Kacy Murillo (adpce.ad)

Subject:

RE: Response to Comments Dye Test Study Workplan

	AFIN: 03-00051
From: McCullough, Dan [mailto:DMcCullough@scsengineers.com]	PMT#: 0249-S1-R2
Sent: Friday, January 27, 2023 12:29 PM	Received
To: Travis Atwood (adpce.ad); Bill Sadler (adpce.ad)	By Kacy Murillo at 1:53 pm, Jan 30, 2023
Cc: Linda Hanson (adpce.ad)	DOC ID#: 83332
Subject: Response to Comments Dye Test Study Workplan	TO: BS>FILE <km< td=""></km<>

Travis;

Attached is our response to you recent comments of the Dye Test Study Work Plan. If all possible, we would like to do the injection next week. In order to do that, we need your approval of the plan, (at least an email) so that we can give that approval to Linda Hanson for approval from the water didvision.

Dan McCullough PG SCS Engineers Cell: (501) 350-8867 Office (501) 503-4778 <u>dmccullough@scsengineers.com</u> <u>scsengineers.com</u>

SCS ENGINEERS

January 26, 2023 File No.: 27222139.01

Mr. Travis Atwood Arkansas Department of Energy & Environmental Division of Environmental Quality (DEQ) 5301 Northshore Drive North Little Rock, AR 72118-5317

Subject: Response to Comments on Dye Trace Study Work Plan Former NABORS Landfill, Baxter County, Arkansas Permit No: 0249-S1-R2; AFIN: 03-00051 Cross Reference: Document ID: 83281

Dear Mr. Atwood:

SCS Engineers has prepared the following responses to the comments provided by the Arkansas Department of Energy & Environmental Division of Environmental Quality (DEQ) on January 18, 2023, regarding the January 2023 Dye Trace Study Work Plan at the above referenced facility.

<u>**DEQ Comment 1.0**</u> Please provide a sampling point in Hutch Creek above the low water crossing at county road 16.

Reply: A sampling point will be added at the requested location.

DEQ Comment 2.0 Table 6 in Ozark Underground Laboratory's book shows that fluorescein can be affected by landfill leachate. Nearby wells MW-1, MW-1R and CAO-1 are elevated in arsenic, cobalt, 1-1-Dichloroethane, and MTBE with vinyl chloride also elevated in two of the three wells. These three wells are also higher in chloride than the other wells on site; indicating a possible leachate component to the impact. Please provide justification of fluorescein over the use of other dyes with considering to this observation.

Reply: As indicated in the Ozark Underground Laboratory (OUL) Groundwater Tracing Handbook Table 6, landfill leachate can be a potential source of background fluorescence in the range of commonly used tracer dyes, including fluorescein because this dye is used in a number of commercially available consumer products. To address the potential for background interference, SCS Engineers is in the process of performing background sampling prior to the introduction of the tracer dye. The first round of background sampling results has been completed and indicated no fluorescence in the range of fluorescein dye at any of the sampling locations. A second round of background sampling will be performed prior to the dye introduction to provide additional background information.

DEQ Comment 3.0 Within 15 days of this letter, please provide DEQ with the report detailing the previous work done at the site from the supplemental subsurface investigation. In addition,

section 4.1 describes already performed background sampling. Please provide DEQ with the results analyzed by the Ozark Underground Laboratory.

Reply A supplemental investigation activities report will be submitted on or before February 10, 2023. The borings and borehole geophysical logs are included in Attachment 1. In addition, the laboratory report from the OUL for the first round of background sampling can be found in Attachment 2.

DEQ Comment 4.0 40 CFR §§ 144 and 146.6 address requirements for Class V UIC wells. Since these are permitted by rule, you must obtain authorization to inject. Please note that authorization is required from the Permits Branch of the Office of Water Quality, Division of Environmental Quality. Please contact Linda Hanson, P.G. at hanson@adeq.state.ar.us or at 501.682.0646 for information pertaining to these requirements.

Reply: SCS Engineers has contacted Linda Hanson, P.G. with the DEQ Permits Branch of the Office of Water Quality and has submitted the requested UIC Inventory information.

DEQ Comment 5.0 Please do not proceed with dye injection until these comments are addressed.

Reply: SCS Engineers will not proceed with the implementation of the Dye Trace Study Work Plan until these responses are accepted by DEQ, and we have the necessary authorization from the Permits Branch of the Office of Water Quality at DEQ.

If you have any questions during your review of this submittal, please contact our office at (501) 812-4551.

Sincerely,

_ mchiller

Dan McCullough, P.G. Senior Project Manager

SCS ENGINEERS slb/dm

cc: Bill Sadler, P.G., DEQ Blake Whittle, P.G., DEQ

Attachments

Stacie Whitmer, REM, ASP, JD Senior Project Manager

Attachment 1

Investigation Boring Logs and Geophysical Logs

1.11.11.11.11.11.11.11.11.11.11.11.11.1		NGINEE			ORING NO.: E			1	MBER: 1 o
		9 Richardson Drive			DRILLER	Kevin	Murphy	SURFACE ELEVATION: 1 0.5	51 ft
	Nor	th Little Rock, AR			DRILLING RIG:			TOC ELEVATION: 105	
	CLIENT: LRS				G METHOD:			WELL DEPTH COMPLETION: 81.	
	JECT NAME: NAI				CONTRACTOR:	GTS		LOCATION:	
	CT NUMBER: 272			_				NORTHING: 11810	
		ee Brothers, AR			10 METUOD -			EASTING: 77470	
	EOLOGIST: Rob				NG METHOD: CO			WATER LEVEL: 63. WATER ELEVATION: 987	-
	INISH DATE: 10/	,			ING DIAMETER: WELL DIAMETER:			WATER LEVEL DATE: 10	
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	Dalauti	to light grey	Core	0-5		52			
	-Dolomite	with brown and dark grey							
		banding							F
— Г							+ $ $ $ $ $ $		
		Shalo, brown							- 10
	Shale	Shale; brown, thinly bedded,		501					\vdash
		non calcareous	Core	5.0-1 0.0		62			
		Dolomite; grey							
		with brown & . dark grey			1 -		+ $ $ $ $ $ $		
_	Dolomite	banding. Some							10
		chert layers &		10.0-					\vdash
		small vugs.	Core	15.0		19			
_									
		Canada and a second							Γ
_		Sandstone; tan Dolomite;			1		1		
		coarse, gray to							10
		tan, with		15.0-				3" Open borehole	+
		occasional chert layers	Core	20.0		79		GS to 81.95' bgs	\vdash
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		grey with some							
		chert layers.			1		1		
_		/// vugs (1" diam) ///							10
		<u>~16.3-17'</u>	~	20.0-		100			\vdash
_		Dolomite; tan // with small vugs //	Core	25.0		100			-
		~18.1'							
		Dolomite; grey							L
	-Dolomite	with iron staining			1		$\left \right $		
		Dolomite; grey							10

SCS E	NGINEE	R S	LOG OF B	ORING NO.:	EB-1		SHEET NU/	MBER: 2 of 4
	19 Richardson Drive			DRILLE	<u>R:Kevin</u>	Murphy	SURFACE ELEVATION: 1 05	1 ft
No	orth Little Rock, AR			DRILLING RIG	G: CME-	55	TOC ELEVATION: 105	1 ft
CLIENT: LR	S			METHOD:			WELL DEPTH COMPLETION: 81.9	95 fbas
PROJECT NAME: NA	ABORS			CONTRACTO	R: GTS		LOCATION:	
PROJECT NUMBER: 27							NORTHING: 118106	61.5
PROJECT LOCATION: Th							EASTING: 77470	
GEOLOGIST: Ro			SAMPLIN	IG METHOD: C	Core		WATER LEVEL: 63.	1 fbgs
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FINISH DATE: 1 C				WELL DIAMETE			WATER LEVEL DATE: 10/	20/2022
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				<u> </u>		CONSTRUCTION	DRILLING NOTES	(,
	to tan with brown banding & some chert. Zones of small vugs. Large vugs (1" diam)	Core	25.0- 30.0		72			
	noted from 25.4-25.75' and 31-31.3'.	Core	30.0- 35.0		73			1020
	Shale; thinly bedded, brown to black	Core	35.0- 40.0		86	_		101 <i>5</i>
	Dolomite; grey to tan, vuggy, with brown banding and chert. Increased chert ~37.04'. Vuggy. At	Core	40.0- 45.0		100	-		 1010
	39.05' and 41.6-41.8, larger vuggy cavities w/ precipitate including iron minerals	Core	45.0- 50.0		91	-		 1005
	Dolomite;					-		 1000
	Heavily weathered, vuggy, grey to tan, with brown banding and chert.	Core	50.0- 55.0		75			
	Brecciated zones beginning ~51.6'.		55.0-					995

	NGINEE	RS	log of B	ORING NO.:	EB-1		SHEET NU	MBER: 3 of
	19 Richardson Drive			DRILLE	<u>R:Kevin</u>	Murphy	SURFACE ELEVATION: 1 0.5	51 ft
No	orth Little Rock, AR			DRILLING RIG			TOC ELEVATION: 105	
CLIENT: LR				METHOD:			WELL DEPTH COMPLETION: 81.	95 fbgs
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PROJECT NUMBER: 27							NORTHING: 118100 EASTING: 77470	
ROJECT LOCATION: Th GEOLOGIST: Ro			SAMPLIN	IG METHOD: C	- ore		WATER LEVEL: 63.	
START DATE: 1 C				NG DIAMETE			WATER ELEVATION: 987	
FINISH DATE: 1 C				WELL DIAMETE			WATER LEVEL DATE: 10/	
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	solution features 56.16'. Large vugs w/ iron	Core	60.0		95			
	mineralization.Dolomite; grey with chert.Small vugs60.9-62.9' and 63.04-63.3'. At 67.9', coarser	Core	60.0- 65.0		96			99
	tan irregularly shaped dolomite infill noted.	Core	65.0- 70.0		100			98
D Dolomite	Shale; black, non calcareous. Dolomite; grey w/ chert Shale; black, non calcareous. Dolomite; grey w/ chert.	Core	70.0- 75.0		85			98
5	Brecciated zones, notably at 72.7'. Shale; black, non calcareous. Dolomite; grey w/ chert.	Core	75.0- 80.0		90			97
	Brecciated/vugg y zone at 78.13'.							97
5 —								
_								

DRILLER: Kevin Murphy SURFACE ELEVATION: 1051 ft DRILLING RIG: CME-55 TOC ELEVATION: 1051 ft DRILLING METHOD: WELL DEPTH COMPLETION: 81.95 fbgs DRILLING CONTRACTOR: GTS LOCATION: SAMPLING METHOD: Core NORTHING: 1181061.5 BORING DIAMETER: 3" WATER LEVEL: 63.11 fbgs Sample gr 2 Sample gr 2 </th <th>North Little Rock, ARDRILLING RIG: CME-55TOC ELEVATION: 1051 ftCLIENT: LRSDRILLING METHOD:WELL DEPTH COMPLETION: 81.95 fbgsPROJECT NAME: NABORSDRILLING CONTRACTOR: GTSLOCATION:ROJECT NUMBER: 27222139.01DRILLING CONTRACTOR: GTSLOCATION:DJECT LOCATION: Three Brothers, AREASTING: 774701.35GEOLOGIST: Robert FowlerSAMPLING METHOD: CoreWATER LEVEL: 63.11 fbgsSTART DATE: 10/5/2022BORING DIAMETER: 3"WATER ELEVATION: 987.84 ftFINISH DATE: 10/14/2022WELL DIAMETER: 3"WATER LEVEL DATE: 10/20/202</th> <th>SCS ENGINEE</th> <th>K S</th> <th></th> <th></th> <th>: EB-1</th> <th></th> <th>SHEET NU</th> <th>////DEK:4 0</th>	North Little Rock, ARDRILLING RIG: CME-55TOC ELEVATION: 1051 ftCLIENT: LRSDRILLING METHOD:WELL DEPTH COMPLETION: 81.95 fbgsPROJECT NAME: NABORSDRILLING CONTRACTOR: GTSLOCATION:ROJECT NUMBER: 27222139.01DRILLING CONTRACTOR: GTSLOCATION:DJECT LOCATION: Three Brothers, AREASTING: 774701.35GEOLOGIST: Robert FowlerSAMPLING METHOD: CoreWATER LEVEL: 63.11 fbgsSTART DATE: 10/5/2022BORING DIAMETER: 3"WATER ELEVATION: 987.84 ftFINISH DATE: 10/14/2022WELL DIAMETER: 3"WATER LEVEL DATE: 10/20/202	SCS ENGINEE	K S			: EB-1		SHEET NU	////DEK:4 0
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S		NGINEE	R S	LOG OF B	ORING NO.	EB-2		SHEET NU/	MBER: 1 o
	11219	9 Richardson Drive				ER: Kevin	Murphy	SURFACE ELEVATION: 105	7.7 f+
	Nor	th Little Rock, AR			DRILLING RI			TOC ELEVATION: 105	
	CLIENT: LRS	•			METHOD:			WELL DEPTH COMPLETION: 84.5	
PRC	DJECT NAME: NA	BORS			CONTRACTO	DR: GTS		LOCATION:	Ť
PROJE	ECT NUMBER: 272	22139.01						NORTHING: 118069	
		ee Brothers, AR						EASTING: 774358	
	GEOLOGIST: Rob				IG METHOD:			WATER LEVEL: 66.4	
	START DATE: 9/2	,			NG DIAMET			WATER ELEVATION: 991	
	FINISH DATE: 9/2	29/2022		\\	VELL DIAMET	EK: 3		WATER LEVEL DATE: 10/	20/20
DEPTH (FT)	LITHOLOGY	LITHOLOGY DESCRIPTION	Sample Type	Sample Depth	RECOVERY (in)	Blow Counts	MONITORING WELL CONSTRUCTION	MONITORING WELL DESCRIPTION/ DRILLING NOTES	ELEVAT (FT)
	Silty Clay	Silty Clay; reddish brown to orange with chert gravels						Sch 40 PVC Casing (gouted) 0'-7' bgs	1C
			SPT (50/2") Core	7-10	-	<u>50/2"</u> 85			10
	Dolomite	Dolomite; light gray to gray, fine crystalline, iron staining in fractures, thin dark gray	Core	10-15	-	57			10
		banding, vuggy between 19.5'-21.5'	Core	15-20		100		3" Open borehole to 7' to 84.58' bgs	10
	Shale Shale	Shale; brown thinly bedded (no reaction to HCL Chert, dark	Core	20-25		73			_ 10 10
; —		gray with light							
		gray banding							\vdash

IPT, INDUCEY DESCRIPTION Type Taple S Could Monore accurate Monore accurate 30		NGINEE	RS	LOG OF BO	ORING NO.:	EB-2		SHEET NUA	ABER: 2 of
North Liftle Rock, AR DBILLING RG; CNE-75 TOC EXPAND.1059 FILIDE CUENT, LRS DBILLING METHOD: WEL DB7H: COMPLEIDN: 84.58 fb PROJECT NAMER 272221 39.01 ROMEN AND PORTON WELL NORTHING: 11800894.47 DRUCK METHOP: SAMPUNG METHOD: WEL DB7H: COMPLEIDN: 84.58 fb DRUCK METHOP: SAMPUNG METHOD: WEL DB7H: COMPLEIDN: 84.58 fb DRUCK METHOP: SAMPUNG METHOD: WEL DB7H: COMPLEIDN: 84.58 fb DRUCK METHOP: SAMPUNG METHOD: WEL DB7H: COMPLEIDN: 84.58 fb DRUCK METHOP: SAMPUNG METHOD: WEL DB7H: COMPLEIDN: 84.58 fb START DIAF: 9/27/2022 BORING DAWETR: 3" WATER EVEL DATE: 10/20/2 DB7H: UTHOLOGY DESCRIPTION Sample Sample 30 Core 25-30 74 MONTENDER WELL ARCE PARONA 33 Dolomite, light gray with drive gray with drive gray with drive gray with light gray with					DRILLE	R:Kevin	Murphy	SURFACE ELEVATION: 105	7.7 ft
PROJECT NUMBER: 272221 39:01 DRULING CONTRACTOR: GTS LOCATION: NUMBER: 27221 39:01 PROJECT NUMBER: 272221 39:01 SAMPUNG METRO: GTS LOCATION: NUMBER: 272221 UCATION: Number: 120064.47 BASTING: 774358.91 CRUCCIST: Robert Fowler SAMPUNG METRO: 3" WATER EVAILON: 901.2 M STAT DIRE 9/27/2022 BORNE DIALETER: 3" WATER EVAILON: 901.2 M DPMI: INFOLOOY UTHOLOOY DESCRIPTION Type: T	No	rth Little Rock, AR							
BROLECT LUXERE 22722139.01 Description Base of the stand Date of	CLIENT: LRS	5		DRILLING	METHOD:			WELL DEPTH COMPLETION: 84.5	58 fbgs
BOJECT LOCATION: Three Brothers, AR LASTING. 774358.91 GEOLOGIS: Robert Fowler SAMPUING METHOD: Core WATR LEVEL 66.48 fb START DALE 9/29/2022 WELL DALETER: 3" WATRE LEVEL DALE 10/20/2 PPTIN INHOLOCY LITHOLOCY DESCRIPTION Image: Start Date 9/29/2022 WATRE LEVEL DALE 10/20/2 PPTIN INHOLOCY LITHOLOCY DESCRIPTION Image: Start Date 9/29/2022 WATRE LEVEL DALE 10/20/2 PPTIN INHOLOCY LITHOLOCY DESCRIPTION Image: Start Date 9/29/2022 WATRE LEVEL DALE 10/20/2 PPTIN INHOLOCY LITHOLOCY DESCRIPTION Image: Start Date 3/2 Image: Start Date 3/2 Core 25-30 74 Image: Start Date 3/2 Image: Start Date 3/2 Core 30-35 100 Image: Start Date 3/2 Image: Start Date 3/2 Core 35-40 100 Image: Start Date 3/2 Image: Start Date 3/2 Core 45-47.5 Core 40-45 78 Image: Start Date 3/2 Core 50-53 82 Image: Start Date 3/2 Image: Start Date 3/2 Image: Start Date 3/2 Image: Start Date 3/2 Core 50-53 82 </td <td>PROJECT NAME: NA</td> <td>BORS</td> <td></td> <td>DRILLING C</td> <td>CONTRACTO</td> <td>R:GTS</td> <td></td> <td></td> <td></td>	PROJECT NAME: NA	BORS		DRILLING C	CONTRACTO	R:GTS			
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DBTH (FT) LITHOLOGY LITHOLOGY DESCRIPTION Sample Type Sample Day Sample Sample Sample Sample Sample Sample Montrolation Mail Construction Anontrolation Mail Dolomite Anontrolation Mail Dolomite Anontrolation Mail Dolomite Anontrolation Dolomite Image: Sample 0		,							
Core 25-30 Core 25-30 74 Core 30-35 Dolomite, light gray to gray with dark gray bending, a thin sondstone loyer(approx 4) noted at 28.5, chert nodules noted between 45-47.5 Core 40-45 78 Core 50-53 82 Core 50-53 83	FINISH DATE: 9/	29/2022		V		:K: 3		VVATER LEVEL DATE: TO/	20/202
30 Core 30-35 100 35 Dolomite, light gray to gray with dark gray banding, a thin sandstone layer(approx Core 35-40 100 40 Dolomite 4 ³ / ₂ / ₅ , chert nodules noted between 35'-40', viggy Core 35-40 100 50 Dolomite 4 ³ / ₂ / ₅ , chert nodules, noted between 45-47, 5 Core 40-45 78 50 Core 45-50 86 50 Core 50-53 82 51 Core 50-53 82		LITHOLOGY DESCRIPTION			RECOVER (in)				ELEVATIO (FT)
5 Dolomite, light gray to gray with light gray no dray bonding, a thin sondstone layer(approx 4') noted at 28.5, chert nodules noted between 35'-40', vuggy between 45-47.5 Core 35-40 100 5 Dolomite 28.5, chert nodules noted between 45-47.5 Core 40-45 78 6 Core 45-50 86 7 Core 50-53 82 7 Core 50-53 82			Core	25-30		74			- 10: -
gray to gray with dark gray banding, a thin sandstone layer(approx 4') noted at 28.5, chert nodules noted between 35'-40', vuggy between 35'-40', vuggy between 45-47.5 100 0			Core	30-35		100			 10:
5 between 35'-40', vuggy between 45-47.5 Core 40-45 78 Core 45-50 86 Core 50-53 82 Core 50-53 82 Core 53-55 83		gray to gray with dark gray banding, a thin sandstone layer(approx 4") noted at 28.5, chert	Core	35-40		100			 10:
Core 45-50 86 Core 50-53 82 Chert, dark gray with light gray and brown banding Core 53-55 83		between 35'-40', vuggy between	Core	40-45		78			 10'
Core 50-53 82 Chert, dark gray with light gray and brown banding Core 53-55 83			Core	45-50		86			 10
gray with light gray and brown banding			Core	50-53		82			
		gray with light gray and brown banding Dolomite, light	Core	53-55		83			
gray to gray, vuggy with									

	NGINEE	RS	LOG OF BO	DRING NO.: EB-	2	SHEET NU	MBER: 3 O
	19 Richardson Drive			DRII FR• K 🛋	vin Murphy	SURFACE ELEVATION: 105	7.7 ft
Nc	orth Little Rock, AR			DRILLING RIG: CM		TOC ELEVATION: 105	
CLIENT: LR	S			METHOD:		WELL DEPTH COMPLETION: 84.	58 fbgs
PROJECT NAME: NA	ABORS		DRILLING C	CONTRACTOR: GT	S	LOCATION:	
PROJECT NUMBER: 27 ROJECT LOCATION: Th			_			NORTHING: 118069 EASTING: 77435	
GEOLOGIST: Ro	-		SAMPLIN	G METHOD: Core		WATER LEVEL: 66.4	
START DATE: 9/				NG DIAMETER: 3"		WATER ELEVATION: 991	
FINISH DATE: 9/				VELL DIAMETER: 3"		WATER LEVEL DATE: 10/	
DEPTH (FT) LITHOLOGY	LITHOLOGY DESCRIPTION	Sample Type	Sample Depth	Blow (ii) ECOUNT	MONITORING WELL CONSTRUCTION	MONITORING WELL DESCRIPTION/ DRILLING NOTES	ELEVATI (FT)
	interbedded Chert to 55, sporadic vuggs	Core	55-60	10)		10
	with quartz present at 59', vuggy at 62 aprox 4" and between 63'-64' with chert nodules noted at 64'	Core	60-65	97			 99
- 1 - 1 - 1 - 1	Dolomite; gray, brecciated with chert nodules	Core	65-70	95			_ _ 99
		Core	70-75	98			 98
	Dolomite; gray with dark gray banding, some chert nodules, vuggy 80.5'-83'	Core	75-80	98			 98
		Core	80-85	90			 97
_							97

Aurphy SURFACE ELEVATION: 1057.7 5 TOC ELEVATION: 1059 ft WELL DEPTH COMPLETION: 84.58 ft LOCATION: NORTHING: 1180694.47 EASTING: 774358.91 WATER LEVEL: 66.48 ft WATER LEVEL: 66.48 ft WATER ELEVATION: 991.2 ft WATER LEVEL DATE: 10/20/
5 TOC ELEVATION: 1059 ft WELL DEPTH COMPLETION: 84.58 ft LOCATION: NORTHING: 1180694.4 EASTING: 774358.91 WATER LEVEL: 66.48 ft WATER ELEVATION: 991.2 ft WATER ELEVATION: 991.2 ft WATER LEVEL DATE: 10/20/
WELL DEPTH COMPLETION: 84.58 ft LOCATION: NORTHING: 1180694.4 EASTING: 774358.91 WATER LEVEL: 66.48 ft WATER ELEVATION: 991.2 ft WATER LEVEL DATE: 10/20/
LOCATION: NORTHING: 1180694.4 EASTING: 774358.91 WATER LEVEL: 66.48 ft WATER ELEVATION: 991.2 ft WATER LEVEL DATE: 10/20/
NORTHING: 1180694.4 EASTING: 774358.91 WATER LEVEL: 66.48 ft WATER ELEVATION: 991.2 ft WATER LEVEL DATE: 10/20/ MONITORING WELL MONITORING WELL DESCRIPTION/
WATER LEVEL: 66.48 ft WATER ELEVATION: 991.2 ft WATER LEVEL DATE: 10/20/
WATER ELEVATION: 991.2 ft WATER LEVEL DATE: 10/20/ MONITORING WELL MONITORING WELL DESCRIPTION/
WATER LEVEL DATE: 10/20/ MONITORING WELL MONITORING WELL DESCRIPTION/
MONITORING WELL MONITORING WELL DESCRIPTION/
MONITORING WELL MONITORING WELL DESCRIPTION/

	NGINEE 19 Richardson Drive		LOG OF B					MBER: 1 o
	• • • • • • • • • • • • • • • • • • • •					Murphy	SURFACE ELEVATION: 104	
	orth Little Rock, AR			DRILLING RIG	CME-7	75	TOC ELEVATION: 104	
CLIENT: LR				METHOD:	0 T C		WELL DEPTH COMPLETION: 81.4	49 fbgs
PROJECT NAME: NA				CONTRACTOR	Reis		LOCATION:	
PROJECT NUMBER: 27							NORTHING: 118109 EASTING: 77509	
OJECT LOCATION: Th GEOLOGIST: Ro	•		SAMPLIN	NG METHOD: C	oro		WATER LEVEL: 54.0	
START DATE: 9/				ING DIAMETER			WATER ELEVATION: 989	-
FINISH DATE: 1 C	,			WELL DIAMETER			WATER LEVEL DATE: 10/	
DEPTH (FT) LITHOLOGY	LITHOLOGY DESCRIPTION	Sample Type	Sample Depth	RECOVERY (in)	Blow Counts	MONITORING WELL CONSTRUCTION	MONITORING WELL DESCRIPTION/ DRILLING NOTES	ELEVAT (FT)
Silty Clay	Silty Clay; reddish brown to orange with chert gravels						Sch 40 PVC Casing (grouted) 0'-6.5' bgs	10 10 10 10
		Core	6.5-1 0		32			10
	Dolomite, tan with brown banding, iron staining in fractures, some vuggy 12'-13.3' and	Core	10-15		93			 10
	18'-18.75 (vuggs filled with silty clay 18'-18.75')	Core	15-20		88		3" Open borehole 6.5' to 81.49' bgs	 1(
		Core	20-25		100			 10

	NGINEE	RS	LOG OF BO	ORING NO	.: EB-4		SHEET NU/	MBER: 2 c
	9 Richardson Drive			DRII	LER: Kevin	Murphy	SURFACE ELEVATION: 104	4.1 ft
No	rth Little Rock, AR				IG: CME-		TOC ELEVATION: 104	
CLIENT: LRS	5		_	METHOD:			WELL DEPTH COMPLETION: 81.4	
PROJECT NAME: NA	BORS		DRILLING C				LOCATION:	
PROJECT NUMBER: 27	222139.01						NORTHING: 118109	
OJECT LOCATION: Thr	ee Brothers, AR						EASTING: 775091	
GEOLOGIST: Ro				G METHOD:			WATER LEVEL: 54.6	
START DATE: 9/				NG DIAME			WATER ELEVATION: 989	
FINISH DATE: 10	/4/2022		V		TER: 3"		WATER LEVEL DATE: 10/	20/20
(FT) LITHOLOGY	LITHOLOGY DESCRIPTION	Sample Type	Sample Depth	RECOVERY (in)	Blow Counts	MONITORING WELL CONSTRUCTION	MONITORING WELL DESCRIPTION/ DRILLING NOTES	ELEVA1 (FT)
	_ Dolomite, light	Core	25-30		51			-
	gray to gray with some chert							- 10
	nodules, vuggy with brown and					_		_
	dark gray banding							-
	22'-25,	C	20.25		40			-
	gastropod fossils noted	Core	30-35		49			
	26.5'-27.5',							- 10
	appears							
	weahtered and							
	29'-30', some							-
	interbedded	6	25.40		(2)			-
	chert 30'-35 up to 2" thick,	Core	35-40		63			
	some brown							1
	banding							10
								_
								-
	Ľ	_						_
	-	Core	40-45		62			
Dolomite								
	-							10
								-
	Dolomite; gray,							_
	brecciated with							
	chert nodules	Core	45-50		75			
								- 99
						+ $ $ $ $ $ $		\vdash
	-							\vdash
								L
	-	Core	50-55		86			
								- 99
						-		\vdash
	L							
	ES REPRESENT APPROXIMATE EEN SOIL AND ROCK TYPES: A							
ANSITIONS MAY BE G								

	NGINEE	K S	LOG OF BC	DRING NO.: EB-4		SHEET NU	MBER: 3 o
	9 Richardson Drive			DRILLER: Kevi	<u>n Murphy</u>	SURFACE ELEVATION: 1 OZ	14.1 ft
Nor	th Little Rock, AR			DRILLING RIG: CME		TOC ELEVATION: 104	14.1 ft
CLIENT: LRS			DRILLING			WELL DEPTH COMPLETION: 81.	49 fbgs
PROJECT NAME: NA				ONTRACTOR: GTS		LOCATION:	~~ ~~
PROJECT NUMBER: 272			_			NORTHING: 11810 EASTING: 77509	
OJECT LOCATION: Thr			CAMPUNI			WATER LEVEL: 54.	
GEOLOGIST: Rok START DATE: 9/2				G METHOD: Core		WATER ELEVATION: 989	
FINISH DATE: 10,				NG DIAMETER: 3" /ELL DIAMETER: 3"		WATER LEVEL DATE: 10	
DEPTH (FT) LITHOLOGY		Sample Type	Sample Depth	Blow (i.j.) Counts	MONITORING WELL CONSTRUCTION	MONITORING WELL DESCRIPTION/ DRILLING NOTES	ELEVAT (FT)
	1	Core	55-60	86		DRILLING NOTES	
	-						98
							90
		Core	60-60	0			_
			.5_/				-
	Dolomite; tan to gray with dark						
	gray with dark gray and	Core	60.5-	31			
	brown banding,	2010	65.5				
	- 50-55 some						98
	vugs with calcite present						-
	in vugs., chert						<u> </u>
	bands up to 1"						
	from 55-60	6	65.5-	50			
	-	Core	70.5	50			
							97
	-						_
	-						
	-						
			70.5-				_
		Core	75.5	81			-
							97
	-						
	-						
	-	Core	75.5- 80.5	93			
	-		80.5				
					_		
-							
_							
_							
<u> </u>							
E STRATIFICATION LIN	ES REPRESENT APPROXIMATE						
	EN SOIL AND ROCK TYPES: A	CTUAL					

	NGINEE	RS	log of B	ORING NO	.: EB-4		SHEET NU	IMBER: 4 o
1121	9 Richardson Drive				ER: Kevin	Murphy	SURFACE ELEVATION: 1 04	44,1 ft
Noi	rth Little Rock, AR			DRILLING R			TOC ELEVATION: 104	
CLIENT: LRS	•			METHOD:			WELL DEPTH COMPLETION: 81.	
PROJECT NAME: NA							LOCATION:	17 18 95
PROJECT NUMBER: 27							NORTHING: 11810	96.52
OJECT LOCATION: Thr							EASTING: 77509	
GEOLOGIST: Rol	-		SAMPLIN	IG METHOD:	Core		WATER LEVEL: 54.	69 fbgs
START DATE: 9/2				NG DIAME			WATER ELEVATION: 989	
FINISH DATE: 10				VELL DIAME			WATER LEVEL DATE: 10	/20/20
(FT) LITHOLOGY	LITHOLOGY DESCRIPTION	Sample Type	Sample Depth	RECOVERY (in)	Blow Counts	MONITORING WELL CONSTRUCTION	MONITORING WELL DESCRIPTION/ DRILLING NOTES	ELEVATI (FT)
_								
_								
_								

	NGINEE	RS	log of b	ORING NO.	EB-5		SHEET NU/	MBER: 1 of
	9 Richardson Drive			DRILL	<u>ER: Kevi</u> n	Murphy	SURFACE ELEVATION: 989	.42 ft
No	rth Little Rock, AR			DRILLING RI		• •	TOC ELEVATION: 989	
CLIENT: LRS				METHOD:			WELL DEPTH COMPLETION: 80.3	3 fbgs
PROJECT NAME: NA				CONTRACTO	DR: GTS		LOCATION: NORTHING: 118162	22.06
PROJECT NUMBER: 27 PROJECT LOCATION: The			_				EASTING: 774465	
GEOLOGIST: Ro	-		SAMPLIN	IG METHOD:	Core		WATER LEVEL: 67.9	73 fbgs
START DATE: 10			BORI	NG DIAMET	ER: 3"		WATER ELEVATION: 921	
FINISH DATE: 10	/18/2022		N	WELL DIAMET	ER: 3"		WATER LEVEL DATE: 10/	20/202
DEPTH (FT) LITHOLOGY	LITHOLOGY DESCRIPTION	Sample Type	Sample Depth	RECOVERY (in)	Blow Counts	MONITORING WELL CONSTRUCTION	MONITORING WELL DESCRIPTION/ DRILLING NOTES	ELEVATIC (FT)
0 Rip Rap Clay Loam 5 Silty Clay 10 Clay Clay	Silty clay; overburden with minor chert Rip rap Clay loam - brown, with some coarse sand Silty Clay; Yellowish brown Clay, red, stiff with occasional chert pebbles						Sch 40 PVC Casing (grouted) 0'-16.5' bgs	990 990 985 985 980 980 980 975
		Cuttings	16.5- 20.5		68		3" Open borehole 16.5' to 80.30' bgs	 970
		Cuttings	20.5- 25.5		88			
	-							

	NGINEE	RS	log of b	ORING NO.	EB-5		SHEET NUA	ABER: 2 of
	9 Richardson Drive			DRILL	ER: Kevin	Murphy	SURFACE ELEVATION: 989	.42 ft
No	rth Little Rock, AR			DRILLING R			TOC ELEVATION: 989	.42 ft
CLIENT: LRS				METHOD:			WELL DEPTH COMPLETION: 80.3	fbgs
PROJECT NAME: NA				CONTRACT	DR: GTS		LOCATION: NORTHING: 118162	2.06
PROJECT NUMBER: 27 PROJECT LOCATION: Thr			-				EASTING: 774465	
GEOLOGIST: Rol	-		SAMPLIN	IG METHOD:	Core		WATER LEVEL: 67.9	
START DATE: 10				NG DIAMET			WATER ELEVATION: 921	
FINISH DATE: 10	/18/2022		١	Vell Diamei	ER: 3"		WATER LEVEL DATE: 10/	20/202
DEPTH (FT) LITHOLOGY	LITHOLOGY DESCRIPTION	Sample Type	Sample Depth	RECOVERY (in)	Blow Counts	MONITORING WELL CONSTRUCTION	MONITORING WELL DESCRIPTION/ DRILLING NOTES	ELEVATIO (FT)
	banding & interbedded chert.	Cuttings	25.5- 30.5		92			
		Cuttings	30.5- 35.5		50			
	Dolomite; light grey with dark grey banding;	Cuttings	35.5- 40.5		85			
	some interbedded chert beginning 40.5'	Cuttings	40.5- 45.5		80			
		Cuttings	45.5- 50.5		100			
		Cuttings	50.5- 55.5		100			
	ES REPRESENT APPROXIMATE EEN SOIL AND ROCK TYPES: A RADUAL	CTUAL						

S		NGINEE	RS	LOG OF B	ORING NO	: EB-5		SHEET NU	MBER: 3 of
		9 Richardson Drive			DRIL	LER: Kevin	Murphy	SURFACE ELEVATION: 989	9.42 ft
	Nor	th Little Rock, AR				IG: CME-		TOC ELEVATION: 989	
	CLIENT: LRS			DRILLING	METHOD:			WELL DEPTH COMPLETION: 80.3	3 fbgs
	ECT NAME: NA			DRILLING (CONTRACT	OR: GTS		LOCATION:	
	T NUMBER: 272			_				NORTHING: 118162	
		ee Brothers, AR						EASTING: 77446	
	EOLOGIST: Rot TART DATE: 10				IG METHOD:			WATER LEVEL: 67.9 WATER ELEVATION: 921	
	NISH DATE: 10				<u>NG DIAME'</u> VELL DIAME			WATER LEVEL DATE: 10	
DEPTH	LITHOLOGY	LITHOLOGY DESCRIPTION	Sample	Sample	(in)	Blow		MONITORING WELL DESCRIPTION/	ELEVATIO
(FT)			Туре	Depth 55.5-	ECC RECC	1	CONSTRUCTION	DRILLING NOTES	(FT)
			Cuttings	60.5		100			
_									
0		Dolomite; grey							
		with dark grey							
		banding. Some small vugs							
_		59-59.5'	Cuttings	60.5-		100			
_		-	coningo	65.5					
5		1							
		-							
_									
_			Cuttings	65.5-		88			
				70.5					
′0 —					-				
-									
-									
			Cuttings	70.5-		97			
_		-	·	75.5					
′5 —		-			-				
-									
		Dolomite,	Cuttings	75.5- 80.5		61			
_		Heavily		00.5					
30 —		weathered, vuggy, grey							
	<u> </u>	,099// 9.0/			-				
_									
_									
_									
35 —									
		ES REPRESENT APPROXIMATE							
SOLINDA		EN SOIL AND ROCK TYPES: A	CTUAL						

	NGINEE	RS	LOG OF B	ORING NO.	: EB-5		SHEET NU	JMBER: 4 of
	9 Richardson Drive			DRILI	ER: Kevin	Murphy	SURFACE ELEVATION: 98	9.42 ft
No	rth Little Rock, AR			DRILLING R			TOC ELEVATION: 98	
CLIENT: LRS	5			METHOD:			WELL DEPTH COMPLETION: 80.	
PROJECT NAME: NA	BORS		DRILLING (CONTRACTO	OR: GTS		LOCATION:	
PROJECT NUMBER: 27							NORTHING: 11816	
OJECT LOCATION: Thr			_				EASTING: 77446	
GEOLOGIST: Ro				G METHOD:			WATER LEVEL: 67.	-
START DATE: 10			BORI	N <mark>G DIAMET</mark> VELL DIAMET	<u>ER: 3"</u>		WATER ELEVATION: 92	
FINISH DATE: 10	/18/2022		1		Blow		WATER LEVEL DATE: 10	
(FT) LITHOLOGY	LITHOLOGY DESCRIPTION	Sample Type	Sample Depth	RECOVERY (in)	Counts	MONITORING WELL CONSTRUCTION	MONITORING WELL DESCRIPTION/ DRILLING NOTES	ELEVATIO (FT)
_								

SCS ENGINEE	R S	LOG OF B	ORING NO.	: IW-1		SHEET NU	MBER: 1 of 4
11219 Richardson Drive			ווומט	FReWayn	ie Johnson	SURFACE ELEVATION: 1 OC	51.1 ft
North Little Rock, AR			DRILLING R			TOC ELEVATION: 1 06	
CLIENT: LRS			METHOD:	,		WELL DEPTH COMPLETION: 91.	
PROJECT NAME: NABORS		DRILLING (CONTRACTO	DR: Ander	son	LOCATION:	
PROJECT NUMBER: 27222139.01		_		Engine	eering	NORTHING: 11816	
PROJECT LOCATION: Three Brothers, AR						EASTING: 77471	
GEOLOGIST: Robert Fowler START DATE: 10/20/2022			G METHOD:			WATER LEVEL: 62. WATER ELEVATION: 998	
FINISH DATE: 10/20/2022			NG DIAMET VELL DIAMET			WATER LEVEL DATE: 10	
	Sample Type	Sample Depth	RECOVERY (in)	Blow Counts		MONITORING WELL DESCRIPTION/ DRILLING NOTES	ELEVATION (FT)
0		_					1065
Silty Clay; Reddish brown to orange with gravels	-					Sch 40 PVC Casing 0'-3' bgs	1060
							1055 1050
15						4.25" Open borehole GS to 91.29' bgs	 1045
							 1040
							 1035

	NGINEE	R S	LOG OF B	ORING NO.	: IW-1		SHEET NU	MBER: 2 of 4
112	9 Richardson Drive			ווואט	FR.Wayn	e Johnson	SURFACE ELEVATION: 1 06	51.1 ft
No	rth Little Rock, AR			DRILLING R			TOC ELEVATION: 106	
CLIENT: LR	S			METHOD:	,		WELL DEPTH COMPLETION: 91.	
PROJECT NAME: NA				CONTRACTO	DR: Ander	son	LOCATION:	•
PROJECT NUMBER: 27	222139.01				Engine	eering	NORTHING: 11816	
PROJECT LOCATION: Th							EASTING: 77471	
GEOLOGIST: Ro				IG METHOD:			WATER LEVEL: 62.7	
START DATE: 1 C FINISH DATE: 1 C			BOKI	NG DIAMET WELL DIAMET	ER: 4.25"		WATER ELEVATION: 998 WATER LEVEL DATE: 10/	
TINGT DATE: TO	/ 20/ 2022		, v					20/2022
DEPTH (FT) LITHOLOGY	LITHOLOGY DESCRIPTION	Sample Type	Sample Depth	RECOVERY (in)	Blow Counts	MONITORING WELL CONSTRUCTION	MONITORING WELL DESCRIPTION/ DRILLING NOTES	ELEVATION (FT)
								1030 1030 1025 1020
45	Dolomite; less dust around 60'	Cuttings						 101 <i>5</i>
	below ground							 1010
								 1005

	INEERS	LOG OF	BORING NO.	: IW-1		SHEET NU/	MBER:3 of ∠
11219 Richa			DRILI	ER: Wavn	e Johnson	SURFACE ELEVATION: 106].] ft
North Little	Rock, AR		DRILLING R			TOC ELEVATION: 106	
CLIENT: LRS		DRILLIN	G METHOD:			WELL DEPTH COMPLETION: 91.2	
PROJECT NAME: NABORS			CONTRACTO	DR: Ander	son	LOCATION:	•
PROJECT NUMBER: 27222139.	.01			Engine	ering	NORTHING: 118162	
PROJECT LOCATION: Three Broth						EASTING: 774716	
GEOLOGIST: Robert Fow			ING METHOD:			WATER LEVEL: 62.7	
START DATE: 10/20/202	22	BO	RING DIAMET			WATER ELEVATION: 998	
FINISH DATE: 10/20/202	22		WELL DIAMET	ER: 4.25"		WATER LEVEL DATE: 10/	20/2022
DEPTH (FT) LITHOLOGY LITHOLO	OGY DESCRIPTION Sample Type	Sample Depth	RECOVERY (in)	Blow Counts	MONITORING WELL CONSTRUCTION	MONITORING WELL DESCRIPTION/ DRILLING NOTES	ELEVATION (FT)
60							1000 1000 995 990 990
							 985
							980 9
							 975

SCS ENGINEE	RS	LOG OF BO	ORING NO.	: IW-1		SHEET NU	MBER: 4 of
11219 Richardson Drive			וווסט	FD. \A/ava	ne Johnson	SURFACE ELEVATION: 1 OC	511£+
North Little Rock, AR			DRILLING R			TOC ELEVATION: 1 06	
CLIENT: LRS			METHOD:	<u>io:::::/</u> u		WELL DEPTH COMPLETION: 91.	
PROJECT NAME: NABORS		DRILLING C		DR: Ander	son	LOCATION:	Ŭ
PROJECT NUMBER: 27222139.01				Engine	eering	NORTHING: 11816	
OJECT LOCATION: Three Brothers, AR						EASTING: 77471	
GEOLOGIST: Robert Fowler			G METHOD:			WATER LEVEL: 62.	
START DATE: 10/20/2022			NG DIAMET			WATER ELEVATION: 998	
FINISH DATE: 10/20/2022		V	VELL DIAMET	EK: 4.20		WATER LEVEL DATE: 10	/20/202
DEPTH (FT) LITHOLOGY LITHOLOGY DESCRIPTION	Sample Type	Sample Depth	RECOVERY (in)	Blow Counts	MONITORING WELL CONSTRUCTION	MONITORING WELL DESCRIPTION/ DRILLING NOTES	ELEVATIC (FT)
							 970
							77

TRANSITIONS MAY BE GRADUAL