PERFORMANCE OF MONTANA HIGHWAY PAVEMENTS DURING SPRING THAW

BY

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LIST OF FIGURES

LIST OF TABLES

APPENDICES

APPENDIX A. GRAIN SIZE DISTRIBUTION.

APPENDIX B. Temperature – Moisture Data

APPENDIX C. BACK-CALCULATED MODULUS

ABSTRACT

Highway pavements in seasonal frost areas undergo annual freeze thaw cycles. Pavements constructed for the design load capacity can become weak during spring thaw. In 1995, Montana Department of Transportation (MDT) initiated a study on developing road restrictions during the spring thaw. Selected sites throughout Montana were instrumented. Field measurements of deflection, moisture, and temperature were made during the winter/spring of 1996-1997. The analysis involved the determination of thaw weakening characteristics of the sites and to develop subgrade modulus values for use in future design of pavement structures in Montana.. Based on the moisture data, the base course layers at Dickey Lake, Wolfpoint, Scobey/Redstone and East Glacier are prone to thaw weakening. Deflection data indicate that the base at Bull Mountain, Swan Lake and Scobey Redstone may be prone to thaw weakening. The subgrade at Dickey Lake, East Glacier, Bull Mountain, Swan Lake and Scobey/Redstone may also be prone to thaw weakening. The length of thaw weakening varied from 4 days (Scobey/Redstone) to 3 weeks (East Glacier). This report provides a general description of the test sites, the measurements and analysis of the data, results of the analysis, and recommendations based on the results. In addition, the report quantifies the effects of thaw weakening on typical roads in Montana based on deflection, surface and subsurface moisture, temperature and other atmospheric measurements taken by MDT

Keywords: Pavements, Thaw weakening, Moisture, Temperature, Moduli, Base, Subgrade.

INTRODUCTION

Highway pavements in seasonal frost areas undergo annual freeze thaw cycles. Pavements constructed for the design load capacity can become weak during spring thaw. During the winter, water is drawn up to the freezing front from shallow water tables by capillary action and converted to ice lenses. This formation of ice lenses is manifested on the surface as frost heave. During the spring, the ice lenses are converted back to liquid water and depending on the hydraulic conductivity of the subsurface layers, these layers can become saturated. In addition, more moisture can be introduced into the subsurface layers from infiltration of melting snow and rain from the surface. As a result, the bearing capacity of the base, subbase and or subgrade can be reduced and damage may be observed on the surface as potholes, alligator cracking, or rutting. The amount of damage can vary. However it has been reported that 90 % of the damage to pavements can occur during the thaw weakening periods. To reduce this damage, load restrictions need to be applied during the thaw weakening periods. However, the timing and length of the load restriction period can be a financial burden to the trucking industry and need to determined with care.

In 1995, Montana Department of Transportation (MDT) initiated a study on developing road restrictions during the spring thaw. The study began with field studies to identify the extent of the effects of thaw weakening on highway pavements. Selected sites throughout Montana were instrumented. Attempts were made to obtain field measurements of deflection, moisture, and temperature during the winter/spring of 1996-1997. Measurements were made to cover the four periods in a freeze thaw cycle: period of deep frost, period of rapid strength loss, period of rapid strength recovery, and period of slow strength recovery (Sheperd & Vosen., 1997).

The U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory (CRREL) was contracted by Montana Department of Transportation (MDT) to assist in the analysis of the test data from the ten sites. The analysis was to determine the thaw weakening characteristics of the sites and to develop subgrade modulus values for use in future design of pavement structures in Montana. This report provides a general description of the test sites, the measurements and analysis of the data, results of the analysis, and recommendations based on the results. In addition, the report quantifies the effects of thaw weakening on typical roads in Montana based on deflection, surface and subsurface moisture, temperature and other atmospheric measurements taken by MDT.

SITE DESCRIPTION

Ten sites were chosen throughout the state of Montana for this project based on their subgrade soil classification, geologic region and their vicinity to weather monitoring stations (Sheperd & Vosen, 1997), Figure 1. Montana can be divided into two geologic regions (Sheperd & Vosen ,1997). These are the Rocky Mountain and the Plains regions. Sites representing the Rocky Mountain region include East Glacier, Sweetgrass, Swan Lake, Dickey Lake and Livingston. The Plains region is represented by Loma, Scobey/Redstone, Alzada, Roundup/Bull Mountain, and Wolf Point.

All the pavement structures in this study were flexible pavements, which represent 97% of Montana roads (Sheperd & Vosen, 1997). With the exception of Swan Lake, the pavement

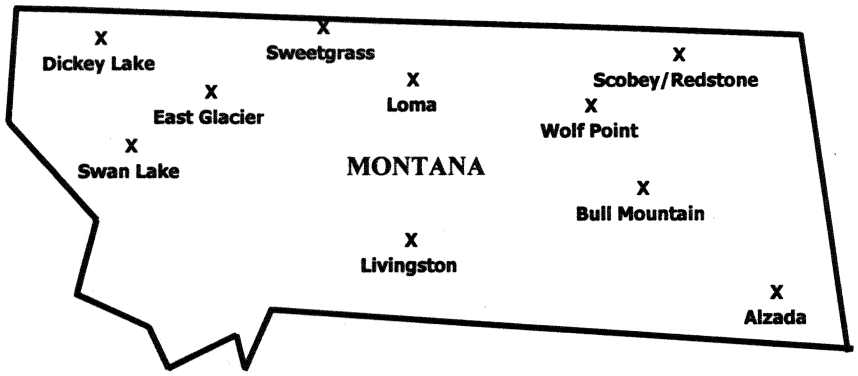
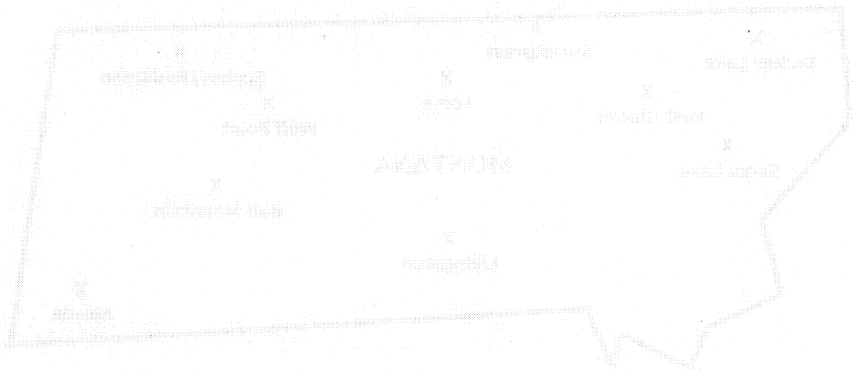


Figure 1. Location of test sites in Montana.



structure at the sites consisted of an asphalt concrete layer over an unstabilized base over the natural subgrade. At Swan Lake, in addition to the base course, there was a subbase layer. The asphalt concrete layers at the test sites ranged from 3 to 13 inches (76 mm to 330 mm), and base thicknesses ranged between 5.5 inches to 27 inches (138 mm to 686 mm) respectively. The subgrade soil classifications are based on the American Association of State Highway Transportation Officials (AASHTO) system. The subgrade soils (based on the top 2 feet (0.6 m)) were classified as either A-2, A-4 or A-6. Site names, AASHTO soil classifications of the base and subgrade, and road layer thickness are given in Table 1 below. Other soil tests conducted by MDT were moisture content, and R-values. Available gradation and Atterberg limit test results for some of the sites are presented in Appendix A.

Table 1. Layer material type and thickness

SITE NAME	Subgrade	LAYER THICKNESSES (mm)		
		Asphalt	Base	Subbase
Loma	A-1	152	686	
East Glacier	A-4	76	584	
Sweetgrass	A-6	330	483	
Swan Lake	A-1	122	122*	127
Dickey Lake	A-2-4	127	427	
Scobey/Redstone	A-6	229	140	
Alzada	A-6	235	603	
Livingston	A-1	152	20.4	
Roundup/Bull Mtn	A-4	254	432	
Wolf Point	A-6	178	152	

*pulverized plant mix surfacing (PMS)

FIELD INSTRUMENTATION & TESTING PROGRAM

Each test site was instrumented with the VITEL Hydra Soil Probes, Figure 2. Subsurface soil temperature, soil dielectric constant and soil conductivity were measured hourly with these robes and recorded with VX1004 dataloggers, manufactured by VITEL, Inc., Chantilly, VA.

Figure 2. VITEL Hydra Moisture Probe

A brief summary of the probe is given in this report. Basically, the probe is a moisture probe. It determines the soil moisture and salinity from a 50 MHz high frequency complex dielectric constant measurement. The dielectric constant can be separated into its real and imaginary components. The real component has been shown to be sensitive to the moisture content of the soil. The imaginary (conductive) component can be related to the salinity of the

soil. Subsurface temperatures were directly measured using thermistors located in the probe head. The volumetric moisture content is determined from calibration equations provided by VITEL for sands, silts and clays. These calibrations are part of the data acquisition system provided by VITEL. Sensor locations provided by the Montana Department of Transportation (MDT) are shown in Table 2.

Table 2: Location of VITEL' sensors for measuring moisture, temperature and salinity

Site Name	VITEL Sensor Depths (mm - from pavement surface)								
	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7	Sensor 8	Sensor 9
Loma	541	960	1184	1483	1684	1984	2385	-	-
East Glacier	457	737	1110	1260	1461	1760	2161	-	-
Sweetgrass	2289	1887	1586	1387	1237	1087	864	572	-
Swan Lake	668	818	968	1168	1468	1869	-	-	-
Dickey Lake	292	584	813	?	1168	1468	-	-	-
Scobey/Redstone	305	445	673	813	965	1168	1473	1867	-
Alzada	279	808	960	1138	1288	1438	1638	1938	2339
Livingston	229	411	747	970	1270	1473	1778	2159	-
Bull Mountain	432	665	902	1207	1422	1702	2108	-	-
Wolf Point	229	381	762	914	1118	1422	1803	-	-

In October 1997, the VITEL probes at seven sites were checked by CRREL and 64% of the sensors were found to be fully operational. With respect to temperature, we found 94 % of the sensors were functioning properly. The results of the site visit are presented in Appendix A.

In addition to the above subsurface instrumentation, the sites were located in areas where Road Weather Information Systems (RWIS) were available. Plans were made initially to supplement the VITEL data with data from the SSI system. However, when the data was reviewed, it was found that data from the SSI sensors were recorded at irregular time intervals based on how often the closest weather station dialed into the site. Because of this irregularity and also only 36% of the data were available for the analysis period, measurements from the SSI

system were not used in the analysis. Also, no data was found for Bull Mountain and only a few readings were found for Livingston, East Glacier and Alzada.

Pavement deflection measurements were obtained nondestructively with the MDT Road Rater, manufactured by Foundation Mechanics, Inc., El Segundo, CA, Figure 3. Surface deflections were measured from steady-state dynamic loads (9 to 22 kN). The loads were applied through a 305 mm diameter steel plate at a frequency of 25 hertz. Deflections were measured at distances of 0, 203, 305, 610, 914 and 1219 millimeters from the center of the plate.

Figure 3. Montana DOT Road Rater

Deflection measurements were taken throughout the year on a monthly basis with the exception of spring, when they were taken biweekly. The test program consisted of one drop at

each test point between 9 and 22 kN. The test section of 30.5 meter was selected in such a way that half the section was either to the right or left of the location where the VITEL probes were installed. The test points were 1.5 m. apart. A total of twenty-one non-destructive testing (NDT) test points, were conducted for each site using the "Road Rater" for most part of the year. During our analysis, it was found that during the spring thaw period that FWD tests were conducted at 4 or 5 test points. In addition to NDT testing, air temperature and in some instances, pavement temperatures were recorded during the tests. Pavement temperatures included surface temperatures and temperature in the middle of the asphalt concrete (AC) layer (defined by MDT as the "material" temperatures).

ENVIRONMENTAL DATA ANALYSIS

Several of the VITEL probes failed after 5 to 6 months after installation. For example, five out of the six probes at Swan Lake stopped functioning within five months from installation and five out of eight probes at Livingston stopped functioning within six months from installation. A power surge, possibly from lightning, was thought to be the most likely cause according to MDT. In addition, it was found that data was missing during the winter and thaw periods in Alzada. Results from these sites were not used in the analysis.

The subsurface moisture in conjunction with deflection data from the Road Rater data were used to determine if the pavement structure was susceptible to thaw weakening. When deflection data is unavailable, the moisture contents can provide a good indication of the thaw weakening susceptibility of the base and/or subgrade. A good illustration of this is with the data from Dickey Lake, Figure 4.

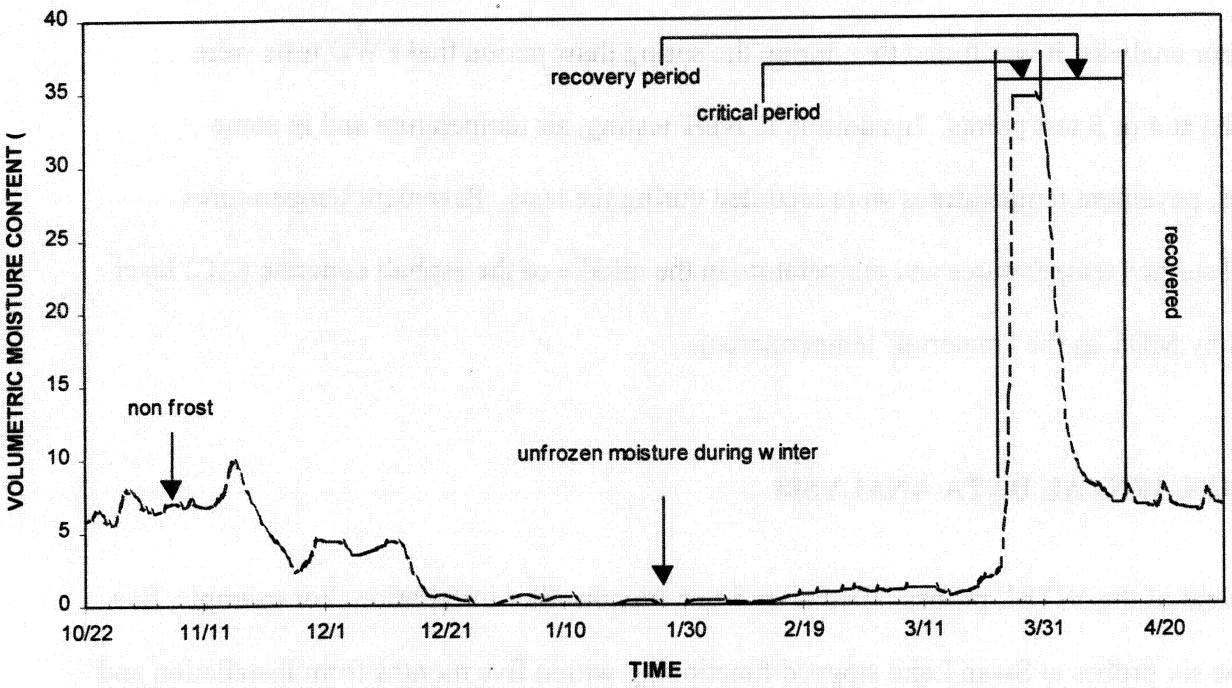


Figure 4. Definitions of critical and recovery periods used in the analysis.

For our analysis, the non-frost moisture content was taken as the average mean moisture content for the month of October when the mean ground temperature was still positive. The unfrozen moisture content during the winter is the average moisture content where the ground temperature is stable at its lowest temperature. The critical period using the moisture data is the time when the moisture content exceeds the non-frost value during the spring thaw to its maximum value. Recovery is at the end of the maximum value to the time when it levels out to either the non-frost or just close to it.

Moisture and temperature data were recorded on an hourly basis. The hourly moisture contents and temperatures were converted to daily mean values and are presented in Appendix B. The subsurface temperature data provided information on the length of the freezing season and was used to estimate the maximum frost penetration. In addition, when available, daily mean air temperatures at the site are presented in Appendix B. The frost depth, in Table 3 is defined as the maximum depth where the temperature reached 0 °C. The period of time that the ground is frozen is defined as the time (to the nearest month) when the ground temperature remains below 0 °C. "NA" in Table 3, indicates that there was either insufficient or missing temperature data to note the trend.

Table 3. Estimated frost depth & period of freezing from measured temperatures and moisture content.

Location	Frost Depths (meter)	Period of Freezing
Loma	2.39	December-April
East Glacier	2.16	September-April
Sweetgrass	2.29	September-April
Swan Lake	NA	NA
Dickey Lake	>1.60*	November-April
Scobey/Redstone	>1.88*	September-April
Alzada	>1.93*	NA
Livingston	>1.27*	NA
Bull Mountain	1.70	NA
Wolf Point	>1.80*	September-April

* Frost penetration exceeded the deepest measurement sensor.

Thaw weakening is due to excess moisture and the rate of dissipation in the pavement structure. Based on the moisture distribution in the pavement structure, one can surmise the potential for thaw weakening. Detailed description of the seasonal moisture variation in the base

and subgrade at 5 sites are given below. These sites are Dickey Lake, Wolfpoint, Sweetgrass, Scobey/Redstone and East Glacier. At these sites there were complete or near complete temperature and moisture data in the base and subgrade. Unfortunately, the selected sites were in the northern half of the state.

Dickey Lake

The base and subgrade gradation as obtained during the instrumentation stage are shown in Figures 5 and 6. Details of the gradation and Atterberg limits are presented in table A-1 in Appendix A. Using the AASHTO soil classification system, the base was classified as an A-1-a soil. Bedrock was found at a depth of 1.5 meters (58") from the surface. The subgrade was found to vary with depth. The top 900 mm (36 ") ranged between an A-2-4 and A-4 soil, Table A-1. The bottom part of the subgrade turned out to be more granular and was classified as an A-1-b subgrade. The percent finer than the 0.075 mm (#200) sieve size in the base ranged between 10 to 13% and in the subgrade, between 18 to 37%. The fines based on the plasticity index were classified as non-plastic. Initial gravimetric moisture contents taken at the time of instrumentation installation (mid-November, 1995) ranged between 8 to 10 % in the base and between 13 to 18 % in the subgrade. The moisture measurements in the subgrade were taken at depths between 686 mm to 1270 mm (27" to 50"). The depth of the water table was not reported.

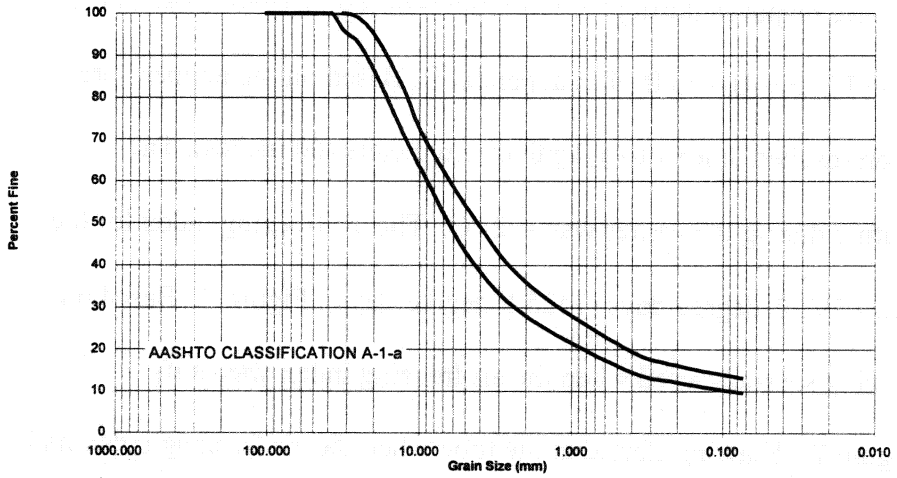


Figure 5. Base Course Grain Size Distribution at Dickey Lake

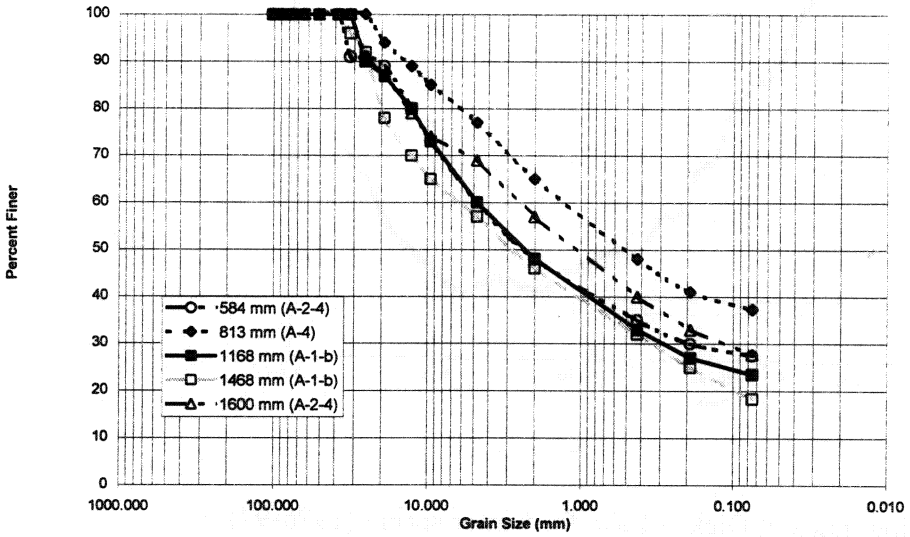


Figure 6. Subgrade Grain Size Distribution at Dickey Lake

The moisture and temperature response during the fall-winter-spring of 1996 /1997 in the base and subgrade are shown in Figures B-1 to B- 4 in appendix B. Based on the temperature measurements, frost penetration reached at least to a depth of 1.6 meters (60 inches). The minimum average air temperature during the winter was –22 °C. The air freezing index for the winter-spring of 1996-1997 was 792 C degree-days (1425 F degree-days), Figure 7. Based on the air freezing index, the freezing season started when the air freezing index was at its maximum (October 17th), Figure 7. Thawing started at the time when the air freezing index had reached its minimum value and became constant (March 21 st), Figure 7.

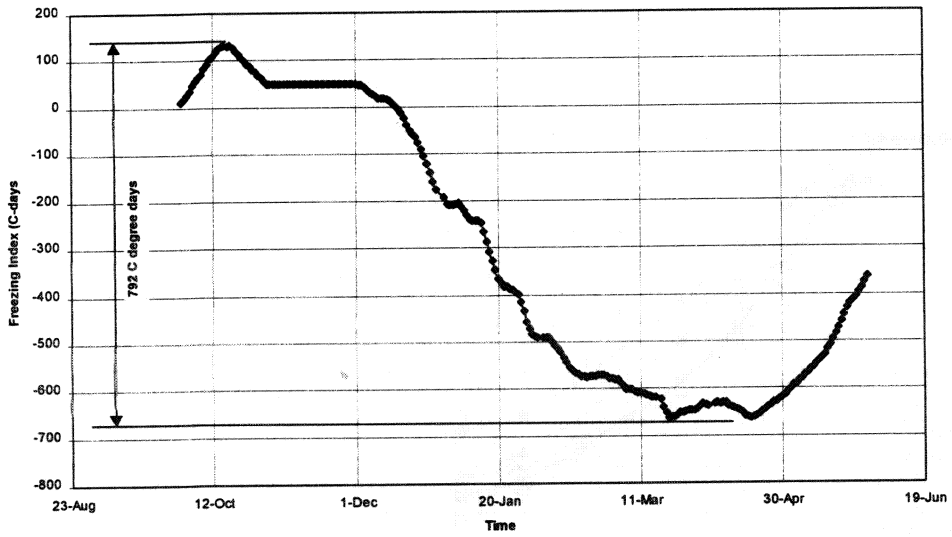


Figure 7. Air Freezing index at Dickey Lake for winter spring (1996-97).

The measurements in the base were made at a depth of 292 mm (11") from the AC surface, which is about the mid-point of the base layer.. Prior, to freezing, the mean daily volumetric

moisture content in the base was approximately 5.5 % (COV = 8.8%). This is based on the average of the moisture measurements for the month of October. This also suggests a fairly dry material. Although the base was classified as an A-1-a soil, there was a substantial increase in moisture content during the thaw (~4X the non-frost value). Based on the moisture data, thawing started around March 20th where the moisture content was greater than 5.5 %. The temperature in the base at this time was – 4 °C. The next day (March 21st), the moisture content in the base was approximately 21 % and on March 22nd, it peaked to around 22%. The temperature in the base at maximum moisture content was – 2.4 °C. This increase in moisture content was at a rate of approximately 9 %/°C. This rapid increase occurred when the temperature in the base was between – 4 and –2 °C. It is possible, that the increase in moisture content was due to infiltration of melting snow into the base course from the surface or from melting ice lenses in the base course. Recovery of the base started on March 23rd and continued to about April 13th, where the moisture content leveled to approximately 7 %. This recovery time could be explained by the 10 to 13 % fines in the base. Janoo et al. (1997) found that when base course layers under airport pavements contained more than 3 % fines, it affected the rate of moisture dissipation during the thaw period. Based on the assumption that the moisture content in the layer controls the strength of that layer, the critical period for the base lasted approximately 3 days (March 20th – March 22nd) and it required another 20 days to recover to near its original moisture content.

The base freezing index was 553 C degree days (995 F degree days), Figure 8. According to Figure 8, freezing of the base started around November 16th, and thawing started on March 30th.

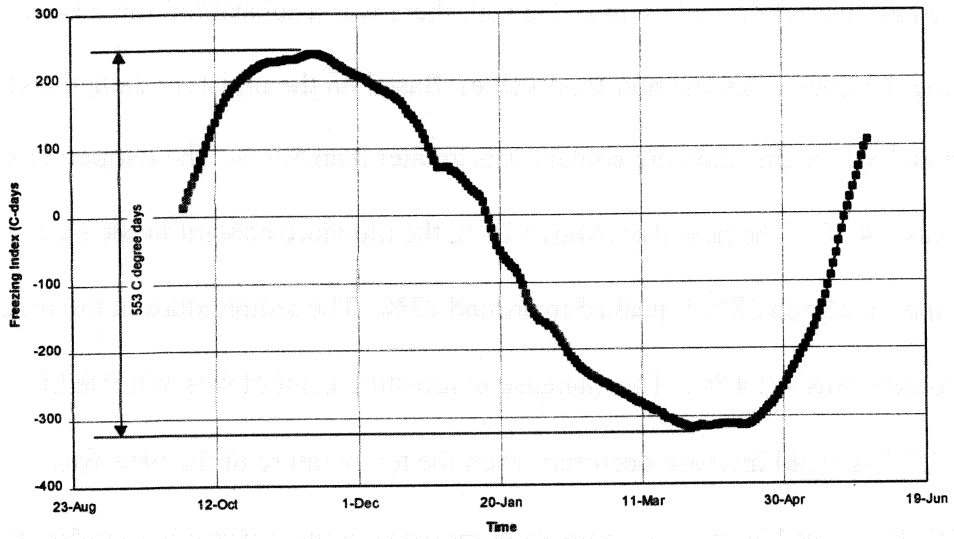


Figure 8. Base Freezing Index for winter – spring (1996/97) – Dickey Lake.

This is 8 days after the base had reached its critical moisture content of 22 %. On March 30th, the base moisture content was approximately 9 % which was close to its recovered moisture content. It may be coincidental that the time of critical moisture content was the same time as the air freezing index indicated thawing.

The top part of the subgrade at Dickey Lake were characterized as A-2-4 and A-4 soils using the AASHTO soil classification system. The first set of measurements in the subgrade shown in Figure B- 2, Appendix B were taken at a depth of 30 mm (1.2 inches) from the bottom of the base in the A-2-4 soil. The results from these measurements can be used to infer the response at the top of the subgrade. The response at the top of the subgrade is very important in

pavement engineering as vertical elastic strain on top of the subgrade is currently used in one of the definitions of failure.

The moisture response (Figure B-2) is similar to the base. The mean non-frost moisture content is about 6.2 % (COV = 10%). As with the base, the moisture content dropped rapidly as the subgrade froze. The minimum temperature reached was –11 °C. When it was frozen, the moisture content was approximately 0 %. Thaw began when there was a rapid increase in moisture content. This rapid increase started around March 24th and became critical on March 25th. The temperature in the subgrade on March 24th was –2.3 °C. The moisture content peaked at about 35% on March 27th and remained at the peak value for a period of 4 days. Recovery starts around April 1st and ended around April 17th. The average moisture content at the end of recovery is approximately 7 %. Based on the moisture data, the thaw weakening period began around March 25th and ended around April 17th, a period of 23 days. Again the significant period of thaw weakening could be attributed to the high fines content in the layer (27% finer then 0,075 mm).

The ground freezing index at the top of the subgrade is shown in Figure 9. The ground freezing index for the top of the subgrade was 506 C degree days (911 F degree days). According to the freezing index, freezing started on Nov 17th and ended on April 17th. This means that if we had based the beginning of thaw based on temperature, we would have missed the thaw period by 23 days and the subgrade by this time had recovered to its non-frost moisture content.

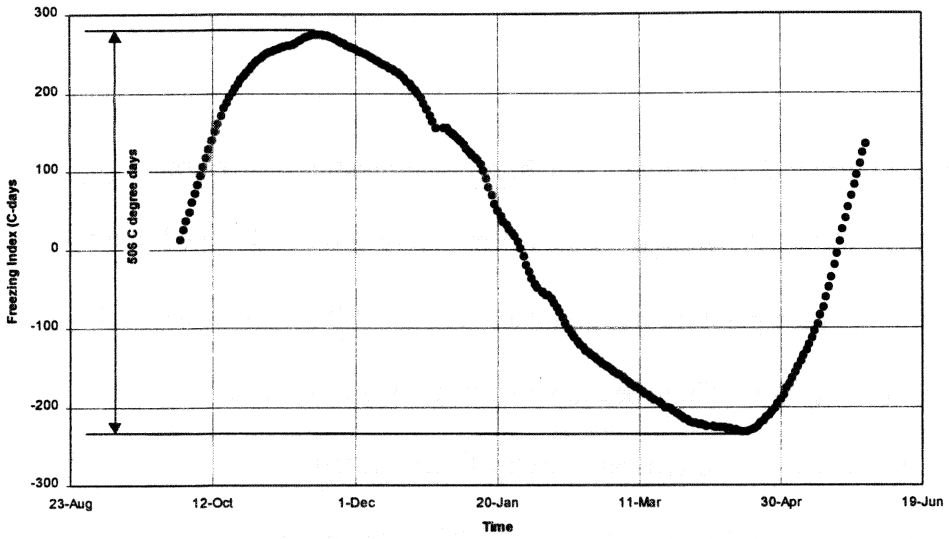


Figure 9. Ground freezing index on top of subgrade for winter spring 1996/97 – Dickey Lake.

At location 813, (Figure B-3), 259 mm (10 inches) from the bottom of the base, the non-frost moisture content is approximately 21 % (COV = 3%). The minimum temperature at this depth was –6 °C. The mean unfrozen moisture content was approximately 14.5 %. Thaw occurred (wrt moisture) when there was a rapid increase in moisture content around April 3rd. The temperature at this depth at this time of rapid moisture increase was – 0.6 °C. The critical moisture content was 34 % and it occurred around April 4th. Recovery began the day after and ended around April 19th. The recovered moisture content was 21 %. The ground freezing index at this depth was 188 C degree days (338 F degree days). Freezing at this depth started on December 18th and ended on April 16th. Again as before in the top of the subgrade, if temperatures were used to determine the thaw period, it would have been missed.

At the depth of 1168 mm from the surface and below, it is difficult to say if the layer has any significant moisture change during the thaw period, Figure B-4. The soils were classified as A-1-b soils and has a significant amount of fines (18 – 24%). The mean non-frost moisture content was around 8%. At this depth, the minimum temperature reached was –4.5 °C. The mean unfrozen moisture content during the winter was close to 0.5 %. However, as before, the moisture content began to increase when the subgrade temperature was around –2 °C. At the end of thaw, the moisture content rapidly increased to its non-frost value of 8%.

At 1468 mm, the soil started to freeze around Jan 19th and started to thaw around March 3th, Figure B-4. The temperature hovered around the 0 °C mark until April 13th. The average non-frost moisture content during the non-frost period is around 15 %. The moisture content increased at a rapid rate around March 27th when the ground temperature was again around –2 °C. Again it is difficult to conclude if there was a period of increased moisture content. It is possible that there may have been an increase of approximately 1.5X to 2X the non-frost moisture content during the spring thaw.

In summary, at Dickey Lake, the base course, and the upper subgrade layer shows significant increase in moisture content during the spring thaw. This suggests that the pavement structure is prone to thaw weakening. Table 4 summarizes the period of thaw weakening and recovery. The critical period in table % is based on the time when a rapid increase in moisture content and also when the moisture content has surpassed its non-frost value. At Dickey Lake, the thaw weakening is controlled by the base course. It lasts a period of approximately 25 days.

Table 4. Summary of freezing, thaw weakening periods and moisture contents (Dickey Lake)

Layer	Depth (mm)	AASHTO	% finer 0.075 mm	Start of Freezing	End of Freezing	Start of Critical Period	Start of Recovery	End of Recovery	Thaw Weakening Period
Base	292	A-1-a	8-10	18-Nov	26-Mar	20-Mar	22-Mar	13-Apr	20-Mar to April 13
Subgrade	584	A-2-4	28	19-Nov	13-Apr	25-Mar	31-Mar	15-Apr	25-Mar to April 15
	813	A-4	37	20-Dec	13-Apr	3-Apr	5-Apr	16-Apr	3-Apr to April 16
	1168	A-1-b	24	21-Dec	17-Apr	NA	NA	NA	NA
	1468	A-1-b	18	19-Jan	3-Mar	NA	NA	NA	NA

Layer	Depth (mm)	Length of (days)				Average volumetric moisture content (%)			
		Freezing	Critical	Recovery	Thaw Weakening	Non frost	Freezing	Critical Period	Recovered
Base	292	128	2	22	24	5.5	0	22	7
Subgrade	584	145	6	15	21	6	0	35	7
	813	114	2	11	13	20	4	34	22
	1168	117	NA	NA	NA	8	0	NA	8
	1468	43	NA	NA	NA	15	0	NA	15

WOLFPOINT

The gradations of the base and subgrade at Wolfpoint are shown in Figures 10 and 11. Additional details of the gradation and Atterberg limits can be found in Appendix A. Based on results from sieve analyses, the base was classified as an A-1-b soil. The subgrade varied between an A-6 and an A-7-6 soil, Table A-2, Appendix A. The percent finer then the 0.075 mm (#200) sieve size in the base ranged between 12 to 15% and in the subgrade, between 56 to 56%. The plasticity index of the subgrade ranged between 19 and 27%. Initial moisture contents taken at the time of instrumentation installation (mid-September, 1996) ranged between 18 to 21 % in the subgrade. These readings in the subgrade appear to correlate with the volumetric moisture contents.

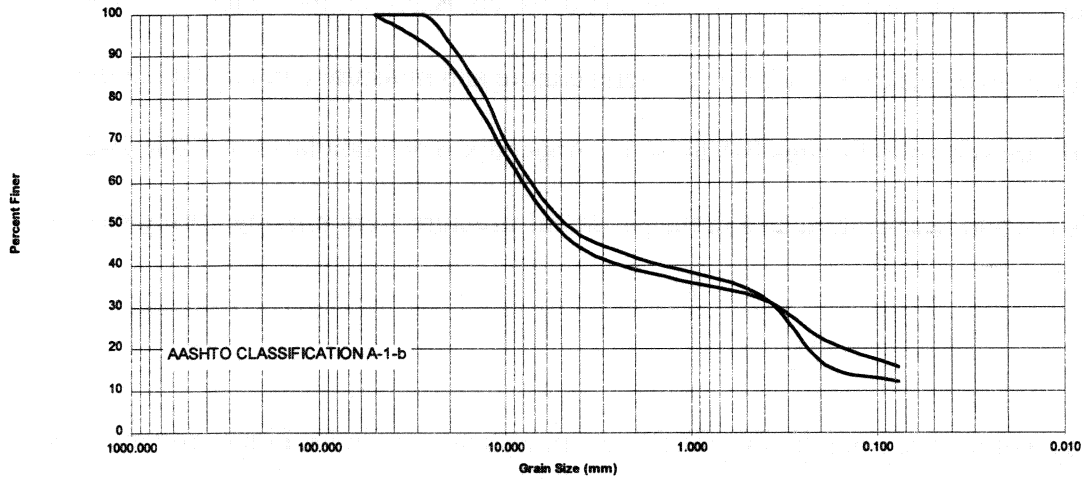


Figure 10. Base Course Grain Size Distribution at Wolf Point

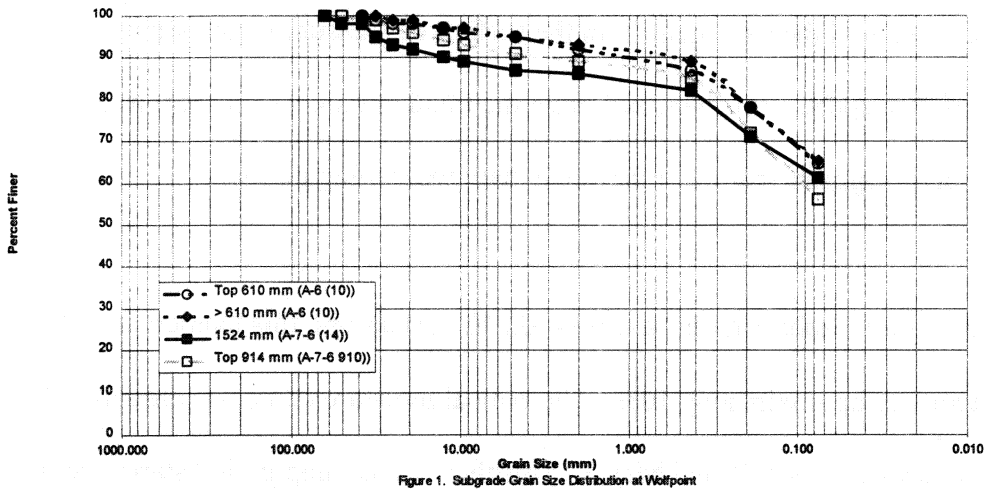


Figure 11. Subgrade Grain Size Distribution at Wolf Point

The air freezing index at Wolfpoint was 1595 C degree days (2873 F degree days). Freezing started around the end of October and ended around mid March. Based on the temperature data, frost penetration was to at least 1.8 m (71"). The temperature and moisture content data in the base and subgrade are shown in Figures B-5 to B- 11, Appendix B and tabulated in Table B-2. Volumetric moisture and temperature data in the pavement structure were missing during part of the winter.

The non–frost volumetric (month of October) moisture content of 46 %, Figure B-5 appears to be high. Assuming a specific gravity of 2.65, this moisture content translates to a gravimetric moisture content of approximately 17%. Measurements from a nuclear density moisture meter during the installation of the gages in mid September indicated a gravimetric moisture content around 8%. Either, water entered the pavement from the surface or measurements of moisture content in the base course is suspect. However, assuming the trend in moisture content as a function of time is correct, it suggests that there may be a thaw weakening period.

The minimum temperature reached in the base was –22 °C. At around this temperature, the unfrozen moisture content was approximately 10%. The critical moisture content is around 57%, and the critical period is between April 21 and May 3. This thaw weakening period starts later in the spring (approximately 9 days after the end of freezing). The weakening may be due to influx of melting snow into the base course.

The subgrade at Wolfpoint was classified as an A-6 to an A-7-6 soil. These soils in general tend to be frost susceptible. However, based on the moisture contents, Figures B-6 to B-11, in the subgrade, appear to recover rapidly to its non-frost value during thaw at all depths with the exception of 914 mm. At this depth, the data suggests some thaw weakening lasting for approximately 4 days. The critical period is for approximately 2 days. Recovery to its non-frost moisture content occurs within the next 2 days. The moisture content during the critical period increased by about 16%, compared to its non-frost value.

A summary of the results for Wolfpoint is given in Table 5. In summary, the base layer may be prone to thaw weakening. If so, the period of thaw weakening is approximately for 2 weeks, staring in mid April. However, this increase in moisture content is possibly due to influx of melting snow from the surface. The subgrade appears to recover to its non-frost moisture content at the end of thaw. Although freezing temperatures and frost susceptible soils were found at Wolfpoint, there was practically no thaw weakening of the subgrade. This leads to the conclusion that there was no nearby source of water to the freezing front (deep or non-existent water table).

Table 5. Summary of freezing, thaw weakening periods and moisture contents (Wolfpoint)

Layer	Depth (mm)	AASHTO	% finer 0.075 mm	Start of Freezing	End of Freezing	Start of Critical Period	Start of Recovery	End of Recovery	Thaw Weakening Period
Base	229	A-1-b	12-15	8-Nov	12-Apr	21-Apr	3-May	9-May	21-Apr to 3-May
Subgrade	381	A-6	65	13-Nov	26-Mar	None	None	None	None
	762	A-6	65	23-Nov	18-Apr	None	None	None	None
	914	A-7-6	56	29-Nov	22-Apr	21-Apr	23-Apr	25-Apr	21-Apr to 25-Apr
	1118	A-7-6	57	30-Nov	8-May	None	None	None	None
	1422	A-7-6	60	ND	13-May	None	None	None	None
	1803	A-7-6	62	22-Jan	19-May	None	None	None	None

- ND – Missing temperature data

Layer	Depth (mm)	Length of (days)				Average volumetric moisture content (%)			
		Freezing	Critical	Recovery	Thaw Weakening	Non frost	Freezing	Critical Period	Recovered
Base	229	155	12	6	18	46	8	57	37
Subgrade	381	133	NA	NA	NA	39	19	NA	39
	762	146	NA	NA	NA	40	22	NA	40
	914	144	2	2	4	37	19	41	37
	1118	159	NA	NA	NA	40	21	NA	36
	1422	ND	NA	NA	NA	42	34	NA	41
	1803	117	NA	NA	NA	39	36	NA	39

SWEETGRASS

The response of the moisture during the thaw period is similar to that of Wolfpoint. With the possible exception of the base, there is no indication of thaw weakening based on the response of the moisture content in the base and subgrade,

The base was mostly classified as an A-1-a soil, Figure 12. The subgrade was classified between an A-4 and an A-6 soil, Figure 13. The percent finer than 0.075 mm (#200) sieve ranged between 7.5 to 13% in the base and between 47 and 68% in the subgrade. Details of the gradation can in found in table A-3, Appendix A.

Detail temperature and moisture data for the winter spring period can be found in Appendix B, Table B-3 and Figures B-12 to B-19. The air freezing index at this site was 841 C degree-days (1346 F degree-days). The base, Figure B-12, started to freeze around mid November and was thawed by late March. The minimum temperature in the base measured was

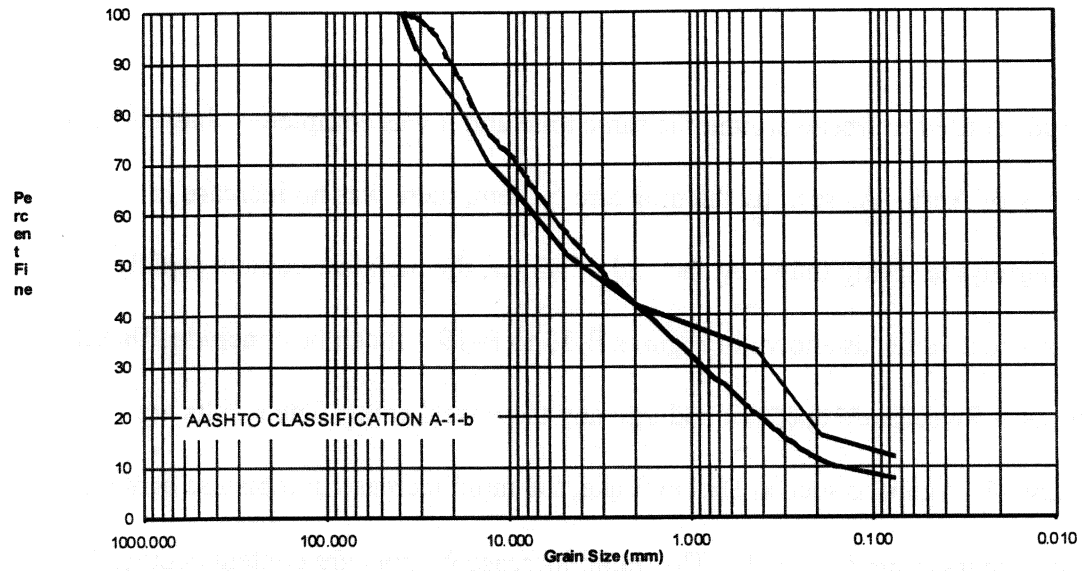


Figure 12. Base Course Grain Size Distribution at Sweetgrass.

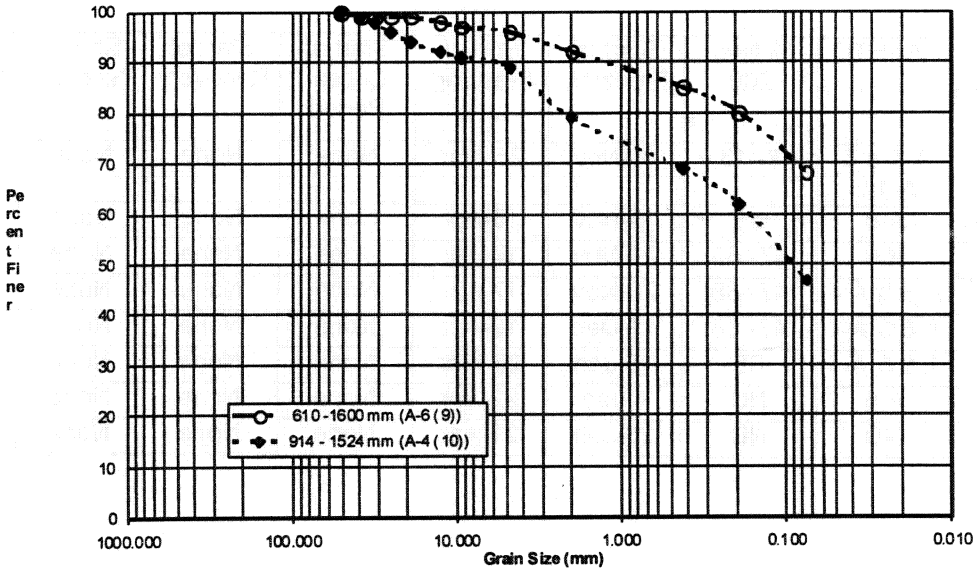


Figure 13. Subgrade Grain Size Distribution at Sweetgrass.

–16 °C. The non-frost moisture content was around 3%. When frozen, the moisture content dropped to zero and at the end of thaw recovered to 4%.

The subgrade started to freeze around the same time and it was completely thawed by the middle to third week of April. As seen by the moisture content, there was no increase in moisture content during the spring thaw. At the end of winter, the moisture content rapidly increased to its non-frost value, as shown in Figures B-13 to B-19. It can be concluded that the pavement structures at Sweetgrass does not undergo any thaw weakening. The results are summarized in Table 6. Again as seen at Dickey Lake, the rapid increase in moisture content during spring thaw occurs around – 2.5 °C. This rapid increase in moisture content occurred about 2 weeks prior to when the ground temperature was above 0 °C.

Table 6. Summary of freezing, thaw weakening periods and moisture contents (Sweetgrass)

Layer (mm)	Depth	AASHTO	% finer 200	Start of Freezing	End of Freezing	Start of Critical Period	Start of Recovery	End of Recovery	Thaw Weakening Period
Base	572	A-1-a & A-1-b	8--13	15-Nov	25-Mar	None	None	None	None
Subgrade	864	A-6	68	19-Nov	15-Apr	None	None	None	None
	1087	A-6	47--68	24-Nov	17-Apr	None	None	None	None
	1237	A-6 & A-4	47--68	28-Nov	17-Apr	None	None	None	None
	1387	A-6 & A-4	47--68	11-Dec	19-Apr	None	None	None	None
	1586	A-6 & A-4	68	13-Jan	26-Mar	None	None	None	None
	1887	A-6	ND	4-Jan	22-Apr	None	None	None	None
	2289	ND	ND	26-Jan	21-Apr	None	None	None	None

Layer	Depth (mm)	Length of (days)				Average volumetric moisture content (%)			
		Freezing	Critical	Recovery	Thaw Weakening	Non frost	Freezing	Critical Period	Recovered
Base	572	130	NA	NA	NA	3	0	NA	4
Subgrade	864	147	NA	NA	NA	28	8	NA	30
	1087	144	NA	NA	NA	34	16	NA	35
	1237	140	NA	NA	NA	37	21	NA	37
	1387	129	NA	NA	NA	31	25	NA	34
	1586	72	NA	NA	NA	37	30	NA	38
	1887	108	NA	NA	NA	31	27	NA	32

SCOBEY/REDSTONE

The base was clsssified as an A-1-b. The subgrade was classified as an A-6, Figures 14 & 15. Additional details of the gradation and Atterberg limits can be found in Table A-4 in Appendix A. The percent finer than the 0.075 mm (#200) sieve was about 15% in the base and approximately 65 % in the subgrade.

The response at Scobey/Redstone is similar to that of Sweetgrass. The base is prone to thaw weakening and the subgrade in general is not. The daily mean temperature and moisture measurements are tabulated in Table B-4 and also presented in Figures B-20 to B-27, Appendix B. Subsurface moisture and temperature data were missing during the winter period. The exception was in the base layer and in the subgrade at 965 mm from the surface. The air freezing index for this site was 1346 C degree days (2442 F degree days).

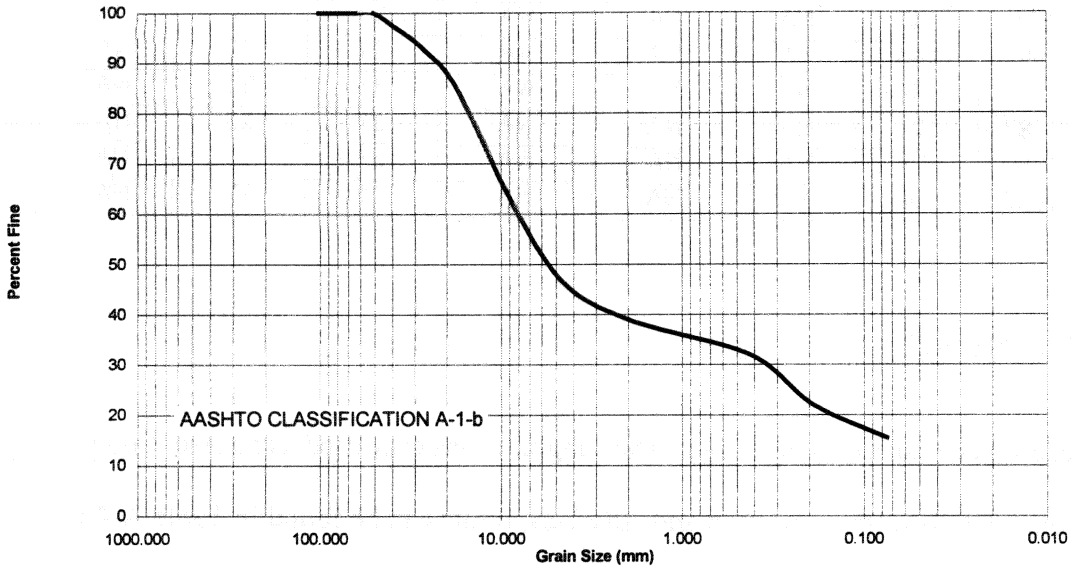


Figure 14. Base Course Grain Size Distribution at Scobey/Redstone

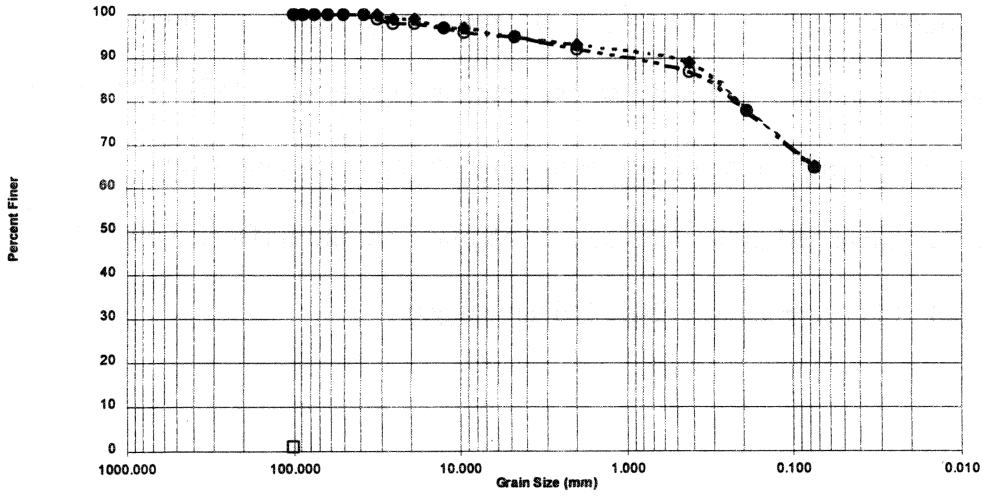


Figure 15. Subgrade Grain Size Distribution at Scobey/Redstone.

The non-frost moisture content in the base course was 21%, Figure B-20. During the winter, the mean air temperature reached a minimum of –32 °C. The minimum average daily temperature during the winter in the base layer was at least –17 °C. At this temperature, the unfrozen moisture content was around 5%. There is a rapid increase in the moisture content on March 22nd, when the base temperature was –1.5 °C. The critical moisture content of 25% was reached two days later. Recovery of the base course started on March 22nd and was completed by March 24th. The base had a thaw weakening period of approximately 4 days.

The subgrade at all depths, with the exception of at 965 mm recovered to its non-frost moisture content at the end of freezing, Figures B-21 to B-27. At 964 mm, there is some thaw weakening of the layer. The critical period is for about a day. Full recovery takes place by 5 days. The thaw weakening period is for about 6 days. A summary of the freezing, thawing and moisture content at various depths are presented in Table 7.

Table 7. Summary of freezing, thaw weakening periods and moisture contents (Scobey/Redstone)

Layer (mm)	Depth	AASHTO	% finer 200	Start of Freezing	End of Freezing	Start of Critical Period	Start of Recovery	End of Recovery	Thaw Weakening Period
Base	305	A-1-b	15	12-Nov	22-Mar	20-Mar	22-Mar	24-Mar	20-Mar to 24-Mar
Subgrade	445	A-6	65	12-Nov	26-Mar	None	None	None	None
	673	A-6	65	20-Nov	15-Apr	None	None	None	None
	813	A-6	65	ND	18-Apr	None	None	None	None
	965	A-6	65	ND	21-Apr	19-Apr	20-Apr	25-Apr	19-Apr to 25-Apr
	1168	A-6	65	10-Dec	28-Apr	None	None	None	None
	1473	A-6	65	26-Dec	5-May	None	None	None	None
	1867	A-6	65	ND	14-May	None	None	None	None

Layer	Depth (mm)	Length of (days)				Average volumetric moisture content (%)			
		Freezing	Critical	Recovery	Thaw Weakening	Non frost	Freezing	Critical Period	Recovered
Base	305	130	2	2	4	21	6	25	21
Subgrade	445	134	NA	NA		33	10	NA	34
	673	146	NA	NA		33	14	NA	33
	813	ND	NA	NA		33	17	NA	33
	965	ND	1	5	6	32	20	39	32
	1168	139	NA	NA		33	18	NA	32
	1473	100	NA	NA		29	18	NA	28
	1867	ND	NA	NA		27	23	NA	27

In summary, there is some thaw weakening of the base and subgrade at Scobey/Resdstone. The thaw weakening period is for about a week. At this site, we found that the rapid increase in moisture content started when the ground temperature warmed up to around –1.5 to –1 °C.

EAST GLACIER

The base course, Figure 16 indicate that it is classified as an A-4 soil. The amount of fine material is about 84%. The subgrade, Figure 17, classifies as an A-6 material, with the percent fines in the area of 65%. Additional detail on the gradation and Atterbergs limits can be found in table A-5, Appendix A.

The mean daily temperatures and moisture contents as a function of depth are presented in Table B-5 and in Figures B-28 to B-34The critical period based on moisture content starts on April 2nd and remains critical until April 22nd. Recovery starts on April 23rd and is fully recovered after April 26th. The thaw weakening period for the base layer is approximately 3 weeks. The moisture content during the critical period is 10 % more than its non-frost value of

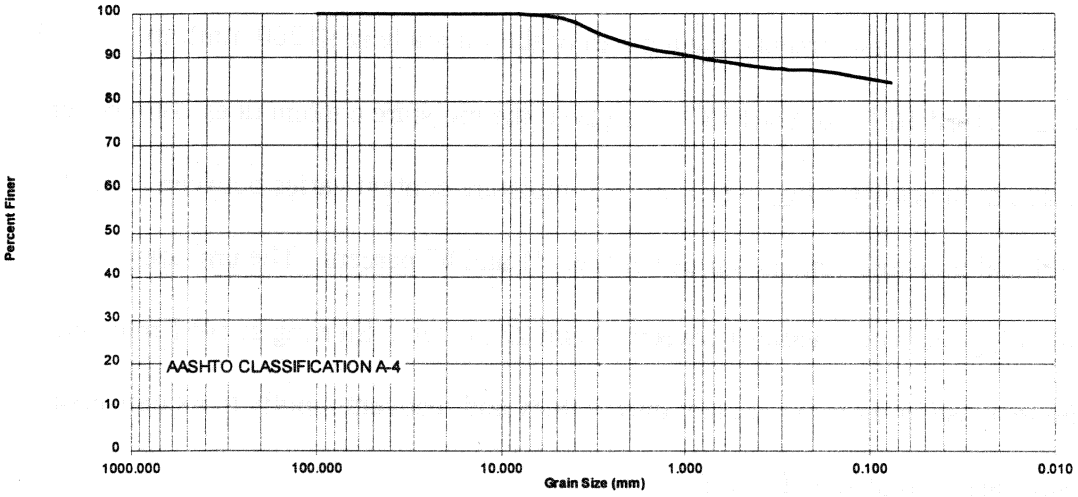


Figure 16. Base Course Gradation at East Glacier.

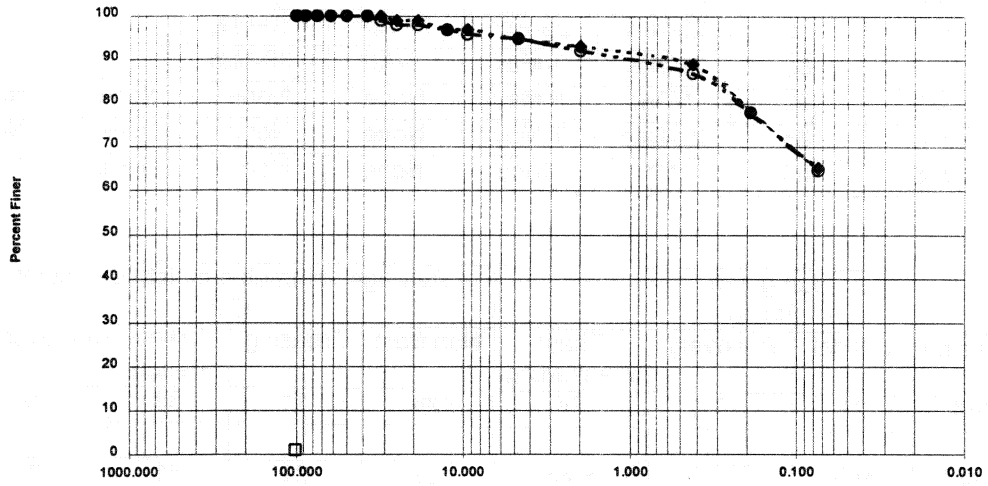


Figure 17. Subgrade Gradation at East Glacier

28%. The rapid increase in moisture content occurs when the base temperature was around –1.5 °C. No air temperature was available for this site for determining the air freezing index.

Based on the moisture measurements, the top part of the subgrade (z ≤1260 mm), the critical period starts between April 16th and April 18th. However, the moisture content does not recover to its non-frost value at the end of May. The non-frost moisture content varies between 34 and 37 percent. The critical moisture content varies between 41 and 47 percent. The unfrozen moisture content during the winter varies between 14 and 22 percent. Starting at 1461 mm and below, there is no increase in moisture content during thaw and recovers rapidly to its non-frost value. These results are tabulated in Table 8.

Table 8. Summary of freezing, thaw weakening periods and moisture contents (East Glacier)

Layer (mm)	Depth	AASHTO	% finer 200	Start of Freezing	End of Freezing	Start of Critical Period	Start of Recovery	End of Recovery	Thaw Weakening Period
Base	457	A-4	84	20-Nov	23-Apr	2-Apr	23-Apr	26-Apr	2-Apr to 26-Apr
Subgrade	737	A-6	85	21-Nov	26-Apr	16-Apr	> 30-May		
	1110	A-6	85	26-Nov	29-Apr	17-Apr	> 30-May		
	1260	A-6	85	27-Nov	3-May	18-Apr	> 30-May		
	1461	A-6	85	7-Dec	5-May	None	None	None	None
	1760	A-6	85	22-Dec	7-May	None	None	None	None
	2161	A-6	85	***	None	None	None	None	None

Layer	Depth (mm)	Length of (days)				Average volumetric moisture content (%)			
		Freezing	Critical	Recovery	Thaw Weakening	Non frost	Freezing	Critical Period	Recovered
Base	457	154	21	3	24	28	11	38	29
Subgrade	737	156	****		> 44	37	22	41	**
	1110	154	****		>43	34	14	47	**
	1260	157	****		>42	35	20	42	**
	1461	149	NA	NA	NA	38	25	NA	38
	1760	136	NA	NA	NA	39	26	NA	39
	2161	None	NA	NA	NA	40			40

In summary, moisture and temperature data from 5 sites were used to evaluate the potential for thaw weakening. These sites were limited to the northern half of Montana as data was unavailable from the southern sites either due to malfunction of instrumentation or data was not collected during the period of analysis.

Out of the five sites, the base courses mostly graded between an A-1-a and A-1-b. Although classified as granular material, the percent fines in the base varied between 8 to 15%. The exception to this was at East Glacier, where it graded out as an A-4. The subgrade at these sites were variable, ranging between an A-1-b, A-2-4, A-4 and A-6. Water table locations were not available from these sites and it was surmised that the water table was either deep or non-existent at Wolfpoint, Sweetgrass and Scobey/Redstone.

Based on the moisture content, the base course layers at Dickey Lake, Wolfpoint, Scobey/Redstone and East Glacier are prone to thaw weakening. The length of thaw weakening varied from 4 days (Scobey/Redstone) to 3 weeks (East Glacier). The top of the subgrade at Dickey Lake and East Glacier are also prone to thaw weakening also.

BACKCALCULATION OF LAYER MODULI

The current AASHTO pavement design procedure requires the effective resilient modulus of the subgrade. This effective resilient modulus is a weighted mean of the monthly resilient

modulus and is a function of the expected damage to the pavement structure. This effective resilient modulus is a single value that produces the same amount of damage to the pavement structure when compared with the damage obtained from the use of seasonal subgrade moduli.

The elastic moduli of the asphalt concrete pavement surface, base and subgrade were computed using the backcalculation routine WESDEF. This program was developed by the U.S. Army Waterways Experiment Station. Briefly, WESDEF is a five layer system, uses all the measured surface deflections, initial layer moduli and an iterative procedure to determine modulus of the surface, base and subgrade layers. The bottom layer is automatically set a rigid layer of infinite depth. Early work by WES found that they were able to obtain better closeness between measured and calculated deflections when an artificial rigid layer was placed at this depth. This location of the rigid layer can be manually over ridden. Any depth of bedrock can be used with this program. Our experience has been that the best results are obtained when the number of unknown moduli layers are limited to three. A solution is obtained when the program matches the measured to the calculated deflection. The error between the measured and calculated deflections is indicated by an absolute arithmetic (AA) sum of the difference between the two. A zero error will indicate a perfect match. An acceptable AA sum error for this study was defined to be less than 20%.

Prior to the backcalculation process, a simple error check was conducted on the deflection data. The data were checked to see if whether the six deflections starting under the center plate to the last sensor located at 1.2 m (4 feet) followed a smooth decreasing trend as the sensor spacing increased. This is based on the theory that sensors located further away from the load

picked up deflections of the deeper layers and thus should decrease away from the point of loading. Points that did not follow the decreasing trend, as determined by visual observation, were not used in the analysis.

As mentioned earlier, deflection tests and measurements obtained from the Road Rater. Surface deflections were generated by applying a steady-state dynamic loads ranging from 9 to 22 kN. Deflections were measured at distances of 0, 203, 305, 610, 914 and 1219 mm from the center of the plate. In several cases, deflections were reported at four or five of the sensor spacing. Each load was applied one time at each of the twenty-one locations in the majority of tests, except when some re-tests were done. Only the deflections obtained from the 18 kN load were used in the back-calculation, since it was the only load common to all tests.

There are many ways to use the back-calculation tool. The process is sensitive to layer thicknesses and in some programs it can be sensitive to the initial layer moduli used to start the process. Our experience with WESDEF is that it is not sensitive to the initial seed moduli. For thin asphalt layers, less than 75 mm, it has been found that back-calculated surface modulus can be in error. The usual practice is to either determine the modulus using other techniques, such as the spectral analysis of surface waves (SASW) or estimating the modulus from laboratory tests. Either of these values can then be used as a constant in the back-calculation process.

In this study all the layer moduli were back-calculated. The pavement structure was idealized as a 3 layer system. A rigid layer was placed at a depth of 6 meters with the exception of Dickey lake where bedrock was discovered at 1.5 meters. The following moduli and Poisson's

ratio were used in the process, Table 9. The rigid layer modulus was set by WESDEF at a constant value of 6895 MPa and at a Poisson's ratio of 0.5.

Table 9. Initial and Range of layer Moduli used in WESDEF

Material Type	Estimated Initial Modulus (MPa)	Minimum Modulus (MPa)	Maximum Modulus (MPa)	Poisson's ratio
Asphalt Concrete	5516	1379	27579	0.35
Base or Subbase	414	14	1379	0.35
Subgrade	140	14	1379	0.40

Other attempts were made to see if we could further reduce the error. For example, we tried assigning a surface elastic modulus and having WESDEF back-calculate only the base and subgrade moduli. The asphalt concrete modulus was estimated from the Asphalt Institute model (1982). This did not reduce the error, instead it increased the error. Another attempt was to divide the subgrade into more than one layer based on changes in moisture content or between frozen and unfrozen layers. This attempt also did not reduce the AA error. The results presented in the following tables are from the first attempt of back-calculating all layers. Based on our experience, we found that the subgrade modulus is not significantly affected by any of the methods and thus can tolerate significantly higher error. The impact is usually on the base and the asphalt concrete layers.

The results for the subgrade, base and asphalt concrete layers from Dickey Lake, East Glacier, Bull Mountain, Livingston, Swan Lake, Alzada, Wolfpoint, Scobey/Redstone, Loma and Sweetgrass are presented in Tables 10, 11 and 12 and in Figures C1 to C19 in Appendix C.

It is apparent from reviewing the results, that in many cases, testing during the critical period was missed. This is illustrated in Figures 18 and 19 for the subgrade at Dickey Lake and in the base at East Glacier respectively. However, based on the existing results, it is possible to surmise that at Alzada, Livingston, Loma and Sweetgrass there is no thaw weakening of the base and subgrade. Thaw weakening may be a problem at Bull Mountain, Wolfpoint (base), Swan Lake and Scobey/Rredstone (base). It is difficult to conclude whether thaw weakening is a critical problem based on the deflection data at Dickey Lake and East Glacier. Moisture data indicates that these two areas may be prone to thaw weakening.

Using all the back-calculated data, monthly subgrade and base course moduli were determined. When more than one monthly back-calculated moduli were available, and if the data looks reasonable, average values were used for the month. These results are presented in Tables 13 and 14.

Table 10. Back calculated layer moduli for Dickey lake, East Glacier, Bull Mountain and Livingston

Dickey Lake

Thickness (mm)	127.0	426.7	919.5	
	back-calculated modulus (MPa)			
DATE	AC	Base	Subgrade	AA (%)
16-May-96	11659.5	193.7	61.9	8.7
29-May-96	1692.8	287.8	53.4	14.7
18-Jun-96	9094.9	339.4	92.7	9.7
24-Jul-96	6398.1	459.4	133.6	25.9
17-Sep-96	8122.7	410.6	122.5	23
16-Oct-96	5779.5	528.3	79.1	33
5-Apr-97	10607.2	832.0	78.6	5.8
26-Apr-97	7915.1	287.0	92.9	5.4
11-May-97	3669.8	448.6	94.3	9.1
18-May-97	3360.0	502.0	96.5	29.1
22-Jun-97	1638.7	233.3	99.0	21.8
15-Jul-97		no solution		
12-Aug-97	4528.3	513.2	118.2	17.4

East Glacier

Thickness (mm)	76.2	584.2	5588	
	back-calculated modulus (MPa)			
DATE	AC	Base	Subgrade	AA (%)
15-May-96	34475.0	134.5	202.9	19.9
29-May-96	27580.0	103.6	179.9	19.2
19-Jun-96	27580.0	255.3	221.5	8.1
24-Jul-96	27580.0	187.0	272.9	16.9
18-Sep-96	27234.9	157.8	253.1	20.4
3-Oct-96	28357.5	158.5	270.4	20.4
26-Apr-97	27580.0	158.0	196.2	16.3
9-May-97	27580.0	163.6	198.3	17.0
21-May-97	27580.0	160.1	183.1	15.6
20-Jun-97	23526.8	148.0	168.6	16.4
15-Jul-97	30497.3	134.1	164.8	24.9
12-Aug-97	34475.0	183.2	214.3	13.1
20-Aug-97	34475.0	184.4	241.0	13.3

Bull Mountain

Thickness (mm)	254.0	431.8	5588.0	
	back-calculated modulus (MPa)			
DATE	AC	Base	Subgrade	AA (%)
23-Oct-96	1905.254	2049.925	142.2576	10
13-Nov-96	1379	5813.65	322.2447	50.4
13-Mar-97	2625.5677	1282.298	152.5795	5.2
1-Apr-97	1671.4514	872.0244	162.7772	18.8
22-Apr-97	1379	400.2616	186.1029	16.2
6-May-97	3830.1587	355.9544	200.5273	5.7
23-May-97	2576.4271	332.3666	204.4712	17.4
16-Jun-97	11518.78	715.5838	196.2731	6.8
21-Jul-97	3666.1129	157.5508	216.1583	11.6
18-Aug-97	2491.0946	372.2817	211.38	1.3

Livingston

Thickness (mm)	152.4	518.16	5588	
	back-calculated modulus (MPa)			
DATE	AC	Base	Subgrade	AA (%)
26-Nov-96	6188.9313	241.8214	121.352	12.6
12-Mar-97	1844.0815	171.2925	110.6441	18.4
1-Apr-97	5280.1358	131.9014	129.1985	3.9
22-Apr-97	5538.1743	122.2208	130.1293	1.4
6-May-97	1379	158.0541	123.3791	9.9
23-May-97	2463.0871	157.1026	133.8044	9.1
16-Jun-97	2295.642	136.5693	164.9284	10.1
24-Jul-97	1624.3655	148.7252	121.352	4.4
18-Aug-97	3564.7219	130.1087	124.0135	6.9

Table 11. Back calculated layer moduli for Swan Lake, Alzada, Wolf Point and Scobey/Redstone

Swan Lake				
Thickness (mm)	121.9	370.8	5588.0	
	back-calculated modulus (MPa)			
DATE	AC	Base	Subgrade	AA (%)
30-Apr-96	6282.2	104.1	146.3	9.8
16-May-96	8081.7	169.9	188.6	9.0
28-May-96	5035.0	142.3	175.3	12.0
17-Jun-96	2614.7	282.7	231.8	8.4
23-Jul-97	12939.3	165.5	464.8	6.2
19-Aug-96	9737.8	285.5	246.3	8.3
19-Sep-97	8990.9	279.7	228.9	17.7
17-Mar-97	2066.9	405.7	384.1	19.9
5-Apr-97	7884.0	175.6	171.4	6.9
11-May-97	5414.5	253.8	198.7	1.3
18-May-97	2549.3	280.8	204.7	3.3
23-Jun-97	2282.3	313.5	193.5	17.1
15-Jul-97	2269.0	329.8	194.2	8.6
11-Aug-97	1656.6	341.2	217.1	11.8

Alzada				
Thickness (mm)	235.0	603.3	5588.0	
	back-calculated modulus (MPa)			
DATE	AC	Base	Subgrade	AA (%)
30-Apr-96	4156.4	174.0	100.4	9.3
23-Jul-96	1908.8	118.0	106.4	15.8
12-Aug-96	1379.0	129.8	123.1	14.3
17-Sep-96	5034.1	142.3	116.4	9.6
1-Oct-96	6637.5	89.6	131.2	9.8
29-Oct-96	1379.0	650.4	67.7	8.6
8-Jan-97	3053.1	3629.7	378.5	9.4
14-Mar-97	5348.3	13790.0	238.4	8.8
2-Apr-97	1439.6	301.7	90.7	20.9
23-Apr-97	1379.0	278.8	87.6	18.9
7-May-97	2982.3	269.5	90.3	10.5
28-May-97	3858.3	187.1	101.5	7.5
13-Jun-97	1798.8	255.3	103.1	11.0
21-Jul-97	1554.6	210.6	88.5	12.7

Wolf Point				
Thickness (mm)	177.8	152.4	5588.0	
	back-calculated modulus (MPa)			
DATE	AC	Base	Subgrade	AA (%)
21-Oct-96	9498.8	79.1	84.2	4.7
4-Dec-96	1379.0	13790.0	329.3	114.6
3-Apr-97	4033.5	37.6	184.1	12.4
24-Apr-97	1379.0	486.4	89.5	8.4
8-May-97	1575.4	391.6	65.3	1.3
18-Jun-97	1379.0	161.4	73.3	8.3
19-Aug-97	1379.0	178.7	64.2	17.7

Scobey/Redstone				
Thickness (mm)	228.6	139.7	5588.0	
	back-calculated modulus (MPa)			
DATE	AC	Base	Subgrade	AA (%)
15-Mar-97	27580.0	13790.0	1488.4	54.1
3-Apr-97	4212.5	26.3	237.5	9.3
24-Apr-97	3937.5	13.8	117.8	6.1
8-May-97	5346.5	13.8	81.6	6.7
22-May-97	1379.0	108.6	53.3	5.1
19-Jun-97	1379.0	94.1	61.2	3.9
19-Aug-97	689.5	86.6	55.1	7.7

Table 12. Back calculated layer moduli for Loma and Sweetgrass.

Loma				
Thickness (mm)	152.4	685.8	5588.0	
	back-calculated modulus (MPa)			
DATE	AC	Base	Subgrade	AA (%)
4-Apr-96	10994.0	490.5	177.0	17.0
29-Apr-96	2147.7	710.4	86.2	18.1
13-May-96	3930.8	589.7	126.4	7.4
30-May-96	1379.0	329.6	120.3	20.2
20-Jun-96	6393.2	880.7	146.2	11.4
20-Aug-96	3906.2	437.3	138.4	6.3
19-Sep-96	6056.6	472.0	132.0	15.2
2-Oct-96	4095.6	444.1	127.0	10.1
21-Oct-96	2020.7	973.3	104.1	9.6
6-Dec-96	1379.0	4336.7	246.9	79.0
7-Jan-97	1379.0	6404.9	451.7	53.0
18-Mar-97	13261.1	1379.0	198.2	9.7
25-Apr-97	27580.0	2001.1	140.9	5.2
8-May-97	1379.0	657.7	126.5	9.8
22-May-97	5228.7	795.9	134.0	2.8
20-Jun-97	1734.8	671.1	136.5	9.8
17-Jul-97	4149.7	775.0	141.9	8.6
25-Jul-97	4122.4	762.2	167.8	2.1
11-Aug-97	6360.9	599.5	156.3	8.1

Sweetgrass				
Thickness (mm)	330.2	482.6	5588	
	back-calculated modulus (MPa)			
DATE	AC	Base	Subgrade	AA (%)
3-Apr-96	3332.7	1337.7	379.6	12.4
13-May-96	3043.2	593.3	66.9	3.9
30-May-96	1379.0	401.4	68.9	18.4
19-Jun-96	3446.1	311.7	78.9	5.0
24-Jul-96	1679.9	129.6	121.2	5.4
18-Sep-96	3709.6	207.6	108.6	6.2
3-Oct-96	3806.7	244.4	105.2	3.4
25-Apr-97	4153.6	198.0	89.4	2.1
9-May-97	3243.0	427.4	90.8	8.9
21-May-97	2508.8	294.8	88.5	7.9
20-Jun-97	1732.3	229.8	94.6	6.2
9-Aug-97	2518.5	995.3	58.8	3.9

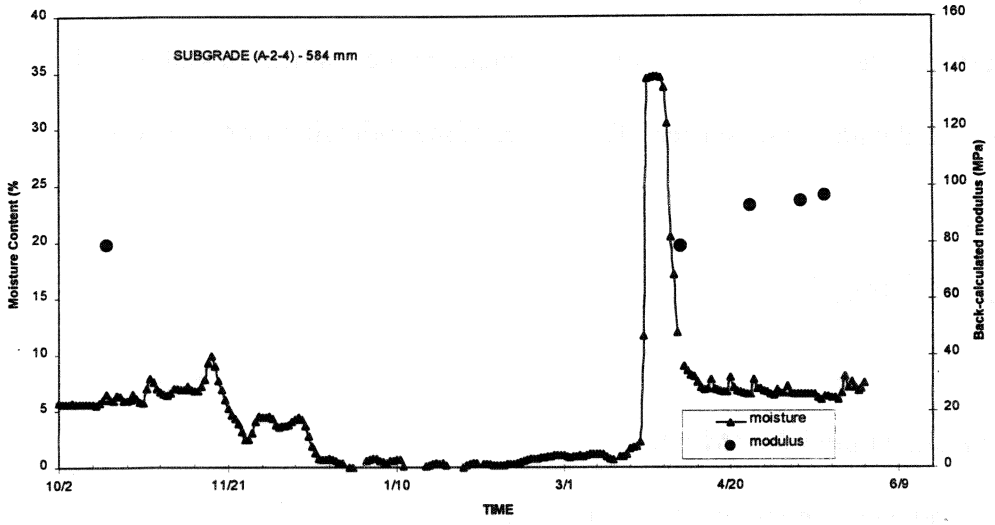


Figure 18. Back-calculated subgrade modulus and moisture content as function of time.

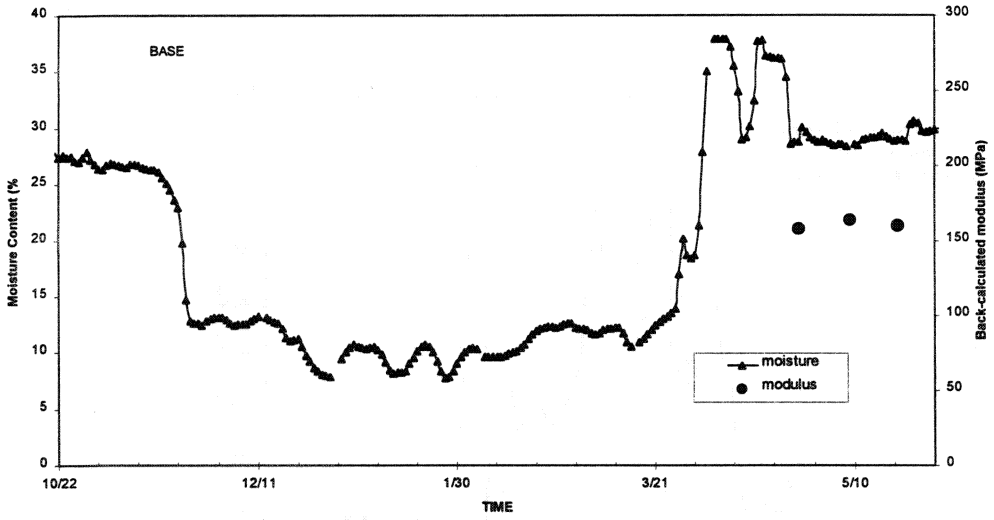


Figure 19. Back-calculated base modulus and moisture content as function of time

The missing monthly subgrade moduli could be estimated from trying to fit a model to the field data. An example of this procedure is shown in Figures 20 and 21. The model attempted to account for the effect of temperature and moisture content on the resilient modulus of the subgrade at Dickey Lake and East Glacier. The model of the following form was used;

$$M_r = k_1(T_{ref} - T)^{k_2}(\omega_{vol})^{k_3}$$

where M_r = resilient modulus (MPa).

T_{ref} = reference temperature (20 °C).

T = temperature (°C).

ω_{vol} = volumetric moisture content at top of subgrade (%)

k_1, k_2, k_3 = constants.

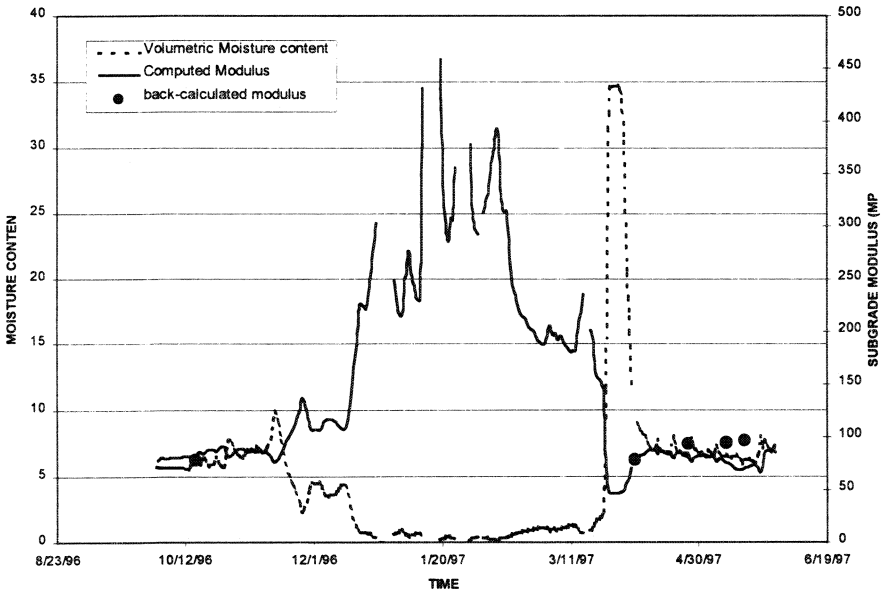


Figure 20. Results of prediction of subgrade modulus, Dickey Lake.

For Dickey Lake (A-2-4 soil), a good fit was found when the following constants were used; k_1 = 105, k_2 = 0.2 and k_3 = - 0.4. Note that this model indicates a reduction in the subgrade modulus as the moisture content increases during the spring thaw period. The model predicts a subgrade modulus of approximately 47 MPa. The non-frost and recovered modulus is around 90 MPa. During the winter, the model predicts the subgrade modulus to average around 350 MPa. For East Glacier, the model also predicts a reduction in the subgrade modulus, as indicated by the field measurements, Figure 21. The reduction is approximately 50% of its non-frost value. For East Glacier (A-6 soil), k_1 = 200, k_2 = 0.7 and k_3 = - 0.7.

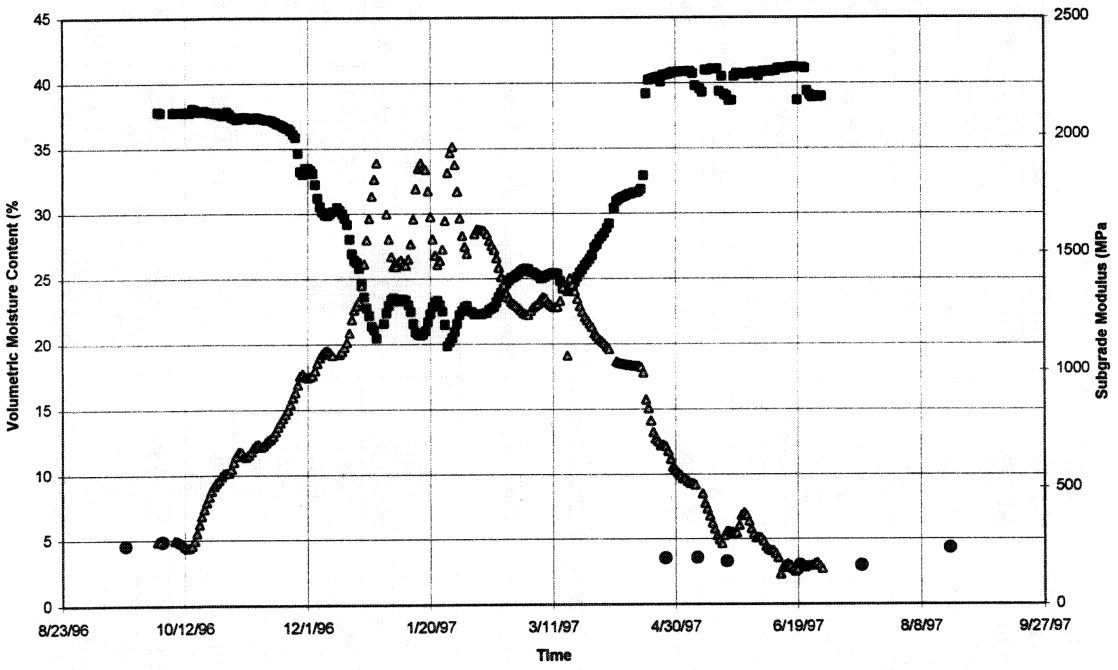


Figure 21. Results of prediction of subgrade modulus, East Glacier.

Table 13. Average Monthly Subgrade Moduli

	Dickey Lake	Bull Mtn	Swan Lake	Wolf Point	Loma	East Glacier	Livingston	Alzada	Scobey/Redstone	Sweetgrass
Month	A-2-4/A-4	A-4	A-1	A-6	A-1	A-4	A-1	A-6	A-6	A-6
January	No Data	No Data	No Data	No Data	452	No Data	No Data	379	No Data	No Data
February	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No data	No Data	No Data
March	No Data	153	384	No Data	198	No Data	111	238	1488	No Data
April	86	174	159	137	135	196	130	93	178	235
May	77	202	192	65	127	191	129	96	100	79
June	96	196	213	73	141	195	165	103	61	87
July	134	216	194	No Data	155	219	121	97	No Data	121
August	118	211	232	64	147	228	124	123	55	59
September	122	No Data	229	No Data	132	253	No Data	116	No Data	109
October	79	142	No Data	84	77	270	No Data	99	No Data	No Data
November	No Data	322	No Data	No Data	No Data	No Data	121	No data	No Data	No Data
December	No Data	No Data	No Data	329	247	No Data	No Data	No data	No Data	No Data

Table 14. Average Monthly Base Course Moduli

	Dickey Lake	Bull Mtn	Swan Lake	Wolf Point	Loma	East Glacier	Livingston	Alzada	Scobey/Redstone	Sweetgrass
Month										
January	No Data	No Data	No Data	No Data	6405	No Data	No Data	3630	No Data	No Data
February	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No data	No Data	No Data
March	No Data	1282	406	No Data	1379	No Data	171	13790	13790	No Data
April	560	636	140	262	1067	158	127	251	20	768
May	358	344	212	392	593	140	158	228	14	429
June	286	716	298	161	776	202	137	255	94	271
July	459	158	330	No Data	769	161	149	164	No Data	130
August	513	372	313	179	518	184	130	130	87	995
September	411	No Data	280	No Data	472	158	No Data	142	No Data	208
October	528	2050	No Data	79	472	158	No Data	370	No Data	No Data
November	No Data	5814	No Data	No Data	No Data	No Data	242	No data	No Data	No Data
December	No Data	No Data	No Data	13790	4337	No Data	No Data	No data	No Data	No Data

Similar models for other soils could be developed if sufficient data becomes available in the future.

The monthly subgrade modulus and relative damage for the test sites are presented in Tables 15 and 16. For the months where back-calculated subgrade modulus is unavailable, a best guess is used based on existing data and from the models. It was found that when the winter resilient modulus was increased by a factor of 5 the effect on the relative damage was insignificant. Subsequently, the effective resilient modulus only increased by approximately 10%. However, these results should be validated with additional FWD testing. For design, the following effective subgrade resilient modulus can be used, Table 16.

Table 17. Effective Subgrade Resilient Modulus.

Location	M_r (MPa)
Alzada	2600 (18000)
Bull Mountain	4300 (29700)
Livingston	2900 (20100)
Wolfpoint	1945 (13400)
Swan Lake	5000 (34500)
Loma	2900 (20100)
East Glacier	5700 (39300)
Sweetgrass	2360 (16300)
Scobey/Redstone	1635 (11250)
Dickey Lake	2200 (15400)

Number in paranthesis is M_r in psi.

Table 15. Monthly Soil Modulus and Relative Damages for Alzada, Bull Mountain, Livingston., Wolfpoint and Swan Lake

	Alzada		Bull Mtn		Livingston		Wolfpoint		Swan Lake	
	Mr	uf	Mr	uf	Mr	uf	Mr	uf	Mr	uf
January	379	0.0012	325	0.0017	300	0.00204	300	0.0020	400	0.0010
February	379	0.0012	325	0.0017	300	0.00204	300	0.0020	400	0.0010
March	238	0.0035	153	0.0098	111	0.02067	150	0.0102	384	0.0012
April	93	0.0310	174	0.0072	130	0.01431	137	0.0126	159	0.0089
May	96	0.0288	202	0.0051	129	0.01459	65	0.0702	192	0.0058
June	103	0.0243	196	0.0055	165	0.00819	73	0.0537	213	0.0045
July	97	0.0277	216	0.0044	121	0.01668	73	0.0537	194	0.0056
August	123	0.0161	211	0.0046	124	0.01586	64	0.0732	232	0.0037
September	116	0.0184	211	0.0046	121	0.01680	71	0.0526	229	0.0038
October	99	0.0265	142	0.0115	121	0.01680	84	0.0389	229	0.0038
November	150	0.0102	322	0.0017	121	0.01668	200	0.0052	350	0.0014
December	379	0.0012	325	0.0017	300	0.00204	329	0.0016	400	0.0010
Summation		0.1901		0.0595		0.1467		0.3761		0.0419
Average		0.0158		0.0050		0.0122		0.0313		0.0035
Mr		2610 kPa		4306 kPa		2919 kPa		1945 kPa		5007 kPa
		17998 psi		29690 psi		20124 psi		13411 psi		34521 psi

Table 16. Monthly Soil Modulus and Relative Damages for Loma, East Glacier, Sweetgrass, Scobey/Redstone and Dickey Lake.

	Loma		East Glacier		Sweetgrass		Scobey/Redstone		Dickey Lake	
	Mr	uf	Mr	uf	Mr	uf	Mr	uf	Mr	uf
January	452	0.0008	2000	0.0000	300	0.0020	400	0.0010	*287*	0.0023
February	452	0.0008	2000	0.0000	300	0.0020	400	0.0010	*271*	0.0026
March	198	0.0053	1500	0.0000	235	0.0036	200	0.0052	*193*	0.0057
March									*119*	0.0175
April	135	0.0131	196	0.0055	235	0.0036	178	0.0069	86	0.0373
May	127	0.0151	191	0.0058	79	0.0455	67	0.0662	77	0.0486
June	141	0.0117	195	0.0055	87	0.0364	61	0.0816	96	0.0288
July	155	0.0095	219	0.0042	121	0.0167	61	0.0816	134	0.0133
August	147	0.0106	228	0.0039	59	0.0896	55	0.1043	118	0.0177
September	132	0.0137	253	0.0030	109	0.0216	55	0.1043	122	0.0163
October	77	0.0479	270	0.0026	150	0.0102	55	0.1043	79	0.0451
November	130	0.0142	800	0.0002	200	0.0052	200	0.0052	*96*	0.0287
December	247	0.0032	1000	0.0001	300	0.0020	400	0.0010	*159*	0.0089
Summation		0.1459		0.0310		0.2385		0.5629		0.2729
Average		0.0122		0.0026		0.0199		0.0469		0.0227
Mr		2925 kPa		5701 kPa		2367 kPa		1635 kPa		2233 kPa
		20170 psi		39309 psi		16320 psi		11272 psi		15400 psi

Summary & Recommendations

In summary, Road Rater deflection, moisture and temperature data were collected from several sites in Montana and were used to evaluate the potential for thaw weakening. The pavement structure consisted of variable thicknesses of asphalt concrete, base over different kinds of subgrade. The base courses mostly graded between an A-1-a and A-1-b. The exception was East Glacier where the base course was classified as an A-4 soil. The percent fines in the base (except for East Glacier) varied between 8 to 15%. The subgrade at these sites were variable, ranging between an A-1-b, A-2-4, A-4 and A-6. Water table locations were not available from these sites.

Due to instrumentation malfunction or problems with data collection, moisture and temperature data were limited to the northern half of the state. The deflection data taken was poor and appeared to miss the critical spring thaw period. This poor data is more due to the limitations of the system with respect to load application. The highest deflections in most cases were in the 6 to 8 mil range. The highest load used was 18 kN (4 kips).

Based on the moisture data, the base course layers at Dickey Lake, Wolfpoint, Scobey/Redstone and East Glacier are prone to thaw weakening. Deflection data indicate that the base at Bull Mountain, Swan Lake and Scobey Redstone may be prone to thaw weakening. The subgrade at Dickey Lake, East Glacier, Bull Mountain, Swan Lake and Scobey/Redstone may also be prone to thaw weakening. The length of thaw weakening varied from 4 days (Scobey/Redstone) to 3 weeks (East Glacier).

Based on the limited deflection data, tenative recommendation for effective subgrade modulus is provided. These values should be validated with additional Falling Weight Deflection testing. These tests should be conducted using the Strategic Highway Research Highway (SHRP) protocol. In addition, prior to any testing, the FWD should be calibrated. The numbers of sites could be reduced and more testing should be conducted during the spring thaw period.

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Asphalt Institute (1982), Research & development of Asphalt Institute's Thickness Design Manual (MS-1), 9th edition, Research Report No. 82-2.

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Janoo, Vincent C. and Richard L. Berg. "PCC Airfield Pavement Response During Thaw-Weakening Periods: A Field Study, US Army Corps of Engineers CRREL Special Report 96-12, May 1996.

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Janoo, V.C., J. Bayer, Jr., G. Durell, and C. Smith, Jr., "Resilient Modulus of New Hampshire Subgrade Soils for use in AASHTO Mechanistic Design", CRREL Special Report 99-XX, August 1999.

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APPENDIX A – GRAIN SIZE DISTRIBUTION

Table A-1. Gradation characteristics for base and subgrade at Dickey Lake

Structure:	5.0"	127 mm	AC						
	17"	432 mm	crushed BC						
Grain Size									
				Subgrade			Base		
Depth (inches)		23	32	46	57.8	63	0 to 6 "	6' to 12 "	12" to 17"
Depth (mm)		584	813	1168	1468	1600	0 to 152 mm	152 to 305 mm	305 to 432 mm
US Sieve Designation	mm			Percent Finer					
4	**101.600**	100	100	100	100	100	100	100	100
3.5	**88.900**	100	100	100	100	100	100	100	100
3	**76.200**	100	100	100	100	100	100	100	100
2.5	**63.500**	100	100	100	100	100	100	100	100
2	**50.800**	100	100	100	100	100	100	100	100
1.50	**38.100**	100	100	100	100	100	100	100	100
1.25	**31.750**	91	100	100	96	100	100	98	96
1.00	**25.400**	91	100	90	92	91	99	91	93
0.75	**19.050**	89	94	87	78	87	94	87	85
0.50	**12.700**	80	89	80	70	79	82	75	71
0.38	**9.525**	73	85	73	65	74	71	68	62
4	**4.750**	60	77	60	57	69	53	50	42
10	**2.000**	48	65	48	46	57	36	33	28
40	**0.425**	35	48	33	32	40	20	17	15
80	**0.190**	30	41	27	25	33	16	14	12
200	**0.075**	27.5	37.3	23.5	18.3	27.7	13.2	11.3	9.6
Liquid Limit		19	22	22	22	20	NP	NP	NP
Plastic Limit		NP	20	20	19	18	NP	NP	NP
Plasticity Index		NP	2	2	3	2	NP	NP	NP
AASHTO class		A-2-4 (0)	A-4 (0)	A-1-b (0)	A-1-b (0)	A-2-4 (0)	A-1-a(0)	A-1-a(0)	A-1-a(0)

Table A-2. Gradation characteristics for base and subgrade at Wolfpoint

Structure:	6.0"	152 mm	AC				
	6"	152 mm	crushed BC				
Grain Size							
				Subgrade			Base
Depth (inches)		Top 24 "	Below 24"	60	Top 36"	0 to 6 "	0 to 6 "
Depth (mm)		610	>610 mm	1524	914	0 to 152 mm	0 to 152 mm
US Sieve Designation	mm			Percent Finer			
4	**101.600**						
3.5	**88.900**						
3	**76.200**						
2.5	**63.500**			100			
2	**50.800**			98	100	100	100
1.50	**38.100**	100	100	98	99	100	97
1.25	**31.750**	99	100	95	99	100	95
1.00	**25.400**	98	99	93	97	99	92
0.75	**19.050**	98	99	92	96	92	87
0.50	**12.700**	97	97	90	94	80	75
0.38	**9.525**	96	97	89	93	68	65
4	**4.750**	95	95	87	91	50	47
10	**2.000**	92	93	86	89	42	39
40	**0.425**	87	89	82	85	33	32
80	**0.190**	78	78	71	72	16	22
200	**0.075**	64.8	65.2	61.2	56.2	11.9	15.4
Liquid Limit		35	35	46	47	NP	20
Plastic Limit		16	16	19	21	NP	NP
Plasticity Index		19	19	27	26	NP	NP
AASHTO class		A-6 (10)	A-6 (10)	A-7-6 (14)	A-7-6 (12)	A-1-b(0)	A-1-b(0)

Table A-3. Gradation characteristics for base and subgrade at Sweetgrass

Structure:	13.0"	330 mm	AC				
	19"	483 mm	crushed BC				
Grain Size							
					Base	Base	Base
Depth (inches)		24 " - 63"	36" - 60"	0 to 6 "	6 to 24 "	6 to 24 "	12 to 18 "
Depth (mm)		610 - 1600	914 -1524 mm	0 to 152 mm	152 to 610 mm	152 to 610 mm	305 to 457 mm
US Sieve Designation	mm						
4	**101.600**						
3.5	**88.900**						
3	**76.200**						
2.5	**63.500**				100		
2	**50.800**	100	100		98		
1.50	**38.100**	99	99	100	94	100	100
1.25	**31.750**	99	98	99	92	95	93
1.00	**25.400**	99	96	96	86	88	88
0.75	**19.050**	99	94	88	79	77	82
0.50	**12.700**	98	92	76	68	69	70
0.38	**9.525**	97	91	71	62	63	65
4	**4.750**	96	89	56	50	50	52
10	**2.000**	92	79	42	42	40	42
40	**0.425**	85	69	20	26	19	33
80	**0.190**	80	62	11	18	12	16
200	**0.075**	68.2	46.7	7.5	13.4	8.8	11.8
Liquid Limit		36	29	NP	27	NP	21
Plastic Limit		21	24	NP	23	NP	NP
Plasticity Index		15	5	NP	4	NP	NP
AASHTO class		A-6 (9)	A-4 (10)	A-1-a(0)	A-1-a(0)	A-1-a(0)	A-1-b(0)

Table A-4. Gradation characteristics for base and subgrade at Scobey/Redstone

Structure:	5.0"	127 mm	AC	
	17"	432 mm	crushed BC	
Grain Size				
			Subgrade	Base
Depth (inches)		24	32	
Depth (mm)		610	813	
US Sieve Designation	mm		Percent Finer	
4	**101.600**	100	100	100
3.5	**88.900**	100	100	100
3	**76.200**	100	100	100
2.5	**63.500**	100	100	100
2	**50.800**	100	100	100
1.50	**38.100**	100	100	97
1.25	**31.750**	99	100	95
1.00	**25.400**	98	99	92
0.75	**19.050**	98	99	87
0.50	**12.700**	97	97	75
0.38	**9.525**	96	97	65
4	**4.750**	95	95	47
10	**2.000**	92	93	39
40	**0.425**	87	89	32
80	**0.190**	78	78	22
200	**0.075**	64.8	65.2	15.4
Liquid Limit		35	35	20
Plastic Limit		16	16	NP
Plasticity Index		19	19	NP
AASHTO class		A-6 (10)	A-6 (10)	A-1-b(0)

Table A-5. Gradation characteristics for base and subgrade at East Glacier.

Structure:	5.0"	127 mm	AC
	17"	432 mm	crushed BC

Grain Size

			Subgrade	Base
Depth (inches)		24	32	
Depth (mm)		610	813	
US Sieve Designation	mm		Percent Finer	
4	**101.600**	100	100	100
3.5	**88.900**	100	100	100
3	**76.200**	100	100	100
2.5	**63.500**	100	100	100
2	**50.800**	100	100	100
1.50	**38.100**	100	100	100
1.25	**31.750**	99	100	100
1.00	**25.400**	98	99	100
0.75	**19.050**	98	99	100
0.50	**12.700**	97	97	100
0.38	**9.525**	96	97	100
4	**4.750**	95	95	99
10	**2.000**	92	93	93
40	**0.425**	87	89	88
80	**0.190**	78	78	87
200	**0.075**	64.8	65.2	84.2
Liquid Limit		35	35	29
Plastic Limit		16	16	21
Plasticity Index		19	19	8
AASHTO class		A-6 (10)	A-6 (10)	A-4(6)

APPENDIX B

Temperature – Moisture Data

Dickey Lake

Table B-1. Moisture Temperature distibution as a function of time and depth at Dickey Lake

	Temperaure						Volumetric Moisture Content					
	Air	Base	Subgrade				Base		Subgrade			
		292 mm	584 mm	813 mm	940 mm	1168 mm	1468 mm	292 mm	584 mm	813 mm	940 mm	1168 mm	1468 mm
10/1/96	11.39	13.05	12.53	13.01	11.75	11.71	13.22	5.32	5.74	20.62	13.56	4.18	11.21
10/2/96	5.83	11.80	12.10	13.11	11.97	11.87	13.31	5.23	5.73	20.62	13.64	4.15	11.24
10/3/96	8.89	11.54	11.65	12.89	11.99	11.94	13.38	5.22	5.67	20.60	13.61	4.15	11.22
10/4/96	8.61	11.72	11.70	12.82	11.91	11.93	13.38	5.23	5.66	20.57	13.62	4.12	11.25
10/5/96	12.78	12.14	11.88	12.83	11.89	11.89	13.35	5.27	5.66	20.51	13.62	4.11	11.22
10/6/96	7.50	11.47	11.69	12.86	11.89	11.88	13.33	5.26	5.70	20.53	13.62	4.09	11.18
10/7/96	6.94	11.36	11.46	12.72	11.85	11.86	13.31	5.30	5.67	20.51	13.59	4.07	11.14
10/8/96	9.17	11.29	11.41	12.63	11.76	11.79	13.27	5.25	5.67	20.50	13.61	4.03	11.14
10/9/96	10.00	11.30	11.35	12.56	11.69	11.73	13.22	5.23	5.68	20.52	13.61	4.01	11.20
10/10/96	10.00	11.51	11.41	12.53	11.62	11.68	13.14	5.20	5.65	20.48	13.55	4.05	11.11
10/11/96	9.17	11.55	11.55	12.57	11.60	11.62	13.11	5.18	5.65	20.46	13.64	4.01	11.11
10/12/96	8.06	10.92	11.24	12.51	11.60	11.60	13.08	5.11	5.62	20.45	13.53	3.87	11.08
10/13/96	8.33	10.72	10.95	12.30	11.50	11.55	13.03	5.15	5.57	20.51	13.49	3.86	11.09
10/14/96	8.06	10.12	10.68	12.17	11.37	11.44	12.95	5.23	5.69	20.49	13.52	3.99	11.17
10/15/96	5.00	8.92	9.80	11.80	11.21	11.35	12.88	5.29	6.07	20.50	13.52	6.28	13.09
10/16/96	1.39	7.87	9.12	11.35	10.91	11.15	12.74	5.33	6.49	20.51	13.61	7.83	14.54
10/17/96	-2.50	5.53	7.59	10.60	10.51	10.91	12.56	5.25	6.06	20.48	13.64	6.77	13.51
10/18/96	3.33	5.55	6.86	9.74	9.90	10.53	12.28	5.32	5.93	20.41	13.62	6.34	13.20
10/19/96	-5.56	4.85	6.26	9.24	9.38	10.06	11.92	5.28	6.43	20.40	13.60	8.49	15.38
10/20/96	-7.78	4.37	5.69	8.68	8.86	9.64	11.56	5.38	6.29	20.39	13.60	7.62	14.11
10/21/96	-7.22	4.30	5.51	8.27	8.44	9.26	11.24	5.34	5.88	20.34	13.55	6.50	13.45
10/22/96	-6.94	4.18	5.29	7.98	8.07	8.91	10.93	5.30	5.91	20.36	13.55	6.42	13.46
10/23/96	-6.94	3.39	4.76	7.63	7.74	8.59	10.64	5.26	5.99	20.37	13.56	6.67	13.40
10/24/96	-5.83	3.19	4.16	7.22	7.38	8.19	10.28	5.53	6.54	20.40	13.64	9.02	16.14
10/25/96	-5.83	3.14	4.17	6.93	7.03	7.92	10.04	5.75	6.13	20.40	13.60	7.30	13.91
10/26/96	-5.83	2.94	4.02	6.72	6.78	7.67	9.81	5.61	5.81	20.38	13.68	6.45	13.45
10/27/96	-5.83	2.53	3.77	6.48	6.53	7.42	9.58	5.53	5.70	20.31	13.55	6.01	13.18
10/28/96	-5.83	2.37	3.15	6.16	6.24	6.98	9.14	6.17	6.98	20.38	13.66	9.39	18.40
10/29/96	-5.83	2.68	3.24	5.89	5.84	6.49	8.70	7.05	7.85	22.28	14.71	10.74	17.26
10/30/96	-7.50	1.36	2.87	5.72	5.70	6.54	8.76	6.63	7.57	22.42	14.66	8.76	14.62
10/31/96	-5.28	0.59	2.10	5.26	5.45	6.40	8.64	6.07	7.05	21.97	14.34	7.71	14.14
11/1/96		0.33	1.73	4.84	5.09	6.14	8.42	5.88	6.73	21.75	14.13	7.32	13.97

		Temperaure						Volumetric Moisture Content					
	Air	Base		Subgrade				Base			Subgrade		
		292 mm	584 mm	813 mm	940 mm	1168 mm	1468 mm	292 mm	584 mm	813 mm	940 mm	1168 mm	1468 mm
11/2/96		0.30	1.46	4.51	4.75	5.84	8.16	5.74	6.56	21.64	14.08	7.12	13.82
11/3/96		0.76	1.58	4.32	4.47	5.55	7.91	5.84	6.46	21.61	14.29	7.24	13.86
11/4/96		0.89	1.68	4.33	4.30	5.27	7.61	6.02	6.62	21.48	14.16	8.55	15.65
11/5/96		0.51	1.36	4.18	4.12	5.05	7.40	6.17	7.01	21.61	14.40	9.38	15.57
11/6/96		0.36	1.25	4.02	3.97	4.88	7.24	6.24	7.05	21.84	14.40	9.73	16.44
11/7/96		0.00	0.97	3.85	3.80	4.71	7.06	6.21	6.94	21.78	14.39	8.99	15.15
11/8/96		0.04	0.82	3.65	3.62	4.55	6.91	6.13	6.89	21.74	14.34	9.53	16.31
11/9/96		0.95	1.11		3.44	4.31	6.69	6.16	7.22		14.58	9.92	16.14
11/10/96		1.18	1.66		3.44	4.28	6.63	6.20	6.93		14.36	8.55	14.68
11/11/96		1.58	1.79	3.89	3.50	4.28	6.61	6.23	6.81	21.95	14.25	7.72	14.28
11/12/96		1.69	2.05	4.03	3.55	4.30	6.60	5.99	6.85	21.83	14.19	7.24	14.01
11/13/96		1.78	2.10	4.12	3.62	4.30	6.53	6.08	7.24	21.79	14.19	8.42	15.48
11/14/96		1.58	1.97	4.14	3.63	4.21	6.42	6.25	7.79	22.01	14.46	10.14	17.04
11/15/96		0.77	1.59	4.04	3.54	4.05	6.26	6.21	9.30	22.84	17.72	11.44	19.28
11/16/96		-0.38	0.83	3.64	3.33	3.95	6.20	6.07	9.84	23.22	19.76	11.16	18.01
11/17/96		-0.86	0.29	3.22	3.11	3.92	6.20	5.10	9.00	22.66	16.15	9.25	15.11
11/18/96		-0.98	0.04	2.94	2.87	3.76	6.10	4.87	7.73	22.10	14.84	8.09	14.37
11/19/96		-1.24	-0.17	2.73	2.65	3.57	5.95	4.42	6.88	21.75	14.50	7.44	14.16
11/20/96		-1.59	-0.49	2.50	2.44	3.38	5.78	4.01	6.00	21.37	14.19	7.05	13.97
11/21/96		-2.12	-0.81	2.27	2.22	3.18	5.61	0.60	5.20	21.03	14.02	6.66	13.79
11/22/96		-2.64	-1.15	2.01	1.99	2.98	5.43		4.69	20.68	13.90	6.46	13.61
11/23/96		-3.15	-1.45	1.76	1.76	2.76	5.26		4.32	20.32	13.73	6.17	13.45
11/24/96		-3.39	-1.71	1.52	1.53	2.55	5.07		3.83	20.06	13.57	5.80	13.21
11/25/96		-3.13	-1.87	1.31	1.30	2.33	4.87		3.13	19.85	13.49	5.57	12.96
11/26/96		-3.02	-1.94	1.16	1.11	2.14	4.70		2.42	19.73	13.35	5.07	12.64
11/27/96		-2.62	-1.94	1.06	0.98	1.97	4.53		2.49	19.69	13.25	4.76	12.31
11/28/96		-2.26	-1.88	1.02	0.84	1.81	4.38		3.07	19.67	13.10	4.46	11.96
11/29/96		-2.03	-1.83	1.00	0.77	1.71	4.28	0.32	4.04	19.65	13.01	4.22	11.62
11/30/96		-1.98	-1.79	0.99	0.72	1.64	4.17	0.31	4.57	19.71	12.95	3.97	11.35
12/1/96		-2.09	-1.74	0.97	0.67	1.55	4.09	0.20	4.47	19.70	12.97	3.83	11.15
12/2/96	-3.33	-2.05	-1.72	0.95	0.63	1.46	4.00	0.14	4.46	19.72	12.95	3.70	11.03
12/3/96	-1.11	-2.11	-1.67	0.96	0.62	1.42	3.95	0.00	4.51	19.75	12.96	3.63	10.94
12/4/96	-3.61	-2.46	-1.68	0.95	0.59	1.39	3.90		4.33	19.72	12.93	3.68	10.90
12/5/96	-5.28	-2.72	-1.91	2.50	0.32	1.06	3.54		3.74	20.98	12.98	3.67	10.87

	Temperaure							Volumetric Moisture Content					
	Air	Base	Subgrade					Base	Subgrade				
		292 mm	584 mm	813 mm	940 mm	1168 mm	1468 mm	292 mm	584 mm	813 mm	940 mm	1168 mm	1468 mm
12/6/96	-6.39	-2.64	-2.06	0.55	0.09	0.76	3.26		3.56	19.69	13.03	3.66	10.88
12/7/96	-2.50	-2.51	-2.06	0.50	0.04	0.72	3.19		3.61	19.65	12.95	3.61	10.83
12/8/96	-4.44	-2.45	-2.05	0.50	0.00	0.67	3.13		3.63	19.65	12.95	3.46	10.74
12/9/96	-5.28	-2.30	-2.03	0.50	-0.03	0.63	3.08	0.02	3.75	19.64	12.92	3.43	10.65
12/10/96	-0.56	-2.21	-2.00	0.50	-0.06	0.60	3.05	0.31	4.00	19.67	12.94	3.33	10.61
12/11/96	0.00	-2.17	-2.00	0.50	-0.06	0.56	3.01	0.58	4.23	19.72	12.92	3.31	10.58
12/12/96	-1.67	-2.25	-1.99	0.49	-0.11	0.51	2.96	0.38	4.42	19.73	12.91	3.30	10.50
12/13/96	-2.22	-2.76	-1.98	0.47	-0.11	0.50	2.93		4.29	19.74	12.95	3.27	10.51
12/14/96	-6.94	-3.02	-2.08	0.43	-0.14	0.45	2.89		3.63	19.65	12.96	3.32	10.52
12/15/96	-6.11	-3.28	-2.19	0.36	-0.17	0.42	2.83		2.75	19.59	12.91	3.31	10.53
12/16/96	-6.39	-3.33	-2.31	0.29	-0.23	0.36	2.79		1.87	19.47	12.90	3.28	10.50
12/17/96	-6.11	-5.31	-2.78	0.22	-0.30	0.29	2.76		1.25	19.25	12.86	3.21	10.46
12/18/96	-13.06	-6.27	-3.70	0.06	-0.40	0.25	2.69		0.83	18.59	12.80	3.09	10.37
12/19/96	-13.33	-5.77	-3.96	-0.11	-0.53	0.15	2.60		0.72	18.09	12.72	3.02	10.29
12/20/96	-11.67	-4.80	-3.74	-0.20	-0.66	0.02	2.53		0.74	17.89	12.58	2.91	10.17
12/21/96	-8.33	-4.74	-3.62	-0.28	-0.76	-0.08	2.43		0.77	17.80	12.54	2.78	10.05
12/22/96	-6.39	-5.83	-4.16	-0.34	-0.82	-0.16	2.33		0.67	17.78	12.45	2.69	9.95
12/23/96	-12.22	-7.08	-4.91	-0.42	-0.90	-0.23	2.27		0.56	17.61	12.38	2.57	9.88
12/24/96	-12.78	-8.10	-5.66	-0.54	-1.00	-0.33	2.19		0.43	17.16	12.31	2.53	9.75
12/25/96	-15.00	-9.05	-6.43	-0.76	-1.13	-0.44	2.09		0.36	12.88	12.16	2.40	9.58
12/26/96	-15.56	-10.61	-7.60	-1.18	-1.27	-0.56	1.99			7.85	11.98	2.22	9.46
12/27/96	-20.00	-9.99	-7.79	-1.70	-1.43	-0.70	1.88		0.01	6.16	11.77	2.09	9.29
12/28/96	-18.06	-10.15	-7.92	-2.05	-1.61	-0.83	1.75		0.00	5.58	11.51	1.97	9.13
12/29/96	-16.94	-10.58	-8.31	-2.40	-1.73	-0.98	1.65			5.21	11.42	1.82	8.94
12/30/96	-16.11												
12/31/96	-14.17												
1/1/97	-4.17	-3.62	-4.14	-1.78	-2.07	-1.43	1.22		0.57	5.39	10.89	1.26	8.36
1/2/97	1.39	-2.89	-3.34	-1.41	-2.10	-1.51	1.12		0.67	5.87	10.90	1.06	8.17
1/3/97	2.50	-2.62	-2.99	-1.19	-2.06	-1.55	1.06		0.79	6.28	11.43	1.02	8.04
1/4/97	1.11	-3.10	-3.00	-1.07	-2.06	-1.56	1.06		0.81	6.61	11.64	1.04	8.09
1/5/97	-5.83	-4.54	-3.68	-1.09	-2.04	-1.55	1.06		0.59	6.70	11.42	0.99	8.07
1/6/97	-9.17	-5.91	-4.68	-1.33	-2.02	-1.53	1.06		0.53	6.24	11.02	1.03	8.05
1/7/97	-10.83	-5.17	-4.72	-1.62	-2.05	-1.54	1.06		0.44	5.80	10.93	1.07	8.13
1/8/97	-8.06	-4.34	-4.22	-1.58	-2.09	-1.56	1.03		0.57	5.80	11.67	1.04	8.10

	Temperaure						Volumetric Moisture Content					
	Air	Base	Subgrade				Base	Subgrade				
		292 mm	584 mm	813 mm	940 mm	1168 mm	1468 mm	292 mm	584 mm	813 mm	940 mm	1168 mm	1468 mm
1/9/97	-2.50	-3.58	-3.69	-1.43	-2.11	-1.60	1.00		0.60	6.01	12.15	1.01	8.03
1/10/97	-0.83	-3.08	-3.28	-1.26	-2.11	-1.61	0.96		0.67	6.22	12.36	1.06	8.01
1/11/97	-0.56	-3.61	-3.22	-1.14	-2.08	-1.61	0.94		0.68	6.41	12.56	1.01	7.99
1/12/97	-3.06	-8.75	-5.63	-1.38	-2.06	-1.61	0.94		0.15	6.14	12.81	1.09	8.00
1/13/97	-18.89	-11.97	-8.55	-2.54	-2.12	-1.62	0.94	0.09		5.06	12.15	1.04	8.09
1/14/97	-21.39	-13.51	-10.24	-3.64	-2.33	-1.68	0.88			4.28	8.62	0.97	8.00
1/15/97	-21.94	-12.90	-10.64	-4.42	-2.79	-1.80	0.77			3.81	6.14	0.87	7.85
1/16/97	-19.44	-13.22	-10.81	-4.81	-3.38	-2.01	0.59			3.65	5.13	0.68	7.54
1/17/97	-19.44	-11.89	-10.63	-5.23	-4.10	-2.25	0.35	0.12		3.44	4.46	0.34	7.13
1/18/97	-18.61	-9.41	-9.12	-5.05	-4.64	-2.69	0.11			3.50	4.14		6.49
1/19/97	-9.17	-6.97	-7.45	-4.48	-4.74	-3.28	-0.14		0.13	3.59	4.00		5.71
1/20/97	-6.39	-5.49	-5.97	-3.70	-4.48	-3.53	-0.35		0.24	3.86	4.12		3.52
1/21/97	-1.39	-4.84	-5.22	-3.09	-4.08	-3.46	-0.50		0.33	4.12	4.27		0.73
1/22/97	-2.78	-4.71	-4.84	-2.68	-3.77	-3.30	-0.53		0.41	4.34	4.38		0.69
1/23/97	-4.44	-4.62	-4.72	-2.44	-3.55	-3.14	-0.46		0.33	4.47	4.56		0.97
1/24/97	-4.44	-5.00	-4.70	-2.29	-3.35	-3.03	-0.41		0.35	4.59	4.59		1.27
1/25/97	-5.00	-8.38	-6.38	-2.53	-3.30	-2.95	-0.35		0.24	4.49	4.65		1.77
1/26/97	-15.28	-10.47	-8.35	-3.48	-3.64	-2.98	-0.33			4.04	4.52		2.24
1/27/97	-20.00	-13.12	-10.30	-4.54	-4.26	-3.24	-0.37			3.65	4.23		1.95
1/28/97	-22.22	-11.97	-10.71	-5.50	-5.04	-3.69	-0.56	0.08		3.29	3.89		0.93
1/29/97	-14.72	-10.35	-9.75	-5.56	-5.50	-4.12	-0.89			3.27	3.73		0.01
1/30/97	-10.83	-7.43	-8.03	-5.15	-5.59	-4.46	-1.25		0.01	3.39	3.64		
1/31/97	-6.67	-5.30	-6.17	-4.24	-5.24	-4.46	-1.39		0.21	3.59	3.72		
2/1/97	-0.83	-4.77	-5.31	-3.46	-4.70	-4.19	-1.29		0.34	3.93	3.88		
2/2/97	0.56	-4.15	-4.70	-2.93	-4.24	-3.89	-1.11		0.38	4.13	4.06		
2/3/97	-0.56	-3.85	-4.27	-2.52	-3.87	-3.63	-0.95		0.38	4.38	4.19		
2/4/97	-1.67												
2/5/97	-9.17	-5.63	-5.22	-2.51	-3.54	-3.25	-0.73		0.33	4.39	4.42		
2/6/97	-6.67	-5.90	-5.45	-2.65	-3.57	-3.22	-0.67		0.30	4.39	4.38		0.16
2/7/97	-6.67	-6.22	-5.67	-2.77	-3.64	-3.22	-0.64		0.28	4.30	4.38		0.21
2/8/97	-8.06	-6.86	-6.12	-2.97	-3.74	-3.26	-0.64		0.24	4.22	4.37		0.25
2/9/97	-10.00	-7.42	-6.57	-3.24	-3.89	-3.34	-0.68		0.23	4.08	4.26		0.19
2/10/97	-10.00	-7.97	-7.07	-3.55	-4.09	-3.46	-0.74		0.19	4.00	4.19		0.10
2/11/97	-11.11	-6.64	-6.58	-3.68	-4.29	-3.62	-0.82		0.20	3.89	4.11		

	Temperaure							Volumetric Moisture Content				
	Air	Base	Subgrade				Base	Subgrade				
		292 mm	584 mm	813 mm	940 mm	1168 mm	1468 mm	292 mm	584 mm	813 mm	940 mm	1168 mm	1468 mm
2/12/97	-9.17	-5.32	-5.63	-3.36	-4.27	-3.71	-0.91		0.30	4.00	4.07		
2/13/97	-3.61	-5.19	-5.22	-3.00	-4.09	-3.65	-0.92		0.33	4.12	4.11		
2/14/97	-3.06	-4.59	-4.89	-2.79	-3.90	-3.54	-0.85		0.32	4.25	4.20		
2/15/97	-3.06	-3.74	-4.23	-2.48	-3.72	-3.40	-0.79		0.42	4.45	4.32		0.03
2/16/97	-0.56	-3.42	-3.82	-2.16	-3.49	-3.27	-0.73		0.54	4.64	4.41		0.13
2/17/97	-1.94	-2.92	-3.44	-1.91	-3.26	-3.13	-0.64		0.63	4.81	4.59		0.30
2/18/97	1.39	-2.65	-3.14	-1.68	-3.09	-3.01	-0.58		0.70	5.11	4.74		0.49
2/19/97	1.11	-2.52	-2.95	-1.50	-2.93	-2.90	-0.50		0.77	5.30	4.89		0.76
2/20/97	0.00	-2.44	-2.83	-1.36	-2.80	-2.80	-0.43		0.81	5.53	5.09		1.06
2/21/97	1.11	-2.38	-2.75	-1.26	-2.70	-2.73	-0.38		0.82	5.73	5.26		1.44
2/22/97	0.83	-2.32	-2.69	-1.18	-2.62	-2.67	-0.33		0.87	5.90	5.43		2.01
2/23/97	-0.28	-2.28	-2.63	-1.12	-2.54	-2.61	-0.28	0.01	0.92	6.17	5.63		2.80
2/24/97	-3.33	-2.24	-2.58	-1.06	-2.49	-2.56	-0.25	0.17	0.94	6.31	5.79		3.90
2/25/97	-3.33	-2.22	-2.54	-1.01	-2.44	-2.51	-0.22	0.29	0.98	6.42	5.93		5.25
2/26/97	-1.67	-2.18	-2.50	-0.98	-2.41	-2.48	-0.17	0.37	1.06	6.62	6.11		6.40
2/27/97	-1.11	-2.17	-2.50	-0.95	-2.38	-2.44	-0.16	0.48	1.08	6.78	6.22		6.35
2/28/97	-0.83	-2.18	-2.46	-0.92	-2.34	-2.40	-0.12	0.45	1.12	6.98	6.40		6.41
3/1/97	-7.50	-2.39	-2.52	-0.89	-2.32	-2.39	-0.07		1.10	7.12	6.56		6.48
3/2/97	-7.22	-2.71	-2.69	-0.90	-2.28	-2.36	-0.02		0.98	7.04	6.68		6.61
3/3/97	-5.00	-2.50	-2.68	-0.94	-2.28	-2.33	0.02		0.89	7.01	6.81		6.72
3/4/97	-0.28	-2.40	-2.61	-0.92	-2.28	-2.33	0.06		1.00	7.03	6.92		6.87
3/5/97	-1.39	-2.42	-2.57	-0.89	-2.27	-2.29	0.11		0.97	7.17	7.02	0.55	6.93
3/6/97	-3.89	-2.39	-2.56	-0.89	-2.22	-2.28	0.13		1.06	7.20	7.13	0.90	7.02
3/7/97	-3.33	-2.35	-2.54	-0.87	-2.22	-2.24	0.17		1.01	7.33	7.26	0.84	7.05
3/8/97	0.56	-2.29	-2.50	-0.84	-2.22	-2.22	0.19	0.04	1.08	7.39	7.41	0.70	7.07
3/9/97	-2.50	-2.24	-2.47	-0.83	-2.22	-2.20	0.22	0.23	1.15	7.50	7.51	0.69	7.12
3/10/97	-3.06	-2.22	-2.44	-0.83	-2.18	-2.17	0.24	0.26	1.18	7.61	7.67	0.66	7.15
3/11/97	-1.94	-2.22	-2.44	-0.81	-2.17	-2.17	0.28	0.24	1.23	7.74	7.82	0.68	7.15
3/12/97	-0.83	-2.21	-2.42	-0.78	-2.17	-2.12	0.28	0.33	1.21	7.86	7.98	0.69	7.08
3/13/97	0.00	-2.36	-2.41	-0.78	-2.17	-2.10	0.28	0.00	1.22	8.02	8.14	0.70	7.14
3/14/97	-6.67	-3.28	-2.72	-0.78	-2.15	-2.06	0.28		0.95	8.13	8.38	0.69	7.14
3/15/97	-15.00	-4.03	-3.22	-0.83	-2.13	-2.06	0.31		0.78	7.86	8.59	0.67	7.15
3/16/97	-13.33	-3.85	-3.57	-0.99	-2.12	-2.04	0.33		0.64	7.16	8.77	0.78	7.21
3/17/97	-11.11												

		Temperaure						Volumetric Moisture Content					
	Air	Base	Subgrade				Base	Subgrade					
		292 mm	584 mm	813 mm	940 mm	1168 mm	1468 mm	292 mm	584 mm	813 mm	940 mm	1168 mm	1468 mm
3/18/97	1.39	-2.38	-2.64	-0.89	-2.07	-1.99	0.37		0.94	7.06	8.72	0.75	7.21
3/19/97	1.94	-2.22	-2.49	-0.81	-2.04	-1.94	0.39		0.94	7.33	8.77	0.86	7.21
3/20/97	3.33	-2.05	-2.34	-0.75	-2.02	-1.95	0.40	8.73	1.15	7.52	8.97	0.76	7.23
3/21/97	5.00	-1.94	-2.24	-0.76	-2.04	-1.96	0.37	21.38	1.65	8.10	9.92	0.76	7.19
3/22/97	1.39	-1.64	-2.24	-0.72	-2.04	-1.94	0.39	22.23	1.81	8.68	10.67	0.84	7.28
3/23/97	1.67	-1.27	-2.22	-0.71	-2.05	-1.94	0.39	16.78	1.92	9.10	10.90	0.86	7.27
3/24/97	2.50	-1.29	-2.22	-0.70	-2.06	-1.94	0.39	11.63	2.31	9.45	10.99	0.91	7.32
3/25/97	-0.56	-0.42	-2.18	-0.67	-2.06	-1.94	0.39	10.85	11.70	9.69	11.15	0.94	7.34
3/26/97	-0.28	0.30	-1.78	-0.67	-2.06	-1.94	0.39	10.33	34.44	9.93	11.36	1.03	7.53
3/27/97	3.61	1.51	-0.74	-0.56	-2.05	-1.94	0.39	10.75	34.56	13.00	11.65	3.19	9.74
3/28/97	5.83	1.11	-0.20	-0.56	-2.04	-1.94	0.39	11.14	34.64	13.81	12.09	5.59	12.12
3/29/97	4.44	-0.71	-1.29	-0.56	-2.02	-1.94	0.39	9.63	34.66	14.17	12.55	6.83	13.18
3/30/97	-2.22	-0.37	-1.19	-0.56	-2.01	-1.93	0.39	9.19	34.56	14.42	12.89	7.32	13.64
3/31/97	-0.83	0.29	-0.90	-0.56	-2.00	-1.91	0.39	8.95	33.65	14.86	13.14	7.54	13.87
4/1/97	3.89	0.86	-0.55	-0.56	-2.00	-1.90	0.39	8.71	30.49	15.40	13.43	7.84	14.15
4/2/97	1.94	0.84	-0.49	-0.56	-2.00	-1.89	0.39	8.45	20.42	16.26	13.85	7.97	14.30
4/3/97	-2.22	0.83	-0.17	-0.54	-2.00	-1.89	0.39	8.40	17.06	19.42	14.27	8.27	14.59
4/4/97	2.50	-0.43	-0.93	-0.50	-2.00	-1.89	0.39	8.23	11.91	33.62	14.55	8.48	14.87
4/5/97	0.00												
4/6/97	-6.67	-0.08	-0.90	-0.40	-2.00	-1.86	0.42	7.55	9.03	24.73	15.84	9.02	15.03
4/7/97	-3.89	0.68	-0.52	-0.30	-2.00	-1.82	0.47	7.58	8.58	24.17	16.80	8.87	14.83
4/8/97	-0.56	0.22	-0.26	-0.16	-2.00	-1.75	0.54	7.43	8.23	23.29	18.31	8.85	14.72
4/9/97	-2.50	-0.69	-0.90	-0.19	-2.00	-1.65	0.64	7.36	8.07	22.82	16.98	8.87	14.83
4/10/97	-3.06	-1.08	-1.21	-0.24	-2.00	-1.53	0.73	7.36	7.60	22.64	15.93	8.72	14.66
4/11/97	-5.56	-0.41	-1.09	-0.22	-1.96	-1.43	0.80	7.26	7.15	22.27	15.37	8.37	14.21
4/12/97	-6.39	0.82	-0.28	0.05	-1.91	-1.35	0.88	7.46	6.93	21.96	15.36	8.02	13.91
4/13/97	-3.06	1.62	0.64	0.54	-1.73	-1.17	0.99	7.42	7.03	21.73	15.61	7.88	13.79
4/14/97	-0.56	1.52	0.77	0.98	-1.07	-0.89	1.15	7.94	7.84	22.11	16.42	8.59	14.87
4/15/97	1.67	2.47	1.29	1.47	-0.41	-0.58	1.38	7.91	6.99	21.87	15.30	7.93	13.88
4/16/97	2.78	3.54	2.20	2.08	0.04	-0.28	1.62	7.66	6.90	21.70	14.98	7.48	13.60
4/17/97	3.06	3.88	2.54	2.57	0.50	0.06	1.87	7.67	6.81	21.60	14.81	7.27	13.38
4/18/97	5.28	4.60	3.40	3.15	0.93	0.40	2.14	7.54	6.70	21.47	14.74	7.14	13.25
4/19/97	4.44	4.45	3.49	3.53	1.37	0.76	2.43	7.28	6.75	21.40	14.64	6.99	13.21
4/20/97	5.56	4.67	3.74	3.83	1.73	1.15	2.76	7.97	8.01	22.56	15.50	8.59	15.42

	Temperaure							Volumetric Moisture Content					
	Air	Base	Subgrade					Base	Subgrade				
		292 mm	584 mm	813 mm	940 mm	1168 mm	1468 mm	292 mm	584 mm	813 mm	940 mm	1168 mm	1468 mm
4/21/97	5.28	4.85	3.91	4.10	2.04	1.41	3.01	7.97	7.09	22.12	15.15	7.95	13.93
4/22/97	4.44	4.91	4.01	4.32	2.29	1.65	3.21	7.66	6.86	21.81	14.87	7.48	13.50
4/23/97	2.78	5.59	4.47	4.59	2.52	1.84	3.39	7.42	6.75	21.69	14.75	7.29	13.36
4/24/97	3.89	6.23	4.88	4.90	2.80	2.07	3.60	7.21	6.60	21.54	14.67	7.06	13.25
4/25/97	4.72	7.18	5.61	5.36	3.12	2.32	3.80	7.11	6.52	21.41	14.58	6.93	13.18
4/26/97	5.56	8.30	6.39	5.88	3.52	2.63	4.04	7.07	6.48	21.38	14.60	6.79	13.12
4/27/97	5.28	8.88	7.53	6.61	4.02	3.05	4.39	7.45	7.80	21.73	14.85	8.38	14.96
4/28/97	8.89	7.47	6.78	6.85	4.50	3.46	4.70	7.75	7.06	21.79	14.86	7.81	13.74
4/29/97	5.28	7.49	6.69	6.85	4.68	3.71	4.97	7.60	7.00	21.66	14.74	7.37	13.43
4/30/97	4.17	7.74	6.71	6.88	4.80	3.90	5.16	7.66	6.82	21.63	14.69	7.24	13.33
5/1/97	5.28	8.14	7.14	7.11	4.96	4.05	5.32	7.46	6.67	21.52	14.67	7.05	13.26
5/2/97	6.39	7.65	6.88	7.19	5.13	4.22	5.49	7.28	6.50	21.39	14.54	6.88	13.15
5/3/97	5.56	7.83	7.06	7.28	5.24	4.37	5.63	7.16	6.45	21.32	14.55	6.76	13.08
5/4/97	4.72	7.77	6.99	7.31	5.34	4.49	5.76	7.24	6.91	21.25	14.51	6.64	13.06
5/5/97	6.94	8.66	7.32	7.42	5.43	4.60	5.88	7.40	6.59	21.25	14.49	6.72	13.07
5/6/97	5.00	10.26	8.45	7.88	5.64	4.73	5.99	7.33	6.57	21.25	14.50	6.65	13.00
5/7/97	8.06	10.20	8.94	8.41	6.02	5.00	6.19	7.59	7.25	21.33	14.58	7.76	13.86
5/8/97	5.83	10.60	9.09	8.70	6.35	5.29	6.43	7.54	6.66	21.30	14.55	7.07	13.33
5/9/97	5.56	12.12	10.03	9.14	6.66	5.55	6.66	7.44	6.55	21.23	14.53	6.77	13.04
5/10/97	7.22	13.46	11.08	9.82	7.11	5.87	6.91	7.31	6.52	21.18	14.49	6.59	12.96
5/11/97	11.39	14.46	12.06	10.57	7.65	6.28	7.23	7.22	6.54	21.17	14.48	6.46	12.90
5/12/97	11.11	15.15	12.77	11.26	8.24	6.75	7.60	7.13	6.49	21.16	14.49	6.40	12.81
5/13/97	10.00	16.14	13.64	11.92	8.80	7.23	8.00	7.10	6.51	21.13	14.44	6.33	12.76
5/14/97	11.94	16.68	14.27	12.55	9.39	7.72	8.41	7.02	6.50	21.10	14.46	6.26	12.75
5/15/97	13.33	17.25	14.94	13.15	9.94	8.20	8.83	6.99	6.50	21.12	14.48	6.18	12.60
5/16/97	14.17	17.41	15.20	13.61	10.46	8.69	9.25	6.97	6.26	21.07	14.45	6.12	12.62
5/17/97	14.17	17.27	15.63	14.09	10.92	9.11	9.64	6.84	6.04	21.06	14.48	6.08	12.54
5/18/97	14.44	15.61	14.68	14.09	11.27	9.52	10.02	6.69	6.32	20.97	14.41	5.98	12.45
5/19/97	9.44	15.28	14.36	13.89	11.34	9.75	10.29	6.65	6.31	20.89	14.40	5.88	12.34
5/20/97	5.28	15.19	14.15	13.74	11.33	9.88	10.48	6.66	6.20	20.78	14.35	5.73	12.23
5/21/97	8.06	14.07	13.54	13.59	11.33	9.96	10.58	6.67	6.21	20.77	14.26	5.64	12.12
5/22/97	8.89	14.63	13.57	13.40	11.26	9.97	10.67	6.69	5.98	20.66	14.19	5.48	12.02
5/23/97	9.44	15.21	14.10	13.51	11.25	10.00	10.71	6.70	6.63	20.69	14.22	5.92	12.61
5/24/97	11.94	13.38	13.52	13.55	11.37	10.21	10.94	7.17	8.10	21.06	14.61	9.10	15.20

	Temperaure							Volumetric Moisture Content					
	Air	Base		Subgrade				Base		Subgrade			
		292 mm	584 mm	813 mm	940 mm	1168 mm	1468 mm	292 mm	584 mm	813 mm	940 mm	1168 mm	1468 mm
5/25/97	12.22	11.71	12.06	12.98	11.24	10.17	10.94	7.37	7.16	21.06	14.54	7.96	13.78
5/26/97	8.06							7.61	7.64	21.15	14.58	8.47	14.45
5/27/97	7.78							7.73	7.13	21.15	14.44	7.52	13.57
5/28/97	9.17							7.63	6.86	21.08	14.44	7.06	13.30
5/29/97	9.44							7.46	7.06	21.06	14.43	7.26	13.70
5/30/97	11.11							7.74	7.50	21.22	14.61	8.36	14.34

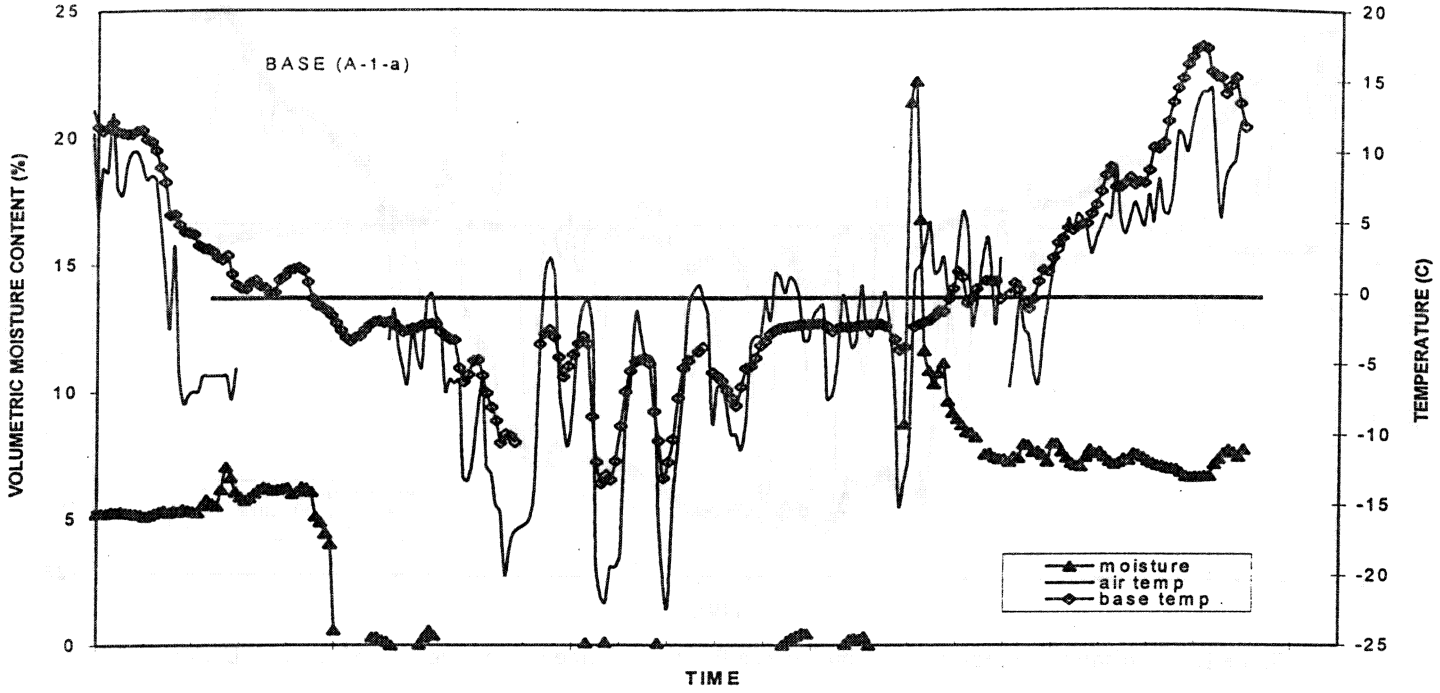


Figure B-1. Moisture Temperature distribution as a function of time in the base course at Dickey Lake.

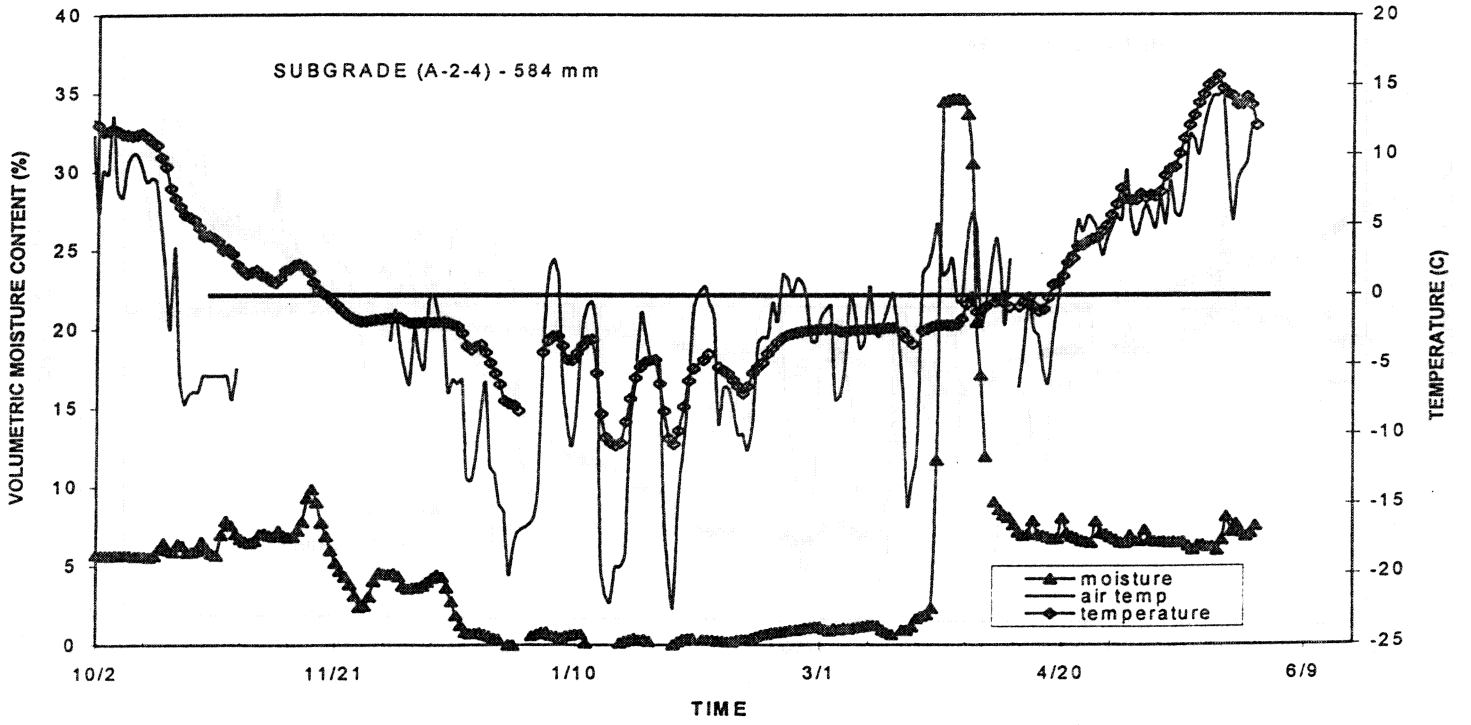


Figure B-2. Moisture Temperature distribution as a function of time in the subgrade (584mm) at Dickey Lake.

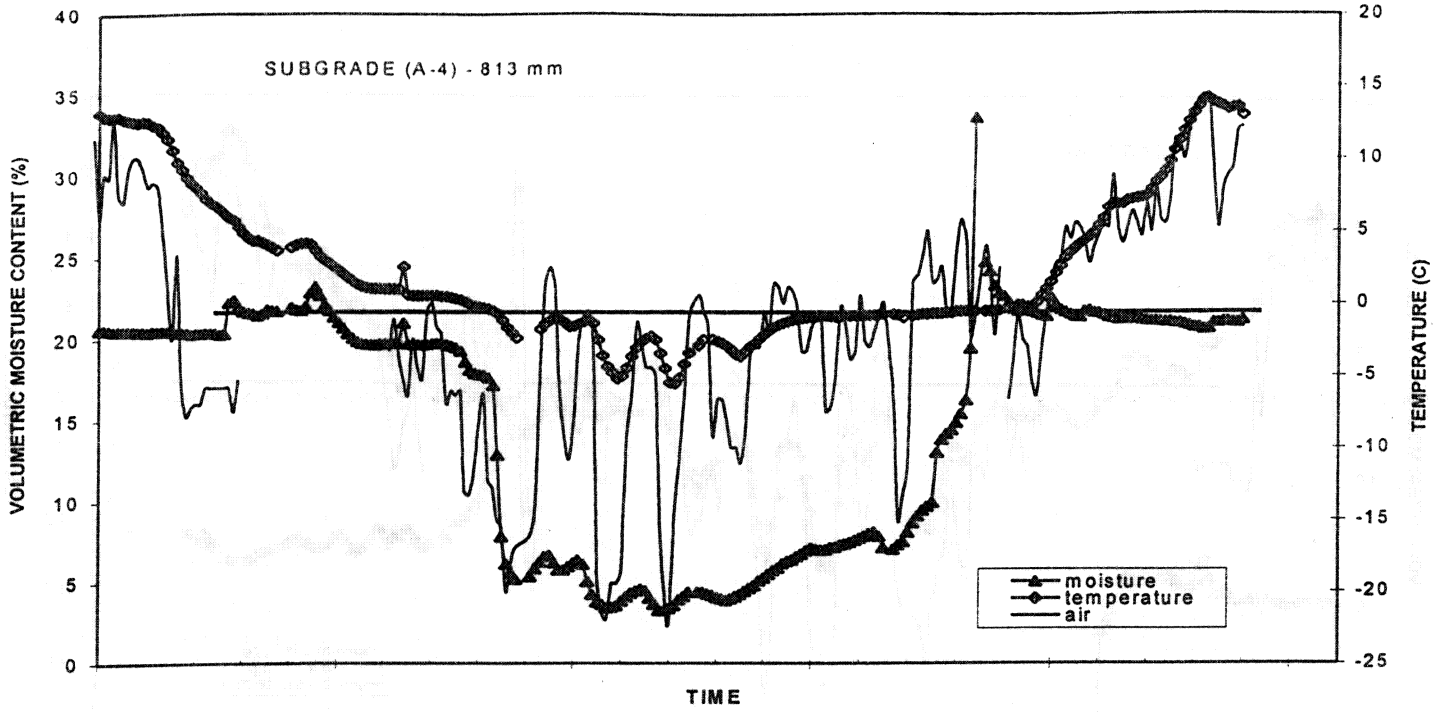


Figure B-3. Moisture Temperature distribution as a function of time in the subgrade (813mm) at Dickey Lake.

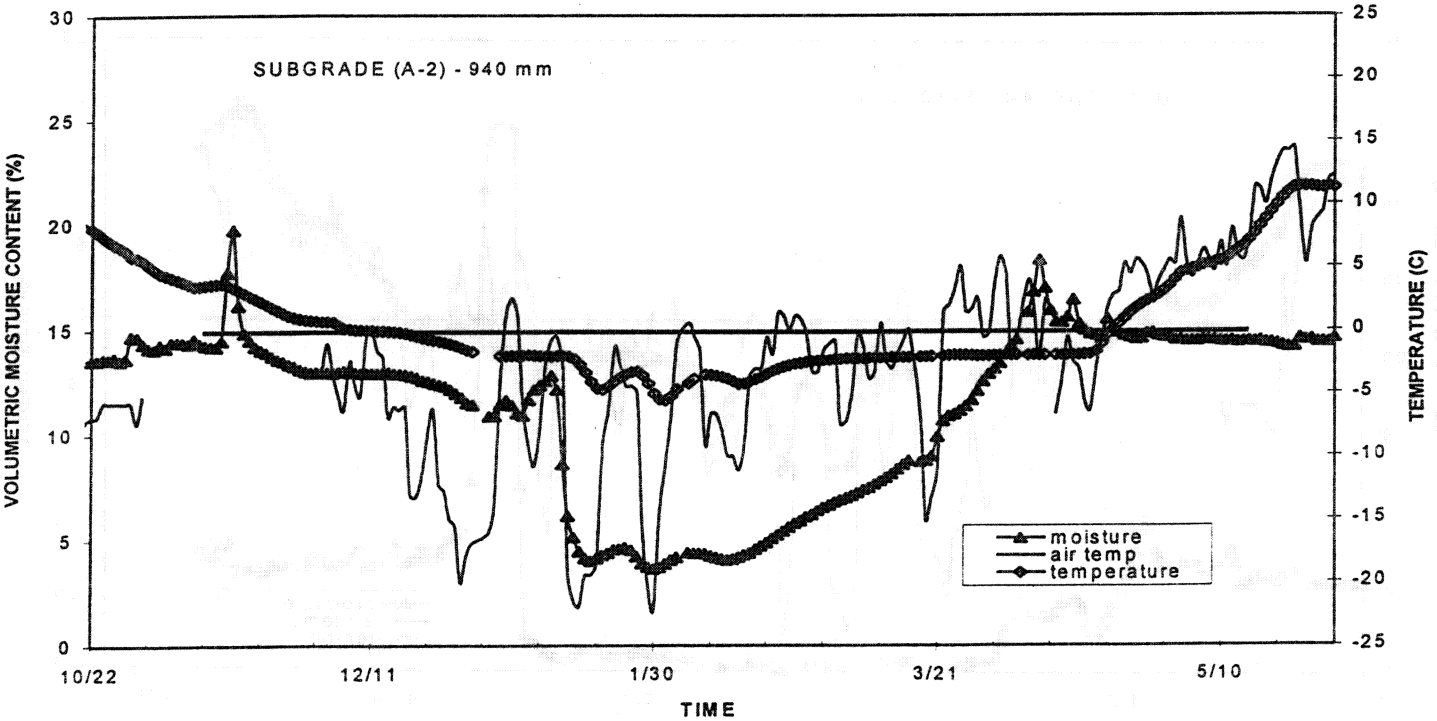


Figure B-4. Moisture Temperature distribution as a function of time in the subgrade (940mm) at Dickey Lake.

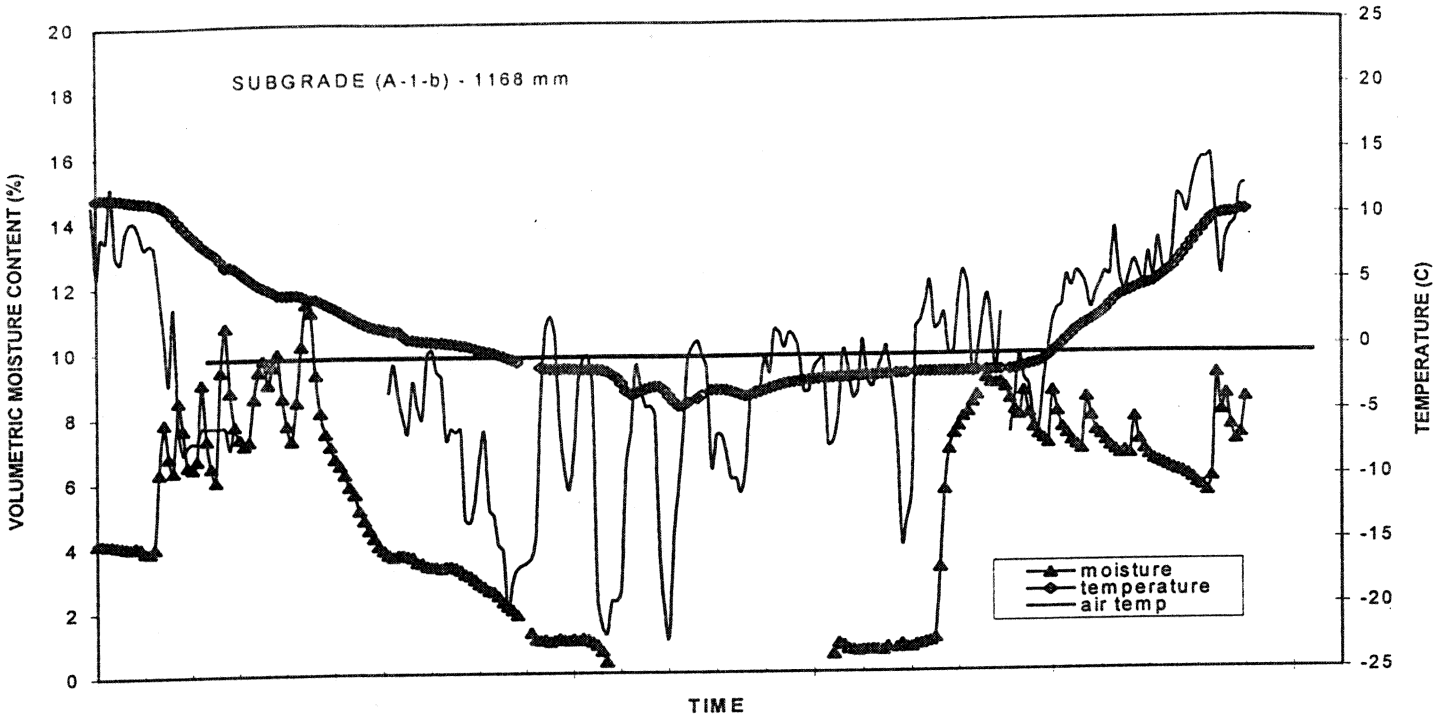


Figure B-5. Moisture Temperature distribution as a function of time in the subgrade (1168mm) at Dickey Lake.

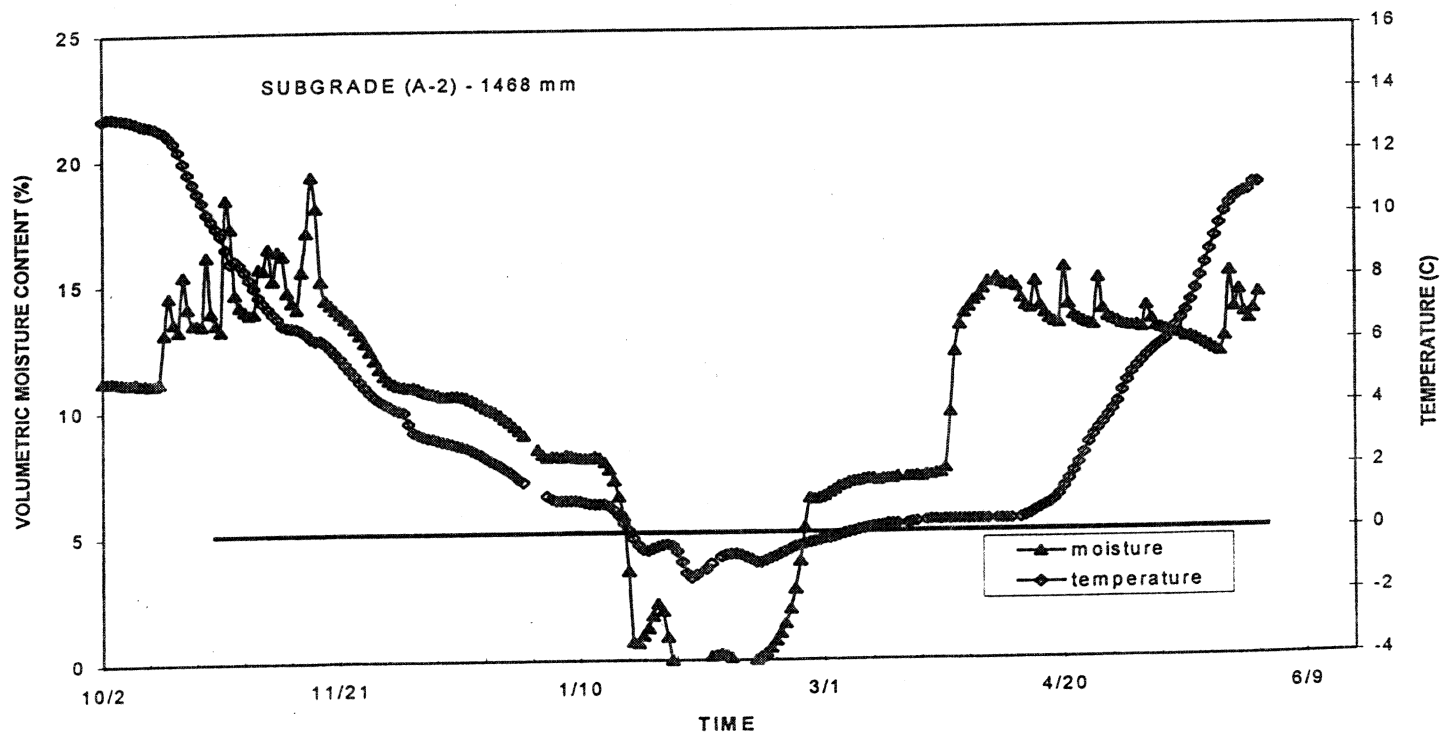
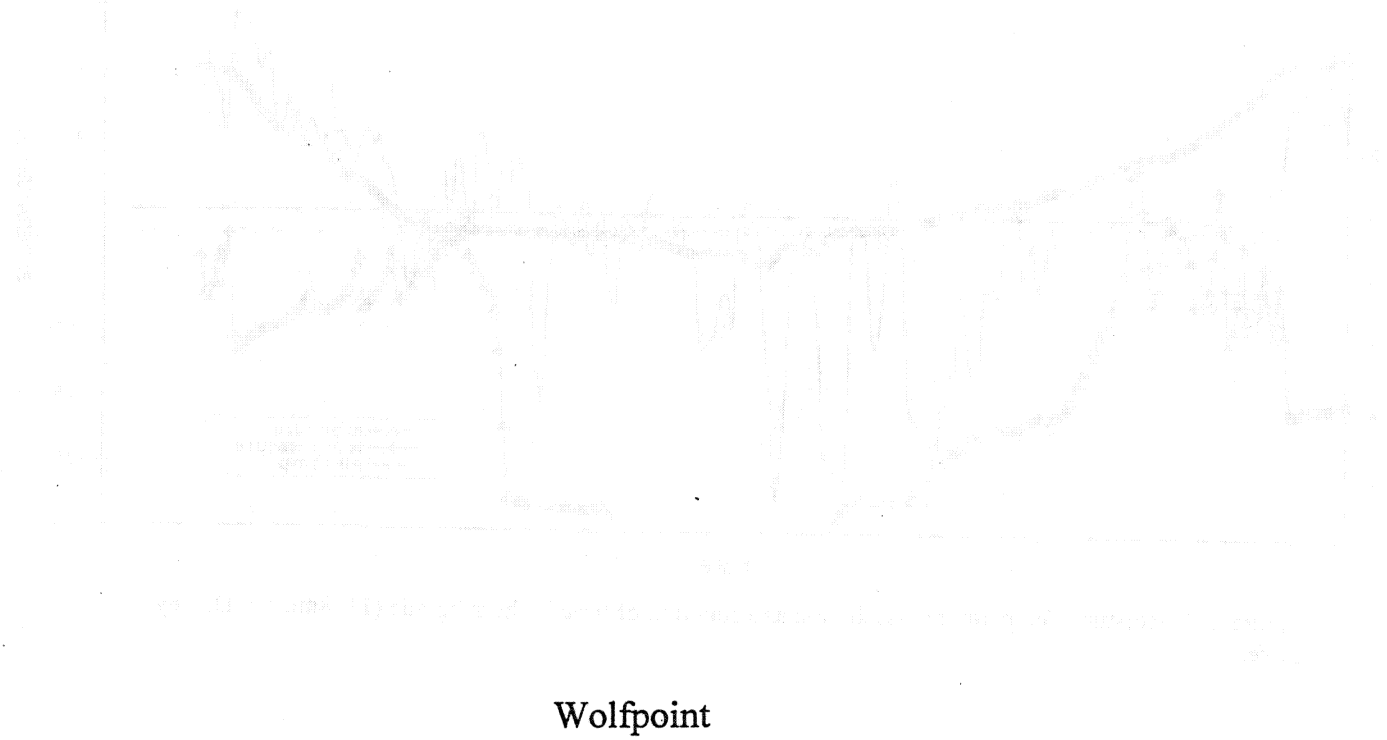


Figure B-6. Moisture Temperature distribution as a function of time in the subgrade (1468mm) at Dickey Lake.



Wolfpoint

Table B-2. Moisture Temperature distibution as a function of time and depth at Wolfpoint

Date	Air	Temperaure (C) Base			Subgrade				Volumetric Moisture Content (%) Base			Subgrade			
		229	381	762	914	1118	1422	1803	229	381	762	914	1118	1422	1803
10/1/96	1.67	6.69	8.76	12.04	13.10	12.92	14.32	15.54	43.01	39.17	40.25	37.80	41.29	44.47	39.95
10/2/96	-0.56	4.47	6.34	11.32	12.73	12.65	14.08	15.36	45.23	38.98	40.22	37.72	41.23	44.27	39.99
10/3/96	8.33	6.51	6.90	10.53	12.16	12.26	13.82	15.17	46.20	39.02	40.13	37.71	41.18	44.41	39.99
10/4/96	11.67	10.28	9.32	10.45	11.75	11.84	13.53	14.97	47.68	39.22	40.15	37.67	41.20	44.29	40.00
10/5/96	16.11	12.62	11.69	11.05	11.76	11.58	13.24	14.76	47.70	39.47	40.16	37.77	41.12	44.15	39.97
10/6/96	9.44	12.13	11.96	11.74	12.05	11.55	13.04	14.54	48.45	39.50	40.22	37.63	41.20	43.89	39.90
10/7/96	13.33	12.61	12.26	12.08	12.30	11.64	12.92	14.36	48.43	39.54	40.26	37.68	41.14	43.90	39.99
10/8/96	12.78	13.13	12.80	12.37	12.49	11.73	12.88	14.21	49.12	39.60	40.31	37.69	41.10	43.83	39.90
10/9/96	8.89	12.34	12.52	12.61	12.67	11.84	12.84	14.10	52.51	39.59	40.32	37.69	41.05	43.99	39.87
10/10/96	12.22	12.15	12.22	12.63	12.76	11.91	12.85	14.01	51.01	39.54	40.31	37.68	41.12	43.80	39.90
10/11/96	16.11	13.90	13.20	12.68	12.79	11.95	12.83	13.94	51.64	39.65	40.31	37.72	41.13	43.99	39.94
10/12/96	15.83	13.95	13.69	13.00	12.92	12.00	12.83	13.89	51.23	39.70	40.34	37.72	41.15	43.93	39.87
10/13/96	13.33	13.89	13.69	13.20	13.08	12.08	12.83	13.83	50.43	39.69	40.33	37.75	41.12	43.71	39.82
10/14/96	11.94	13.39	13.65	13.35	13.20	12.17	12.89	13.78	49.92	39.69	40.35	37.68	41.09	43.96	39.92
10/15/96	10.00	11.28	12.16	13.24	13.27	12.23	12.89	13.78	48.79	39.55	40.34	37.74	41.09	43.90	39.94
10/16/96	4.72	9.44	10.84	12.83	13.12	12.22	12.89	13.75	47.85	39.44	40.33	37.71	41.09	44.04	39.93
10/17/96	2.50	7.01	9.02	12.20	12.81	12.10	12.88	13.72	47.23	39.27	40.25	37.72	41.05	44.05	39.95
10/18/96	4.17	5.18	7.02	11.30	12.32	11.86	12.79	13.67	46.60	39.09	40.22	37.81	41.11	43.94	39.86
10/19/96	8.06	7.66	7.97	10.54	11.74	11.48	12.63	13.64	47.57	39.17	40.14	37.57	41.04	43.70	39.83
10/20/96	1.67	4.55	6.92	10.33	11.37	11.11	12.41	13.54	46.34	39.05	40.15	37.53	40.93	44.06	39.82
10/21/96	0.56	2.49	4.53	9.56	10.98	10.82	12.20	13.43	45.73	38.84	40.06	37.54	40.96	43.80	39.90
10/22/96	4.17	2.66	4.08	8.70	10.38	10.45	12.01	13.35	45.67	38.81	40.01	37.41	40.83	43.83	39.88
10/23/96	5.28	4.18	4.83	8.18	9.82	9.98	11.71	13.19	46.27	38.87	39.97	37.41	40.83	43.53	39.89
10/24/96	1.67	3.23	4.70	8.02	9.48	9.57	11.39	13.01	45.73	38.86	39.95	37.36	40.78	43.52	39.85
10/25/96	2.78	2.69	3.94	7.69	9.19	9.26	11.12	12.82	45.56	38.80	39.95	37.36	40.76	43.44	39.85
10/26/96	-0.28	2.60	3.96	7.36	8.86	8.94	10.85	12.62	45.55	38.80	39.91	37.34	40.72	43.50	39.84
10/27/96	1.67	2.24	3.31	7.03	8.56	8.64	10.59	12.42	45.64	38.72	39.90	37.32	40.68	43.43	39.83
10/28/96	7.78	3.48	3.80	6.74		8.35	10.35	12.24	45.85	38.78	39.89	37.28	40.69	43.25	39.87
10/29/96	-1.11	3.71	4.88	6.83	8.06	8.08	10.09	12.03	45.79	38.89	39.88	37.23	40.64	43.13	39.84
10/30/96	-8.06	-0.62	1.79	6.63	7.99	7.91	9.86	11.83	28.16	38.62	39.88	37.21	40.61	42.98	39.81
10/31/96	-7.50	-1.69	0.46	5.72	7.68	7.66	9.68	11.65	18.51	38.33	39.81	37.20	40.59	42.94	39.82
11/1/96	-1.67	-1.06	0.21	4.99	6.98	7.27	9.44	11.47	19.77	38.32	39.75	37.15	40.57	43.03	39.79
11/2/96	5.56	-0.81	0.30	4.54	6.50	6.85	9.15	11.28	25.56	38.40	39.70	37.05	40.55	42.87	39.83
11/3/96	5.28	1.08	1.32	4.34	6.15	6.47	8.85	11.08	47.91	38.81	39.88	37.51	40.45	42.83	39.77
11/4/96	1.94	2.71	2.90	4.62	6.04	6.19	8.56	10.86	41.02	38.89	39.93	37.61	40.44	42.81	39.71
11/5/96	-0.28	2.06	2.84	4.95	6.12	6.08	8.33	10.64	36.88	38.84	39.92	37.43	40.42	42.60	39.75
11/6/96	0.00	1.16	2.25	4.96	6.14	6.01	8.17	10.44	34.46	38.75	39.90	37.36	40.44	42.63	39.76
11/7/96	-0.28	0.72	1.83	4.78	6.05	5.93	8.03	10.27	32.87	38.70	39.82	37.28	40.43	42.70	39.74
11/8/96	-2.50	-0.22	1.17	4.53	5.88	5.79	7.90	10.11	30.42	38.63	39.83	37.22	40.41	42.60	39.72

		Temperaure (C)							Volumetric Moisture Content (%)						
Date	Air	Base	Subgrade						Base	Subgrade					
		229	381	762	914	1118	1422	1803	229	381	762	914	1118	1422	1803
11/9/96	-2.50	0.03	0.95	4.20	5.66	5.62	7.61	9.96	30.32	38.62	39.75	37.19	40.40	42.51	39.77
11/10/96	-6.11	-0.42	0.74	3.99	5.43	5.41	7.58	9.71	27.16	38.60	39.74	37.16	40.42	42.47	39.64
11/11/96	-9.17	-1.30	0.14	3.72	5.22	5.43		9.66	17.33	38.41	39.71	37.10	40.38		39.71
11/12/96	-9.72	-2.13	0.04	3.38	4.97	4.99		9.51	15.98	38.16	39.78	37.09	40.35		39.66
11/13/96	-8.89	-2.75	-0.62	3.05	3.76	4.96		9.35	15.35	37.69	39.69	35.46	40.29		39.73
11/14/96	-6.67	-2.83	-0.94	2.80	4.59	4.51		9.20	15.25	36.04	39.63	37.02	40.33		39.71
11/15/96	-7.78	-2.49	-1.03	2.55	4.20	4.28	6.66	9.03	15.51	35.54	39.64	36.96	40.28	42.14	39.69
11/16/96	-17.22	-5.67	-1.98	2.32	3.97	4.03	6.45	8.86	12.76	32.61	39.62	36.95	40.26	42.06	39.68
11/17/96	-18.89	-7.33	-3.58	2.00	3.73	3.81	6.25	8.70	11.70	29.53	39.56	36.96	40.25	42.13	39.72
11/18/96	-16.94	-8.09	-4.78	1.58	3.42	3.56	6.05	8.53	11.25	27.98	39.50	37.12	40.20	41.98	39.66
11/19/96	-10.83	-6.70	-4.63	1.14	3.07	3.26	5.84	8.36	11.87	27.95	39.42	36.89	40.20	42.13	39.69
11/20/96	-16.94	-7.25	-4.68	0.78	2.72	2.95	5.59	8.18	11.70	28.06	39.32	36.81	40.18	42.10	39.66
11/21/96	-22.22	-10.28	-6.75	0.46	2.41	2.65	5.35	7.99	10.26	26.35	39.19	36.74	40.13	42.02	39.66
11/22/96	-18.33	-10.00	-7.27	0.08	2.09	2.34	5.11	7.80	10.28	25.96	38.98	36.59	40.13	41.94	39.58
11/23/96	-20.00	-9.78	-7.25	-0.33	1.74	2.03	4.85	7.60	10.34	25.92	38.70	36.47	40.07	41.97	39.63
11/24/96	-21.94	-12.37	-9.00	-0.77	1.39	1.70	4.59	7.41	9.38	24.74	37.90	36.43	40.04	41.88	39.60
11/25/96	-22.78		-10.02	-1.36	0.66	1.38	4.33	7.21		24.21	36.02	35.50	39.99	41.79	39.59
11/26/96	-19.44		-9.89	-2.03	0.29	1.06	4.06	7.00		24.11	34.34	35.37	39.83	41.82	39.57
11/27/96	-13.61		-9.28	-2.48	0.34	0.71	3.80	6.79		24.43	33.40	36.03	39.71	41.81	39.54
11/28/96	-2.78		-6.75	-2.62	0.06	0.41	3.53	6.58		25.85	33.01	35.80	39.60	41.71	39.54
11/29/96	-3.89		-3.97	-2.18	-0.14	0.14	3.26	6.36		28.14	33.20	35.56	39.50	41.60	39.49
11/30/96	-8.33		-3.91	-1.80	-0.20	-0.07	3.03	6.14		28.23	33.52	35.43	39.48	41.59	39.47
12/1/96	-11.11		-4.67	-1.73	-0.22	-0.18	2.83	5.93		27.92	33.64	35.34	39.48	41.62	39.43
12/2/96	-10.28		-5.17	-1.86	-0.25	-0.27	2.68	5.75		27.41	33.56	35.24	39.45	41.51	39.41
12/3/96	-12.78		-5.92	-2.02	-0.33	-0.37	2.53	5.57		26.81	33.44	35.08	39.41	41.54	39.36
12/4/96	-13.33														
12/5/96	-5.83	-7.47	-6.61	-2.60				4.93	11.41	26.17	33.01				39.44
12/6/96	-6.11	-6.57			-0.63				11.82	36.54	40.38	34.48			
12/7/96	-8.33											38.66			
12/8/96	-10.83														
12/9/96	-1.67														
12/10/96	-4.44														
12/11/96	-1.94														
12/12/96	-8.61														
12/13/96	-11.39														
12/14/96	-11.94														
12/15/96	-9.44														
12/16/96	-9.17														
12/17/96	-18.61														
12/18/96	-22.22														
12/19/96	-16.67														

Date	Air	Temperaure (C) Base			Subgrade				Volumetric Moisture Content (%) Base			Subgrade			
		229	381	762	914	1118	1422	1803	229	381	762	914	1118	1422	1803
12/20/96	-7.50														
12/21/96	-18.06														
12/22/96	-25.28														
12/23/96	-26.39														
12/24/96	-29.17														
12/25/96	-29.44														
12/26/96	-26.39														
12/27/96	-22.22														
12/28/96	-24.72														
12/29/96	-28.33														
12/30/96	-20.56														
12/31/96	-7.22														
1/1/97	-0.83														
1/2/97	-0.83														
1/3/97	-1.94														
1/4/97	-11.39														
1/5/97	-15.28														
1/6/97	-13.33														
1/7/97	-8.33														
1/8/97	-7.50	-8.37	-8.06		-4.43			1.14	10.79	34.49	27.46	23.39			39.22
1/9/97	-17.22	-13.71		-5.78	-6.97				8.83	23.41	32.97	28.97			
1/10/97	-32.50		-17.78		-4.78			1.02	6.18	11.47	26.50	28.90			
1/11/97	-32.22	-23.62		-9.46	-5.99	-5.75	-2.00	0.96	5.95	18.53	24.65	22.11	26.48	38.73	39.18
1/12/97	-27.22		-0.41	-10.97	-7.17	-6.47	-2.15	0.88	9.65	20.79	23.33	20.99	25.72	38.47	39.15
1/13/97	-24.17	-21.39	-19.10	-11.63	-7.95	-7.16	-2.39	0.81	6.66	18.27	22.71	20.11	24.82	38.10	39.16
1/14/97	-20.28		-18.11	-11.90	-8.45	-7.76	-2.71	0.73	7.04	18.59	22.42	19.59	24.05	37.65	39.19
1/15/97	-13.61	-14.65	-14.51	-11.35	-8.56	-8.16	-3.03	0.66	8.26	20.11	22.64	19.35	23.53	37.22	39.16
1/16/97	-25.56	-18.98	-16.48	-10.81	-8.26	-8.23	-3.30	0.55	7.17	19.28	22.99	19.44	23.46	36.90	39.13
1/17/97	-23.33	-19.11	-17.34	-11.39	-8.53	-8.38	-3.54	0.43	7.15	18.95	22.62	19.32	23.28	36.65	39.15
1/18/97	-7.22	-12.27	-13.57	-11.25	-8.71	-8.62	-3.76	0.32	9.11	20.65	22.73	19.16	22.92	36.40	39.11
1/19/97	-1.11	-8.12	-9.47	-9.63	-8.11	-8.56	-3.95	0.22	10.78	23.24	23.68	19.42	22.92	36.19	39.10
1/20/97	-2.78	-6.56	-7.42	-8.10	-7.17	-8.10	-4.00	0.10	11.65	24.91	24.74	20.11	23.15	36.06	39.06
1/21/97	-8.06	-6.58	-6.76	-7.03	-6.35	-7.55	-3.94	0.00	11.68	24.94	25.62	20.64	23.45	36.10	39.04
1/22/97	-16.67	-11.31	-9.22	-6.65	-5.80	-7.08	-3.81	-0.10	9.66	23.74	26.02	21.20	23.80	36.11	39.03
1/23/97	-17.50	-13.22	-11.49	-7.32	-5.83	-6.85	-3.69	-0.17	8.91	22.31	25.66	21.20	24.01	36.18	38.88
1/24/97	-22.78	-16.25	-13.30	-8.03	-6.19	-6.96	-3.69	-0.24	8.00	21.19	25.18	21.06	23.96	36.19	38.65
1/25/97	-31.39	-20.19	-16.87	-9.35	-6.82	-7.29	-3.77	-0.30	6.99	19.23	24.23	20.55	23.78	36.10	38.53
1/26/97	-26.39	-20.20	-17.72	-10.74	-7.79	-7.88	-3.97	-0.36	6.96	18.78	23.19	19.89	23.42	36.04	38.39
1/27/97	-27.50	-21.88	-19.05	-11.69	-8.60	-8.54	-4.24	-0.43	6.63	18.14	22.45	19.27	22.88	35.83	38.24
1/28/97	-21.94	-19.28	-18.04	-12.38	-9.29	-9.13	-4.55	-0.53	7.11	18.43	21.98	18.65	22.42	35.50	38.02
1/29/97	-14.72	-17.54	-16.72	-12.24	-9.54	-9.55	-4.84	-0.65	7.54	18.94	21.96	18.39	21.96	35.21	37.77

Date	Temperaure (C)								Volumetric Moisture Content (%)						
	Air	Base	Subgrade					Base	Subgrade						
		229	381	762	914	1118	1422	1803	229	381	762	914	1118	1422	1803
1/30/97	1.39	-9.63	-11.81	-11.39	-9.40	-9.72	-5.10	-0.77	10.15	21.65	22.44	18.39	21.76	34.95	37.49
1/31/97	0.28	-5.10	-7.34	-9.37	-8.47	-9.45	-5.22	-0.91	12.62	24.90	23.65	18.86	21.82	34.78	37.22
2/1/97	-4.17	-4.82	-5.90	-7.67	-7.31	-8.77	-5.17	-1.06	13.03	26.13	24.94	19.66	22.17	34.82	36.98
2/2/97	-7.78	-6.25	-6.22	-6.70	-6.44	-8.08	-4.95	-1.17	12.13	26.09	25.74	20.37	22.61	34.86	36.82
2/3/97	-6.94	-6.16	-6.35	-6.30	-5.89	-7.55	-4.70	-1.22	12.20	26.06	26.20	20.80	22.95	34.96	36.73
2/4/97	-6.67	-5.94	-6.07	-5.97	-5.53	-7.18	-4.50	-1.27	12.33	26.16	26.52	21.23	23.33	35.07	36.66
2/5/97	-9.72	-6.92	-6.45	-5.73	-5.25	-6.89	-4.31	-1.28	11.76	25.85	26.82	21.53	23.52	35.18	36.60
2/6/97	-10.83	-8.02	-7.32	-5.75	-5.10			-1.28	11.19	25.42	26.88	21.75			37.62
2/7/97	-7.22	-6.66	-6.70	-5.79	-5.05			-1.25	11.80	25.51	26.78	21.84			36.60
2/8/97	-9.44	-7.37	-6.83	-5.62	-4.92	-6.48	-3.97	-1.22	11.51	25.61	26.90	21.89	23.94	35.36	36.63
2/9/97	-10.28	-12.46	-7.11	-5.64	-4.84	-6.41	-3.92	-1.22	23.01	25.94	26.95	21.98	23.99	35.37	36.62
2/10/97	-8.61	-5.73	-6.02	-5.52	-4.79	-6.33	-3.86	-1.22	12.27	25.88	26.99	21.94	24.03	35.41	36.63
2/11/97	-8.89	-5.35	-5.43	-5.19	-4.63	-6.24	-3.83	-1.22	12.60	26.56	27.34	22.07	24.08	35.43	36.63
2/12/97	-11.39	-7.45	-6.51	-5.05	-4.47	-6.10	-3.77	-1.22	11.51	25.79	27.50	22.33	24.22	35.48	36.60
2/13/97	-4.17	-5.69	-5.94	-5.15	-4.44	-6.01	-3.72	-1.20	12.28	26.18	27.45	22.38	24.25	35.50	36.61
2/14/97	-7.78	-5.37	-5.46	-4.92	-4.34	-5.97	-3.67	-1.18	12.66	26.59	27.59	22.47	24.32	35.49	36.60
2/15/97	-7.50	-4.76	-4.88	-4.68	-4.19	-5.87	-3.63	-1.17	13.04	27.07	27.90	22.55	24.46	35.57	36.59
2/16/97	-2.78	-4.68	-4.90	-4.51	-4.04	-5.75	-3.58	-1.17	13.18	27.24	28.09	22.74	24.55	35.60	36.61
2/17/97	1.94	-2.77	-3.66	-4.25	-3.90	-5.63	-3.52	-1.17	14.87	28.48	28.35	22.96	24.67	35.62	36.65
2/18/97	-3.33	-7.38	-8.06	-9.06	-8.90	-5.50	-3.43	-1.13	27.17	15.74	15.43	10.07	24.79	35.62	36.66
2/19/97	-2.78	-3.75	-3.59	-3.57	-3.42	-5.32	-3.34	-1.11	14.25	28.36	29.19	23.52	24.93	35.73	36.63
2/20/97	-1.39	-1.99	-2.74	-3.41	-3.24	-5.17	-3.25	-1.09	15.84	29.27	29.36	23.75	25.16	35.78	36.63
2/21/97	-4.44	-2.31	-2.61	-3.15	-3.07	-5.03	-3.17	-1.06	15.53	29.61	29.69	23.97	25.33	35.88	36.66
2/22/97	-8.89	-3.22	-2.78	-2.99	-2.91	-4.88	-3.08	-1.03	14.73	29.34	29.94	24.22	25.49	35.95	36.66
2/23/97	-13.33	-6.94	-5.19	-3.09	-2.80	-4.75	-3.00	-1.00	11.99	27.21	29.90	24.40	25.64	36.01	36.68
2/24/97	-8.06	-5.35	-5.19	-3.57	-2.94	-4.72	-2.92	-0.96	12.98	26.94	29.53	24.26	25.73	36.10	36.69
2/25/97	-1.94	-3.22	-3.80	-3.61	-3.06	-4.76	-2.89	-0.94	14.55	28.17	29.49	24.13	25.77	36.16	36.69
2/26/97	-10.28	-3.11	-3.24	-3.33	-2.98	-4.74	-2.88	-0.92	14.66	28.77	29.65	24.21	25.72	36.13	36.70
2/27/97	-11.67	-5.35	-4.27	-3.19	-2.86	-4.68	-2.84	-0.89	12.97	27.92	29.79	24.36	25.82	36.17	36.74
2/28/97	-10.56	-5.53	-4.90	-3.41	-2.87	-4.62	-2.80	-0.89	12.84	27.44	29.64	24.37	25.90	36.21	36.76
3/1/97	-11.67	-6.17	-5.49	-3.65	-2.97	-4.65	-2.78	-0.85	12.54	26.89	29.49	24.30	25.92	36.27	36.81
3/2/97	-10.00	-5.19	-4.92	-3.77	-3.08	-4.70	-2.78	-0.83	13.03	27.33	29.31	24.21	25.92	36.29	36.77
3/3/97	-10.00	-5.24	-4.69	-3.72	-3.11	-4.72	-2.78	-0.83	12.99	27.43	29.38	24.15	25.78	36.32	36.75
3/4/97	-17.50	-18.04	-16.72	-14.29	-13.60	-4.74	-2.78	-0.83	34.02	0.00	2.42	-2.25	25.80	36.33	36.79
3/5/97	-13.61	-8.35	-7.14	-4.35	-3.35	-4.83	-2.80	-0.83	12.12	25.39	28.87	23.92	25.72	36.29	36.78
3/6/97	-14.72	-14.00	-13.00	-9.96	-8.85	-5.00	-2.85	-0.83	24.80	11.59	15.10	10.50	25.60	36.24	36.80
3/7/97	-4.17	-5.95	-6.55	-5.04	-3.90	-5.18	-2.92	-0.83	12.67	25.65	28.25	23.40	25.48	36.22	36.75
3/8/97	-1.94	-3.12	-4.07	-4.56	-3.88	-5.30	-3.01	-0.87	14.55	27.74	28.50	23.39	25.38	36.13	36.80
3/9/97	-3.33	-3.53	-3.85	-3.99	-3.61	-5.23	-3.06	-0.89	14.37	28.06	28.91	23.52	25.38	36.09	36.75
3/10/97	-0.28	-1.64	-2.68	-3.63	-3.34	-5.11	-3.04	-0.94	16.48	29.42	29.28	23.78	25.48	36.10	36.77
3/11/97	-4.72	-1.42	-2.12	-3.18	-3.08	-4.94	-2.99	-0.94	17.36	30.02	29.67	24.05	25.56	36.15	36.76

Date	Air	Temperaure (C) Base	Subgrade						Volumetric Moisture Content (%) Base	Subgrade					
		229	381	762	914	1118	1422	1803	229	381	762	914	1118	1422	1803
3/12/97	-11.39	-4.91	-3.28	-2.90	-2.82	-4.75	-2.92	-0.93	13.65	28.93	30.04	24.33	25.68	36.17	36.74
3/13/97	-15.28	-7.94	-6.07	-3.19	-2.75	-4.63	-2.84	-0.89	11.54	26.27	29.86	24.46	25.90	36.21	36.75
3/14/97	-18.61	-13.83	-12.43	-9.14	-8.24	-4.63	-2.78	-0.88	24.06	11.83	15.83	11.10	25.97	36.25	36.78
3/15/97	-17.22														
3/16/97	-3.33	-5.88	-6.49	-4.93	-3.75	-5.04	-2.85	-0.83	12.67	25.38	28.35	23.60	25.60	36.21	36.80
3/17/97	-10.83	-5.49	-5.20	-4.56	-3.78	-5.21	-2.94	-0.86	12.84	26.54	28.56	23.48	25.49	36.15	36.76
3/18/97	-2.78	-4.54	-5.03	-4.33	-3.68	-5.20	-3.00	-0.89	13.64	26.81	28.70	23.58	25.43	36.16	36.74
3/19/97	5.00	-1.53	-2.96	-3.97	-3.55	-5.15	-3.02	-0.91	19.08	28.85	28.99	23.66	25.47	36.10	36.77
3/20/97	5.00	-0.04	-1.94	-3.39	-3.22	-5.04	-3.01	-0.94	26.10	30.70	29.52	23.86	25.49	36.09	36.73
3/21/97	1.67	0.82	-1.41	-2.92	-2.91	-4.84	-2.96	-0.94	27.24	32.06	30.02	24.21	25.61	36.14	36.66
3/22/97	3.61	1.69	-1.04	-2.58	-2.65	-4.64	-2.88	-0.92	27.38	33.74	30.44	24.51	25.81	36.18	36.67
3/23/97	3.33	1.30	-0.68	-2.31	-2.42	-4.47	-2.79	-0.89	26.80	37.09	30.86	24.77	25.99	36.22	36.75
3/24/97	1.39	1.31	-0.39	-2.10	-2.24	-4.31	-2.70	-0.86	26.46	37.50	31.27	25.08	26.14	36.29	36.75
3/25/97	3.06	1.52	-0.21	-1.92	-2.08	-4.17	-2.63	-0.83	26.27	37.60	31.55	25.44	26.39	36.34	36.81
3/26/97	10.28	4.55	1.23	-1.77	-1.94	-4.05	-2.55	-0.80	27.13	37.93	31.83	25.69	26.60	36.39	36.81
3/27/97	5.28	4.08	2.36	-1.64	-1.82	-3.94	-2.48	-0.78	38.19	39.18	32.07	25.89	26.76	36.49	36.80
3/28/97	2.22	1.03	0.35	-1.51	-1.70	-3.85	-2.42	-0.78	36.62	39.52	32.47	26.14	26.96	36.56	36.82
3/29/97	3.61	1.96	0.67	-1.38	-1.62	-3.75	-2.35	-0.74	34.62	39.22	32.81	26.39	27.15	36.63	36.84
3/30/97	6.11	3.19	1.47	-1.30	-1.53	-3.66	-2.29	-0.72	31.89	38.68	33.07	26.70	27.31	36.72	36.86
3/31/97	11.39	5.92	3.11	-1.20	-1.44	-3.58	-2.24	-0.68	31.46	38.59	33.34	26.86	27.49	36.88	36.93
4/1/97	3.61	4.13	3.57	-1.03	-1.36	-3.52	-2.19	-0.67	40.22	38.91	34.12	27.05	27.70	36.93	36.93
4/2/97	1.67	2.16	1.26	-0.93	-1.27	-3.42	-2.14	-0.63	40.56	38.86	35.32	27.28	27.83	36.92	36.97
4/3/97	6.11	3.38	2.00	-0.90	-1.19	-3.36	-2.08	-0.61	33.35	38.70	35.43	27.61	28.00	36.98	36.98
4/4/97	1.94	2.70	2.39	-0.83	-1.14	-3.30	-2.04	-0.59	31.71	38.64	35.75	27.84	28.17	37.04	36.98
4/5/97	-4.17	-0.46	0.09	-0.78	-1.08	-3.24	-2.00	-0.56	29.67	38.34	36.13	28.09	28.31	37.13	37.03
4/6/97	-7.22	-1.07	-0.73	-0.78	-1.02	-3.19	-1.96	-0.55	19.63	38.16	36.37	28.28	28.47	37.19	37.04
4/7/97	-10.00	-1.86	-0.78	-0.78	-0.98	-3.14	-1.92	-0.52	16.85	37.99	36.44	28.57	28.65	37.25	37.06
4/8/97	-10.56	-1.96	-0.83	-0.78	-0.95	-3.09	-1.89	-0.50	16.86	36.85	36.47	28.74	28.79	37.32	37.14
4/9/97	-8.06	-6.97	-6.24	-6.11	-6.25	-3.06	-1.86	-0.49	28.48	21.89	22.75	15.50	28.90	37.39	37.14
4/10/97	-5.56	-6.89	-6.31	-6.11	-6.22	-3.03	-1.83	-0.45	30.84	21.20	22.82	15.61	29.00	37.44	37.20
4/11/97	-1.94	-0.50	-0.87	-0.78	-0.89	-3.00	-1.79	-0.44	25.89	34.86	36.53	29.12	29.14	37.50	37.19
4/12/97	0.83	1.01	-0.79	-0.78	-0.85	-2.96	-1.77	-0.44	30.50	35.35	36.58	29.23	29.22	37.55	37.24
4/13/97	3.89	2.15	-0.16	-0.78	-0.83	-2.94	-1.74	-0.42	30.34	38.34	36.55	29.34	29.33	37.61	37.25
4/14/97	7.22	3.98	2.11	-0.76	-0.83	-2.93	-1.72	-0.39	29.52	38.42	36.57	29.40	29.43	37.67	37.29
4/15/97	2.22	4.58	2.84	-0.72	-0.82	-2.89	-1.71	-0.39	29.16	38.42	36.74	29.51	29.54	37.72	37.30
4/16/97	8.61	6.62	4.31	-0.68	-0.78	-2.88	-1.68	-0.38	29.35	38.57	37.03	29.62	29.60	37.74	37.32
4/17/97	15.28	10.40	6.94	-0.53	-0.78	-2.86	-1.67	-0.35	30.13	38.82	38.48	29.73	29.70	37.80	37.37
4/18/97	11.67	12.56	9.15	0.24	-0.78	-2.83	-1.67	-0.33	30.45	39.01	39.22	29.87	29.80	37.83	37.34
4/19/97	12.22	12.79	10.14	1.41	-0.73	-2.83	-1.66	-0.33	30.23	39.10	39.27	30.19	29.89	37.90	37.39
4/20/97	9.17	11.85	10.20	2.57	-0.63	-2.81	-1.65	-0.33	36.13	39.43	39.59	31.24	30.01	37.93	37.39
4/21/97	6.94	8.30	8.69	4.20	-0.27	-2.78	-1.62	-0.33	57.21	40.67	41.02	38.94	30.11	37.98	37.43

Date	Air	Temperaure (C) Base			Subgrade				Volumetric Moisture Content (%) Base			Subgrade			
		229	381	762	914	1118	1422	1803	229	381	762	914	1118	1422	1803
4/22/97	5.56	6.13	5.92	3.04	0.12	-2.73	-1.61	-0.32	57.12	40.45	40.26	41.24	30.41	38.02	37.46
4/23/97	7.22	6.31	5.49	2.32	0.25	-2.69	-1.61	-0.29	50.44	40.21	39.97	39.85	30.75	38.07	37.49
4/24/97	6.94	7.04	5.60	2.17	0.31	-2.64	-1.57	-0.28	50.33	40.07	39.89	38.44	31.08	38.09	37.49
4/25/97	8.89	8.50	6.91	2.39	0.48	-2.60	-1.56	-0.28	43.87	39.58	39.81	38.24	31.44	38.13	37.51
4/26/97	8.61	8.67	7.12	2.79	0.74	-2.56	-1.55	-0.28	51.74	39.47	39.83	38.12	31.84	38.19	37.52
4/27/97	10.00	9.73	7.84	3.15	1.01	-2.50	-1.52	-0.28	52.94	39.51	39.84	38.03	32.54	38.25	37.60
4/28/97	10.56	10.90	9.26	3.68	1.33	-2.46	-1.50	-0.28	53.62	39.63	39.85	37.95	34.29	38.31	37.59
4/29/97	5.56	9.83	8.50	4.11	1.72	-2.40	-1.50	-0.24	53.35	39.58	39.85	37.90	36.68	38.38	37.61
4/30/97	8.89	9.97	8.88	4.30	1.97	-2.23	-1.46	-0.22	53.22	39.59	39.81	37.86	36.49	38.45	37.67
5/1/97	7.22	8.73	8.05	4.44	2.22	-1.92	-1.44	-0.22	52.80	39.51	39.80	37.83	36.41	38.52	37.69
5/2/97	5.56	8.70	7.71	4.36	2.35	-1.63	-1.43	-0.22	52.89	39.53	39.78	37.76	36.38	38.58	37.67
5/3/97	-10.28	10.33	8.44	4.39	2.44	-1.37	-1.40	-0.22	53.43	39.57	39.77	37.72	36.27	38.69	37.73
5/4/97	10.00	11.87	10.13	4.83	2.67	-1.10	-1.39	-0.22	42.83	39.63	39.79	37.69	36.29	38.83	37.76
5/5/97	10.83	12.03	10.18	5.33	3.07	-0.78	-1.34	-0.21	38.22	39.53	39.75	37.66	36.25	38.97	37.78
5/6/97	15.00	13.61	11.44	5.80	3.44	-0.43	-1.32	-0.19	37.35	39.63	39.77	37.68	36.27	39.12	37.80
5/7/97	11.67	13.69	12.17	6.44	3.89	-0.06	-1.28	-0.17	36.76	39.65	39.76	37.63	36.25	39.45	37.83
5/8/97	8.61	13.15	11.41	6.79	4.33	0.35	-1.20	-0.17	36.32	39.50	39.77	37.63	36.27	40.53	37.84
5/9/97	15.00	14.81	12.54	7.05	4.63	0.71	-1.05	-0.17	36.78	39.60	39.66	37.59	36.25	41.28	37.90
5/10/97	15.28	16.34	14.12	7.63	5.00	1.05	-0.81	-0.17	37.42	39.72	39.60	37.52	36.24	41.34	37.91
5/11/97	9.44	14.40	13.28	8.20	5.49	1.46	-0.51	-0.17	36.49	39.64	39.62	37.58	36.26	41.29	37.96
5/12/97	10.56	14.97	13.19	8.32	5.83	1.85	-0.14	-0.17	36.68	39.61	39.60	37.53	36.29	41.34	38.02
5/13/97	11.39	15.42	13.85	8.58	6.09	2.19	0.23	-0.17	37.24	39.71	39.57	37.46	36.19	41.34	38.05
5/14/97	9.72	15.38	13.61	8.84	6.40	2.52	0.61	-0.16	37.09	39.66	39.56	37.46	36.23	41.33	38.12
5/15/97	16.67	16.61	14.47	9.10	6.66	2.85	0.96	-0.14	37.32	39.73	39.54	37.45	36.21	41.32	38.17
5/16/97	20.28	20.18	16.88	9.68	7.03	3.18	1.32	-0.12	38.20	39.93	39.57	37.43	36.18	41.34	38.25
5/17/97	18.89	20.05	17.95	10.70	7.65	3.63	1.74	-0.11	38.31	40.05	39.62	37.45	36.24	41.46	38.52
5/18/97	8.33	14.79	15.58	11.26	8.30	4.22	2.25	0.00	36.94	39.81	39.65	37.48	36.29	41.36	39.06
5/19/97	2.78	11.27	11.62	10.59	8.51	4.75	2.88	1.17	35.90	39.42	39.60	37.47	36.35	41.57	39.15
5/20/97	7.22	11.96	11.32	9.68	8.23	4.97	3.50	2.38	36.10	39.41	39.53	37.45	36.38	41.69	39.23
5/21/97	11.94	13.25	12.12	9.42	8.05	5.04	3.94	3.01	36.28	39.45	39.49	37.42	36.31	41.74	39.28
5/22/97	11.11	14.31	12.97	9.55	8.06	5.14	4.26	3.47	36.48	39.53	39.49	37.36	36.30	41.82	39.34
5/23/97	12.50	15.72	13.93	9.87	8.27	5.33	4.55	3.85	36.68	39.62	39.51	37.37	36.34	41.82	39.38
5/24/97	12.50	14.15	14.01	10.38	8.59	5.58	4.81	4.17	39.95	39.62	39.56	37.43	36.35	41.89	39.37
5/25/97	10.28	11.25	11.48	10.28	8.85	5.89	5.10	4.47	52.05	39.59	39.54	37.38	36.41	41.88	39.42
5/26/97	11.39	12.70	11.66	9.84	8.77	6.07	5.36	4.76	53.07	39.52	39.51	37.37	36.42	41.86	39.40
5/27/97	12.50	14.38	12.98	9.91	8.75	6.12	5.56	5.01	54.03	39.57	39.50	37.39	36.42	41.94	39.42
5/28/97	10.56	14.53	13.43	10.28	8.92	6.25	5.73	5.24	54.10	39.58	39.51	37.37	36.38	41.92	39.45
5/29/97	11.39	16.34	14.26	10.57	9.17	6.45	5.91	5.44	54.85	39.68	39.52	37.41	36.42	42.00	39.45
5/30/97	16.39	19.22	16.54	11.21	9.49	6.68	6.11	5.63	55.79	39.86	39.58	37.41	36.43	41.95	39.48

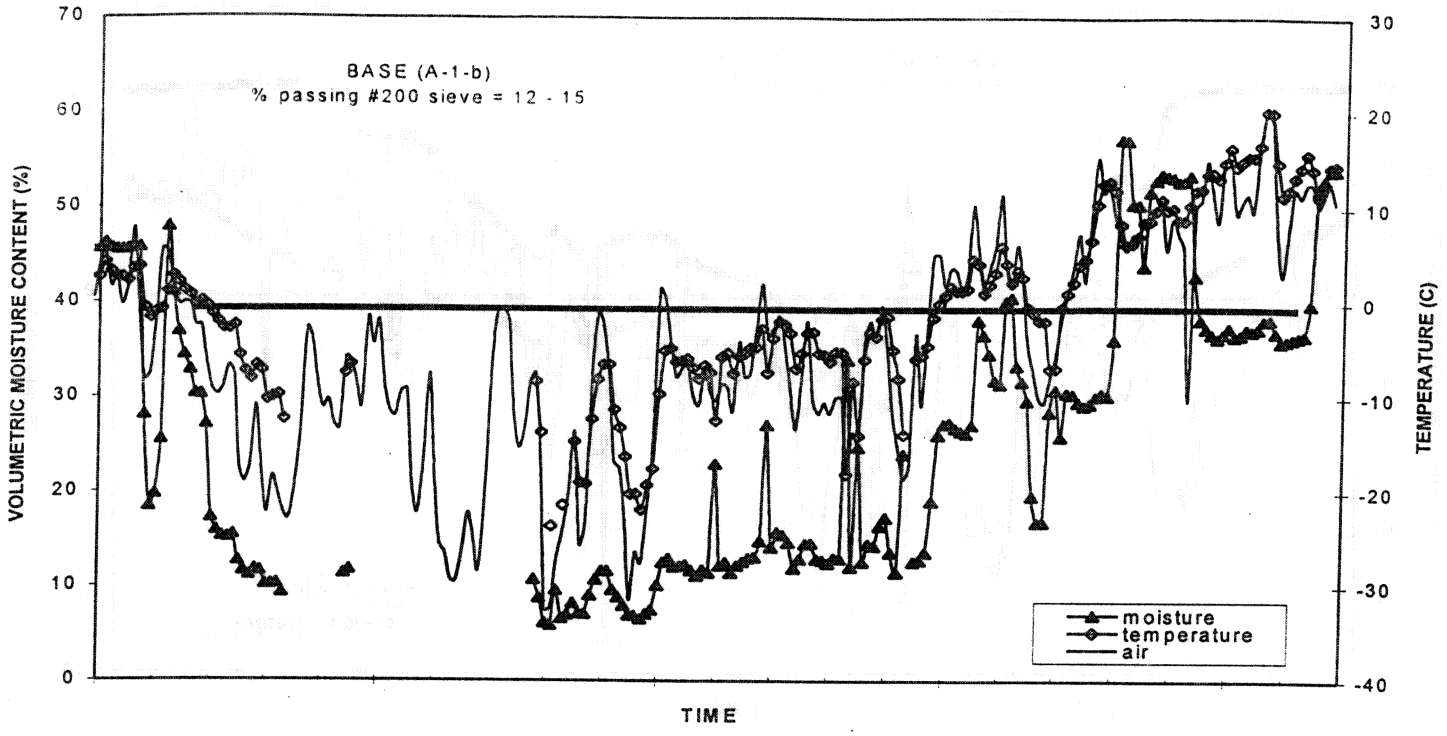


Figure B-7. Moisture Temperature distribution as a function of time in the base course at Wolfpoint.

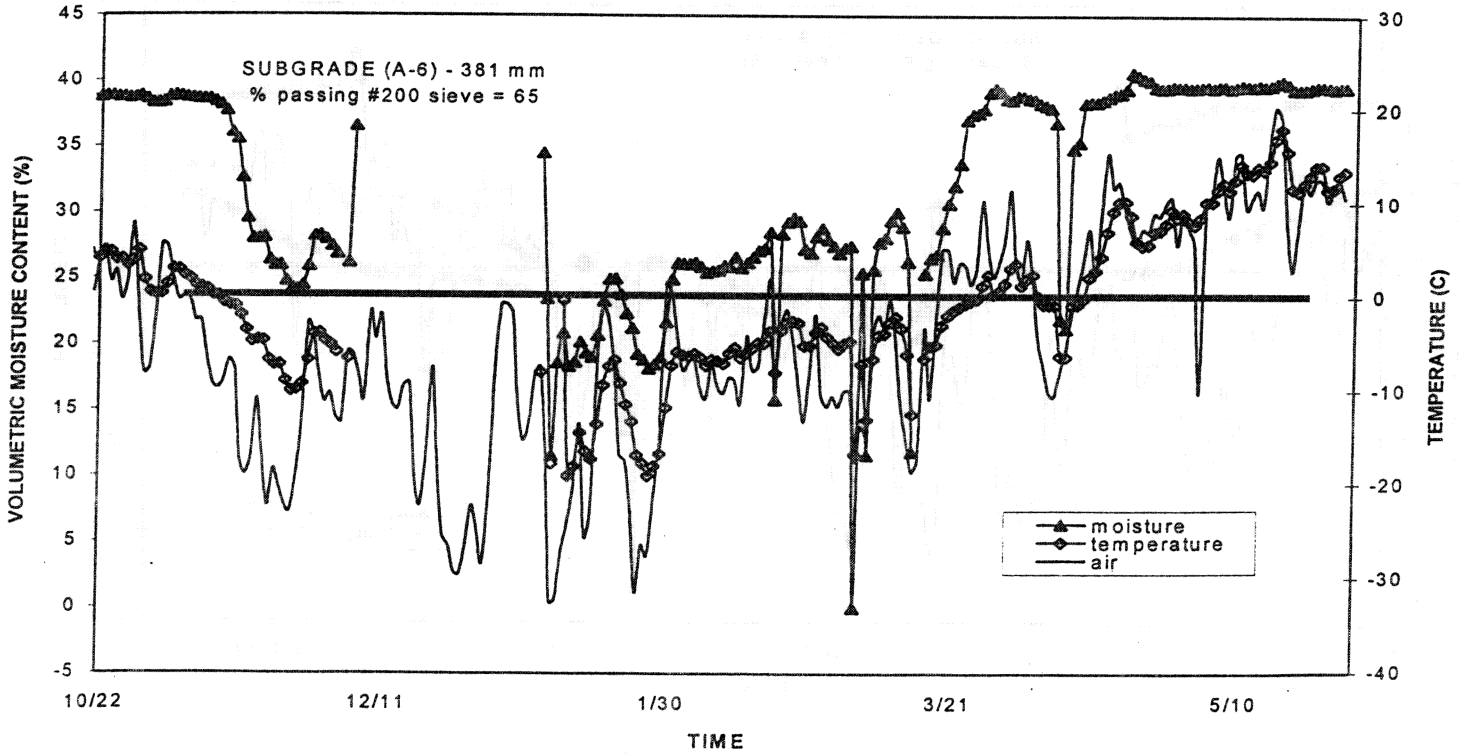


Figure B-8. Moisture Temperature distribution as a function of time in the subgrade (381mm) at Wolpoint.

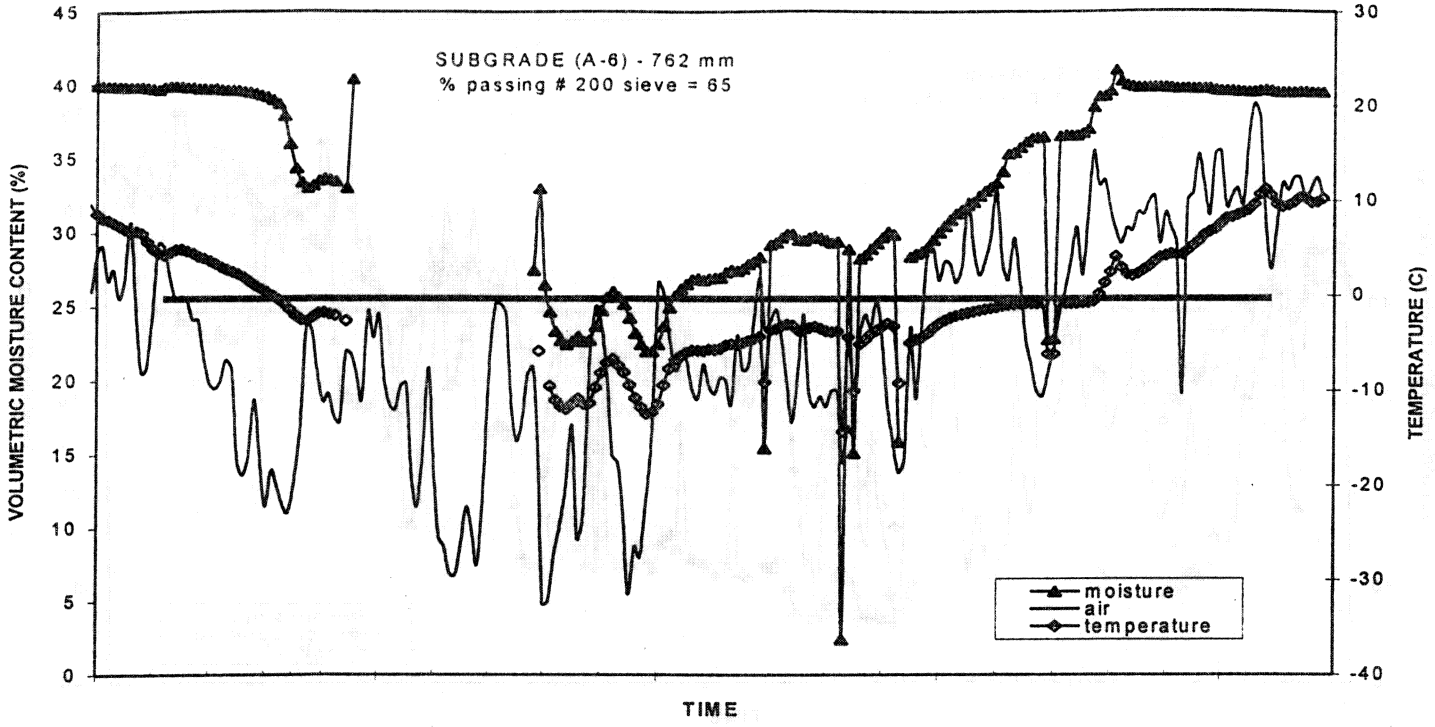


Figure B-9. Moisture Temperature distribution as a function of time in the subgrade (762mm) at Wolpoint.

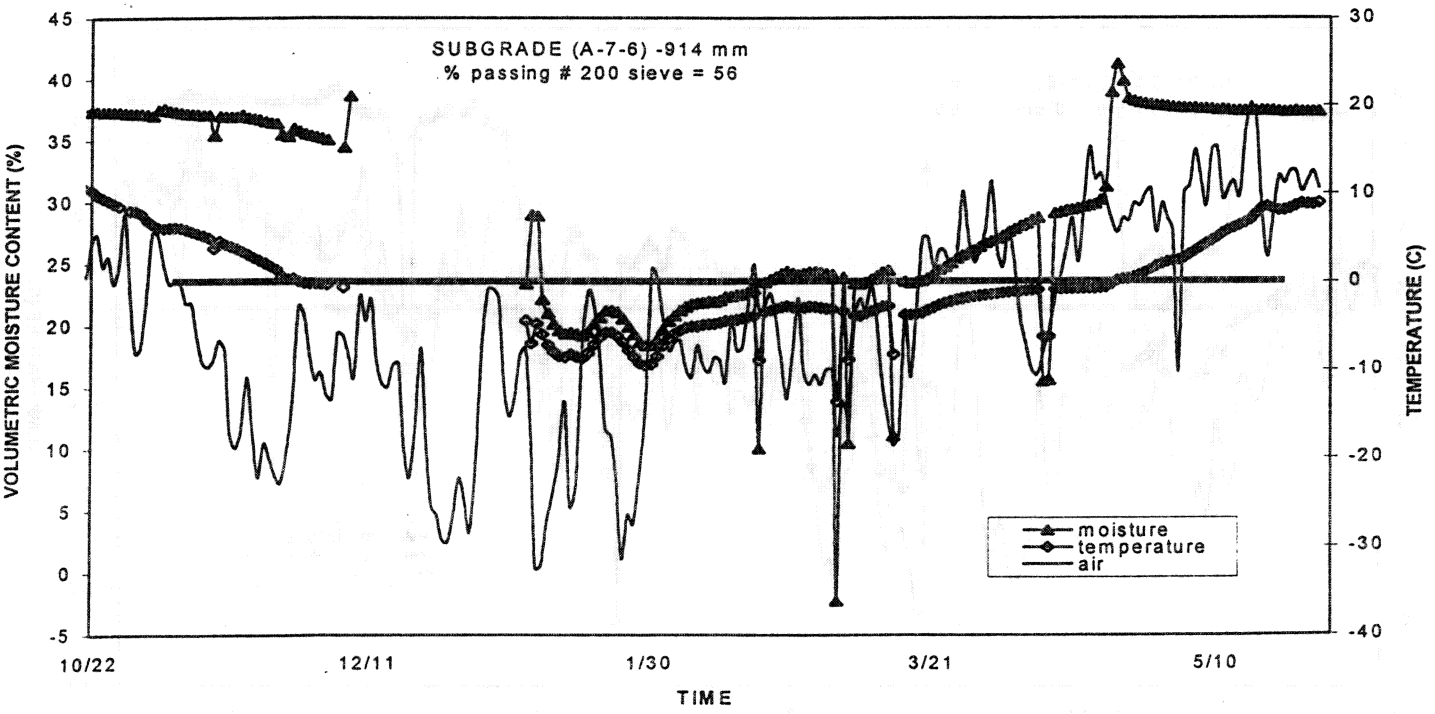


Figure B-10. Moisture Temperature distribution as a function of time in the subgrade (914mm) at Wolpoint.

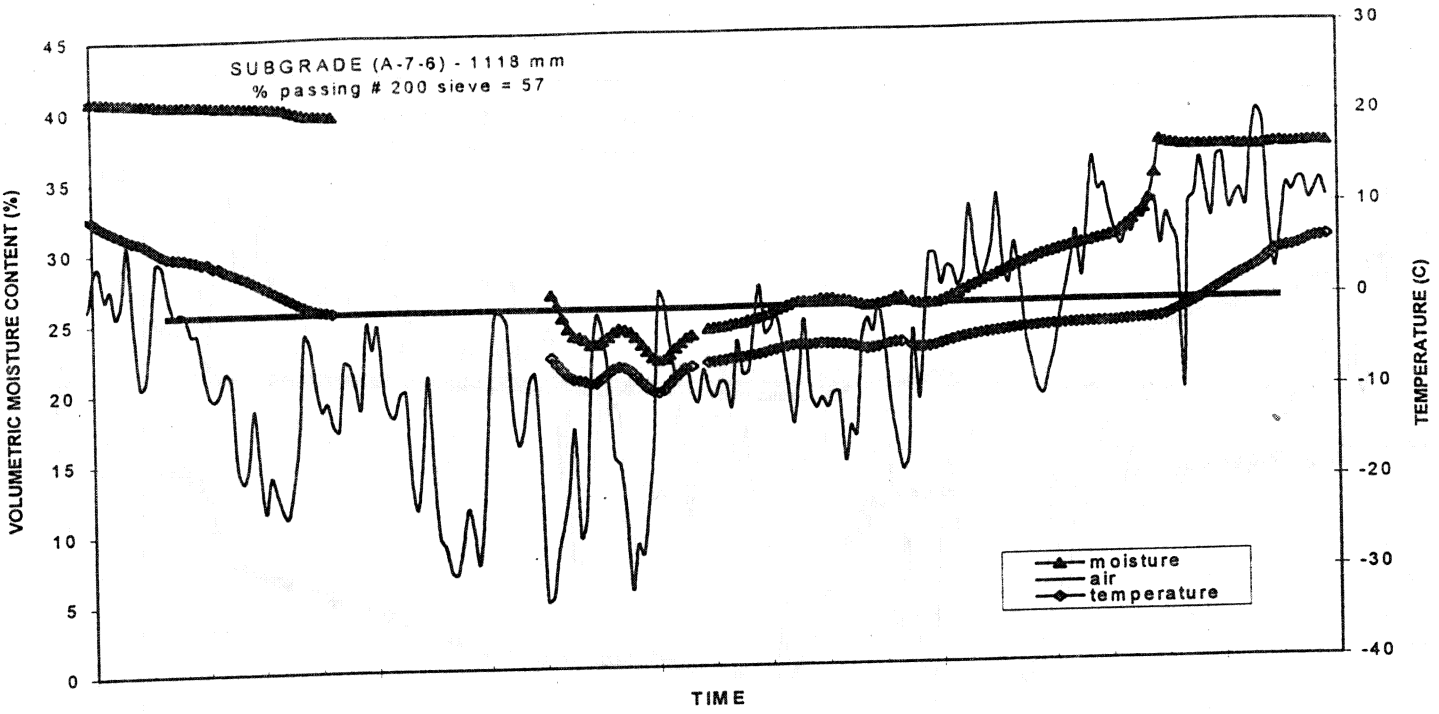


Figure B-11. Moisture Temperature distribution as a function of time in the subgrade (1118mm) at Wolpoint.

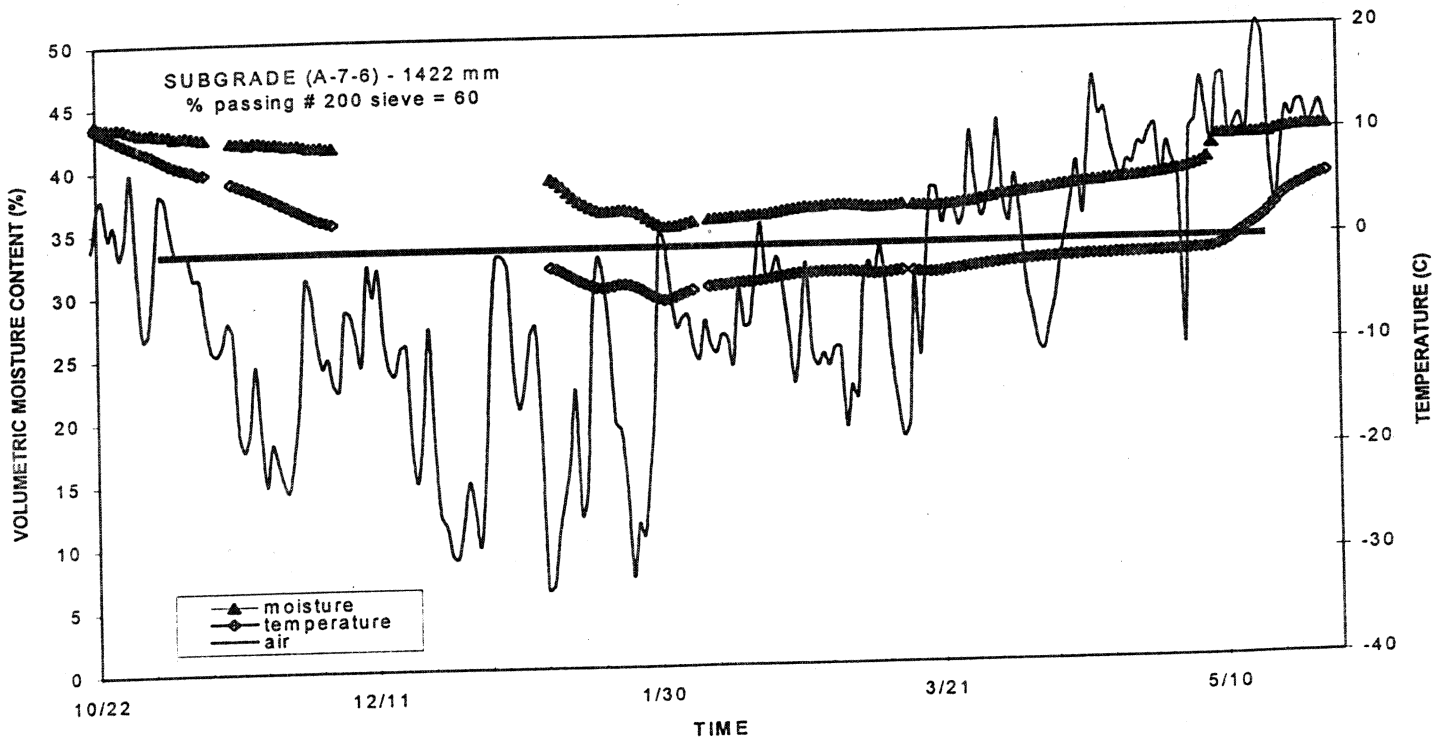


Figure B-12. Moisture Temperature distribution as a function of time in the subgrade (1422mm) at Wolpoint.

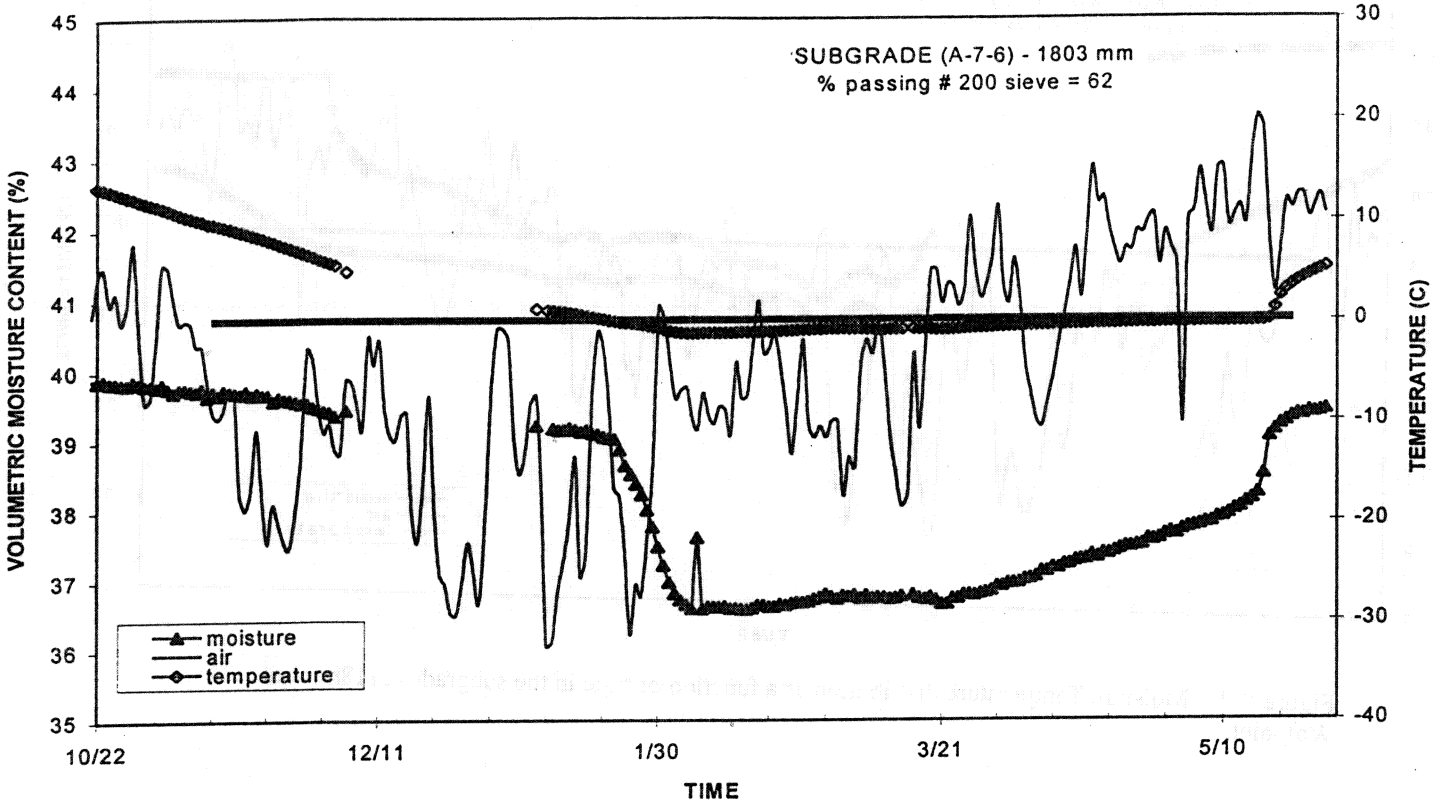


Figure B-13. Moisture Temperature distribution as a function of time in the subgrade (1803mm) at Wolpoint.

Sweetgrass

Table B-3. Moisture Temperature distibution as a function of time and depth at Sweetgrass

Date	Air	Temperature (C) Base			Subgrade					Volumetric Moisture Content (%) Base			Subgrade				
		572	864	1087	1237	1387	1586	1887	2289	572	864	1087	1237	1387	1586	1887	2289
10/1/96	3.61	11.50	12.59	13.29	13.65	13.78	15.69	14.23	14.27	4.19	29.99	34.85	37.23	27.93	37.73	31.52	1.11
10/2/96	4.44	9.81	11.76	12.91	13.39	13.62	15.56	14.09	14.14	4.01	29.66	35.00	37.42	28.26	38.00	31.87	7.00
10/3/96	14.17	10.27	11.15	12.35	12.95	13.31	15.35	13.95	14.02	4.07	29.62	34.88	37.38	29.37	38.16	31.23	0.00
10/4/96	14.17	12.02	11.51	12.15	12.65	12.99	15.11	13.77	13.89	4.22	29.61	34.77	37.34	28.32	38.18	31.53	6.89
10/5/96	14.72	12.88	12.12	12.33	12.66	12.85	14.90	13.61	13.64	4.31	29.66	34.86	37.28	28.65	37.93	31.30	1.98
10/6/96	9.17	12.88	12.52	12.60	12.82	12.85	14.79	13.44	13.63	4.22	29.85	34.93	37.23	28.52	38.14	31.49	
10/7/96	14.44	12.68	12.50	12.69	12.91	12.88	14.76	13.31	13.49	4.20	29.54	34.86	37.35	27.24	37.62	31.38	
10/8/96	15.00	13.52	12.71	12.75	12.94	12.82	14.72	13.21	13.37	4.30	29.56	34.84	37.39	27.50	36.92	31.38	
10/9/96	12.22	12.56	13.07		13.06	12.92	14.69	13.13	13.28	4.41	28.45		37.36	27.78	37.72	31.44	
10/10/96	15.83	13.88	12.87		13.18	12.98	14.70	13.08	13.19	4.33	29.71		37.35	29.03	38.04	31.76	
10/11/96		13.15			12.03	13.05	14.72	13.01	13.11	4.27	34.21		37.19	30.62	37.77	31.43	4.04
10/12/96	13.33	14.20			13.37	13.11	14.75	13.00	13.04	4.24	29.85		35.75	29.19	37.96	31.35	1.65
10/13/96	15.28	13.70			13.47	13.20	14.78	12.95	12.99	4.29	29.79		25.90	30.48	37.79	31.40	1.84
10/14/96	12.50	13.42	13.34	13.35	13.18	13.21	14.80	12.96	12.94	4.26	29.60	34.40	37.18	26.96	37.92	31.30	0.42
10/15/96	7.78	12.74	13.06	13.25	13.38	13.18	14.79	12.93	12.89	4.18	29.40	34.82	37.29	28.45	38.13	31.39	5.51
10/16/96		11.39	12.50	13.00	13.22	13.09	14.76	12.90	12.87	4.27	29.25	34.82	35.70	27.49	37.83	31.41	12.33
10/17/96	1.94	9.57	11.51	12.51	12.89	12.92	14.66	12.88	12.83	3.78	29.18	34.92	37.25	27.20	37.97	31.32	11.51
10/18/96	6.39	9.21	9.47	11.80	12.39	12.61	14.50	12.81	11.59	3.75	28.92	33.44	37.22	29.40	37.94	31.31	14.22
10/19/96		8.75	10.21	11.34	11.91	12.23	14.26	12.71		3.64	28.85	34.66	37.16	30.14	37.66	31.29	11.42
10/20/96		6.88	9.45	9.68	11.58	11.89		12.57	12.66	3.50	28.73	34.64	35.89	29.45	35.78	30.03	11.38
10/21/96	3.33	6.89	8.75	10.28	11.02	11.50		11.16	12.58	3.51	28.64	34.52	36.87	28.79	36.76	29.81	13.06
10/22/96	6.94	7.10	8.34	9.77	10.54	11.11	13.45		12.48	3.53	28.68	34.44	37.00		37.27	31.30	9.68
10/23/96	4.44	7.29	8.30	9.50	10.21	14.61	13.15	10.80		3.52	28.69	34.61	36.92		22.08	31.56	12.96
10/24/96	4.44	7.15	8.15	8.98	9.98	10.50	12.89	11.84	12.22	3.49	28.63	34.63	36.92	31.39	37.43	31.24	17.60
10/25/96	1.67	6.82	7.99	9.09	9.75	10.26	12.66	11.94	12.08	3.46	28.73	34.56	36.90	31.03	37.35	31.32	12.45
10/26/96	-0.83	5.71	7.50	8.83	9.29	10.05	12.47	11.45	11.96	3.33	28.46	34.48	36.96	29.91	37.45	31.45	12.87
10/27/96	3.89	5.40	6.97	8.41	9.19	10.98	12.26	11.27	11.81	3.36	28.43	34.52	36.91	30.87	37.62	31.48	16.48
10/28/96	8.61	6.33	6.88	8.08	8.85		11.94	11.08	11.77	3.36	28.38	34.29	36.78	30.92	42.95	31.39	16.36
10/29/96	-1.67	5.72	7.05	8.06	8.73	9.25	11.79	10.89	11.51	3.36	28.32	34.28	36.79	30.24	37.31	31.40	18.41
10/30/96	-7.22	3.08	6.08	7.74	8.52	9.09	10.43	10.71	11.38	3.10	28.17	34.33	36.72	31.56	37.57	30.01	12.57
10/31/96	-2.78	2.17	4.94	6.99	7.98	8.75	11.40	10.53	11.24	2.96	28.11	34.27	36.80	30.65	37.35	31.18	23.06
11/1/96	5.56	2.44	4.35	6.34	7.41	8.30	11.10	10.35	11.10	3.02	28.01	34.28	36.60	30.99	37.40	31.28	18.01
11/2/96	8.61	3.76	4.50	6.02	6.99	7.89	10.75	10.13	10.95	3.19	27.95	34.23	36.68	31.63	37.26	31.24	21.96
11/3/96	6.11	4.88	5.05	6.04	6.88	7.62	10.47	9.88	10.76	3.28	28.14	34.33	36.56	31.50	37.33	31.21	22.81
11/4/96	4.72	4.61	5.32	6.23	6.93	7.51	10.29	9.66	10.60	3.28	28.05	34.33	36.52	31.69	37.47	31.01	22.03
11/5/96	1.11	4.12	5.19	6.23	6.94	7.47	10.17	9.49	10.43	3.18	28.00	34.26	36.71	31.62	37.59	31.05	21.32
11/6/96	1.39	3.63	4.93	6.08	6.82	7.37	10.05	9.31	10.29	3.10	28.05	34.31	36.63	31.44	37.67	31.05	24.43
11/7/96	0.56	3.28	4.59	5.87	6.64	7.22	9.93	9.17	10.13	3.03	27.97	34.32	36.60	30.33	37.45	30.74	23.69
11/8/96	5.28	3.25	4.38	5.65	6.43	7.04	9.77	9.01	10.00	3.08	27.94	34.23	36.56	31.46	37.49	30.99	23.82
11/9/96	4.17	3.80	4.43	5.50	6.27	6.86	9.62	8.87	9.86	3.14	27.89	34.27	36.61	31.30	37.47	30.89	23.09
11/10/96	-1.39	3.03	4.34	5.44	6.16	6.73	9.47	8.71	9.72	3.02	27.86	34.23	36.48	31.57	37.50	30.92	23.49
11/11/96	-5.56	1.80	3.79	5.22	6.00	6.59	9.33	8.57	9.59	2.86	27.88	34.20	36.62	31.18	37.22	30.97	24.49

Date	Air	Temperature (C) Base	Subgrade							Volumetric Moisture Content (%) Base	Subgrade						
		572	864	1087	1237	1387	1586	1887	2289	572	864	1087	1237	1387	1586	1887	2289
11/12/96	-5.00	1.00	3.11	4.78	5.68	6.37	9.18	8.43	9.46	2.84	27.74	34.09	36.47	30.71	37.33	30.86	24.42
11/13/96	-5.28	0.46	2.56	4.32	5.29	6.07	8.97	8.29	9.33	2.82	27.84	34.06	36.44	30.95	37.14	30.78	26.45
11/14/96	-3.61	0.06	2.08	3.89	4.91	5.76	8.74	8.12	9.20	2.70	27.63	34.05	36.50	31.55	37.24	30.70	26.66
11/15/96	-9.17	-0.31	1.71	3.52	4.56	5.44	8.49	7.93	9.06	2.71	27.41	34.00	36.34	31.71	37.48	30.75	25.77
11/16/96	-16.11	-1.07	1.24	3.14	4.23	5.14	8.25	7.74	8.92	2.41	27.24	33.99	36.35	31.84	37.49	30.88	24.87
11/17/96	-16.94	-1.79	0.63	2.67	3.82	4.79	7.98	7.53	8.77	0.78	27.04	33.83	36.17	31.76	37.33	30.75	26.92
11/18/96	-16.11	-2.49	0.10	2.20	3.41	4.44	7.70	7.31	8.59		26.57	33.75	36.08	32.21	37.21	30.65	22.56
11/19/96	-19.17	-3.77	-0.37	1.78	2.99	4.07	7.41	7.10	8.43		25.83	33.62	36.00	32.08	37.38	30.78	26.03
11/20/96	-22.50	-5.13	-0.86	1.35	2.61	3.74	7.13	6.87	8.26		24.80	33.40	35.92	32.18	37.28	30.74	25.42
11/21/96	-25.56	-6.35	-1.40	0.92	2.21	3.37	6.83	6.64	8.08		23.34	33.03	35.76	31.80	37.16	30.53	26.24
11/22/96	-21.67	-6.77	-1.86	0.49	1.81	3.00	6.54	6.39	7.91		22.04	32.84	35.65	32.46	37.08	30.64	26.31
11/23/96	-22.22	-7.15	-2.30	0.09	1.43	2.66	6.25	6.15	7.72		18.37	32.55	35.58	32.86	37.06	30.50	25.59
11/24/96		-7.40	-2.85	-0.35	1.02	2.28	5.94	5.90	7.52		14.99	32.16	35.56	32.82	37.15	30.47	27.25
11/25/96	-17.78	-7.53	-3.39	-0.73	0.65	1.91	5.64	5.65	7.33		13.81	31.64	35.37	32.98	37.12	30.37	26.74
11/26/96	-13.33	-7.52	-3.78	-1.05	0.32	1.61	5.36	5.41	7.14		13.09	31.35	35.30	32.83	36.88	30.72	27.34
11/27/96	-9.44	-6.17		-1.35	0.02	1.29	5.09	5.17	6.94		12.90	29.83	35.22	32.90	36.93	30.52	26.92
11/28/96	1.39	-4.15	-3.46	-1.54	-0.22	1.01	4.82	4.91	6.74		13.19	30.65	35.00	33.02	36.87	30.32	26.88
11/29/96	-2.50	-3.31	-2.99		-0.33	0.80	4.58	4.67	6.53	2.59	13.65	30.63	34.51	32.88	36.92	30.36	27.28
11/30/96	-3.61	-3.44	-2.79	-1.54	-0.37	0.70	4.42	4.44	6.33		13.98	30.82	35.18	32.97	36.67	30.37	27.48
12/1/96	-1.11	-3.26	-2.73	-1.52	-0.38	0.61	4.28	4.25	6.13		14.00	31.13	35.02	32.50	36.70	30.18	27.31
12/2/96	-3.89	-2.91	-2.64	-1.49	-0.42	0.55	4.16	4.08	5.95		14.15	31.21	35.10	33.06	36.64	30.18	27.68
12/3/96	-6.67	-3.20	-2.58	-1.47	-0.43	0.49	4.09	3.92	5.78		14.27	31.39	35.02	32.78	36.59	30.03	27.43
12/4/96	-4.72	-3.80	-2.63	-1.44	-0.42	0.45	3.98	3.78	5.63		14.27	31.26	35.07	32.78	36.70	29.98	28.34
12/5/96		-3.54	-2.69	-1.43	-0.42	0.40	3.93	3.64	5.47		14.14	31.28	35.01	32.96	36.70	29.75	28.29
12/6/96	-1.94	-3.39	-2.62	-1.43	-0.43	0.36	3.87	3.53	5.34		14.27	31.37	35.05	32.88	36.65	29.78	28.41
12/7/96		-3.66	-2.65	-1.43	-0.46	0.30	3.78	3.43	5.21		14.19	31.29	35.09	33.11	36.70	29.74	28.50
12/8/96	-2.50	-3.44	-2.64	-1.45	-0.49	0.28	3.72	3.31	5.10		14.12	31.27	35.07	32.94	36.54	29.79	27.69
12/9/96	-0.56	-3.10	-2.58	-1.48	-0.52	0.22	3.66	3.21			14.32	31.17	35.04	33.25	36.70	29.64	28.82
12/10/96	-1.39																
12/11/96	0.56	-3.19	-2.88	-1.82	-0.89	-0.15	3.34	2.84	4.65		14.92	31.67	35.38	34.07	37.31	30.42	31.77
12/12/96	-5.28	-3.36	-2.83	-1.79	-0.89	-0.17	3.28	2.76	4.55		15.06	31.70	35.46	34.07	37.18	30.44	31.40
12/13/96		-3.88	-2.87	-1.78	-0.89	-0.17	3.26	2.69	4.46		15.00	31.74	35.46	34.38	37.20	30.27	31.70
12/14/96	-6.39	-4.27	-2.97	-1.78	-0.90	-0.21	3.21	2.60	4.36		14.81	31.70	35.45	34.34	37.16	30.43	31.52
12/15/96	-3.06	-4.27	-3.07	-1.81	-0.94	-0.24	3.16	2.54	4.28		14.60	31.56	35.35	34.18	37.17	30.25	31.54
12/16/96	-6.67	-4.37	-3.08	-1.86	-0.98	-0.29	3.10	2.47	4.18		14.59	31.45	35.39	34.20	37.20	30.12	31.51
12/17/96	-13.33	-5.62	-3.30	-1.91	-1.03	-0.35	3.06	2.38	4.10		14.18	31.28	35.29	34.21	37.09	30.29	31.41
12/18/96	-15.56	-6.79	-3.77	-1.99	-1.09	-0.41	3.01	2.31	4.02		13.50	31.10	35.17	34.15	37.00	30.13	31.78
12/19/96	-6.39	-6.40	-4.15	-2.14	-1.22	-0.50	2.94	2.26	3.95		12.99	30.47	34.97	34.26	37.15	30.22	31.63
12/20/96		-5.00	-3.98	-2.29	-1.36	-0.62	2.83	2.18	3.87		13.10	29.58	34.86	34.21	37.28	30.19	31.93
12/21/96		-6.25	-3.95	-2.38	-1.47	-0.74	2.75	2.07	3.78		13.17	28.96	34.74	34.06	37.18	30.11	31.21
12/22/96	-28.06	-9.46	-4.85	-2.50	-1.56	-0.81	2.65	1.99	3.70		12.32	27.16	34.59	34.19	37.08	30.13	30.38
12/23/96	-28.33	-11.69	-6.20	-2.78	-1.70	-0.94	2.57	1.91	3.61		11.08	24.04	34.34	34.17	37.14	30.16	29.84
12/24/96	-28.06	-13.07	-7.47	-3.46	-1.96	-1.14	2.44	1.80	3.52		10.22	21.57	33.62	34.08	36.91	29.99	30.79
12/25/96	-22.78	-13.54	-8.47	-4.28	-2.30	-1.40	2.27	1.70	3.44		9.52	20.08	30.79	34.03	37.13	29.97	30.15

Date	Air	Temperature (C) Base	Subgrade							Volumetric Moisture Content (%) Base	Subgrade						
		572	864	1087	1237	1387	1586	1887	2289	572	864	1087	1237	1387	1586	1887	2289
12/26/96	-25.28	-14.17	-9.15	-5.03	-2.83	-1.68	2.07	1.58	3.34		9.09	19.19	27.76	33.97	37.23	30.20	29.99
12/27/96	-21.94	-14.25	-9.79	-5.72	-3.46	-1.99	1.85	1.41	3.23		8.77	18.49	26.30	33.85	37.16	30.02	30.18
12/28/96	-28.06	-14.85	-10.17	-6.28	-4.06	-2.29	1.61	1.24	3.10		8.29	17.93	25.28	33.82	37.08	29.96	30.10
12/29/96	-30.28	-16.24	-11.01	-6.89	-4.63	-2.60	1.36	1.06	2.99		8.05	17.36	24.51	32.82	37.11	29.83	30.66
12/30/96	-11.39																
12/31/96	-7.22																
1/1/97		-9.50	-9.62	-7.53	-5.80	-3.86	0.63	0.45	2.55		8.47	16.54	22.96	28.80	36.86	29.88	30.62
1/2/97	3.89	-6.85	-7.78	-6.65	-5.38	-3.99	0.40	0.24	2.37		9.22	17.11	23.26	28.46	36.75	29.73	31.09
1/3/97		-5.59	-6.45	-5.77	-4.85	-3.91	0.26	0.03	2.21		10.34	17.76	23.76	28.48	36.44	29.68	29.26
1/4/97		-5.77	-5.79	-5.17	-4.43	-3.78	0.18	-0.16	2.03		10.81	18.22	24.10	28.64	36.37	29.63	29.80
1/5/97		-6.33	-5.73	-4.92	-4.16	-3.65	0.12	-0.28	1.88		10.81	18.35	24.28	28.77	36.30	29.72	30.14
1/6/97	-5.00	-6.63	-5.86	-4.84	-4.06	-3.58	0.11	-0.39	1.75		10.81	18.48	24.36	28.80	36.26	29.66	31.22
1/7/97	-1.67	-5.88	-5.73	-4.82	-4.04	-3.55	0.10	-0.47	1.65		10.82	18.41	24.37	28.74	36.18	29.66	31.50
1/8/97		-5.22	-5.35	-4.66	-3.96	-3.53	0.08	-0.54	1.54		11.09	18.63	24.51	28.87	36.19	29.62	31.60
1/9/97		-6.05	-5.22	-4.52	-3.84	-3.48	0.07	-0.60	1.41		11.22	18.91	24.61	28.88	36.16	29.41	30.94
1/10/97		-8.40	-5.97	-4.64	-3.84	-3.40	0.06	-0.65	1.36		10.84	18.77	24.63	28.87	36.22	29.41	31.03
1/11/97		-10.97	-7.22	-5.19	-4.12	-3.51	0.06	-0.71	1.27		10.10	18.32	24.41	28.80	36.14	29.50	31.16
1/12/97		-13.82	-8.96	-6.08	-4.69	-3.74	0.03	-0.75	1.19		9.05	17.67	24.04	28.62	36.15	29.44	31.01
1/13/97	-26.67	-15.85	-10.74	-7.22	-5.47	-4.05	-0.04	-0.78	1.13		8.14	16.75	23.33	28.27	35.89	29.48	30.89
1/14/97	-11.11	-15.99	-11.91	-8.24	-6.25	-4.49	-0.15	-0.85	1.06		7.32	15.97	22.53	27.62	35.07	29.41	30.59
1/15/97	-13.61	-12.94	-11.45	-8.64	-6.77	-4.95	-0.33	-0.94	1.00		7.67	15.58	21.98	26.90	33.65	29.42	31.27
1/16/97																	
1/17/97	-8.33	-13.32	-11.05	-8.57	-6.90	-5.40	-0.78	-1.20	0.80		7.85	15.69	21.85	26.25	31.91	29.31	30.91
1/18/97	3.61	-10.29	-10.30	-8.46	-6.97	-5.58	-0.98	-1.35	0.71		8.12	15.68	21.74	26.04	31.27	29.26	31.34
1/19/97		-7.45	-8.60	-7.72	-6.60	-5.57	-1.15	-1.50	0.60		8.69	16.10	21.93	25.89	30.92	29.12	31.12
1/20/97		-5.75	-7.18	-6.80	-5.99	-5.32	-1.21	-1.63	0.47		9.80	16.71	22.32	26.07	30.83	29.08	31.36
1/21/97		-5.08	-6.15	-6.02	-5.41	-5.00	-1.15	-1.74	0.34		10.47	17.32	22.78	26.26	30.82	29.12	31.37
1/22/97	-13.33	-6.61	-5.97	-5.53	-4.97	-4.70	-1.07	-1.84	0.25		10.67	17.81	23.22	26.62	30.88	29.07	30.99
1/23/97	-16.67	-8.59	-6.72	-5.59	-4.86	-4.56	-1.00	-1.89	0.15		10.24	17.75	23.30	26.91	30.98	29.03	31.65
1/24/97	-23.61	-10.84	-7.80	-6.08	-5.10	-4.59	-0.97	-1.94	0.07		9.68	17.37	23.21	26.88	31.02	29.10	30.73
1/25/97	-28.61	-13.17	-9.27	-6.88	-5.60	-4.82	-1.04	-1.97	0.00		8.89	16.83	22.75	26.61	30.93	28.89	30.71
1/26/97	-25.56	-14.54	-10.65	-7.85	-6.30	-5.22	-1.18	-2.01	-0.08		8.19	16.15	22.25	26.16	30.74	28.89	30.99
1/27/97	-21.94	-15.18	-11.59	-8.68	-6.99	-5.68	-1.37	-2.07	-0.14		7.70	15.63	21.70	25.88	30.33	28.81	31.03
1/28/97		-14.38	-11.96	-9.24	-7.52	-6.07	-1.60	-2.14	-0.18		7.47	15.21	21.27	25.46	30.05	28.79	31.49
1/29/97	-8.61	-12.61	-11.46	-9.33	-7.76	-6.39	-1.81	-2.21	-0.24		7.63	15.06	20.75	25.17	29.63	28.68	31.06
1/30/97		-9.13	-10.11	-8.86	-7.62	-6.50	-1.98	-2.30	-0.32		8.22	15.29	21.09	25.06	29.41	28.54	31.36
1/31/97	4.44	-6.68	-8.32	-7.90	-7.03	-6.32	-2.05	-2.40	-0.42		8.58	15.84	21.39	25.12	29.14	28.36	30.10
2/1/97	1.39	-5.74	-7.06	-6.95	-6.34	-5.94	-1.97	-2.51	-0.52		9.88	16.45	21.94	25.29	29.20	28.15	29.78
2/2/97	0.56	-5.07	-6.30	-6.27	-5.77	-5.55	-1.83	-2.59	-0.61		10.41	16.99	22.32	25.67	29.38	27.70	29.83
2/3/97	-0.56	-4.51	-5.68	-5.75	-5.29	-5.21	-1.67	-2.64	-0.69		10.79	17.48	22.66	25.84	29.51	27.36	30.94
2/4/97	-6.39	-4.89	-5.32	-5.34	-4.93	-4.92	-1.53	-2.67	-0.77		11.00	17.89	23.05	25.96	29.60	27.07	30.82
2/5/97	-6.67																
2/6/97	-3.06	-5.54	-5.59	-5.17	-4.61	-4.58	-1.29	-2.70	-0.84		10.93	18.00	23.31	26.26	29.85	26.72	30.28
2/7/97	-4.44	-5.24	-5.39	-5.10	-4.54	-4.50	-1.22	-2.69	-0.88		11.00	18.08	23.43	26.34	29.94	26.68	30.40

Date	Air	Temperature (C) Base	Subgrade							Volumetric Moisture Content (%) Base	Subgrade						
		572	864	1087	1237	1387	1586	1887	2289	572	864	1087	1237	1387	1586	1887	2289
2/8/97	-1.39	-5.20	-5.31	-4.99	-4.47	-4.41	-1.16	-2.68	-0.90		10.99	18.14	23.57	26.45	30.04	26.66	30.55
2/9/97	-2.50	-4.71	-5.12	-4.88	-4.36	-4.34	-1.10	-2.67	-0.91		11.17	18.24	23.71	26.64	30.10	26.92	30.80
2/10/97	-5.56	-4.85	-4.99	-4.74	-4.24	-4.25	-1.05	-2.67	-0.94		11.31	18.39	23.89	26.87	30.15	26.94	30.23
2/11/97	-6.11	-5.14	-5.03	-4.67	-4.17	-4.17	-1.00	-2.66	-0.94		11.28	18.49	23.98	27.08	30.26	26.97	30.08
2/12/97	-2.22	-5.26	-5.10	-4.67	-4.12	-4.12	-0.96	-2.62	-0.95		11.29	18.49	23.97	26.90	30.42	26.99	30.32
2/13/97	-1.39	-4.67	-5.00	-4.64	-4.11	-4.09	-0.93	-2.62	-0.94		11.32	18.48	24.02	26.94	30.46	27.05	30.45
2/14/97	1.67	-4.05	-4.71	-4.51	-4.04	-4.05	-0.89	-2.61	-0.96		11.53	18.62	24.06	27.03	30.47	27.06	30.64
2/15/97	-0.56	-3.67	-4.44	-4.34	-3.94	-3.99	-0.86	-2.61	-0.96		11.73	18.74	24.16	27.07	30.47	27.26	30.44
2/16/97	5.83	-3.24	-4.16	-4.16	-3.82	-3.91	-0.82	-2.60	-0.97		12.05	19.03	24.28	27.22	30.47	27.30	30.49
2/17/97	7.22	-2.86	-3.91	-3.98	-3.68	-3.82	-0.78	-2.57	-0.99		12.37	19.22	24.51	27.43	30.61	27.36	29.90
2/18/97	1.67	-2.59	-3.68	-3.82	-3.56	-3.74	-0.75	-2.56	-1.00		12.70	19.44	24.69	27.51	30.79	27.40	29.58
2/19/97	4.44	-2.44	-3.48	-3.67	-3.40	-3.65	-0.69	-2.56	-1.00		13.01	19.69	24.91	27.73	30.94	27.48	30.06
2/20/97	3.06	-2.32	-3.32	-3.55	-3.28	-3.57	-0.65	-2.54	-1.00	0.09	13.21	19.91	25.15	27.89	31.12	27.56	29.77
2/21/97	-0.28	-2.24	-3.20	-3.43	-3.19	-3.48	-0.61	-2.51	-1.00	0.43	13.47	20.17	25.35	28.07	31.14	27.67	29.79
2/22/97	-0.83	-2.18	-3.12	-3.32	-3.10	-3.38	-0.55	-2.50	-1.00	1.48	13.66	20.37	25.54	28.13	31.29	27.63	30.19
2/23/97	-1.94	-2.16	-3.04	-3.26	-3.03	-3.32	-0.51	-2.49	-1.00	1.78	13.86	20.51	25.69	28.45	31.30	27.72	30.05
2/24/97	4.17	-2.16	-2.99	-3.17	-2.96	-3.26	-0.47	-2.46	-0.99	1.52	13.97	20.74	25.87	28.51	31.51	27.81	30.26
2/25/97	4.17	-2.10	-2.94	-3.10	-2.90	-3.22	-0.44	-2.44	-0.99	2.34	14.10	20.94	26.02	28.61	31.54	27.82	29.53
2/26/97	-4.44	-2.10	-2.89	-3.07	-2.86	-3.17	-0.40	-2.43	-0.97	2.33	14.36	21.07	26.12	28.81	31.62	27.98	29.85
2/27/97	-5.56	-2.11	-2.86	-3.05	-2.81	-3.13	-0.38	-2.39	-0.95	2.02	14.54	21.27	26.29	28.94	31.85	28.17	30.20
2/28/97		-2.11	-2.83	-3.01	-2.78	-3.10	-0.34	-2.38	-0.95	1.75	14.69	21.35	26.50	29.08	31.91	28.42	30.35
3/1/97		-2.13	-2.80	-2.96	-2.73	-3.06	-0.32	-2.34	-0.94	1.26	14.70	21.42	26.75	29.16	32.08	28.40	30.12
3/2/97	-3.61	-2.17	-2.78	-2.94	-2.72	-3.03	-0.28	-2.32	-0.94	0.92	14.84	21.57	26.79	29.17	32.36	28.51	30.14
3/3/97		-2.23	-2.78	-2.93	-2.67	-3.00	-0.28	-2.28	-0.93	0.25	14.86	21.66	26.82	29.39	32.40	28.45	30.15
3/4/97	-8.33	-2.53	-2.78	-2.90	-2.67	-2.98	-0.25	-2.27	-0.90		14.92	21.73	26.92	29.57	32.47	28.57	30.30
3/5/97	-10.83	-3.28	-2.86	-2.89	-2.64	-2.95	-0.22	-2.22	-0.89		14.68	21.88	27.12	29.73	32.67	28.50	30.47
3/6/97	-2.50	-3.75	-3.09	-2.92	-2.63	-2.94	-0.22	-2.21	-0.89		14.11	21.77	27.05	29.83	32.76	28.66	29.89
3/7/97	3.33	-3.00	-3.23	-2.99	-2.66	-2.92	-0.18	-2.17	-0.88		13.88	21.52	27.04	29.97	32.90	28.70	30.14
3/8/97	2.50	-2.64	-3.14	-3.03	-2.69	-2.93	-0.17	-2.16	-0.85		13.98	21.46	26.93	29.95	33.00	28.67	30.04
3/9/97	1.67	-2.45	-3.04	-3.00	-2.67	-2.93	-0.17	-2.11	-0.84		13.99	21.54	27.02	30.02	33.04	28.69	29.75
3/10/97		-2.36	-2.98	-2.97	-2.67	-2.90	-0.17	-2.11	-0.83		14.23	21.58	27.04	29.98	33.14	28.68	29.99
3/11/97	-0.28	-2.25	-2.90	-2.92	-2.64	-2.89	-0.17	-2.06	-0.82		14.51	21.69	27.10	30.02	33.32	28.75	29.73
3/12/97	-6.67	-2.21	-2.85	-2.94	-2.61	-2.89	-0.16	-2.06	-0.80	0.21	14.67	21.70	27.16	30.06	33.30	28.79	29.74
3/13/97	-15.83	-2.40	-2.82	-2.89	-2.61	-2.89	-0.16	-2.02	-0.78		14.71	21.86	27.18	30.05	33.53	28.84	30.11
3/14/97	-16.94	-3.68	-2.90	-2.89	-2.59	-2.86	-0.12	-2.00	-0.78		14.58	21.92	27.29	30.19	33.75	28.97	30.02
3/15/97	-14.17	-4.58	-3.28	-2.93	-2.58	-2.84	-0.11	-1.98	-0.78		13.83	21.77	27.33	30.34	33.89	28.85	29.94
3/16/97	-2.78																
3/17/97	-9.72	-4.18	-3.86	-3.25	-2.74	-2.86	-0.09	-1.94	-0.78		13.08	21.21	27.08	30.30	34.12	28.93	30.39
3/18/97	0.56	-4.04	-3.90	-3.33	-2.82	-2.89	-0.06	-1.90	-0.75		13.04	21.10	26.91	30.26	34.35	28.86	29.94
3/19/97	11.67	-2.97	-3.68	-3.33	-2.87	-2.92	-0.07	-1.89	-0.73		13.26	21.01	26.85	30.15	34.64	28.89	29.54
3/20/97	11.11	-2.17	-3.32	-3.23	-2.84	-2.94	-0.06	-1.88	-0.72	1.14	13.58	21.24	26.85	30.08	34.79	28.98	29.67
3/21/97	4.44	-1.50	-3.08	-3.12	-2.77	-2.90	-0.06	-1.85	-0.72	2.62	13.94	21.32	26.86	30.22	35.23	28.78	29.84
3/22/97	4.72	-0.89	-2.93	-3.02	-2.71	-2.88	-0.05	-1.83	-0.72	2.88	14.40	21.42	27.03	30.19	35.58	28.84	29.91
3/23/97	5.56	-0.32	-2.82	-2.94	-2.65	-2.84	-0.03	-1.83	-0.71	2.89	14.72	21.68	27.09	30.35	35.90	28.87	30.24

Date	Air	Temperature (C) Base			Subgrade				Volumetric Moisture Content (%) Base			Subgrade				
		572	864	1087	1237	1387	1586	1887	2289	572	864	1087	1237	1387	1586	1887	2289
3/24/97	8.33	-1.00	-2.74	-2.88	-2.61	-2.83	-0.01	-1.82	-0.71	2.82	15.11	21.87	27.30	30.42	36.29	28.81	30.32
3/25/97	10.28	0.02	-2.67	-2.84	-2.57	-2.81	0.00	-1.80	-0.68	2.98	15.56	22.09	27.36	30.47	36.65	28.80	30.62
3/26/97	10.28	1.35	-2.59	-2.81	-2.54	-2.78	0.00	-1.78	-0.68	3.22	16.25	22.27	27.53	30.52	36.75	28.86	30.55
3/27/97	9.17	2.08	-2.33	-2.78	-2.50	-2.78	0.01	-1.78	-0.67	3.24	25.75	22.43	27.70	30.75	36.80	28.81	30.60
3/28/97	4.44	1.50	-1.88	-2.74	-2.50	-2.77	0.05	-1.77	-0.67	3.13	29.95	22.68	27.77	30.85	36.74	28.78	30.93
3/29/97	1.11	0.59	-1.73	-2.71	-2.45	-2.73	0.06	-1.74	-0.67	3.03	30.06	23.01	28.03	30.95	36.88	28.79	30.77
3/30/97	7.22	0.85	-1.67	-2.66	-2.43	-2.72	0.06	-1.72	-0.67	3.11	30.17	23.53	28.15	30.97	36.88	28.76	30.80
3/31/97	6.94	1.70	-1.24	-2.62	-2.41	-2.72	0.08	-1.72	-0.67	3.17	30.13	23.99	28.38	31.10	36.77	28.78	30.79
4/1/97	0.00	1.35	-0.97	-2.56	-2.39	-2.71	0.11	-1.72	-0.66	3.13	30.02	24.86	28.63	31.20	36.71	28.82	31.00
4/2/97	2.78	0.67	-1.04	-2.51	-2.36	-2.70	0.11	-1.70	-0.65	3.04	29.88	27.81	28.95	31.45	36.91	28.77	30.92
4/3/97	7.22	1.55	-0.90	-2.43	-2.33	-2.67	0.13	-1.67	-0.64	3.16	29.72	33.87	29.24	31.72	36.71	28.88	30.77
4/4/97	-0.28	1.27	-0.51	-2.20	-2.30	-2.67	0.15	-1.67	-0.63	3.04	29.83	34.53	29.76	31.92	37.00	28.70	30.68
4/5/97	-7.50	-0.68	-1.08	-2.06	-2.25	-2.67	0.17	-1.67	-0.61	2.80	29.72	34.70	31.21	32.03	36.87	28.70	31.03
4/6/97	-6.11	-0.92	-1.60	-2.16	-2.22	-2.64	0.18	-1.67	-0.61	2.75	29.59	34.63	33.56	32.31	36.93	28.82	30.73
4/7/97	-7.78	-0.67	-1.65	-2.19	-2.19	-2.62	0.22	-1.66	-0.61	2.81	29.57	34.57	35.62	32.83	37.14	28.84	30.94
4/8/97	-8.06	-0.86	-1.62	-2.14	-2.17	-2.61	0.24	-1.61	-0.61	2.80	29.48	34.56	36.31	33.36	37.03	28.77	30.28
4/9/97	-7.78	-1.25	-1.79	-2.17	-2.17	-2.61	0.29	-1.60	-0.59	2.67	29.39	34.54	36.43	34.09	37.20	28.94	29.74
4/10/97	-6.39	-0.85	-1.78	-2.15	-2.13	-2.56	0.35	-1.56	-0.56	2.74	29.25	34.53	36.38	35.09	37.11	28.91	29.16
4/11/97	-5.00	-0.14	-1.49	-2.05	-2.09	-2.47	0.42	-1.52	-0.56	2.80	29.21	34.54	36.30	34.95	37.24	29.02	29.40
4/12/97		0.41	-1.08	-1.84	-1.96	-2.39	0.49	-1.49	-0.53	2.88	29.29	34.57	36.29	35.17	37.23	29.26	29.85
4/13/97	0.28	1.28	-0.64	-1.57	-1.74	-2.25	0.59	-1.44	-0.50	3.00	29.31	34.55	36.30	34.90	37.25	29.41	30.49
4/14/97	4.72	1.80	-0.14	-1.21	-1.43	-2.04	0.70	-1.38	-0.48	3.02	29.33	34.59	36.36	35.18	37.22	29.72	30.71
4/15/97	3.89	2.27	0.28	-0.82	-1.04	-1.72	0.86	-1.31	-0.44	3.05	29.34	34.55	36.44	35.08	37.17	30.02	31.09
4/16/97		3.67	0.99	-0.34	-0.59	-1.29	1.10	-1.21	-0.40	3.20	29.31	34.46	36.37	34.91	37.22	30.38	30.91
4/17/97	10.56	4.58	1.77	0.32	0.02	-0.79	1.41	-1.08	-0.34	3.27	29.53	34.49	36.44	34.98	37.30	30.66	31.32
4/18/97	9.44	5.56	2.63	1.02	0.65	-0.27	1.77	-0.90	-0.27	3.41	29.51	34.64	36.56	34.81	37.40	30.61	31.26
4/19/97	9.44	6.23	3.38	1.70	1.25	0.24	2.12	-0.70	-0.18	3.43	29.52	34.65	36.58	34.63	37.33	30.83	31.61
4/20/97		6.77	4.05	2.31	1.83	0.73	2.48	-0.46	-0.08	3.51	29.42	34.64	36.63	34.59	37.46	30.80	31.37
4/21/97	7.78	6.50	4.36	2.82	2.33	1.19	2.85	-0.22	0.06	3.49	29.67	34.72	36.59	34.59	37.50	30.76	31.62
4/22/97	4.72	6.20	4.45	3.13	2.70	1.60	3.20	0.04	0.22	3.44	29.88	34.79	36.62	34.68	37.52	31.05	31.47
4/23/97	5.28	6.67	4.59	3.34	2.95	1.91	3.50	0.30	0.36	3.50	29.82	34.90	36.60	34.63	37.41	31.20	31.85
4/24/97		7.44	5.05	3.64	3.23	2.17	3.76	0.54	0.53	3.67	29.85	34.92	36.70	34.67	37.52	31.29	32.70
4/25/97	6.11																
4/26/97	10.00	8.73	5.99	4.39	3.92	2.78	4.27	0.98	0.86	3.80	29.96	34.91	36.87	34.33	37.57	31.43	32.39
4/27/97	13.33	9.58	6.70	4.90	4.34	3.13	4.52	1.21	1.03	3.88	30.08	34.98	36.85	34.42	37.60	31.32	31.63
4/28/97	7.22	8.38	6.81	5.33	4.77	3.52	4.83	1.44	1.19	3.77	30.12	34.93	36.90	34.26	37.71	31.42	32.25
4/29/97	7.50	8.24	6.65	5.43	4.97	3.82	5.12	1.69	1.37	3.69	29.99	34.99	36.94	34.17	37.89	31.39	32.47
4/30/97	8.33	8.35	6.67	5.49	5.10	4.01	5.34	1.92	1.55	3.72	29.93	34.98	36.94	34.14	37.97	31.50	32.76
5/1/97		8.29	6.79	5.62	5.23	4.17	5.52	2.12	1.72	3.71	29.92	35.04	36.96	34.08	38.03	31.60	32.48
5/2/97	6.39	7.64	6.54	5.65	5.33	4.33	5.70	2.32	1.90	3.65	30.10	35.12	36.99	34.14	37.97	31.66	32.67
5/3/97	9.17	8.12	6.57	5.63	5.35	4.42	5.82	2.50	2.05	3.68	30.10	35.00	37.02	34.56	37.90	31.82	32.46
5/4/97	11.11	9.17	6.95	5.78	5.46	4.51	5.94	2.66	2.22	3.83	30.10	34.98	37.00	33.98	37.72	31.79	32.18
5/5/97	8.89	9.62	7.40	6.08	5.69	4.68	6.08	2.81	2.34	3.88	30.10	34.92	37.06	34.15	38.01	31.82	32.53
5/6/97		10.74	7.99	6.46	5.98	4.92	6.24	2.95	2.50	3.98	30.12	35.13	37.05	33.66	38.05	31.74	31.91

Date	Air	Temperature (C) Base	Subgrade							Volumetric Moisture Content (%) Base	Subgrade						
		572	864	1087	1237	1387	1586	1887	2289	572	864	1087	1237	1387	1586	1887	2289
5/7/97	10.56	10.62	8.49	6.90	6.36	5.21	6.45	3.11	2.62	3.95	30.21	35.12	37.09	33.85	38.07	31.81	32.27
5/8/97	10.28	9.62	8.30	7.11	6.64	5.49	6.69	3.29	2.76	3.78	30.13	35.01	37.19	33.87	37.98	31.74	32.11
5/9/97	13.89																
5/10/97	14.72	12.53	9.37	7.59	7.02	5.86	7.04	3.64	3.06	4.18	30.25	35.07	37.19	34.17	38.14	31.68	32.78
5/11/97		12.72	9.93	8.13	7.47	6.18	7.27	3.82	3.21	4.21	30.28	35.23	37.16	34.07	38.14	31.77	32.21
5/12/97	14.72	13.96	10.57	8.58	7.87	6.54	7.52	4.01	3.34	4.38	30.27	35.22	37.16	34.22	38.17	31.77	32.42
5/13/97		15.06	11.38	9.16	8.36	6.92	7.81	4.20	3.50	4.56	30.35	35.37	37.24	33.56	38.19	31.83	32.02
5/14/97		15.88	12.19	9.81	8.91	7.35	8.13	4.42	3.66	4.70	30.46	35.39	37.37	33.29	38.01	31.85	32.58
5/15/97	15.83	16.95	12.95	10.43	9.47	7.83	8.48	4.67	3.83	4.81	30.66	35.36	37.39	33.23	38.19	31.78	32.92
5/16/97	15.56	17.77	13.75	11.11	10.07	8.31	8.86	4.95	4.02	4.84	30.74	35.23	37.42	33.80	38.25	31.83	32.68
5/17/97	14.44	18.22	14.47	11.76	10.66	8.83	9.26	5.24	4.21	4.88	30.86	35.26	37.44	33.85	38.10	31.77	32.96
5/18/97	2.22	15.34	14.28	12.19	11.17	9.33	9.67	5.53	4.42	4.50	30.75	35.21	37.54	33.45	38.40	32.02	32.51
5/19/97	8.33	12.94	12.86	11.84	11.17	9.60	10.02	5.85	4.64	4.05	30.37	35.27	37.43	33.82	38.46	32.07	32.58
5/20/97	11.67	13.55	12.22	11.30	10.83	9.57	10.18	6.13	4.88	4.16	30.22	35.17	37.57	33.72	38.37	32.07	32.32
5/21/97		13.77	12.25	11.14	10.66	9.49	10.24	6.35	5.10	4.24	30.07	35.29	37.47	33.67	38.10	32.03	32.77
5/22/97	9.44	13.90	12.28	11.12	10.62	9.48	10.30	6.52	5.30	4.25	30.14	35.39	37.50	33.53	38.28	32.16	33.11
5/23/97	6.67	13.11	10.92	11.07	10.61	9.50	9.77	6.65	5.46	4.15	30.02	34.06	37.47	33.43	36.80	32.14	32.95
5/24/97	8.33	12.04	11.61	10.90	10.27	9.49	9.81	6.37	5.61	4.01	29.96	35.13	37.34	33.47	38.30	30.67	32.70
5/25/97	7.78	10.77	10.91	9.37	10.08	9.47	10.50	6.98	5.78	5.70	30.51	35.48	36.30	33.92	38.72	33.80	33.50
5/26/97	9.72	9.95	10.18	10.21	10.24	9.76	11.07	8.13	5.90	5.16	32.53	38.39	38.09		39.60	39.24	26.68
5/27/97	11.39		9.78		9.84	9.42	10.89		6.52	10.98	32.25	36.39	37.88		38.91	39.28	24.54
5/28/97	13.89	11.27	9.91	9.57	9.57	9.09	10.58	7.78	6.57	5.06	32.15	35.83	37.84		38.73	39.34	27.62

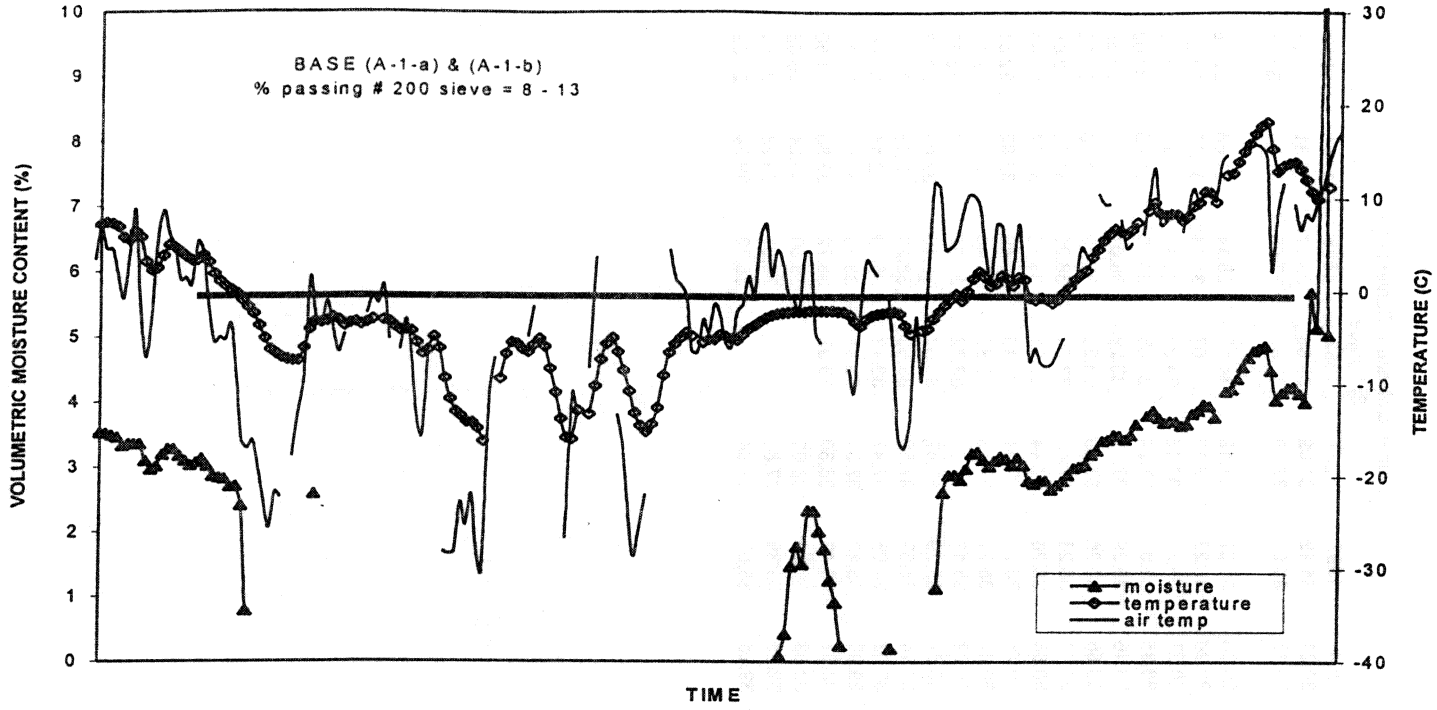


Figure B-14. Moisture Temperature distribution as a function of time in the base course at Sweetgrass.

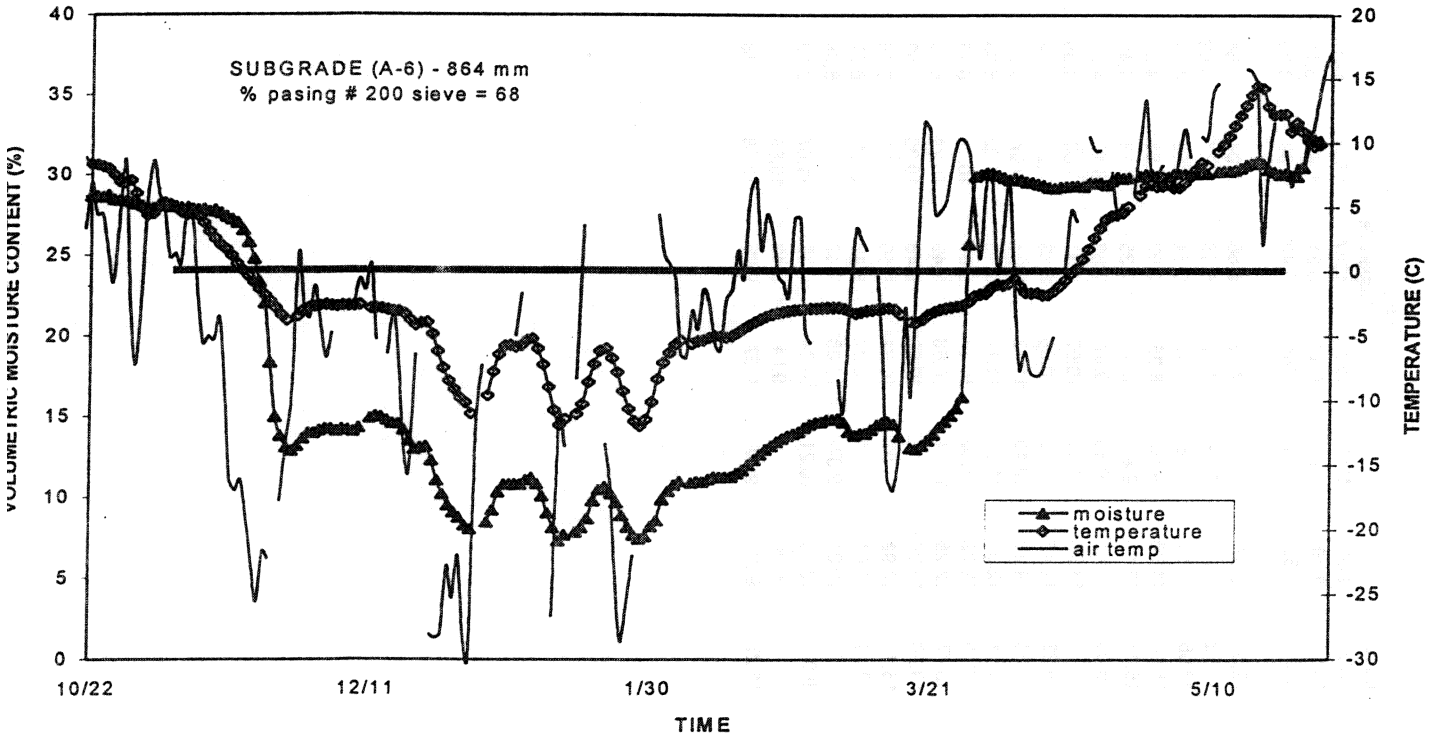


Figure B-15. Moisture Temperature distribution as a function of time in the subgrade (864mm) at Sweetgrass.

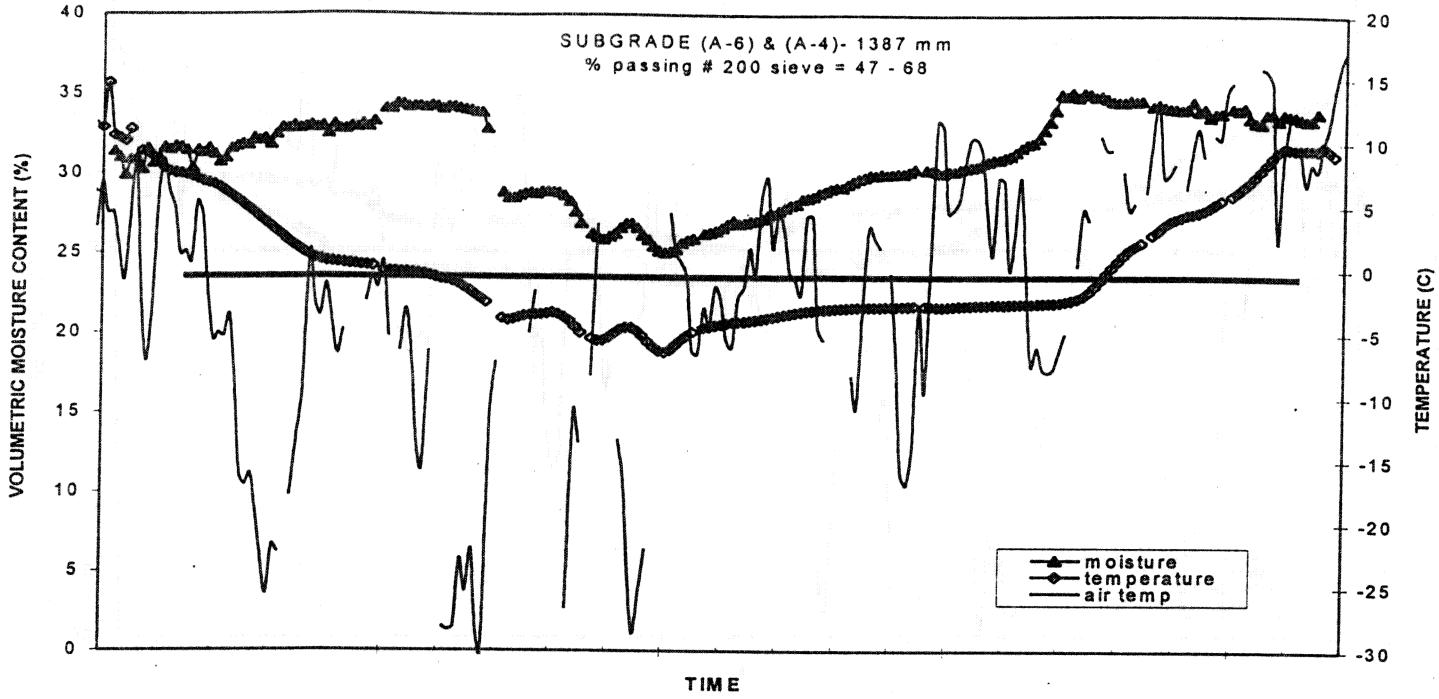


Figure B-18. Moisture Temperature distribution as a function of time in the subgrade (1387mm) at Sweetgrass.

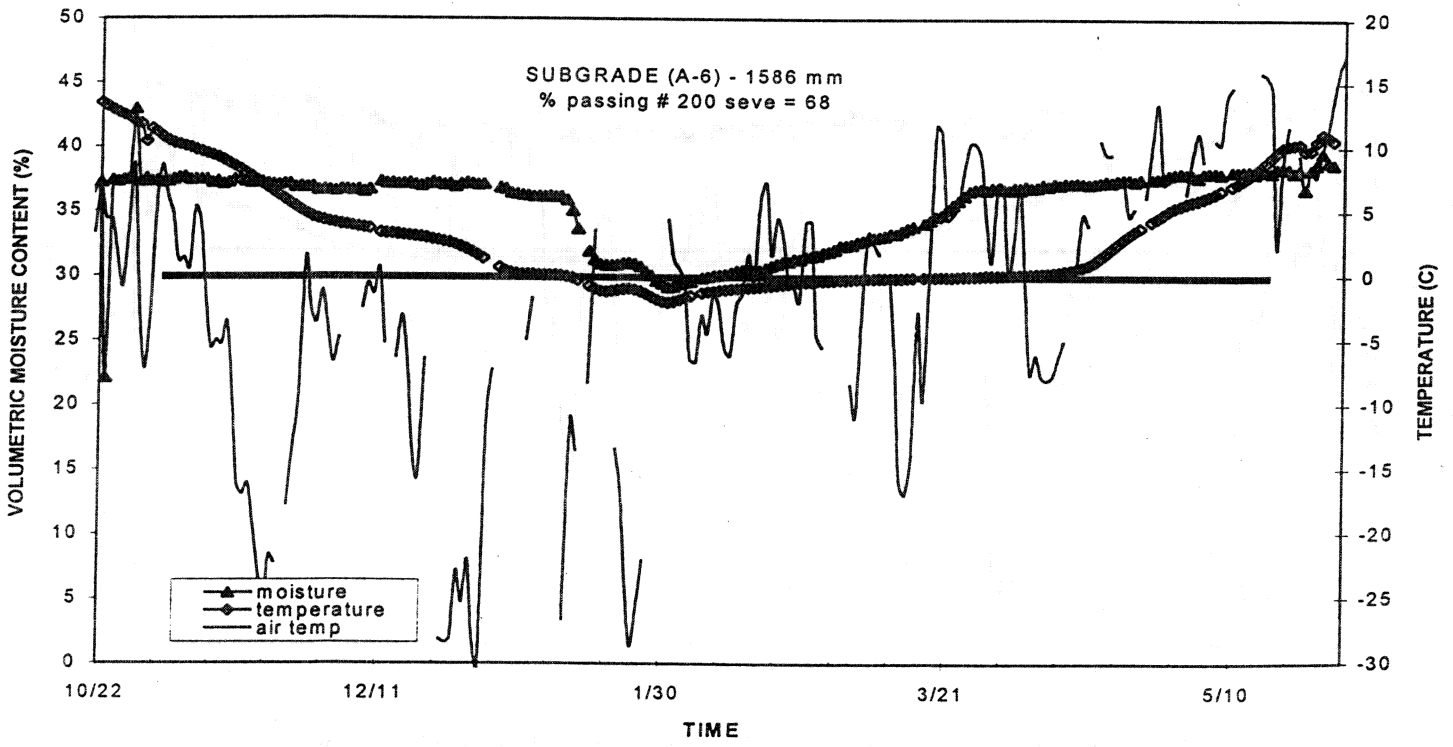


Figure B-19. Moisture Temperature distribution as a function of time in the subgrade (1586mm) at Sweetgrass.

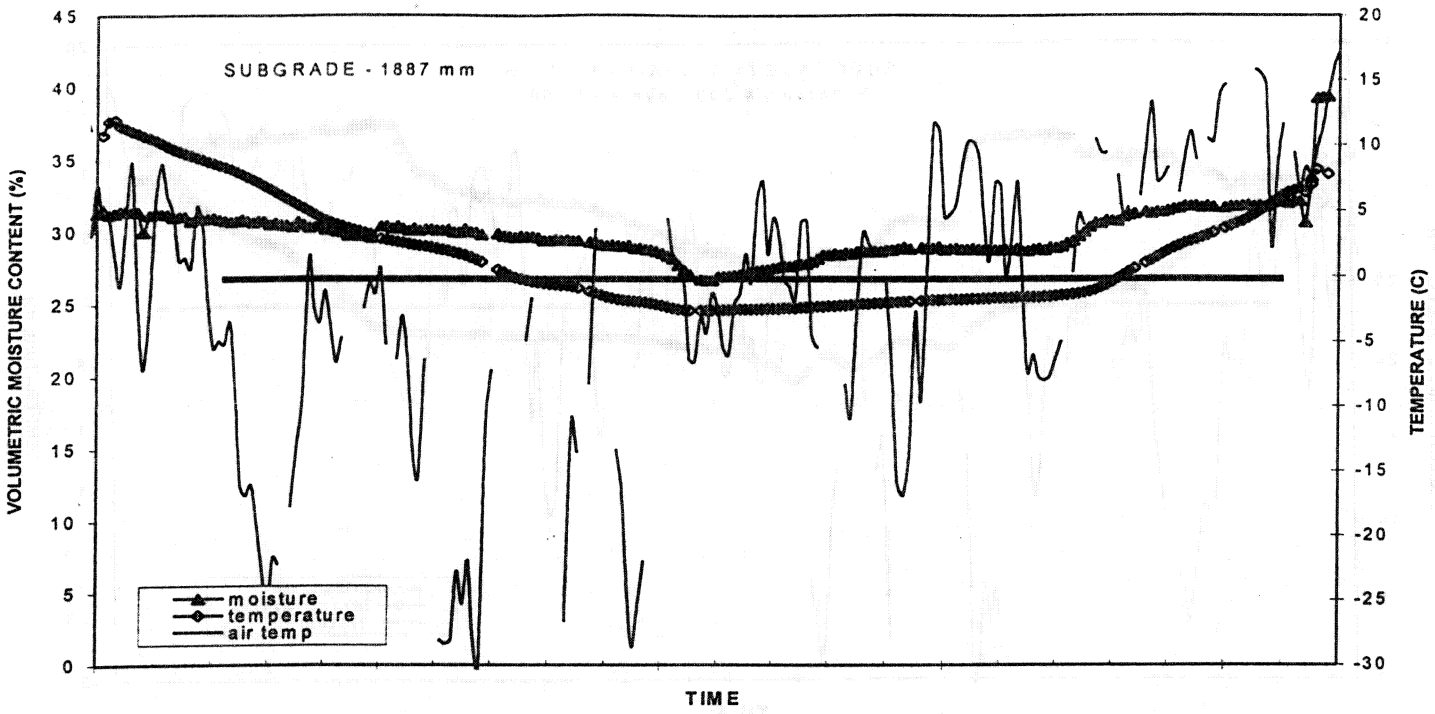


Figure B-20. Moisture Temperature distribution as a function of time in the subgrade (1887mm) at Sweetgrass.

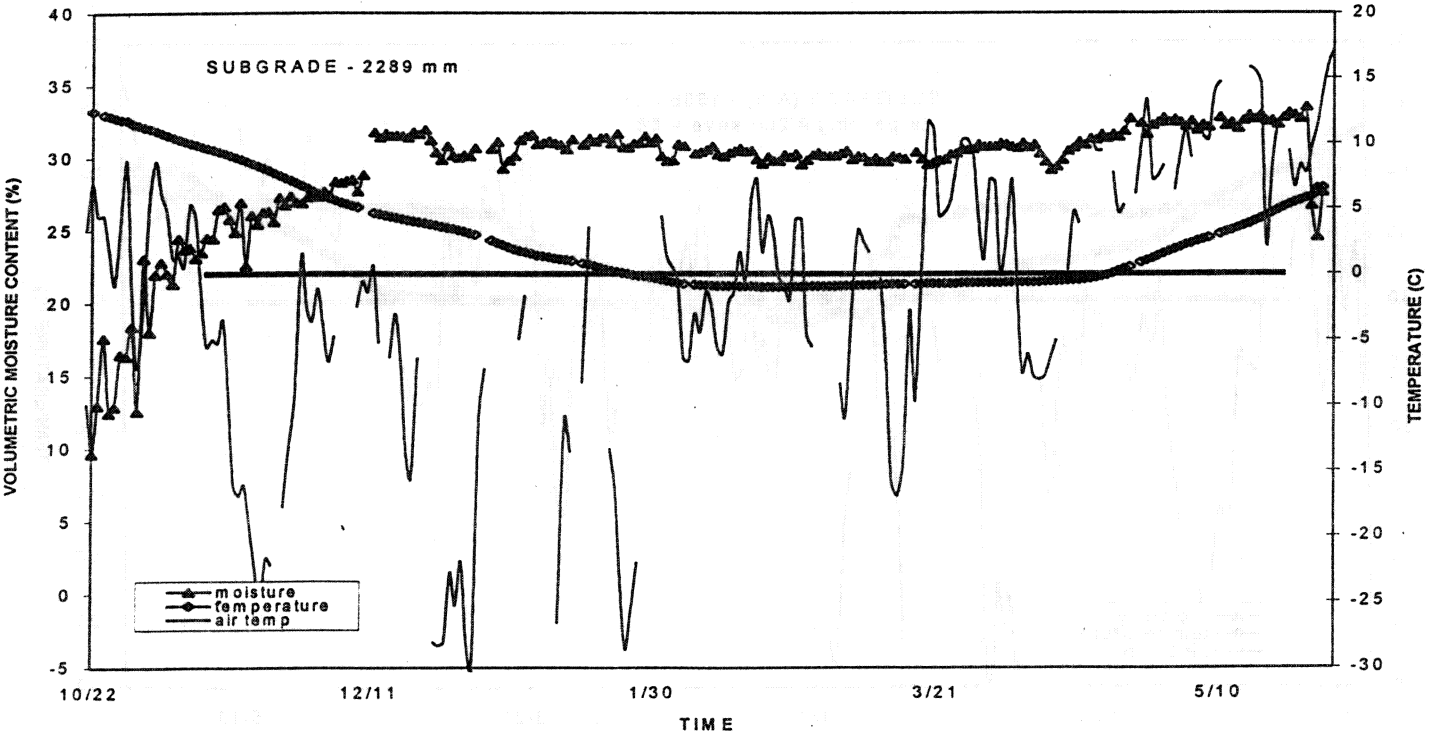


Figure B-21. Moisture Temperature distribution as a function of time in the subgrade (2289mm) at Sweetgrass.

Scobey Redstone

Table B-4. Moisture Temperature distibution as a function of time and depth at Scobey Redstone

Date	Air	Temperature (C) Base	Subgrade						Volumetric Moisture Content (%) Base	Subgrade						
		305	445	673	813	965	1168	1473	1867	305	445	673	813	965	1168	1473	1867
10/1/96	1.94	8.46	8.94	11.69	12.59	13.42	14.21	15.01	15.58	22.62	33.69	33.73	34.27	31.90	36.99	30.68	27.05
10/2/96	-0.28	6.43	6.94	10.61	11.85	12.90	13.83	14.71	15.37	22.31	33.62	33.42	34.21	32.37	36.71	30.84	27.61
10/3/96	7.78	7.40	7.32	9.89	11.10	12.23	13.33	14.38	15.15	22.38	33.55	33.66	33.75	31.75	36.36	30.29	27.59
10/4/96	11.94	9.61	8.95	10.04	10.88	11.82	12.88	14.00	14.91	22.63	33.63	33.18	33.77	32.10	36.09	30.32	26.82
10/5/96	12.22	11.69	10.87	10.86	11.22	11.82	12.64	13.67	14.65	22.85	33.78	33.45	33.73	32.09	35.93	30.19	27.28
10/6/96	8.06	11.83	11.23	11.49	11.71	12.09	12.63	13.47	14.41	22.89	33.69	33.29	33.86	31.75	35.79	30.34	27.42
10/7/96	11.94	12.38	11.70	11.83	11.99	12.30	12.68	13.36	14.19	22.92	33.81	33.32	33.95	31.88	35.86	30.38	26.86
10/8/96	9.44	12.72	12.13	12.19	12.27	12.48	12.77	13.32	14.04	22.92	33.72	33.41	34.06	31.83	35.98	29.89	27.43
10/9/96	6.67	12.12	11.75	12.31	12.44	12.64	12.85	13.28	13.91	22.80	33.88	33.29	34.19	31.76	35.98	29.81	27.28
10/10/96	10.56	12.14	11.68	12.23	12.43	12.67	12.89	13.28		22.70	33.79	33.32	33.89	31.56	35.89	28.75	26.40
10/11/96	16.11	13.89	12.86	12.44	12.49	12.69	12.89	7.93	13.74	22.93	33.69	33.35	33.86	32.06	29.94	29.83	26.46
10/12/96	11.11	14.55	13.75	13.11	12.91	12.90	12.94	13.22	13.67	23.03	33.56	33.47	34.18	32.04	36.04	30.03	26.65
10/13/96	10.83	13.99	13.43	2.55	13.20	13.16	13.11	13.25	13.62	22.86	24.35	33.42	34.00	31.62	35.89	29.86	26.77
10/14/96	11.67	13.89	13.38	13.40	13.30	13.29	13.23	13.32	13.56	22.88	33.46	33.78	33.98	31.88	35.77	29.84	26.64
10/15/96	10.00	12.60		13.20	13.27	13.33	13.30	13.35	13.56	17.50	33.38	33.28	24.64	31.89	35.81	29.92	26.64
10/16/96	4.17	11.47	11.41	12.71	12.98	13.20	13.26	13.39	13.56	22.53	33.54	33.09	33.74	31.87	36.02	29.88	26.80
10/17/96	-0.28	9.76	10.04	12.05	12.53	12.91	13.14	13.34	13.51	22.28	33.51	33.36	33.77	31.68	35.69	30.07	26.49
10/18/96	0.28	7.80	8.22	11.02	11.81					21.97	33.36	33.22	33.67				
10/19/96	6.39	8.67	8.42	10.26	11.06	11.83	12.46	13.00	13.35	22.05	33.30	33.14	33.53	31.69	35.48	29.71	26.82
10/20/96	2.22																
10/21/96	1.11																
10/22/96	0.56																
10/23/96	2.78		5.36	7.71	8.83	9.90	11.00	12.08	12.96	21.66	33.20	32.92	33.11	32.01	35.31	29.64	27.44
10/24/96	2.78	5.43	5.51	7.68	8.61	9.57	10.61	11.75	12.75	21.65	33.23	33.05	33.50	31.95	35.21	29.29	27.08
10/25/96	0.83	4.78	4.85	7.33	8.34	9.29	10.31	11.45	12.54	21.56	33.22	33.17	33.39	31.86	35.03	29.53	27.43
10/26/96	0.28	4.61	4.73	7.05	8.03	8.98	10.02	11.18	12.32	21.51	33.15	32.87	33.13	31.94	34.90	29.70	27.49
10/27/96	1.67	4.11	4.12	6.64	7.69	8.68	9.72	10.91	12.10	21.46	33.04	32.82	33.28	31.55	34.78	29.44	27.29
10/28/96	8.61	5.16	4.75	6.47		8.37	9.43	10.64	11.90	21.58	33.08	32.67	33.46	31.67	34.75	29.30	27.27
10/29/96	-1.39	5.89	5.74	6.92	7.53	8.27	9.20	10.40	11.67	21.65	33.28	32.77	33.16	31.58	34.81	29.40	27.89
10/30/96	-7.50	1.70	2.52	6.29	7.35	8.22	9.11	10.21	11.47	21.15	32.97	32.71	33.27	31.91	34.69	29.33	27.77
10/31/96	-7.50	0.38	0.90	4.88	6.34	7.60	8.78	10.01	11.29	20.88	32.80	32.87	33.06	31.77	34.40	29.32	27.72
11/1/96	-17.78	0.31	0.53	4.00	5.49	6.88	8.27	9.71	11.10	20.86	32.79	32.73	32.85	31.87	34.37	29.73	27.59
11/2/96		0.76	0.78	3.64	5.00	6.33	7.77	9.34	10.88	20.97	32.76	32.63	32.63	31.75	34.08	29.23	27.60
11/3/96	-2.22	2.79	2.28	3.87	4.90	6.03	7.39	8.98	10.62	21.25	32.95	32.74	32.64	31.73	34.18	29.08	27.03
11/4/96	3.89	3.80	3.36	4.50	5.22	6.08	7.20	8.69	10.38	21.39	32.99	32.72	32.51	32.15	33.86	29.22	27.17
11/5/96	4.72	3.13	3.01	4.74	5.44	6.21	7.16	8.50	10.13	21.28	32.97	32.87	32.90	31.66	33.82	29.32	27.23
11/6/96	2.78	2.59	2.52	4.54	5.36	6.18	7.10	8.35	9.93	21.21	33.00	32.82	32.76	31.79	33.78	29.18	27.21
11/7/96	-0.83	2.25	2.20	4.30	5.17	6.02	6.98	8.23	9.75	21.18	32.93	32.62	32.77	31.83	33.94	28.79	27.56
11/8/96	-1.94	1.28	1.42	3.96	4.91	5.84	6.83	8.07	9.59	21.06	32.82	32.54	32.85	31.54	33.96	29.12	27.71
11/9/96	0.56	1.18	1.13	3.52	4.55	5.54	6.61	7.91	9.44	21.05	32.91	32.62	32.79	31.80	33.69	28.97	27.65
11/10/96	-3.06	0.92	0.96	3.31	4.31	5.29	6.37	7.71	9.26	20.95	32.79	32.51	32.74	31.56	33.71	28.93	27.72
11/11/96	-2.78	0.25	0.33	2.96	4.03	5.04	6.15	7.51	9.10	20.88	32.80	32.49	32.74	31.87	33.60	28.86	27.73

Date	Air	Temperature (C) Base			Subgrade					Volumetric Moisture Content (%) Base			Subgrade				
		305	445	673	813	965	1168	1473	1867	305	445	673	813	965	1168	1473	1867
12/26/96	-26.67	-16.51	-15.77	-9.86	-7.07	-4.77	-2.02	-0.02	1.94	4.81	8.83	12.78	17.08	21.58	24.36	27.91	27.90
12/27/96	-28.61	-15.18	-14.98	-10.22	-7.65	-5.40	-2.50	-0.19	1.78	5.02	8.96	12.62	16.63	20.81	22.85	27.90	27.95
12/28/96	-30.56	-14.56	-14.24	-9.95	-7.70	-5.70	-2.95	-0.36	1.66	5.12	9.15	12.67	16.55	20.56	21.67	27.55	28.11
12/29/96	-28.33	-16.09	-15.52	-10.43	-8.00	-5.97	-3.31	-0.55	1.49	4.86	8.85	12.48	16.37	20.28	20.99	27.19	28.01
12/30/96	-23.33																
12/31/96	-24.17																
1/1/97	-31.39	-8.79	-9.92	-8.83	-7.51	-6.25	-4.13	-1.10	1.02	6.33	10.54	13.02	16.34	19.75	19.51	25.26	27.83
1/2/97	-21.11	-5.33	-6.77	-7.03	-6.30	-5.55	-3.99	-1.33	0.85	7.36	11.91	14.03	16.93	20.10	19.47	24.62	27.85
1/3/97	-8.06	-5.41	-6.15	-5.73	-5.19	-4.75	-3.65	-1.46	0.72	7.41	12.33	14.87	17.60	20.64	19.70	24.24	27.99
1/4/97		-6.64	-6.85	-5.39	-4.69	-4.25	-3.33	-1.53	0.58	7.06	11.96	15.07	17.95	20.93	19.89	24.12	27.67
1/5/97	-0.56	-9.08	-8.84	-5.95	-4.84	-4.16	-3.19	-1.56	0.47	6.38	11.06	14.76	17.88	20.99	20.00	24.14	27.85
1/6/97	0.83	-9.63	-9.59	-6.68	-5.36	-4.48	-3.30	-1.60	0.37	6.27	10.77	14.34	17.65	20.83	19.90	24.10	27.66
1/7/97	-7.50																
1/8/97	-12.50	-8.08	-8.61	-6.85	-5.76	-4.89	-3.66	-1.73	0.23	6.58	11.07	14.23	17.43	20.55	19.73	23.82	27.59
1/9/97	-19.72																
1/10/97	-18.33																
1/11/97	-13.06																
1/12/97	-10.56																
1/13/97	-17.22																
1/14/97	-31.94																
1/15/97	-31.11																
1/16/97	-28.61																
1/17/97	-24.44																
1/18/97	-18.33																
1/19/97	-13.06																
1/20/97	-25.56																
1/21/97	-28.89																
1/22/97	-9.72																
1/23/97	-4.17																
1/24/97	-5.28																
1/25/97	-8.06																
1/26/97	-17.22																
1/27/97	-18.33																
1/28/97	-21.11																
1/29/97	-32.22																
1/30/97	-29.17																
1/31/97	-29.72																
2/1/97	-23.61																
2/2/97	-18.33																
2/3/97	0.00																
2/4/97	0.00																
2/5/97																	
2/6/97	-2.50																
2/7/97	-9.72																

Date	Air	Temperature (C) Base			Subgrade				Volumetric Moisture Content (%) Base			Subgrade				
		305	445	673	813	965	1168	1473	1867	305	445	673	813	965	1168	1473	1867
2/8/97	-6.67	-5.74	-6.43	-5.62	-5.11	-4.90	-4.44	-3.35	-1.76	7.25	12.06	14.61	17.31	19.62	17.55	17.64	23.10
2/9/97	-5.83	-6.04	-6.59	-5.56	-5.02	-4.79	-4.33	-3.29	-1.73	7.18	12.03	14.67	17.36	19.69	17.58	17.73	23.09
2/10/97	-11.39	-4.90	-5.81	-5.38	-4.92	-4.73	-4.26	-3.23	-1.72	7.45	12.39	14.76	17.42	19.74	17.63	17.78	23.04
2/11/97	-12.50	-4.58	-5.34	-5.00	-4.65	-4.56	-4.16	-3.18	-1.72	7.57	12.65	15.08	17.61	19.90	17.71	17.79	23.09
2/12/97	-6.94	-6.00	-6.31	-5.00	-4.53	-4.40	-4.03	-3.11	-1.72	7.16	12.17	15.07	17.74	20.00	17.81	17.86	23.15
2/13/97	-10.83	-5.00	-5.86	-5.17	-4.62	-4.43	-3.99	-3.05	-1.69	7.49	12.37	15.01	17.69	20.06	17.89	17.90	23.16
2/14/97	-11.94	-4.97	-5.62	-4.89	-4.46	-4.31	-3.93	-3.00	-1.67	7.49	12.52	15.18	17.77	20.13	17.91	17.99	23.17
2/15/97	-5.83	-4.62	-5.34	-4.74	-4.32	-4.20	-3.86	-2.96	-1.67	7.60	12.66	15.24	17.90	20.22	18.02	17.96	23.11
2/16/97	-8.33	-4.42	-5.23	-4.64	-4.21	-4.10	-3.79	-2.92	-1.67	7.67	12.76	15.34	17.95	20.34	18.05	18.01	23.19
2/17/97	-10.83	-2.43	-3.75	-4.24	-4.01	-3.99	-3.71	-2.87	-1.67	8.74	13.86	15.71	18.11	20.43	18.09	18.01	23.18
2/18/97	-3.61	-1.72	-2.89	-3.64	-3.59	-3.74	-3.58	-2.81	-1.67	9.48	14.80	16.28	18.63	20.62	18.22	18.08	23.15
2/19/97	-10.83	-2.68	-3.41	-3.31	-3.23	-3.44	-3.37	-2.73	-1.64	8.80	14.35	16.66	18.88	20.88	18.46	18.18	23.14
2/20/97	-8.89	-1.66	-2.77	-3.16	-3.08	-3.24	-3.21	-2.63	-1.61	9.48	15.02	16.85	18.99	21.04	18.63	18.28	23.18
2/21/97	-2.50	-1.60	-2.56	-2.89	-2.85	-3.07	-3.06	-2.54	-1.61	9.65	15.27	17.24	19.33	21.30	18.80	18.40	23.26
2/22/97	0.00	-1.83	-2.57	-2.71	-2.68	-2.90	-2.93	-2.45	-1.57	9.50	15.32	17.47	19.52	21.48	18.90	18.51	23.23
2/23/97	-2.50	-4.32	-4.33	-2.91	-2.65	-2.79	-2.81	-2.36	-1.56	8.01	13.77	17.27	19.69	21.73	19.07	18.61	23.18
2/24/97	-5.00	-4.92	-5.22	-3.56	-2.99	-2.90	-2.78	-2.29	-1.51	7.76	13.10	16.62	19.40	21.63	19.17	18.71	23.23
2/25/97	0.28	-2.66	-3.76	-3.60	-3.19	-3.08	-2.83	-2.26	-1.50	8.69	14.05	16.56	19.20	21.48	19.14	18.83	23.33
2/26/97	-3.89	-2.37	-3.22	-3.16	-2.95	-2.99	-2.83	-2.25	-1.50	8.91	14.45	16.92	19.43	21.53	19.15	18.77	23.35
2/27/97	-6.67	-3.62	-3.96	-3.09	-2.82	-2.87	-2.76	-2.22	-1.46	8.31	14.00	16.99	19.49	21.67	19.15	18.82	23.37
2/28/97	-13.33	-4.05	-4.50	-3.38	-2.94	-2.88	-2.72	-2.18	-1.44	8.11	13.62	16.75	19.43	21.64	19.23	18.87	23.33
3/1/97	-10.28	-4.89	-5.21	-3.71	-3.13	-2.98	-2.75	-2.17	-1.44	7.76	13.16	16.54	19.30	21.55	19.23	18.90	23.27
3/2/97	1.11	-4.22	-4.79	-3.84	-3.31	-3.13	-2.81	-2.17	-1.44	7.96	13.30	16.36	19.13	21.46	19.17	18.94	23.31
3/3/97	-5.56	-4.20	-4.69	-3.80	-3.33	-3.17	-2.88	-2.20	-1.44	7.98	13.37	16.41	19.13	21.33	19.11	18.90	23.32
3/4/97	-12.22	-6.24	-6.24	-4.17	-3.49	-3.24	-2.91	-2.22	-1.44	7.33	12.58	16.12	19.06	21.30	19.08	18.94	23.39
3/5/97	-9.44	-6.31	-6.54	-4.67	-3.88	-3.49	-3.01	-2.26	-1.44	7.27	12.38	15.69	18.74	21.14	19.05	18.91	23.30
3/6/97		-7.35	-7.46	-5.13	-4.22	-3.75	-3.17	-2.32	-1.44	6.96	11.95	15.40	18.49	21.00	18.93	18.80	23.34
3/7/97	-13.33	-5.72	-6.52	-5.29	-4.52	-4.01	-3.37	-2.41	-1.45	7.42	12.26	15.26	18.23	20.78	18.77	18.74	23.34
3/8/97	-11.39	-3.46	-4.61	-4.65	-4.26	-4.01	-3.50	-2.52	-1.50	8.26	13.33	15.64	18.31	20.72	18.61	18.65	23.35
3/9/97	-9.44	-2.88	-3.91	-3.99	-3.80	-3.75	-3.42	-2.56	-1.51	8.58	13.90	16.10	18.65	20.88	18.67	18.62	23.36
3/10/97	-21.11	-1.67	-2.90	-3.49	-3.40	-3.47	-3.27	-2.55	-1.55	9.44	14.83	16.54	18.83	21.04	18.75	18.65	23.34
3/11/97	-15.00	-1.81	-2.70	-3.03	-3.01	-3.16	-3.09	-2.48	-1.56	9.40	15.06	17.03	19.25	21.26	18.88	18.60	23.33
3/12/97	-18.89	-3.64	-3.80	-2.96	-2.80	-2.95	-2.93	-2.39	-1.53	8.34	14.11	17.10	19.53	21.48	19.01	18.69	23.38
3/13/97	-10.83	-4.90	-5.12	-3.50	-3.01	-2.94	-2.83	-2.31	-1.50	7.76	13.22	16.62	19.35	21.54	19.11	18.76	23.36
3/14/97	-4.72	-6.35	-6.38	-4.15	-3.42	-3.15	-2.86	-2.27	-1.50	7.28	12.46	16.07	19.07	21.36	19.09	18.81	23.33
3/15/97	-1.94																
3/16/97	0.56	-4.58	-5.48	-4.71	-4.06	-3.73	-3.18	-2.32	-1.44	7.85	12.73	15.64	18.58	21.03	18.96	18.77	23.38
3/17/97	-4.44	-3.93	-4.68	-4.21	-3.83	-3.69	-3.27	-2.41	-1.46	8.05	13.33	15.93	18.67	20.94	18.83	18.67	23.32
3/18/97	-10.83	-3.43	-4.31	-3.96	-3.63	-3.56	-3.21	-2.45	-1.48	8.30	13.65	16.23	18.85	20.98	18.82	18.58	23.29
3/19/97	-13.33	-1.58	-2.89	-3.49	-3.33	-3.37	-3.14	-2.43	-1.50	9.69	14.81	16.58	18.92	21.05	18.86	18.68	23.32
3/20/97	-22.50	-0.85	-2.11	-2.91	-2.91	-3.10	-3.01	-2.39	-1.50	14.74	16.16	17.23	19.28	21.23	18.96	18.65	23.24
3/21/97	-23.89	-0.27	-1.71	-2.52	-2.55	-2.82	-2.83	-2.31	-1.49	25.30	17.76	17.69	19.60	21.59	19.01	18.66	23.20
3/22/97	-3.89	0.36	-1.45	-2.24	-2.29	-2.61	-2.66	-2.22	-1.46	23.49	20.80	18.23	19.97	21.88	19.24	18.82	23.13
3/23/97	-11.39	0.38	-1.19	-2.05	-2.10	-2.43	-2.52	-2.14	-1.44	21.87	32.50	18.63	20.18	22.17	19.35	18.85	23.19

		Temperature (C)								Volumetric Moisture Content (%)							
Date	Air	Base			Subgrade					Base			Subgrade				
		305	445	673	813	965	1168	1473	1867	305	445	673	813	965	1168	1473	1867
3/24/97	-1.94	0.44	-1.07	-1.88	-1.93	-2.29	-2.42	-2.06	-1.43	21.36	33.27	19.08	20.40	22.48	19.52	18.84	23.22
3/25/97	4.72	0.70	-0.88	-1.75	-1.81	-2.16	-2.31	-2.00	-1.41	20.95	33.30	19.47	20.80	22.51	19.67	18.95	23.20
3/26/97	4.17	2.82	0.34	-1.65	-1.69	-2.05	-2.20	-1.92	-1.38	20.98	33.49	19.82	20.98	22.73	19.92	19.02	23.19
3/27/97	4.17	3.01	1.23	-1.55	-1.62	-1.95	-2.12	-1.88	-1.38	20.90	33.45	20.45	21.13	23.02	20.05	19.07	23.21
3/28/97	3.06	0.86	-0.24	-1.41	-1.51	-1.86	-2.03	-1.82	-1.35	20.75	33.31	21.29	21.37	23.19	20.21	19.11	23.22
3/29/97	1.39	1.59	0.25	-1.32	-1.41	-1.78	-1.98	-1.76	-1.33	20.87	33.56	21.93	21.66	23.45	20.39	19.17	23.16
3/30/97	2.22	2.05	0.66	-1.25	-1.32	-1.70	-1.91	-1.72	-1.31	20.97	33.53	22.81	21.78	23.63	20.48	19.24	23.14
3/31/97	3.33	3.75	1.91	-1.16	-1.24	-1.65	-1.84	-1.68	-1.29	21.15	33.65	24.35	22.00	23.83	20.60	19.35	23.14
4/1/97	11.11	4.16	2.79	-0.91	-1.19	-1.60	-1.80	-1.66	-1.28	21.16	33.76	30.15	22.37	23.93	20.69	19.47	23.24
4/2/97	6.11	2.15	1.00	-0.77	-1.08	-1.53	-1.74	-1.63	-1.27	20.87	33.53	31.55	22.72	24.19	20.76	19.54	23.18
4/3/97	1.67																
4/4/97	1.67	3.43	2.34	-0.25	-0.97	-1.41	-1.67	-1.56	-1.25	16.77	33.66	32.47	23.55	24.66	21.07	19.70	23.22
4/5/97	4.44	0.52	0.03	-0.45	-0.91	-1.37	-1.63	-1.52	-1.22	20.59	33.39	32.30	24.28	24.76	21.24	19.77	23.25
4/6/97	9.17	-1.23	-1.00	-0.82	-0.85	-1.31	-1.59	-1.49	-1.21	20.30	33.32	32.21	24.71	25.17	21.42	19.73	23.21
4/7/97		-0.59	-1.19	-0.90	-0.84	-1.29	-1.55	-1.46	-1.20	17.69	33.01	32.03	24.83	25.31	21.50	19.91	23.28
4/8/97	6.39	-0.77	-1.22	-0.93	-0.85	-1.27	-1.52	-1.44	-1.20	13.54	31.52	31.84	24.99	25.38	21.68	19.97	23.25
4/9/97	3.06	-0.75	-1.23	-0.94	-0.86	-1.24	-1.50	-1.41	-1.18	13.35	29.67	31.76	25.02	25.52	21.73	20.09	23.23
4/10/97	6.11																
4/11/97	4.17	-0.60	-1.22	-0.95	-0.85	-1.23	-1.44	-1.36	-1.16	17.82	28.73	31.38	25.05	25.68	21.87	20.20	23.30
4/12/97	-3.61	0.06	-1.12	-0.95	-0.84	-1.21	-1.44	-1.35	-1.16	22.65	30.63	31.28	25.05	25.79	22.05	20.31	23.26
4/13/97	-6.39	2.06	0.53	-0.83	-0.79	-1.20	-1.41	-1.33	-1.15	21.48	34.16	32.18	26.33	25.92	22.09	20.35	23.21
4/14/97	-9.44	4.57	2.87	-0.27	-0.81	-1.17	-1.40	-1.32	-1.15	21.15	34.07	32.25	26.44	25.97	22.17	20.42	23.37
4/15/97	-10.00	4.79	3.24	0.31	-0.78	-1.16	-1.38	-1.30	-1.13	20.88	34.06	32.67	26.91	26.00	22.19	20.52	23.37
4/16/97	-6.67	5.93	4.23	0.86	-0.66	-1.16	-1.38	-1.28	-1.12	20.81	34.07	32.51	30.93	26.11	22.28	20.52	23.35
4/17/97	-5.56	8.33	6.13	1.69	-0.16	-1.12	-1.37	-1.27	-1.12	21.06	34.05	32.94	32.65	26.40	22.35	20.61	23.33
4/18/97	-3.33	10.35	8.12	2.96	0.70	-1.07	-1.33			21.29	34.11	32.84	32.96	27.10		19.79	23.44
4/19/97	-0.56	10.71	8.86	4.02	1.67	-0.88	-1.33	-1.27	-1.11	21.17	34.14	32.77	32.71	30.41	22.69	20.72	23.44
4/20/97	2.50	9.80	8.21	4.41	2.33	-0.24			-1.11	21.13	33.98	32.75	32.91	38.98		20.86	
4/21/97	6.39	9.14	7.93	4.64	2.72	0.43	-1.23	-1.22	-1.11	21.17	34.10	32.84	32.83	32.12	23.24	20.98	23.35
4/22/97	0.83	7.48			2.77	0.79	-1.15	-1.22	-1.10	19.85	24.81	33.06	36.22	31.98	23.99	20.89	23.38
4/23/97	8.06																
4/24/97	14.44																
4/25/97	9.72	7.62	6.32	4.02	2.82	1.24	-0.69	-1.16	-1.08	21.16	34.00	32.85	32.77	32.00	31.04	21.18	23.50
4/26/97	10.56	8.28	6.78	4.23	3.01	1.45	-0.44	-1.13	-1.07	21.23	33.96	33.01	33.17	32.44	31.34	21.37	23.66
4/27/97	8.06	9.23	7.65	4.70	3.38	1.73	-0.17	-1.10	-1.06	21.36	34.08	32.86	33.11	32.40	31.53	21.50	23.70
4/28/97	9.17	11.02	9.22	5.48	3.92	2.12	0.14	-1.08	-1.05	21.68	34.35	32.98	33.19	32.17	31.65	21.82	23.75
4/29/97	7.22	10.61	9.18	6.13	4.55	2.65	0.52	-1.05	-1.05	21.57	34.17	33.35	33.26	32.50	31.64	22.09	23.71
4/30/97	7.50	10.74	9.33	6.39	4.88	3.05	0.89	-1.01	-1.05	21.53	34.44	33.07	33.40	32.55	31.51	22.59	23.79
5/1/97	7.78	10.12	8.95	6.56	5.13	3.35	1.23	-0.96	-1.05	21.45	34.03	33.18	33.52	32.33	31.62	23.42	23.82
5/2/97	10.28	9.50	8.38	6.42	5.17	3.53	1.50	-0.84	-1.04	21.32	34.15	33.18	33.33	32.55	31.60	26.41	23.80
5/3/97	5.83	10.13	8.66	6.34	5.13	3.61	1.70	-0.60	-1.04	21.36	34.11	33.00	33.07	32.61	31.49	28.04	23.91
5/4/97	9.17	11.64	10.11	6.93	5.46	3.82	1.91	-0.30	-1.04	21.66	34.23	33.13	33.39	32.57	31.48	28.10	23.91
5/5/97	12.78	11.86	10.28	7.37	5.92	4.21	2.22	0.04	-1.02	21.54	34.25	32.80	33.60	32.58	31.47	27.99	23.99
5/6/97	5.83	12.96	11.31	7.95	6.37	4.59	2.58	0.38	-1.01	21.72	34.00	33.16	33.25	32.33	31.44	28.12	24.09

Date	Air	Temperature (C) Base			Subgrade					Volumetric Moisture Content (%) Base			Subgrade				
		305	445	673	813	965	1168	1473	1867	305	445	673	813	965	1168	1473	1867
5/7/97	7.50	13.94	12.30	8.66	6.95	5.08	2.97	0.76	-0.99	21.86	34.37	33.19	33.45	32.48	31.68	28.11	24.12
5/8/97		12.48	11.31	8.93	7.40	5.56	3.42	1.14	-0.99	21.58	34.13	33.33	33.75	32.23	31.74	28.06	24.29
5/9/97	5.83	13.80	12.12	9.01	7.53	5.81	3.77	1.52	-0.96	21.81	34.12	33.16	33.62	32.50	31.80	28.15	24.48
5/10/97	5.00	15.42	13.69	9.80	8.05	6.18	4.08	1.84	-0.92	22.02	34.21	33.43	33.33	32.42	31.80	28.09	25.13
5/11/97	6.11	14.03	12.87	10.23	8.59	6.69	4.50	2.18	-0.84	21.77	34.09	33.40	33.57	32.48	31.95	28.20	26.87
5/12/97	10.00	14.00	12.67	10.14	8.71	6.95	4.86	2.55	-0.67	21.75	34.13	33.58	33.32	32.53	31.96	28.16	27.34
5/13/97	11.39	14.51	13.19	10.40	8.91	7.16	5.12	2.88	-0.29	21.81	34.13	33.38	33.52	32.13	31.93	28.12	27.44
5/14/97	11.94	13.97	12.72	10.44	9.06	7.40	5.40	3.19	0.19	21.74	34.06	33.48	33.55	32.01	31.99	27.83	27.27
5/15/97	14.44	15.00	13.44	10.61	9.21	7.57	5.63	3.49	0.67	21.88	34.24	33.37	33.44	32.31	31.92	27.94	27.39
5/16/97	9.44	17.68	15.59	11.39	9.67	7.88	5.89	3.78	1.06	22.17	34.00	33.55	33.05	32.69	31.93	27.98	27.40
5/17/97	13.33	18.69	16.85	12.55	10.56	8.52	6.30	4.09	1.40	22.44	33.99	33.64	33.32	32.01	32.00	27.83	27.25
5/18/97	13.33	16.12	15.56	13.08	11.25	9.18	6.84	4.47	1.73	21.96	33.97	33.53	33.72	32.31	32.15	28.02	27.31
5/19/97	9.17	12.05	11.68	11.73	10.83	9.31	7.23	4.87	2.08	21.35	34.11	33.34	33.36	31.85	32.34	28.02	27.18
5/20/97	8.61	12.55	11.62	10.75	10.01	8.86	7.21	5.16	2.43	21.39	33.91	33.46	33.34	32.05	32.26	28.05	27.48
5/21/97	14.17	13.69	12.54	10.75	9.79	8.61	7.07	5.26	2.71	21.65	33.95	33.01	33.39	31.98	32.13	27.97	27.15
5/22/97	7.22																
5/23/97	13.33	14.93	13.46	11.13	10.03	8.72	7.16	5.44	3.17	21.67	34.14	33.08	33.48	31.88	32.01	27.81	26.87
5/24/97	18.89	15.64	14.46	11.80	10.42	8.95	7.29	5.58	3.39	21.76	33.73	33.29	33.27	31.88	32.14	27.88	26.93
5/25/97	18.33	13.07	12.51	11.62	10.58	9.21	7.53	5.77	3.60	21.49	33.94	33.23	33.07	32.26	32.14	27.93	27.04
5/26/97	11.39	13.63	12.43	11.07	10.25	9.11	7.65	5.97	3.85	21.55	34.07	33.44	33.48	31.97	31.99	27.89	27.01
5/27/97	2.22	15.37	13.99	11.49	10.36	9.10	7.67	6.12	4.08	21.69	33.82	33.47	33.17	31.82	32.11	27.97	26.81
5/28/97	4.17	15.14	13.94	11.88	10.72	9.36	7.83	6.28	4.31	21.70	33.98	33.44	33.17	31.87	32.13	27.87	26.97
5/29/97	12.78	16.40	14.83	12.18	10.97	9.59	8.05	6.49	4.55	21.94	33.76	33.48	32.99	31.97	32.16	27.86	27.04
5/30/97	11.94	18.42	16.57	13.00	11.52	9.96	8.32	6.73	4.79	22.09	34.11	33.21	33.29	32.07	32.30	28.05	27.22

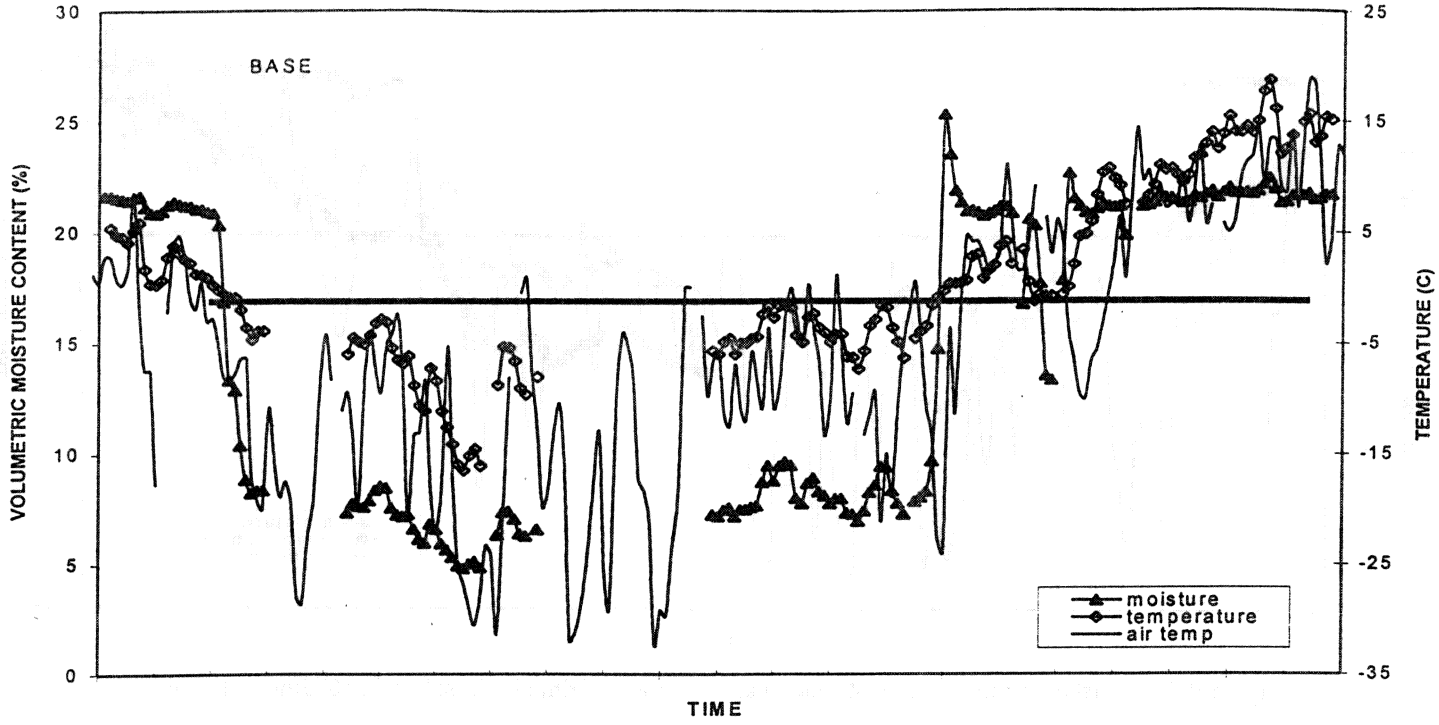


Figure B-22. Moisture Temperature distribution as a function of time in the base course at Scobey.

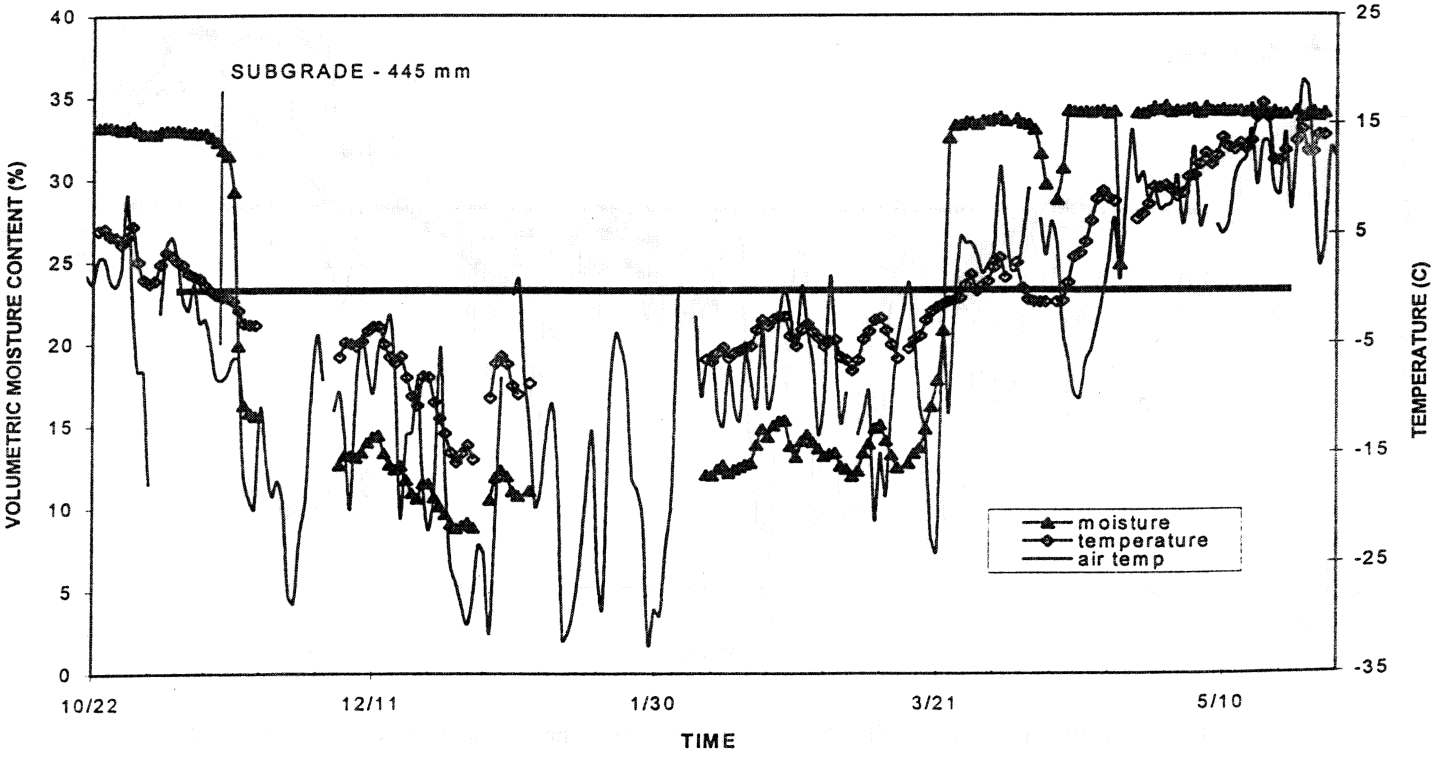


Figure B-23. Moisture Temperature distribution as a function of time in the subgrade (445mm) at Scobey.

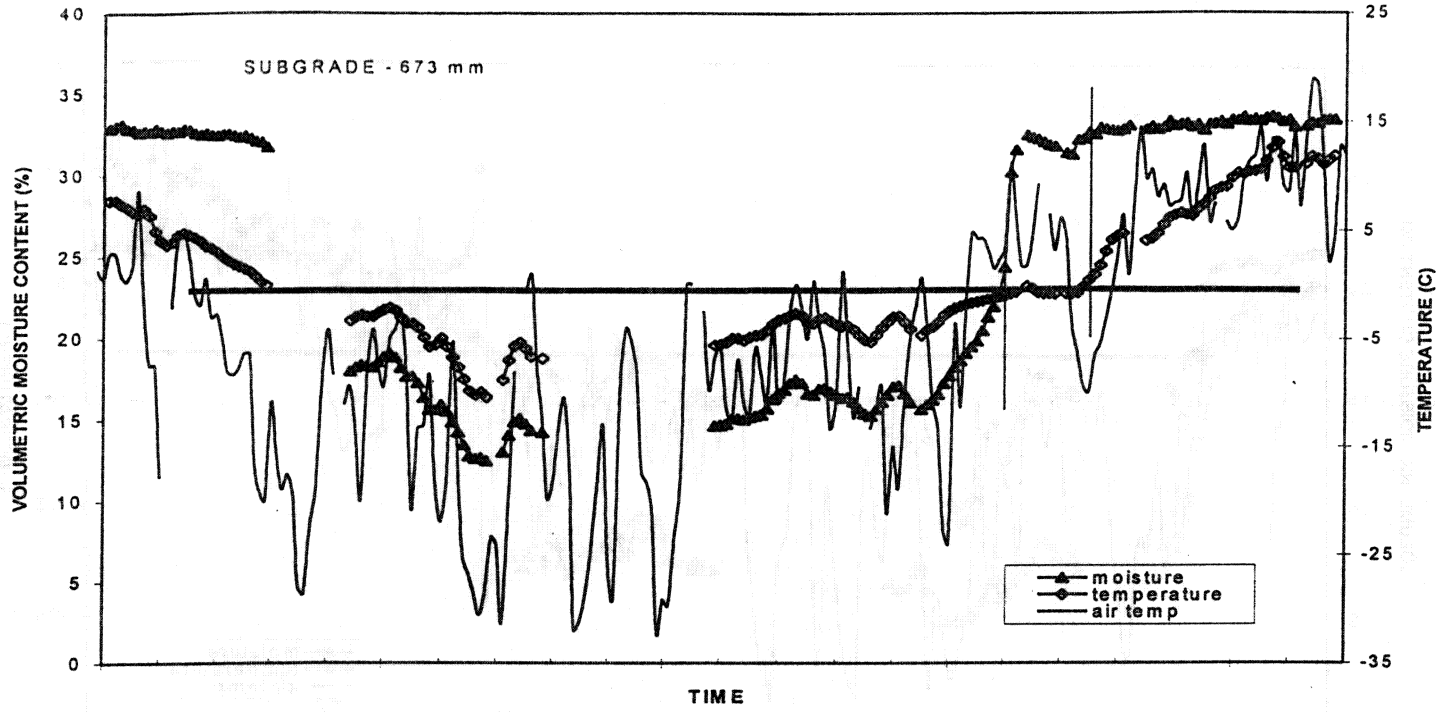


Figure B-24. Moisture Temperature distribution as a function of time in the subgrade (673mm) at Scobey.

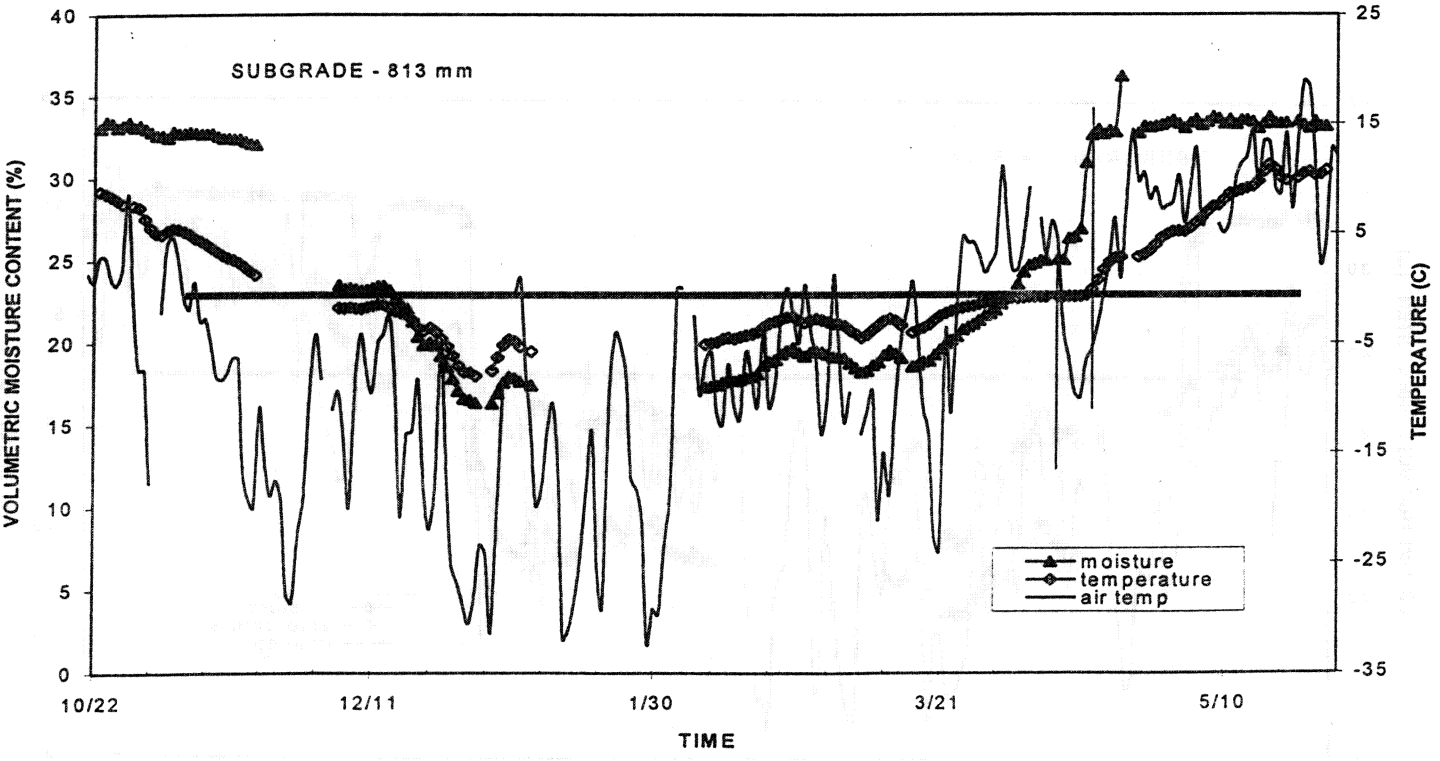


Figure B-25. Moisture Temperature distribution as a function of time in the subgrade (813mm) at Scobey.

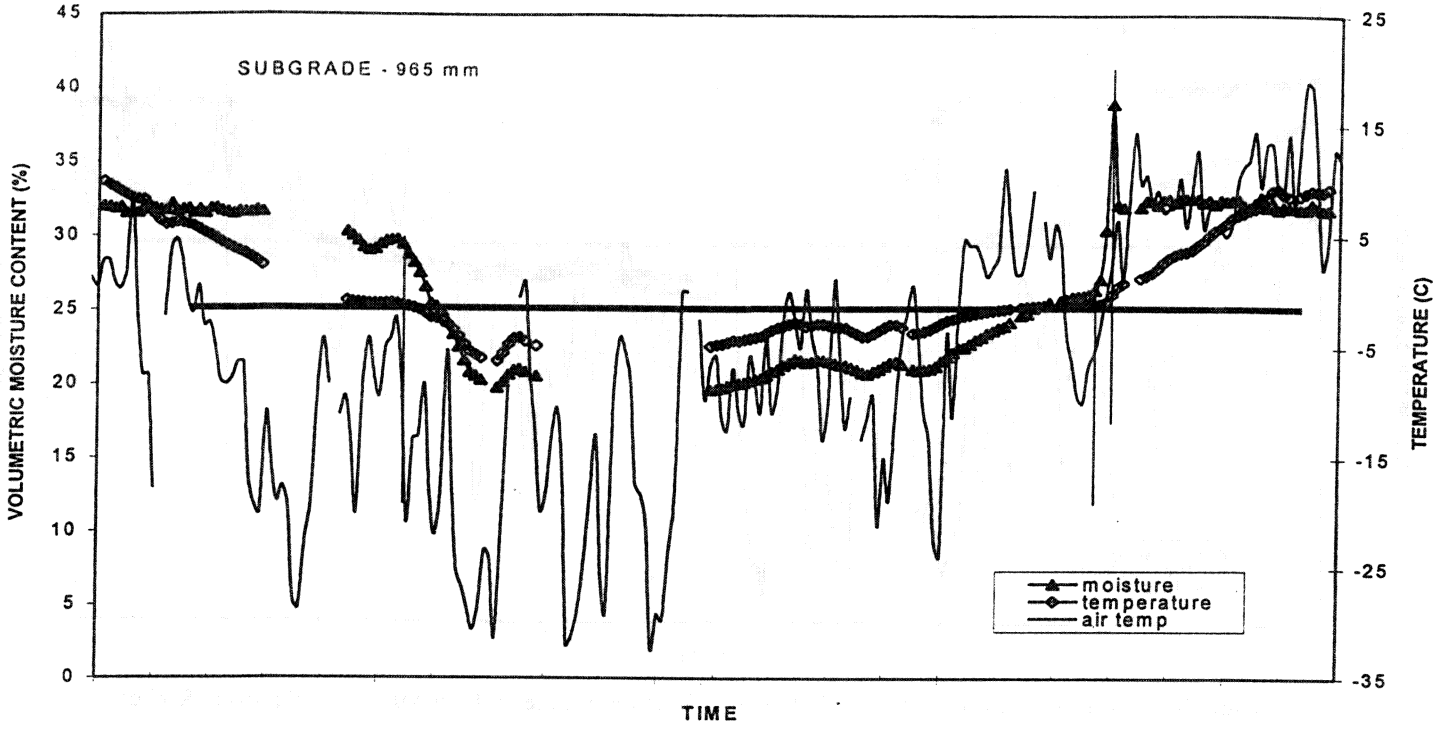


Figure B-26. Moisture Temperature distribution as a function of time in the subgrade (965mm) at Scobey.

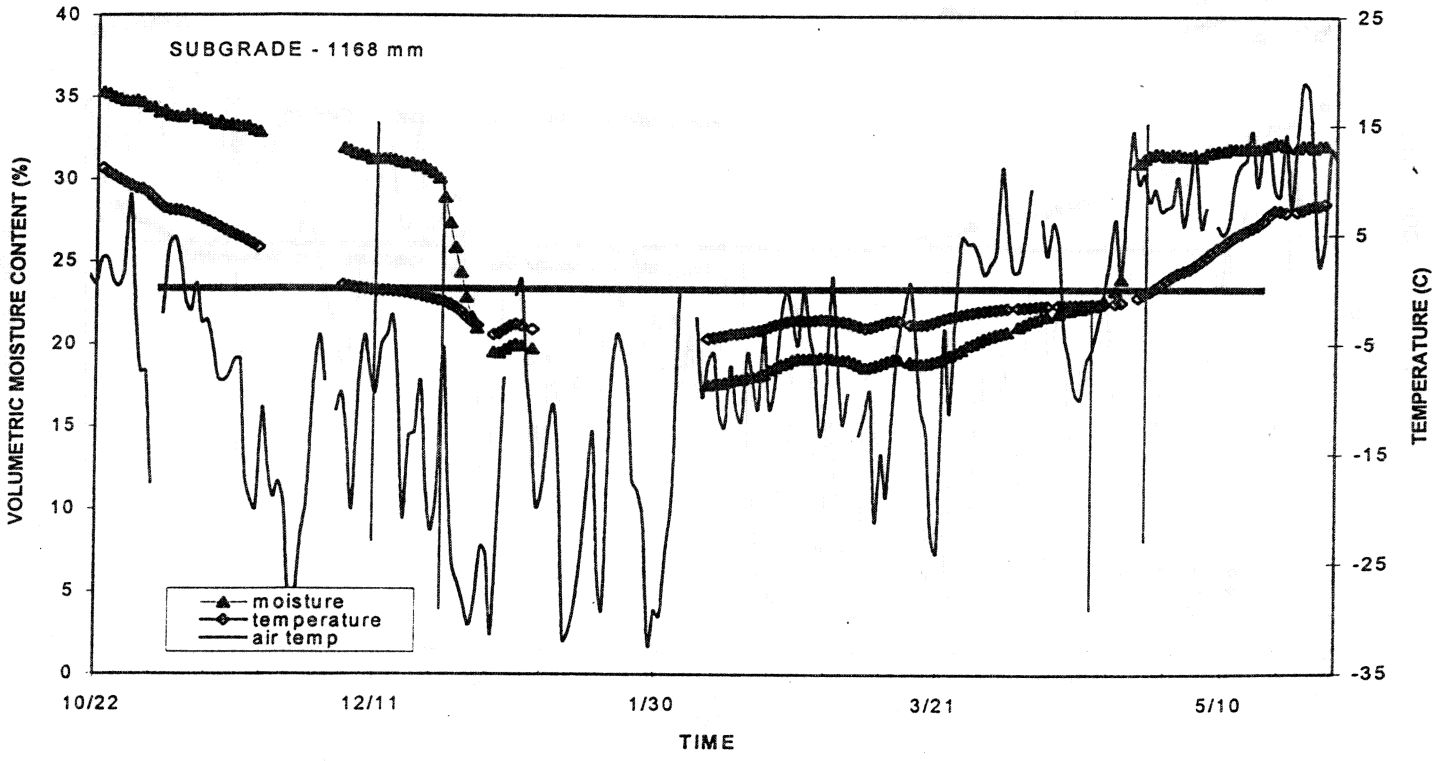


Figure B-27. Moisture Temperature distribution as a function of time in the subgrade (1168mm) at Scobey.

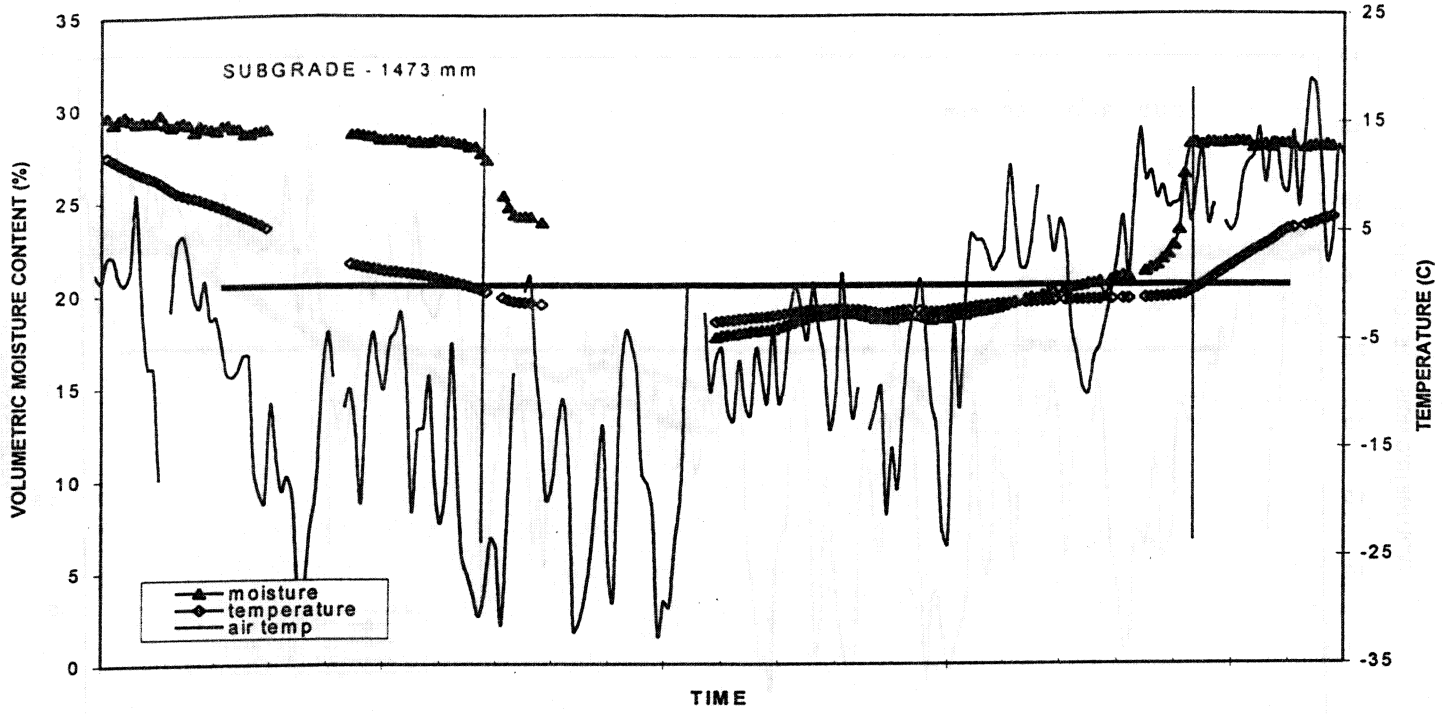


Figure B-28. Moisture Temperature distribution as a function of time in the subgrade (1473mm) at Scobey.

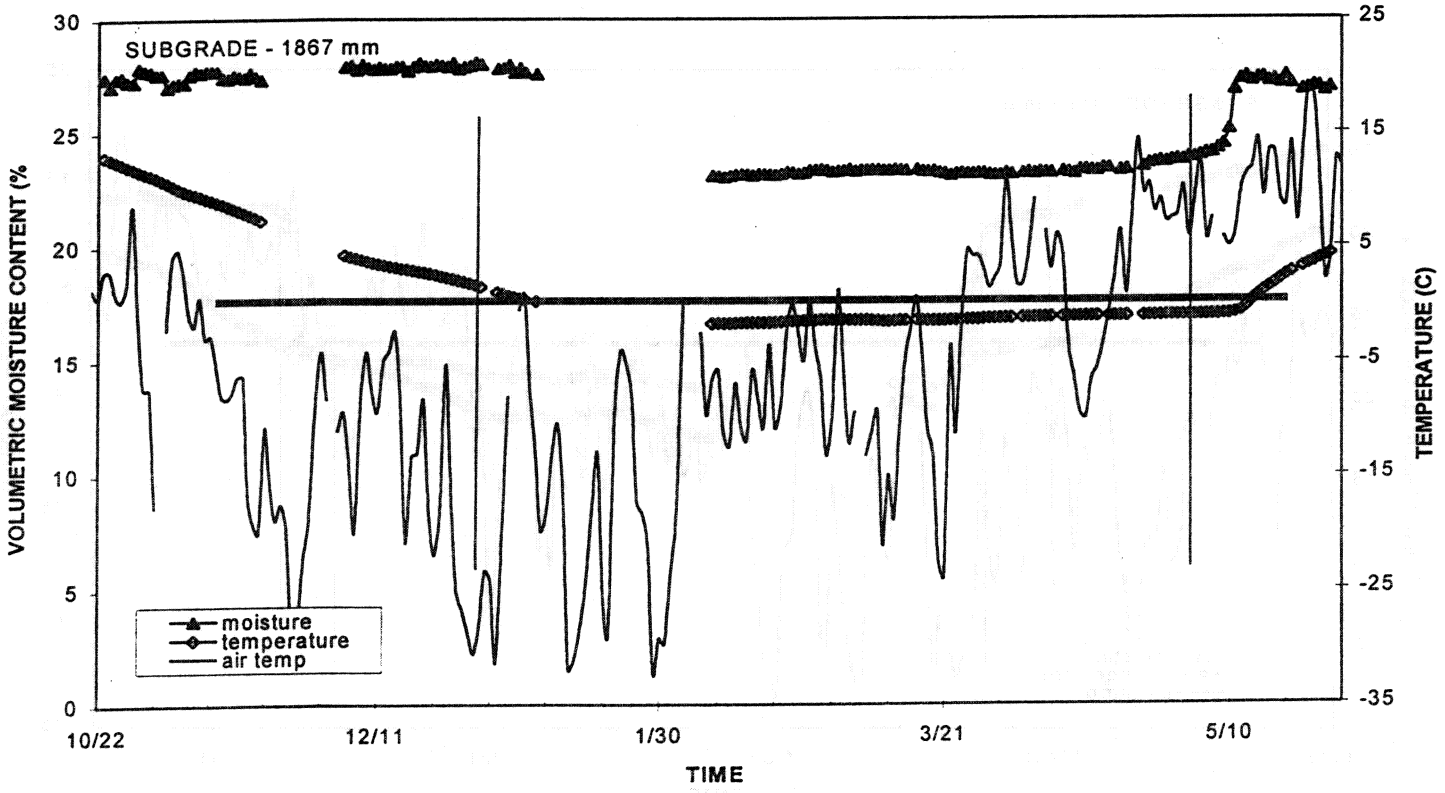


Figure B-29. Moisture Temperature distribution as a function of time in the subgrade (1867mm) at Scobey.

East Glacier

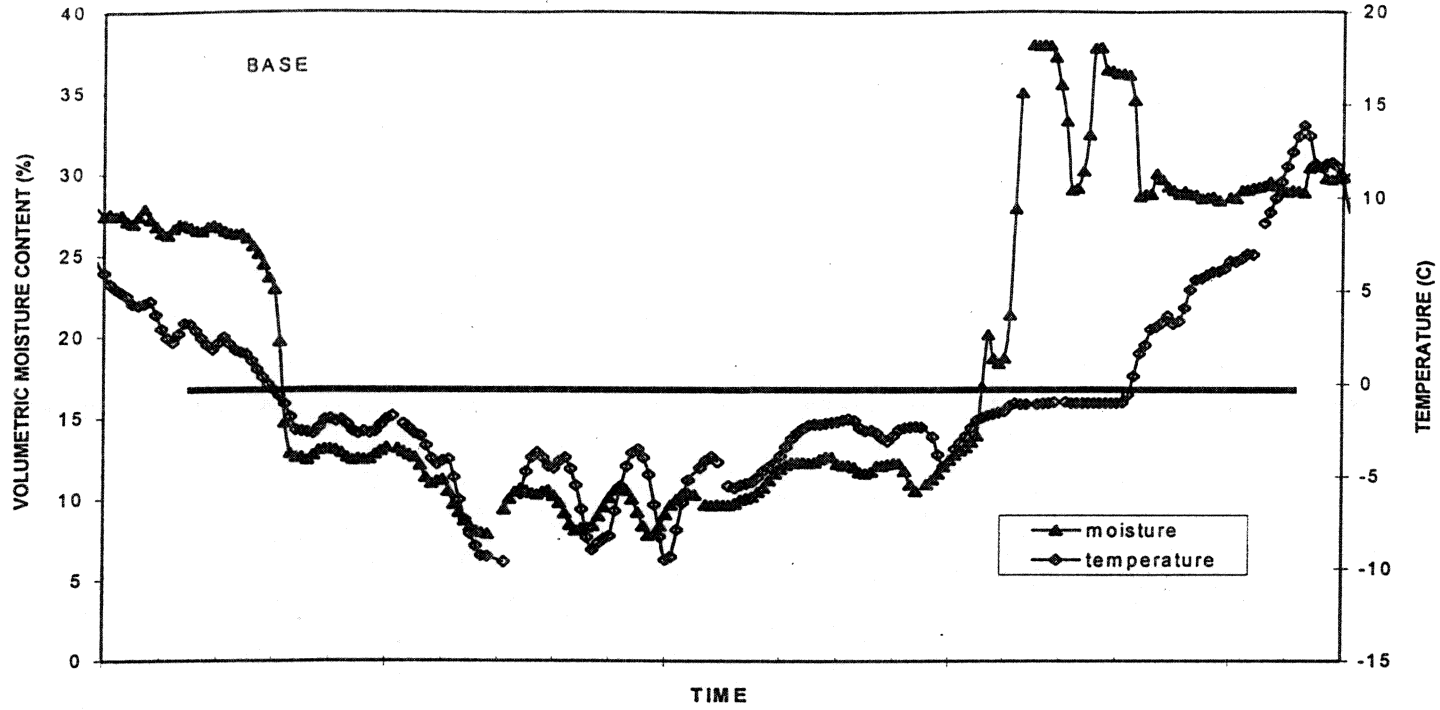


Figure B-30. Moisture Temperature distribution as a function of time in base course at East Glacier.

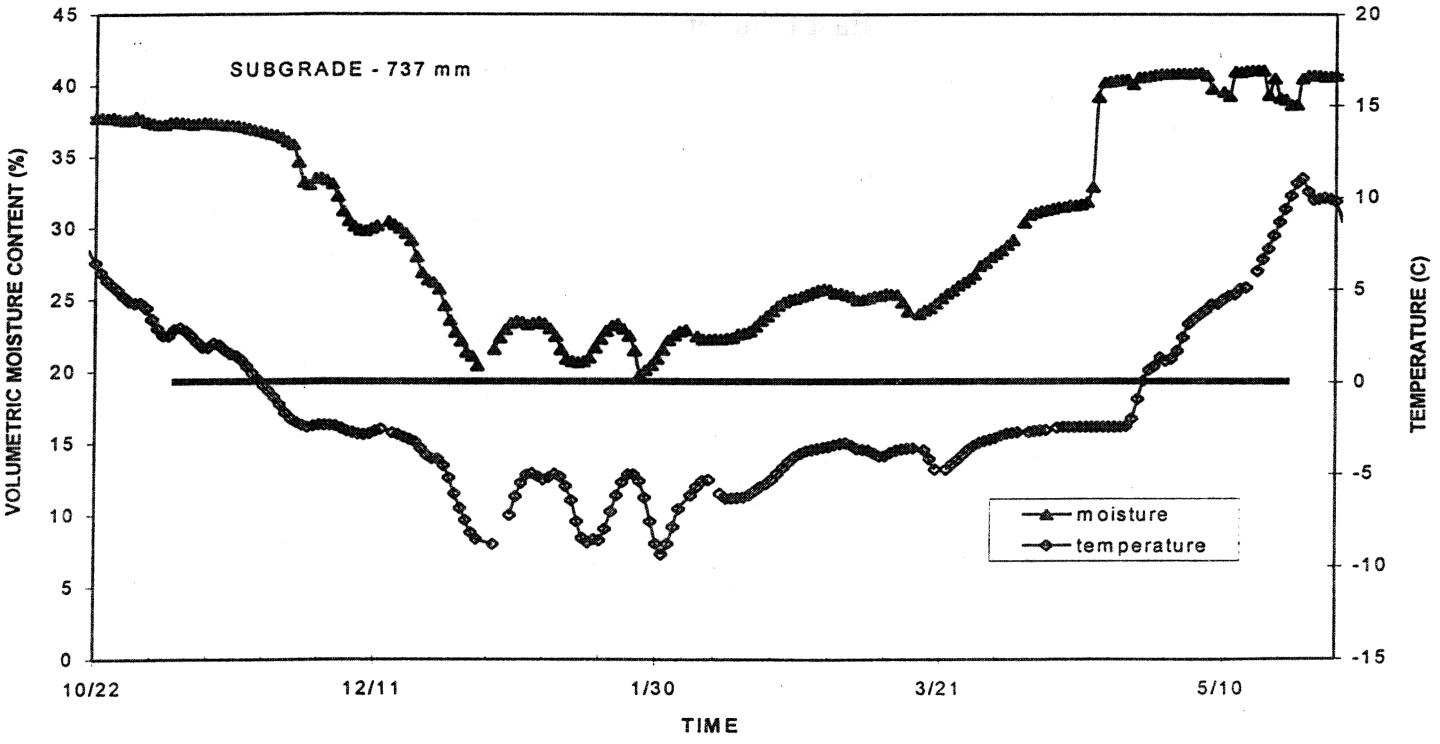


Figure B-31. Moisture Temperature distribution as a function of time in the subgrade (737mm) at East Glacier.

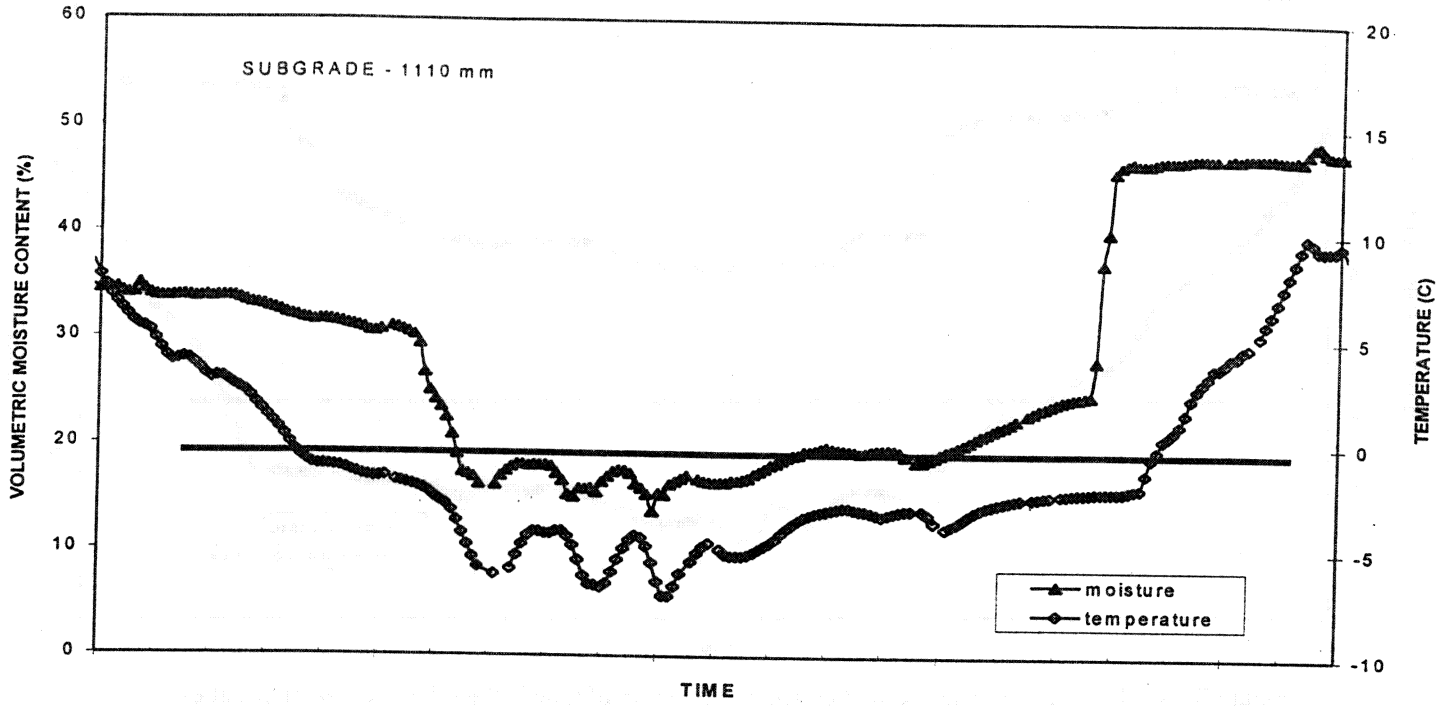


Figure B-32. Moisture Temperature distribution as a function of time in the subgrade (1110mm) at East Glacier.

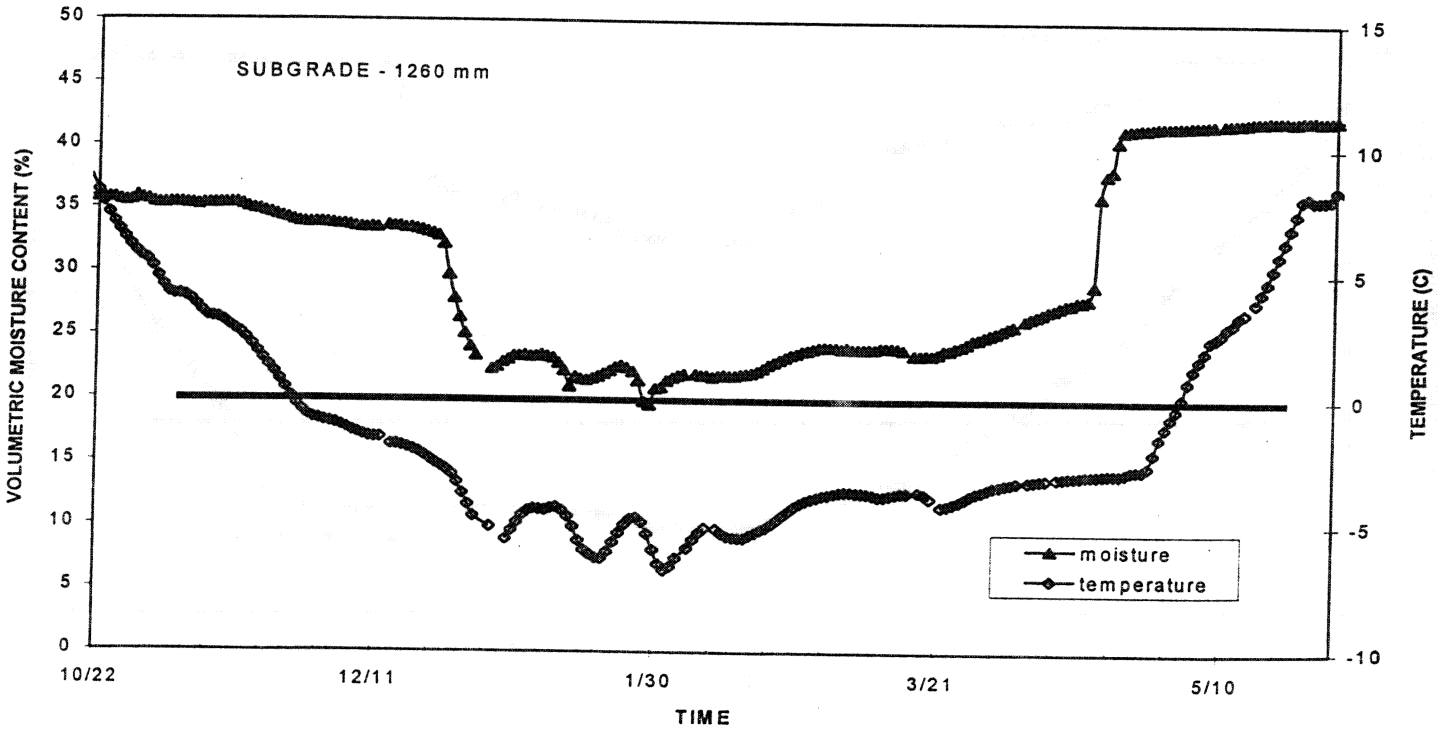


Figure B-33. Moisture Temperature distribution as a function of time in the subgrade (1260mm) at East Glacier.

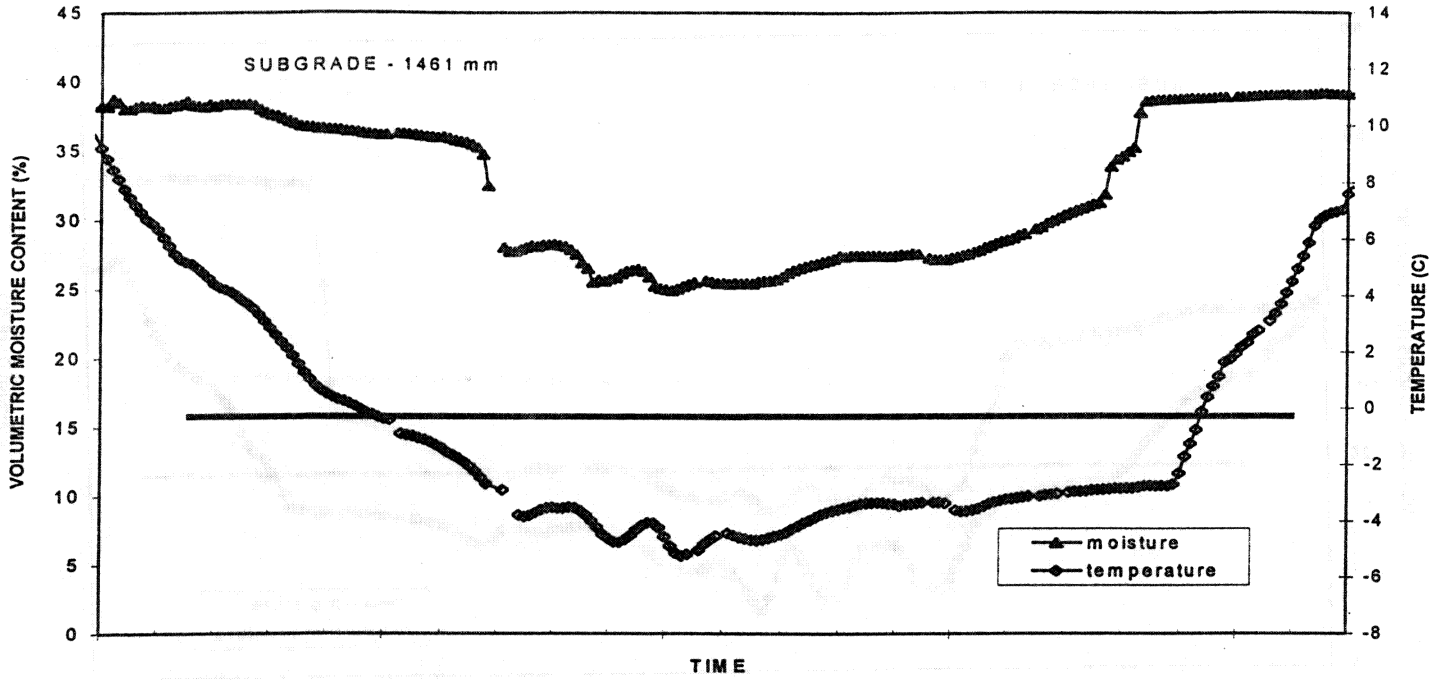


Figure B-34. Moisture Temperature distribution as a function of time in the subgrade (1461mm) at East Glacier.

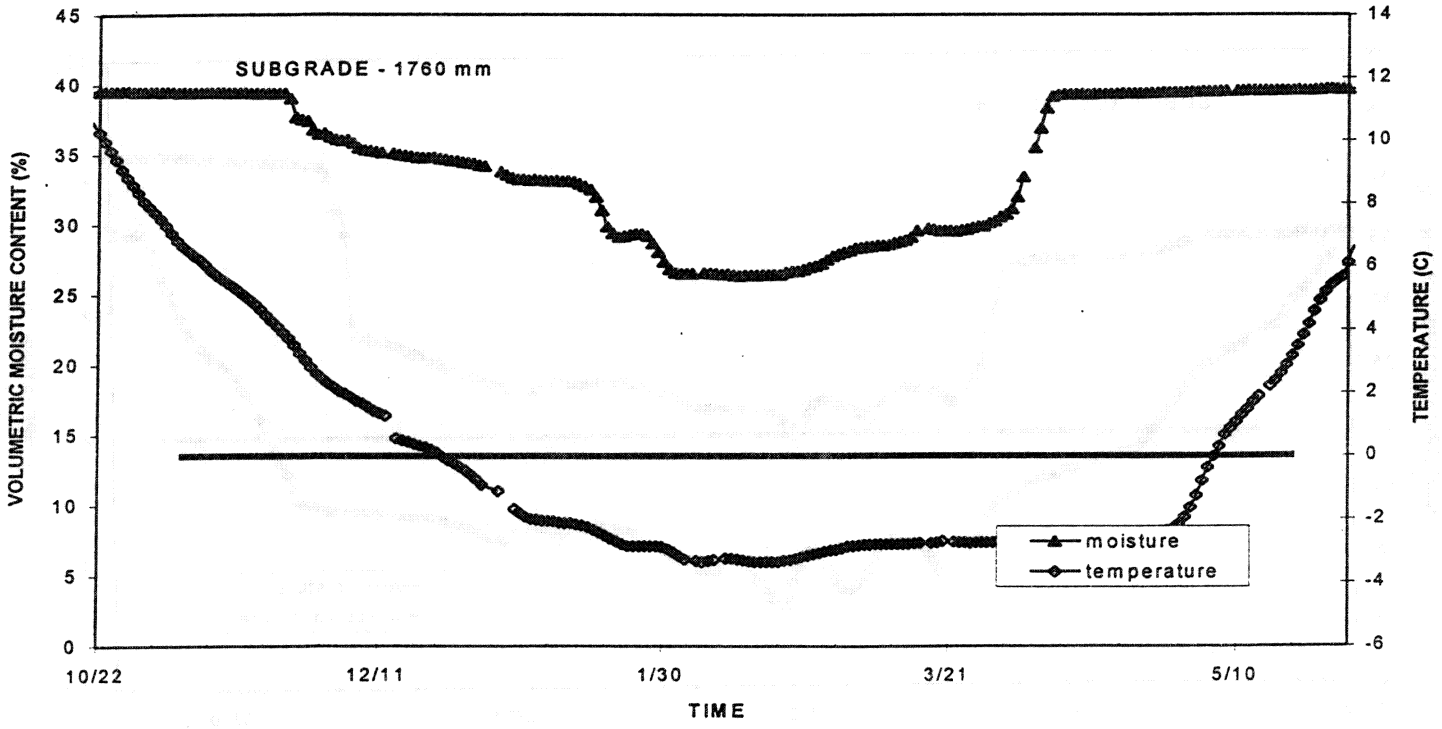


Figure B-35. Moisture Temperature distribution as a function of time in the subgrade (17mm) at East Glacier.

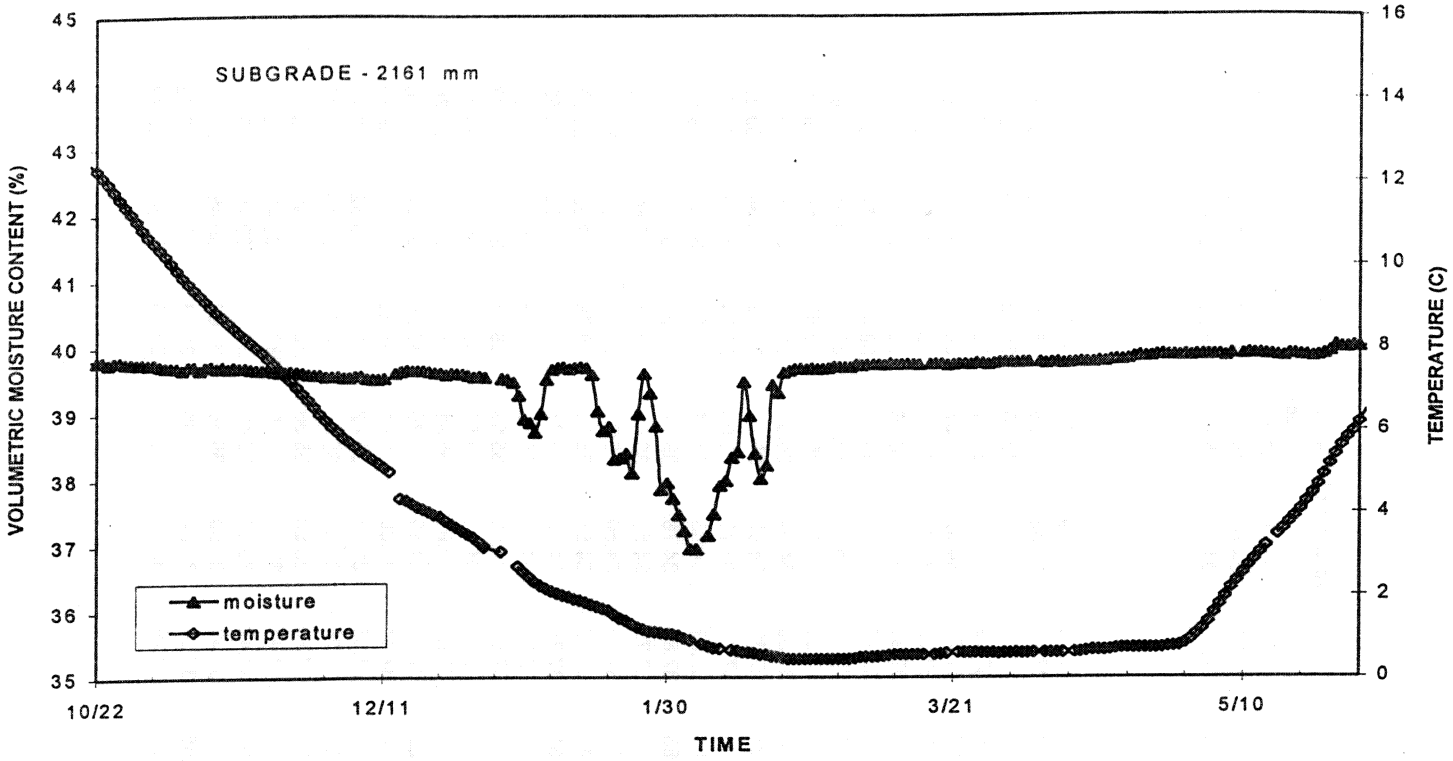


Figure B-36. Moisture Temperature distribution as a function of time in the subgrade (2161mm) at East Glacier.

Table B-5. Moisture Temperature distibution as a function of time and depth at East Glacier

Date	Air	Temperaure (C) Base	Subgrade						Volumetric Moisture Content (%) Base	Subgrade					
		457	737	1110	1260	1461	1760	2161	457	737	1110	1260	1461	1760	2161
10/1/96		11.88	11.07	11.46	11.08	11.50	12.04	13.74	27.86	37.81	34.40	35.97	38.32	39.63	39.84
10/2/96		11.50	11.04	11.51	11.15	11.50	11.94	13.60	27.55	37.77	34.38	35.92	38.28	39.61	39.85
10/3/96		10.51	10.54	11.30	11.04	11.43	11.87	13.50							
10/4/96															
10/5/96															
10/6/96															
10/7/96									27.75	37.76	34.29	35.86	38.30	39.57	39.87
10/8/96		11.63	10.93	11.28	10.81	11.06	11.39	13.03	27.73	37.78	34.32	35.88	38.25	39.58	39.85
10/9/96		11.85	10.96	11.30	10.78	11.06	11.37	12.98	27.75	37.77	34.32	35.90	38.28	39.59	39.83
10/10/96		12.05	11.12	11.37	10.84	11.06	11.33	12.90	27.78	37.79	34.31	35.94	38.31	39.57	39.84
10/11/96		12.30	11.26	11.46	10.91	11.06	11.28	12.87	27.88	37.77	34.37	35.97	38.37	39.56	39.82
10/12/96		12.75	11.53	11.62	11.00	11.10	11.28	12.82	27.92	37.80	34.32	35.97	38.38	39.57	39.87
10/13/96		12.87	11.76	11.83	11.14	11.18	11.28	12.78	27.72	37.81	34.36	36.06	38.41	39.56	39.80
10/14/96		12.50	11.69	11.89	11.23	11.25	11.32	12.77	27.64	37.76	34.32	36.03	38.43	39.57	39.80
10/15/96		12.04	11.43	11.77	11.20	11.28	11.33	12.72	28.68	38.07	35.35	36.46	38.57	39.55	39.80
10/16/96		11.12	10.94	11.50	11.06	11.22	11.34	12.72	28.22	38.01	35.13	36.28	38.58	39.56	39.80
10/17/96		9.89	10.15	11.02	10.75	11.09	11.30	12.71	27.73	37.90	34.64	35.96	38.42	39.56	39.82
10/18/96		8.72	9.24	10.37	10.30	10.82	11.21	12.67	27.63	37.82	34.57	35.97	38.62	39.54	39.80
10/19/96		7.83	8.38	9.67	9.75	10.49	11.05	12.63	28.03	37.91	34.75	35.98	38.54	39.53	39.78
10/20/96		7.14	7.70	9.05	9.20	10.07	10.81	12.54	28.03	37.91	34.83	35.94	38.29	39.57	39.81
10/21/96		6.40	7.01	8.44	8.67	9.65	10.54	12.44	27.86	37.83	34.76	35.87	38.21	39.57	39.82
10/22/96		5.96	6.48	7.90	8.16	9.23	10.27	12.31	27.44	37.75	34.52	35.81	38.25	39.56	39.80
10/23/96		5.37	5.94	7.42	7.72	8.85	9.98	12.15	27.57	37.76	34.50	35.81	38.22	39.54	39.81
10/24/96		5.09	5.51	6.97	7.28	8.46	9.69	11.99	27.43	37.72	34.53	35.79	38.78	39.53	39.77
10/25/96		4.90	5.22	6.63	6.91	8.13	9.40	11.81	27.51	37.75	34.59	35.77	38.52	39.53	39.80
10/26/96		4.69	4.97	6.33	6.60	7.78	9.09	11.61	27.12	37.64	34.25	35.60	38.06	39.55	39.80
10/27/96		4.29	4.62	6.03	6.29	7.47	8.83	11.43	26.99	37.57	34.08	35.53	38.05	39.55	39.77
10/28/96		4.20	4.37	5.74	5.99	7.21	8.58	11.26	27.39	37.59	34.12	35.59	38.22	39.52	39.77
10/29/96		4.29	4.28	5.54	5.76	6.96	8.35	11.08	27.86	37.82	34.98	35.91	38.31	39.52	39.76
10/30/96		4.41	4.29	5.44	5.56	6.70	8.07	10.88	27.22	37.65	34.46	35.70	38.24	39.52	39.76
10/31/96		3.71	4.00	5.29	5.43	6.55	7.89	10.70	26.80	37.44	34.06	35.64	38.29	39.52	39.75
11/1/96		2.93	3.41	4.90	5.15	6.34	7.71	10.54	26.41	37.36	33.88	35.42	38.12	39.52	39.76
11/2/96		2.44	2.90	4.46	4.78	6.05	7.51	10.39	26.27	37.26	33.80	35.36	38.14	39.49	39.73
11/3/96		2.21	2.54	4.08	4.42	5.76	7.29	10.23	26.65	37.29	33.80	35.36	38.27	39.48	39.71
11/4/96		2.66	2.52	3.88	4.14	5.48	7.05	10.06	26.92	37.41	33.83	35.40	38.33	39.49	39.71
11/5/96		3.24	2.84	3.94	4.06	5.28	6.82	9.88	26.85	37.42	33.87	35.40	38.44	39.45	39.70
11/6/96		3.17	2.93	4.01	4.06	5.18	6.63	9.71	26.72	37.40	33.90	35.38	38.62	39.46	39.67
11/7/96		2.83	2.76	3.94	4.00	5.11	6.50	9.56	26.55	37.34	33.84	35.36	38.33	39.45	39.72
11/8/96		2.42	2.48	3.74	3.86	4.96	6.34	9.41	26.51	37.29	33.76	35.32	38.29	39.44	39.72

Date	Air	Temperaure (C) Base			Subgrade				Volumetric Moisture Content (%) Base			Subgrade			
		457	737	1110	1260	1461	1760	2161	457	737	1110	1260	1461	1760	2161
11/9/96		2.07	2.17	3.51	3.65	4.80	6.22	9.27	26.76	37.33	33.80	35.25	38.21	39.45	39.67
11/10/96		1.82	1.89	3.24	3.41	4.61	6.06	9.14	26.84	37.38	33.88	35.34	38.42	39.44	39.71
11/11/96		2.17	1.87	3.06	3.21	4.42	5.88	8.99	26.73	37.34	33.78	35.36	38.25	39.46	39.72
11/12/96		2.48	2.09	3.13	3.17	4.28	5.72	8.85	26.50	37.30	33.84	35.36	38.38	39.44	39.69
11/13/96		2.11	1.98	3.11	3.13	4.21	5.60	8.73	26.37	37.25	33.85	35.38	38.40	39.45	39.72
11/14/96		1.78	1.73	2.94	3.02	4.12	5.48	8.60	26.32	37.22	33.85	35.38	38.40	39.43	39.69
11/15/96		1.67	1.53	2.77	2.84	3.99	5.37	8.48	26.34	37.20	33.80	35.40	38.38	39.43	39.71
11/16/96		1.58	1.42	2.62	2.71	3.83	5.23	8.36	26.06	37.18	33.63	35.41	38.37	39.41	39.69
11/17/96		1.20	1.20	2.46	2.56	3.70	5.10	8.24	25.60	37.09	33.43	35.28	38.39	39.41	39.70
11/18/96		0.74	0.85	2.21	2.35	3.53	4.95	8.13	25.12	36.99	33.25	35.06	38.30	39.39	39.68
11/19/96		0.32	0.48	1.90	2.09	3.33	4.80	8.01	24.48	36.90	33.14	34.93	38.01	39.38	39.67
11/20/96		-0.03	0.14	1.60	1.82	3.09	4.64	7.89	23.66	36.83	33.04	34.88	37.79	39.39	39.67
11/21/96		-0.36	-0.18	1.31	1.55	2.86	4.44	7.74	22.96	36.71	32.84	34.74	37.64	39.39	39.68
11/22/96		-0.68	-0.48	1.03	1.28	2.61	4.27	7.62	19.74	36.61	32.71	34.63	37.56	39.37	39.65
11/23/96		-1.11	-0.82	0.74	1.02	2.37	4.09	7.49	14.73	36.54	32.52	34.49	37.38	39.37	39.63
11/24/96		-1.81	-1.23	0.41	0.72	2.13	3.90	7.34	12.83	36.36	32.28	34.34	37.16	39.37	39.64
11/25/96		-2.51	-1.66	0.03	0.40	1.87	3.73	7.22	12.61	36.11	32.11	34.23	37.00	39.01	39.64
11/26/96		-2.56	-1.99	-0.33	0.05	1.57	3.49	7.06	12.61	35.86	32.00	34.06	36.83	37.65	39.63
11/27/96		-2.61	-2.18	-0.59	-0.25	1.28	3.24	6.90	12.45	34.65	31.81	33.93	36.77	37.49	39.62
11/28/96		-2.69	-2.33	-0.78	-0.48	1.03	3.02	6.75	12.76	33.25	31.71	33.88	36.74	37.39	39.60
11/29/96		-2.38	-2.43	-0.93	-0.68	0.81	2.81	6.58	13.05	33.04	31.61	33.86	36.65	36.75	39.60
11/30/96		-1.95	-2.38	-1.00	-0.79	0.66	2.61	6.41	13.10	33.49	31.69	33.88	36.66	36.44	39.59
12/1/96		-1.91	-2.31	-1.00	-0.84	0.53	2.45	6.26	13.10	33.51	31.70	33.87	36.62	36.53	39.56
12/2/96		-2.03	-2.33	-1.02	-0.90	0.43	2.30	6.11	13.06	33.37	31.62	33.85	36.60	36.26	39.57
12/3/96		-1.96	-2.33	-1.05	-0.95	0.33	2.18	5.97	12.89	33.11	31.58	33.80	36.56	36.08	39.57
12/4/96		-2.20	-2.37	-1.08	-1.01	0.27	2.05	5.84	12.60	32.24	31.46	33.73	36.47	36.01	39.55
12/5/96		-2.56	-2.49	-1.16	-1.09	0.19	1.97	5.73	12.45	31.21	31.30	33.74	36.46	36.06	39.55
12/6/96		-2.68	-2.64	-1.27	-1.18	0.09	1.87	5.62	12.53	30.53	31.19	33.69	36.40	35.82	39.57
12/7/96		-2.59	-2.73	-1.36	-1.29	-0.02	1.75	5.50	12.48	30.14	31.07	33.57	36.32	35.48	39.57
12/8/96		-2.67	-2.80	-1.45	-1.38	-0.14	1.66	5.41	12.50	29.89	30.92	33.53	36.25	35.33	39.53
12/9/96		-2.58	-2.83	-1.51	-1.46	-0.20	1.56	5.31	12.78	29.85	30.64	33.49	36.22	35.27	39.52
12/10/96		-2.23	-2.78	-1.55	-1.53	-0.29	1.43	5.21	13.00	29.99	30.59	33.52	36.17	35.21	39.52
12/11/96		-1.93	-2.65	-1.54	-1.56	-0.36	1.36	5.11	13.21	30.16	30.76	33.49	36.19	35.13	39.54
12/12/96		-1.77	-2.54	-1.50	-1.56	-0.39	1.28	5.01							
12/13/96									13.14	30.47	31.08	33.69	36.28	35.08	39.61
12/14/96		-2.19	-2.74	-1.72	-1.83	-0.90	0.56	4.36	12.93	30.25	30.95	33.60	36.26	35.01	39.64
12/15/96		-2.45	-2.84	-1.77	-1.84	-0.94	0.50	4.31	12.75	29.99	30.79	33.61	36.23	34.93	39.66
12/16/96		-2.70	-2.97	-1.83	-1.88	-0.97	0.45	4.24	12.60	29.65	30.56	33.49	36.19	34.90	39.65
12/17/96		-2.84	-3.10	-1.91	-1.95	-1.04	0.38	4.15	12.11	29.15	30.27	33.50	36.12	34.80	39.65
12/18/96		-3.36	-3.24	-1.99	-2.03	-1.10	0.32	4.10	11.36	28.01	29.46	33.40	36.09	34.76	39.65
12/19/96		-4.05	-3.58	-2.09	-2.12	-1.18	0.28	4.03	11.01	26.89	26.74	33.29	36.02	34.78	39.63

Date	Air	Temperaure (C) Base	Subgrade						Volumetric Moisture Content (%) Base	Subgrade					
		457	737	1110	1260	1461	1760	2161	457	737	1110	1260	1461	1760	2161
12/20/96		-4.35	-3.95	-2.25	-2.24	-1.28	0.21	3.96	11.16	26.40	25.05	33.16	35.99	34.79	39.62
12/21/96		-4.17	-4.15	-2.48	-2.40	-1.39	0.12	3.92	11.22	26.24	24.20	33.04	36.03	34.69	39.61
12/22/96		-4.09	-4.17	-2.66	-2.56	-1.54	-0.02	3.81	10.51	25.77	23.50	32.85	35.92	34.64	39.59
12/23/96		-5.07	-4.52	-2.82	-2.67	-1.65	-0.14	3.73	9.70	24.61	22.52	32.21	35.76	34.57	39.60
12/24/96		-6.28	-5.19	-3.11	-2.80	-1.76	-0.22	3.65	9.20	23.59	20.92	29.79	35.66	34.54	39.60
12/25/96		-7.36	-6.05	-3.60	-2.99	-1.89	-0.33	3.56	8.68	22.77	19.05	27.92	35.61	34.45	39.59
12/26/96		-8.11	-6.83	-4.18	-3.31	-2.05	-0.44	3.49	8.30	22.15	17.40	26.42	35.43	34.40	39.58
12/27/96		-8.78	-7.48	-4.74	-3.74	-2.24	-0.58	3.41	8.04	21.36	17.22	25.15	35.22	34.36	39.55
12/28/96		-9.29	-8.14	-5.33	-4.19	-2.45	-0.74	3.30	7.95	21.09	16.95	24.12	34.73	34.22	39.56
12/29/96		-9.33	-8.49	-5.79	-4.65	-2.68	-0.91	3.18	7.87	20.43	16.25	23.40	32.45	34.16	39.55
12/30/96															
12/31/96															
1/1/97		-9.63	-8.77	-6.14	-5.05	-2.89	-1.10	3.06	9.39	21.55	16.16	22.35	27.99	33.76	39.53
1/2/97									10.03	22.37	17.03	22.55	27.69	33.53	39.51
1/3/97									10.45	22.93	17.52	22.90	27.70	33.34	39.47
1/4/97		-5.98	-7.20	-5.88	-5.54	-3.77	-1.66	2.70	10.68	23.37	17.90	23.12	27.86	33.23	39.27
1/5/97		-4.76	-6.20	-5.25	-5.21	-3.84	-1.80	2.57	10.55	23.51	18.14	23.39	28.00	33.20	38.91
1/6/97		-4.00	-5.47	-4.71	-4.88	-3.80	-1.92	2.45	10.38	23.44	18.14	23.41	28.12	33.15	38.86
1/7/97		-3.73	-5.02	-4.31	-4.60	-3.69	-1.99	2.32	10.30	23.27	18.03	23.48	28.08	33.20	38.72
1/8/97		-4.01	-4.95	-4.10	-4.41	-3.60	-2.00	2.24	10.45	23.37	18.11	23.38	28.18	33.16	39.00
1/9/97		-4.46	-5.12	-4.11	-4.33	-3.53	-2.03	2.16	10.57	23.44	18.06	23.42	28.20	33.12	39.51
1/10/97		-4.55	-5.27	-4.20	-4.36	-3.50	-2.05	2.10	10.24	23.36	18.08	23.52	28.23	33.11	39.66
1/11/97		-4.19	-5.16	-4.20	-4.39	-3.54	-2.06	2.05	9.78	23.00	17.94	23.37	28.16	33.15	39.69
1/12/97		-4.00	-4.98	-4.09	-4.32	-3.53	-2.10	2.00	9.15	22.47	17.29	23.25	28.09	33.08	39.70
1/13/97		-4.60	-5.12	-4.08	-4.28	-3.50	-2.11	1.96	8.44	21.54	16.62	22.85	27.87	33.10	39.67
1/14/97		-5.49	-5.64	-4.33	-4.41	-3.52	-2.11	1.91	8.11	20.91	15.29	22.25	27.52	33.04	39.69
1/15/97		-6.79	-6.40	-4.76	-4.64	-3.62	-2.16	1.88	8.24	20.72	15.09	21.00	26.90	32.91	39.70
1/16/97		-8.31	-7.54	-5.46	-5.06	-3.78	-2.18	1.83	8.29	20.66	15.90	21.80	26.50	32.71	39.69
1/17/97		-8.95	-8.43	-6.21	-5.59	-3.98	-2.24	1.78	8.38	20.72	15.83	21.59	25.52	32.47	39.59
1/18/97		-8.61	-8.66	-6.60	-5.96	-4.21	-2.32	1.73	8.98	20.98	15.91	21.53	25.71	31.97	39.04
1/19/97		-8.38	-8.50	-6.63	-6.14	-4.45	-2.41	1.68	9.53	21.67	15.55	21.68	25.60	31.01	38.74
1/20/97		-8.22	-8.56	-6.74	-6.27	-4.60	-2.50	1.64	10.10	22.28	16.51	21.83	25.74	29.82	38.80
1/21/97		-6.88	-7.95	-6.55	-6.29	-4.73	-2.60	1.53	10.57	22.84	17.00	22.05	25.85	29.36	38.31
1/22/97		-5.54	-6.99	-6.02	-6.03	-4.74	-2.68	1.44	10.75	23.18	17.47	22.28	26.13	29.10	38.33
1/23/97		-4.47	-6.13	-5.42	-5.67	-4.65	-2.77	1.38	10.54	23.32	17.62	22.57	26.31	29.16	38.40
1/24/97		-3.76	-5.43	-4.89	-5.29	-4.49	-2.83	1.30	10.01	22.98	17.58	22.68	26.38	29.27	38.10
1/25/97		-3.56	-5.01	-4.49	-4.97	-4.29	-2.83	1.22	9.20	22.50	17.29	22.50	26.46	29.33	38.99
1/26/97		-4.01	-5.01	-4.28	-4.73	-4.14	-2.83	1.18	8.36	21.46	16.32	22.20	26.31	29.31	39.60
1/27/97		-4.92	-5.36	-4.38	-4.68	-4.06	-2.83	1.12	7.78	19.82	15.91	21.50	25.89	29.18	39.30
1/28/97		-6.55	-6.25	-4.80	-4.87	-4.07	-2.83	1.11	7.84	20.11	15.35	19.84	25.25	28.66	38.80
1/29/97		-8.28	-7.54	-5.56	-5.32	-4.23	-2.83	1.09	8.36	20.45	13.76	19.60	25.07	28.03	37.85

Date	Air	Temperaure (C) Base			Subgrade				Volumetric Moisture Content (%) Base			Subgrade			
		457	737	1110	1260	1461	1760	2161	457	737	1110	1260	1461	1760	2161
1/30/97		-9.51	-8.74	-6.47	-5.95	-4.55	-2.86	1.06	9.06	20.91	15.47	20.85	24.99	27.32	37.95
1/31/97		-9.36	-9.30	-7.13	-6.51	-4.88	-2.93	1.06	9.66	21.52	15.30	20.97	24.92	26.81	37.71
2/1/97		-7.90	-8.75	-7.14	-6.76	-5.12	-3.03	1.02	10.00	22.20	16.29	21.51	25.04	26.54	37.47
2/2/97		-6.44	-7.82	-6.68	-6.61	-5.23	-3.15	0.96	10.32	22.53	16.55	21.74	25.23	26.49	37.22
2/3/97		-5.23	-6.86	-6.08	-6.27	-5.17	-3.25	0.91	10.37	22.81	16.84	21.89	25.36	26.48	36.95
2/4/97									10.28	22.91	17.13	22.00	25.50	26.50	36.94
2/5/97		-4.56	-6.13	-5.51	-5.87	-5.02	-3.31	0.83							
2/6/97		-4.17	-5.69	-5.10	-5.53	-4.80	-3.33	0.76	9.64	22.46	16.80	22.03	25.63	26.53	37.15
2/7/97		-3.97	-5.36	-4.79	-5.26	-4.65	-3.30	0.72	9.60	22.26	16.62	21.93	25.55	26.52	37.48
2/8/97		-4.24	-5.30	-4.62	-5.08	-4.51	-3.27	0.70	9.64	22.27	16.53	21.93	25.45	26.49	37.91
2/9/97									9.63	22.28	16.48	21.81	25.46	26.44	37.98
2/10/97		-5.53	-6.04	-4.92	-5.12	-4.42	-3.22	0.67	9.63	22.27	16.50	21.89	25.41	26.46	38.33
2/11/97		-5.64	-6.30	-5.14	-5.28	-4.49	-3.22	0.66	9.74	22.32	16.53	21.95	25.45	26.38	38.41
2/12/97		-5.49	-6.30	-5.22	-5.40	-4.57	-3.25	0.61	9.97	22.37	16.68	21.90	25.42	26.34	39.47
2/13/97		-5.41	-6.27	-5.23	-5.44	-4.61	-3.28	0.61	10.06	22.61	16.69	21.91	25.46	26.39	38.96
2/14/97		-5.32	-6.24	-5.22	-5.46	-4.66	-3.31	0.59	10.17	22.70	16.79	22.01	25.42	26.37	38.39
2/15/97		-5.06	-6.11	-5.19	-5.46	-4.67	-3.33	0.56	10.46	22.82	16.94	22.06	25.57	26.38	38.01
2/16/97		-4.72	-5.90	-5.07	-5.36	-4.64	-3.33	0.56	10.73	23.17	17.31	22.13	25.62	26.39	38.21
2/17/97		-4.51	-5.68	-4.91	-5.25	-4.59	-3.33	0.51	11.17	23.57	17.57	22.29	25.65	26.39	39.43
2/18/97		-4.28	-5.52	-4.77	-5.14	-4.53	-3.33	0.50	11.59	23.90	17.83	22.50	25.75	26.43	39.30
2/19/97		-3.90	-5.27	-4.62	-5.05	-4.47	-3.33	0.48	11.90	24.23	18.18	22.80	25.93	26.42	39.61
2/20/97		-3.42	-4.96	-4.42	-4.90	-4.40	-3.29	0.44	12.13	24.61	18.37	23.00	26.20	26.58	39.64
2/21/97		-2.99	-4.63	-4.16	-4.72	-4.27	-3.27	0.45	12.25	24.86	18.64	23.19	26.40	26.64	39.67
2/22/97		-2.66	-4.32	-3.94	-4.56	-4.17	-3.22	0.44	12.26	25.04	18.90	23.39	26.56	26.67	39.67
2/23/97		-2.42	-4.06	-3.73	-4.39	-4.06	-3.18	0.44	12.27	25.11	19.09	23.59	26.67	26.78	39.67
2/24/97		-2.26	-3.88	-3.56	-4.21	-3.96	-3.14	0.44	12.25	25.23	19.18	23.71	26.78	26.95	39.68
2/25/97		-2.20	-3.75	-3.40	-4.09	-3.86	-3.09	0.44	12.29	25.37	19.47	23.89	26.88	27.04	39.67
2/26/97		-2.20	-3.68	-3.30	-3.98	-3.76	-3.05	0.44	12.49	25.54	19.50	23.96	27.00	27.18	39.67
2/27/97		-2.14	-3.62	-3.21	-3.91	-3.70	-3.00	0.44	12.63	25.68	19.61	24.07	27.12	27.49	39.68
2/28/97		-2.10	-3.55	-3.14	-3.85	-3.63	-2.97	0.45	12.62	25.76	19.78	24.18	27.23	27.74	39.70
3/1/97		-2.07	-3.50	-3.09	-3.78	-3.59	-2.94	0.45	12.21	25.72	19.89	24.22	27.45	27.90	39.70
3/2/97		-1.98	-3.42	-3.04	-3.74	-3.53	-2.91	0.45	12.10	25.48	19.73	24.20	27.39	28.02	39.69
3/3/97		-1.92	-3.35	-2.99	-3.69	-3.49	-2.84	0.45	12.10	25.46	19.64	24.20	27.48	28.13	39.69
3/4/97		-2.00	-3.31	-2.94	-3.64	-3.43	-2.83	0.46	11.99	25.35	19.61	24.11	27.46	28.29	39.73
3/5/97		-2.40	-3.43	-2.94	-3.61	-3.39	-2.82	0.49	11.69	25.23	19.54	24.21	27.44	28.34	39.72
3/6/97		-2.56	-3.63	-3.01	-3.62	-3.35	-2.80	0.50	11.61	25.00	19.46	24.07	27.48	28.41	39.73
3/7/97		-2.53	-3.67	-3.06	-3.66	-3.34	-2.79	0.50	11.74	25.04	19.37	24.07	27.46	28.41	39.73
3/8/97		-2.69	-3.72	-3.10	-3.67	-3.34	-2.78	0.50	12.06	25.13	19.40	24.05	27.46	28.50	39.73
3/9/97		-2.96	-3.86	-3.16	-3.69	-3.35	-2.78	0.52	12.07	25.27	19.53	24.09	27.42	28.50	39.73
3/10/97		-3.12	-4.03	-3.26	-3.74	-3.38	-2.78	0.54	12.15	25.30	19.62	24.07	27.42	28.56	39.75
3/11/97		-2.82	-4.01	-3.33	-3.81	-3.40	-2.78	0.56	12.23	25.42	19.64	24.18	27.46	28.67	39.73

		Temperaure (C)							Volumetric Moisture Content (%)						
Date	Air	Base	Subgrade						Base	Subgrade					
		457	737	1110	1260	1461	1760	2161	457	737	1110	1260	1461	1760	2161
3/12/97		-2.50	-3.84	-3.26	-3.81	-3.44	-2.78	0.56	12.20	25.39	19.67	24.19	27.53	28.76	39.74
3/13/97		-2.40	-3.72	-3.17	-3.75	-3.40	-2.78	0.56	11.75	25.34	19.64	24.19	27.53	28.88	39.74
3/14/97		-2.35	-3.65	-3.11	-3.71	-3.39	-2.77	0.56	10.92	24.81	19.48	24.15	27.60	29.08	39.74
3/15/97		-2.33	-3.61	-3.06	-3.67	-3.36	-2.76	0.56	10.52	24.20	19.06	24.01	27.57	29.55	39.73
3/16/97		-2.36	-3.60	-3.05	-3.66	-3.33	-2.74	0.56							
3/17/97									10.94	24.01	18.51	23.61	27.27	29.71	39.74
3/18/97		-2.88	-3.70	-3.07	-3.63	-3.33	-2.75	0.56	11.24	24.26	18.55	23.57	27.16	29.63	39.75
3/19/97		-3.84	-4.18	-3.25	-3.70	-3.33	-2.73	0.57	11.59	24.43	18.77	23.61	27.16	29.55	39.75
3/20/97		-4.47	-4.74	-3.61	-3.88	-3.36	-2.69	0.59	12.03	24.74	18.98	23.59	27.17	29.53	39.73
3/21/97									12.43	25.10	19.25	23.71	27.27	29.53	39.74
3/22/97		-3.55	-4.73	-3.91	-4.20	-3.61	-2.71	0.61	12.74	25.44	19.52	23.98	27.35	29.51	39.74
3/23/97		-3.19	-4.45	-3.77	-4.16	-3.66	-2.72	0.61	12.99	25.67	19.69	24.00	27.48	29.61	39.75
3/24/97		-2.84	-4.22	-3.65	-4.09	-3.64	-2.72	0.61	13.21	26.00	19.93	24.21	27.55	29.66	39.74
3/25/97		-2.38	-3.95	-3.47	-4.00	-3.61	-2.74	0.61	13.54	26.23	20.18	24.33	27.71	29.78	39.77
3/26/97		-2.00	-3.68	-3.27	-3.88	-3.55	-2.73	0.60	13.91	26.47	20.46	24.54	27.81	29.87	39.75
3/27/97		-1.84	-3.47	-3.11	-3.76	-3.47	-2.72	0.60	16.95	26.77	20.76	24.80	28.03	29.90	39.74
3/28/97		-1.72	-3.30	-2.98	-3.66	-3.38	-2.72	0.60	20.15	27.37	21.03	24.91	28.15	30.09	39.76
3/29/97		-1.64	-3.20	-2.88	-3.58	-3.32	-2.72	0.59	18.68	27.59	21.28	25.10	28.34	30.25	39.77
3/30/97		-1.57	-3.11	-2.80	-3.51	-3.27	-2.69	0.61	18.39	27.98	21.52	25.26	28.47	30.54	39.78
3/31/97		-1.50	-3.04	-2.74	-3.41	-3.23	-2.67	0.60	18.70	28.20	21.77	25.40	28.56	30.73	39.77
4/1/97		-1.22	-2.91	-2.68	-3.37	-3.21	-2.67	0.61	21.37	28.46	21.96	25.59	28.69	31.11	39.77
4/2/97		-1.06	-2.82	-2.61	-3.32	-3.18	-2.67	0.60	27.88	28.84	22.18	25.82	28.91	31.97	39.78
4/3/97		-1.11	-2.78	-2.56	-3.28	-3.15	-2.67	0.60	35.00	29.19	22.52	25.92	29.01	33.38	39.77
4/4/97		-1.11	-2.74	-2.50	-3.23	-3.12	-2.66	0.61							
4/5/97									37.96	30.40	23.01	26.40	29.35	35.47	39.78
4/6/97		-1.11	-2.72	-2.47	-3.20	-3.11	-2.66	0.61	37.92	30.95	23.25	26.60	29.47	36.86	39.76
4/7/97		-1.08	-2.68	-2.43	-3.17	-3.07	-2.65	0.61	37.93	31.09	23.55	26.76	29.76	38.30	39.77
4/8/97		-1.06	-2.64	-2.39	-3.14	-3.05	-2.61	0.61	37.89	31.20	23.70	26.93	29.93	39.15	39.78
4/9/97		-1.01	-2.61	-2.36	-3.11	-3.02	-2.61	0.61	37.20	31.27	23.92	27.16	30.13	39.27	39.76
4/10/97									35.50	31.36	24.12	27.25	30.33	39.31	39.76
4/11/97		-0.99	-2.49	-2.30	-3.06	-2.99	-2.61	0.61	33.27	31.46	24.32	27.46	30.51	39.31	39.77
4/12/97		-1.06	-2.45	-2.28	-3.04	-2.95	-2.61	0.63	29.03	31.50	24.44	27.64	30.68	39.32	39.78
4/13/97		-1.06	-2.46	-2.25	-3.01	-2.94	-2.61	0.65	29.14	31.59	24.56	27.68	30.83	39.33	39.78
4/14/97		-1.06	-2.46	-2.23	-3.00	-2.94	-2.60	0.67	30.19	31.59	24.60	27.88	30.99	39.31	39.77
4/15/97		-1.06	-2.44	-2.22	-2.98	-2.90	-2.58	0.67	32.44	31.65	24.71	27.90	31.12	39.32	39.79
4/16/97		-1.06	-2.44	-2.22	-2.95	-2.89	-2.56	0.67	37.75	31.84	24.81	28.05	31.21	39.33	39.78
4/17/97		-1.06	-2.44	-2.19	-2.94	-2.88	-2.54	0.68	37.80	32.89	28.07	29.12	31.79	39.33	39.81
4/18/97		-1.05	-2.44	-2.17	-2.93	-2.87	-2.51	0.70	36.42	39.17	37.24	36.16	33.83	39.34	39.81
4/19/97		-1.06	-2.44	-2.17	-2.90	-2.83	-2.49	0.72	36.36	40.21	40.16	37.93	34.34	39.36	39.81
4/20/97		-1.06	-2.44	-2.17	-2.89	-2.84	-2.46	0.72	36.21	40.27	45.94	38.27	34.57	39.36	39.82
4/21/97		-1.01	-2.44	-2.17	-2.89	-2.83	-2.45	0.72	36.19	40.34	46.49	40.60	34.90	39.37	39.85

Date	Air	Temperaure (C) Base			Subgrade				Volumetric Moisture Content (%) Base			Subgrade			
		457	737	1110	1260	1461	1760	2161	457	737	1110	1260	1461	1760	2161
6/2/97		8.66	7.68	7.93	7.29	7.02	6.22	6.63	29.83	40.78	47.94	42.46	39.14	39.71	39.99
6/3/97		9.52	7.95	7.88	7.07	6.73	6.02	6.67	29.42	40.52	47.59	42.46	39.15	39.71	40.00
6/4/97		10.70	8.57	8.15	7.14	6.65	5.93	6.69	29.64	40.79	47.65	42.50	39.13	39.72	39.99
6/5/97		11.69	9.34	8.66	7.44	6.74	5.90	6.72	30.29	40.86	48.22	42.55	39.17	39.72	40.00
6/6/97		12.15	9.90	9.13	7.81	6.95	5.98	6.76	30.32	40.86	48.35	42.54	39.17	39.74	40.02
6/7/97		12.44	10.39	9.59	8.23	7.29	6.14	6.81	30.25	40.90	48.60	42.56	39.21	39.74	40.00
6/8/97		12.16	10.35	9.74	8.43	7.46	6.28	6.90	30.18	40.86	48.23	42.61	39.20	39.75	40.00
6/9/97		12.35	10.38	9.78	8.52	7.60	6.43	7.00	29.89	40.91	47.76	42.61	39.22	39.75	40.01
6/10/97		12.96	10.72	10.01	8.70	7.75	6.58	7.10	29.84	40.90	47.65	42.65	39.20	39.74	39.99
6/11/97		13.42	11.32	10.49	9.13	8.14	6.83	7.23	37.88	41.09	50.14	42.86	39.33	39.82	40.08
6/12/97		13.89	11.65	10.78	9.38	8.33	6.96	7.33	36.94	41.12	49.98	42.85	39.34	39.83	40.09
6/13/97		13.60	11.81	11.06	9.65	8.56	7.15	7.47	37.07	41.08	49.79	42.88	39.34	39.83	40.10
6/14/97		13.94	11.81	11.08	9.72	8.67	7.29	7.59	32.79	41.10	49.65	42.81	39.35	39.82	40.10
6/15/97		14.50	12.15	11.31	9.90	8.81	7.43	7.72	30.86	41.13	49.33	42.88	39.33	39.82	40.08
6/16/97		15.26	12.65	11.65	10.15	8.98	7.58	7.84	30.95	41.19	49.29	42.85	39.34	39.79	40.04
6/17/97		16.64	14.75	13.44	11.64	10.36	8.47	8.07	30.79	41.22	49.22	42.85	39.35	39.82	40.05
6/18/97		15.38	13.90	13.05	11.55	10.28	8.43	8.22	30.78	41.16	49.11	42.86	39.33	39.83	40.03
6/19/97		15.15	13.54	12.83	11.48	10.38	8.61	8.37	29.58	38.66	39.73	42.90	39.34	39.81	40.00
6/20/97		15.25	13.37	12.62	11.29	10.18	8.60	8.49							
6/21/97		15.68	13.56	12.70	11.30	10.18	8.65	8.61	30.13	41.17	48.22	42.90	39.36	39.83	40.04
6/22/97		16.47	14.03	12.96	11.47	10.29	8.76	8.74	29.99	41.08	47.89	42.87	39.33	39.84	40.04
6/23/97		16.52	14.35	13.30	11.77	10.47	8.90	8.86	29.77	39.37	47.92	42.91	39.34	39.83	40.03
6/24/97		16.11	14.33	13.49	12.05	10.78	9.14	9.04	29.64	39.08	47.90	42.90	39.33	39.81	40.01
6/25/97		17.49	15.33	14.54	13.30	12.38	11.14	11.20	29.41	38.89	47.84	42.88	39.35	39.79	40.01
6/26/97									29.45	38.97	48.03	42.78	39.32	39.78	40.04
6/27/97		15.45	13.81	13.22	12.00	10.94	9.48	9.40	29.57	38.93	47.84	42.88	39.32	39.79	40.01
6/28/97		15.52	13.78	13.20	11.99	11.01	9.59	9.52	29.63	38.92	47.81	42.83	39.33	39.80	40.00
6/29/97		15.55	13.82	13.22	12.01	11.05	9.66	9.62	29.95	38.95	47.63	42.86	39.36	39.77	39.99
6/30/97		15.36	13.76	13.22	12.04	11.07	9.72	9.72							
7/1/97		14.92	13.56	13.13	12.00	11.07	9.78	9.80							
7/2/97		15.21	13.47	13.01	11.90	11.06	9.82	9.90							
7/3/97		15.82	13.82	13.16	11.97	11.07	9.88	9.97							
7/4/97		16.34	14.20	13.41	12.14	11.17	9.94	10.04							
7/5/97		16.78	14.63	13.76	12.42	11.37	10.04	10.11							

APPENDIX C

BACK-CALCULATED MODULUS

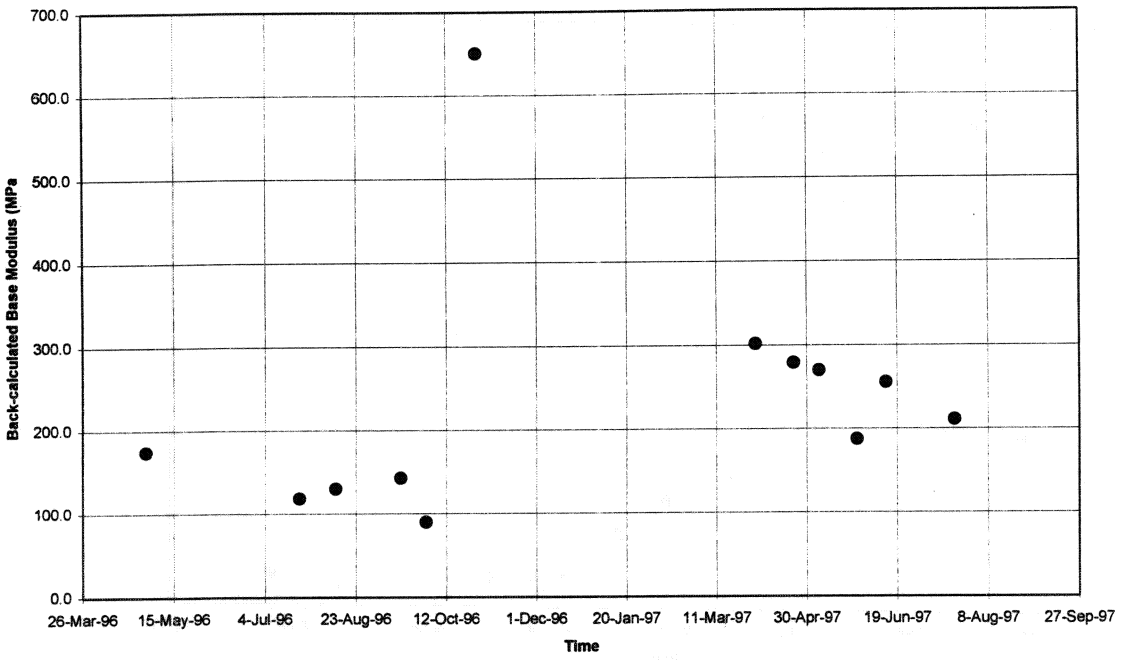


Figure C1. Back Calculated Base modulus as a function of time (Alzada)

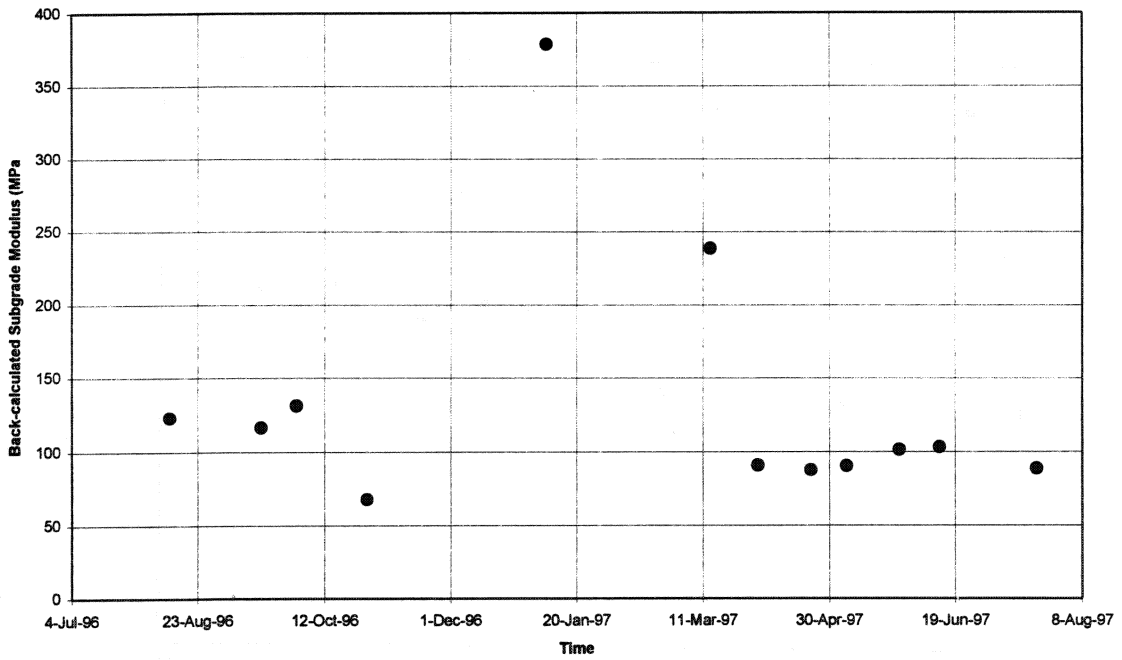


Figure C2. Back Calculated Subgrade modulus as a function of time (Alzada)

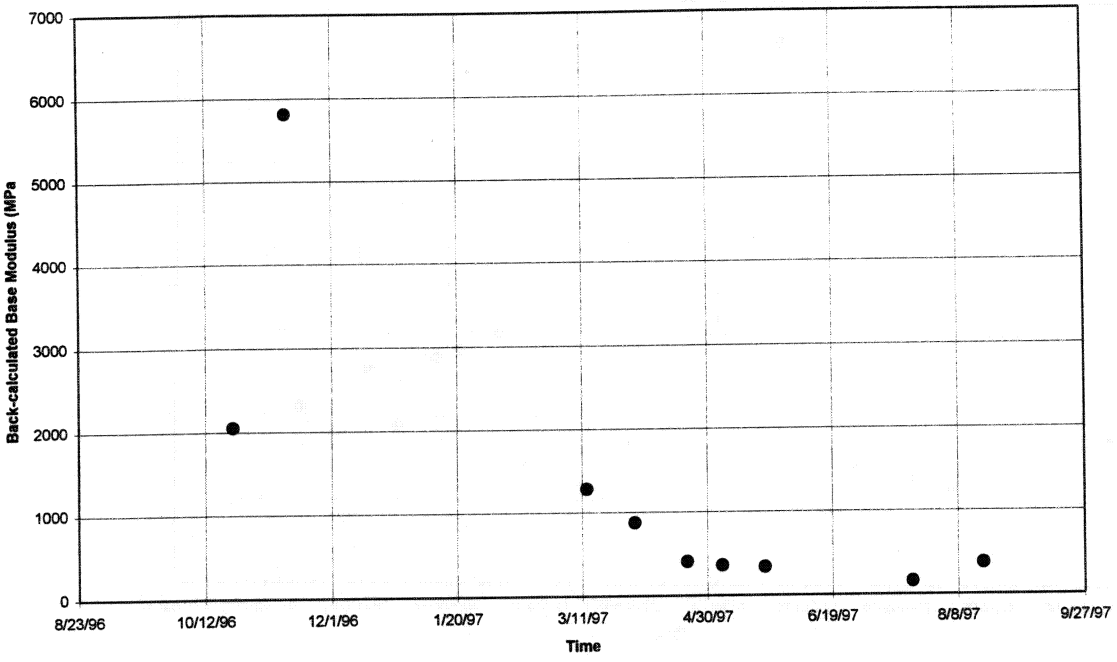


Figure C3. Back Calculated Base modulus as a function of time (Bull Mountain)

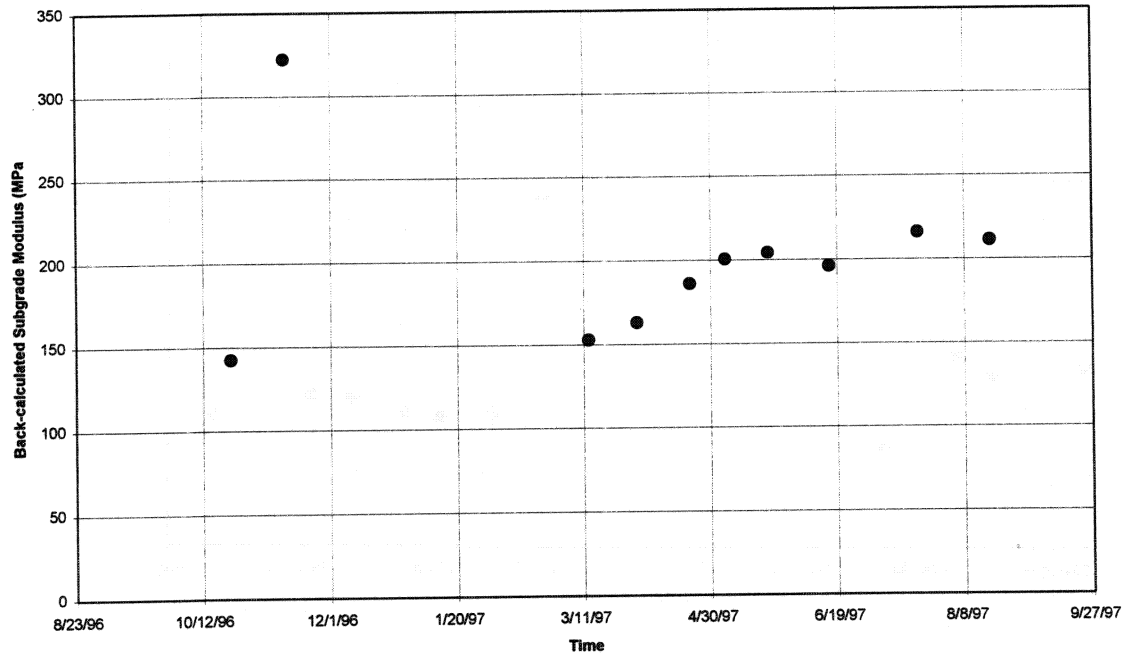


Figure C4. Back Calculated Subgrade modulus as a function of time (Bull Mountain)

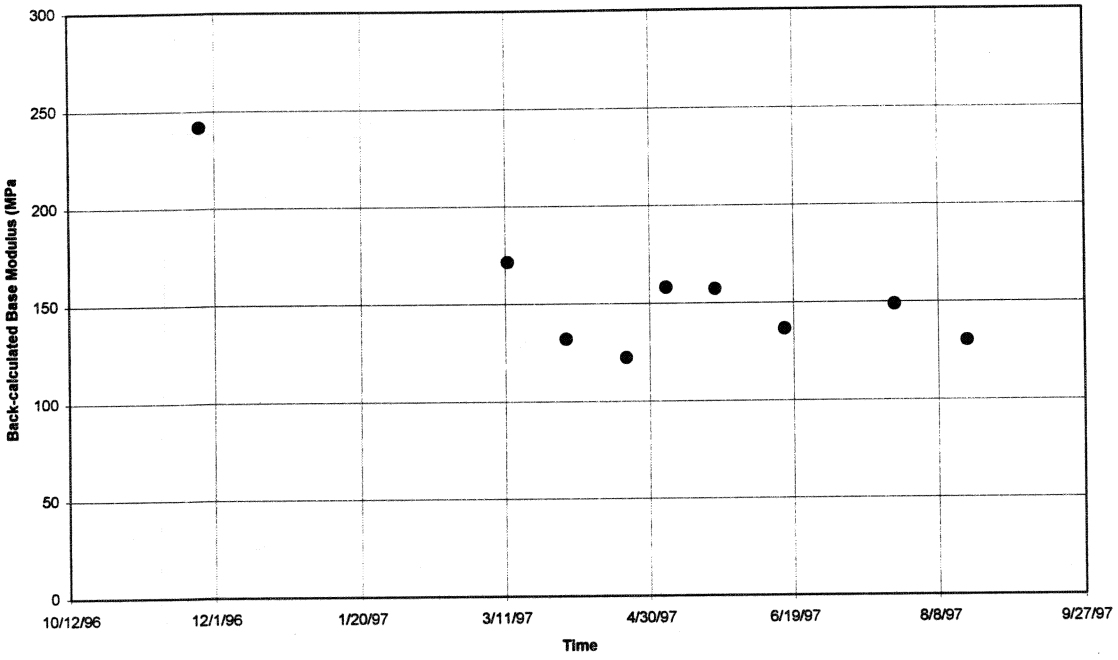


Figure C5. Back Calculated Base modulus as a function of time (Livingston).

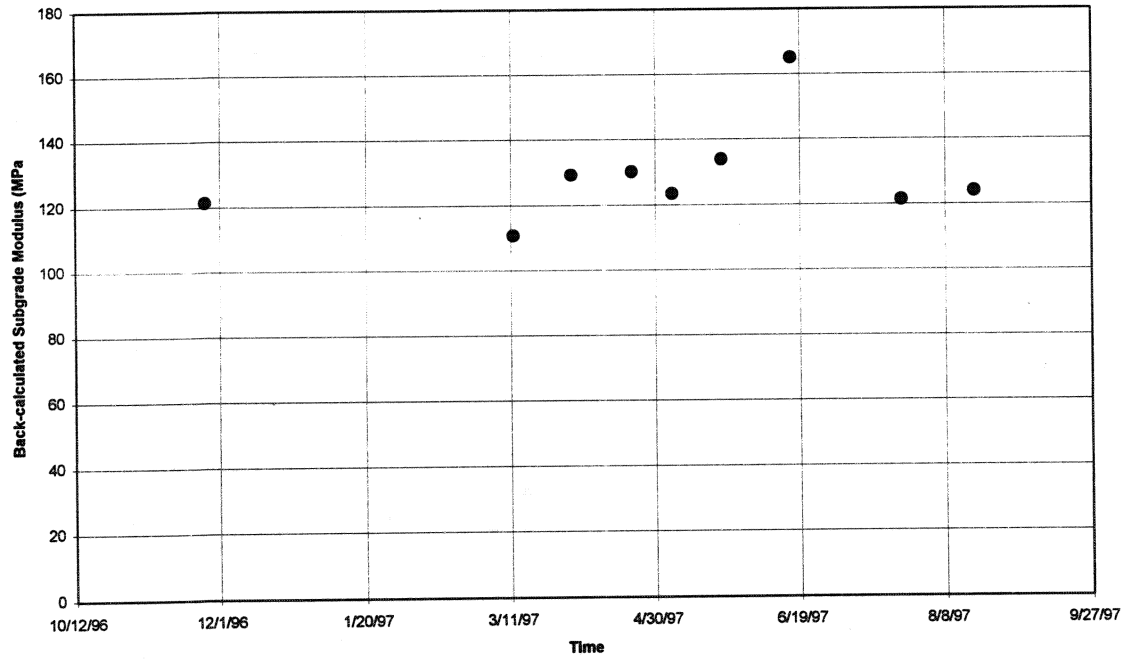


Figure C6. Back Calculated Subgrade modulus as a function of time (Livingston).

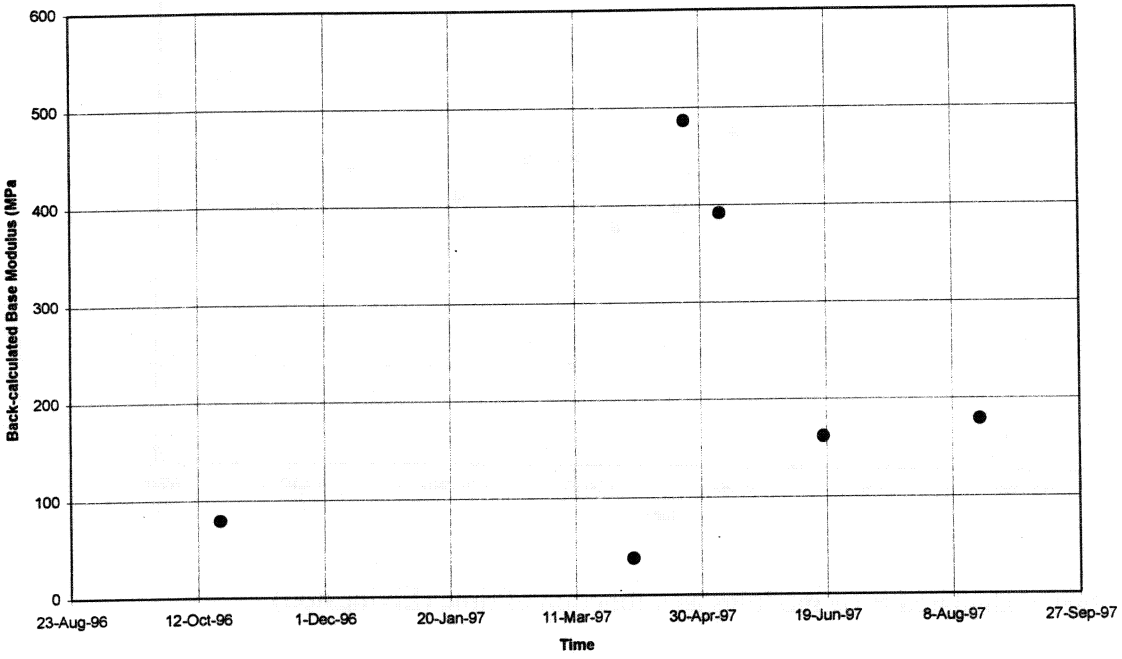


Figure C7. Back Calculated Base modulus as a function of time (Wolfpoint).

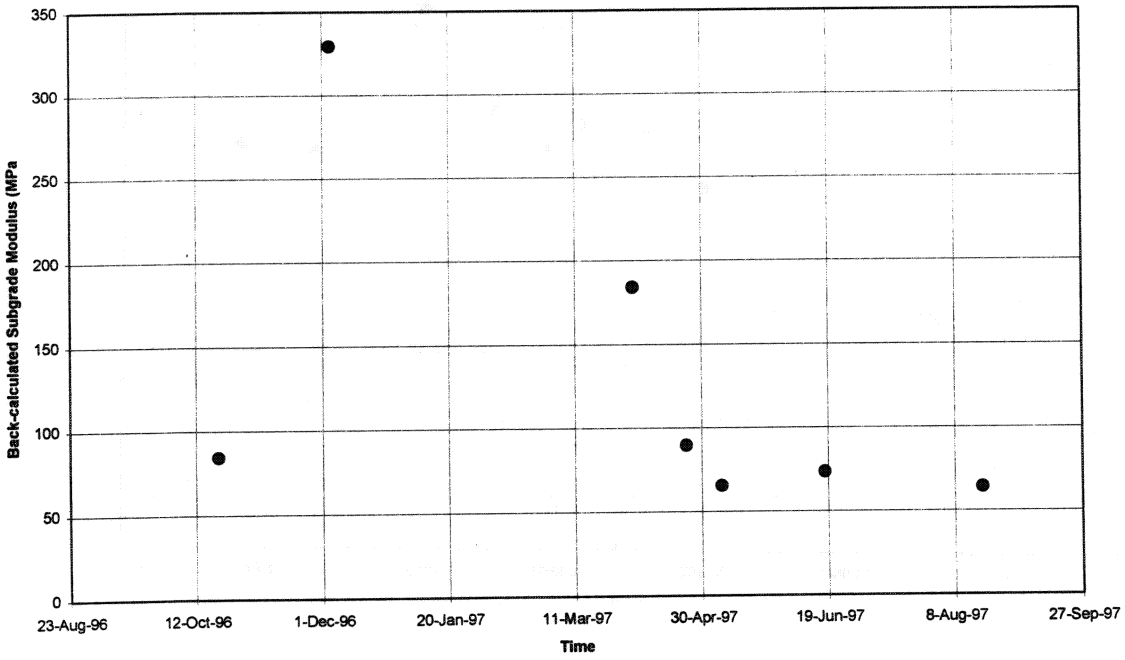


Figure C8. Back Calculated Subgrade modulus as a function of time (Wolfpoint).

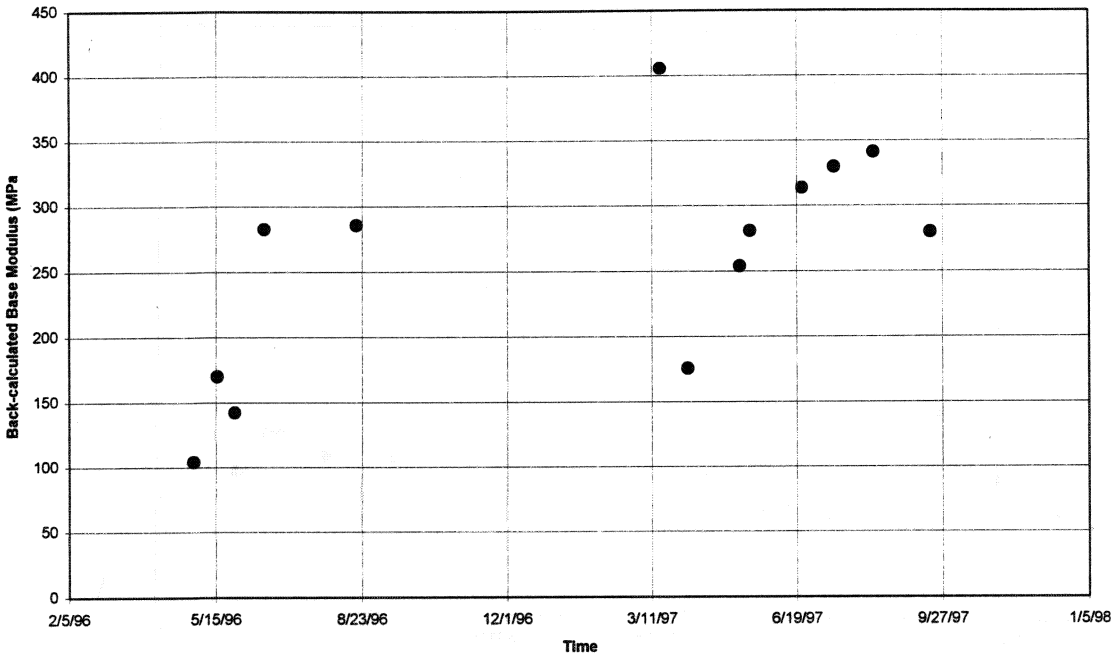


Figure C9. Back Calculated Base modulus as a function of time (Swan Lake).

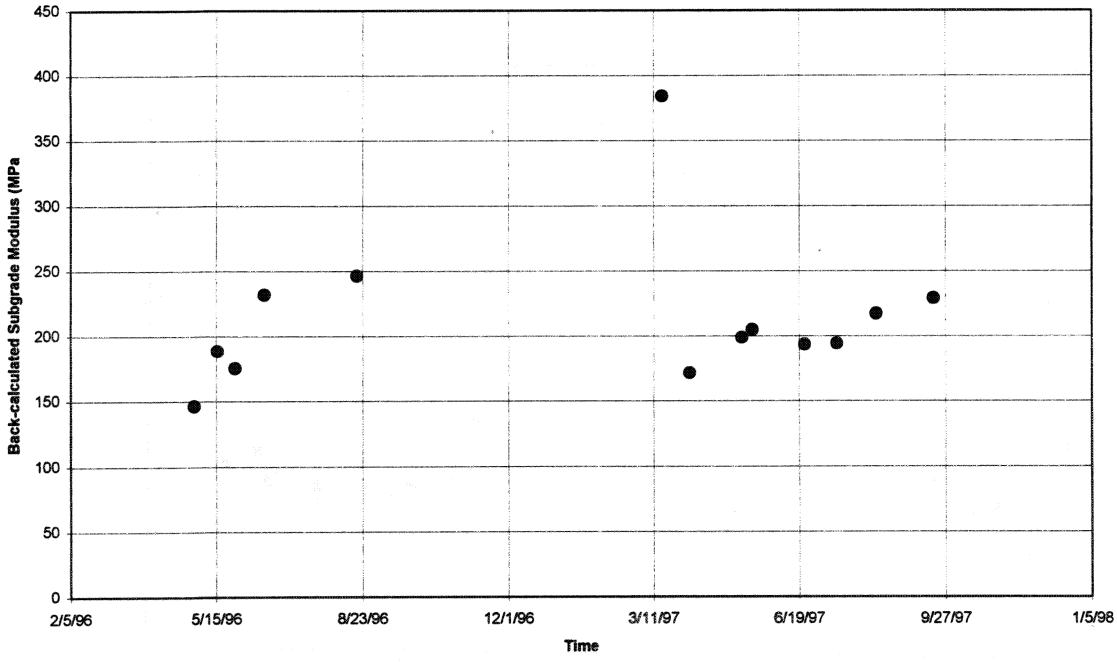


Figure C10. Back Calculated Subgrade modulus as a function of time (Swan Lake).

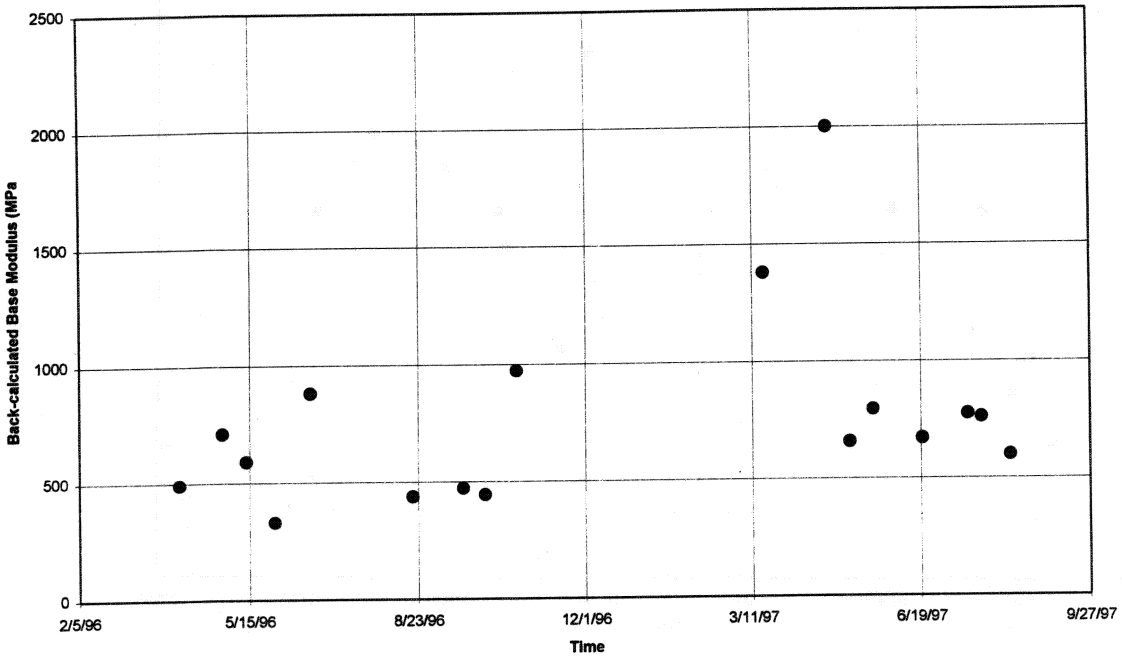


Figure C10. Back Calculated Base modulus as a function of time (Loma).

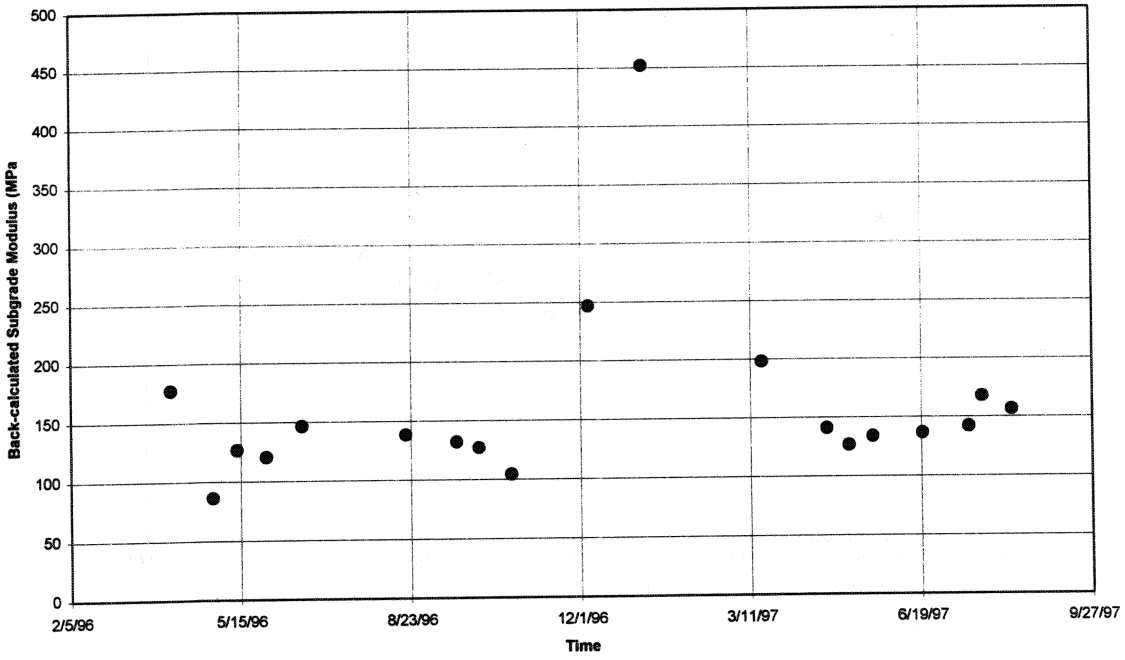


Figure C11. Back Calculated Subgrade modulus as a function of time (Loma).

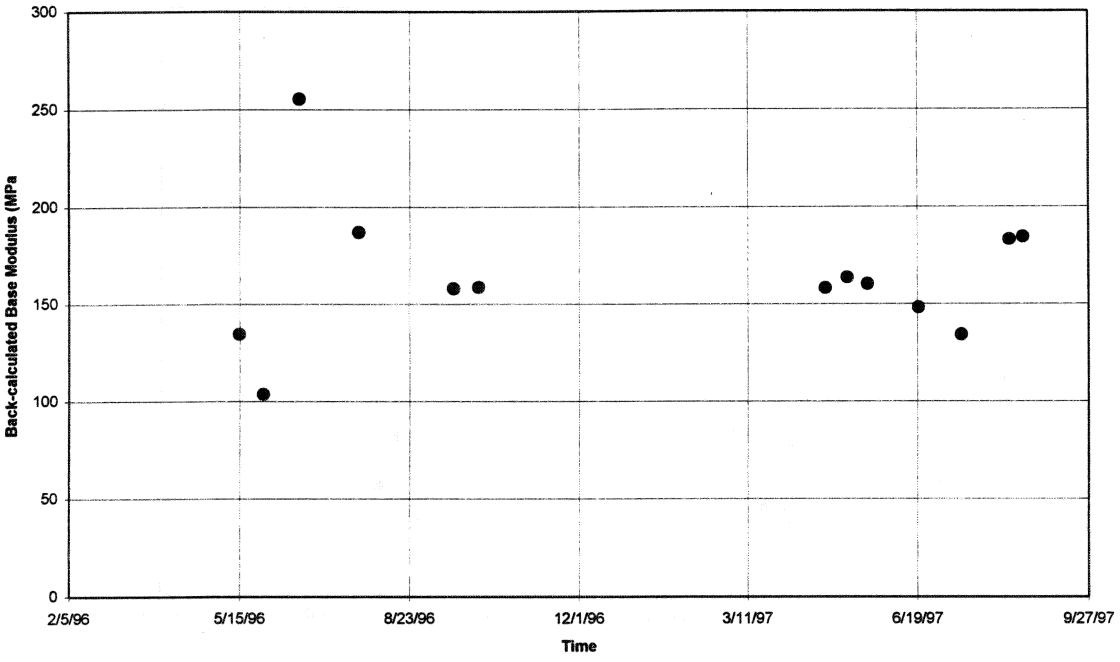


Figure C12. Back Calculated Base modulus as a function of time (East Glacier).

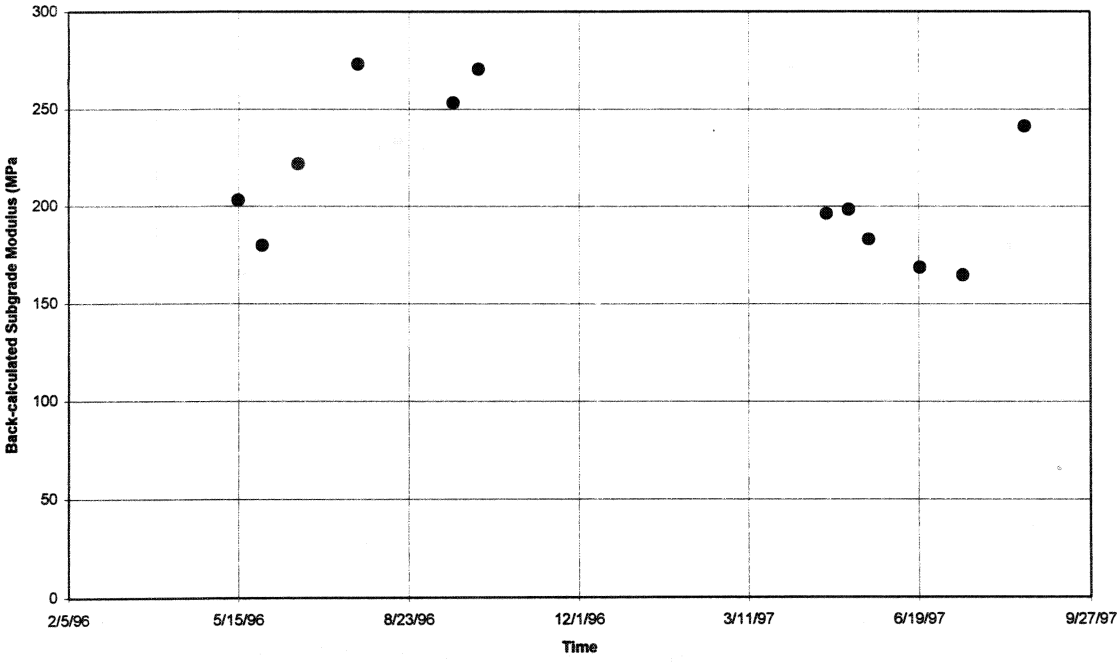


Figure C13. Back Calculated Subgrade modulus as a function of time (East Glacier).

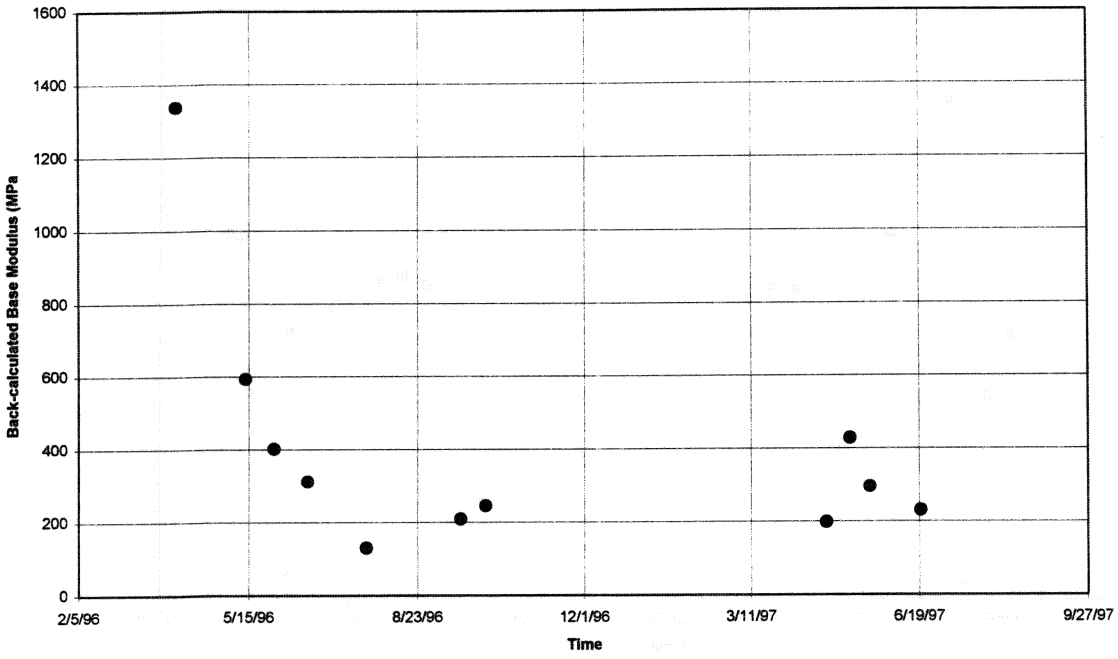


Figure C14. Back Calculated Base modulus as a function of time (Sweetgrass).

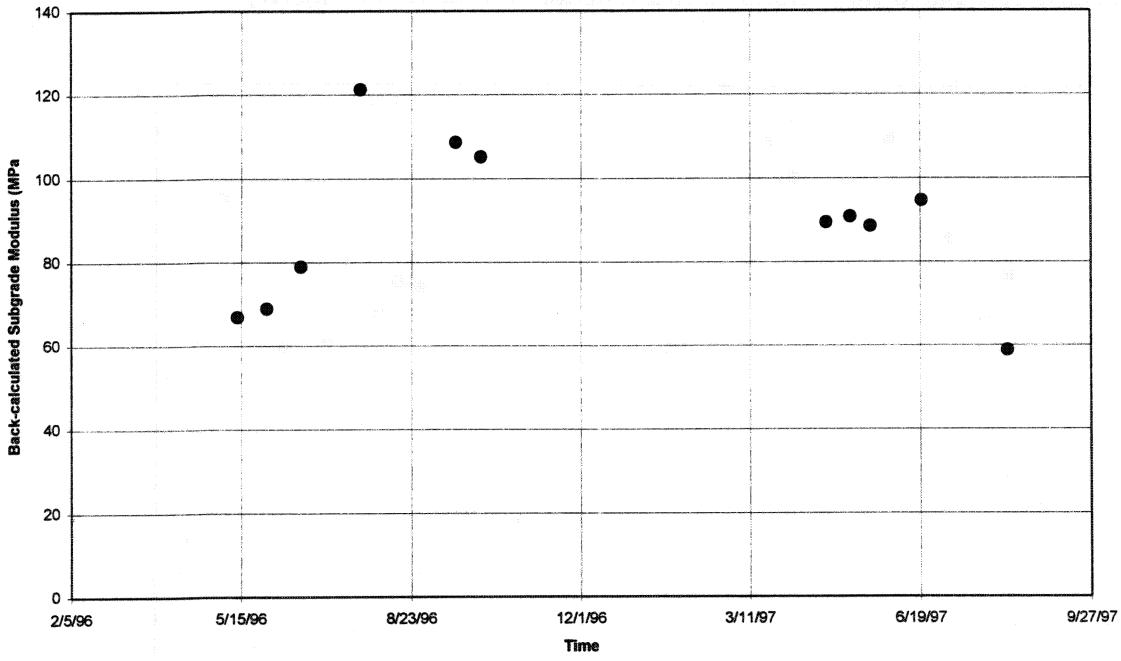


Figure C15. Back Calculated Subgrade modulus as a function of time (Sweetgrass).

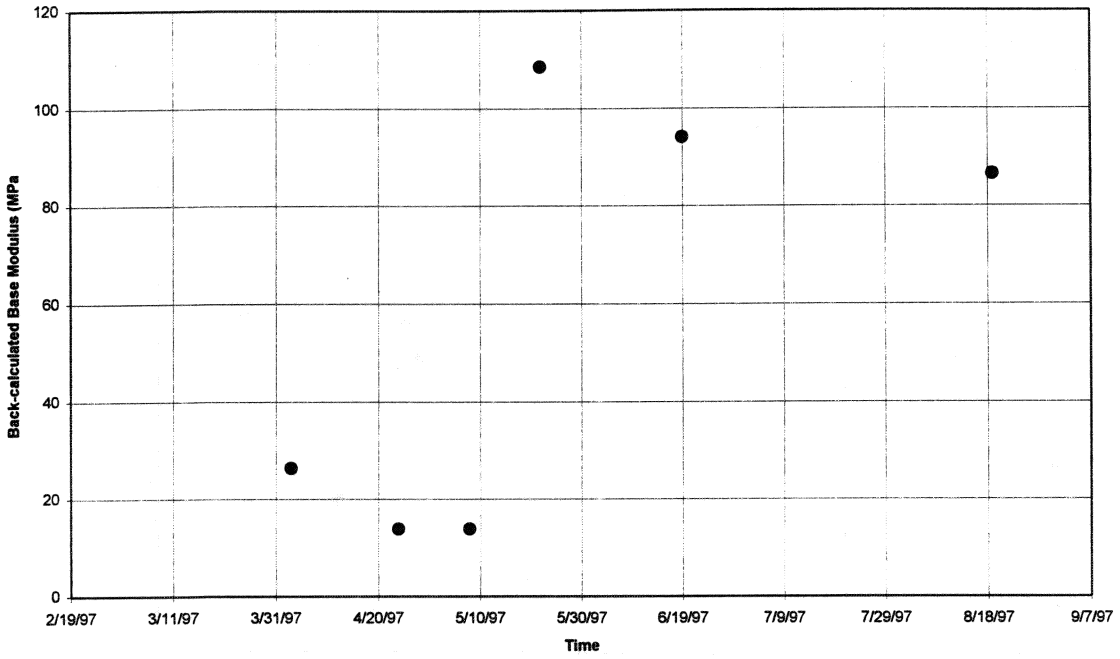


Figure C16. Back Calculated Base modulus as a function of time (Scobey/Redstone).

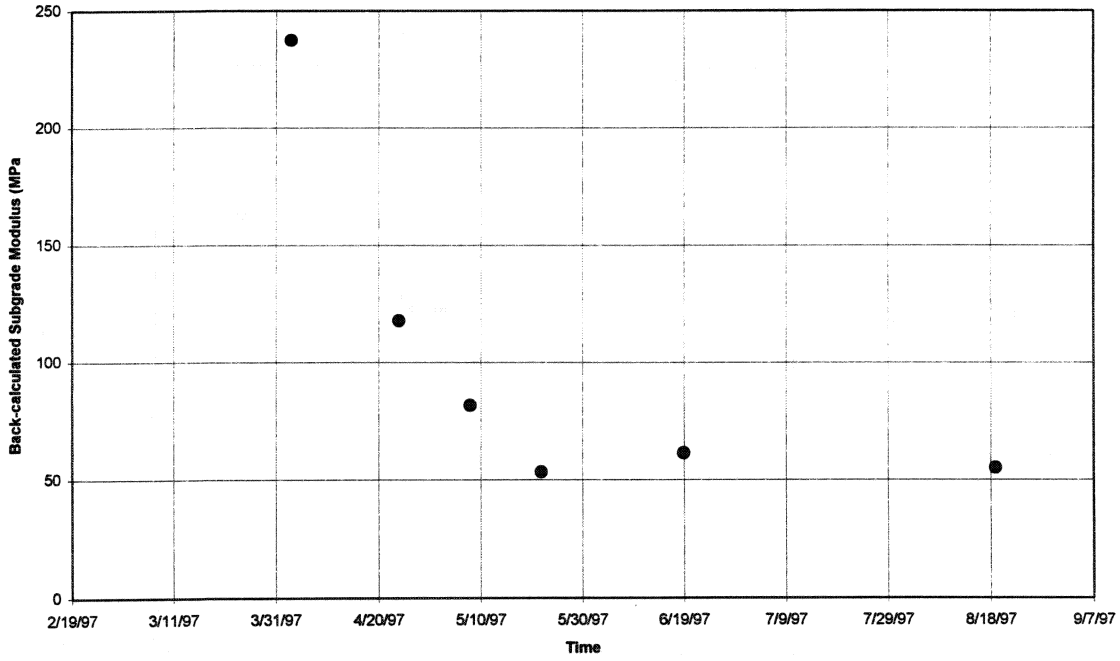


Figure C17. Back Calculated Subgrade modulus as a function of time (Scobey/Redstone).

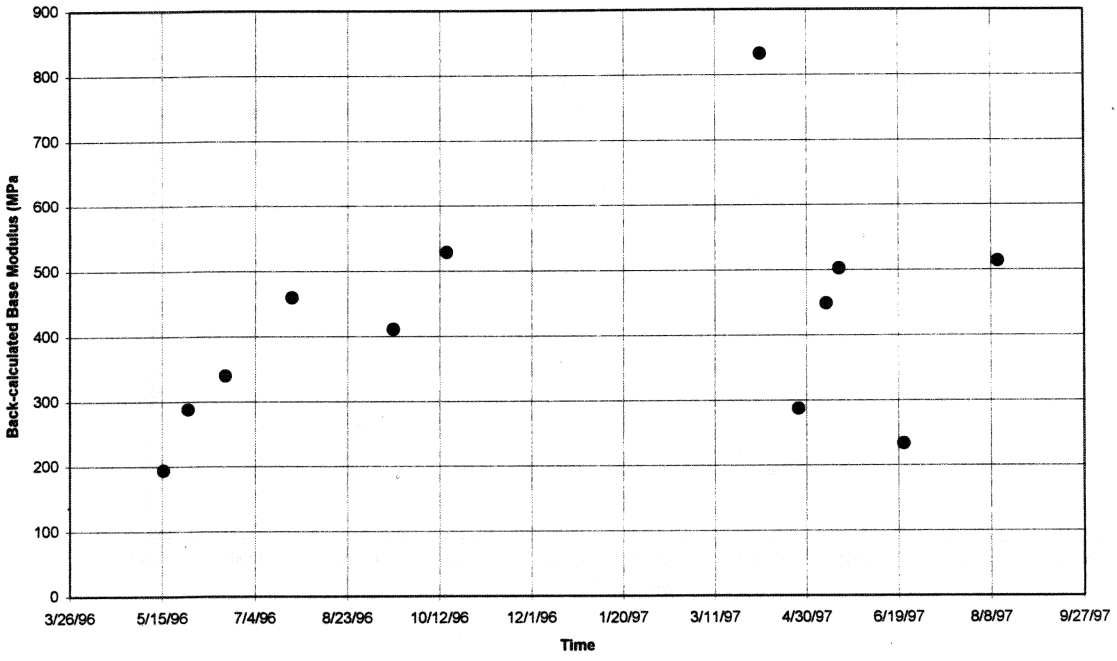


Figure C18. Back Calculated Base modulus as a function of time (Dickey Lake).

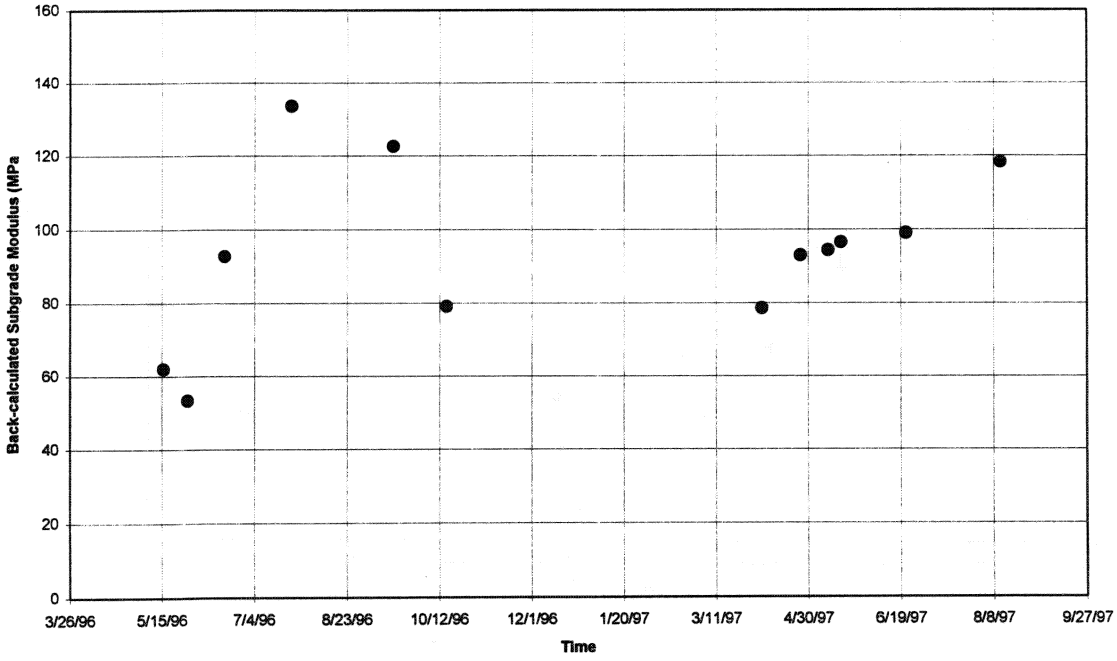


Figure C19. Back Calculated Subgrade modulus as a function of time (Dickey Lake).