



Original Report Date: 12/23/2019 Proposed SN: 083-0071 Route: F.A.P. 776
 Revised Date: 1/27/2020 Existing SN: 083-0032 Section: 124B-2
 Geotechnical Engineer: BBS Foundation & Geotech Unit Bill Kramer County: Saline
 Structural Engineer: BBS Planning Nephtali Rivera-Martinez Contract: 78151

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): The anticipated structure type is a single span steel beam superstructure with integral abutments supported by steel H-piles driven to bedrock. The estimated factored loading is reported to be 1225 kips/abutment which if a pile is placed under each beam, it would require a nominal required bearing of 372 kips/pile.

Discuss the existing boring data, existing plans foundation information, new subsurface exploration and need for any additional exploration to be provided with SGR Technical Memo (attach all data and subsurface profile plot): Two borings were taken by the district which both extended to bedrock which was encountered around 45' below the bottom of the abutments. One core was taken which provided a minimum of 52% RQD which is typical. At our request, a sample was tested to determine the Unconfined Compressive Strength which was 572 tsf.

Provide the location and maximum height of any new soil fill or magnitude of footing bearing pressure. Estimate the amount and time of the expected settlement. Indicate if further testing, analysis, and/or ground improvement/treatment is necessary: With the new grade raise expected to be less than a foot, this new load is not enough to cause any settlement given the highest moisture content is 28%, we would not expect any settlement at this location.

Identify any new cuts or fill slope angles and heights. Estimate the factor of safety against slope failure. Indicate if further testing, analysis or ground improvement/treatment is necessary: The slopes are going to be cut back at a 2:1 with no sign of existing side slope instability. Given strong soil strengths and only a very small raise grade raise, we believe the factor of safety against slope instability is well above the minimum required for a cut slope.

Indicate at each substructure, the 100-year and 200-year total scour depths in the Hydraulics report, the non-granular scour depth reduction, the proposed ground surface, and the recommended foundation design scour elevations: Since both abutment end slopes are protected by rip rap, no scour losses have been taken into account so the scour elevations would be the bottom of abutment elevation which is 363.45'.

Determining the seismic soil site class, the seismic performance zone, the 0.2 and 1.0 second design spectral accelerations and indicate if that the soils are liquefiable: Soil Site Class is "D", the Seismic performance zone is "3", and the SD1 & SDS is equal to 0.327g and 0.766g respectively. Liquefaction is not a concern at this location due to the consistently cohesive nature of the soils at the site.

Confirm feasibility of the proposed foundation or wall type and provide design parameters. Attach a pile design table indicating feasible pile types, various nominal required bearings, factored resistances available and corresponding estimated lengths at locations where piles will be used. Provide factored bearing resistance and unit sliding resistance at various elevations and confirm no ground improvement/treatment is necessary where spread footings are proposed. Estimated top of rock elevations as well as preliminary factored unit side and tip resistance values shall be indicated when drilled shafts are proposed: We recommend using H-Piles to support the proposed abutments. H piles are preferred in high seismic areas such as this although Metal shell piles are also feasible for lower factored pile loadings. Specifying Metal Shells with larger bearings would run the risk of running long and being damaged if they encounter bedrock. Metal Shells would also require the use of a test pile. The consistent top of rock elevations allows us to avoid using a test pile if H-Piles are used by estimating the pile length conservatively long to avoid splicing. Please see the attached table for a list of Nominal Required Bearings, Factored Resistances Available and the corresponding Estimated Pile Lengths. The piles used at this location must be fitted with a metal shoe or pile point.

Calculate the estimated water surface elevation and determine the need for cofferdams (type 1 or 2), and seal coat: The estimated water surface elevation was calculated to be equal to 363.45'. No cofferdams or seal coats will be required.

Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns: The structure will be stage constructed and the stage one removal of the existing closed abutment stem will require Temporary Sheet Piling which is found to be feasible. The first sheet should be connected to the existing abutment stem to help promote sheeting stability due to the footing preventing sheeting penetration.

Pile Design Table

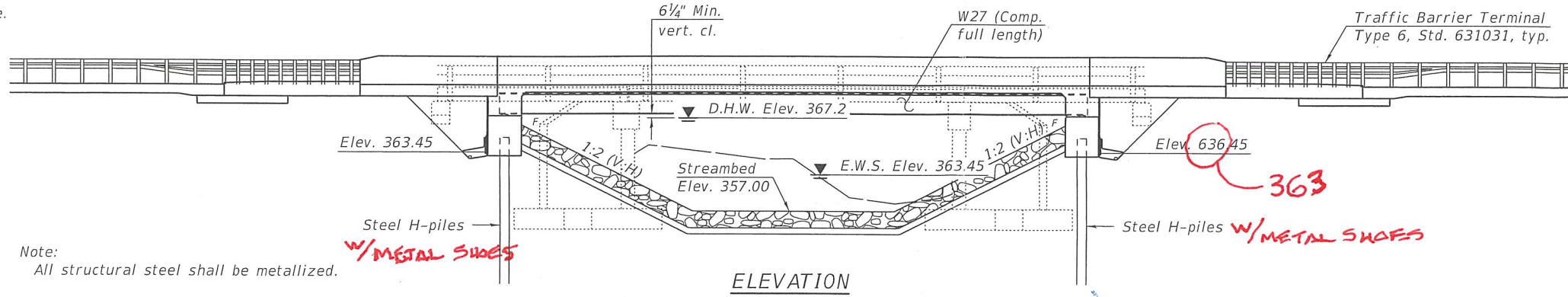
	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 8 X 36	286	157	51
Steel HP 10 X 42	335	184	51
Steel HP 10 X 57	454	250	52
Steel HP 12 X 53	418	230	52
Steel HP 12 X 63	497	273	52
Steel HP 12 X 74	589	324	53
Steel HP 12 X 84	664	365	54
Steel HP 14 X 73	578	318	54
Steel HP 14 X 89	705	388	54
Steel HP 14 X 102	810	445	55
Steel HP 14 X 117	929	511	55
Metal Shell 12"Φ w/.25" walls	194	107	30
	211	116	32
	224	123	35
Metal Shell 14"Φ w/.25" walls	190	104	25
	215	119	27
	231	127	30
	251	138	32
	264	145	35
Metal Shell 14"Φ w/.312" walls	190	104	25
	215	119	27
	231	127	30
	251	138	32
	264	145	35
Metal Shell 16"Φ w/.312" walls	191	105	22
	223	123	25
	253	139	27
	269	148	30
	292	161	32
	306	168	35

Benchmark: BM 505: Chis "C" on the Northeast corner of wingwall of SN 083-0032 at Sta. 14+83, 18' right, Elev. 368.794.

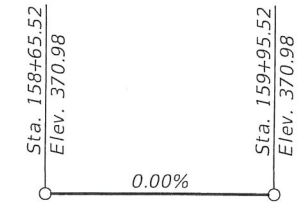
Existing Structure: Structure number 083-0032 was originally constructed in 1928 under SBI 142, Section 124ABC. In 1983, the structure was reconstructed under FA Route 776, Section 124 BC-DR-1, consisting of substructure widening, superstructure replacement, approach replacement, waterproofing, and overlay. The superstructure consists of a single span, 11'-36" wide, 17" PPC deck beams on closed abutments with shallow foundation spread footings. The structure is 38'-0" back-to-back of abutments, no skew, and has a 33'-8" out-to-out bridge width. The structure will be replaced utilizing stage construction.

No salvage.

Draft



Note: All structural steel shall be metallized.



PROFILE GRADE
(Along C/L Rte. 142)

DESIGN SPECIFICATIONS
2017 AASHTO LRFD Bridge Design Specifications, 8th Edition

DESIGN STRESSES

FIELD UNITS
f'c = 3,500 psi (Concrete)
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)

HIGHWAY CLASSIFICATION

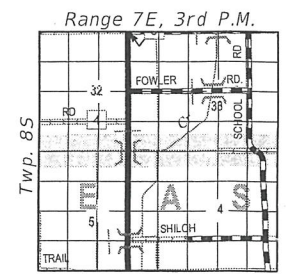
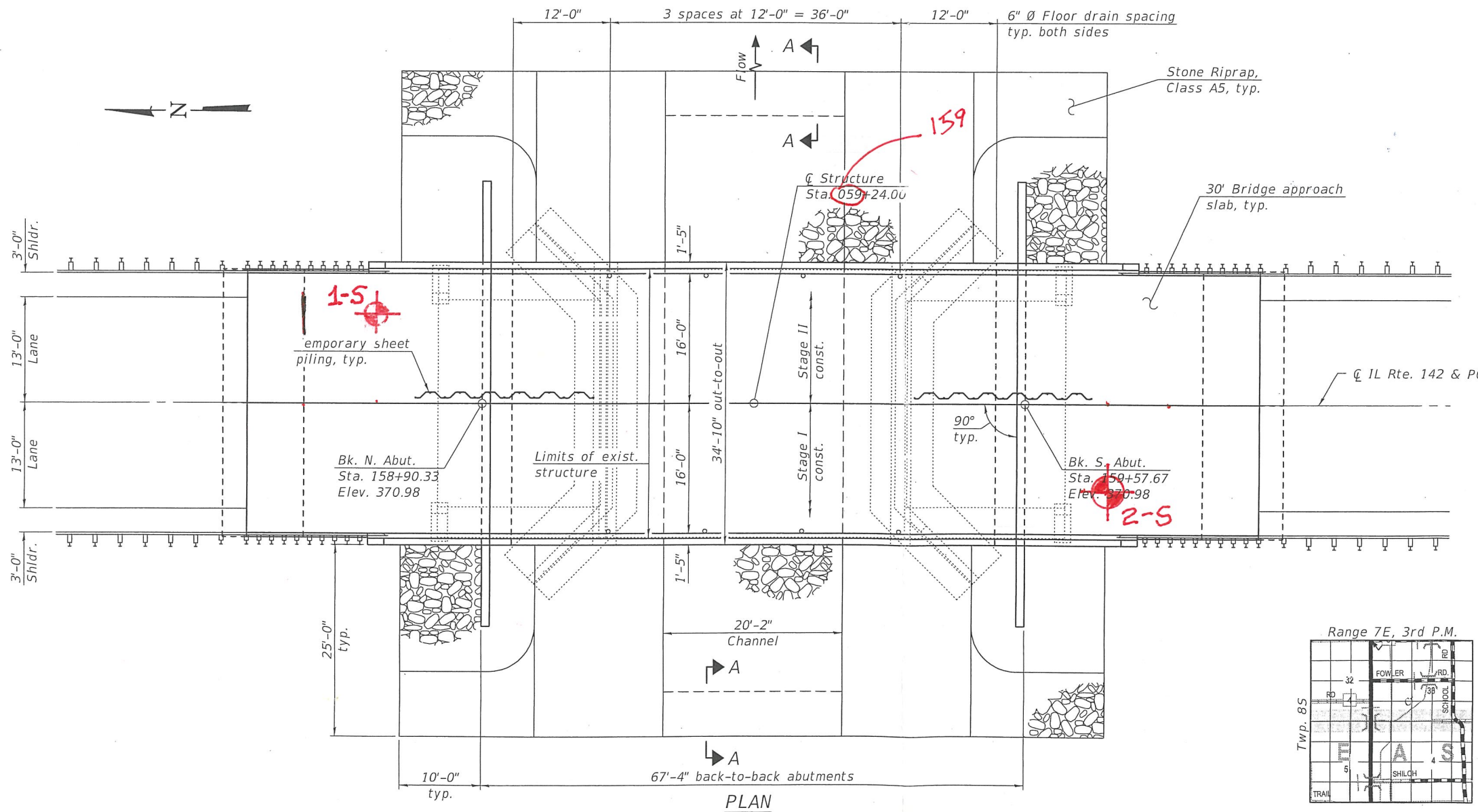
F.A.P. Rte. 776 - IL Rte. 142
Functional Class: Minor Arterial (Non-Urban)
ADT: 2,050 (2017); 2,600 (2041)
ADTT: 304 (2017); 385 (2041)
DHV: 235 (2041)
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
Two-Way Traffic
Directional Distribution: 50:50

LOADING HL-93

Allow 50#/sq. ft. for future wearing surface.

SEISMIC DATA

Seismic Performance Zone (SPZ) = 3
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.324
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.766
Soil Site Class = D



LOCATION SKETCH

GENERAL PLAN & ELEVATION
ILLINOIS RTE. 142 OVER INDIAN CREEK
F.A.P. RTE. 776 - SEC. 124B-2
SALINE COUNTY
STATION 159+24.00
STRUCTURE NO. 083-0071

MODEL: 0830071-78151-TSL-001
FILE NAME: pw:\planroom\dot.illinois.gov\PWIDOT\Documents\Bureau of Bridges and Structures\Projects\0830071\CADD Plans\0830071-78151.dgn

DESIGNED -	NEPHTALI RIVERA-MARTINEZ
CHECKED -	NICHOLAS R. BARNETT
DRAWN -	MICHAEL B. MOSSMAN
CHECKED -	N.R. / N.R.B.

10/25/2019 1:12:09 PM

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SH. N
776	124B-2	SALINE	2	1

CONTRACT NO. 781
ILLINOIS FED. AID PROJECT



Illinois Department of Transportation

Memorandum

To: Carrie Nelsen Attn: Dave Piche
From: Greg Smothers ^{GSS} By: Rob Graeff
Subject: *Boring Logs & Liquefaction Analysis
Date: May 25, 2010

**FAP 776 (IL 142) over Indian Creek
Structure 083-0032(E)
Saline County**

Foundation boring logs have been obtained for the above listed structure and are attached.

Liquefaction Analysis

Liquefaction calculations indicate no liquefiable soils at this structure location.

Slope Stability

At the time of this report, a preliminary TSL is not available. Therefore, we are unable to provide any slope stability calculations for the proposed endslope configuration. This office should be contacted to complete the slope stability calculations when a proposed endslope configuration is determined.

Structure Geotechnical Report

Due to a current shortage of staffing, the District Nine Geotechnical Unit is unable to complete the required Structure Geotechnical Report. Any additional foundation recommendations should be evaluated by a competent consultant.

Miscellaneous

During drilling, we discovered a very hard, dense, grey Igneous formation. After consultation with a Geologist from the Illinois State Geological Survey, the formation was determined to be a Ultramafic Lamprophyre (Alnoite). This very dense material may require the use of metal shoes during the pile driving operations on this structure.

Attachments
RG:rg

cc: Soils File

**ILLINOIS DEPARTMENT OF TRANSPORTATION
District Nine Materials**

Bridge Foundation
Boring Log

Sheet 1 of 2

FAP 776 (IL 142) Over Indian Creek

Route: FAP 776 (IL 142) Structure Number: 083-0032

Date: 4/29/2010

Section: 124B

Bored By: R Moberly

County: Saline

Location: 3 mi North of Eldorado

Checked By: R Graeff

Boring No 1-S	Station	Offset	Ground Surface	DEPTH	BLOWS	Qu tsf	W%	Surf Wat Elev:	DEPTH	BLOWS	Qu tsf	W%
								358.4				
			370.6Ft									
			369.1					Very stiff, moist, brown and grey, Clay A7-6		8 13	3.5S	20
								343.6				
					1			Hard, damp, brown, Clay A7-6		4		
					2	1.5B	22			11	4.4S	22
					2					18		
				5.0	1				30.0	4		
					2	1.3B	28			10	4.2S	22
					2					15		
			363.6					338.6				
					1			Very stiff, moist, brown, Clay A7-6		3		
					2	0.9B	25			7	3.3S	20
					2					12		
			361.1					336.1				
				10.0	1			Hard, moist, brown to grey, Clay A7-6	35.0	3		
					1	0.8B	26			9	5.0B	21
					2					15		
			358.6					333.6				
					1			Very stiff, moist, grey brown, Clay A7-6		4		
					3	1.5B	23			9	3.3B	24
					5					14		
			356.1					331.1				
				15.0	2			Stiff, moist, grey, Clay A7-6	40.0	2		
					4	2.3B	19			4	1.5B	26
					6					6		
					2							
					5	2.9B	22					
					6							
			351.1					326.1				
				20.0	2			Very stiff, moist, grey, Clay A7-6	45.0	2		
					6	4.2S	21			6	2.1B	28
					9					10		
					3							
					8	5.6B	21					
					12							
			346.1					321.1				
				25.0	3				50.0	4		

BOTTOM OF ABUT.

N-Std Penetr Test: 2" OD Sampler, 140# Hammer, 30" Fall (Type Fail. B-Bulge S-Shear E-Estimated P-Penetrometer)

Route: MAP 776 (IL 142)
 Section: 124B
 County: Saline

Boring No: 1-S

Station: 158+78

Offset: 11' Lt CL

Ground Surface: 370.6Ft

	DEPTH	BLOWS	Qu tsf	W%	DEPTH	BLOWS	Qu tsf	W%
Soft, very moist, bluish grey, Loam A-4	11 15		0.4S	30				
	317.6							
Very dense, dry, bluish grey, Ultramafic Lamprophyre	316.1							
	55.0	100/1"			80.0			
Cored 54.6 to 59.6 feet								
72% Rec; 52% RQD								
Very dense, dry, bluish grey, Ultramafic Lamprophyre	311.1							
	60.0				85.0			
Cored 59.6 to 64.6 feet								
94% Rec; 75% RQD								
Very dense, dry, bluish grey, Ultramafic Lamprophyre	306.1							
	65.0				90.0			
Bottom of hole = 64.6 feet								
Free water observed at 49.5 feet								
Elevation referenced to BM @ NE wingwall; Elev. = 368.8 feet								
To convert "N" values to "N60" multiply by 1.25	70.0				95.0			
	75.0				100.0			

N-Std Penetr Test: 2" OD Sampler, 140# Hammer, 30" Fall (Type Fail. B-Bulge S-Shear E-Estimated P-Penetrometer)

**ILLINOIS DEPARTMENT OF TRANSPORTATION
District Nine Materials**

Bridge Foundation
Boring Log
Sheet 1 of 2

FAP 776 (IL 142) Over Indian Creek

Route: FAP 776 (IL 142) Structure Number: 083-0032

Date: 4/30/2010

Section: 124B

Bored By: R Moberly

County: Saline

Location: 3 mi North of Eldorado

Checked By: R Graeff

Boring No 2-S

Station 159+68

Offset 11' Rt CL

Ground Surface 370.5 Ft

Surf Wat Elev: 358.4
Ground Water Elevation when Drilling 353.5
At Completion _____
At: _____ Hrs: _____

Description	DEPTH	BLOW S	Qu tsf	W%	Remarks	DEPTH	BLOW S	Qu tsf	W%
Asphalt and concrete over crushed aggregate					Very stiff to hard, damp to moist, brown streaked grey, Clay A7-6		10	3.1S	26
369.0							15		
Stiff, moist, brown, Clay to Silty Clay A7-6		1					3		
		2	1.6B	19			9	2.8S	24
		2					14		
366.0									
Medium to soft, very moist, brown, Clay to Silty Clay A7-6	5.0	1				30.0	3		
		1	0.5B	23			9	3.3S	22
		1					14		
363.5									
Soft, very moist, grey, Silty Clay A7-6		WH					4		
		WH	0.3B	26			9	3.5B	22
		WH					15		
361.0									
Stiff, moist, grey mottled brown, Clay A7-6	10.0	WH				35.0	3		
		1	1.1B	24			7	2.7S	24
		2					10		
358.5									
Very stiff, moist, grey mottled brown, Clay A7-6		1					3		
		2	2.1B	22			8	2.7B	23
		4					12		
	15.0	2				40.0	2		
		4	2.7B	19			7	2.1S	25
		8					10		
353.5									
Medium, very moist, brown, Sand Loam A-4		2							
		6	0.8S	26					
		9							
350.5	20.0	2				45.0	1		
Very stiff, moist, brown and grey, Clay A7-6		2	2.1B	20			4	2.3B	18
		3					6		
348.5									
Very stiff to hard, damp to moist, brown streaked grey, Clay A7-6		3							
		9	4.6B	20					
		14							
	25.0	4				320.5	50.0	7	

BOTTOM OF ABUT.

N-Std Penetr Test: 2" OD Sampler, 140# Hammer, 30" Fall (Type Fail. B-Bulge S-Shear E-Estimated P-Penetrometer)

Route: TAP 776 (IL 142)

Section: 124B

County: Saline

Boring No: 2-S

Station: 159+68

Offset: 11' Rt CL

Ground Surface: 370.5 Ft

	DEPTH	BLOWS	Qu tsf	W%		DEPTH	BLOWS	Qu tsf	W%
Hard, damp, grey, weathered Clay Shale		18							
		30							
318.5									
Very dense, dry, bluish grey, Ultramafic Lamprophyre		100/1"							
317.5									
Bottom of hole = 52.1 feet									
	55.0					80.0			
Free water encountered at 17.0 ft									
Elevation referenced to BM @ NE wingwall; Elev. = 368.8 feet									
To convert "N" values to "N60" multiply by 1.25									
	60.0					85.0			
	65.0					90.0			
	70.0					95.0			
	75.0					100.0			

Illinois Department of Transportation
District Nine Materials
Unconfined Compressive Strength

FAP 776 (IL 142)
Structure 083-0032 (Boring 1-S)
Saline County



Boring #	Specimen#	Depth	Unconfined Compression
1-S	1	53'0" – 64'6"	7949 psi.
1-S	2	No Test - Sample too small	