



MEMORANDUM

Missouri Department of Transportation Construction - Materials Central Laboratory

TO: Richard Bennett-co/mt

CC/ATT: Gary Goessmann-sw/ma

FROM: Alan Miller
Geotechnical Engineer

DATE: January 13, 2016

SUBJECT: Materials
Geotechnical Section
Foundation Investigation for
Structure No. Lt2363
Branson Radio Tower
Job No. R35G
Route 248, Taney County

Attached are logs of geotechnical borings performed for the above referenced structure located on Route 248 in Taney County, Missouri. Also included are aerial photos of boring locations as Figures 1 and 2.

The values in the following table may be used for the design of the radio tower foundations.

Table 1

Boring	Elev., ft. From - To	LPile Soil Class.	Effective Unit Wt., pcf	Allowable Skin Friction, tsf	Allowable End Bearing, tsf	Internal Friction Angle, ϕ°	Undrained Shear Strength S_u , psf	Strain ϵ_{50}	Lateral Subgrade Modulus, k_f
T-15-54	1417.3 - 1414.0	Ignore ¹	--	--	--	--	--	--	--
	1114.0 - 1110.0	Hard Clay	121	0.4	4.0	--	4000	0.004	1350
	1110.0 - 1380.0	Hard Clay	122	0.6	6.00	--	6000	0.004	2000

¹ The fill material (the upper 3 feet) is ignored due to frost depth

cs
j:\sublec\alan\lt2363 taney radio tower ltr.doc
Attachments

**Missouri Department of Transportation
Construction and Materials**

BORING NO. T-15-54
Page 1 of 2

Job No.: R35G Lt2363
 Design: Lt2363
 Bent: _____
 Station: _____
 Offset: _____
 Elevation: 1417.3
 Requested Station: _____
 Requested Offset: _____
 Requested Elevation: _____
 Drill No.: G-9577

County: Taney
 Skew: _____
 Logged By: Kevin Moore
 Northing: 333233.4
 Easting: 1412741.6
 Requested Northing: _____
 Requested Easting: _____
 Equipment: CME 45 Split-Spoon Sampler, NX
 Location Note: _____
 Hammer Efficiency: 79%

Route: 248
 Location: Branson
 Operator: Kenny Mathews
 Date of Work: 12/22/15-12/22/15
 Depth to Water: _____
 Depth Hole Open: _____
 Time Change: _____
 Drilling Method: Hollow Stem Auger

Depth (ft)	Graphic	Description	Elevation (ft)	Sample Type	REC % (RQD %)	Blow Counts (N ₆₀)	Shear Data	Field Tests	Index Tests		
0											
5		0.0-23.0' Brownish red to reddish brown, FAT CLAY with rock fragments, very stiff to very hard, moist	1415		67	2-5-7 (17)		PP = 3.00 tsf	MC = 34.7% γ _{sat} = 117 pcf ⁽¹⁾		
			1410		93	3-7-11 (25)		PP = 4.00 tsf	MC = 29.4% γ _{sat} = 121 pcf ⁽¹⁾ LL = 70 PL = 31		
10				1405		100	12-26-36 (87)		PP = 9.00 tsf	MC = 18.3% γ _{sat} = 132 pcf ⁽¹⁾	
					1405		103	36/0.5', 10/0'		MC = 19.3% γ _{sat} = 131 pcf ⁽¹⁾	
15					1400		93	9-21-24 (63)		PP = 9.00 tsf	MC = 27.6% γ _{sat} = 122 pcf ⁽¹⁾ LL = 79 PL = 35
					1400		80	17-19-19 (53)		PP = 8.00 tsf	MC = 42.0% γ _{sat} = 112 pcf ⁽¹⁾
20					1395		100	6-16-24 (56)		PP = 8.00 tsf	MC = 44.2% γ _{sat} = 110 pcf ⁽¹⁾
					1395		93	8-16-24 (56)		PP = 6.00 tsf	MC = 33.4% γ _{sat} = 118 pcf ⁽¹⁾
25				23.0-23.5' Cherty Limestone, light greenish gray and light gray, medium bedded, moderately hard, moderately weathered to highly weathered, fine grained, "Cap rock"	1390		101	11-36/0.5', 10/0'		PP = 6.00 tsf	MC = 39.4% γ _{sat} = 113 pcf ⁽¹⁾
				23.0-141.5' Switch from HSA to roll-cone drilling.							
30		23.5-41.5' Reddish brown, FAT CLAY scattered rock fragments, very stiff to very hard, moist to dry, Highly weathered limestone and chert rock fragments.	1385		34 (0)						
			1385		93	13-36/0.3', 10/0'		PP = 5.00 tsf	MC = 35.7% γ _{sat} = 116 pcf ⁽¹⁾		
35											

LETTER BOREHOLE - MODOOT 20150728.GDT - 1/13/16 12:35 - J:\SG\GINT\PROJECT FILES\R35G_LT2363.GPJ

N₆₀ = (Em/60)Nm N₆₀ - Corrected N value for standard 60% SPT efficiency; Em - Measured hammer efficiency in percent; Nm - Observed N-value
 (1) = Assumed, (2) = Actual

Coordinate System: U.S. State Plane 1983 Coordinate Zone: Missouri Central Coordinate Proj. Factor: 1.00000
 Coordinate Datum: NAD 83 (CONUS) Coordinate Units: U.S. Survey Feet

* Persons using this information are cautioned that the materials shown are determined by the equipment noted and accuracy of the "log of materials" is limited thereby and by judgement of the operator. THIS INFORMATION IS FOR DESIGN PURPOSES ONLY.

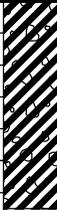
**Missouri Department of Transportation
Construction and Materials**

BORING NO. T-15-54
Page 2 of 2

Job No.: R35G Lt2363
 Design: Lt2363
 Bent: _____
 Station: _____
 Offset: _____
 Elevation: 1417.3
 Requested Station: _____
 Requested Offset: _____
 Requested Elevation: _____
 Drill No.: G-9577

County: Taney
 Skew: _____
 Logged By: Kevin Moore
 Northing: 333233.4
 Easting: 1412741.6
 Requested Northing: _____
 Requested Easting: _____
 Equipment: CME 45 Split-Spoon Sampler, NX
 Location Note: _____
 Hammer Efficiency: 79%

Route: 248
 Location: Branson
 Operator: Kenny Mathews
 Date of Work: 12/22/15-12/22/15
 Depth to Water: _____
 Depth Hole Open: _____
 Time Change: _____
 Drilling Method: Hollow Stem Auger

Depth (ft)	Graphic	Description	Elevation (ft)	Sample Type	REC % (RQD %)	Blow Counts (N ₆₀)	Shear Data	Field Tests	Index Tests
35		23.5-41.5' Reddish brown, FAT CLAY scattered rock fragments, very stiff to very hard, moist to dry, Highly weathered limestone and chert rock fragments. (continued)	1380	X	100	7-36-26 (87)			
40				X	67	7-13-13 (36)			
			Bottom of borehole at 41.5 feet.						

LETTER BOREHOLE - MODOT 20150728.GDT - 1/13/16 12:35 - J:\SG\GINT\PROJECT FILES\R35G_LT2363.GPJ

N₆₀ = (Em/60)Nm N₆₀ - Corrected N value for standard 60% SPT efficiency; Em - Measured hammer efficiency in percent; Nm - Observed N-value
 (1) = Assumed, (2) = Actual

Coordinate System: U.S. State Plane 1983 **Coordinate Zone:** Missouri Central **Coordinate Proj. Factor:** 1.00000
Coordinate Datum: NAD 83 (CONUS) **Coordinate Units:** U.S. Survey Feet

* Persons using this information are cautioned that the materials shown are determined by the equipment noted and accuracy of the "log of materials" is limited thereby and by judgement of the operator. THIS INFORMATION IS FOR DESIGN PURPOSES ONLY.



Missouri Department of Transportation
 1617 Mo. Blvd.
 Jefferson City, Mo. 65109

KEY TO SYMBOLS

CLIENT _____

PROJECT NAME Branson Radio Tower

PROJECT NUMBER R35G Lt2363

PROJECT LOCATION Branson

LITHOLOGIC SYMBOLS (Unified Soil Classification System)

 CHG: USCS High Plasticity Gravelly Clay

 LIMESTONE: Limestone

SAMPLER SYMBOLS

 Rock Core Barrel

 Split-Spoon Sampler

WELL CONSTRUCTION SYMBOLS

ABBREVIATIONS

LL - LIQUID LIMIT (%)
 PI - PLASTIC INDEX (%)
 W - MOISTURE CONTENT (%)
 DD - DRY DENSITY (PCF)
 NP - NON PLASTIC
 -200 - PERCENT PASSING NO. 200 SIEVE
 PP - POCKET PENETROMETER (TSF)
 Qu - UNCONFINED COMPRESSIVE STRENGTH (PSF)

TV - TORVANE
 PID - PHOTOIONIZATION DETECTOR
 UC - UNCONFINED COMPRESSION
 ppm - PARTS PER MILLION

 Water Level at Time of Drilling

 Water Level at End of Drilling

 Water Level after Drilling

Figure 1: Boring Location
Job No.R35G
Structure No. Lt2363
Branson Radio Tower
Taney County, Missouri



Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure 2: Tower Site Location
Job No. R35G
Structure No. Lt2363
Branson Radio Tower
Taney County, Missouri

