installations,
Joe Korzilius - involvement with instrumentation, and
Dave Bullock - involvement with instrumentation and FWD Spring Recovery testing.

Please give copies of the meeting announcement and agenda to the people you think need to attend. It is very important that someone in charge of drilling operations attend the meeting. If you have any questions or need additional information, please call me or Ron Urbach at 800-344-7477 or 612-776-7522.

Sincerely,

Robert Van Sambeek
Project Engineer
s:\wp\bob_v\mnmtg1.sm

What: Meeting Announcement for Activities in LTPP's Seasonal Monitoring Program in Minnesota

When: August 12, 1993 from 9:30 AM to 12:00 Noon

Where: Mn/DOT Library Conference Room
1991 Industrial Park Road
Baxter, MN

(0.25 miles south of Paul Bunyan in Brainerd)

Who: State Level

SHRP Representative
LTPP Contact

District Level

Materials Engineer and/or Soils Engineer

Maintenance Superintendent or Maintenance Sub Area Supervisor

Other Interested Parties

DOT staff involved with instrumentation or spring recovery study

University students

Agenda: See next page

FHWA-LTPP SEASONAL MONITORING PROGRAM IN MINNESOTA

MEETING AGENDA

Introduction
- Review of LTPP Program and Activities
- Objectives of the Seasonal Monitoring Program
- Overview of Sensor Installation and Monitoring Activities

Test Sections
- Section Location
- Allowable Maintenance

Sensors, Sensor Layout, and Installation
- TDR Probes
- Thermistor Probe
- Resistivity Instrumentation
- Air Temperature
- Rain Gauge
- Equipment Cabinet and On-Site Instrumentation
- Observation Piezometer

Schedule
- Installation
- Monitoring

Responsibilities
- Mn/DOT State Level
  - Project contacts
- Mn/DOT District Level
  - Traffic control
  - Utility clearance
  - Pavement saw and operator
  - Filter sand
  - Bentonite pellets
  - Sac-crete
  - Pavement repairs
- Mn/DOT Materials and Research Laboratory
  - Drill rig and operator
  - Access cover for piezometer
- NCRCO and FHWA Staff
  - Instrumentation
  - Monitoring activities

Closing Comments

271028

BRAUN INTERTEC

Braun Intertec Pavement, Inc.
1983 Sloan Place
St. Paul, Minnesota 55117-2004
612-776-7522 Fax: 776-7201

Engineers and Scientists Serving the Built and Natural Environments

July 29, 1993

Mr. Bud Wyborny
Minnesota Department of Transportation
P.O. Box 666
1000 West Highway 10
Detroit Lakes, MN 56502

Dear Mr. Wyborny:

Re: Group Meeting Announcement for Activities in FHWA's Seasonal Monitoring Program in Minnesota

Braun Intertec, under contract with FHWA LTPP Division, has responsibility for the Seasonal Monitoring Program initiated by SHRP. Earlier this year, we worked together with Fred Maurer to contact the Districts regarding sections to include in the program, and GPS section 271028 on US TH-10 east of Detroit Lakes in District 4A was approved for use in the program. In addition, sections by Bemidji, Grand Rapids, and Little Falls were approved.

With the four sites in Minnesota relatively close together, only one group meeting is planned for the Districts involved. A tentative meeting agenda and who should attend the meeting is attached. The meeting objectives include;

* Inform involved parties about the Seasonal Monitoring Program
* Assign and coordinate responsibilities for installation and monitoring
* Finalize schedules for equipment and traffic control requirements, and
* Address any questions or concerns about the Seasonal Monitoring Program.

Please make arrangements for appropriate district people to participate in the meeting. It is very important someone in charge of traffic control and maintenance attend the meeting. If you have any questions or need additional information, please call me or Ron Urbach at 800-344-7477 or 612-776-7522.

Sincerely,

Robert Van Sambeek
Project Engineer

s:\wp\bob_v\mnmtg4a.sm

BRAUN
INTERTEC

271028
SITE VISIT
8/12/93

CONCERNS

- Powerline runs along R.O.W. — no concern
- downhill (slight) grade
- rutting (see dipstick data)

COMMENTS

- drill rig back into ditch
- 10' AC shoulder
- expect crack maintenance
- Section markers at 17' to 18' off edge stripe
  - Set equip. cabinet in line?
- Powerpole more than 10' above section may work as 2nd benchmark — Sta. 1450

CONCLUSIONS

- Distress wise use Sta. 0400 to Sta. 2400

BOB V.
NOTES

FHWA-LTPP SEASONAL MONITORING PROGRAM IN MINNESOTA
MEETING AGENDA

August 12, 1993 from 9:30 AM to 12:00 Noon
Mn/DOT Library Conference Room
1991 Industrial Park Road, Baxter, MN

Introduction
- Review of LTPP Program and Activities
- Objectives of the Seasonal Monitoring Program
- Overview of Sensor Installation and Monitoring Activities

Test Sections
- Section Location
- Allowable Maintenance

Sensors, Sensor Layout, and Installation
- TDR Probes
- Thermistor Probe
- Resistivity Instrumentation
- Air Temperature
- Rain Gauge
- Equipment Cabinet and Instrument Pole
- Interface/Communications Equipment
- Observation Piezometer

Schedule
- Instrumentation Installation and Initial Monitoring
- Long Term Monitoring

Responsibilities
- Mn/DOT State Level
  - Project contacts — PR ?
- Mn/DOT District Level
  - Traffic control
  - Equipment
  - Materials
  - Pavement repairs — Mow GRASS? utility clearance
- Mn/DOT Materials and Research Laboratory
  - Drill rig and operator
  - Materials
- NCRCO and FHWA Staff — PR?
  - Instrumentation
  - Monitoring activities

Closing Comments

SAFETY

?s for Dist/Agency
- Cabinet location – not 30' – any problem
- Piezometer location – outside paved sho.
- Maintenance activities – before install?
- Snow plow concerns?
- BM install or not?
- Safety requirements – clothes

SITE VISIT
- BM – 2nd alt.
- Utilities – Power-lines, Culver
- Drill rig in ditch
- Any Rock
- Distress @ instr. hole
- Required maintenance
- Trees, wind constant
- [illegible]

Introduction

Review of LTPP Program and Activities

- see handout

Objectives of the Seasonal Monitoring Program

- Collect and analyze data to better understand the short and long term impacts of environmental factors including temperature, moisture, and frost/thaw depth on a pavement structure for improving pavement design.

- Factors defined in the core experiment monitored by FHWA-LTPP include
    - wet or dry climate
    - freeze or no freeze climate
    - pavement surface type (AC or PCC)
    - pavement surface thickness

- Factors not defined in the core experiment include
    - pavement edge drains
    - recycled materials
    - CRCP
    - shallow water table
    - shallow bedrock
    - etc.

- Agencies are encouraged to monitor supplemental sections to study factors not included in the core experiment.
    - reduced monitoring requirements
    - use existing GPS or SPS sections

Overview of Sensor Installation and Monitoring Activities

- Two days for initial instrumentation installation and monitoring

- About $10,000 of equipment installed at each site

- Monitor sections every other year (70 days over a 10 year period)

- Relate environmental variations to changes in
    - pavement, base and subgrade strength
        - deflection data collected 14 times per year
            - monthly most of year, and bi-weekly in the spring
    - ride quality
        - profile data collected five times per year
    - pavement distress
        - detailed pavement distress surveys two times per year
    - frost heave/swelling soil
        - elevation data collected five times in first year
        - elevations two times per year after the first year

Test Sections

Section Location

- 64 sections in the Core Experiment monitored under FHWA-LTPP contract

- 16 sections in the North Central Region
  - four core sections in Minnesota
    - 271018, EB US-10, MP 140, North of Little Falls
    - 271028, EB US-10, MP 58, East of Detroit Lakes
    - 274040, WB US-2, MP 173, West of Grand Rapids
    - 276251, WB US-2, MP 113, By pass in Bemidji

  - supplemental sections in Minnesota
    - none identified at this time

Allowable Maintenance

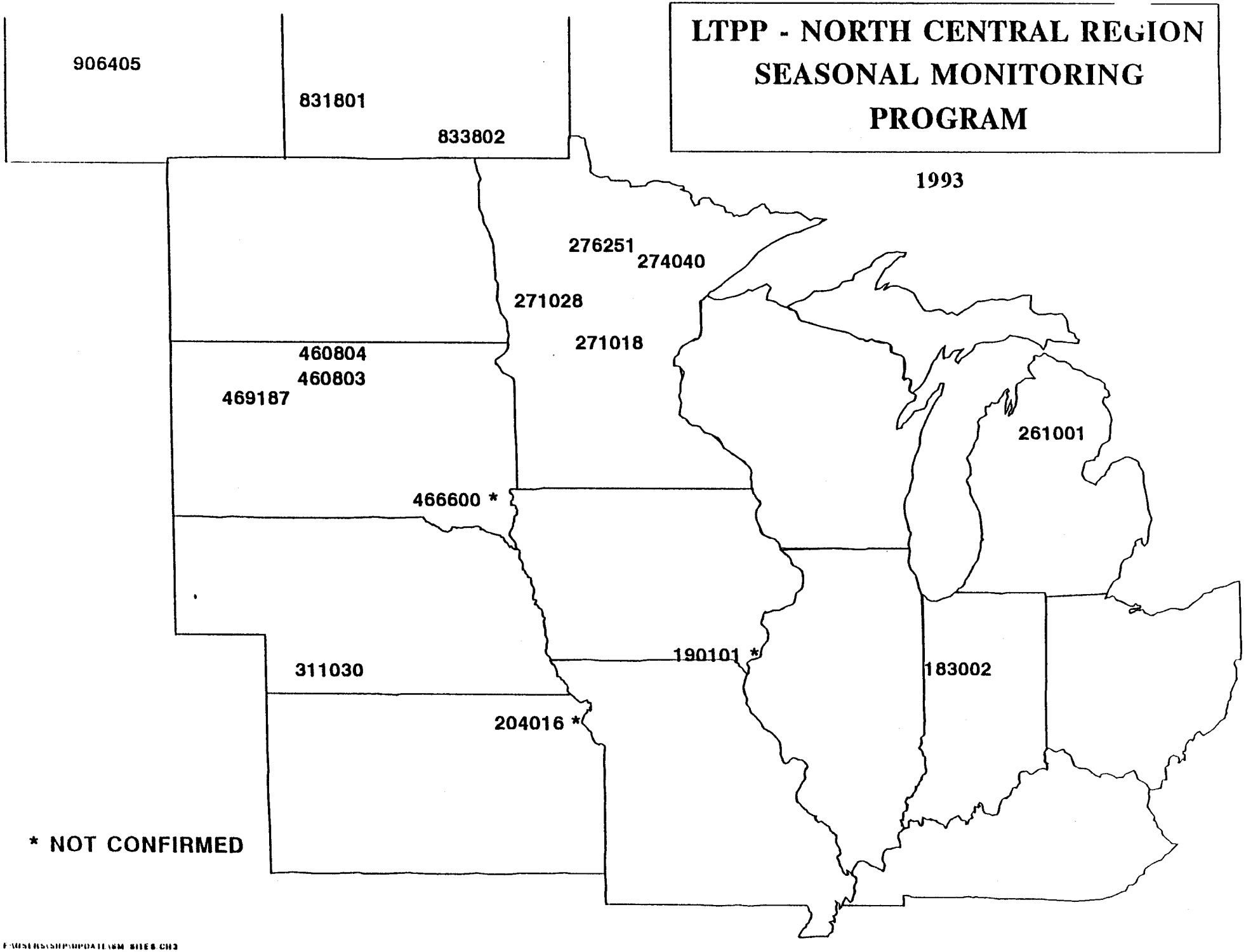
- routine maintenance

- no structural rehab preferred for ten years

- safety is primary concern

LTPP - NORTH CENTRAL REGION SEASONAL MONITORING PROGRAM

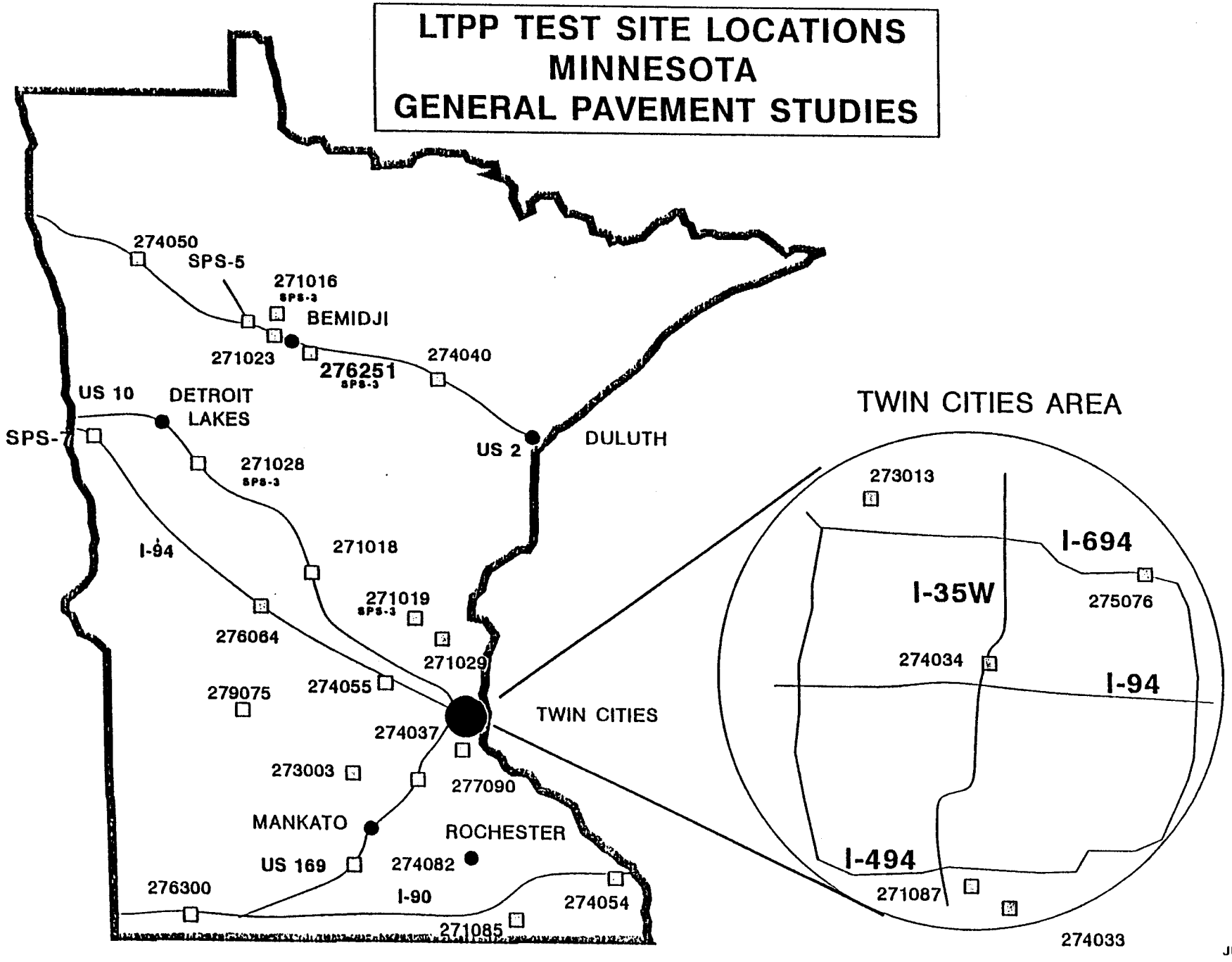
1993



* NOT CONFIRMED

F:\WSERS\SHIP\UPDATE\SM SITES.CH3

LTPP TEST SITE LOCATIONS
MINNESOTA
GENERAL PAVEMENT STUDIES



JUNE 1992

Sensors, Sensor Layout, and Installation

TDR (Time Domain Reflectometry) Probes

- FHWA design and manufacture
  - three prong
  - $60.00 each

- measure dielectric of material between probes and relate to moisture content
  - air = 1.0
  - dry soil = 3 to 4
  - water = 80

- calibration
  - laboratory in air and water
  - field moisture test on material placed on probes
  - retain soil samples for additional laboratory calibration

- 10 probes per installation
  - one mid-depth in the base
  - seven at six inch intervals in the top of the subgrade
  - two at 12 inch intervals approximately seven feet below the surface

- cable reader
  - generate signal for cable
  - monitor return signal
  - $8000.00

Thermistor Probe

- Measurement Research Corporation (MRC)
  - $1000.00 each

- thermistors change resistance with change in temperature

- built in multiplexer for automated readings

- two part
  - stainless steel section
    - monitor temperature gradient through the pavement surface
      - one inch deep
      - mid depth
      - one inch from bottom of pavement

  - plexiglass section
    - monitor 15 temperatures at six inch intervals

- laboratory calibration at three temperatures

Resistivity Instrumentation

- CRREL design
  - PVC probe with 36 electrodes at two inch intervals
  - $800.00 each

- large increase in resistance when moisture in the soil freezes
  - determine both frost and thaw depth

- require signal generator and multimeters
  - compute AC resistance between electrodes

- both manual measurement and automated

Air Temperature

- Campbell Scientific
  - $150.00 each

- Air probe and radiation shield

- mount on instrument pole

Rain Gauge/Tipping Bucket

- Texas Electronics
  - $255.00 each

- 0.1 mm (0.004 inches) precipitation per tip
  - liquid precipitation only

- mount on instrument pole

Equipment Cabinet and Instrument Pole

- telephone pedestal
  - break away classification
  - contain power supply, CR10 data logger, terminal strip for sensor connections, and cables for mobile reader
  - conduit runs into cabinet from instrumentation hole
  - pea rock inside base to prevent condensation

- instrument pole
  - break away classification
  - extend below frost line
  - holds rain gauge and air temperature probe

Interface/Communications Equipment

- mobile unit
  - used on site to read TDR probes and resistivity probe
  - multiplexers for automated readings

- cable reader
  - Tectronics model 1502
  - required for reading TDR probes

- computer and software
  - "onsite" used to record data everyday
  - "mobile" used to record data monthly

Observation Piezometer

- monitor depth to ground water table

- designed to act as frost free bench mark
  - Dave Esch design
  - anchor at 14 foot depth
  - sliding section extends six feet below the surface
    - filled with water proof grease

Schedule

Instrumentation Installation and Initial Monitoring

- two days required with third day as contingency
  - first day complete instrument installation
  - second day collect data

- tentative schedule
  - Aug. 23 & 24 - 271018, EB US-10, MP 140, North of Little Falls
  - Sept. 8 & 9 - 271028, EB US-10, MP 58, East of Detroit Lakes
  - Sept. 21 & 22 - 274040, WB US-2, MP 173, West of Grand Rapids
  - Sept. 14 & 15 - 276251, WB US-2, MP 113, By pass in Bemidji

Long Term Monitoring

- one day every month

- every other year for 10 years

Responsibilities

Mn/DOT State Level

- project contacts for maintenance activities and traffic control

Mn/DOT District Level

- traffic control for full lane closure
  - two days for initial installation and monitoring
  - lane closure for 500 foot section
    - signs, cones, and arrow board
- equipment
  - pavement saw and operator
    - if drill rig not able to core 12 inch diameter, then saw 14 inch square block out of the pavement
      - located in the outer wheel path
      - will put core back in-place on AC sections
    - equipment capable of cutting one inch deeper than estimated pavement thicknesses below
      - 271018 4.5 inch AC
      - 271028 9.6 inch AC
      - 274040 8.2 inch PCC
      - 276251 7.9 inch AC
    - saw three to four inch wide trench for conduit
      - from outer wheel path to outside pavement/shoulder
- materials
  - coordinate with Materials and Research Laboratory
  - asphalt patch for conduit trench
    - estimate 500 pounds
  - water for mixing sackcrete and equipment clean-up
    - estimate 30 gallons
- pavement repairs
  - patch conduit trench on AC shoulders with asphalt patch
  - assist with core or block replacement on AC sections
  - assist with rapid set concrete patch for instrumentation hole and conduit trench on PCC pavements

Mn/DOT Materials and Research Laboratory

- drill rig and operator
  - only required for instrument installation (first day)

  - if possible, cut 12 inch core for instrumentation
    - 12 inch inside diameter core barrel required
    - core located in outer wheel path

  - bore one six-inch diameter hole for piezometer
    - 14 foot depth
    - located on shoulder

  - bore one 12 inch diameter hole for instrumentation
    - solid stem auger preferred
    - eight foot depth
    - located in outer wheel path
    - NCRCO has 12 inch diameter auger with two-inch hex drive

  - bore one 12 inch diameter hole for equipment cabinet
    - two feet deep
    - located about 26 feet outside the driving lane in the ditch

  - bore one six-inch diameter hole for the instrumentation pole
    - 10 feet deep
    - located adjacent to the equipment cabinet in the ditch

- materials

  - cover assembly for piezometer
    - must function for ten years
    - able to open in the winter

  - sackcrete for piezometer cover and instrumentation pole
    - estimate four bags required

  - quick set concrete to repair PCC sections
    - only for 274040 by Grand Rapids
    - estimate three to four cubic feet

  - bentonite pellets for sealing piezometer
    - five gallon bucket

  - filter sand for piezometer
    - 400 pounds (four bags)
    - particle size not critical

  - pea gravel for equipment cabinet
    - 500 pounds
    - 3/8 inch size preferred

NCRCO (Braun Intertec) and FHWA Staff

- instrumentation
  - provide all instrumentation
  - install all instrumentation
    - may ask DOT people for assistance

- monitoring activities
  - will collect all required monitoring data

Closing Comments

-7IC18 – WHEN CRACK REPAIR? PROCEDURE?
– REPAIR PRIOR TO INSTALLATION?

– Cut grass

– Report to Dist. in Spring for load restricti

MP. 114 frost tube

Change ID. (MN) ⟹ Change Identifier COY 310 Y ##

#–four digit work item

– Gopher One Call – Utility Clearance

– PR – FHWA ON SITE

– SAFETY

– Utility to K.C.W. – grants for Lanty

* PRIMARY CONTACTS IN DIST. FOR SMP

Ex 32745

LTPP SEASONAL MONITERING MEETING

Aug 12, 1993 Brainerd

	Name	AFF:/Office	Dist	Phone No
	* Andy Istvanovich	Crimal Rapids Sgt.	1B	(218) 327-4493
KILLERS	Harland Vitalis	Maplewood Lab		(612) 779-5610
	Eugene Tormonen	" "		" " "
	John Savaloja	Materials	3A	218/828-2271
	Bob Matthews	Materials	3A	218 828-2231
*	Tom Stanko	Maint	2	218-755-3799
* 11013	Lee Furdham	Maint.	3A	218-828-2472
	Don Hardy	Maint.	3A	218-828-2478
276251	Greg Gilbertson	Materials	2	218-755-3807
	PAT HUSTON	SOILS	1	218.723-4883
	Kelvin Howieson	Soils	3	218-828-2240
11013	ROBIN ALLEN	MATERIALS	3A	218-828-2768
MnDOT MATLS	Fred Maurer	Pav't Mgt. C.O. MR&E		(612) 779-5568
✓	RON URBACH	BRAUN INTERTEC		612-776 7522
	Joseph Korzilius	MN/DOT Pvmt Dgn.		612-779-5565
✓	WILLIAM LOHR	FHWA (~~Loan~~ TRAINEE)		612 776 7520
271013 →	KEN WATSNICE	MnDOT	3A	218-828-2481
Coordinator Milling	Warren Pladsen	MnDOT	MR&E	612-779-5612
*	Bud Wyharny	MnDoT	4A	218-847-1562
	Tom Swenson	MnDOT	4	218-846-0743
✓	BOB VAN SAMBEEK	BRAUN INTERTEC	—	1-800-344-7477 612-776-7522
✓	GENE SKOK	"	"	" " "

SECTION ID	HIGHWAY	MILEPOINT	CONTROL SECTION	DISTRICT	DISTRICT MAINTENANCE SUPERINTENDANT	MAINTENANCE SUB AREA SUPERVISOR	DISTRICT MATERIALS ENGINEER	DISTRICT SOILS ENGINEER
271018	US 10 EB	140.15	4902	3A	LEE PURDHAM (218) 828-2472 BRAINERD	GARY LOUDAN (612) 632-6116 LITTLE FALLS	KEN WASNIE (218) 828-2481 ext 2544 BRAINERD	KEVIN HOWIESON (218) 828-2240 BRAINERD
271028	US 10 EB	58.28	5607	4A	DENNIS REDIG (218) 847-1575 DETROIT LAKES	JOE STEGMAIER (218) 847-1500 DETROIT LAKES	BUD WYBORNY (218) 847-1562 DETROIT LAKES	TOM SWENSON (218) 846-0743 DETROIT LAKES
276251	US 2 WB	113.00	0406	2A	LARRY SCHANUS (218) 755-2943 BEMIDJI	TOM STANKO (218) 755-3799 BEMIDJI	CRAIG GILBERTSON (218) 755-3807 BEMIDJI	TODD VONASEK (218) 755-3992 BEMIDJI
274040	US 2 WB	173.21	3103	1B	WOODIE CRAIG (218) 749-7793 VIRGINIA	ANDY ISTANOVICH (218) 327-4493 GRAND RAPIDS	ROD GARVER (218) 723-4835 DULUTH	PAT HUSTON (218) 723-4883 DULUTH

if not in call 749-7793

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

To BOB VAN SAM BEEK	From DAVE BULLOCK
Co. BRAUN	Co. MnDOT
Dept.	Phone # 779-5942
Fax # 776-7201	Fax # 779-5616

Traffic Control Contacts

BRAUN INTERTEC

Braun Intertec Pavement, Inc.
1983 Sloan Place
St. Paul, Minnesota 55117-2004
612-776-7522 Fax: 776-7201

Engineers and Scientists Serving the Built and Natural Environments

Memorandum

Date: August 17, 1993

To: Bud Wyborny - District Materials Engineer for 218-846-0744
Tom Swenson - District Soils Engineer

From: Robert J. Van Sambeek

Re: Instrument Installation and Monitoring Activities for GPS Section 271028 on US-10 Eastbound MP 58.

This letter is a follow up to District level responsibilities discussed at the August 12, 1993 meeting in Baxter, MN. Also, Fred Maurer asked that all work related to the FHWA-LTPP project be billed to charge I.D. 00 310 ####, where #### represents the four digit work item.

* Utility Clearance
  - MP 58.26 to MP 58.39 of eastbound US-10.
    - 700 feet total from 100 feet west of Sta.0+00 to 100 feet east of Sta.5+00.
    - Stations marked on right edge of driving lane with white paint.
    - Clear driving lane and 40 feet south of section into the ditch.

* If possible, mow grass in area identified for utility clearance, or bring weed whip to site on September 8th.

* Traffic Control September 8th and 9th (Schedule September 10th as contingency day for weather delays or equipment break down).
  - Full lane closure MP 58.26 to MP 58.39 in the eastbound driving lane.
  - Traffic control in-place by 7:30 AM both days.

* Pavement Saw and Operator on September 8th.
  - Able to saw about 10.5 inch depth.
  - Cut 14 inch square block out of the pavement in the outer wheel path.
    - Remove block in one piece to bond back in-place later in the day.
  - Cut four inch wide trench from outer wheel path across 11 foot paved shoulder.

18

* Materials for Equipment Installation and Pavement Repairs.
  - Six bags sackcrete.
  - 500 pounds 3/8 inch pea gravel or trap rock.
  - 500 pounds asphalt patch.
  - Water for sackcrete and equipment clean-up (Not more than 30 gallons).

* Patch four inch wide trench and assist with block replacement in the outer wheel path.

BRAUN INTERTEC

27 Oct 93

Mn/DOT

BM

Dickson Hoile
296-1542
- locations to shoot in later on

- Surplus rod + pvc from Mn/ROAD

- Look @ ALL 4 SITES

John Zollers
- Caps for BM

- EQUIPMENT
  - Power hammer
  - Grinder
  - etc.

} Geo. crew. ~~tool~~ Loan

- Warren still looking into caps for BM.

- will talk to Harland Wittlif about installing.

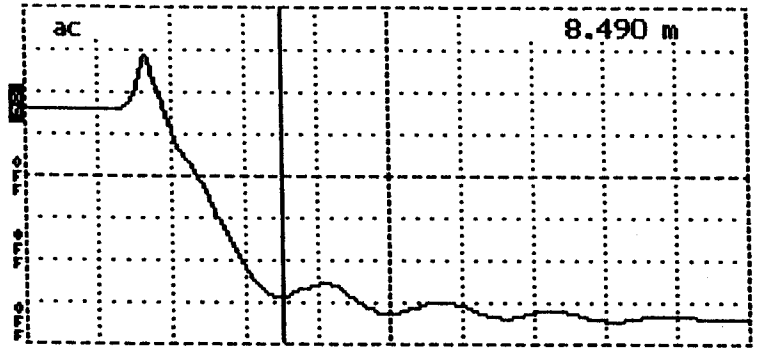
Appendix B-2: Pre-Installation Equipment Checks/Calibration Information

Appendix B-2 contains the following data sheets for the pre-installation equipment checks/calibration:

- 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;
- Data Sheet SMP-C04: Function Generator, Multi-meter, and Switch Box Checks; and
- Data Sheet SMP-C05: Tipping-Bucket Rain Gauge Calibration.

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

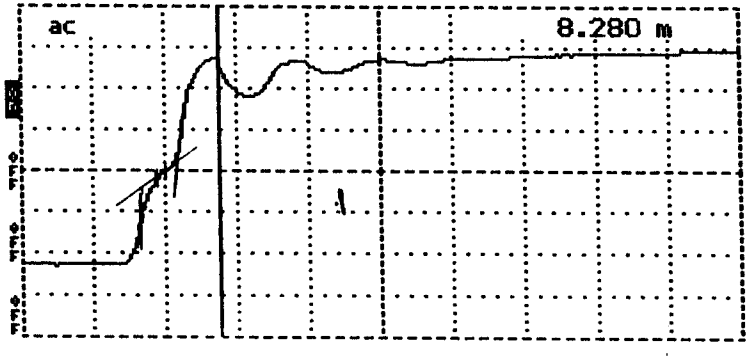
ursor ..... 8.490 m
istance/Div..... .25 m/div
ertical Scale.... 177 mρ/div
ρ 0.50
oise Filter..... 8 avg
wer..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 27028 - 127801
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

Cursor ..... 8.280 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
ρ 0.50
Noise Filter..... 8 avg
Power..... ac

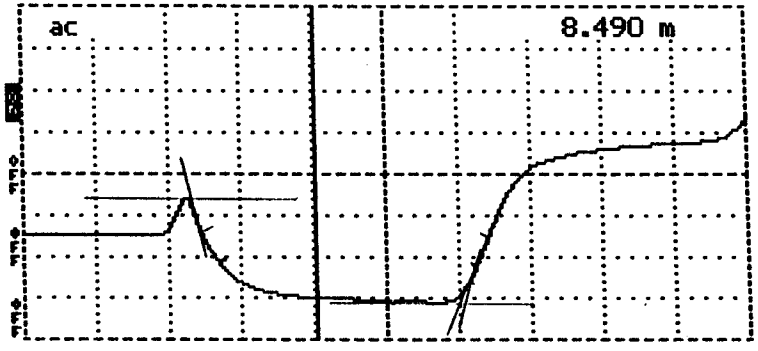


Tektronix 1502B TDR
Date 9-3-93
Cable 27028 27801
Notes IN AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.13	1.64

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

ursor ..... 8.490 m
stance/Div..... .25 m/div
ertical Scale.... 177 mρ/div
P 0.50
oise Filter..... 8 avg
ower..... ac



Tektronix 1502B TDR
Date 9-6-93
Cable 1028 - 27B01
Notes IN H2O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.92	76.89

[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: 27B01 TDR Probe Length, L: .(1) m Length of Coax Cable: (1). m

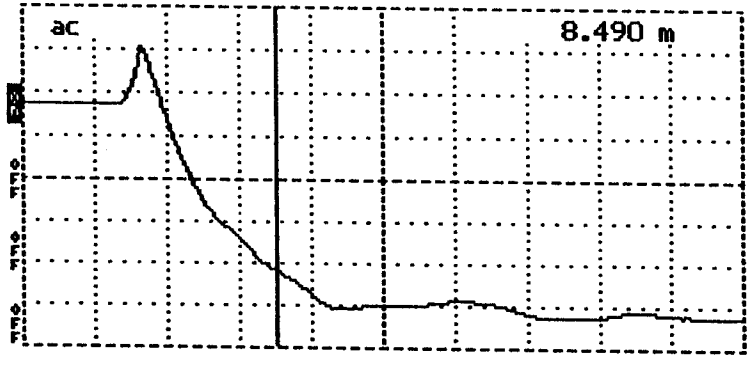
Comments: (1) Not measured in 1993, used 0.203M for "L" and 0.5 for "Vp" instead of 0.99 ~~Pilot installation - Calibration procedure done with help from WRCO.~~

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 15/NOV/95 (installed 1993)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

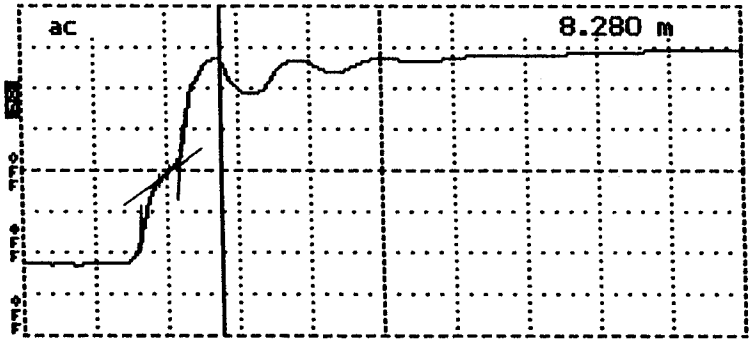
'sor ..... 8.490 m
tance/Div..... .25 m/div
'tical Scale.... 177 mρ/div
..... 0.50
:e Filter..... 8 avg
'er..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 27/028 -2 27B02
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

ursor ..... 8.280 m
'istance/Div..... .25 m/div
ertical Scale.... 177 mρ/div
› 0.50
)ise Filter..... 8 avg
'wer..... ac

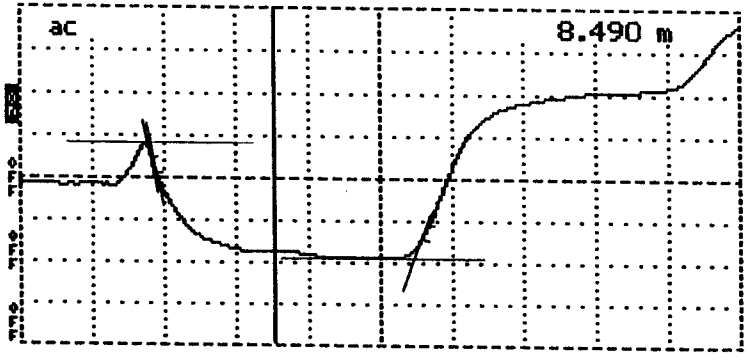


Tektronix 1502B TDR
Date 9-2-93
Cable 27/028 -2 27B02
Notes IN AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	0.13	1.64

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

ursor ..... 8.490 m
istance/Div..... .25 m/div
rtical Scale.... 177 mρ/div
..... 0.50
ise Filter..... 8 avg
wer..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 27028 - 2 27B02
Notes In H2O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.92	82.16

[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: 27B02 TDR Probe Length, L: __.(1)___ m Length of Coax Cable: __(1).__ m

Comments: (1) see probe #1

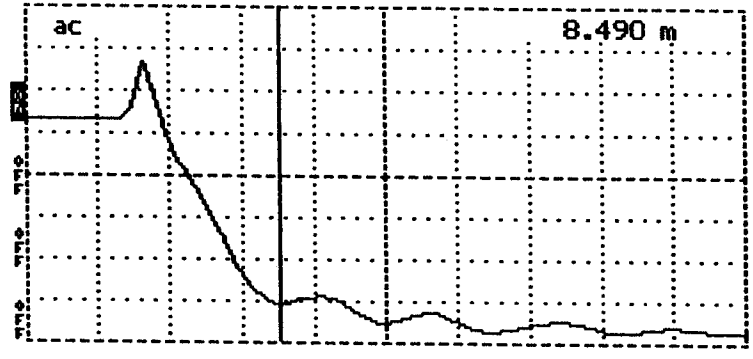
Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 15/NOV/95 (installed 1993)

Data Sheet SMP-C01: TDR Probe Check (Continued)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

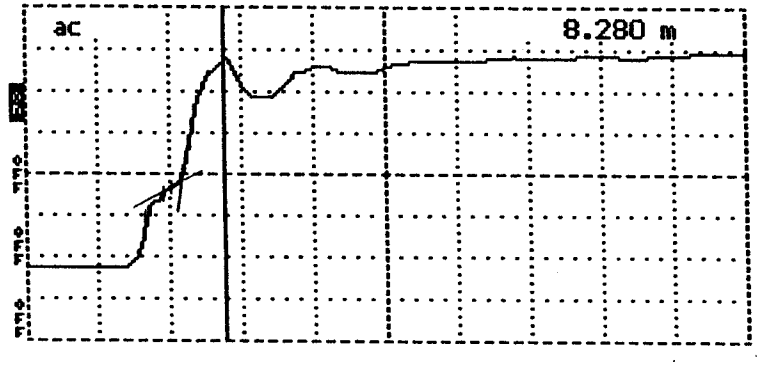
rsor ..... 8.490 m
stance/Div..... .25 m/div
rtical Scale.... 177 mρ/div
..... 0.50
se Filter..... 8 avg
ver..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 27028 - 3 27B03
Notes SPIKES
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

rsor ..... 8.280 m
stance/Div..... .25 m/div
rtical Scale.... 177 mρ/div
..... 0.50
ise Filter..... 8 avg
wer..... ac

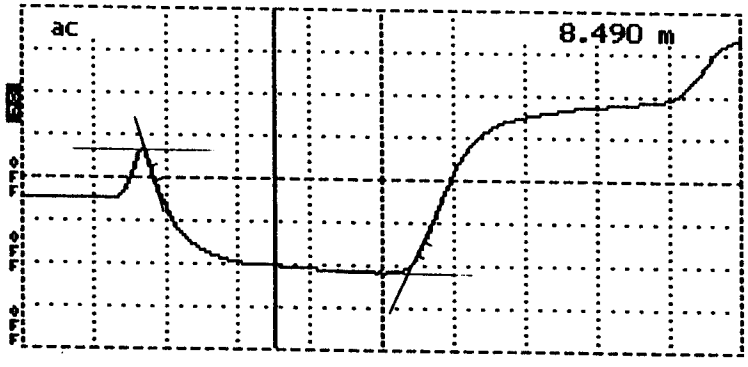


Tektronix 1502B TDR
Date 9-2-93
Cable 27028 - 3 27B03
Notes IN AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.13	1.64

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

irsor ..... 8.490 m
stance/Div..... .25 m/div
rtical Scale.... 177 mρ/div
..... 0.50
se Filter..... 8 avg
'er..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 271028-3 27B03
Notes
1N H_2O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.93	83.95

[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: 27B03 TDR Probe Length, L: __.(1)___ m Length of Coax Cable: (1)__.__ m

Comments: (1) see probe #1

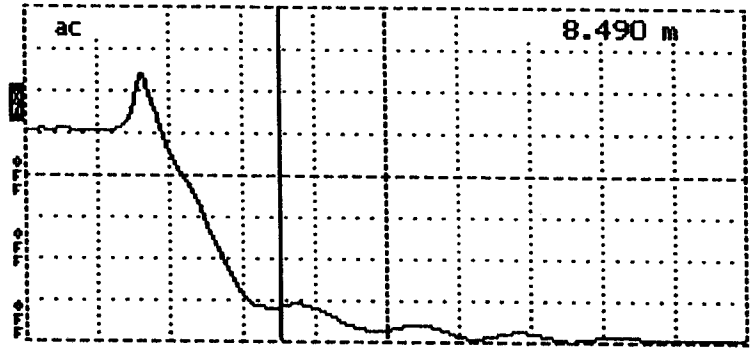
Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 15/NOV/95 (installed 1993)

Data Sheet SMP-C01: TDR Probe Check (Continued)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

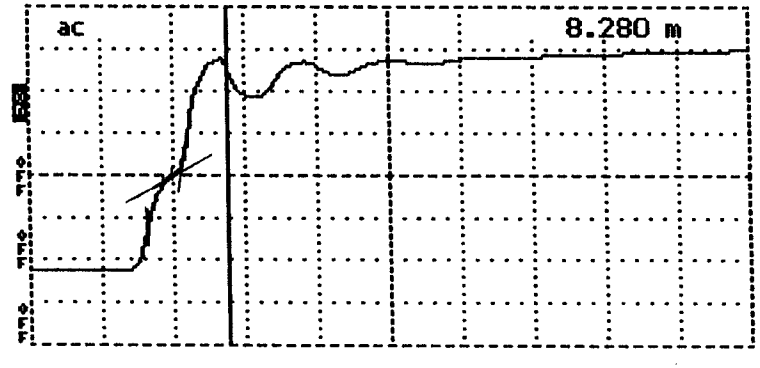
rsor ..... 8.490 m
tance/Div..... .25 m/div
tical Scale.... 177 mρ/div
..... 0.50
se Filter..... 8 avg
er..... ac



Tektronix 1502B TDR
Date 9-2
Cable 1028-4
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

ursor ..... 8.280 m
istance/Div..... .25 m/div
ertical Scale.... 177 mρ/div
..... 0.50
oise Filter..... 8 avg
ower..... ac

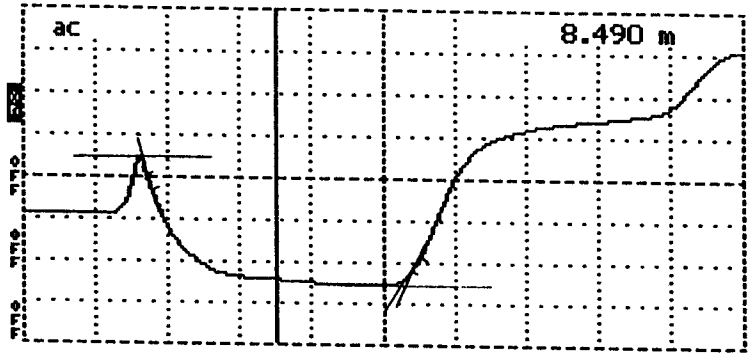


Tektronix 1502B TDR
Date 9-2-93
Cable 1028 1/2 21W1
Notes IN AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.12	1.40

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

rsor ..... 8.490 m
tance/Div..... .25 m/div
rtical Scale.... 177 mρ/div
..... 0.50
se Filter..... 8 avg
rer..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 271028-4 27B04
Notes 1K Hgc
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.91	80.38

[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: 27B04 TDR Probe Length, L: .(1)___ m Length of Coax Cable: (1). m

Comments: (1) see probe #1

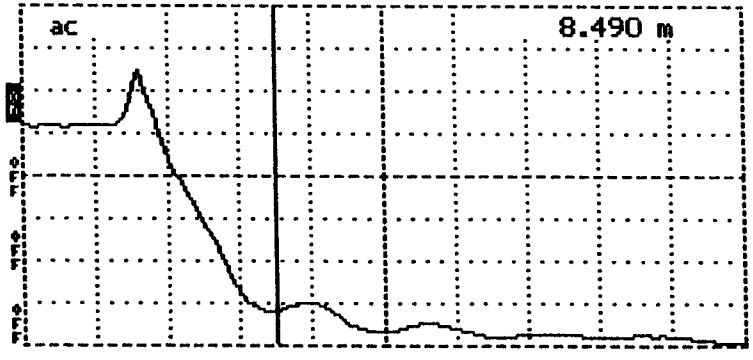
Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 15/NOV/95 (Installed 1993)

Data Sheet SMP-C01: TDR Probe Check (Continued)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

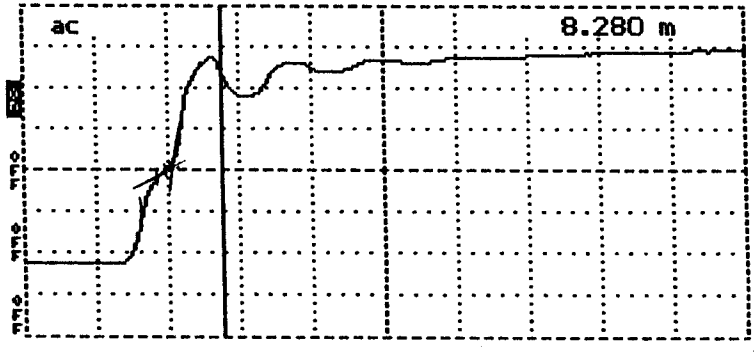
sor ..... 8.490 m
tance/Div..... .25 m/div
tical Scale.... 177 mρ/div
..... 0.50
e Filter..... 8 avg
er..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 27/028 - 5 27B05
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

sor ..... 8.280 m
ance/Div..... .25 m/div
tical Scale.... 177 mρ/div
..... 0.50
e Filter..... 8 avg
er..... ac

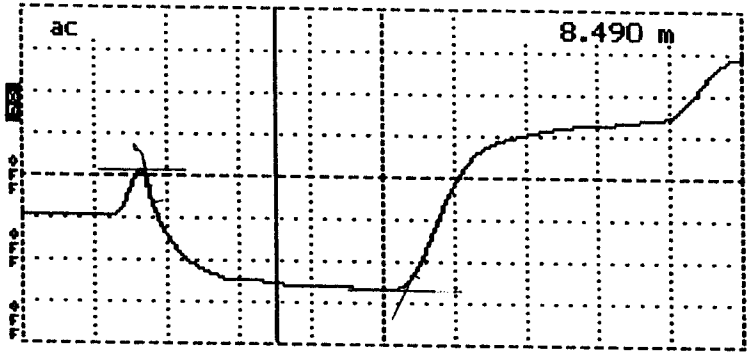


Tektronix 1502B TDR
Date 9-2-93
Cable 27/028 5 27B05
Notes IN AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.11	1.17

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

ursor ..... 8.490 m
stance/Div..... .25 m/div
rtical Scale.... 177 mP/div
' 0.50
ise Filter..... 8 avg
wer..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 21028-5 27B05
Notes
IN H_2O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.90	78.62

[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: 27B05 TDR Probe Length, L: (1) m Length of Coax Cable: (1) m

Comments: (1) see probe #1

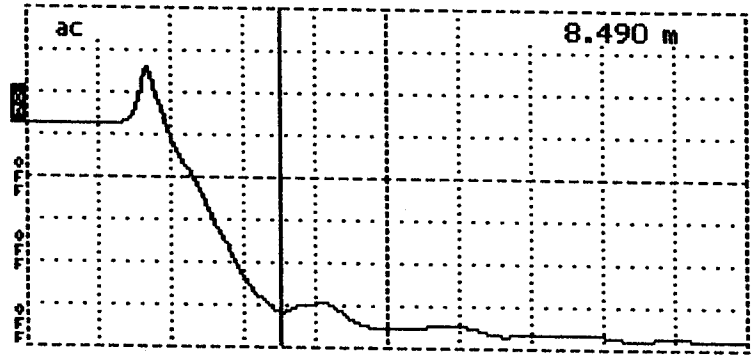
Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 15/NOV/95 (Installed 1993)

Data Sheet SMP-C01: TDR Probe Check (Continued)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

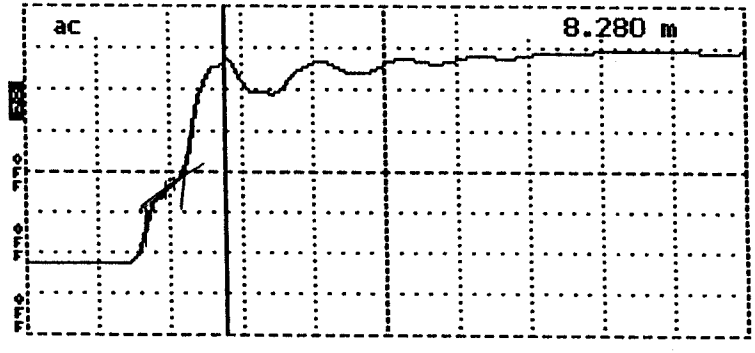
sor ..... 8.490 m
ance/Div..... .25 m/div
tical Scale.... 177 mρ/div
..... 0.50
e Filter..... 8 avg
er..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 21028 - 6 21BOC
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

sor ..... 8.280 m
tance/Div..... .25 m/div
tical Scale.... 177 mρ/div
..... 0.50
se Filter..... 8 avg
rer..... ac

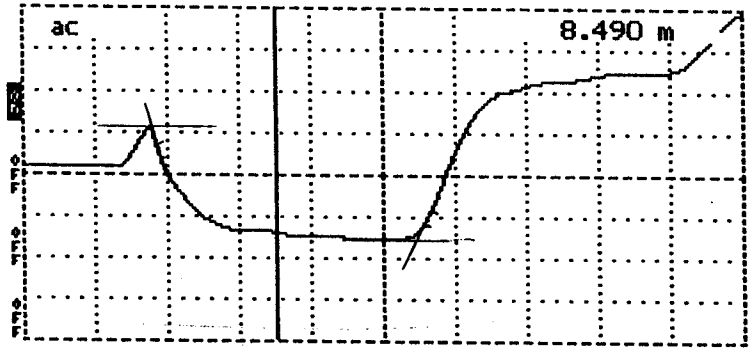


Tektronix 1502B TDR
Date 9-2-93
Cable 21028 - 6 21BOC
Notes IN AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.14	1.90

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

or ..... 8.490 m
ance/Div..... .25 m/div
ical Scale.... 177 mP/div
..... 0.50
e Filter..... 8 avg
er..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 27028-6 27B06
Notes 1N H2O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.92	82.16

[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: 27B06 TDR Probe Length, L: .(1) m Length of Coax Cable: (1). m

Comments: (1) see probe #1

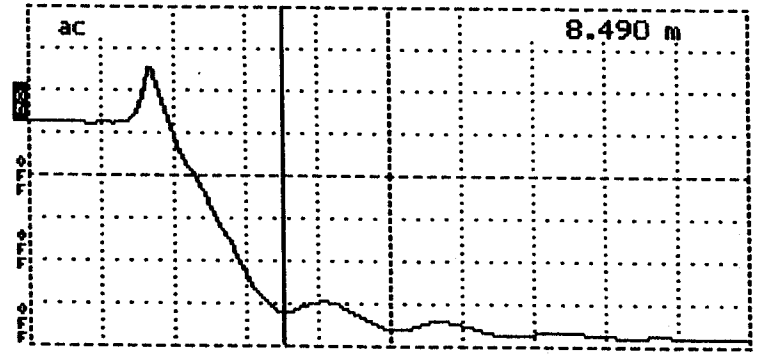
Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 15/NOV/95 (installed 1993)

Data Sheet SMP-C01: TDR Probe Check (Continued)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

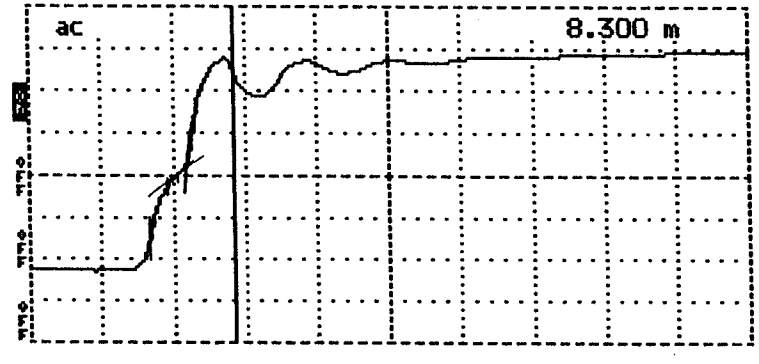
irsor ..... 8.490 m
stance/Div..... .25 m/div
rtical Scale.... 177 mρ/div
..... 0.50
ise Filter..... 8 avg
ver..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 27102B-7 27B07
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

rsor ..... 8.300 m
tance/Div..... .25 m/div
tical Scale.... 177 mρ/div
..... 0.50
se Filter..... 8 avg
ver..... ac

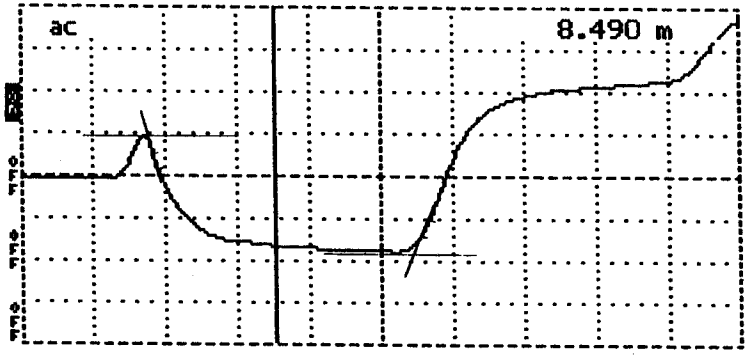


Tektronix 1502B TDR
Date 9-2-93
Cable 27102B-7 27B07
Notes IN AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.13	1.64

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

ursor ..... 8.490 m
istance/Div..... .25 m/div
ertical Scale.... 177 mρ/div
> 0.50
oise Filter..... 8 avg
ower..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 27/028-2 27B07
Notes IN Hyd
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.91	80.38

[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: 27B07 TDR Probe Length, L: .(4) m Length of Coax Cable: (1). m

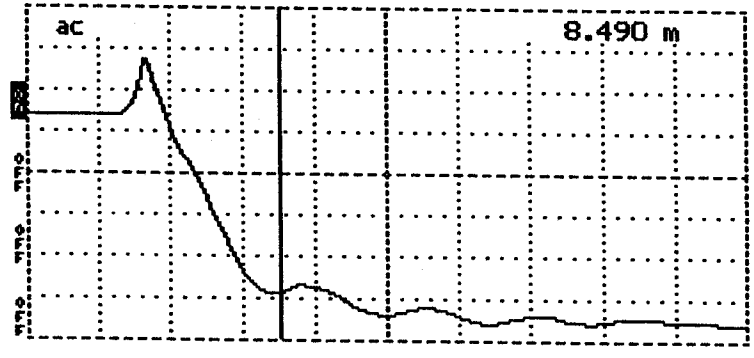
Comments: (1) see probe #1

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 15/NOV/95 (installed 1993)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

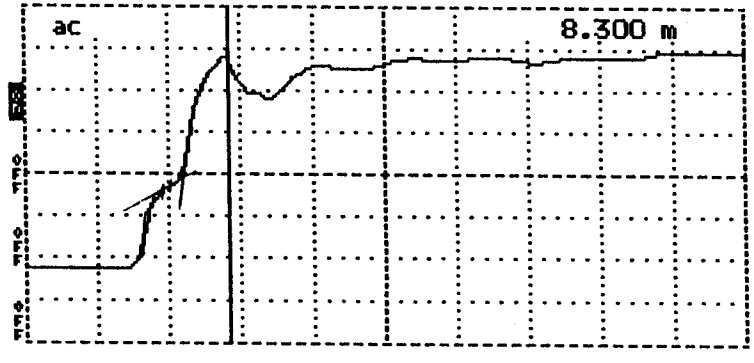
'rsor ..... 8.490 m
·tance/Div..... .25 m/div
'tical Scale.... 177 mρ/div
..... 0.50
se Filter..... 8 avg
'er..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 27028-8 27B08
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

'ursor ..... 8.300 m
istance/Div..... .25 m/div
'rtical Scale.... 177 mρ/div
..... 0.50
ise Filter..... 8 avg
'ver..... ac

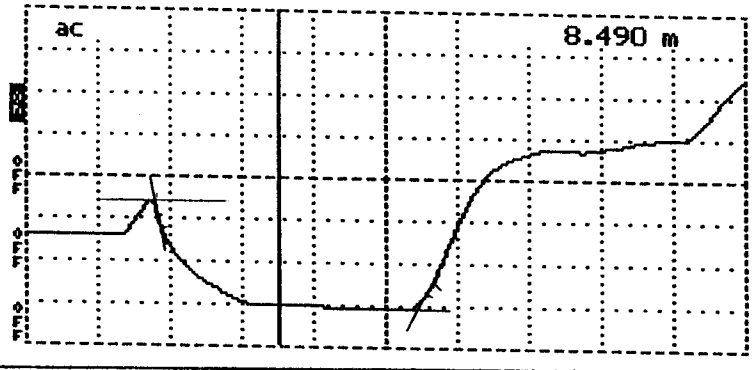


Tektronix 1502B TDR
Date 9-2-93
Cable 27028-8 27B08
Notes IN AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	0.14	1.90

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

rsor ..... 8.490 m
tance/Div..... .25 m/div
tical Scale.... 177 mρ/div
..... 0.50
se Filter..... 8 avg
ver..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 27/028 - 8 27B08
Notes IN H₂O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.90	78.62

[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: 27B08 TDR Probe Length, L: __.(1)__ m Length of Coax Cable: (1).__ m

Comments: (1) see probe #1

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 15/NOV/95 (installed 1993)

Data Sheet SMP-C01: TDR Probe Check (Continued)

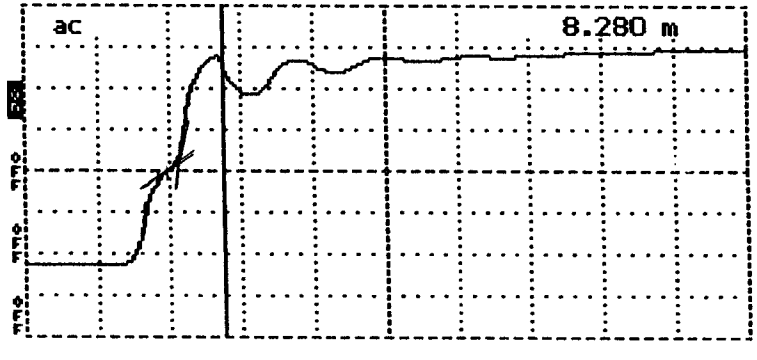
LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

Cursor ..... 8.840 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.50
Noise Filter..... 8 avg
Power..... ac

Tektronix 1502B TDR
Date 9-2-93
Cable 1028 - 9 27BCM
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

rsor ..... 8.280 m
tance/Div..... .25 m/div
rtical Scale.... 177 mρ/div
..... 0.50
se Filter..... 8 avg
ver..... ac

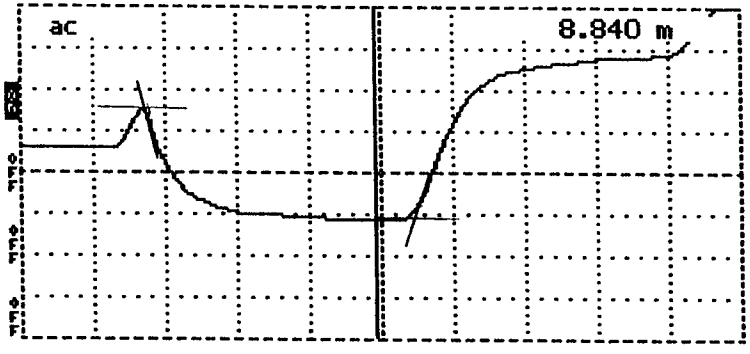


Tektronix 1502B TDR
Date 9-2-93
Cable 1028 - 9 27BCM
Notes IN AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.12	1.40

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

rsor ..... 8.840 m
tance/Div..... .25 m/div
tical Scale.... 177 mρ/div
..... 0.50
se Filter..... 8 avg
ver..... ac



Tektronix 1502B TDR
Date 9-2 '93
Cable 27/028-9 27309
Notes
IN H₂O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.93	83.95

[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: 27809 TDR Probe Length, L: .(1)__ m Length of Coax Cable: (1).__ m

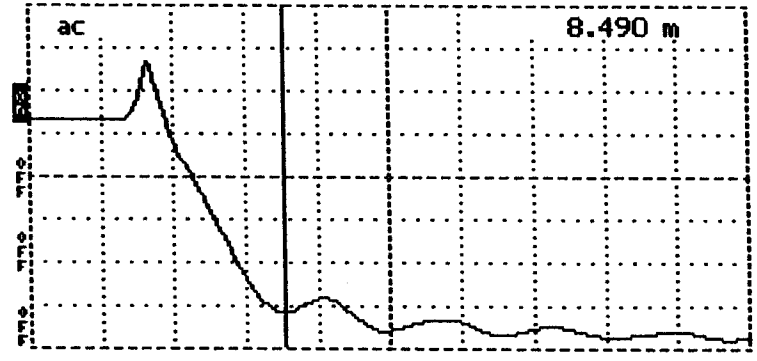
Comments: (1) see probe #1

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 15/NOV/95 (installed 1993)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

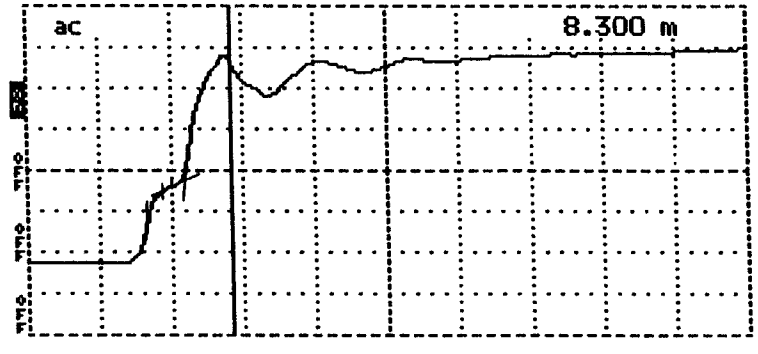
ursor ..... 8.490 m
stance/Div..... .25 m/div
rtical Scale.... 177 mρ/div
' 0.50
ise Filter..... 8 avg
wer..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 2102A-10 27B10
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

rsor ..... 8.300 m
tance/Div..... .25 m/div
tical Scale.... 177 mρ/div
..... 0.50
se Filter..... 8 avg
ver..... ac

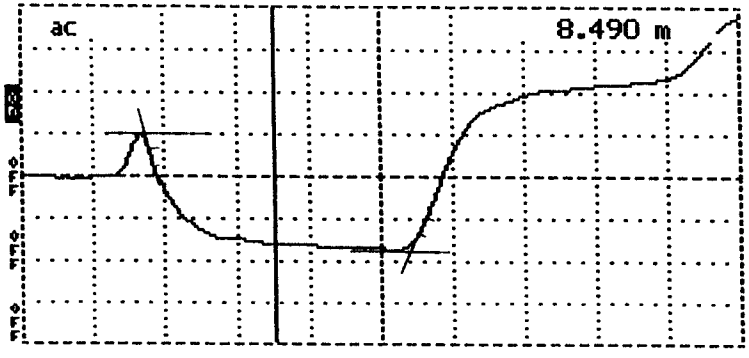


Tektronix 1502B TDR
Date 9-2-93
Cable 2102A-10 27B10
Notes IN AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.13	1.64

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [27] LTPP Section ID [1028]

Cursor ..... 8.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.50
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 9-2-93
Cable 27/028 - 1C27B10
Notes In H2O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	0.91	81.38

[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: 27B10 TDR Probe Length, L: .(1). m Length of Coax Cable: (1). m

Comments: (1) see probe #1

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 15/NOV/95 (installed 1993)

Data Sheet SMP-C01: TDR Probe Check (Continued)

LTPP Seasonal Monitoring Program Data Sheet SMP-C02 Thermistor Probe Check	Agency Code [27] LTPP Section ID [1028]

Thermistor Probe Assigned Serial Number : [27 B T]

Air Temperature Probe Assigned Serial Number: [27 B A T]

Thermistor Number	Distance from Top (m)	Temperature (°C) – Calibration in: Ice-Bath; T = (1) °C	Other Water Bath; T = (1) °C	Comments
1	0.000	2.7	42.1	WSS PROBE
2	0.152	1.9	42.0	
3	0.305	1.6	42.0	
4	0.023	4.2	41.7	
5	0.096	1.1	43.5	
6	0.171	0.8	43.5	
7	0.251	0.6	43.4	
8	0.325	0.4	43.2	
9	0.475	0.5	43.1	
10	0.628	1.2	42.6	
11	0.784	1.4	42.8	
12	0.935	1.9	42.4	
13	1.086	2.0	41.8	
14	1.239	2.8	42.0	
15	1.395	2.8	41.8	
16	1.545	2.6	41.8	
17	1.700	2.2	41.5	
18	1.845	1.4	41.0	
End	(1)	n/a	n/a	
Air Probe	n/a	(1)	(1)	

Comments: (1) NOT MEASURED IN 1993. ALL DATA TRANSFERRED FROM OLD DATA SHEETS. TWO - ICE, TWO - RM. TEMP. AND FOUR ICE-BATH SETS DONE. ONLY TWO ENTERED.

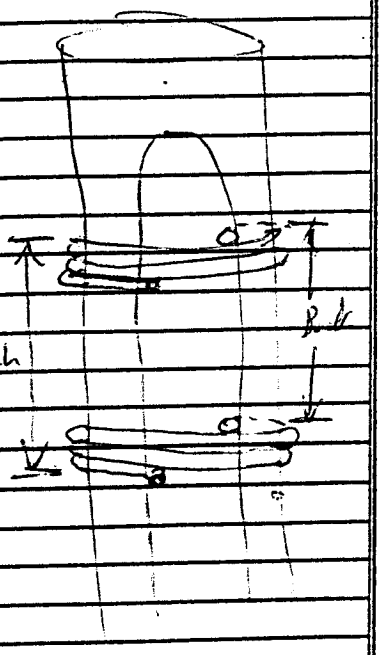
Prepared by: RJV FILE 1993 INFO Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 21/Nov/95

LTPP Seasonal Monitoring Program Data Sheet SMP-C03 Resistivity Probe Check	Agency Code [-7] LTPP Section ID [1 0 2 3]

Electrical Resistivity Serial Number: 2 7 B R

DB37 Connector Pin Number	Electrode Number	Distance from Top (m) Line 1	Line 2	~~Avg~~	Continuity ✓	Spacing (m)	Comments
36	1			0.030			
35	2			0.080	0.802	0.050	* Two lines on probe for "spacing" in 1993
34	3			0.131	0.131	0.051	
33	4			0.183	0.183	0.052	
32	5			0.234	0.234	0.051	
31	6			0.286		0.051	* Guessing "trench" line spacings are too large — outside to outside measurement
30	7			0.337		0.052	
29	8			0.388		0.051	
28	9			0.439		0.051	
27	10			0.489		0.051	
26	11			0.541		0.051	* Adjusted values to obtain #36 @ about 1805 mm.
25	12			0.592		0.052	
24	13			0.644		0.052	
23	14			0.695		0.051	
22	15			0.746		0.051	
21	16			0.796		0.050	
20	17			0.847		0.051	
19	18			0.898		0.051	
18	19			0.948		0.050	
17	20			0.998		0.051	
16	21			1.049		0.051	
15	22			1.100		0.051	
14	23			1.151		0.051	
13	24			1.202		0.051	
12	25			1.251		0.050	
11	26			1.302		0.050	
10	27			1.353		0.051	
9	28			1.403		0.051	
8	29			1.454		0.050	
7	30			1.503		0.050	
6	31			1.556		0.053	
5	32			1.605		0.049	
4	33			1.656		0.051	
3	34			1.706		0.050	
2	35			1.756		0.050	
1	36			1.807	✓	0.051	
	Bottom			*1.830	n/a	n/a	*Estimated — not measured



Comments: Data from 1993 had "spacing" vs. Dist. From Top. - Values adjusted to get #36 @ about 1805 mm

Prepared by: [illegible] Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 20 / Nov / 95 (For 1993 installations)

LTPP Seasonal Monitoring Program Data Sheet SMP-C04 Function Generator, Multimeter, and Switch Box Checks	Agency Code [27] LTPP Section ID [1 6 2 8]

Start Time (military): ____

Test Position	Switch Settings		Voltage (ACV)		Current (ACA)		Measured Resistance R = V/I (ohms)	Known Resistance (ohms)
	I_1 V_1	I_2 V_2	Range Setting	Reading	Range Setting	Reading		
36	36	37					R1 =	R1 =
37	37	38					R2 =	R2 =
38	38	39					R3 =	R3 =
39	39	00					R4 =	R4 =
36	36	37					R1 =	R1 =
37	37	38					R2 =	R2 =
38	38	39					R3 =	R3 =
39	39	00					R4 =	R4 =
36	36	37					R1 =	R1 =
37	37	38					R2 =	R1 =
38	38	39					R3 =	R1 =
39	39	00					R4 =	R2 =

Comments: NOT DONE IN 1993

Prepared by: RJV Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 20/NOV/95 (FOR 1993 INSTALLATIONS)

Data Sheet SMP-C04: Function Generator, Multimeter, and Switch Box Checks

LTPP Seasonal Monitoring Program Data Sheet SMP-C05 Rain Gauge Calibration	Agency Code [27] LTPP Section ID [1028]

General Information:

Manufacturer: TEXAS ELECTRONICS INC

Model Number: TRP-525M

Serial Number: 12071

Note: The screen should be tacked inside the funnel using silicon at three to four points to prevent loss from wind.

Rain Gauge Calibration Data

Trial	Start Time (Military)	End Time (Military)	Volume (ml)	Number of Tips	Adjustment[1] No. of Turns
1	(1)				
2					
3					

[1] Adjust gauge to obtain 100 tips ± 3 for 473 ml of water.

Comments: (1) DATA NOT RECORDED IN 1993 CHECKS. GAUGE WAS CALIBRATED PRIOR TO INSTALLATION

Prepared by: RJV Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 20/NOV/95 (FOR 1993 INSTALLATIONS)

Appendix C-1: Instrumentation Installation Information

Appendix C-1 contains the following installation data sheets and associated field notes, as well as, photographs documenting the installation:

- Data Sheet SMP-I01: List of Installed Instrumentation;
- 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-I05(A): Lab Gravimetric Moisture Contents;
- Data Sheet SMP-I05(B): Gravimetric Moisture Comparison;
- Data Sheet SMP-I06: TDR Moisture Content;
- Data Sheet SMP-I07: Representative Dry Density; and
- Installation Photographs.

27 S B 93A

Seasonal Monitoring Program Guidelines: Version 2.1a/March 1995

LTPP Seasonal Monitoring Program Data Sheet SMP-I01 Instrumentation Installed and Participants	Agency Code [27] LTPP Section ID [1028]

List of Equipment:

Equipment	Quantity	Serial Number(s)
Instrument Hole:		
Thermistor Probe	01	27BT
Resistivity Probe	01	27BR
TDR Sensors	10	27B01 to 27B10
Equipment Cabinet:		
Campbell Scientific CR10 Datalogger	01	16584
Battery Package	01	5652
Weather Station:		
Rain Gauge	01	12071
Air Temperature Probe	01	27BAT
Radiation Shield	01	———
Observation Piezometer/Bench Mark:	01	n/a
D.O.T. BM @	01	n/a

List of Participants:

Name of Participant	Agency/Employer
Robert Van Sambeek	Braun Intertec Corp.
Ron Urbach	" " "
Dana Miller	" " "
Julie VandenBoushie – FWD	" " "
HARLAND VITALIS	MnDOT
EUGENE TORMONEN	MnDOT

Prepared by: RJV Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 20/NOV/95 (For 08-SEP-93 INSTALL)

Data Sheet SMP-I01: List of Installed Instrumentation

2 7 S B 9.3 A

LTPP Seasonal Monitoring Program Data Sheet SMP-I02 Installed Instrument Location	Agency Code [27] LTPP Section ID [1028]

Longitudinal and Transverse Location of Instrumentation:

Instrument	Station (Customary Units)		Offset (m)[1]	
	Planned	Actual	Planned	Actual
Instrumentation Hole	0-15	0-15	0.76	0.76
Observation Piezometer	1+00	1+00	-3.66	-3.66
Equipment Cabinet	0-15	0-15	-7.60	-7.62
Weather Station	0-15	0-15	-7.90	-7.93
DOT BM		0+00		-15.20

[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	0.025	0.025	Not measured.
	Metal Bottom	0.218	0.220	Not measured.
	PVC Top	0.292	0.300	
Resistivity Probe		0.292	0.290	

PIEZ. was 0.430Z meters below the PZ @ Sta. 1+00 on 09-Sep-93.

TDR Number	Depth from Pavement Surface to Probe (m)		Comments
	Planned Location	Actual Location	
1	0.305	0.310	All depths ±0.005M
2	0.460	0.460	
3	0.610	0.610	
4	0.760	0.760	
5	0.915	0.920	
6	1.070	1.085	
7	1.219	1.229	
8	1.370	1.380	
9	1.680	1.650	
10	1.980	1.955	

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: Robert Lee Sowalsky/Terrance Dicks Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 11/Dec/95 (for 08-Sep-93 Install)

27 S B 9 3 A

Seasonal Monitoring Program Guidelines: Version 2.1a/March 1995

LTPP Seasonal Monitoring Program Data Sheet SMP-I03 Log of Piezometer Hole	Agency Code [27] LTPP Section ID [1028]

Operator: H. VITALIS Equipment Used: MOBILE CORE/DRILL

Location: Station: 1+00 Offset: -3.66 m (from lane edge)

Bore Hole Diameter: 150. mm Auger Type: SOLID STEM

Scale (m)	Depth from Surface[1] (m)	Material Description	Material Code[2]
	0.30	SILTY SAND DK BROWN TOPSOIL	214
0.5		SLIGHTLY SILTY SAND BROWN, WITH A TRACE OF GRAVEL	214-202
1.0	1.22		
1.5		CLEAN SAND BROWN	
2.0			
2.5			202
3.0			
3.5			
4.0			
4.5	4.57		
5.0			

[1] Format: __.____ m; [2] Format: ____

Prepared by: RJV From 1993 DATA RECORDED BY RRH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 20/NOV/95 (For 8-SEP-1993 INSTALLATION)

BRAUN
INTERTEC 27102B

9-8-93

PIEZOMETER/BENCHMARK

STARTED OUT WITH 6" SOLID STEM AUGER. BUT HOLE WOULD NOT STAY OPEN. SEVERAL ATTEMPTS WERE DONE TO GET A OPEN HOLE TO INSTALL THE PIEZOMETER/BENCHMARK.

A 5 GALLON PAIL OF SOIL WAS TAKEN FROM THE 1.5 TO 5 FOOT DEPTHS. THIS SAMPLE MAY BE USED FOR LABORATORY TESTING AT A LATER DATE.

THE SAND CAVED IN AT A DEPTH OF ABOUT 10 FOOT DEPTH

THE PIEZOMETER/BENCHMARK WAS 14 FEET 2 INCHES LONG.

THE DRILL RIG WAS USED TO PUSH THE PIEZOMETER/BENCHMARK. THE BOTTOM WAS PUSHED TO A DEPTH OF ABOUT 14 FEET 9 INCHES.

A SMALL AMOUNT OF FILTER SAND WAS PLACED. TO A DEPTH OF ABOUT 9 FEET BELOW EXISTING SURFACE. EXISTING SOIL CAVED IN AROUND THE PIEZOMETER. THE CAVE IN SOILS WERE SURFACE COMPACTED. BEFORE ADDING THE SAMPLE AMOUNT OF FILTER SAND.

BENTONITE PELLETS WERE PLACED FROM ABOUT THE 9 FOOT DEPTH UP TO THE DEPTH OF 7 FEET 3 INCHES.

BRAUN
INTERTEC 271028

9-8-93

FROM THE TOP OF THE BENTONITE LAYER AT THE 7 FOOT 3 INCH DEPTH, TO ABOUT 2 FEET BELOW EXISTING GRADE. SOIL REMOVED WITH THE AUGER WAS USED AS BACKFILL. THE SOILS WERE COMPACTED WITH A FLOOR FLANGE ON A PIPE.

THE PROTECTIVE STEEL SLEEVE WAS PLACED SO THE TOP WAS ABOUT 4 INCHES BELOW EXISTING GRADE. THE THE STEEL SLEEVE WAS ABOUT 2 FEET LONG. LUGS WERE WELDED ON THE OUT SIDE OF THE SLEEVE TO HELP ANCHOR THE SLEEVE IN CONCRETE BACKFILL. THE CONCRETE WAS PLACED TO ABOUT 3 INCHES FROM THE TOP OF THE SLEEVE.

FILTER SAND WAS PLACED TO FILL THE VOID BETWEEN THE INSIDE OF THE SLEEVE AND THE PIEZOMETER PIPE. SAND WAS PLACED TO ABOUT 2 INCHES FROM THE TOP OF THE PIPE.

A 1¼" PVC CAP WAS SET ON TOP OF THE 1 INCH PIPE OF THE PIEZOMETER.

27 5 B 9 3 A

Seasonal Monitoring Program Guidelines: Version 2.1a/March 1995

LTPP Seasonal Monitoring Program Data Sheet SMP-I04 Log of Instrumentation Hole	Agency Code [27] LTPP Section ID [1 0 2 8]

Operator: H. VITALIS Equipment Used: MOBILE CORE/DRILL

Location: Station: 0-15 Offset: +0.76 m (from lane edge)

Bore Hole Diameter: 290. mm

Scale (m)	Strata Change[1] (m)	Material Description	Material Code[2]
0.10 0.20	0.240	AC	700
0.30 0.40	0.420	SILTY SAND	214
0.50 0.60	0.760	SAND BROWN	202
0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 1.50 1.60 1.70 1.80 1.90	1.98	SAND WITH GRAVEL - BROWN	202
2.00 2.10 2.20 2.30 2.40 2.50			

[1] Format: _._____ m; [2] Format: ___

Prepared by: RJV FROM 1993 DATA BY RRN (OLD DATA SHEET ON FILE) Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 20/NOV/95 For 8-Sep-93 Installation

Data Sheet SMP-I04: Log of Instrumentation Hole

LTPP Seasonal Monitoring Program Data Sheet SMP-I05 Field Gravimetric Moisture Content	Agency Code [27] LTPP Section ID [1028]

TDR Probe	Probe Depth[1] (m)	Moisture Sample No.	Pan No.	Wt. of Pan (gms) = A	Wt. of Pan + Wet Soil (gms) = B	Wt. of Pan + Dry Soil (gms) = C	Wt. of Dry Soil (gms) = D = C - A	Wt. of Water (gms) = E = B - C	Moisture Content (%) = w = E/D * 100
1	0.310		4	224.2	686.0	662.7	438.5	23.3	5.3
2	0.460		3	224.3	758.6	735.2	510.9	23.4	4.6
3	0.610		1	224.2	673.3	654.5	430.3	18.8	4.4
4	0.760		4	224.2	791.1	770.2	546.0	20.9	3.8
5	0.920		1	224.2	863.4	842.0	617.8	21.4	3.5
6	1.035		3	224.3	935.6	911.3	687.0	24.3	3.5
7	1.220		1	224.2	601.3	591.9	367.7	9.4	2.6
8	1.380		3	224.3	732.6	710.2	485.9	22.4	4.6
9	1.650		1	224.2	911.6	896.4	672.2	15.2	2.3
10	1.960		3	224.3	661.1	647.7	423.4	13.4	3.2

[1] Distance in meters from pavement surface to TDR probe

Comments: _____

Prepared by: RJV (From 08-Sep-93 Data) Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 20/Nov/95 (For 08-Sep-93 installation)

LTPP Seasonal Monitoring Program Data Sheet SMP-I05 (A) LAB ~~Field~~ Gravimetric Moisture Content	Agency Code [27] LTPP Section ID [1028]

TDR Probe	Probe Depth[1] (m)	Moisture Sample No.	Pan No.	Wt. of Pan (gms) = A	Wt. of Pan + Wet Soil (gms) = B	Wt. of Pan + Dry Soil (gms) = C	Wt. of Dry Soil (gms) = D = C - A	Wt. of Water (gms) = E = B - C	Moisture Content (%) = w = E/D * 100
1	0.310								5.0
2	0.460								4.8
3	0.610								4.6
4	0.760								3.6
5	0.920								3.7
6	1.035								3.0
7	1.220								2.8
8	1.380								2.6
9	1.650								2.9
10	1.960								3.1

[1] Distance in meters from pavement surface to TDR probe

Comments: MN DOT MATLS AND RESEARCH MOISTURE DATA

Prepared by: RTV (FROM MN DOT DATA) Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 20/NOV/95 (FOR 08-SEP-93 INSTALL)

LTPP Seasonal Monitoring Program Data Sheet SMP-I05 (B) Gravimetric Moisture Comparison	Agency Code [27] LTPP Section ID [1028]

TDR	SMP-I02 TDR Depth (m)	SMP-I04 Material Code	Lab Data Dry Density 5+62 (pcf)	TDR Installation Data		Gravimetric Moistures		Comments
				SMP-I06 La (m)	Calculated Gravimetric (percent)	SMP-I05 Field (percent)	SMP-I05A Lab (percent)	
1	0.310	214	125.9	0.54	6.5	5.3	5.0	
2	0.455	202	125.9	0.54	6.5	4.6	4.8	
3	0.610	202	125.9	0.51	5.7	4.4	4.6	
4	0.760	202	125.9	0.50	5.4	3.8	3.6	
5	0.920	202	125.9	0.52	5.9	3.5	3.7	
6	1.085	202	125.9	0.49	5.1	3.5	3.0	
7	1.220	202	125.9	0.46	4.3	2.6	2.8	
8	1.380	202	125.9	0.48	4.8	(4.6)	(2.6)	I05A AND I05 DIFFER.
9	1.650	202	125.9	0.47	4.5	2.3	2.9	
10	1.955	202	125.9	*±0.34	*—	3.2	3.1	Missing first inflection point

TDR Gravimetric moistures calculated using equations on pages II-2 and II-5 of FHWA-RD-94-110 with La = 0.203 m, and Vp = 0.99.

Comments: * unknown portion of data (≈0.34), Dry Density from Form 504 with test location at 5+62. → Subgrade 125.9 pcf.

Prepared by: _____ Employer: Braun Intertec Corporation Date (dd/mmm/yy): __/___/__

$$\omega = \left(-330.72 + 4526.78\,La^2 - 2103.88\,La^4 + 402.25\,La^6\right)/\gamma_d$$; La (meters), γ_d (pcf), ω (%)

2 7 SB 93 A

LTPP Seasonal Monitoring Program Data Sheet SMP-I06 TDR Moisture Content	Agency Code [27] LTPP Section ID [1028]

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	0.310	(1)	0.54	7.22	
2	0.460	"	0.54	7.22	
3	0.610	"	0.51	6.44	
4	0.760	"	0.50	6.19	
5	0.920	"	0.52	6.69	
6	1.035	"	0.49	5.94	
7	1.220	"	0.46	5.24	
8	1.380	"	0.48	5.70	
9	1.650	"	0.47	5.47	
10	1.960	"	*.+0.34	*.+2.86	*BAD TRACE.

[1] Distance in meters from pavement surface to TDR probe ($L_a \geq 0.34$)
[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.

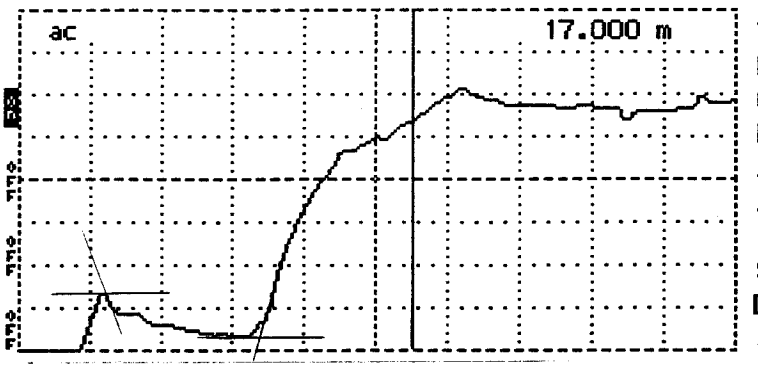
Comments: (1) NOT RECORDED IN 1993.
(*) FIRST INFLECTION POINT NOT ON PRINTED TRACE.

Prepared by: RSV FROM DATA COLLECTED ON 07-SEPT-1993 Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (FOR 07-SEP-1993 INSTALL)

07 - SEP - 1993 DBNX92700 BG TDR TRACES - INSTALL 271028 (1/5)

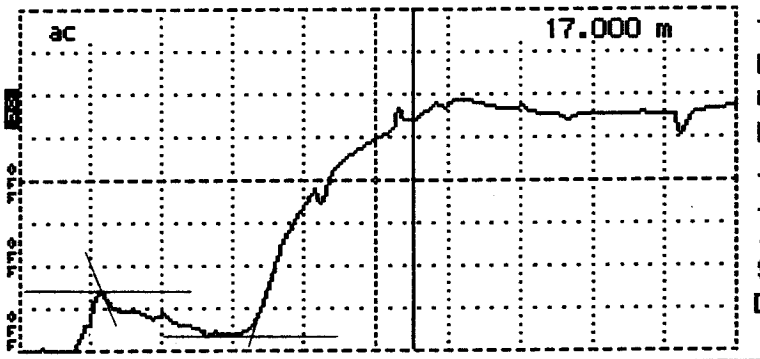
. 17.000 m
. .25 m/div
. 103 mΩ/div
. 0.99
. 8 avs
..... ac



Tektronix 1502
Date 9-7-93
Cable 271028 (27B01)
Notes _____
INSTALL
Dry Sand
Input Trace _____
Stored Trace _____
Difference Trace _____

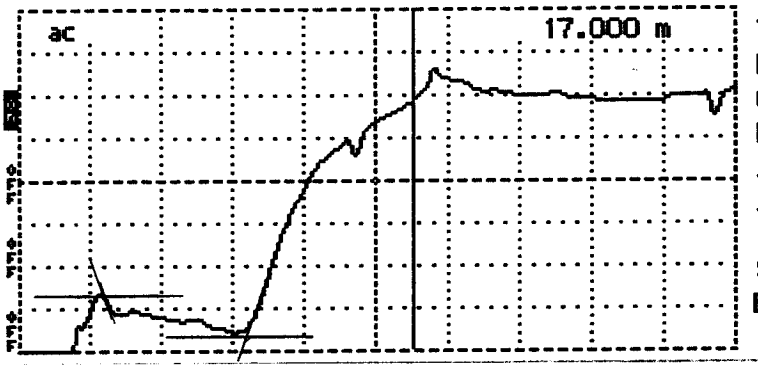
22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

..... 17.000 m
..... .25 m/div
..... 103 mΩ/div
..... 0.99
..... 8 avs
..... ac



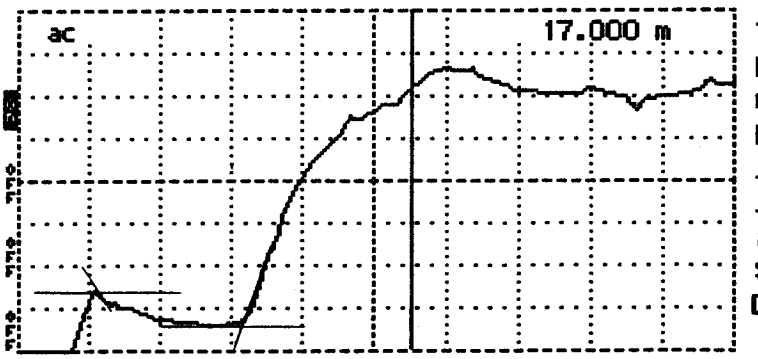
Tektronix 1502B TDR
Date 9-7-93
Cable 271028-2 (27B02)
Notes _____
INSTALL
Dry Sand
Input Trace _____
Stored Trace _____
Difference Trace _____

..... 17.000 m
..... .25 m/div
..... 103 mΩ/div
..... 0.99
..... 8 avs
..... ac



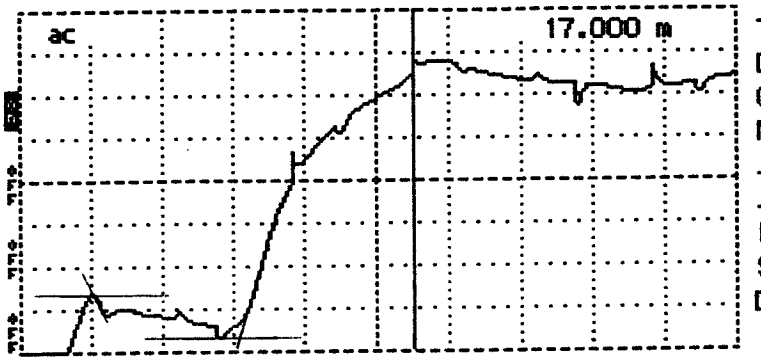
Tektronix 1502B TDR
Date 9-7-93
Cable 271028-3
Notes (27B03)
INSTALL
Dry Sand
Input Trace _____
Stored Trace _____
Difference Trace _____

..... 17.000 m
..... .25 m/div
..... 103 mΩ/div
..... 0.99
..... 8 avs
..... ac



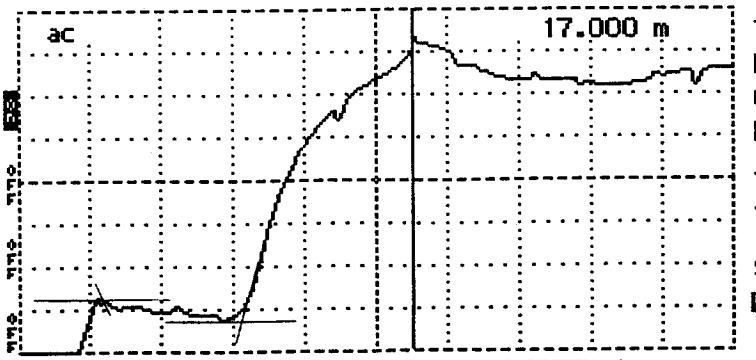
Tektronix 1502 TDR
Date 9-7-93
Cable 271028-4
Notes (27B04)
INSTALL
Dry Sand
Input Trace _____
Stored Trace _____
Difference Trace _____

..... 17.000 m
/Div..... .25 m/div
Scale.... 103 mΩ/div
..... 0.99
..... 8 avs
..... ac



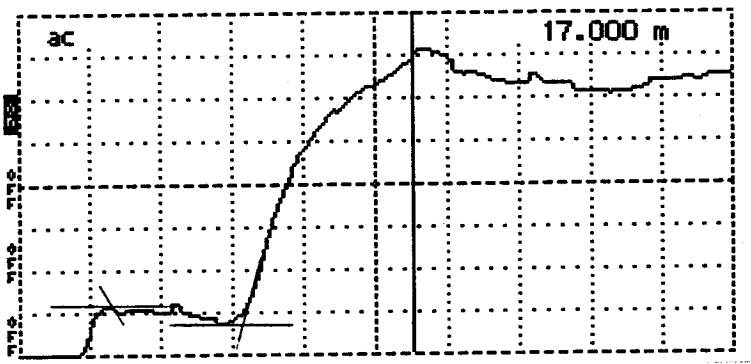
Tektronix 1502 TDR
Date 9-7-93
Cable 271028-5
Notes (27B05)
INSTALL
Dry Sand
Input Trace _____
Stored Trace _____
Difference Trace _____

07-SEP-1993 DBNXQ2700 BG TDR TRACES - INSTALL (21)
271---



..... 17.000 m
Div..... .25 m/div
Scale.... 103 mρ/div
..... 0.99
er..... 8 avg
..... ac

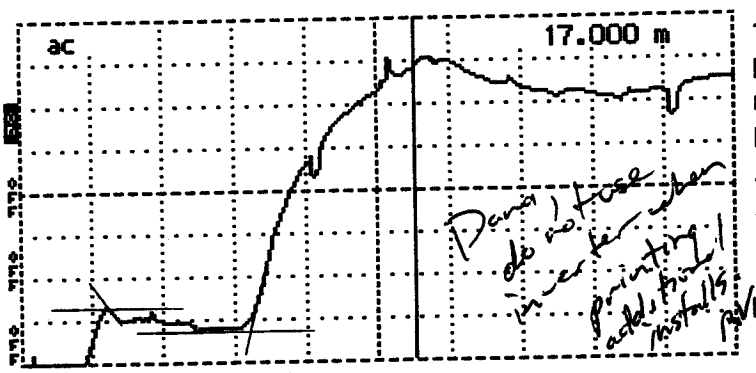
Tektronix 1502B TDR
Date 9-7-93
Cable 271028-6
Notes 27B06
INSTALL
Dry Sand
Input Trace
Stored Trace
Difference Trace



..... 17.000 m
Div..... .25 m/div
Scale.... 103 mρ/div
..... 0.99
er..... 8 avg
..... ac

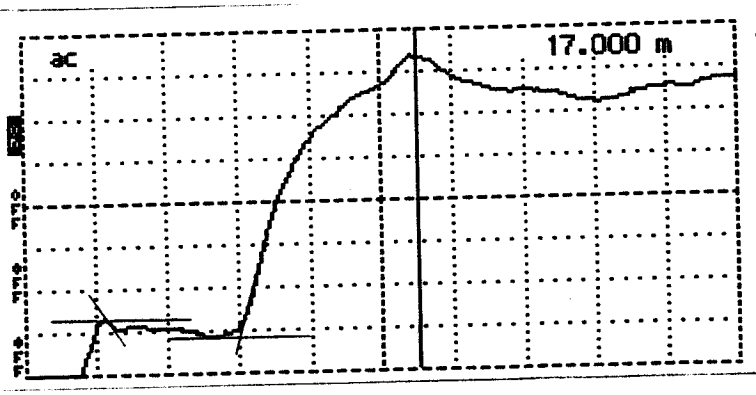
Tektronix 1502B TDR
Date 9-7-93
Cable 271028-7
Notes 27B07
INSTALL
Dry Sand
Input Trace
Stored Trace
Difference Trace

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD



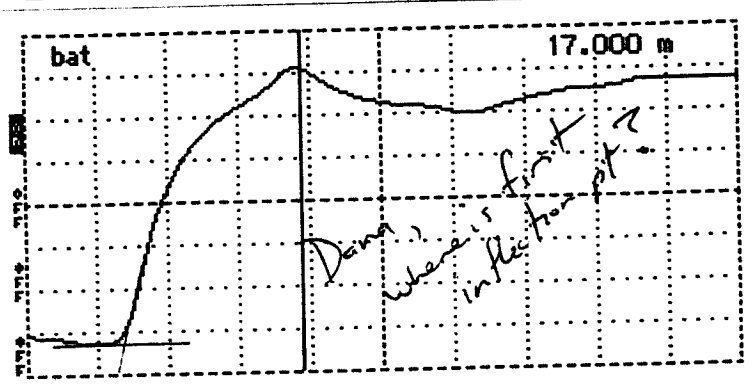
..... 17.000 m
Div..... .25 m/div
Scale.... 103 mρ/div
..... 0.99
ter..... 8 avg
..... ac

Tektronix 1502B TDR
Date 9-7-93
Cable 271028-8
Notes 27B08
INSTALL
Dry Sand
Input Trace
Stored Trace
Difference Trace



..... 17.000 m
Div..... .25 m/div
Scale.... 103 mρ/div
..... 0.99
er..... 8 avg
..... ac

Tektronix 1502B TDR
Date 9-7-93
Cable 271028-9
Notes (27B09)
INSTALL
Dry Sand
Input Trace
Stored Trace
Difference Trace



..... 17.000 m
Div..... .25 m/div
Scale.... 103 mρ/div
..... 0.99
..... 8 avg
..... bat

Tektronix 1502B TDR
Date 9-7-93
Cable 271028-10
Notes (27B10)
INSTALL
Dry Sand
Input Trace
Stored Trace
Difference Trac

27 5873 A

LTPP Seasonal Monitoring Program Data Sheet SMP-I07 Representative Dry Density	Agency Code [27] LTPP Section ID [1028]

Depth of Representative Sample (from pavement surface): __ . __ __ m

Dry Density Determination:

a. Tare Weight of Empty Mold: _____ g (__ . __ __ lb)

b. Weight of Mold and Compacted Soil: _____ g (__ . __ __ lb)

c. Weight of Compacted Sample (b - a): _____ g (__ . __ __ lb)

d. Unit Weight of Compacted Soil = [(b - a) / 943.0] = __ . __ __ g/cm^3

([(b - a) * 30] = ____ . __ lb/ft^3)

e. Dry Density of Compacted Soil = [d / (100 - r)] = __ . __ __ g/cm^3

(____ . __ lb/ft^3)

Moisture Content Determination:

m. Tare Weight of Pan: ____ . __ g

n. Weight of Pan and Moisture Sample: ____ . __ g

o. Weight of Pan and Dry Sample: ____ . __ g

p. Weight of Moisture (n - o): ____ . __ g

q. Weight of Dry Sample (o - m): ____ . __ g

r. Moisture Content by Weight = [(p / (p + q) * 100] = ___ . __ %

Comments: NOT DONE IN 1993

Prepared by: RJV Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 20 / NOV / 95 (FOR 1993 INSTALLATION)

BRAUN℠

INTERTEC 271028

9-8-93

TIPPING BUCKET RAIN GAGE/ AIR TEMPERATURE PROBE

TO GET A HOLE TO PUT IN THE BOTTOM SECTION OF THE 2 INCH PIPE. THE 11½ INCH AUGER WAS USED.

THE LOWER SECTION OF 2" PIPE WAS 10 FEET 4 INCHES LONG. IT HAD A 5½ INCH FLOOR FLANGE ON THE BOTTOM.

THE BOTTOM WAS PLACED AT ABOUT 9.5 FEET BELOW EXISTING GROUND.

DRY PACK SAKRETE WAS PLACED AROUND THE PIPE TO A DEPTH OF ABOUT 4 FEET OF EXISTING GROUND SURFACE. A TOTAL THICKNESS OF 5.5 FEET. IT WAS COMPACTED AS IT WAS PLACED.

SOILS REMOVED DURING DRILLING WERE USED AS BACK FILL ABOVE THE DRY PACK. THIS SOIL WAS ALSO COMPACTED WHEN IT WAS PLACED.

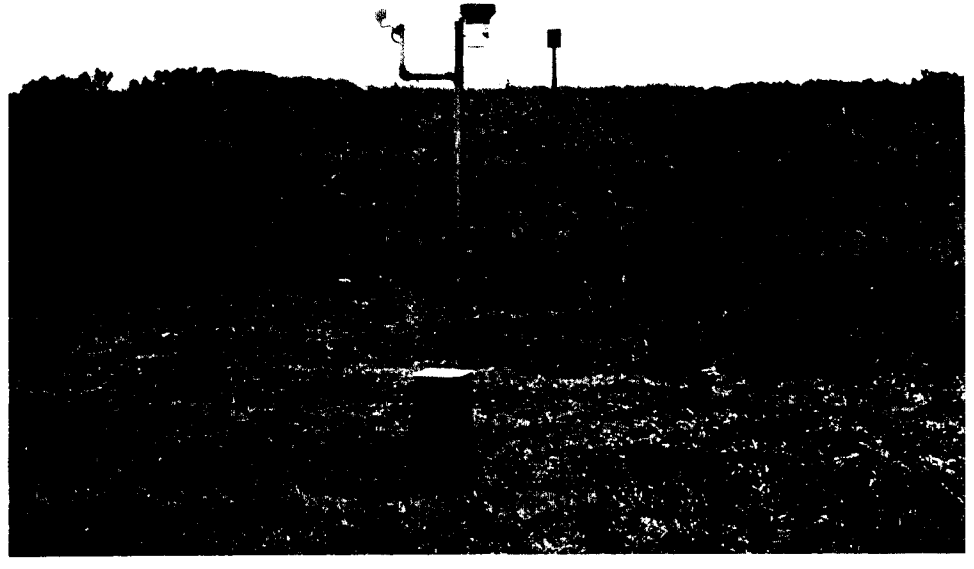
THE POLE WAS PLACED WITHIN 6 INCHES OF THE EQUIPMENT CABINET.

27SB93 - 271028

SEASONAL INSTALLATION

SEPT. 08, 1993

271028

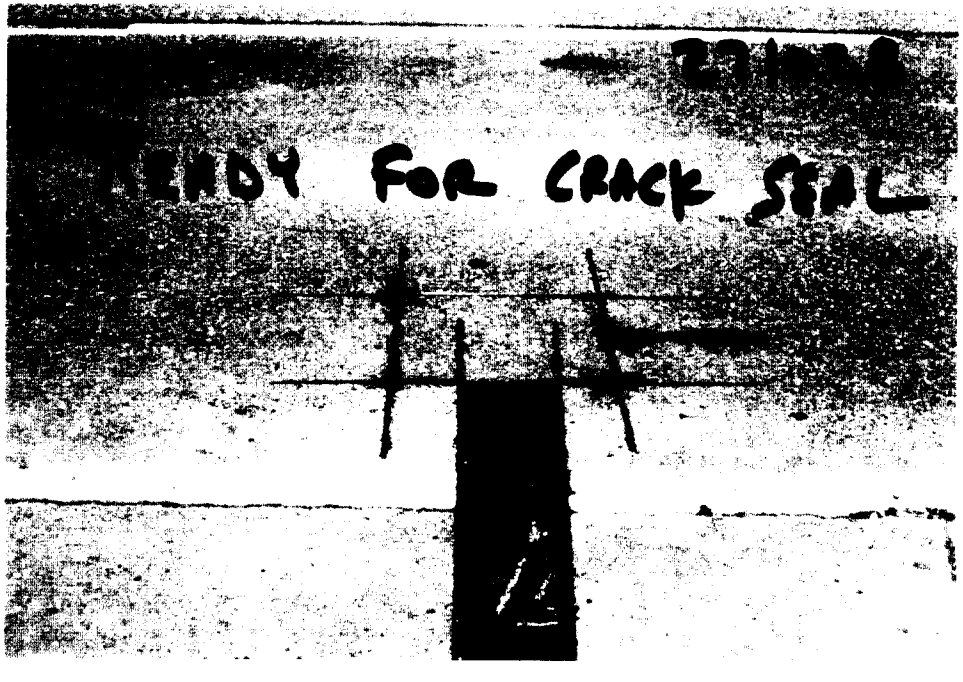


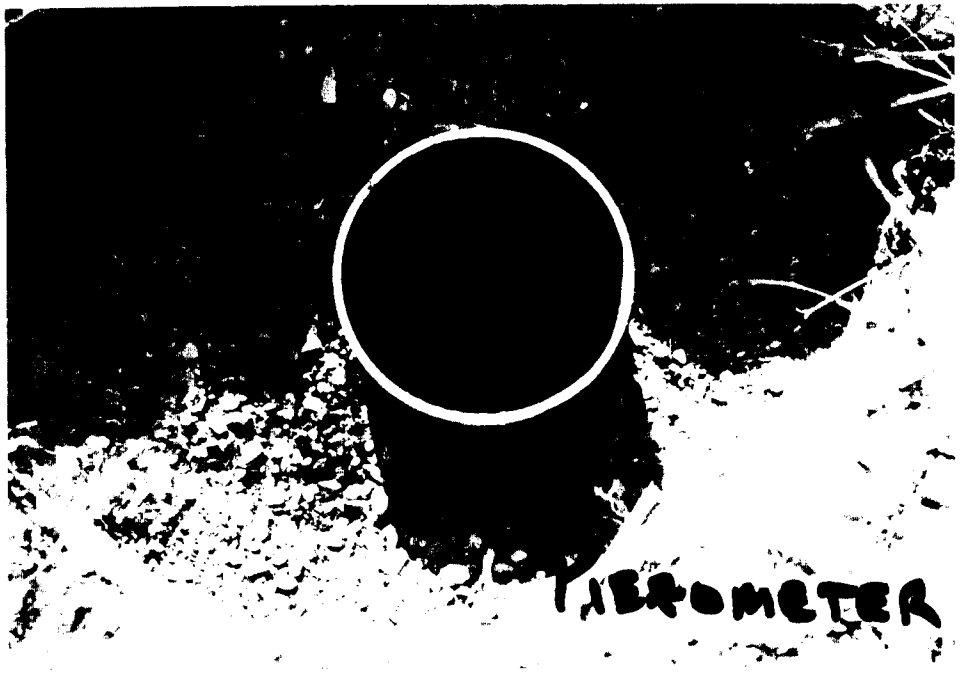
OVERVIEW 271028

271028


KEIWELD
1000
EPOXY


TRENCH
REPAIR


FOR CRACK SEAL


TER

271028

WEATHER POLE HOLE

271028

271028

Appendix D-1: Initial SMP Monitoring Data Collection

Appendix D-1 contains the following data sheets with information collected the day after instrumentation installation:

- Data Sheet SMP-D03: Contact Resistance Measurements;
- Data Sheet SMP-D04: Four-Point Resistivity Measurements;
- Data Sheet SMP-D05: Ground Water Table Measurements; and
- Data Sheet SMP-D08: Surface Elevation Measurements - AC Pavements.

DATA COLLECTED TWO MONTHS AFTER INSTALLATION 275893D

Seasonal Monitoring Program Guidelines: Version 1.1/June 1993

LTPP Seasonal Monitoring Study Data Sheet D03 Contact Resistance Measurements	* State Code [27] * Test Section Number [1028]

1. Date (Month - Day - Year) [11-18-93] NOV
2. Time Measurements Began (Military) [10:25] ← Assumed Time
3. Comments SIG. GEN. ON ALK. BAT.'S, USING FHWA LED BOX

Test Position	Connections I_1 V_1	Connections I_2 V_2	Voltage (ACV) Range Setting	Voltage (ACV) Reading	Current (ACA) Range Setting	Current (ACA) Reading	Notes	RESISTANCE
1	1	2	V	10.00	μA	908.		11,000
2	3	2		10.11		817		12,400
3	3	4		10.37		592		17,500
4	5	4		10.41		559		18,600
5	5	6		10.28		668		15,400
6	7	6		10.29		662		15,500
7	7	8		10.24		708		14,500
8	9	8		10.17		760		13,400
9	9	10		10.37		588		17,600
10	11	10		10.42		539		19,300
11	11	12		10.37		589		17,600
12	13	12		10.34		616		16,800
13	13	14		10.39		569		18,300
14	15	14		10.51		451		23,300
15	15	16		10.56		403		26,200
16	17	16		10.53		430		24,500
17	17	18		10.52		440		23,900
18	19	18		10.50		455		23,100
19	19	20		10.44		508		20,600
20	21	20		10.43		522		20,000
21	21	22		10.39		555		18,700
22	23	22		10.27		655		15,700
23	23	24		0		0	#24 OUT	~~∞~~
24	25	24		10.38		553	TEST.	18,800
25	25	26		10.43		509	POSITION	20,500
26	27	26		10.49		454		23,100
27	27	28		10.46		476		22,000
28	29	28		10.46		472		22,200
29	29	30		10.49		451		23,300
30	31	30		10.48		455		23,000
31	31	32		10.54		390		27,000
32	33	32		10.60		328		32,300
33	33	34		10.55		379		27,800
34	35	34		10.54		380		27,700
35	35	36		10.59		332		31,900
36	37	38						
37	38	39						
38	39	40						

NO FROST

Preparer RJV Employer BROWN INTERNATIONAL

Figure III-5 - Contact Resistant Measurements - Data Sheet R1

DATA COLLECTED TWO MONTHS AFTER INSTALLATION

27SB93D

LTPP Seasonal Monitoring Study Data Sheet ~~R2~~ D04 Four-Point Resistivity Measurements	* State Code [27] * Test Section Number [1028]

1. Date (Month - Day - Year) [11-18-93]
2. Time Measurements Began (Military) NOV [10:08] to 10:20
3. Comments SIG. GEN. ON ALK. BAT.'S, USING FHWA BOX

Test Position	Connections				Voltage (ACV)		Current (ACA)		Notes
	I_1	V_1	V_2	I_2	Range Setting	Reading	Range Setting	Reading	
1	1	2	3	4	V	0.369	μA	609.	
2	2	3	4	5	"	0.410	"	726	
3	3	4	5	6	"	0.533	"	666	
4	4	5	6	7	"	0.323	"	537	
5	5	6	7	8	"	0.479	"	669	
6	6	7	8	9	"	0.418	"	673	
7	7	8	9	10	"	0.341	"	533	
8	8	9	10	11	"	0.534	"	631	
9	9	10	11	12	"	0.507	"	618	
10	10	11	12	13	"	0.546	"	523	
11	11	12	13	14	"	0.509	"	513	
12	12	13	14	15	"	0.501	"	449	
13	13	14	15	16	"	0.577	"	463	
14	14	15	16	17	"	0.637	"	446	
15	15	16	17	18	"	0.523	"	389	
16	16	17	18	19	"	0.595	"	412	
17	17	18	19	20	"	0.678	"	447	
18	18	19	20	21	"	0.552	"	438	
19	19	20	21	22	"	0.647	"	494	
20	20	21	22	23	"	0.720	"	554	
21	21	22	23	24	"	0	"	0	#24 OUT
22	22	23	24	25	"	0.726	—	540	
23	23	24	25	26	"	0.641	"	509	
24	24	25	26	27	"	0.601	"	453	
25	25	26	27	28	"	0.675	"	493	
26	26	27	28	29	"	0.620	"	415	
27	27	28	29	30	"	0.614	"	422	
28	28	29	30	31	"	0.682	"	437	
29	29	30	31	32	"	0.546	"	362	
30	30	31	32	33	"	0.547	"	348	
31	31	32	33	34	"	0.672	"	427	
32	32	33	34	35	"	0.511	"	306	
33	33	34	35	36	"	0.536	"	310	

NO FROST ?

TEST POSITION 21

Preparer RJV Employer Braun Intertec

Figure III-6 - Four-Point Resistivity Measurements - Data Sheet R2

27 S B 9 3 B

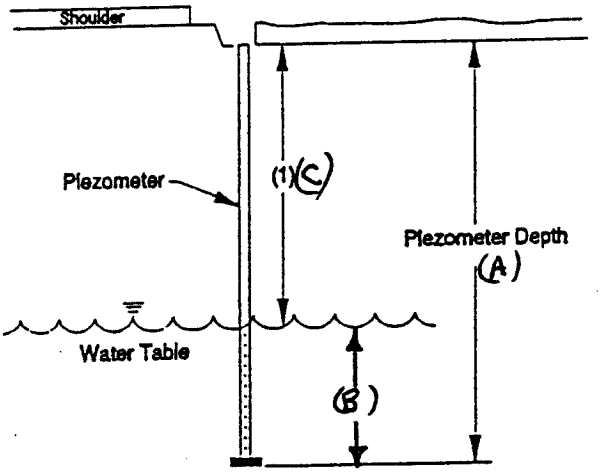
LTPP Seasonal Monitoring Program Data Sheet SMP-D05 Ground Water Table Measurement	Agency Code [27] LTPP Section ID [1028]

Piezometer Depth (m): (A) 4.310

Measurement Number	Time (military)	(C) Calculated (A−B) Depth to Water[1,2] (m)	(B) Measure Depth of Water (cm)	Comments
1	1000	DRY	____	PIPE IS DRY
2	_____	____	____	

[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.



Comments: DAY AFTER INSTALLATION

Prepared by: RJV Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 09/SEP/93

Entered 9/9

27SB93 B

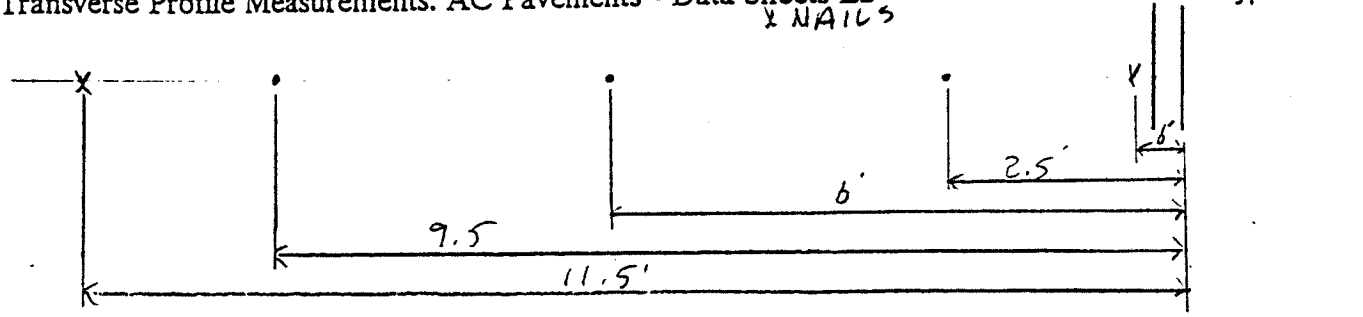
Estimate Time — 1000

LTPP Seasonal Monitoring Study Form ~~B~~ D08 Transverse Profile Measurements-AC			State Code (__) GPS Section No. 271028 Test Section Number (___) Sheet 1 of 1			
STA	BS	HI	IFS	TFS	ELEV	REMARKS
~~MNDOT BENCH~~	1.7144	~~11.7144~~	1.7144		~~10.0000~~	BM (MNDOT)
PIEZO	1.7726		~~1.7726~~		~~9.9418~~	LTPPPIZ
			~~1.7144~~		~~10.0000~~	CHECK BACK TO BM
TYPE OF INSTRUMENT						
STA	EOP	OWP	MID	IWP	CL	REMARKS
0+30 ELEV	1.3598 ~~10.3546~~	1.3548 ~~10.3596~~	1.3290 ~~10.3854~~	1.3258 ~~10.3886~~	1.3014 ~~10.4130~~	
0+15 ELEV	1.3632 10.3512	~~1.3525~~ 10.3619	1.3280 10.3864	1.3218 10.3926	1.2964 10.4180	FIRST HOLE DOWN SIM 1.3524 ul 1.3526
0+10 ELEV	1.3572 10.3572	1.3504 10.3640	1.3259 10.3885	1.3196 10.3948	1.2939 10.4205	
0+00 ELEV	1.3536 10.3608	1.3463 10.3686	1.3227 10.3917	1.3160 10.3984	1.2916 10.4228	
0+25 ELEV	1.3415 10.3729	1.3386 10.3758	1.3142 10.4002	1.3079 10.4065	1.2804 10.4340	
0+50 ELEV	1.3347 10.3797	1.3296 10.3848	1.3055 10.4089	1.2981 10.4163	1.2731 10.4413	
0+75 ELEV	1.3358 10.3786	1.3307 10.3837	1.3058 10.4086	~~1.2986~~ 10.4158	1.2726 10.4418	
1+00 ELEV	1.3424 10.3720	1.3371 10.3773	1.3131 10.4013	1.3054 10.4090	1.2807 10.4337	

Prepared by: RRL/DM Employer: Braun Intertec Date: 9-8-93

Sep

Transverse Profile Measurements: AC Pavements - Data Sheets E2



Entered: 9/4/93

27SB93B

LTPP Seasonal Monitoring Study Form E2 Transverse Profile Measurements-AC			State Code (__) GPS Section No. 271028 Test Section Number (___) Sheet 2 of 2			
STA	BS	HI	IFS	TFS	ELEV	REMARKS
		11.7144				
TYPE OF INSTRUMENT						
STA	EOP	OWP	MID	IWP	CL	REMARKS
1+25	1.3499	1.3455	1.3206	1.3194	1.2878	
ELEV	10.3145	10.3189	10.3438	10.4000	10.4246	
1+50	1.3668	1.3633	1.3386	1.3326	1.3069	
ELEV	10.3476	10.3511	10.3758	10.3818	10.4075	
1+75	1.3891	1.3845	1.3609	1.3548	1.3298	
ELEV	10.3253	10.3299	10.3535	10.3576	10.3856	
2+00	1.4236	1.4203	1.3927	1.3868	1.3606	
ELEV	10.2908	10.2941	10.3210	10.3276	10.3538	
+						
ELEV						
+						
ELEV						
+						
ELEV						
+						
ELEV						

Prepared by: RRU / DM Employer: _____ Date: 9-8-93 Sep

Appendix D-2: Routine SMP Monitoring Data Collection Summary

Appendix D-2 contains the following information:

- Standard LTPP SMP data tracking log;
- Field testing information sheet; and
- Screen prints documenting equipment problems.

27SB- 271028, US-10 EB LANES, 13 MILES EAST OF DETROIT LAKES, MN (MP 58.3)

Date dd/mmm/yy (ctrl+shft+d)	Visit ID	ONSITE Data			MOBILE Data		Manual Data								FWD Data				Distress		Profile		Comments
		Pvmt. Temp.	Air Temp.	Rain	TDR	Frost Volts	Backup Temp	Backup TDR	Frost 2-Pt.	Frost 4-Pt.	Water Table	Pvmt. Elev.	Joint Open.	Joint Fault	Man. Temp.	No. of Cycles/Visit OWP	ML	PE	M	P	P	D	
01-Nov-92																					X		
01-Jun-93																				X			
27-Jul-93																			X				
08-Sep-93	93A														X	1	1						INSTALLATION, MANUAL TDR DATA.
09-Sep-93	93B	X	X	X	X	X						X			X	4	4						NO RESISTIVITY SWITCH BOX.
20-Oct-93	93C	X	X	X	X	X					X				X	1	1						NO RESISTIVITY SWITCH BOX.
18-Nov-93	93D	X	X	X	X	X			X	X	X	X			X	3	3						ADDED RELAY TO ONSITE, TWO FILES FOR THE DAY.
20-Nov-93																					X		
08-Dec-93	93E	X	X	X	X	X					X	X			X	2	2						BAD RESISTIVITY SWITCH BOX.
12-Jan-94	94A	X	X	X	X	X					X				X	3	3						BAD RESISTIVITY SWITCH BOX.
09-Feb-94	94B	X	X	X	X	X			X	X	X					0	0						
17-Feb-94																					X		
09-Mar-94	94C	X	X	X	X	X			X	X	X	X			X	2	2		X				MANUAL READING ON TDR#1, ODD TRACE.
23-Mar-94	94D	X	X	X	X	X			X	X	X	X			X	3	3						BAD RESISTIVITY DATA.
05-Apr-94	94E	X	X	X	X	X			X	X	X				X	3	3						
20-Apr-94																					X		
26-Apr-94	94F	X	X	X	X	X			X	X	X				X	1	1						
10-May-94	94G	X	X	X	X	X			X	X	X	X			X	4	4						
14-Jun-94	94H	X	X	X	X	X			X	X	X				X	4	4						
12-Jul-94	94I	X	X	X	X	X			X	X	X				X	4	4						
28-Jul-94																					X		
09-Aug-94	94J	X	X	X	X	X			X	X	X	X			X	4	4		X				NO "MOBILE.DAT" FILE FOUND, DOWNLOADED PROGRAM AGAIN?
19-Sep-94	94K	X	X	X	X	X					X					0	0						PROBLEMS WITH DATALOGGER, CHECK FILE CONTENTS.
29-Sep-94																					X		
11-Oct-94	94L	X	X	X	X	X			X	X	X				X	2	2						
08-Nov-94	94M	X	X	X	X	X			X	X	X	X			X	3	3						
06-Dec-94	94N	X	X	X	X	X			X	X	X				X	3	3						
10-Jan-95	95A	X	X	X	X	X			X	X	X				X	3	3						

SMP DATA COL TION SUMMARY

27SB- 271028, US-10 EB LANES, 13 MILES EAST OF DETROIT LAKES, MN (MP 58.3)

Date		ONSITE Data			MOBILE Data		Manual Data								FWD Data				Distress		Profile		Comments
dd/mmm/yy (ctrl+shft+d)	Visit ID	Pvmt. Temp.	Air Temp.	Rain	TDR	Frost Volts	Backup Temp	Backup TDR	Frost 2-Pt.	Frost 4-Pt.	Water Table	Pvmt. Elev.	Joint Open.	Joint Fault	Man. Temp.	No. of Cycles/Visit OWP	ML	PE	M	P	P	D	
20-Jan-95																					X		PROFILE DATA NOT RECIEVED BY RCO.
07-Feb-95	95B	X	X	X	X	X			X	X						0	0						WEATHER REDUCED TESTING, CAP FROZE ON PIEZOMETER.
08-Mar-95	95C	X	X	X	X	X			X	X	X					0	0						
21-Mar-95	95D	X	X	X	X	X			X	X	X	X			X	3	3		X				REPLACED METAL COVER ON PIEZOMETER.
04-Apr-95	95E	X	X	X	X	X			X	X	X					0	0						
18-Apr-95	95F	X	X	X	X	X			X	X	X				X	2	2						
09-May-95	95G	X	X	X	X	X			X	X	X					0	0						WEATHER REDUCED TESTING. #9 PIN ON RESISTIVITY CABLE REPAIRED.
15-May-95	95H	X	X	X	X	X			X	X	X	X			X	2	2						
14-Jun-95	95I	X	X	X	X	X			X	X	X	X			X	2	3						
01-Aug-95																			X				

271028 - 27SB

Updated 31-Oct-95

LOCATION - US-10 EB Lanes, 13 Miles East of Detroit Lakes, MN (MP 58.3)
CONTACTS - Joe Stegmaier (218) 847-1500, Dennis Redding (218) 847-1575
TEMP HOLES - Sta 0-04, Depths are about 1.0", 5.2", and 8.2" (AC thickness= 8.5")

DISTRESS COMMENTS:

Sta F1 - Tests at Sta 0-15, and at 25 foot intervals from Sta 0+00 to Sta 2+00.

-15 LP ADJACENT TO INSTRUMENTATION HOLE AND L-TRANS.CR. BEHIND LP
125 M-TRANS.CR. 2' BEHIND LP AND M-TRANS.CR. 8" IN FRONT OF D7
175 M-TRANS.CR. 1' IN FRONT OF D7
200 M-TRANS.CR. 1' BEHIND LP

Sta F3 - Tests at Sta 0-30, 0-20, 0-10, and at 25 foot intervals from Sta 0+00 to Sta 2+00.

-30 L-LONG.CR. DEVELOPING IN THE OWP BEHIND THE LP
-20 D7 ON INSTRUMENTATION HOLE AND L-TRANS.CR. EXTENDS FROM SAW BETWEEN D6 AND D7
-10 M-TRANS.CR. UNDER D7
125 M-TRANS.CR. 2' BEHIND LP AND 10" IN FRONT OF D7
200 M-TRANS.CR. 1' BEHIND LP

PIEZOMETER - Sta 1+00, 2.0 feet from edge of paved shoulder, Depth = 4.310M

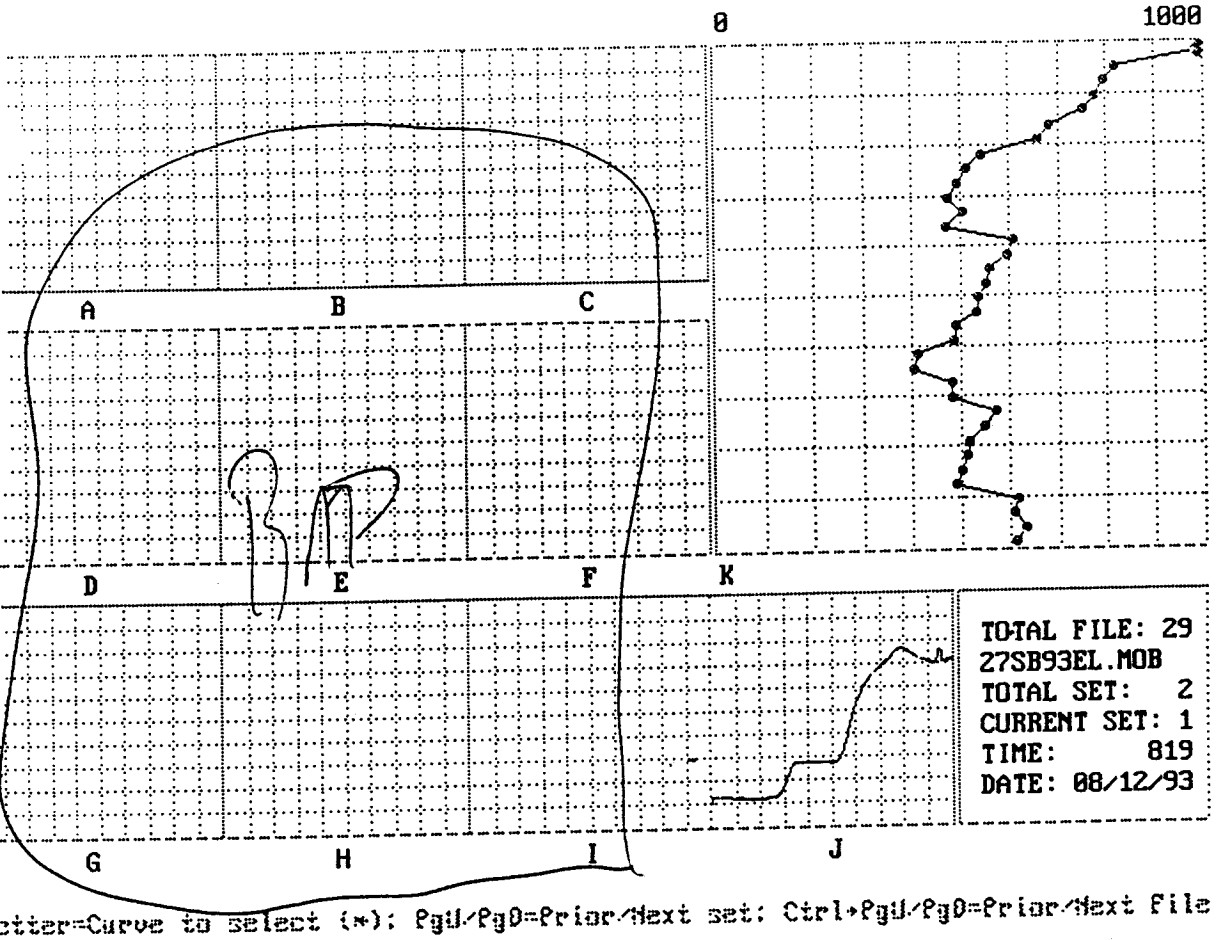
ELEVATIONS - Mn/DOT BM at Sta 0+00, 40 feet from edge of paved shoulder

Offsets:	PE	OWP	ML	IWP	ILE
(M)	0.16	0.76	1.83	2.90	3.51
(ft)	0.5	2.5	6.0	9.5	11.5
	(nail)	(hole)	(hole)	(hole)	(hole)

Sta: Transverse profiles at Sta 0-30, 0-15, 0-10, and every 25 feet from Sta 0+00 to Sta 2+00 (None at Sta 0-20).

COMMENTS - No nails at ILE. In 1996, may want to install nails at -0.5 and 12.5 feet according to current guide lines.


271023
11/8/94



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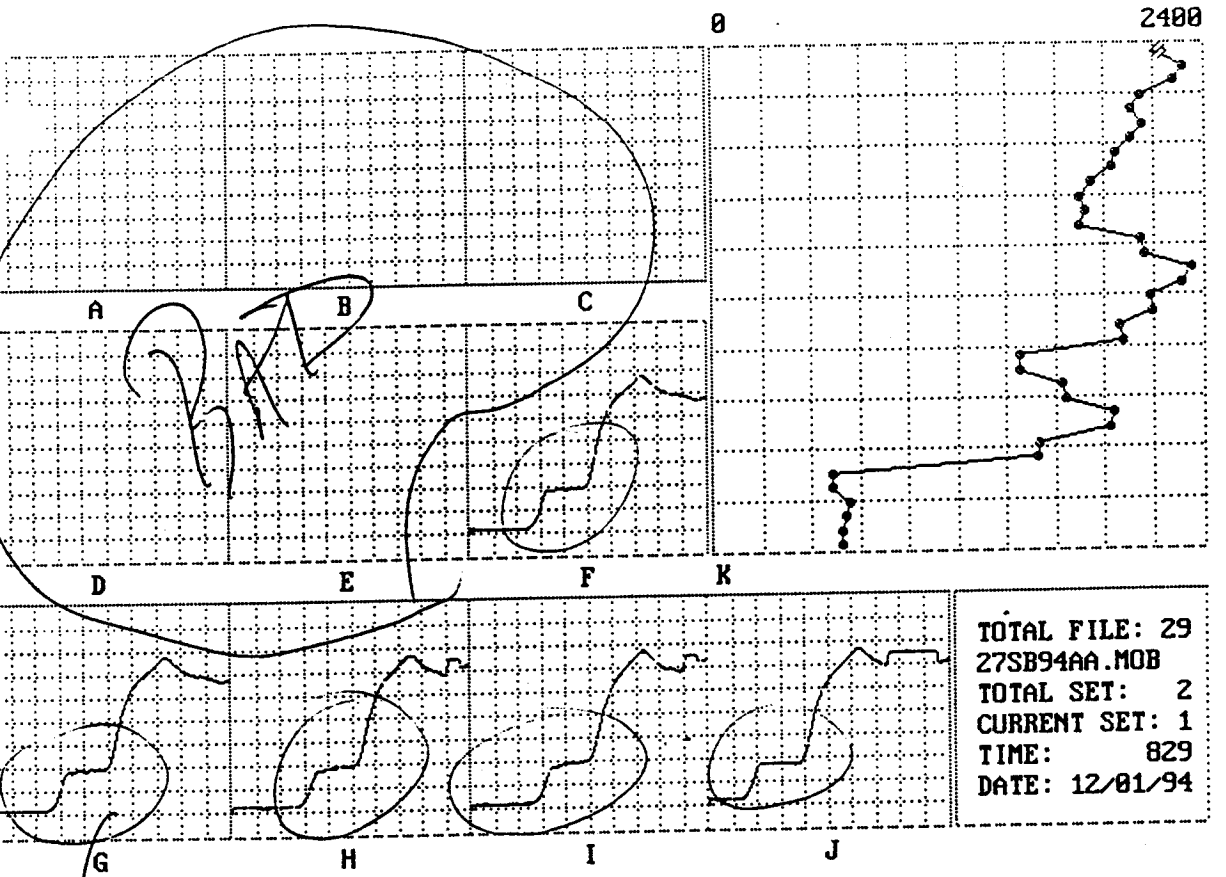
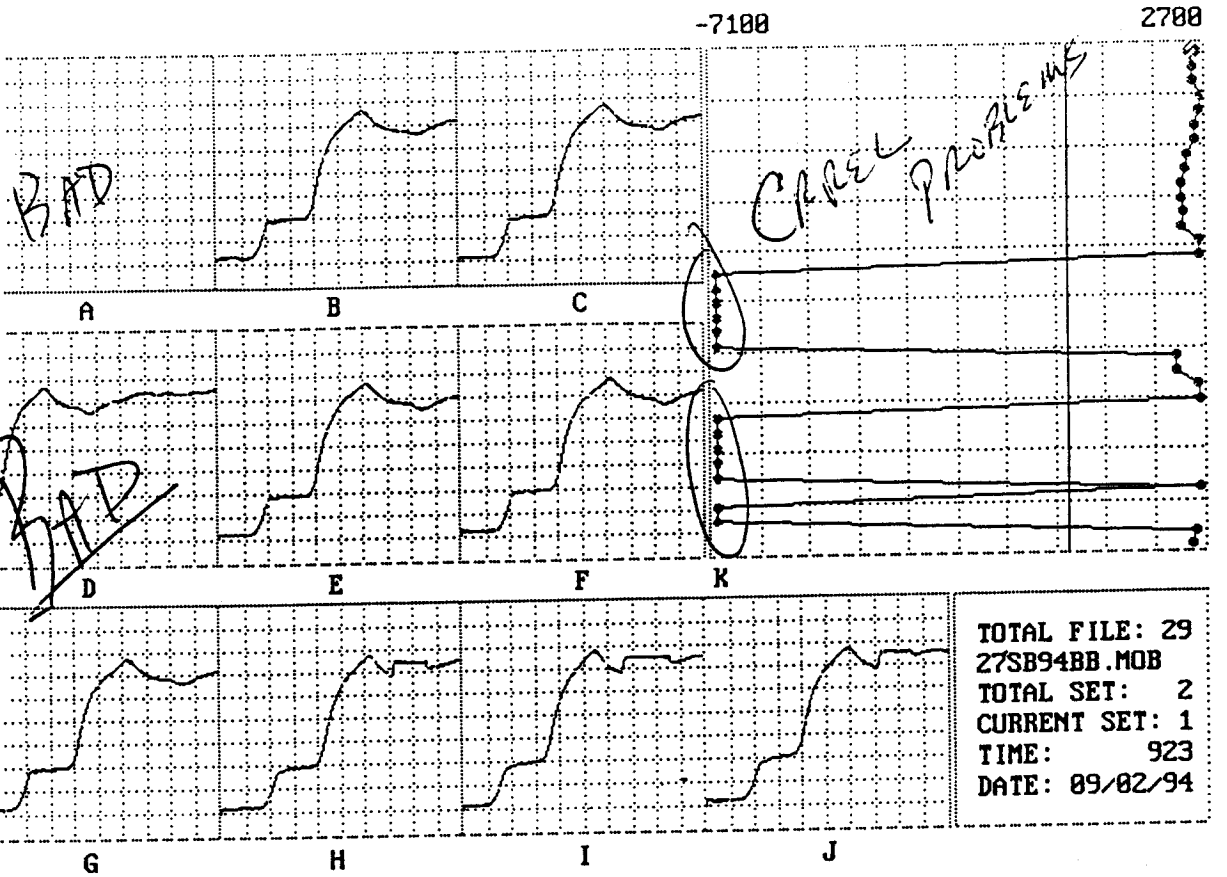
TDR 1 to 9 BAD



NO SECOND INFLECTION PER TYPICAL TRACE

—NO CHANGE FROM (+) to (−) SLOPE.

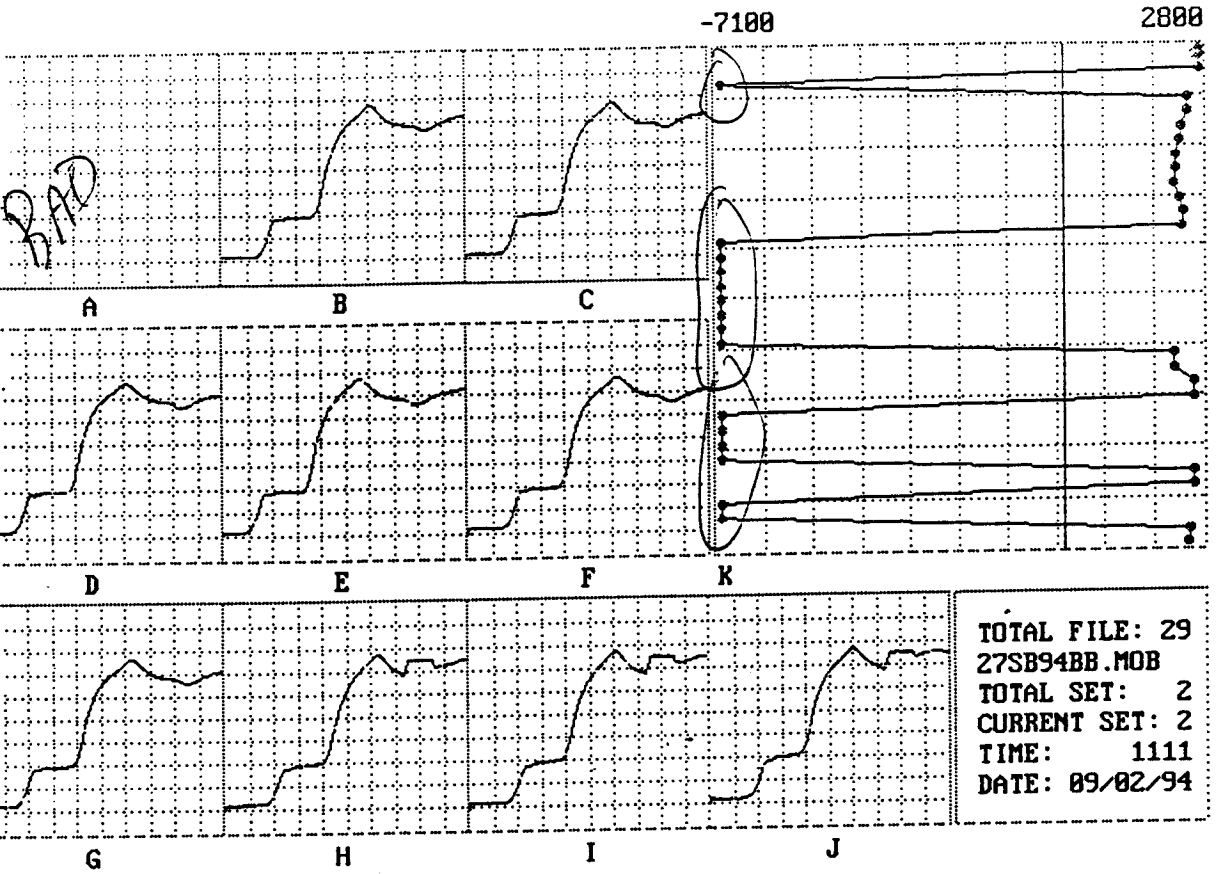


ASSIGN -6999 to +3000

- FIRST PART END OF PROBE (1994)

TDR #4 NO 1st INFLECTION

< PROBE IS GOOD ON 2nd DATA SET



ASSIGN -6999 to +3000

FROST PAST END OF PROBE

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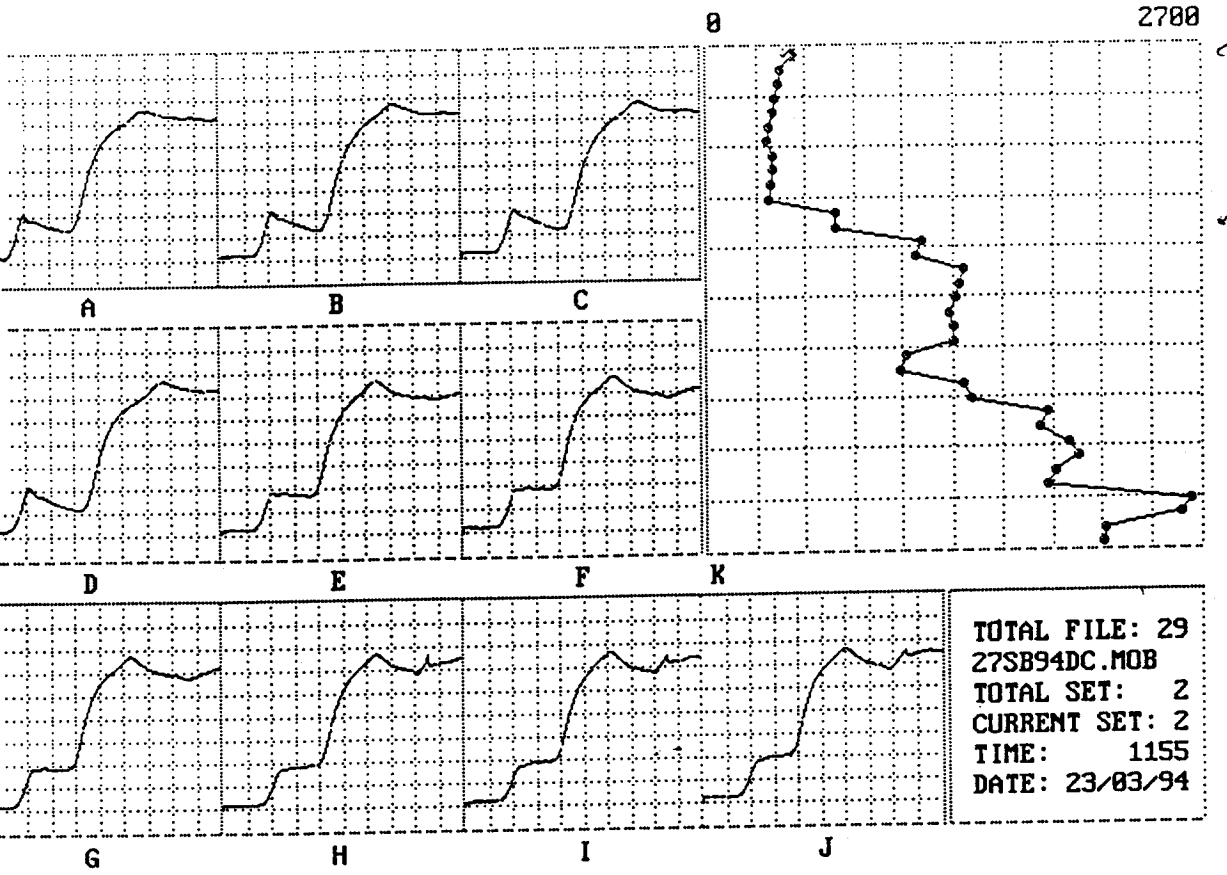
PROBE #4 OKAY ON SECOND DATA SET



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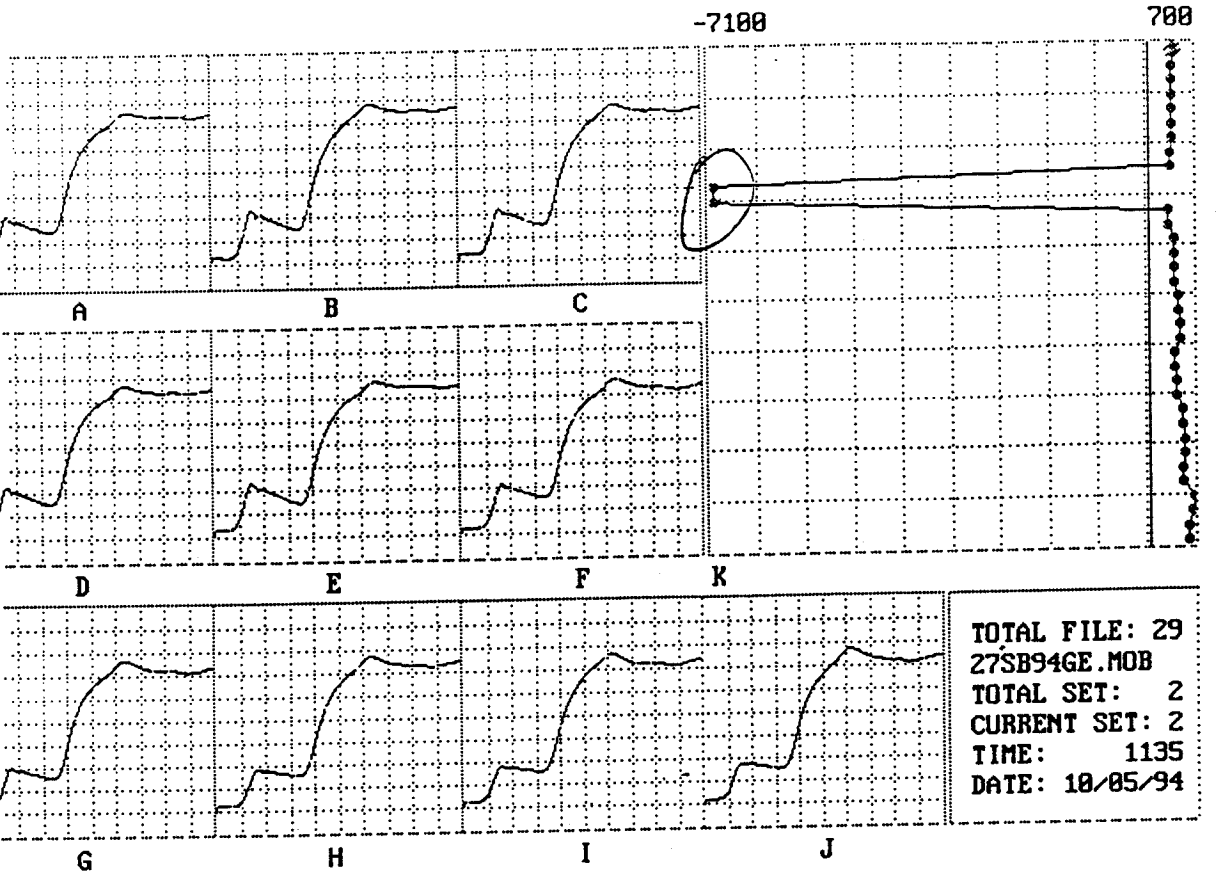

Assign -6999 to -1.

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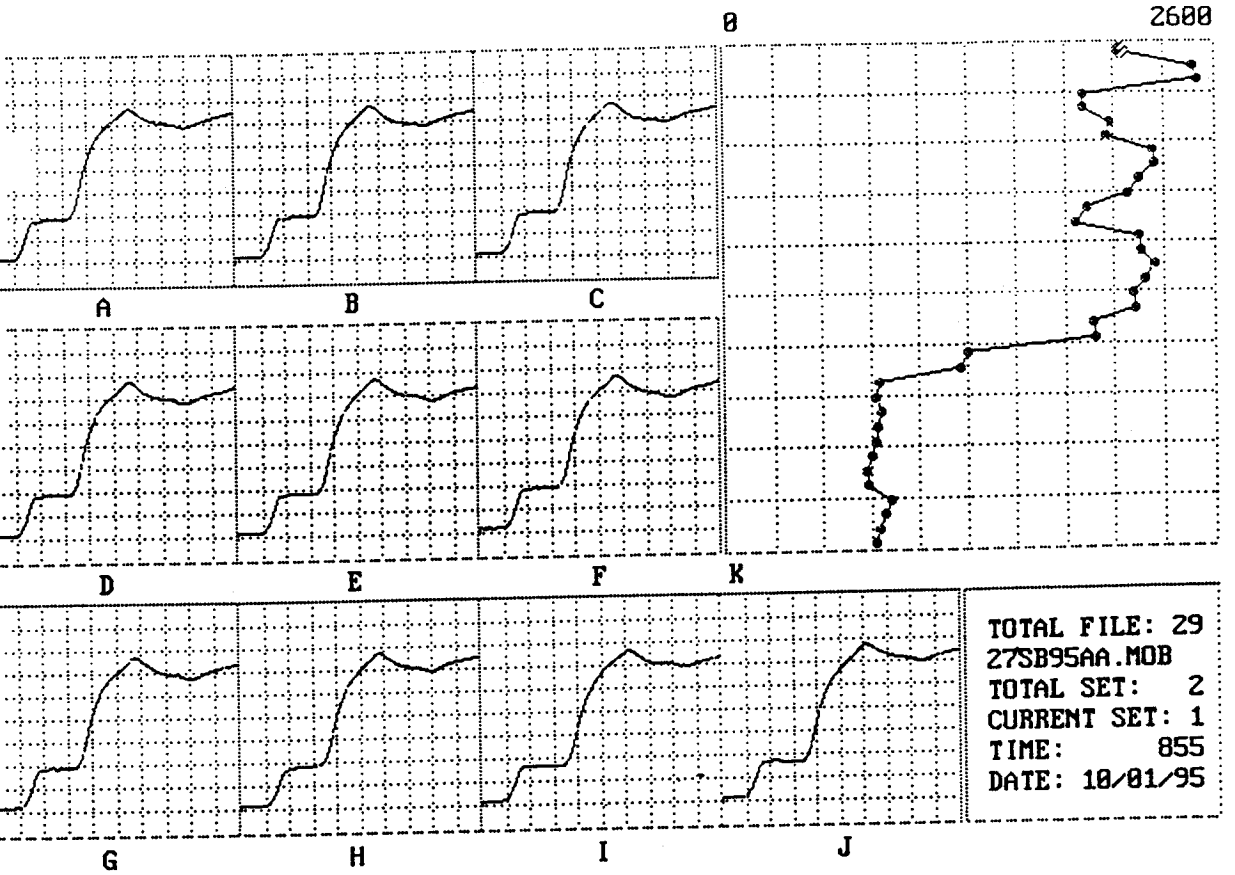
CRREL problem w/ test positions

10/11.

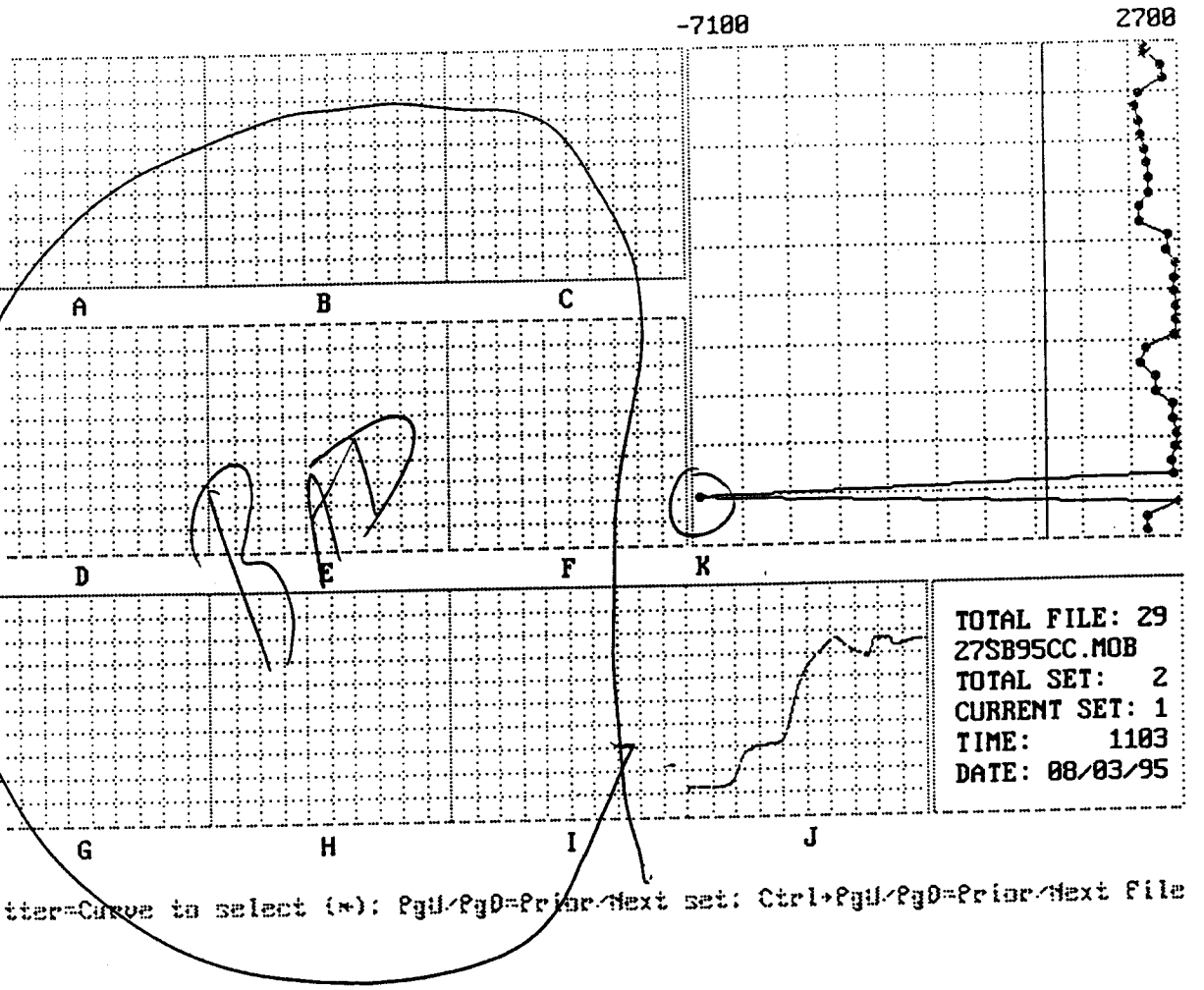


FROST

TOTAL FILE: 29
27SB95AA.MOB
TOTAL SET: 2
CURRENT SET: 1
TIME: 855
DATE: 10/01/95

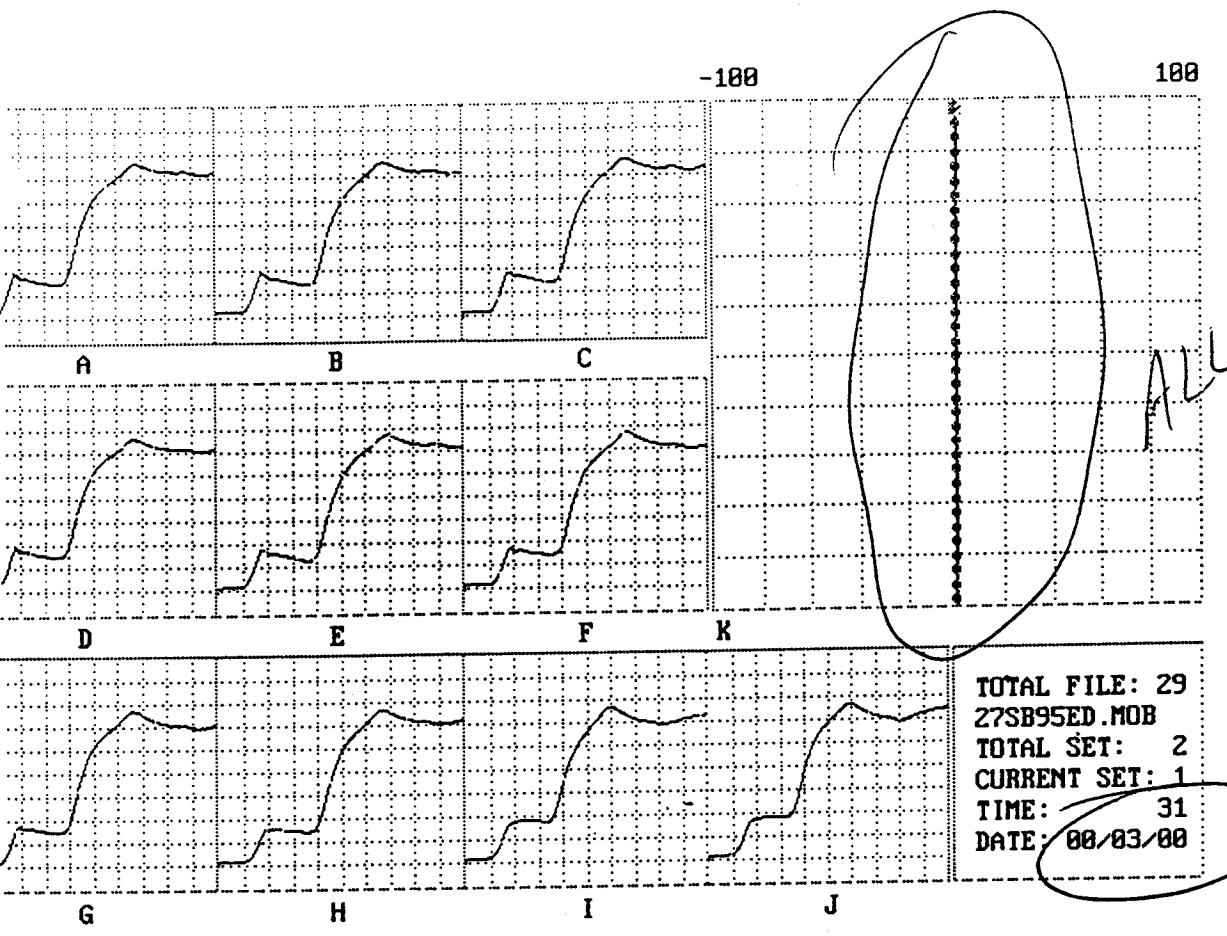
Letter=Curve to select (*); PgU/PgD=Prior/Next set; Ctrl+PgU/PgD=Prior/Next File

NO INFLECTION IN FROZEN SAND.



ASSIGN -6999 to +3000

FROST PAST END OF PROBE (1995)

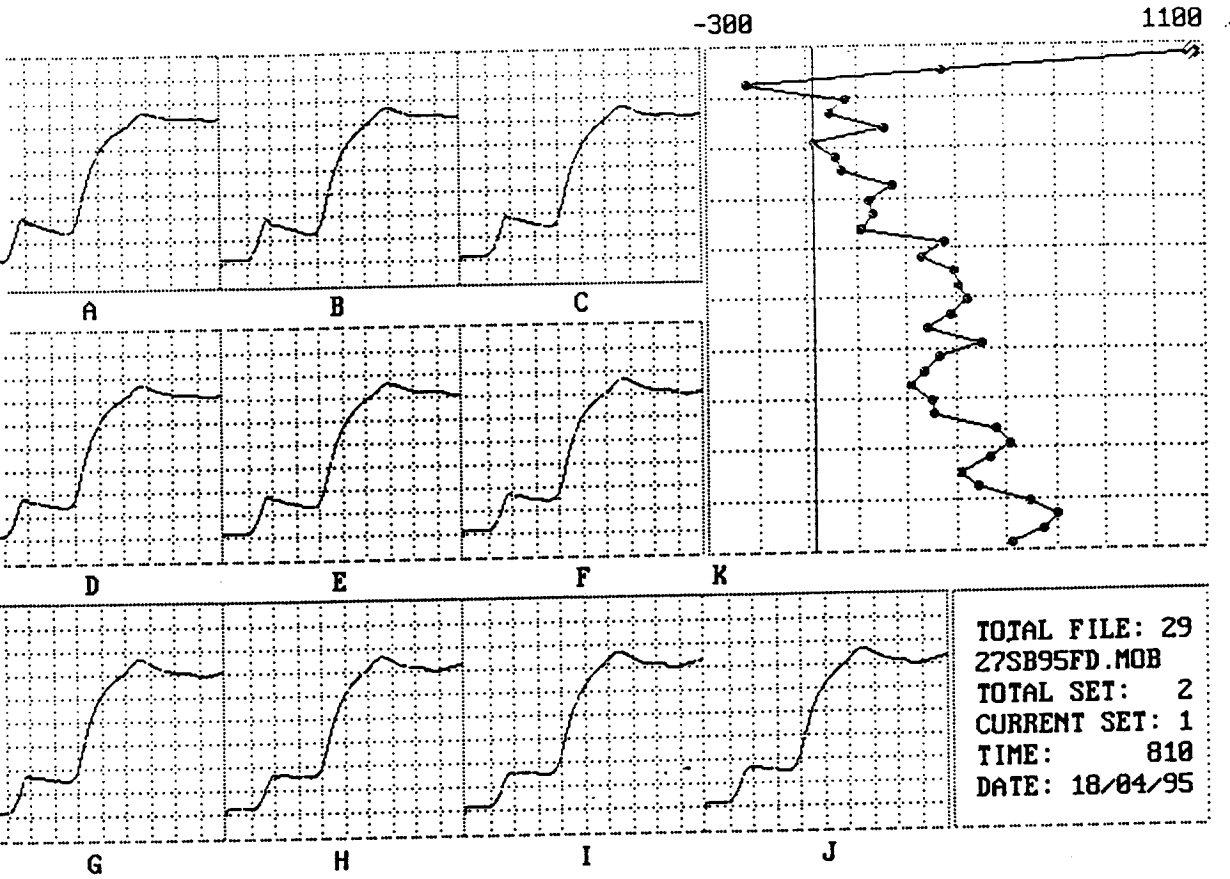


ALL BAD

April 04, 95

tter=Curve to select (*): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

EDIT DATE

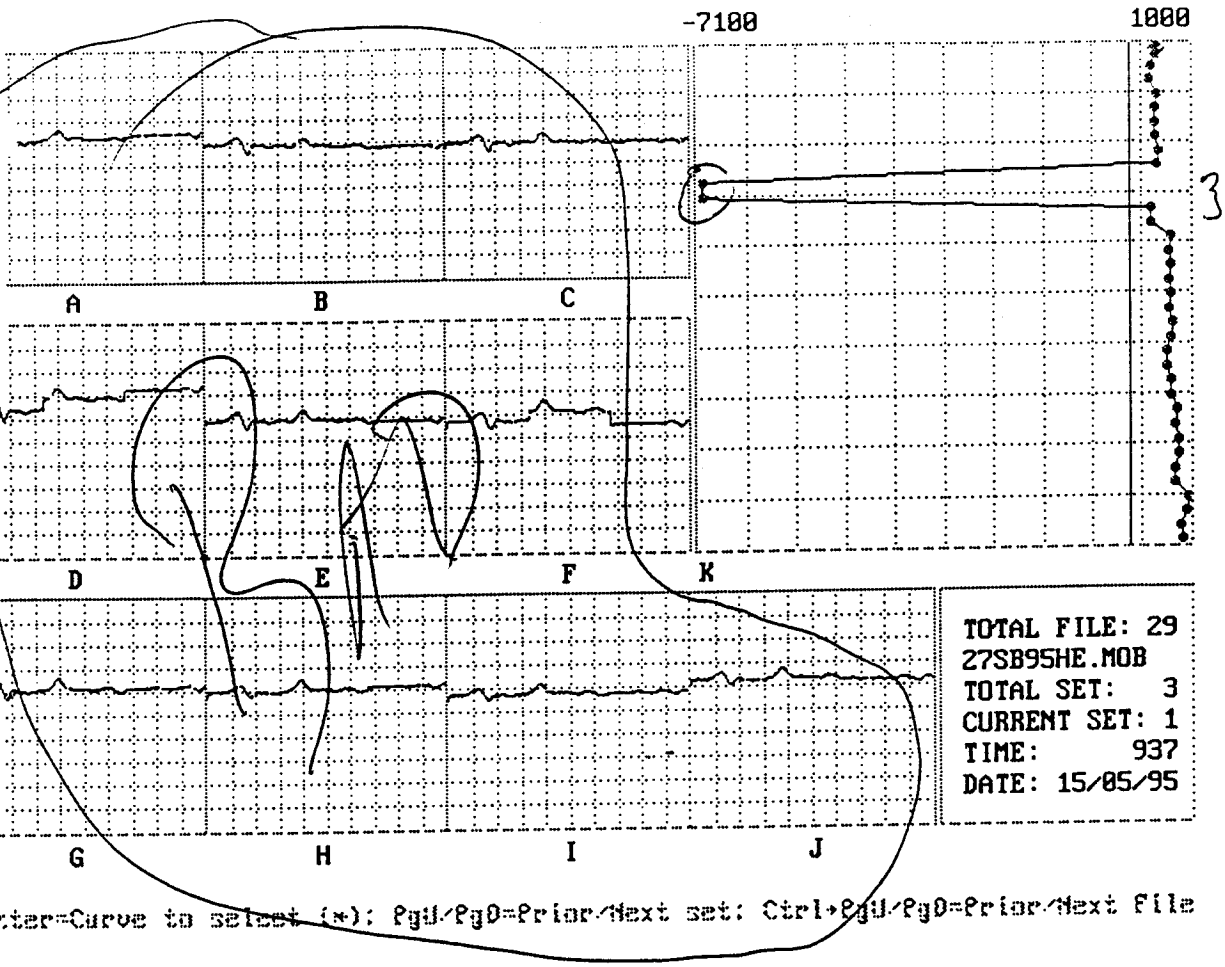


?

TAL OR FAWA ADVISE

CRREL PROBLEM

- NEED TRAINING ON WHAT IS GOOD / BAD FOR THIS EQUIPMENT FAILURE.



3 ASSIGN — 1

PROBLEM W/ CONNECTOR ON

CABLE READER

271028 (station 0-30)

SAND SUBGRADE AND DRY TO 4.3 METERS