ARKANSAS DEPARTMENT OF TRANSPORTATION



SUBSURFACE INVESTIGATION

STATE JOB NO.		050478	
FEDERAL AID PROJEC	CT NO	NHPP-0032(40)	
HWY. 1	67 EMERGENO	CY ROUTE (RAMSEY MO	UNTAIN) (S)
STATE HIGHWAY	167	SECTION	17
IN	I	NDEPENDENCE	COUNTY

The information contained herein was obtained by the Department for design and estimating purposes only. It is being furnished with the express understanding that said information does not constitute a part of the Proposal or Contract and represents only the best knowledge of the Department as to the location, character and depth of the materials encountered. The information is only included and made available so that bidders may have access to subsurface information obtained by the Department and is not intended to be a substitute for personal investigation, interpretation and judgment of the bidder. The bidder should be cognizant of the possibility that conditions affecting the cost and/or quantities of work to be performed may differ from those indicated herein.

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT

January 26, 2001

TO:

Mr. Lyndal Waits, District 5 Engineer

SUBJECT: Hwy. 167 Slide (Batesville)

U.S. 167, Section Independence County

Transmitted herewith are the logs of rotary wash borings conducted in the vicinity of the Hwy. 167 Slide near Batesville. The Stations are referenced to the center of a cross drain, located North of the slide area, with an assumed Station 0+00 and an assumed elevation of 1000.0' on the culvert headwall. Figure 1 illustrates a plan view of boring locations.

Discussions with you and your staff indicated that cracking and subsidence have been visually observed for several years. However, only recently have cracks in the roadway become more prevalent. In 1975 your staff indicated that a row of piling were driven within the slope and cabled together to help resist movement at that time. Figure 2 illustrates the piling locations after installation. Also, it was revealed that the septic field lines from the "Scenic Motel" crossed Highway 167 and drained into the area at the toe of the embankment slope. This area is presently being cleared for future development.

A subsurface investigation was conducted in November 2000 to determine properties of existing soil and bedrock conditions. A total of eight borings were drilled along both shoulders of the existing Highway 167 and at the toe of the embankment slope. The existing material consists of a Soft to Medium Stiff Clay intermixed with Sandstone fragments and underlain by a Highly Weathered Shale and Hard Shale. The depth of the Hard Shale is greater than 20 feet. Only two borings indicated saturated layers within the slope (Borings 1 & 6). Observations of the slope, pavement, adjacent area and boring logs do not reveal an obvious slippage plane. A predicted failure plane is at the Soil and Weathered Shale interface.

The samples obtained by the Standard Penetration tests were brought to the laboratory and visually classified. The rock cores are available for inspection at the Materials Division.

Attached on Figures 3, 4 and 5 are several recommendations for the repair of the slope for your consideration.

JG: lw

Roadway Design Engineer

Repair Alternatives

Before any final alternative is accepted, the field lines for the adjacent motel should be located and inspected to determine if they are broken or leaking into the roadway embankment. If possible, these lines should be relocated.

The most positive correction would be to excavate all of the soft unstable material above the Hard Shale and backfill and reconstruct the slope with buttress material. However, due to the excessive excavation required this alternative does not appear to be reasonable to construct and keep the traffic lanes open. Therefore, the following alternatives are presented for your review.

- Alternate 1: Construct a buttress on stone columns to resist movement of the roadway and provide drainage. The Stone Columns could be installed through the existing softer materials and founded on the harder Shale. With minimal excavation and additional right-of-way, the buttress could be constructed on top of the Stone Columns. Figure 3 illustrates the proposed configuration.
- Alternate 2: Construct a longitudinal drainage wall within existing right-of-way and connect horizontal drains to the wall for water outlets. The depth of the wall would be dependant on equipment capabilities, but is recommended that it extend into the Weathered Shale layer. This would be less effective than Alternate 1, however, it would provide drainage to the existing slope and ultimately strengthen the material. Figure 4 illustrates the proposed configuration.
- Alternate 3: Construct a tiered berm utilizing a combination of lightweight and crushed stone material. This alternative would require minimal excavation and a large amount of additional right-of-way. Figure 5 illustrates the proposed configuration.
- Alternate 4: Other specialized repair methods to consider include Soil Nailing, Anchored Walls and Roadway Relocation.

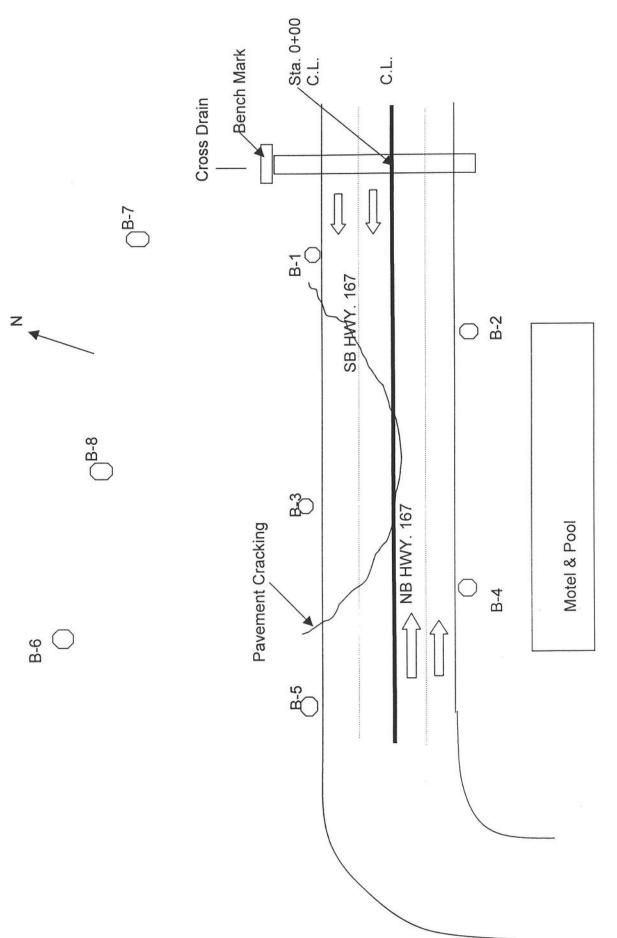


Figure 1: PLAN VIEW

HIGHWAY 167 SLIDE

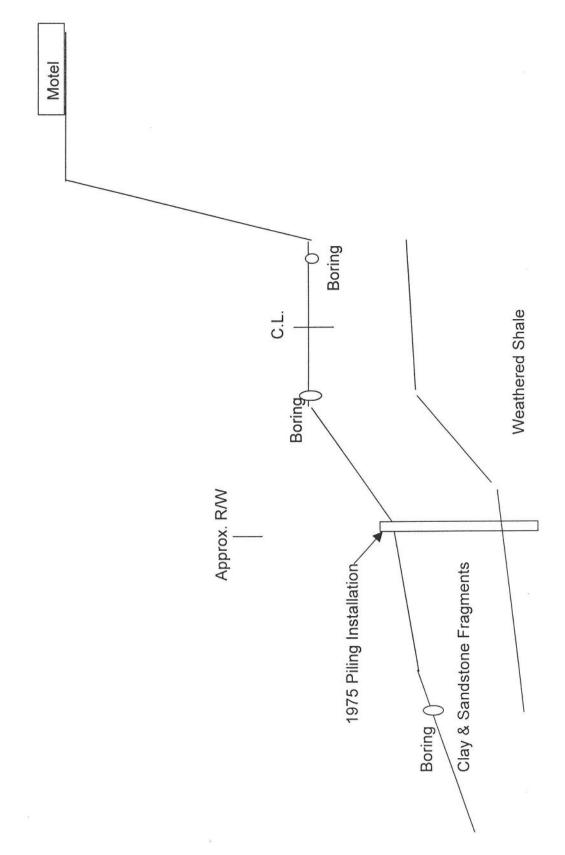


Figure 2: Cross Section View

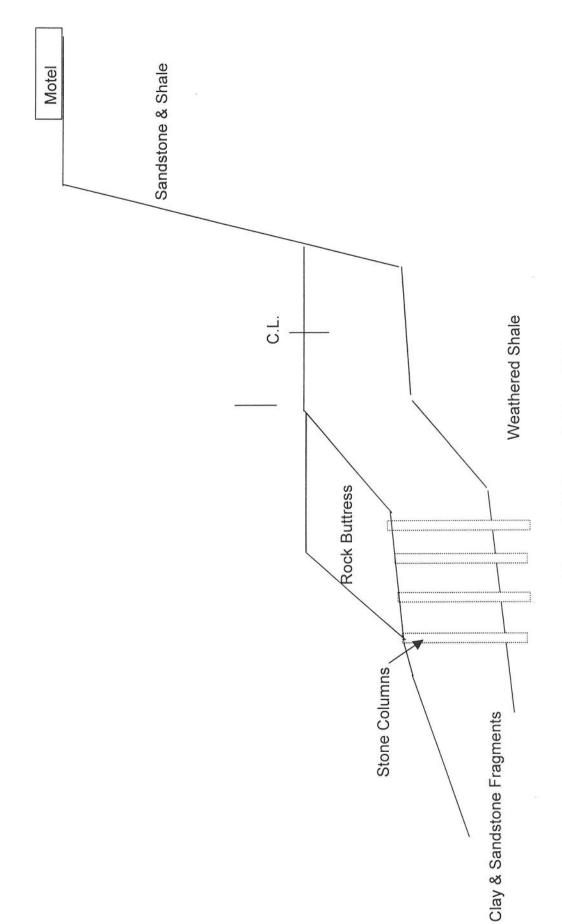
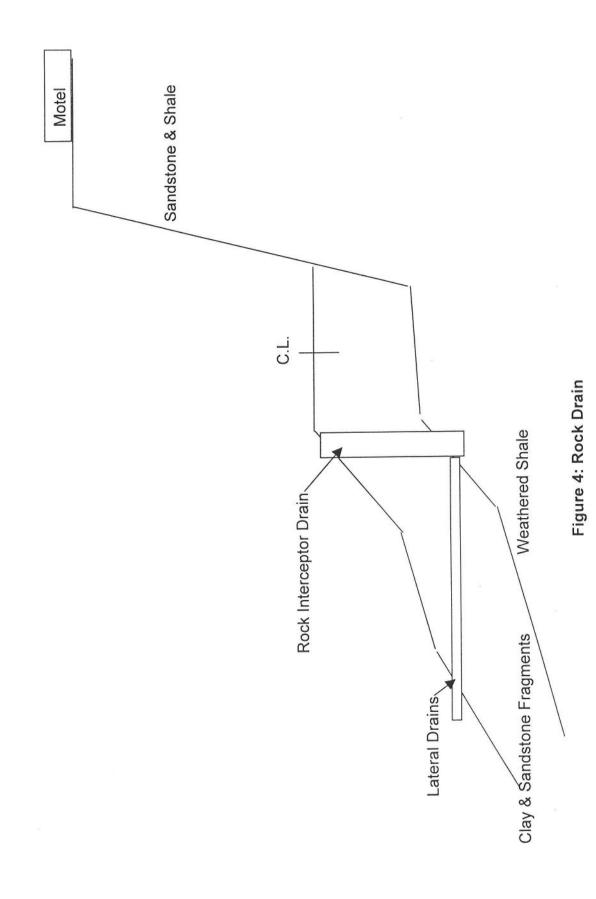


Figure 3: Buttress & Stone Columns



DIST5SLIDESI.DOC

HIGHWAY 167 SLIDE

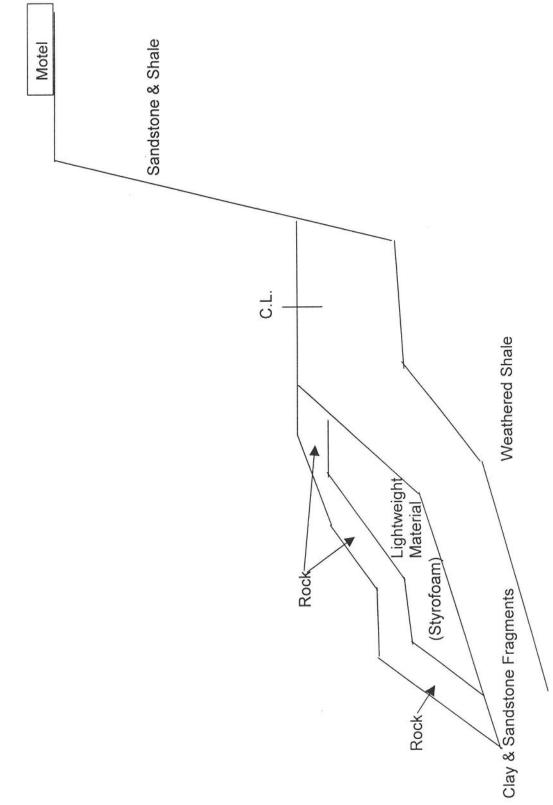


Figure 5: Multi-Level Berm

LEGEND

SOIL TYPES (SHOWN IN SYMBOL COLUMN) (PREDOMINANT TYPE SHOWN HEAVY)





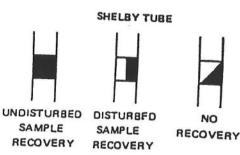






ORGANIC MATTER

SAMPLER TYPES (SHOWN IN SAMPLE COLUMN)



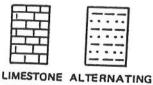
ROCK TYPES (SHOWN IN SYMBOL COLUMN)





or SILTSTONE or DOLOMITE



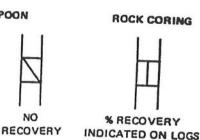


LAYERS of SHALE and

SANDSTONE



SPLIT SPOON SAMPLE RECOVERY



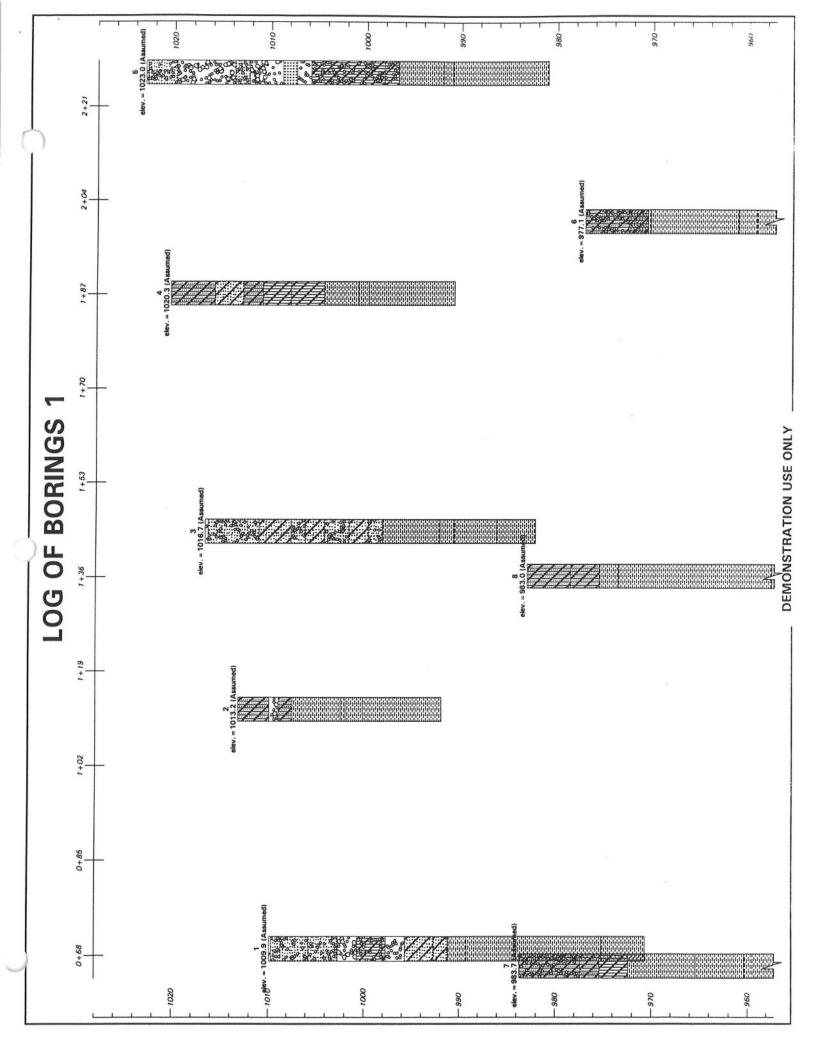
TERMS DESCRIBING CONSISTENCY OR CONDITION

	LAR SOIL	CL	.AY	CLAY-	SHALE	SHALI	
"N" Value 0-4 5-10 11-30	Density Very Loose Loose Medium Dense	"N" Value 0-1 2-4 5-8	Consistency Very Soft Soft Medium Stiff	"N" Value	Condition Medium Stiff	"N" Value 31-60 Over 60	Condition Saft
31 -50 Over 50	Dense Very Dense	9-15 16-30 31-60 Over 60	Stiff Vary Stiff Hard Vary Hard	9-15 16-30 31-60 Over 60	Stiff Very Stiff Hard Very Hard	More than 2" Penetration in 60 Blows: Less than 2" Penetration in 60 Blows:	Medium Hard

GENERAL NOTES

- 1. Ground water elevations indicated on boring logs represent ground water elevation at date or time shown on drilling log. Absence of water surface implies that no ground water data is available but does not necessarily mean that ground water will not be encountered at locations or within the vertical reaches of these borings.
- 2. Borings represent subsurface conditions at their respective locations for their respective depths. Variations in conditions between or adjacent to boring locations may be encountered.
- 3. Terms used for describing soils according to their texture or grain size distribution are in accordance with the Unified Soil Classification System.

Standard Penetration Test - Driving a 2.0" O.D., 1-3/8" I.D., sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6.0 inches of penetration on the drill log (Example - The "N" Value can be obtained by adding the bottom two numbers (i.e. $\frac{6}{100}$, 8 + 9 = 17 blows/ft)



ARKANSAS HWY. & TRANS. DEPARTMENT MATERIALS DIVISION - GEOTECHNICAL SEC.	BORING NO. 1 PAGE 1 OF 2
JOB NO. District 5 Slide Independence Cou	
JOB NAME: Hwy. 167 Slide (Batesville)	TYPE OF DRILLING: Hollow Stem Auger
U.S. 167	
STATION: 0+67 *	EQUIPMENT: CME AT Drill
LOCATION: 28' Right of Center Line of Hwy. 167	LOGGED BY: Steven Faulkner
COMPLETION DEPTH: 39.2	
D S S A P M M DESCRIPTION OF MATERIAL B L O E	PLASTIC LIMIT % MOIST. LIQUID LIMIT DRY WEIGHT LBS PER CU.FT. NO. OF BLOWS DER 6-IN. DO 2 % DO 2 %
FT. L S SURFACE ELEVATION: 1009.9 (Assu	med)
Asphalt Pavement	
Moist, Very Loose, Black and Gray Sa Gravel with Asphalt Fragments (Fill M	nd and aterial)
Moist, Very Loose, Black and Gray Sa Gravel with Asphalt Fragments and sa Seams (Fill Material)	nd and 1-2
Moist, Loose, Brown and Gray Sands Fragments and Cobbles with some Sa	ndy Clay
Moist, Stiff, Brown and Gray Silty Cla Sandstone Fragments	y with 4-6
Moist to Wet, Loose, Brown and Graves Sandstone Fragments with some San	, 3-4
Wet, Soft, Brown and Gray Sandy Cl some Sandstone Fragments	
Moist, Stiff, Brown and Gray Sandy (
Soft, Brown and Gray Highly Weathe	red Shale
Soft to Medium Hard, Gray Weathere	d Shale
	50 0
Hard, Dark Gray and Brown to Dark Fractured Shale	30 C
REMARKS: Hollow stem augers were utilized to a d	epth of 20.7'. * Station
referenced to Top of Cross Drain, North	of Slide Area, with Assumed

			IWY. & TRANS. DEPARTMENT DIVISION - GEOTECHNICAL SEC.		BOI PAC	RING GE	NO 2		2					
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T	M B	Р	DESCRIPTION OF WATERIAL	SOIL	UP S	JC	IST.		VEIC	ER (F BI	6-IN.	% S C R	QD
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	P	AGE	1	OF	2					
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LOCATION: 28' Right of Center Line of Hwy. 167	L	OGGED	BY:		S	teve	n Fa	ulkne	er	
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REMARKS: Hollow stem augers were utilized to a depth of 24	.0'. * \$	Statio	n	204						
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REMARKS: Hollow stem augers were utilized to a depth of 24.0'. * Station referenced to Top of Cross Drain, North of Slide Area, with Assumed Station 0 + 00 and Assumed Elevation 1000.0'. Water level 23.0'(24 hr).

	HWY. & TRANS. DEPARTMENT DIVISION - GEOTECHNICAL SEC.	100	ORING AGE	3 NO 1	OF	ALC: UNKNOWN					
OB NO. OB NAME:	District 5 Slide Independence County Hwy. 167 Slide (Batesville)		ATE: YPE OF	DRI					2000 Stem		er
STATION:	U.S. 167 1+85 * 28' Left of Center Line of Hwy. 167		QUIPM .OGGEE						`Dril ulkne		
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DEPTH SAMPLE	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTIC LIMIT	MOIST.	LIQUID	DRY WEIGHT	LBS PER CU.FT.	NO. OF BLOWS	PER 6-IN.	% S C R	R C C
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			IWY. & TRANS. DEPARTMENT DIVISION - GEOTECHNICAL SEC.		BORING PAGE	1		2					
OB N			District 5 Slide Independence County		DATE:		No			6-7,			
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			Hollow stem augers were utilized to a depth of 33				-					1	_

District 5 Silde Independence County Hwy. 167 Silde (Batesville) Ly. 167 Silde (Batesville) L	ARKA	NSA	SH	IWY. & TRANS. DEPARTMENT		BORING PAGE	G NO 2		2					
DISPANSE: Hollow stem augers were utilized to a depth of \$2.0. * Station referenced to Ton of Cross Drain, North of Slide Assumed TYPE OF DRILLING. Hollow Stem Auger TYPE OF DRILLING. Hollow Stem Auger CME AT Drill Steven Faulkner CME AT Dr	-						-			ber	6-7,	2000)	
10 NAME: 10 Note to be consisted 10 Note to be							FDRI							er
STATION: 24-25* LOCATION: 28' Right of Center Line of Hwy. 167 COMPLETION DEPTH: 42 B C N Y M P T M B C L E SURFACE ELEVATION: 1023.0 (Assumed) Hard, Dark Gray Shale Boring Terminated Boring Terminated CME AT Drill Steven Faulkner CME AT D	JOB NA	AME:												
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COMPLETION DEPTH: 42 Completion Depth 42 Depth 43 Depth 44 Depth 45 Depth						SHIRT COLUMN			S	teve	n Fa	ulkn	er	- 1
DESCRIPTION OF MATERIAL SOIL FIT. U SURFACE ELEVATION: 1023.0 (Assumed) Boring Terminated	LOCA	HON:		28 Right of Center Line of Twy. 107										_
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			IWY. & TRANS. DEPARTMENT		BORI PAGE		NO 1	. 6 OF	: 1					
JOB N	-	_	DIVISION - GEOTECHNICAL SEC. District 5 Slide Independence County		DATE			-	THE OWNER OF THE OWNER,	ıber	4-5,	2000)	
JOB N			Hwy. 167 Slide (Batesville)		-		DRI	LLING				y W		
10011	. LIVIE.		U.S. 167											
STATI	ON:		1 + 98 *		EQUI	PME	NT:		(Dril	1	
LOCA	TION:		132' Right of Center Line of Hwy. 167		LOGG	ED	BY:			Tin	n Wi	lson		
COM	DI ET	TON	V DEPTH: 25.9											\dashv
D		S	(DEF 1 H. 23.9		T	T								
E	S	Α							T	LBS PER CU.FT	OF BLOWS		%	%
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FT.	Ľ	E	SURFACE ELEVATION: 977.1 (Assumed)		PLASTIC	LIM	% W	LIQUID	DRY	LBS	NO.	PER 6-IN.		
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REM	ARK		Hollow stem augers were utilized to a depth of 9 referenced to Top of Cross Drain, North of Slide	Area,	with	As	sur	ned						
		_	Station 0 + 00 and Assumed Elevation 1000.0'.			a should								

BORING NO. 7 ARKANSAS HWY. & TRANS. DEPARTMENT OF 1 PAGE MATERIALS DIVISION - GEOTECHNICAL SEC. December 5-6, 2000 DATE: Independence County District 5 Slide JOB NO. Rotary Wash TYPE OF DRILLING: Hwy. 167 Slide (Batesville) JOB NAME: U.S. 167 CME AT Drill EQUIPMENT: 0 + 64 *STATION: Tim Wilson 112' Right of Center Line of Hwy. 167 LOGGED BY: LOCATION: **COMPLETION DEPTH: 34.2** LBS PER CU.FT. S OF BLOWS DRY WEIGHT E % SCR Y R DESCRIPTION OF MATERIAL P M SOIL M % MOIST PER 6-IN. PLASTIC LIMIT GROUP T LIQUID B H NO. 0 Ε L SURFACE ELEVATION: 983.7 (Assumed) S FT. Moist, Stiff, Brown and Gray Sandy, Silty Clay with Sandstone Fragments 4-5 5 3 Moist, Stiff, Brown and Gray Sandy, Silty 5-9 Clay with Traces of Sandstone Fragments 5-6 Moist, Stiff, Brown and Gray Silty Clay with 10 some Highly Weathered Shale 14 20-20 4 16-21 Soft, Brown and Gray Highly Weathered Shale 15 16 23-26 12 14-14 20 Soft, Brown and Gray Weathered Shale 6 12-29 48 Medium Hard, Brown and Gray Weathered 60 (0.4')Shale 25 Hard, Brown and Gray Fractured Shale 76 38 30 Hard, Dark Gray Shale 58 80 **Boring Terminated** REMARKS: Hollow stem augers were utilized to a depth of 23.3'. * Station referenced to Top of Cross Drain, North of Slide Area, with Assumed Station 0 + 00 and Assumed Elevation 1000.0'.

ARKANSAS HWY. & TRANS. DEPARTMENT MATERIALS DIVISION - GEOTECHNICAL SEC. JOB NO. District 5 Slide Independence County DATE: December 6, 2000													
JOB N			District 5 Slide Independence County		DATE:		-	-	mbei	r 6, 2	2000		
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STATI			1+34 * 122' Right of Center Line of Hwy. 167		EQUIPM LOGGE			(n Wi		.1	
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