Illinois Department of Transportation

Abbreviated Structure Geotechnical Report

Original Report Date: 2-26-2018	**Proposed SN:** 010-0294	**Route:**	FAU 7110 (Bradley Avenue)
Revised Date: 4-17-2018	**Existing SN:** 010-0174	**Section:**	10-33BR
Geotechnical Engineer: Terry McCleary of McCleary Engineering		**County:**	Champaign
Structural Engineer: Mike Cummins of Cummins Engineering		**Contract:**	70A61

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): The proposed overhead structure will carry two 11 ft. driving lanes, two 6 ft. sidewalks, and two 6 ft. bike lanes on Bradley Avenue over Interstate 57. A two span structure is proposed, 250.00 ft. in total length from back to back of abutments. The superstructure will be an 8 inch concrete slab deck supported by 44 inch plate girders on integral abutments supported by piling and a footing supported pier on piling, with an approximately 22 degree skew. The factored loadings are estimated to be 1,260 kips at the east and west abutments and 3,640 kips at the pier. The pier foundation width is estimated to be near 51.84 ft. Please refer to the TSL drawing for a more accurate picture of what is to be constructed.

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): The existing structure plans show piling supported abutments and spread footings for the three piers, which would be typical of the time of construction and area. There were 3 recorded borings from 1958. These borings were all about 30 ft. deep; the deepest ended at elevation 711.00 ft. The 1958 borings showed a predominance of silty clays, silty clay loams, clay tills, and silty clay loam tills. They also reporteded the approximate elevation the hard tills were found in the lower to mid 730 elevations. We felt more comfortable using the information from the March 2016 borings in our analyses; the 1958 borings reported blow counts and Qu's significantly higher than the 2016 borings. This may be a result of the changes in modern sampling and testing. The 1958 data is on the attached General Plan and Elevation Sheet for the old structure.

Three current borings were taken for the proposed structure on 3-7-16 and 3-8-16, one at the center pier and one at each abutment. None of the borings found bedrock--all 3 borings were advanced to an elevation between 665 and 672 ft., where the materials had become hard Silty Clay Loam Till or hard Clay Loam Till, with blow counts at or beyond 50 per foot. The abutment borings were advanced 90 ft. deep, the pier boring was advanced 76.5 ft. deep.

The borings at the abutments (SB-1 and SB-3) were drilled through about 25 ft. of existing fill which was constructed of stiff to very stiff silty clay fills and silty clay till fills, and the center pier boring (SB-2) went through about 6 ft. of stiff silty clay fill. The Qu's of this fill material ranged from 0.8 tsf to 5.0 tsf. Below the top fill materials, all three borings had about 60 ft. of various layers of stiff to very stiff Silty Clays, Silty Clay Loams, and Silty Clay Loam Tills. SB-1 reported a 2 ft. layer of medium dense coarse sand, a 9 ft. layer of medium dense to dense silty sand, and a 7.5 ft. layer of dense Sand and Gravel. SB-2 had a 1.5 ft. layer of medium dense Silt. SB-3 had a 1.5 ft. layer of Clayey Sand and Gravel.

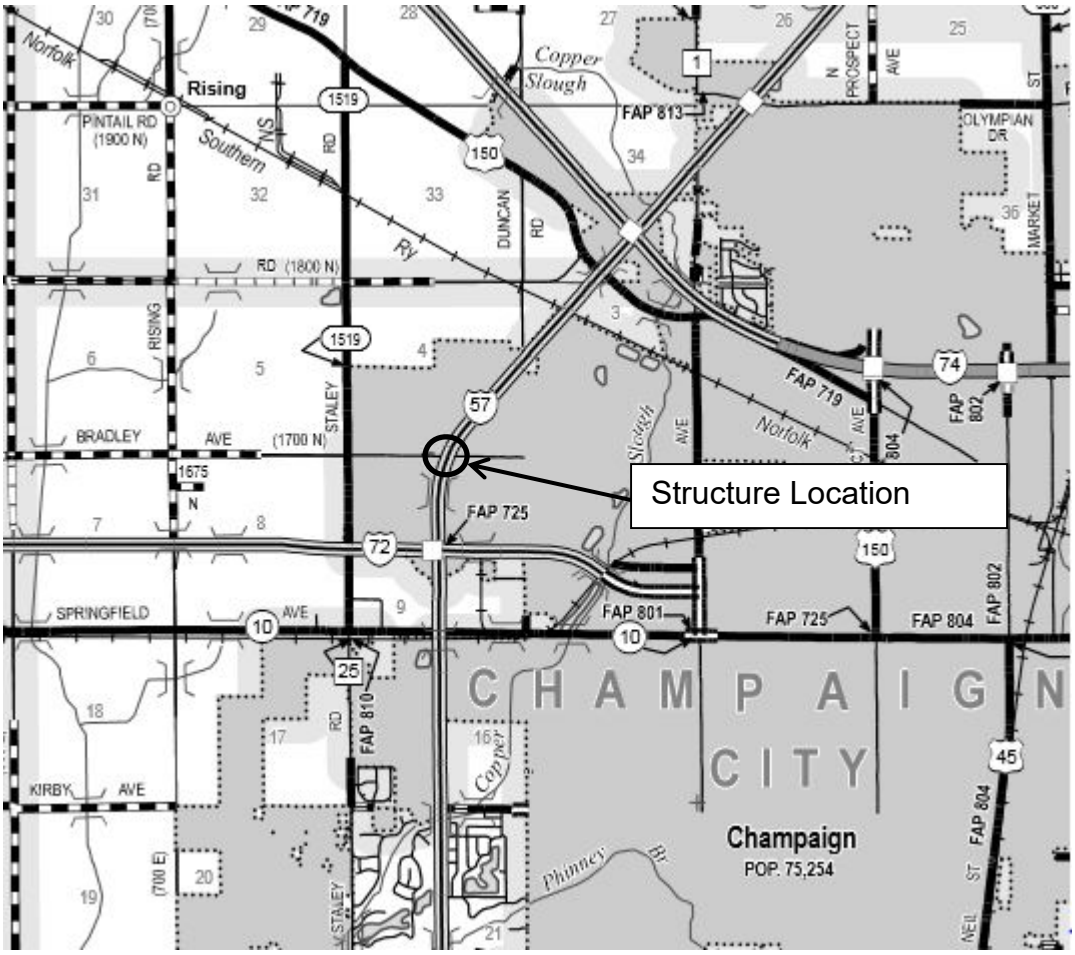
The groundwater elevation upon completion in SB-1 was 691.8 ft., there was no groundwater encountered in SB-2, and the groundwater at SB-3 was first encountered at 706.9, but not measured at completion.

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: Using the cross section at sta. 24+60 the grade will be raised a little over 1 ft. and new fill will be required at the far edges of the bridge cone to allow for the bridge cone widening. Minimal, 0.03 inches of settlement (see spreadsheet) is expected to occur from raising the grade. There will be approximately 15 ft. of widening per side. There will be fill added for new side slopes (2:1 slopes, and benching with a 15 ft. shelf and an 9 ft. fill thickness were assumed for settlement analysis, also see the slope stability analysis drawing for further details) to both sides of the existing bridge cone to construct widening for the sidewalks and bike paths. Using this standard construction procedure to bench this new embankment into the existing embankment, settlement of 0.18 inches is expected. Because of the large overturning moments, the design team has focused on a pile supported foundation at the pier, however the factored resistance for a spread footing option was calculated to be 6200 psf. using a factor of 0.5 (see attached spreadsheet). No further testing, analysis, and/or ground improvement/treatment is necessary.

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: Fifteen feet of cohesive fill widening per side with a 2:1 sideslope was added to allow for the addition of a sidewalk and bike path. The analysis for a short term (undrained) condition yields a factor of safety of 3.87. See the attached analysis for more information.
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: N/A
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: This site is in a seismic performance zone, SPZ=1 and has a seismic soil site class of "C", an SDs = 0.177 and an SD1=0.096. Because of the SPZ=1, a liquefaction analysis was not performed.
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: See attached discussion of pile length analysis and estimated pile resistance tables. Also attached is the Integral Abutment Feasibility spreadsheet that shows the soils are too stiff for the use of integral abutments without treatment. A table of soil parameters is attached to be used in a lateral load analysis.
Calculate the estimated water surface elevation and determine the need for cofferdams (type 1 or 2), and seal coat: N/A
Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns: Bradley Avenue will be closed for the duration of bridge construction, therefore, we do not see a need for temporary sheeting on Bradley Ave. to maintain traffic. However, there may be a need to temporarily retain soil during the construction of the pier on Interstate 57. Since the blow counts per foot were all less than 20 in the soils above an elevation of 680 ft., the author sees no problems driving temporary sheet piling.

Prepared by McCleary Engineering
Terry McCleary
Terry@McClearyEngineering.com
Office Phone 815-780-8486

LOCATION MAP



Existing SN 010-0174

Proposed SN 010-0294

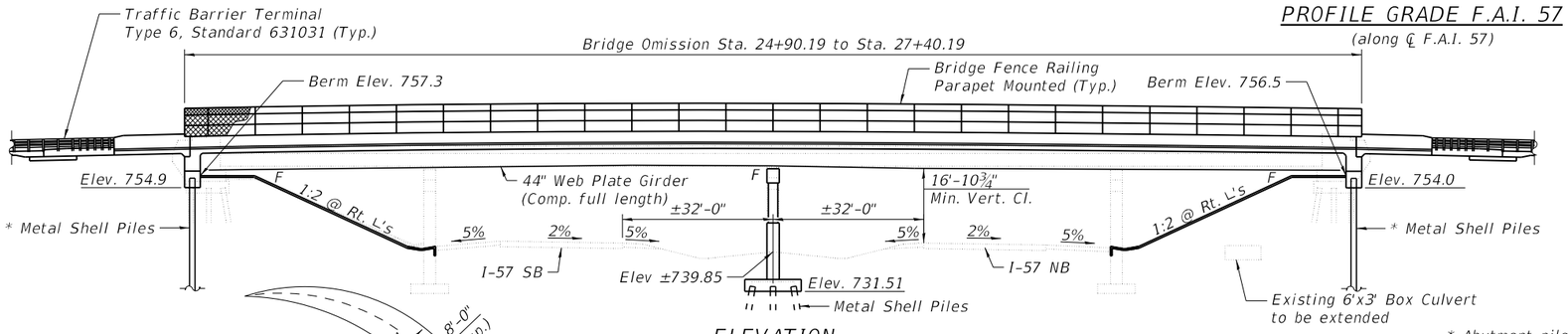
Bradley Avenue over I-57

Champaign

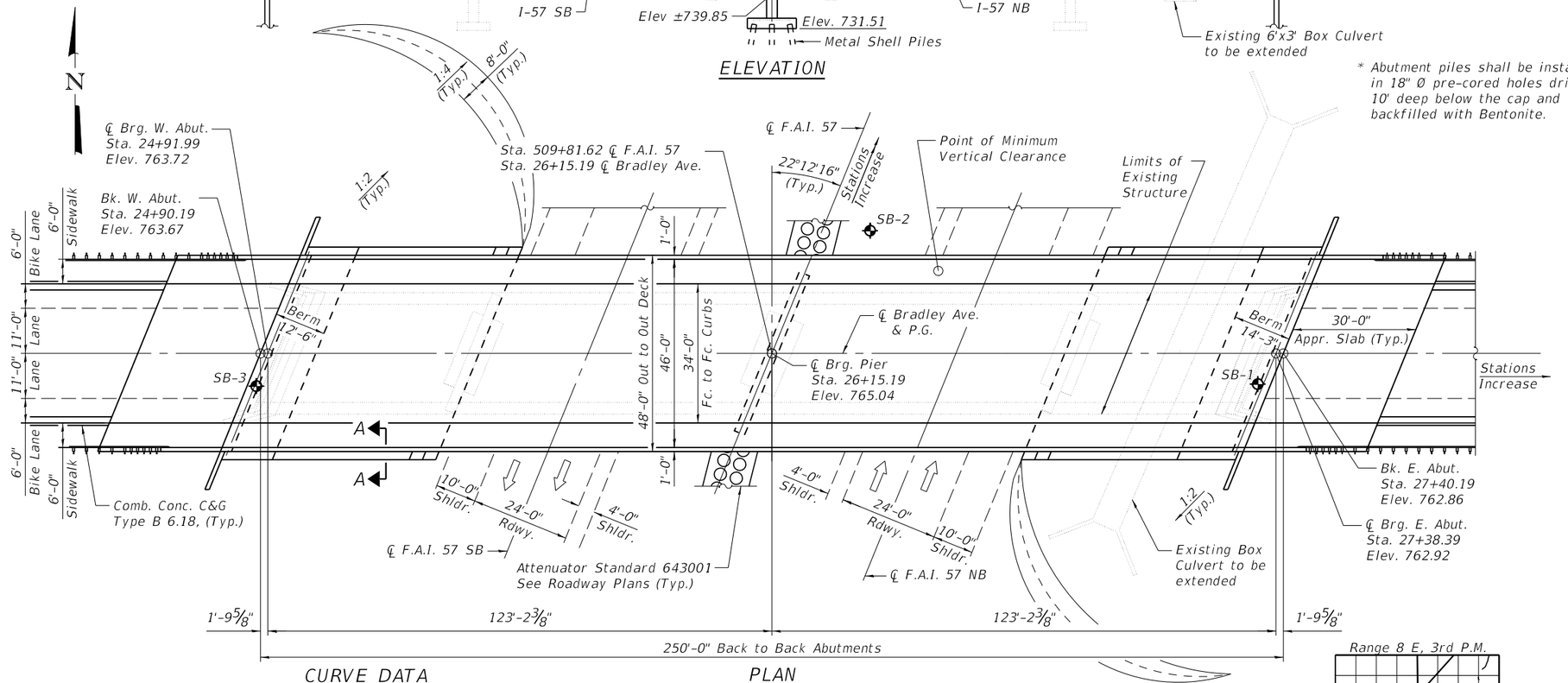
Benchmark: # 4651-2 Chisled Square on top of bridge curb at the NE corner of SN 010-0174, 13.26' Lt. Sta. 27+38.99, Elev. 762.43

Existing Structure: SN 010-0174, originally built in 1965 as F.A.I. 57, Section 10-33HB-1 at Sta 26+15.19. The superstructure consists of a reinforced concrete deck supported by steel wide flange beams continuous over four spans. The substructure consists of concrete stub abutments on concrete piles and hammer head piers on spread footings. The structure is 240'-5" back to back abutments and is 29'-8" out to out deck. The structure is skewed 21°12'16" left forward. The existing structure is to be removed and replaced under road closure.

No salvage.

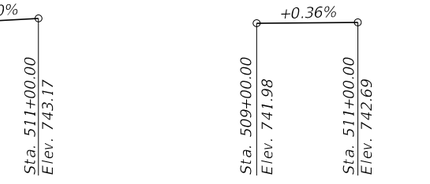


ELEVATION

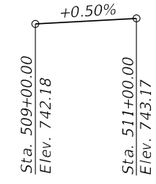


PLAN

* Abutment piles shall be installed in 18" Ø pre-cored holes drilled 10' deep below the cap and backfilled with Bentonite.

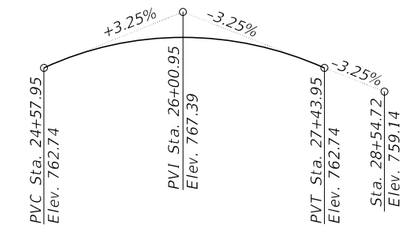


PROFILE GRADE F.A.I. 57
(along ℄ F.A.I. 57)



PROFILE GRADE F.A.I. 57
(along ℄ Southbound Roadway)

PROFILE GRADE F.A.I. 57
(along ℄ Northbound Roadway)



PROFILE GRADE BRADLEY AVENUE
(along ℄ Roadway)
LVC= 286'

HIGHWAY CLASSIFICATION

FAU Route 7110 - Bradley Avenue
Functional Class: Minor Arterial
ADT: 7,700 (2016); 10,000 (2036)
ADTT: 270 (2036)
DHV: 940 (2036)
Design Speed: 40 mph
Posted Speed: 35 mph
Directional Distribution: 55:45

FAI Route 57
Functional Class: Interstate
ADT: 36,400 (2016); 43,700 (2036)
ADTT: 12,629 (2036)
DHV: 3,490 (2036)
Design Speed: 70 mph
Posted Speed: 70 mph

DESIGN SPECIFICATIONS

2017 AASHTO LRFD Bridge Design Specifications, 8th Edition

LOADING HL-93

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

DESIGN STRESSES

FIELD UNITS (New Construction)

f'c = 3,500 psi
f'c = 4,000 psi (Superstructure concrete)
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)

SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.096g
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.177g
Soil Site Class = C

CURVE DATA

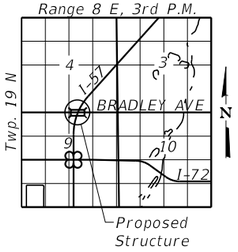
(℄ F.A.I. Route 57)
Δ = 41° 43' 31"
D = 1° 30' 00"
T = 1,455.76'
R = 3,819.72'
L = 2,781.69'
E = 268.05'
P.C. Sta. = 494+19.23
P.I. Sta. = 508+74.99
P.T. Sta. = 523+30.75
S.E. = 0.020'/Ft.
ATTAINED STA. 493+48.29 TO STA. 494+90.17
REMOVED STA. 521+29.98 TO STA. 522+71.86

CURVE DATA

(℄ F.A.I. Route 57 NB)
Δ = 41° 43' 31"
D = 1° 31' 02"
T = 1,438.99'
R = 3,775.72'
L = 2,749.64'
E = 264.92'

CURVE DATA

(℄ F.A.I. Route 57 SB)
Δ = 41° 43' 31"
D = 1° 28' 38"
T = 1,472.53'
R = 3,863.72'
L = 2,813.73'
E = 271.09'



LOCATION SKETCH

GENERAL PLAN

BRADLEY AVENUE OVER F.A.I. RTE 57

F.A.U. 7110 SECTION 10-33BR

CHAMPAIGN COUNTY

STATION 26+15.19

STRUCTURE NO. 010-0294

CEC Cummins Engineering Corporation
Civil and Structural Engineering

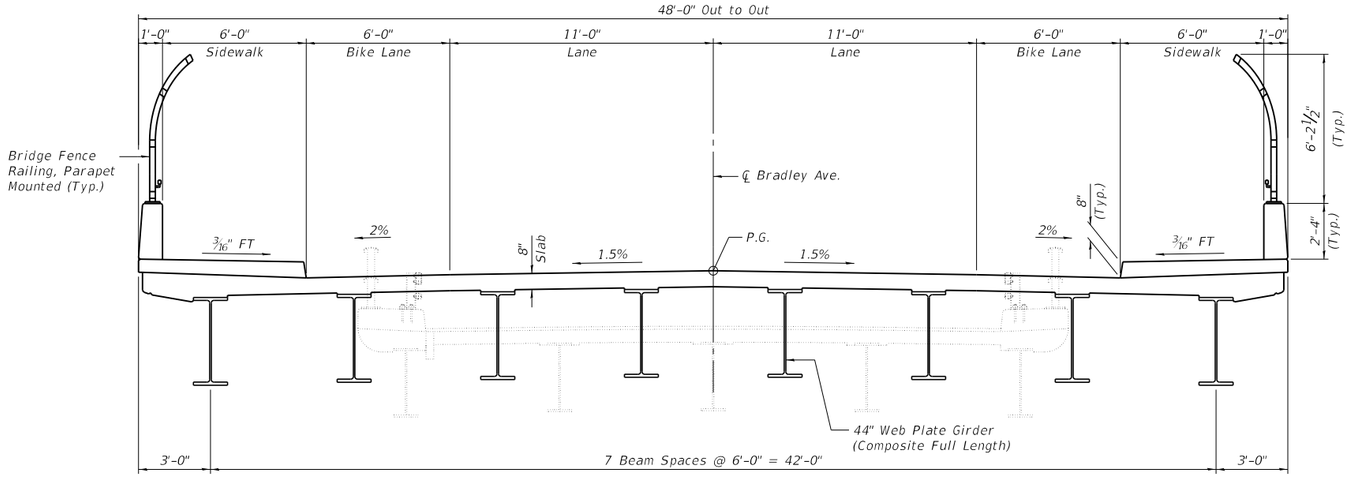
JOB = 2399,5	DESIGNED - CGF	REVISED -	
FILE NAME = 010-0294-70A61-00-TSL.dgn	CHECKED - AAN	REVISED -	
PLOT DATE = 4/19/2018	DRAWN - SJS	REVISED -	
	CHECKED - MDC	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2 SHEETS

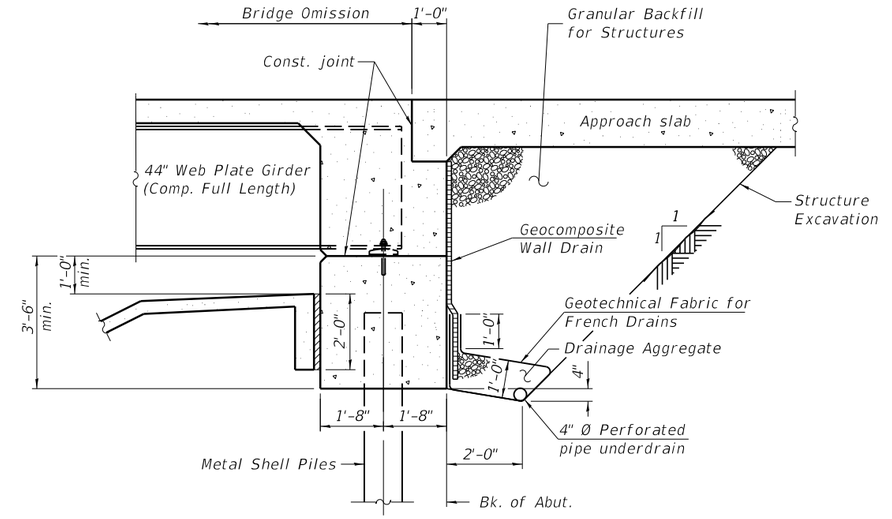
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
57	10-33BR	CHAMPAIGN		
		CONTRACT NO. 70A61		
	ILLINOIS	FED. AID PROJECT		

MODEL: Sheet 1 of 2
FILE NAME: H:\2399 DS Various\WOS\Files\Sheets\TSL010-0294-70A61-00-TSL.dgn



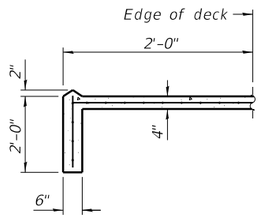
CROSS SECTION

(Looking East)



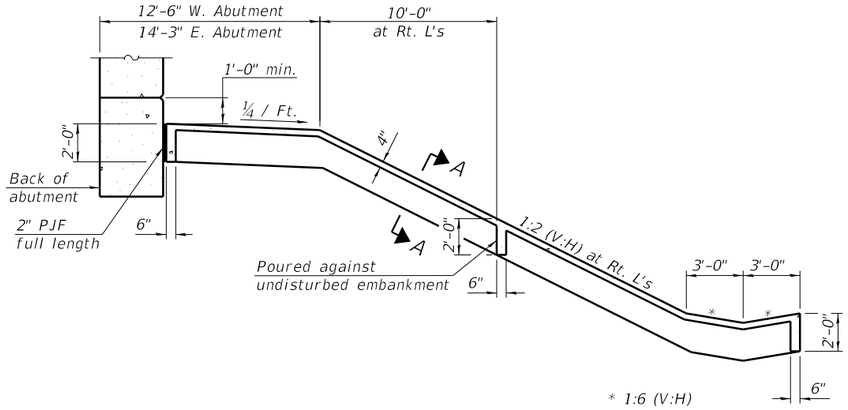
SECTION THRU INTEGRAL ABUTMENT

(Horiz. dim. @ Rt. L's)

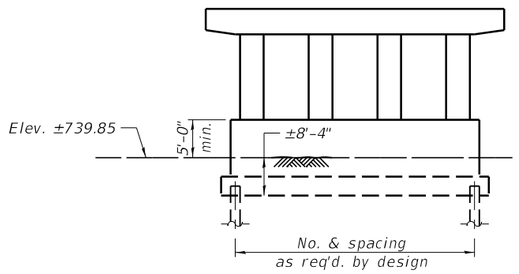


SECTION A-A

(Typ. All four corners)



SECTION THRU CONCRETE SLOPEWALL



PIER SKETCH

MODEL: Sheet 1 of 2
FILE NAME: H:\2399 DS Various\WO5\Files\Sheets\TSL\010-0294-70A61-00-TSL.dgn

CEC Cummins Engineering Corporation — Civil and Structural Engineering	JOB = 2399,5	DESIGNED - CGF	REVISED -
	FILE NAME = 010-0294-70A61-00-TSL.dgn	CHECKED - AAN	REVISED -
	PLOT DATE = 4/19/2018	DRAWN - SJS	REVISED -
		CHECKED - MDC	REVISED -

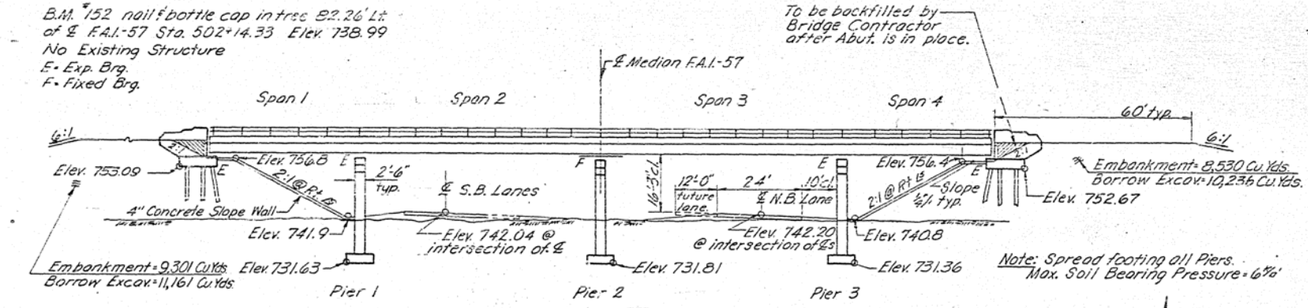
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 2 SHEETS

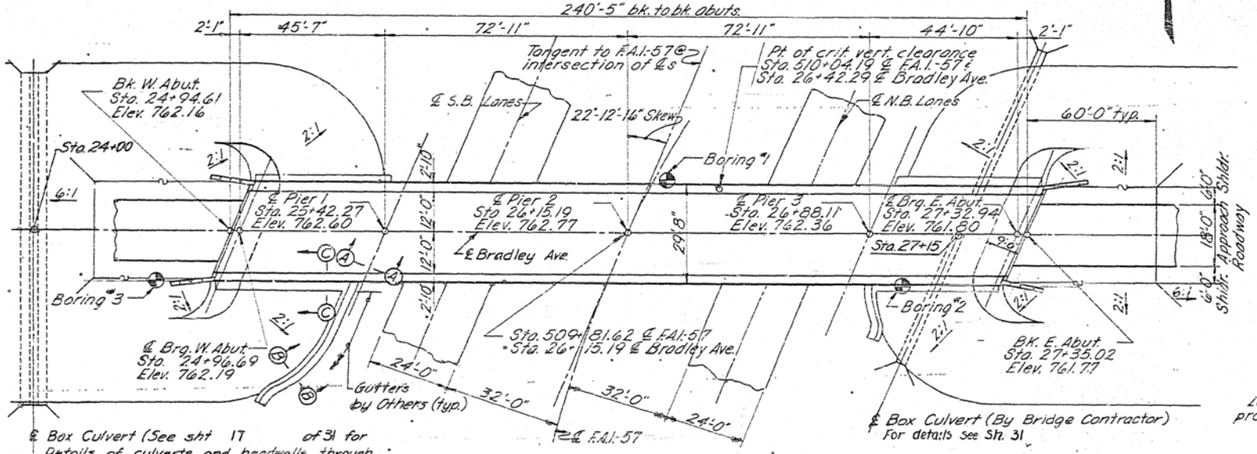
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
57	10-33BR	CHAMPAIGN		
		CONTRACT NO. 70A61		
	ILLINOIS	FED. AID PROJECT		

ROUTE NO	SECTION	COUNTY	TOTAL SHEETS	SHEET NO
FAI- 57	10-33HB-1	CHAMPAIGN	54	9
FED. ROAD DIST. NO. 7	ILLINOIS	PROJECT	I-57-5(21)	

B.M. "152 nail & bottle cap in tree S2.26' Lt. of ℄ F.A.I.-57 Sta. 502+14.33 Elev. 738.99
No Existing Structure
E - Exp. Brg.
F - Fixed Brg.



ELEVATION
SCALE: 1"=20'



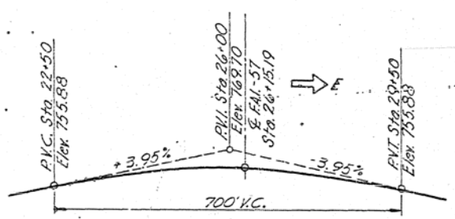
℄ Box Culvert (See sht 17 of 31 for Details of culverts and headwalls through Bridge Embankment Cones, by Bridge Contractor.)

℄ Box Culvert (By Bridge Contractor) For details see Sh. 31

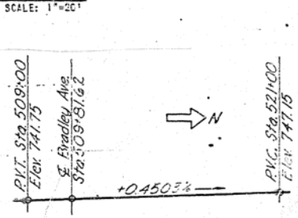
PLAN
SCALE: 1"=20'

F.A.I. RTE. 57 HORIZONTAL CURVE DATA

P.I. STA. 508+74.99
Δ = 41°-43'-31"
D = 1°-30'
T = 1455.76
L = 2781.69'
R = 3819.72
E = 268.03
SUPER ELEV. = 0.02 1/1 ATTAINED IN 150'



PROFILE OF BRADLEY AVE.



PROFILE OF FAI 57

DESIGN STRESSES

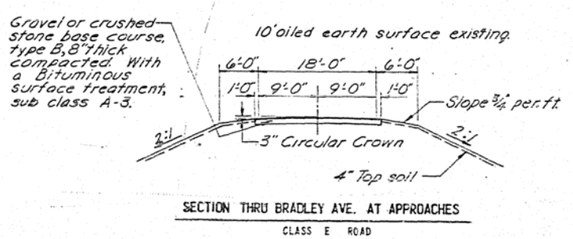
fc = 1400 psi (SUPER & SUBSTRUCT)
fs = 20,000 psi (REINF.)
fs = 20,000 psi (STRUCT.) (A-36)
n = 10
v = 75 psi (FOOTING)
L.L. DEFL. = L/1000 (NON.-COMPOSITE)

LOADING

H15-S12-44

FUNCTIONS OF SKEW ANGLE

cos 22°-12'-16" = 0.92584127
sin 22°-12'-16" = 0.37791261
tan 22°-12'-16" = 0.40818293



SECTION THRU BRADLEY AVE. AT APPROACHES

CLASS E ROAD
A.D.T. = 480 (1981)

740.2

	N	Qu	W
740	–	–	–
	15	3.8	20.2
	20	4.4	12.2
730	20	8.2	12.0
	19	6.8	11.9
	20	5.4	11.2
720	15	–	–
	18	6.3	11.7
	18	3.9	11.5

BLACK & BROWN SILTY CLAY FIRM
WATER ELEV. AFTER 24 HOURS
BROWN SANDY LOAM LOOSE
BROWN MOTTLED SILTY CLAY VERY STIFF
BROWN MOTTLED CLAY HARD
GRAY CLAY TILL HARD

BORING #1
STA. 26+21
15' LEFT OF ℄

740.5

	N	Qu	W
740	–	–	–
	6	–	–
	17	6.3	13.4
730	14	3.4	10.5
	26	8.3	11.2
	25	6.3	11.5
720	17	5.8	11.4
	29	4.9	11.1
	25	3.9	12.4

BLACK SILTY CLAY FIRM
GRAY SILTY CLAY FIRM
GRAY SILTY CLAY LOOSE
BROWN GRAY MOTTLED CLAY HARD
GRAY CLAY TILL HARD

BORING #2
STA. 27+36
15' RIGHT OF ℄

739.3

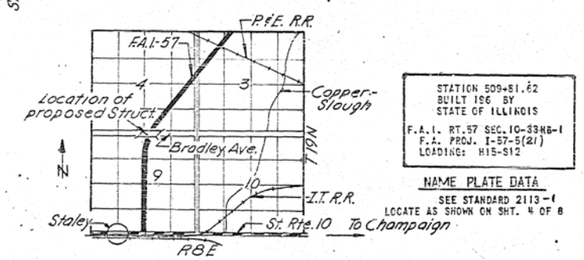
	N	Qu	W
	–	–	–
	15	–	–
730	22	8.2	12.2
	22	7.8	11.6
	25	7.3	11.2
	25	7.8	11.6
720	41	6.3	11.7
	23	3.0	18.8
	22	4.9	12.6

BROWN SILTY CLAY FIRM
BROWN MOTTLED SILTY CLAY STIFF
BROWN MOTTLED CLAY HARD
GRAY CLAY TILL HARD
GRAY SILTY CLAY VERY STIFF
GRAY CLAY TILL HARD

BORING #3
STA. 24+76
15' RIGHT OF ℄

NOTE:
N = BLOWS PER FOOT OF PENETRATION OF SAMPLING SPOON.
HAMMER WEIGHT = 170 LBS.
DROP = 2'-0"
Qu = UNCONFINED COMPRESSIVE STRENGTH IN TONS PER SQUARE FOOT.
W = PERCENTAGE MOISTURE

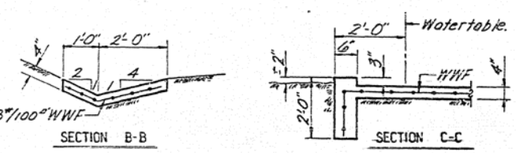
BORING DATA



LOCATION SKETCH
CHAMPAIGN COUNTY

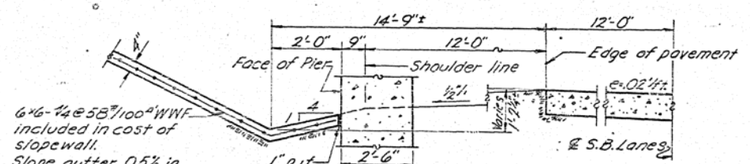
STATION 509+81.62
BUILT 196 BY
STATE OF ILLINOIS
F.A.I. RT. 57 SEC. 10-33HB-1
F.A. PROJ. I-57-5(21)
LOADING: H15-S12

NAME PLATE DATA
SEE STANDARD 2113-1
LOCATE AS SHOWN ON SHT. 4 OF 8



SECTION B-B

SECTION C-C



SECTION A-A

SLOPE WALL AND GUTTER DETAILS

GENERAL NOTES

1. SPECIFICATIONS: THE STATE OF ILLINOIS "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION" ADOPTED JANUARY 2, 1969 AND THE REVISIONS THERETO SHALL APPLY.
2. CONCRETE: CLASS X CONCRETE SHALL BE USED THROUGHOUT. THE CONCRETE FLOOR SHALL BE FOURED IN ONE CONTINUOUS OPERATION BETWEEN CONSTRUCTION JOINTS IN ACCORDANCE WITH ARTICLE 51.11 OF THE STANDARD SPECIFICATIONS AND SHALL BE FINISHED IN ACCORDANCE WITH ARTICLE 51.19. COARSE AGGREGATE WHICH IS TO BE USED IN END POSTS MUST BE FREE OF CHERT, FLINT LIMONITE, LIGNITE AND SOFT LIMESTONE.
3. RIVETS: 3/4" ϕ DIA., OPEN HOLES 13/16", DIA., UNLESS NOTED.
4. PRECORING: HOLES SHALL BE PRECORED FOR THE ABUTMENT PILES IN ACCORDANCE WITH ARTICLE 60.9 (c) OF THE STANDARD SPECIFICATIONS.
5. TEST PILES: THE CONTRACTOR SHALL DRIVE ONE CONCRETE TEST PILE AT EACH ABUTMENT IN PERMANENT LOCATION IN ACCORDANCE WITH ARTICLE 60.95 OF THE STANDARD SPECIFICATIONS BEFORE ORDERING THE REMAINDER OF THE PILES.
6. PAINT: EXCEPT AS OTHERWISE PROVIDED ALL STRUCTURAL STEEL SHALL RECEIVE ONE SHOP COAT OF RED LEAD PAINT AND TWO FIELD COATS OF ALUMINUM PAINT IN ACCORDANCE WITH ARTICLES 56.1 THROUGH 56.5 OF THE STANDARD SPECIFICATIONS. ALL PAINT SHALL BE FURNISHED AND APPLIED BY THE CONTRACTOR.

TOTAL BILL OF MATERIAL (FOR BRIDGE)

ITEM	UNIT	SUPER. STR.	SUB. STR.	TOTAL
CLASS X CONCRETE	CU. YD.	192.3	219.7	412.0
REINFORCEMENT BARS	LBS.	40,144	19,779	59,923
STRUCTURAL STEEL	LBS.	172,489		172,489
METAL HANDRAIL	LIN. FT.	476		476
NAME PLATES	EACH		2	2
SLOPE WALL	SQ. YD.		297	297
CLASS A EXCAV. FOR STRUCTS.	CU. YD.		308	308
*BORROW EXCAVATION	CU. YD.		21,397	21,397
CONCRETE PILES	LIN. FT.		400	400
TEST PILES (CONCRETE)	EACH		2	2
PROTECTIVE COAT	SQ. YDS.	840		840

* NO OVERHAUL WILL BE ALLOWED.

NO.	REVISION	BY	DATE

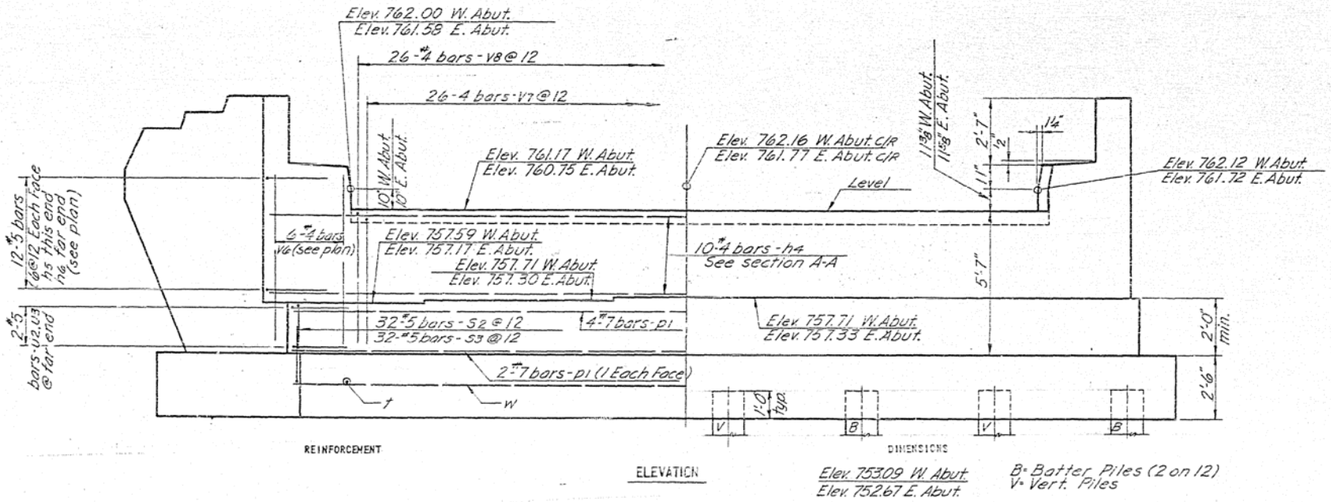
GENERAL PLAN AND ELEVATION
SECTION 10-33HB-1 STATION 509+81.62
F.A.I. RTE. 57 PROJECT
CHAMPAIGN COUNTY

CLARK, DAILY, DIETZ AND ASSOCIATES
CONSULTING ENGINEERS
URBANA, ILLINOIS

DESIGNED C.B.P.	SCALE AS NOTED	SHEET 1
DRAWN T.K.C.	DATE 3-26-1981	OF 8
CHECKED C.B.P.		JOB NO. 394-VS

DESIGNED BY C.B.P. | DRAWN BY T.K.C. | DATE 3-26-81 | CHECKED BY C.B.P. | DATE 3-26-81 | QUANTITIES BY M.F.T.

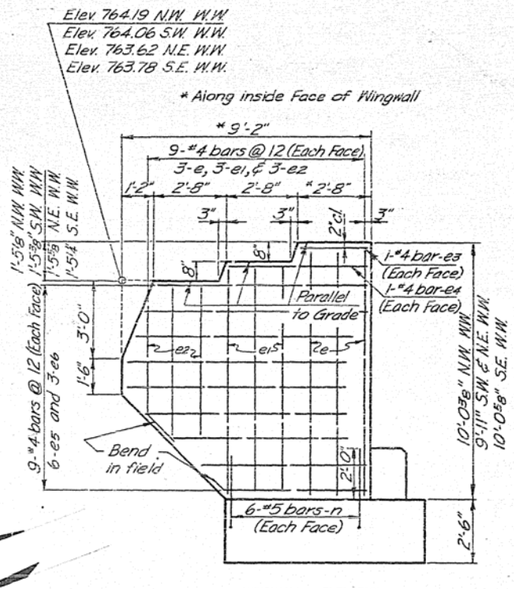
Rev-Quan. Class X Conc. from 403.6 to 412.0 cu yds E.B. 6-26-63



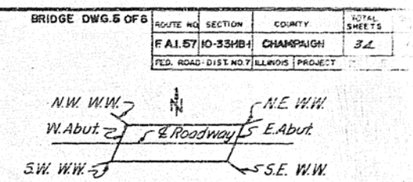
ELEVATION

Elev. 753.09 W. Abut.
Elev. 752.67 E. Abut.

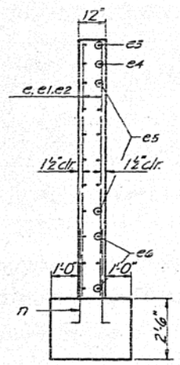
B = Batter Piles (2 on 12)
V = Vert. Piles



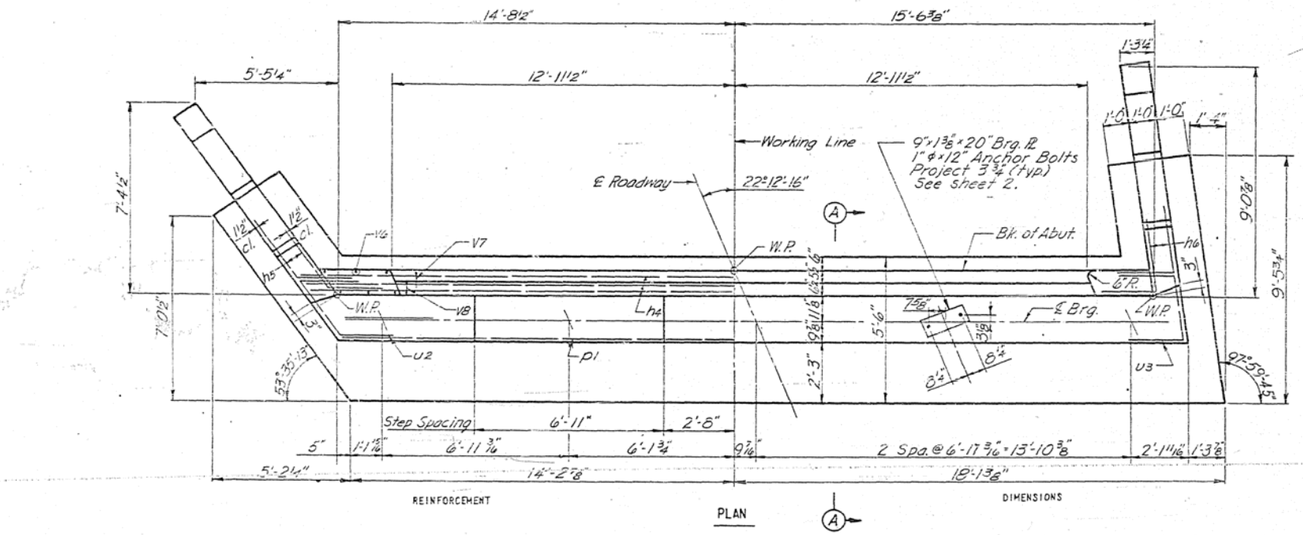
WINGWALL ELEVATION
(SHOWING DIMENSIONS & REINFORCEMENT)



LOCATION SKETCH



SECTION B-B



PLAN

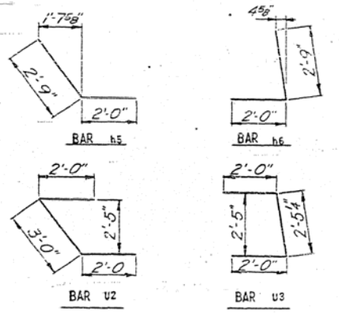
W. Abut.
E. Abut.

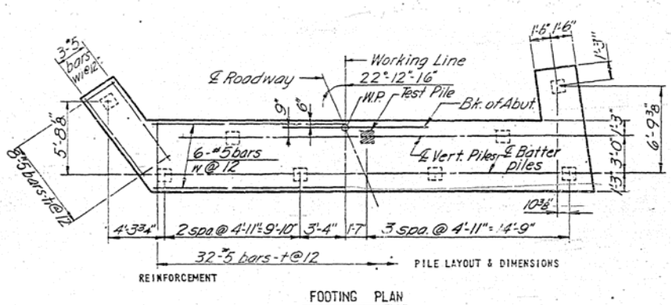
PILE DATA

TYPE: ------- CONCRETE. SEE SPEC. PROVISIONS FOR OPTIONAL TYPES.
CAPACITY: ----25 TON MIN.
ESTIMATED LENGTH: -----25 FEET
NO. REQ'D: ---16 (DOES NOT INCLUDE TEST PILES)
TEST PILES: ---2 (1 EACH ABUT.)

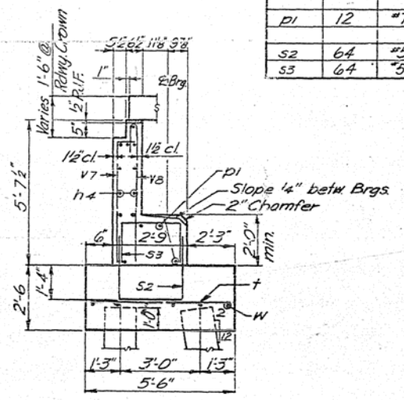
BILL OF MATERIAL
(TWO ABUTMENTS)

BAR	NO.	SIZE	LENGTH	SHAPE	BAR	NO.	SIZE	LENGTH	SHAPE
e	24	#4	9'-7"	——	t	64	#5	5'-0"	——
e1	24	#4	8'-10"	——	t1	32	#5	2'-6"	——
e2	24	#4	6'-6"	——					
e3	8	#4	2'-3"	——	U2	4	#5	7'-0"	⊏
e4	8	#4	5'-0"	——	U3	4	#5	6'-6"	⊐
e5	48	#4	7'-8"	——					
e6	24	#4	6'-4"	——	V6	24	#4	6'-9"	——
					V7	52	#4	5'-7"	⌐
					V8	52	#4	6'-9"	¬
h4	20	#4	31'-6"	——					
h5	24	#5	4'-9"	⌞	W	12	#5	31'-0"	——
h6	24	#5	4'-9"	⌟	W1	12	#5	7'-3"	——
n	48	#5	4'-1"	⌋					
P1	12	#7	31'-3"	——	CLASS X CONCRETE			CU. YDS.	698
					REINFORCEMENT BARS			LBS	47941
S2	64	#5	7'-3"	⊔	CONCRETE PILES			LIN. FT.	400
S3	64	#5	6'-1"	⊓	TEST PILES (CONCRETE)			EACH	2





FOOTING PLAN



SECTION A-A

ABUTMENTS
F.A.I. RTE. 57 SEC. 10-33HB-1
CHAMPAIGN COUNTY.
STA. 509 + 81.62

BRIDGE DWG. 5 OF 8

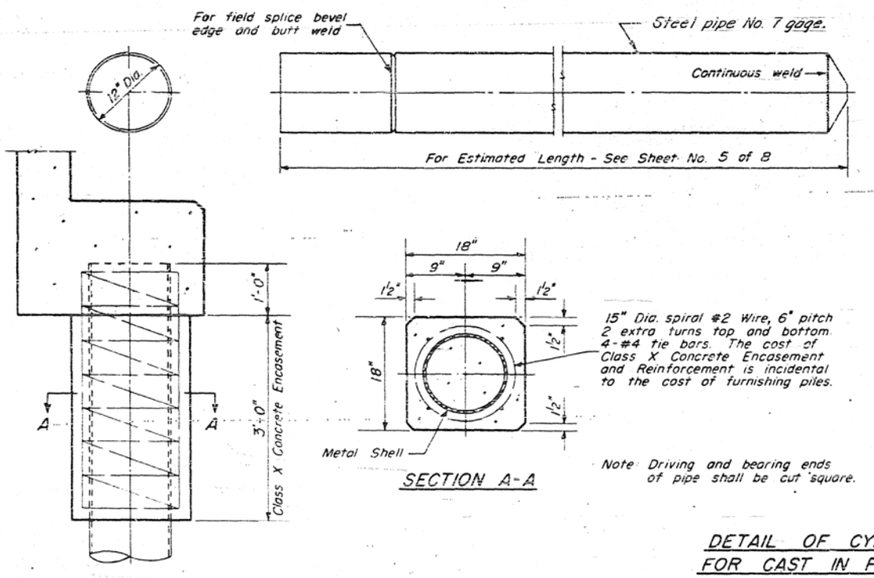
JOB NO. 394-V9

DESIGNED BY E.L.M.
DRAWN BY R.K.G.
CHECKED BY E.L.M.
DATE 3-22-61
IN CHARGE M.F.Z.

STATE OF ILLINOIS
DEPARTMENT OF PUBLIC WORKS & BUILDINGS
DIVISION OF HIGHWAYS

BRIDGE DWG 8 of 8

ROUTE NO.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
F.A.I 57	10-33HB-1	CHAMPAIGN	34	16
FED. ROAD DIST. NO. 7	ILLINOIS	FED. AID PROJECT		

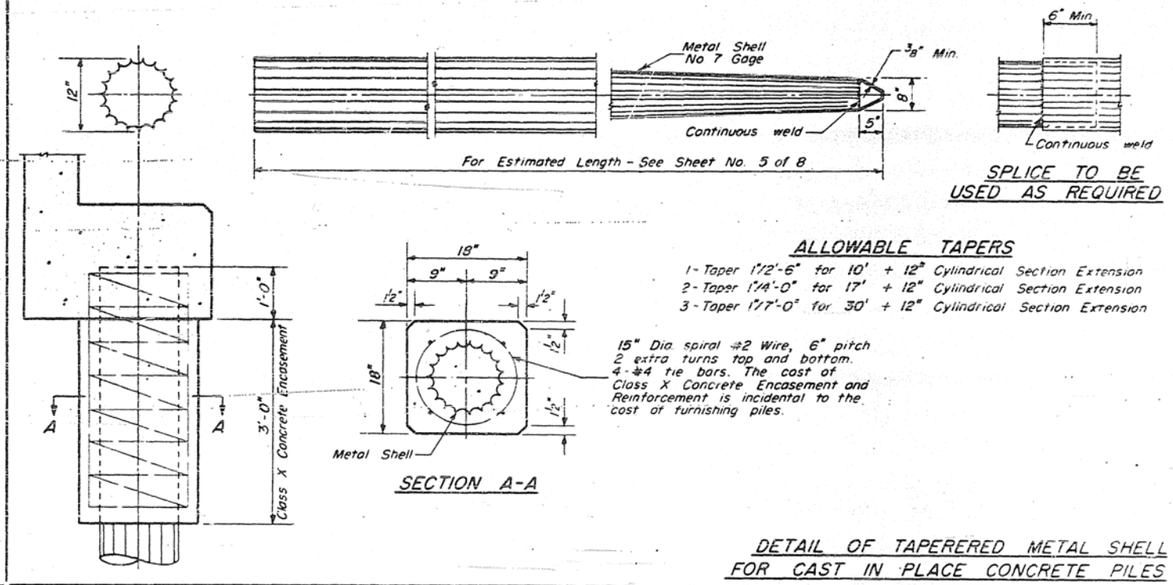


SECTION A-A

¾" Plate
Continuous weld

OPTIONAL FLAT END

DETAIL OF CYLINDRICAL STEEL SHELL
FOR CAST IN PLACE CONCRETE PILES



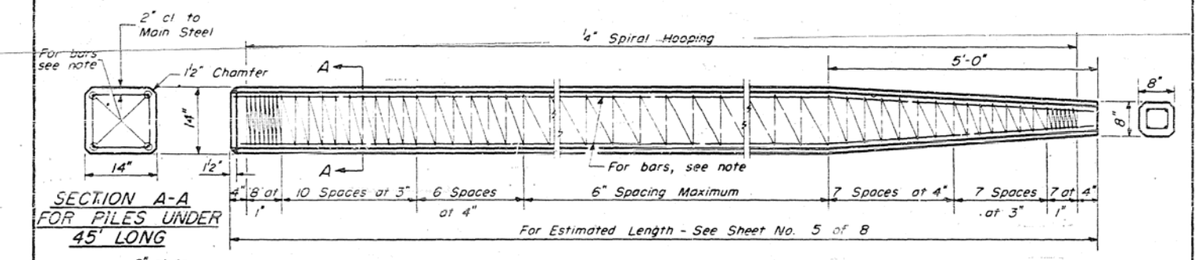
SECTION A-A

SPLICE TO BE
USED AS REQUIRED

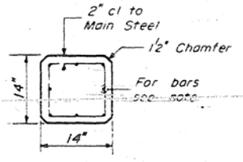
ALLOWABLE TAPERS

1 - Taper 1'1/2'-6" for 10' + 12" Cylindrical Section Extension
2 - Taper 1'1/4'-0" for 17' + 12" Cylindrical Section Extension
3 - Taper 1'7'-0" for 30' + 12" Cylindrical Section Extension

DETAIL OF TAPERERED METAL SHELL
FOR CAST IN PLACE CONCRETE PILES



SECTION A-A
FOR PILES UNDER
45' LONG



SECTION A-A
FOR PILES 45'
OR MORE

Note: For 14" Piles 45' long or more use 8-#8 bars 4 for the full length and 4 to the point of bevel.
For 14" Piles under 45' long use 4-#9 bars the full length.

Handling: For Pile lengths up to 45', use two slings placed at a distance of 0.21 L* from each end.
For Piles longer than 45', use three slings placed at a distance of 0.12 L* from each end and or mid-point of pile.

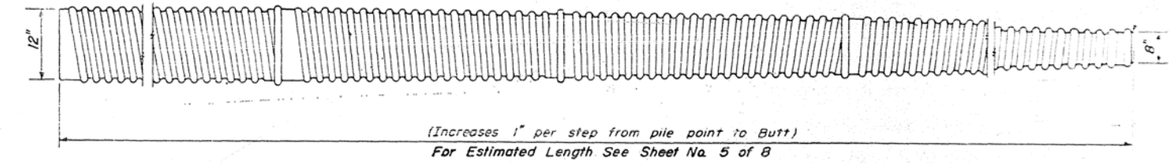
*L = Over all length of pile to be handled

DESIGNED	
CHECKED	
DRAWN	W. A. Sausaman
CHECKED	

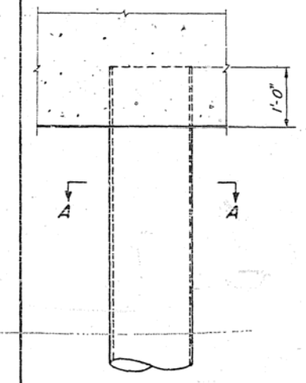
19
EXAMINED
ENGINEER OF BRIDGE & TRAFFIC STRUCTURES
PASSED
ENGINEER OF DESIGN
APPROVED
CHIEF HIGHWAY ENGINEER

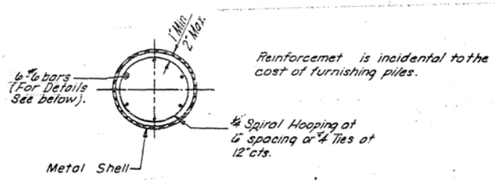
X-1 Re-drawn 9-24-59

DETAIL OF PRECAST CONCRETE PILES

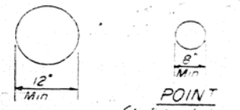


At least ¼ of the length of pile shall have a butt diameter equal to or greater than 12".
Gages are furnished to suit soil conditions (14 Gage Min.)





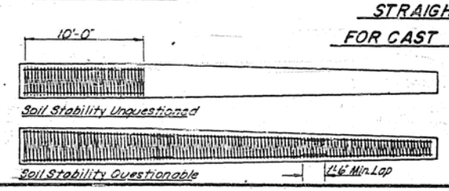
SECTION A-A



BUTT

POINT
(Applies only to Step Taper type pile).

DETAIL OF MANDREL DRIVEN
STRAIGHT OR STEP-TAPER PILES
FOR CAST IN PLACE CONCRETE PILES



PILE DETAILS
F.A.I. RTE 57 SEC. 10-33HB-1
CHAMPAIGN COUNTY
STA. 509+81.62

BRIDGE DWG 8 OF 8

JOB 394-V8

Mc Cleary Engineering
3705 Progress Blvd
Peru, Il 61354
815 780-8486

SOIL BORING LOG

Solutions You Can Build On

Date 3/8/16

ROUTE FAU 7110 **DESCRIPTION** Bradley Ave. over IL-57(East Abutment) **LOGGED BY** TLM

SECTION 10-33RR **LOCATION** , **SEC.** , **TWP.** , **RNG.** ,
Latitude , **Longitude**

COUNTY Champaign **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 010-0294 (Prop.)
Station 509+81.62

BORING NO. SB-1
Station 27+33.94
Offset 7.5 ft Rt.
Ground Surface Elev. 761.80 ft

Surface Water Elev. - ft
Stream Bed Elev. - ft

Groundwater Elev.:
First Encounter 713.8 ft ▼
Upon Completion 691.8 ft ▽
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
4.2" HMA 761.45			
7.2" PCC 760.80			
Medium Stiff Black/Brown/Gray Silty Clay (fill)			
	6		
-5	4 4	0.8 P	20
754.80			
Stiff Gray Silty Clay Till (fill)			
	5		
-10	4 5	2.0 P	13
749.80			
Stiff Gray with Brown/Black Silty Clay Till (fill)			
	4		
-15	5 6	2.3 B	15
	4		
-20	5 8	2.3 B	18
Stiff Gray with Brown/Black Silty Clay Till (fill) *(continued)*			
737.80	8		
Brown Medium Coarse Sand			
-25	7 7	2.5 P	11
735.80			
Very Stiff to Hard Brown Silty Clay Loam Till	5		
	12 15	3.0 P	9
*rock in shoe			
	4		
-30	6 8	5.8 B	11
731.30			
Stiff Gray Silt to Very Silty Clay	6		
	5 6	2.1 B	15
728.80			
Very Stiff Gray Silty Clay Loam Till	8		
-35	7 7	3.5 P	12
726.30			
Stiff Gray Silty Clay	4		
	5 6	2.5 B	18
723.80			
Very Stiff Gray Silty Clay Loam Till	4		
-40	5 7	3.3 B	11

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Mc Cleary Engineering
3705 Progress Blvd
Peru, Il 61354
815 780-8486

SOIL BORING LOG

Solutions You Can Build On

Date 3/8/16

ROUTE FAU 7110 **DESCRIPTION** Bradley Ave. over IL-57(East Abutment) **LOGGED BY** TLM

SECTION 10-33RR **LOCATION** , **SEC.** , **TWP.** , **RNG.** ,
Latitude , **Longitude**

COUNTY Champaign **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 010-0294 (Prop.)
Station 509+81.62

BORING NO. SB-1
Station 27+33.94
Offset 7.5 ft Rt.
Ground Surface Elev. 761.80 ft

Surface Water Elev. - ft
Stream Bed Elev. - ft

Groundwater Elev.:
First Encounter 713.8 ft ▼
Upon Completion 691.8 ft ▽
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff Gray Silty Clay Loam Till *(continued)*			
	4		
	5 6	3.3 B	12
	3		
	5 9	1.8 B	12
-45	3		
	4 5	2.5 B	13
713.80 ▼			
Medium Dense Silty Fine Sand, Wet	3		
	6 7	-	16
-50	9		
	9 11	-	17
707.80	12		
Dense Silty Fine to Medium Sand	13 19	-	12
-55			
704.80			
Stiff Gray Silty Clay Loam Till	3		
	4 7	2.5 B	13
-60			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Stiff Gray Silty Clay Loam Till *(continued)*			
	3		
697.30			
	9 15	2.3 B	13
-65 Dense Gray Sand & Gravel			
	15		
	25 20	-	15
▽ -70			
689.80			
Stiff Gray Silty Clay Till	22		
	10 10	2.3 B	13
-75			
	14		
No Recovery	17 21	-	
681.80 -80			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

McCleary Engineering
3705 Progress Blvd
Peru, Il 61354
815 780-8486

SOIL BORING LOG

Solutions You Can Build On

Date 3/8/16

ROUTE FAU 7110 **DESCRIPTION** Bradley Ave. over IL-57(East Abutment) **LOGGED BY** TLM

SECTION 10-33RR **LOCATION** , **SEC.** , **TWP.** , **RNG.** ,
Latitude , **Longitude**

COUNTY Champaign **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 010-0294 (Prop.)
Station 509+81.62

BORING NO. SB-1
Station 27+33.94
Offset 7.5 ft Rt.
Ground Surface Elev. 761.80 ft

Surface Water Elev. - ft
Stream Bed Elev. - ft

Groundwater Elev.:
First Encounter 713.8 ft ▼
Upon Completion 691.8 ft ▽
After - **Hrs.** - ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Hard Silty Clay Loam Till		13		
		17	3.7	12
		22	B	
		19		
		21	9.6	9
	-85	27	B	
		19		
		24	6.6	9
671.80	-90	34	B	
End of Boring	-95			
	-100			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Mc Cleary Engineering
3705 Progress Blvd
Peru, Il 61354
815 780-8486

SOIL BORING LOG

Solutions You Can Build On

Date 3/7/16

ROUTE FAU 7110 **DESCRIPTION** Bradley Ave. over IL-57 (Center Pier) **LOGGED BY** TLM

SECTION 10-33RR **LOCATION** , **SEC.** , **TWP.** , **RNG.** ,
Latitude , **Longitude**

COUNTY Champaign **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 010-0294 (Prop.)
Station 509+81.62

BORING NO. SB-2
Station 26+39.19
Offset 30.0 ft Lt.
Ground Surface Elev. 741.57 ft

Surface Water Elev. - ft
Stream Bed Elev. - ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After - **Hrs.** Dry ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Stiff Dark Brown & Black Silty Clay Fill, trace organics			
	2		
	3 7	1.7 B	24
	4		
-5	6 7	3.3 B	22
	2		
735.07 Stiff Brown/Gray Silty Clay Till			
	2 3	1.0 P	17
	3		
-10	4 6	1.7 B	15
	4		
730.07 Medium Dense Brown Silt			
	7 11	2.1 B	22
728.57 Very Stiff Gray Silty Clay Till			
	4		
-15	6 8	2.1 B	13
	4		
	7 10	3.1 B	12
723.57 Stiff Gray Silty Clay Till			
	4		
-20	4 6	1.9 B	13
Stiff Gray Silty Clay Till *(continued)*			
	4		
	4 7	1.8 S	13
	3		
-25	3 6	1.2 B	13
	4		
	5 7	1.6 B	13
713.57 Stiff Gray Clay Till			
	3		
-30	3 6	1.4 B	13
	2		
-35	4 5	1.4 B	13
	2		
-40	3 5	1.5 B	15
701.57			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Mc Cleary Engineering
3705 Progress Blvd
Peru, Il 61354
815 780-8486

SOIL BORING LOG

Solutions You Can Build On

Date 3/7/16

ROUTE FAU 7110 **DESCRIPTION** Bradley Ave. over IL-57 (Center Pier) **LOGGED BY** TLM

SECTION 10-33RR **LOCATION** , **SEC.** , **TWP.** , **RNG.** ,
Latitude , **Longitude**

COUNTY Champaign **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 010-0294 (Prop.)
Station 509+81.62

BORING NO. SB-2
Station 26+39.19
Offset 30.0 ft Lt.
Ground Surface Elev. 741.57 ft

Surface Water Elev. - ft
Stream Bed Elev. - ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After - **Hrs.** Dry ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Stiff Gray Clay Loam Till			
	3		
	6	1.7	13
-45	7	B	
693.07			
Soft Silt Seam	5		
	8	1.6	13
-50	8	B	
	5		
	7	1.8	12
-55	11	B	
683.07			
Gray Silty Clay Loam Till	4		
	6	1.9	12
-60	9	B	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Gray Silty Clay Loam Till *(continued)*			
679.57			
Hard Gray Clay Loam Till	15		
	21	4.5	9
-65	45	P	
	28		
	30	-	6
-70	44		
	16		
	26	-	13
666.57 -75	38		
No Recovery	43		
	40	-	
665.07	67		
End of Boring			
-80			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Mc Cleary Engineering
3705 Progress Blvd
Peru, Il 61354
815 780-8486

SOIL BORING LOG

Solutions You Can Build On

Date 3/8/16

ROUTE FAU 7110 **DESCRIPTION** Bradley Ave. over IL-57 (West Abutment) **LOGGED BY** TLM

SECTION 10-33RR **LOCATION** , **SEC.** , **TWP.** , **RNG.** ,
Latitude , **Longitude**

COUNTY Champaign **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 010-0294 (Prop.)
Station 509+81.62

BORING NO. SB-3
Station 24+89.19
Offset 8.0 ft Rt.
Ground Surface Elev. 761.91 ft

Surface Water Elev. - ft
Stream Bed Elev. - ft

Groundwater Elev.:
First Encounter 706.9 ft ▼
Upon Completion - ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
3.6" HMA 761.51			
7.2" PCC 760.91			
Stiff Black & Gray Silty Clay (fill)	6		
	4 6	1.5 P	23
-5			
754.91			
Very Stiff Gray & Brown Silty Clay w/ trace sand & small gravel, (reworked glacial till fill)	5		
	4 6	3.1 B	13
-10			
749.91			
Very Stiff to Hard Gray Silty Clay Till (fill)	4		
	5 7	5.0 B	11
-15			
	3		
742.41			
Stiff Black Silty Clay (fill)	6 8	4.1 B	14
-20			
741.41			
Stiff Black & Gray Silty Clay (fill)	4		
737.41	4 6	1.2 B	21
Stiff Brown/Gray & Black Silty Clay (fill) -25			
735.41	4		
Stiff Black Silty Clay (original ground)	6 9	1.5 B	26
733.91			
Very Stiff Brown Silty Clay Loam Till	3		
	5 8	2.9 B	21
-30			
731.41			
Very Stiff Brown Silty Clay Loam Till	4		
	7 10	3.3 B	14
729.41			
Stiff to Very Stiff Gray Silty Clay Loam Till	6		
	7 9	2.5 B	13
-35			
	6		
	7 8	3.5 B	12
	9		
722.41			
Gray Clayey Sand & Gravel -40	11 12	2.9 B	11

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Mc Cleary Engineering
3705 Progress Blvd
Peru, Il 61354
815 780-8486

SOIL BORING LOG

Solutions You Can Build On

Date 3/8/16

ROUTE FAU 7110 **DESCRIPTION** Bradley Ave. over IL-57 (West Abutment) **LOGGED BY** TLM

SECTION 10-33RR **LOCATION** , **SEC.** , **TWP.** , **RNG.** ,
Latitude , **Longitude**

COUNTY Champaign **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 010-0294 (Prop.)
Station 509+81.62

BORING NO. SB-3
Station 24+89.19
Offset 8.0 ft Rt.
Ground Surface Elev. 761.91 ft

Surface Water Elev. - ft
Stream Bed Elev. - ft

Groundwater Elev.:
First Encounter 706.9 ft ▼
Upon Completion - ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Gray Clayey Sand & Gravel *(continued)* 720.91			
	6		
Very Stiff Gray Silty Clay Loam Till with 1" sand seams 6" apart	5 8	2.5 P	11
718.91			
Very Stiff Gray Silty Clay Loam Till	5		
-45	6 7	2.5 B	12
	4		
*Rock in shoe	6 7	2.5 E	14
	4		
-50	6 7	2.1 B	13
	7		
	7 8	4.0 P	12
	4		
▼-55	5 7	2.5 B	13
	4		
-60	6 9	2.3 B	12

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff Gray Silty Clay Loam Till *(continued)*			
	6		
-65	11 10	3.1 B	11
694.91			
Medium Dense Grey Silt to Silty Clay	5		
-70	7 7	2.5 B	17
689.91			
Stiff to Very Stiff Gray Silty Clay Loam Till	5		
-75	8 10	2.5 B	13
	5		
681.91 -80	10 14	2.9 B	12

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Mc Cleary Engineering
3705 Progress Blvd
Peru, Il 61354
815 780-8486

SOIL BORING LOG

Solutions You Can Build On

Date 3/8/16

ROUTE FAU 7110 **DESCRIPTION** Bradley Ave. over IL-57 (West Abutment) **LOGGED BY** TLM

SECTION 10-33RR **LOCATION** , **SEC.** , **TWP.** , **RNG.** ,
Latitude , **Longitude**

COUNTY Champaign **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 010-0294 (Prop.)
Station 509+81.62

BORING NO. SB-3
Station 24+89.19
Offset 8.0 ft Rt.
Ground Surface Elev. 761.91 ft

Surface Water Elev. - ft
Stream Bed Elev. - ft

Groundwater Elev.:
First Encounter 706.9 ft ▼
Upon Completion - ft
After - **Hrs.** - ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Hard Gray w/ Pink Hue Silty Clay Loam Till				
		19		
		33	10.1	7
	-85	47	S	
		18		
		23	9.9	10
671.91	-90	31	B	
End of Boring				
	-95			
	-100			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

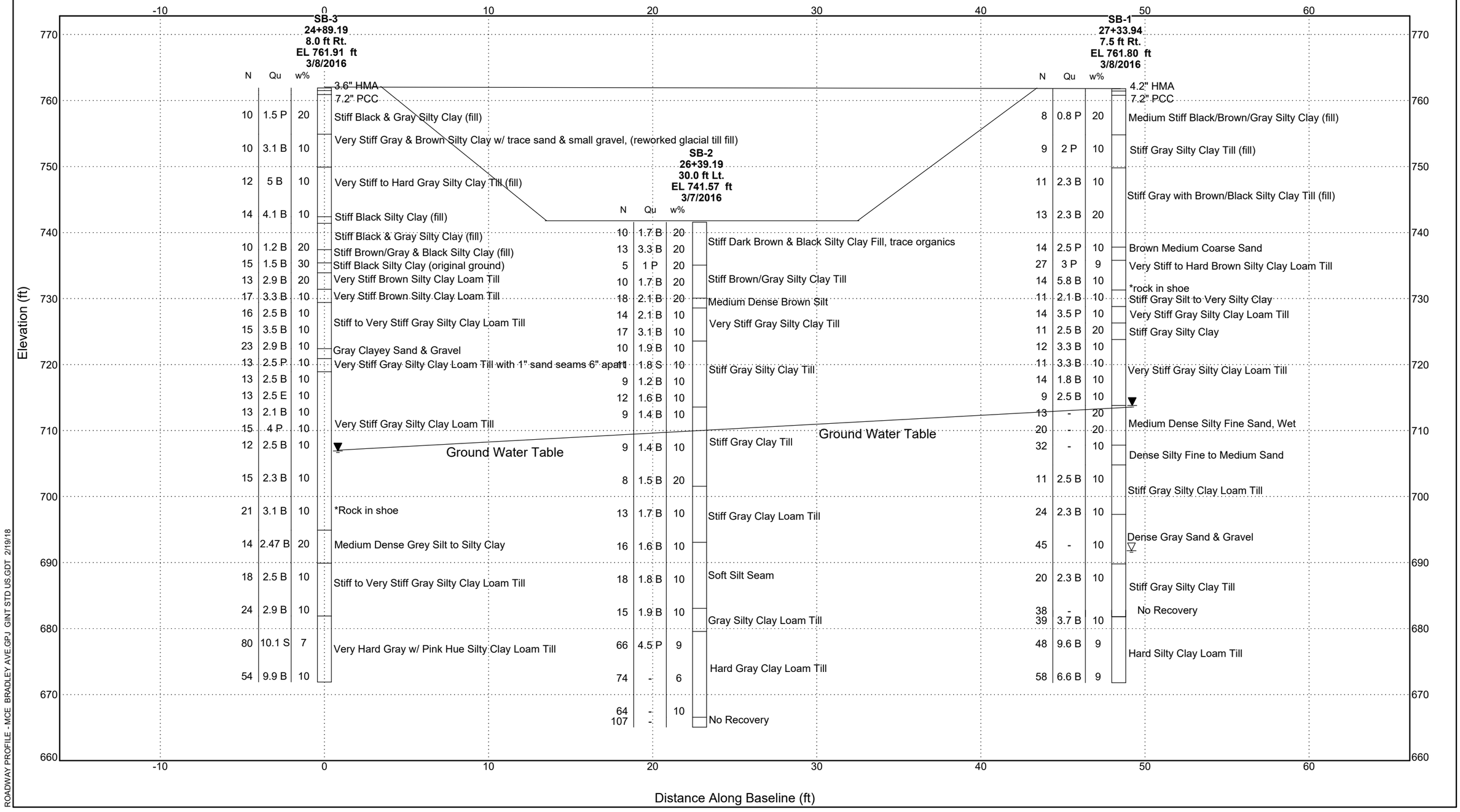
McCleary Engineering
3705 Progress Blvd
Peru, Il 61354
Telephone: 815 780-8486

ROUTE FAU 7110
SECTION 10-33RR
COUNTY Champaign
PROJECT LOCATION Bradley Ave. over IL-57

SUBSURFACE PROFILE

LEGEND
EL = Elevation (ft)
D = Depth Below Existing Ground Surface (ft)
N = SPT N-Value (AASHTO T206)
Qu = Unconfined compressive Strength (tsf)
Failure Mode (B= Bulge, S= shear, P= penetrometer)
w% = Moisture Content Percentage

WATER TABLE LEGEND
▼ = First Encountered
▽ = Upon Completion
▼ = After __ hours



ROADWAY PROFILE - MCE BRADLEY AVE.GPJ GINT STD US.GDT 2/19/18

Illinois Department of Transportation

COHESIVE SOIL SETTLEMENT ESTIMATE

LOCATION AND BORING USED ====: West Abut/ Boring SB-3. GRADE RAISE
TYPE OF SURCHARGE ================================ 1 (1=2:1 bridge cone, 2=continuous embank., 3=rectangular surch.)
DEPTH TO WATER TABLE (below top of existing embankment) == 24 FT

NEW EMBANKMENT:
- NEW EMBANKMENT FILL UNIT WEIGHT ========== 120 PCF
- NEW EMBANKMENT FILL HEIGHT ========== 22.8 FT
- PROPOSED WIDTH AT TOP ========== 56 FT
- PROPOSED WIDTH AT BOTTOM ========== 146 FT (which is a 2.0:1 slope)

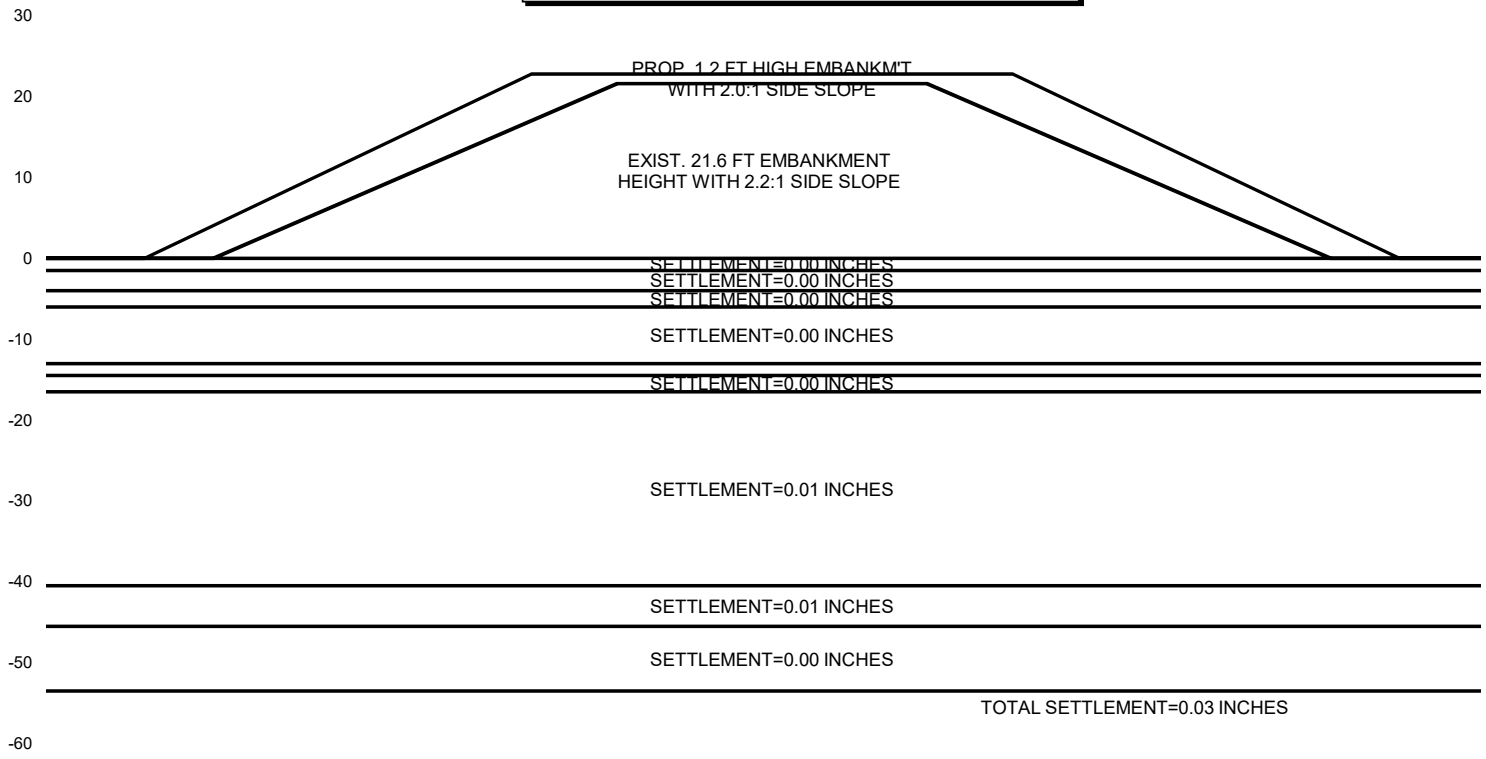
EXISTING EMBANKMENT (IF ANY):
- EXISTING EMBANKMENT UNIT WEIGHT ========== 120 PCF
- EXISTING EMBANKMENT HEIGHT ========== 21.6 FT
- EXISTING WIDTH AT TOP ========== 36 FT
- EXISTING WIDTH AT BASE ========== 130 FT (which is a 2.2:1 slope)

ASSUMPTIONS:
Soil Deposit is Normally Consolidated
Cohesive Layers are Saturated
Soils have a Low Sensitivity
Liquid Limit (LL)=Moist. Content (MC%)
Initial Void Ratio (Eo)=2.7*(MC%)/100
Comp. Index (Cc)=0.009*(LL-10)
Neglecting Granular & Secondary Settlem't

LAYER THICK (FT)	*TOTAL UNIT WT. (PCF)*	*UNCONF. COMP. STRENGTH (Qu) (TSF)*	*MOIST. CONTENT (%)*	*EXISTING PRESSURE (KSF)*	*PRESSURE INCREASE (KSF)*	*INITIAL VOID RATIO*	*COMPRESSION INDEX (Cc)*	*Qu CORRECTION FACTOR*	*LAYER SETTLEMENT (IN.)*
1.5	120	1.50	26	2.668	0.144	0.702	0.144	0.142	**0.00**
2.5	120	2.90	21	2.847	0.144	0.567	0.099	0.100	**0.00**
2.0	120	3.30	14	2.933	0.145	0.378	0.036	0.100	**0.00**
7.0	120	3.00	12	3.098	0.150	0.324	0.018	0.100	**0.00**
1.5	120	0.00	11	3.248	0.159	0.297	0.009	1.000	**Granular**
2.0	120	2.50	11	3.308	0.164	0.297	0.009	0.100	**0.00**
24.0	120	2.70	12	3.749	0.196	0.324	0.018	0.100	**0.01**
5.0	120	2.50	17	4.277	0.214	0.459	0.063	0.100	**0.01**
8.0	120	2.90	13	4.532	0.215	0.351	0.027	0.100	**0.00**

TOTAL SETTLEMENT UNDER CENTER OF BRIDGE CONE = 0.03 IN.

EMBANKMENT AND SOIL PROFILE



Illinois Department of Transportation

COHESIVE SOIL SETTLEMENT ESTIMATE

LOCATION AND BORING USED ====: West Abut/ Boring SB-3 WIDENING
TYPE OF SURCHARGE ================================ 1 (1=2:1 bridge cone, 2=continuous embank., 3=rectangular surch.)
DEPTH TO WATER TABLE (below top of existing embankment) == 54 FT

NEW EMBANKMENT:
- NEW EMBANKMENT FILL UNIT WEIGHT ========== 120 PCF
- NEW EMBANKMENT FILL HEIGHT ========== 22 FT
- PROPOSED WIDTH AT TOP ========== 15 FT
- PROPOSED WIDTH AT BOTTOM ========== 103 FT (which is a 2.0:1 slope)

EXISTING EMBANKMENT (IF ANY):
- EXISTING EMBANKMENT UNIT WEIGHT ========== 120 PCF
- EXISTING EMBANKMENT HEIGHT ========== 13 FT
- EXISTING WIDTH AT TOP ========== 15 FT
- EXISTING WIDTH AT BASE ========== 67 FT (which is a 2.0:1 slope)

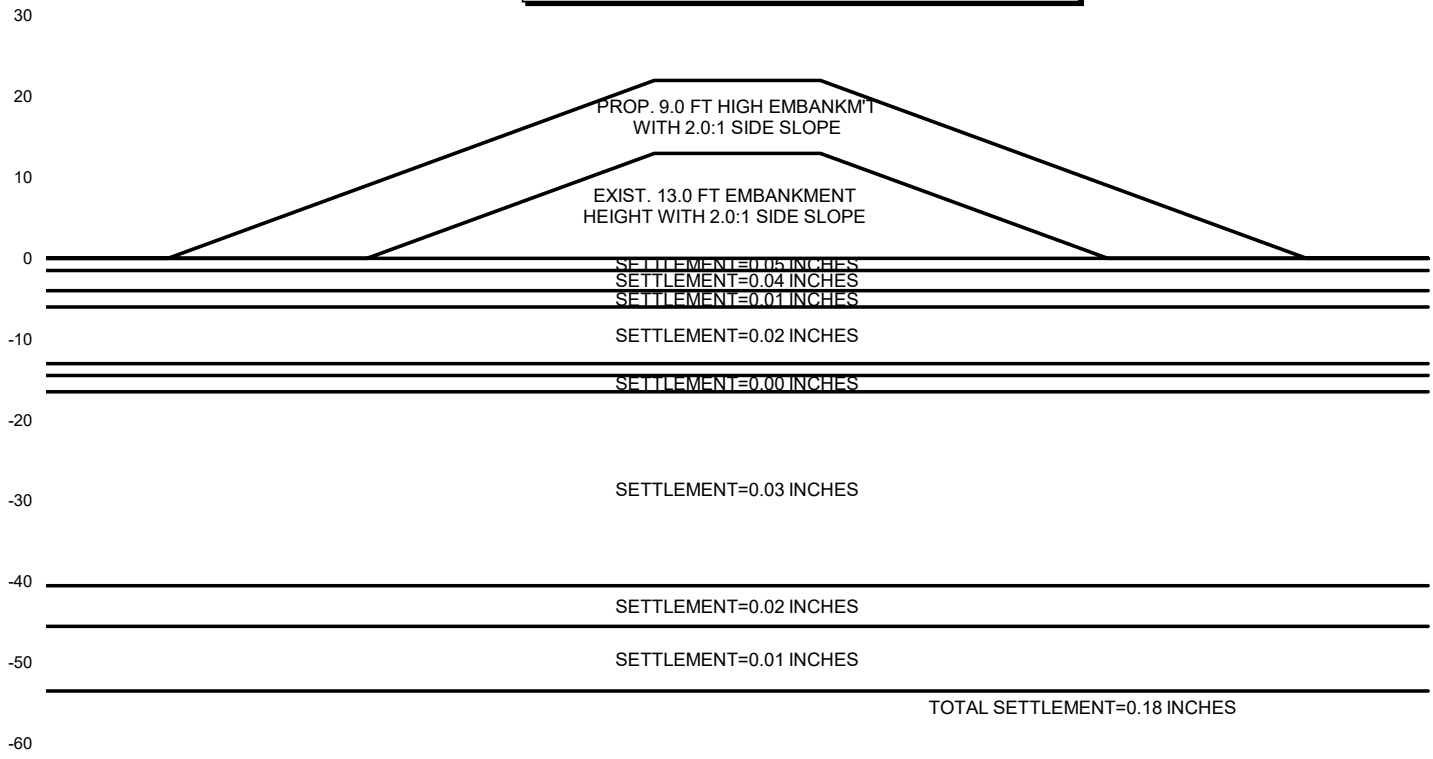
ASSUMPTIONS:

Soil Deposit is Normally Consolidated
Cohesive Layers are Saturated
Soils have a Low Sensitivity
Liquid Limit (LL)=Moist. Content (MC%)
Initial Void Ratio (Eo)=2.7*(MC%)/100
Comp. Index (Cc)=0.009*(LL-10)
Neglecting Granular & Secondary Settlem't

LAYER THICK (FT)	*TOTAL UNIT WT. (PCF)*	*UNCONF. COMP. STRENGTH (Qu) (TSF)*	*MOIST. CONTENT (%)*	*EXISTING PRESSURE (KSF)*	*PRESSURE INCREASE (KSF)*	*INITIAL VOID RATIO*	*COMPRESSION INDEX (Cc)*	*Qu CORRECTION FACTOR*	*LAYER SETTLEMENT (IN.)*
1.5	120	1.50	26	1.636	1.080	0.702	0.144	0.142	**0.05**
2.5	120	2.90	21	1.836	1.080	0.567	0.099	0.100	**0.04**
2.0	120	3.30	14	2.055	1.079	0.378	0.036	0.100	**0.01**
7.0	120	3.00	12	2.479	1.073	0.324	0.018	0.100	**0.02**
1.5	120	0.00	11	2.873	1.060	0.297	0.009	1.000	**Granular**
2.0	120	2.50	11	3.036	1.052	0.297	0.009	0.100	**0.00**
24.0	120	2.70	12	4.304	0.964	0.324	0.018	0.100	**0.03**
5.0	120	2.50	17	5.704	0.837	0.459	0.063	0.100	**0.02**
8.0	120	2.90	13	6.009	0.782	0.351	0.027	0.100	**0.01**

TOTAL SETTLEMENT UNDER CENTER OF BRIDGE CONE = 0.18 IN.

EMBANKMENT AND SOIL PROFILE



BEARING CAPACITY OF SHALLOW FOUNDATIONS
Terzaghi and Vesic Methods

Date: February 19, 2018
Identification: Bradley Ave. over I-57 (PIER)

Input

Units of Measurement

	E	SI or E

Foundation Information

Shape	RE	SQ, CI, CO, or RE
B =	15	ft
L =	50	ft
D =	4	ft

Soil Information

c =	1980	lb/ft^2
phi =	0	deg
gamma =	120	lb/ft^3
Dw =	4	ft

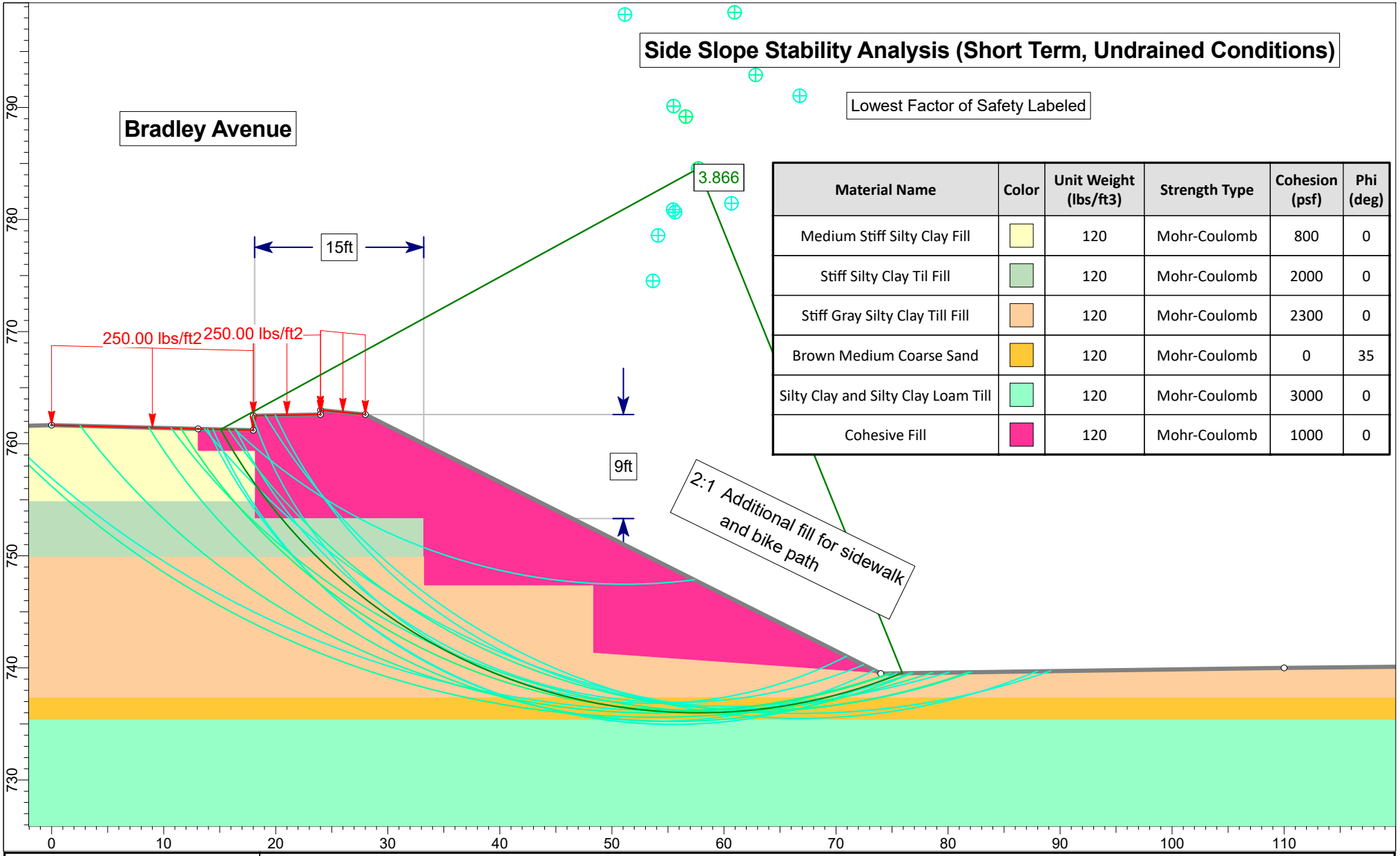
Factor of Safety

F =	1

Results

	Terzaghi		Vesic	
Bearing Capacity				
q ult =	n/a	lb/ft^2	12,400	lb/ft^2
q a =	n/a	lb/ft^2	12,400	lb/ft^2
Allowable Column Load				
P =	#VALUE!	k	9,300	k

Side Slope Stability Analysis (Short Term, Undrained Conditions)



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Medium Stiff Silty Clay Fill		120	Mohr-Coulomb	800	0
Stiff Silty Clay Til Fill		120	Mohr-Coulomb	2000	0
Stiff Gray Silty Clay Till Fill		120	Mohr-Coulomb	2300	0
Brown Medium Coarse Sand		120	Mohr-Coulomb	0	35
Silty Clay and Silty Clay Loam Till		120	Mohr-Coulomb	3000	0
Cohesive Fill		120	Mohr-Coulomb	1000	0

McCleary Engineering

SLIDEINTERPRET 6.039

SLIDE - An Interactive Slope Stability Program	Bradley Avenue Over Interstate 57 SN 010-0294		
Analysis Description	Bradley Ave SLIDE Analysis Undrained Revised 2-22-18.slim Slope Analysis		
Drawn By	MJ	Scale 1:142	Company McCleary Engineering
Date	2/22/2018, 1:06:39 PM		File Name Bradley Ave SLIDE Analysis Undrained Revised 2-22-18.slim

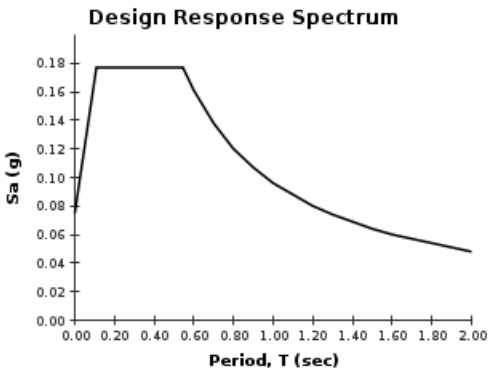
USGS Design Maps Summary Report

User–Specified Input

Report Title	SN 101-0294 Bradley Ave over I-57 in Champaign Wed August 24, 2016 17:12:45 UTC
Building Code Reference Document	2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design (which utilizes USGS hazard data available in 2002)
Site Coordinates	40.12682°N, 88.30316°W
Site Soil Classification	Site Class C – "Very Dense Soil and Soft Rock"

USGS–Provided Output

PGA =	0.063 g	**A_s =**	0.075 g
S_S =	0.147 g	**S_{DS} =**	0.177 g
S_1 =	0.057 g	**S_{D1} =**	0.096 g



SEISMIC SITE CLASS DETERMINATION

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified on 12/10/10

PROJECT TITLE=====Bradley Avenue over I-57 in Champaign SN 010-0294 (Prop.)

Substructure 1

Base of Substruct. Elev. (or ground surf for bents)	754.39	ft.
Pile or Shaft Dia.	12	inches
Boring Number	SB-1	
Top of Boring Elev.	761.8	ft.
Approximate Fixity Elev.	748.39	ft.

Individual Site Class Definition:

N (bar):	20	(Blows/ft.)	Soil Site Class D
N_{ch} (bar):	35	(Blows/ft.)	Soil Site Class D <----Controls
s_u (bar):	3.11	(ksf)	Soil Site Class C

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	760.8	1.00	4	1.00	B
	758.3	2.50	8	0.80	
	755.8	2.50	8	0.80	
	754.8	1.00	8	0.80	B
	752.3	2.50	9	2.00	
	749.8	2.50	9	2.00	B
1.1	747.3	2.50	11	2.30	
3.6	744.8	2.50	11	2.30	
6.1	742.3	2.50	13	2.30	
8.6	739.8	2.50	13	2.30	
10.6	737.8	2.00	13	2.30	B
12.6	735.8	2.00	14	2.50	B
15.1	733.3	2.50	27	3.00	
17.1	731.3	2.00	14	5.80	B
19.6	728.8	2.50	11	2.10	B
22.1	726.3	2.50	14	3.50	B
24.6	723.8	2.50	11	2.50	B
27.1	721.3	2.50	12	3.30	B
29.6	718.8	2.50	11	3.30	
32.1	716.3	2.50	14	1.80	
34.6	713.8	2.50	9	2.50	B
37.1	711.3	2.50	13		
39.6	708.8	2.50	20		
40.6	707.8	1.00	20		B
43.6	704.8	3.00	32		B
46.1	702.3	2.50	11	2.50	
48.6	699.8	2.50	11	2.50	
51.1	697.3	2.50	11	2.50	B
53.6	694.8	2.50	24	2.30	
56.1	692.3	2.50	45		
58.6	689.8	2.50	45		B
61.1	687.3	2.50	20	2.30	
63.6	684.8	2.50	20	2.30	
66.1	682.3	2.50	38	2.30	
68.6	679.8	2.50	39	3.70	
71.1	677.3	2.50	39	3.70	
73.6	674.8	2.50	48	9.60	
76.6	671.8	3.00	58	6.60	B
100.0	648.4	23.40	48	6.60	R

Substructure 2

Base of Substruct. Elev. (or ground surf for bents)	739.85	ft.
Pile or Shaft Dia.	12	inches
Boring Number	SB-2	
Top of Boring Elev.	741.57	ft.
Approximate Fixity Elev.	733.85	ft.

Individual Site Class Definition:

N (bar):	19	(Blows/ft.)	Soil Site Class D
N_{ch} (bar):	NA	(Blows/ft.)	NA
s_u (bar):	2.32	(ksf)	Soil Site Class C <----Controls

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	739.1	2.50	10	1.70	
	736.6	2.50	13	3.30	
	735.1	1.50	13	3.30	B
1.3	732.6	2.50	5	1.00	
3.8	730.1	2.50	10	1.70	B
5.3	728.6	1.50	18	2.10	B
7.8	726.1	2.50	14	2.10	
10.3	723.6	2.50	17	3.10	B
12.8	721.1	2.50	10	1.90	
15.3	718.6	2.50	11	1.80	
17.8	716.1	2.50	9	1.20	
20.3	713.6	2.50	12	1.60	B
22.8	711.1	2.50	9	1.40	
25.3	708.6	2.50	9	1.40	
27.8	706.1	2.50	9	1.40	
30.3	703.6	2.50	9	1.40	
32.3	701.6	2.00	8	1.50	B
34.8	699.1	2.50	8	1.50	
37.3	696.6	2.50	13	1.70	
39.8	694.1	2.50	13	1.70	
42.3	691.6	2.50	16	1.60	
44.8	689.1	2.50	16	1.60	
47.3	686.6	2.50	18	1.80	
49.8	684.1	2.50	18	1.80	
50.8	683.1	1.00	18	1.80	B
52.3	681.6	1.50	15	1.90	
54.3	679.6	2.00	15	1.90	B
56.8	677.1	2.50	66	4.50	
59.3	674.6	2.50	66	4.50	
61.8	672.1	2.50	66	4.50	
64.3	669.6	2.50	74	4.50	
65.8	668.1	1.50	74	4.50	
67.3	666.6	1.50	64	4.50	
68.8	665.1	1.50	104	4.50	B
100.0	633.9	31.20	81	4.50	R

Substructure 3

Base of Substruct. Elev. (or ground surf for bents)	754.85	ft.
Pile or Shaft Dia.	12	inches
Boring Number	SB_3	
Top of Boring Elev.	761.91	ft.
Approximate Fixity Elev.	748.85	ft.

Individual Site Class Definition:

N (bar):	20	(Blows/ft.)	Soil Site Class D
N_{ch} (bar):	NA	(Blows/ft.)	NA
s_u (bar):	3.22	(ksf)	Soil Site Class C <----Controls

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	760.9	1.00	4	1.00	B
	757.9	3.00	10	1.50	
	754.9	3.00	10	1.50	B
	752.4	2.50	10	1.50	
	749.9	2.50	10	3.10	B
1.4	747.4	2.50	10	3.10	
3.9	744.9	2.50	12	5.00	
6.4	742.4	2.50	12	5.00	B
8.9	739.9	2.50	14	4.10	
11.4	737.4	2.50	14	4.10	B
13.4	735.4	2.00	10	1.20	B
14.9	733.9	1.50	15	1.50	B
17.4	731.4	2.50	13	2.90	B
19.4	729.4	2.00	17	3.30	B
21.4	727.4	2.00	16	2.50	
23.9	724.9	2.50	15	3.50	
26.4	722.4	2.50	23	2.90	B
27.9	720.9	1.50	10		B
29.9	718.9	2.00	13	2.50	B
31.9	716.9	2.00	13	2.50	
34.4	714.4	2.50	13	2.50	
36.9	711.9	2.50	13	2.10	
39.4	709.4	2.50	15	4.00	
41.9	706.9	2.50	12	2.50	
44.4	704.4	2.50	12	2.50	
46.9	701.9	2.50	15	2.30	
49.4	699.4	2.50	15	2.30	
51.9	696.9	2.50	21	3.10	
53.9	694.9	2.00	21	3.10	B
56.4	692.4	2.50	21	3.10	
58.9	689.9	2.50	14	2.47	B
61.4	687.4	2.50	14	2.47	
63.9	684.9	2.50	18	2.50	
66.9	681.9	3.00	24	2.90	B
69.4	679.4	2.50	24	2.90	
71.9	676.9	2.50	80	10.10	
74.4	674.4	2.50	80	10.10	
76.9	671.9	2.50	54	9.90	B
100.0	648.8	23.10	71	10.10	R

Substructure 4

Base of Substruct. Elev. (or ground surf for bents)		ft.
Pile or Shaft Dia.		inches
Boring Number		
Top of Boring Elev.		ft.
Approximate Fixity Elev.		ft.

Individual Site Class Definition:

N (bar):		(Blows/ft.)	NA
N_{ch} (bar):		(Blows/ft.)	NA
s_u (bar):		(ksf)	NA

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary

Global Site Class Definition: Substructures 1 through 3

N (bar):	20	(Blows/ft.)	Soil Site Class D
N_{ch} (bar):		(Blows/ft.)	NA, H < 0.1*H (Total)
s_u (bar):	2.87	(ksf)	Soil Site Class C <----Controls

Pile Discussion for SN 010-0294:
Three borings, from 2016 SB-1(east abut), SB-2 (center pier) and SB-3 (west abut) were used to design the foundations of the proposed structure. All 3 borings show similar soils and stratifications. There were 3 recorded borings from 1958. These borings were all about 30 ft. deep; the deepest ended at elevation 711.00 ft. The 1958 borings showed a predominance of silty clays, silty clay loams, clay tills, and silty clay loam tills. They also reporteded the approximate elevation the hard tills were found in the lower to mid-730 elevations. We felt more comfortable using the more complete and more extensive information from the 2016 borings in our analyses; the 1958 borings reported blow counts and Qu's significantly higher than the 2016 borings.

The factored loadings for the East and West Abutment is 1,260 kips; the center pier is 3,640 kips.

The existing bridge at this location (SN 010-0174) used concrete piles at the abutments --the attached as-built plans scheduled 25' pile lengths. The 3 piers were supported on spread footings sitting at about an elevation of 731 ft.

For SN 010-0294, we recommend the use of metal shell piles because of the suitable soils and no bedrock encountered. Based on the subsurface information, estimated lengths of H-piles cannot be adequately determined. Metal Shell 12 inch diameter with 0.25 inch walls or greater piles would be suitable for use here if we follow the new integral abutment policy. However, because some layers of the subsoils are very stiff to hard a thicker wall is recommended, 0.312 inch. Some of the deeper deposits of sand and gravel are dense with high N-values, but these layers are believed to be below the tips of the proposed pilings. The calculated settlement is less than 0.4 inches, therefore, down drag was not used in the analysis. Also, the site is in a SPZ 1, therefore, liquefaction was not considered.

Integral Abutments –To allow the required movement of the support piling for an integral abutment, the piles for the west abutment should be pre-cored for ten feet (18 inch diameter) and backfilled with Bentonite.

Assumptions used for the pile length analysis include:

- Bottom of East Abutment Elevation = 754.39 ft.
- Bottom of West Abutment Elevation = 754.85 ft. – 10 ft. pre-core = 744.85 ft.
- Bottom of Center Pier Elevation = 731.51ft.
- The pile cutoff elevation was assumed to allow for a 2 ft. embedment into concrete.
- No other geotechnical losses, such as liquefaction or down drag, were accounted for in the analysis.

Lateral Load Soil Parameters, (boring SB-1)

Elevations	Soil Discussion	Effective Friction phi, (degrees)	Cohesion C, (psf)	Soil Factor E50	Effective Unit Wt. (pcf)	Spring Constant k
744 to 738	Stiff to V. Stiff Cohesive Fill	0	2000	0.005	120	500
738 to 736,	Medium Dense Silty Fine Sand	32	N/A	N/A	50	60
736 to 731	Hard Cohesive Soil	0	4000	0.004	130	1000
731 to 714	Very Stiff Cohesive Soil	0	2700	0.005	125	1000
714 to 708	Medium Dense Silty Fine Sand	32	N/A	N/A	50	60
708 to 705	Dense Silty Fine to Medium Coarse Sand	36	N/A	N/A	57.6	125
705 to 697	Very Stiff Cohesive Soil	0	2400	0.005	62.6	1000
697 to 690	Dense Sand & Gravel	38	N/A	N/A	67.6	125
690 to 678	Very Stiff Cohesive Soil	0	2400	0.005	62.6	1000
Below 678	Hard Cohesive Soil	0	4000	0.004	67.6	1000

Mark Jones

From: terry@mcclearyengineering.com
Sent: Monday, February 12, 2018 11:10 AM
To: 'Albert Niemerg'
Cc: 'Michael Cummins'; 'Mark Jones'; davidm@mcclearyengineering.com
Subject: RE: Bradley Ave. over I-57 Substructure Loads

Albert,

Would you happen to have the old plans for this structure?

Thanks,

Terry McCleary
McCleary Engineering
3705 Progress Blvd., Suite 2
Peru, IL 61354
Office # 815.780.8486
Cell # 815.830.6405

From: Albert Niemerg [mailto:albert@cumminsengineering.com]
Sent: Wednesday, February 07, 2018 2:36 PM
To: terry@mcclearyengineering.com
Cc: Michael Cummins <mike@cumminsengineering.com>
Subject: Bradley Ave. over I-57 Substructure Loads

Terry,

The vertical loads at the substructure units are as follows:

	Service	Strength I (LRFD)
Pier	2,680k	3,640k
Abut.	920k	1,260k

Please let me know if you need any additional information from us.

Thanks
Albert A. Niemerg, P.E.
Cummins Engineering Corporation
135 West Lake Shore Drive
Springfield, Illinois 62703
Phone: 217-523-2311

Illinois Department of Transportation

INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 10/30/17

GENERAL DATA

STRUCTURE NUMBER	010-0294 Bradley Ave		TOTAL STRUCTURE LENGTH	250.00	FT
STRUCTURE TYPE	MULTI-SPAN		NUMBER OF SPANS	2	
STRUCTURE SKEW	22.2	DEGREES	END SPAN LENGTH	123.19	FT
SUPER. DATA IN REFERENCE TO SUB. DATA	ABUT 1		ADJACENT INTERIOR SPAN LENGTH	0.01	FT

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (END OR MAIN SPAN)

BEAM TYPE	PLATE GIRDER	
TOP FLANGE WIDTH	16.00	IN
TOP FLANGE THICKNESS	1.00	IN
WEB DEPTH	44.00	IN
WEB THICKNESS	0.31	IN
BOTTOM FLANGE WIDTH	16.00	IN
BOTTOM FLANGE THICKNESS	1.00	IN
BEAM SPACING PERP. TO CL	5.50	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	4.00	KSI

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (ADJACENT SPAN)

TOP FLANGE WIDTH		IN
TOP FLANGE THICKNESS		IN
WEB DEPTH		IN
WEB THICKNESS		IN
BOTTOM FLANGE WIDTH		IN
BOTTOM FLANGE THICKNESS		IN
BEAM SPACING PERP. TO CL	5.50	FT
SLAB THICKNESS		IN
SLAB F'C		KSI

ABUTMENT #1 DATA

ABUTMENT NAME	East	
ABUTMENT REFERENCE BORING	SB-1	
BOTTOM OF ABUTMENT ELEVATION	754.39	FT
ESTIMATED NUMBER OF PILES AT ABUT.	9	
PILE SPACING PERP. TO CL	5.5	FT

ABUTMENT #2 DATA

ABUTMENT NAME	West	
ABUTMENT REFERENCE BORING	SB-3	
BOTTOM OF ABUTMENT ELEVATION	754.85	FT
ESTIMATED NUMBER OF PILES AT ABUT.	9	
PILE SPACING PERP. TO CL	5.5	FT

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #1

BOT. OF LAYER ELEV. (FT)	*LAYER THICKNESS (FT)*	*UNCONFINED COMPRESSIVE STRENGTH (TSF)*	*N S.P.T. VALUE (BLOWS/12 IN.)*	*Qu EQUIV. FOR N VALUE (TSF)*
749.80	4.59	2.0		
744.39	5.41	2.3		

10.00 FT = TOTAL DEPTH ENTERED

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #2

BOT. OF LAYER ELEV. (FT)	*LAYER THICKNESS (FT)*	*UNCONFINED COMPRESSIVE STRENGTH (TSF)*	*N S.P.T. VALUE (BLOWS/12 IN.)*	*Qu EQUIV. FOR N VALUE (TSF)*
749.91	4.94	3.1		
744.85	5.06	5.0		

10.00 FT = TOTAL DEPTH ENTERED

WEIGHTED AVERAGE Qu FOR ABUTMENT #1 = 2.16 TSF

PILE STIFFNESS MODIFIER FOR ABUTMENT #1
= 1/(1.45-[0.3*2.16]) = 1.25

WEIGHTED AVERAGE Qu FOR ABUTMENT #2 = 4.06 TSF

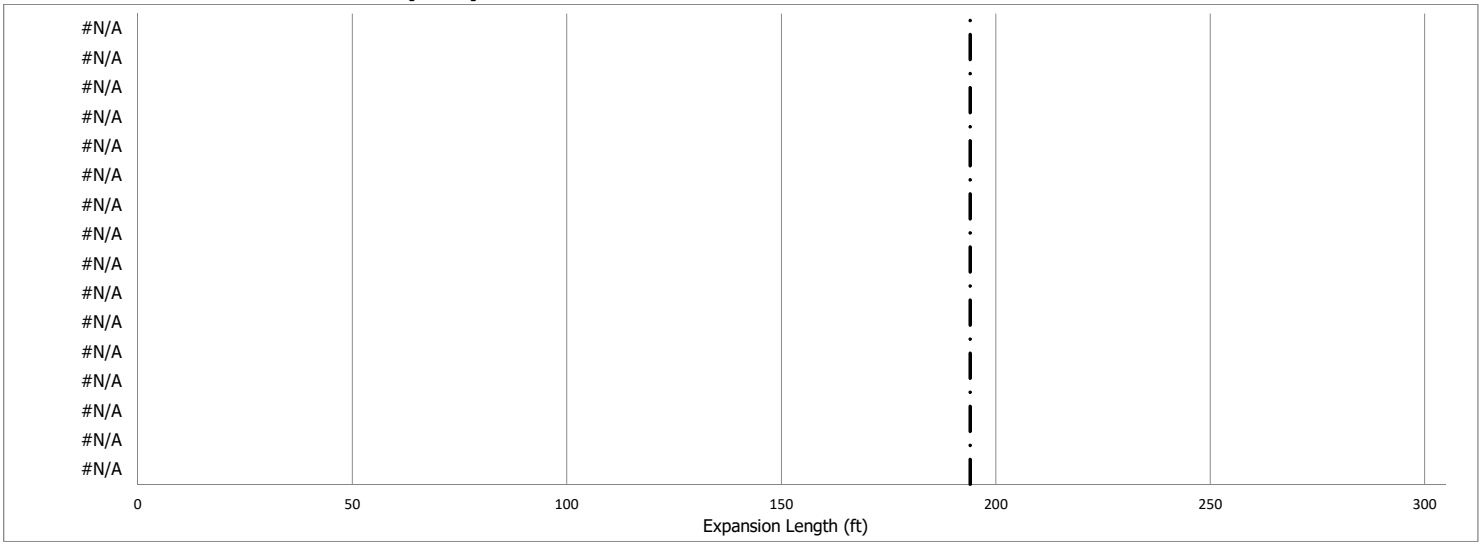
PILE STIFFNESS MODIFIER FOR ABUTMENT #2
= 1/(1.45-[0.3*4.06]) = 4.32

WEIGHTED AVG. Qu > 3.0 TSF WITH TRIB. LENGTH > 20%, INTEGRAL ABUTMENT STRUCTURE NOT ALLOWED

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [1.25*9*0+4.32*9*250]/[1.25*9+4.32*9] = 193.95 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [4.32*9*0+1.25*9*250]/[4.32*9+1.25*9] = ~~56.05~~ FT

ABUT 1 (East) - EXPANSION LENGTH LIMIT CHART - 22.2 DEG. SKEW



= Estimated expansion length for the indicated abutment. Piles with an expansion length greater than this are suitable for consideration.
(Note: The same size pile should be used at both abutments.)

Illinois Department of Transportation

INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 8/12/17

GENERAL DATA

STRUCTURE NUMBER	010-0294		TOTAL STRUCTURE LENGTH	250.00	FT
STRUCTURE TYPE	MULTI-SPAN		NUMBER OF SPANS	2	
STRUCTURE SKEW	22.2	DEGREES	END SPAN LENGTH	123.20	FT
SUPER. DATA IN REFERENCE TO SUB. DATA	ABUT 1		ADJACENT INTERIOR SPAN LENGTH	0.01	FT

SUPERSTRUCTURE DATA (END OR MAIN SPAN)

BEAM TYPE	WIDE FLANGE	
WIDE FLANGE	W44X230	
BEAM SPACING PERP. TO CL	5.50	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	4.00	KSI

SUPERSTRUCTURE DATA (ADJACENT SPAN)

WIDE FLANGE	W44X230	
BEAM SPACING PERP. TO CL	5.50	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	4.00	KSI

ABUTMENT #1 DATA

ABUTMENT NAME	West	
ABUTMENT REFERENCE BORING	SB-3	
BOTTOM OF ABUTMENT ELEVATION	754.85	FT
ESTIMATED NUMBER OF PILES AT ABUT.	8	
PILE SPACING PERP. TO CL	5.5	FT

ABUTMENT #2 DATA

ABUTMENT NAME	East	
ABUTMENT REFERENCE BORING	SB-1	
BOTTOM OF ABUTMENT ELEVATION	754.39	FT
ESTIMATED NUMBER OF PILES AT ABUT.	8	
PILE SPACING PERP. TO CL	5.5	FT

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #1

BOT. OF LAYER ELEV. (FT)	LAYER THICKNESS (FT)	UNCONFINED COMPRESSIVE STRENGTH (TSF)	N S.P.T. VALUE (BLOWS/12 IN.)	Qu EQUIV. FOR N VALUE (TSF)
749.91	4.94	0.0		
744.85	5.06	0.0		

10.00 FT = TOTAL DEPTH ENTERED

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #2

BOT. OF LAYER ELEV. (FT)	LAYER THICKNESS (FT)	UNCONFINED COMPRESSIVE STRENGTH (TSF)	N S.P.T. VALUE (BLOWS/12 IN.)	Qu EQUIV. FOR N VALUE (TSF)
749.80	4.59	2.0		
744.39	5.41	2.3		

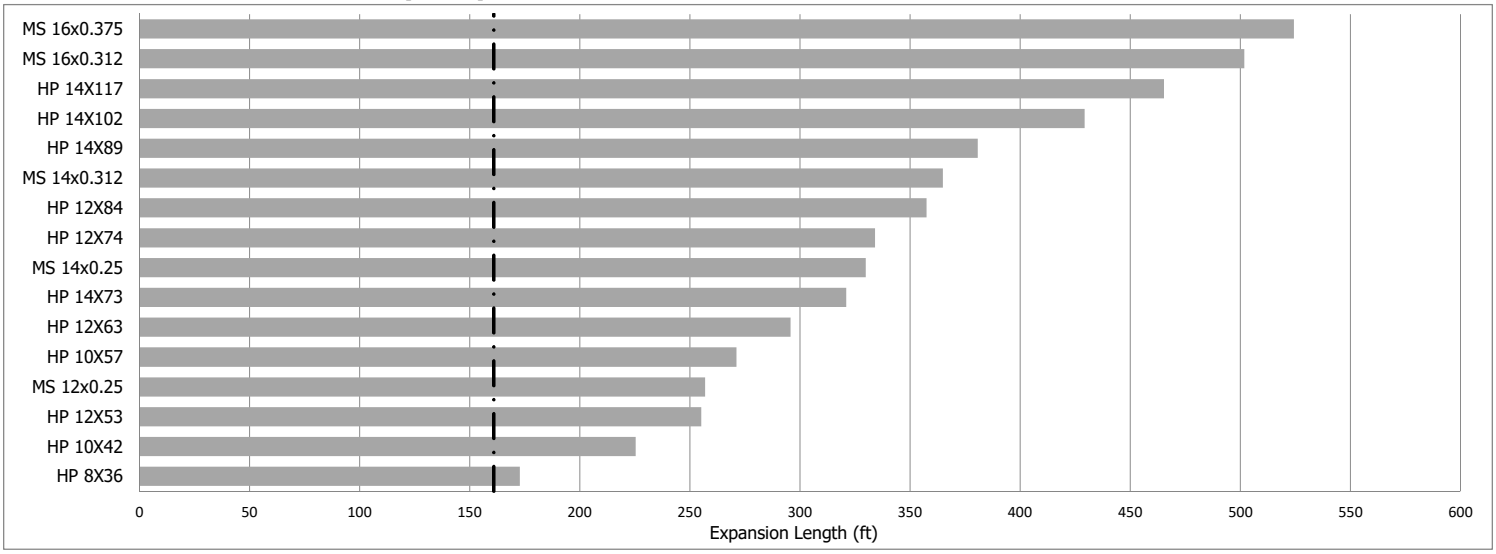
10.00 FT = TOTAL DEPTH ENTERED

WEIGHTED AVERAGE Qu FOR ABUTMENT #1	0.00	TSF	WEIGHTED AVERAGE Qu FOR ABUTMENT #2	2.16	TSF
PILE STIFFNESS MODIFIER FOR ABUTMENT #1 Equal to 1.0 since ave. Qu < 1.5	0.69		PILE STIFFNESS MODIFIER FOR ABUTMENT #2 = 1/(1.45-[0.3*2.16])	1.25	

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [0.69*8*0+1.25*8*250]/[0.69*8+1.25*8] = 161.02 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [1.25*8*0+0.69*8*250]/[1.25*8+0.69*8] = 88.98 FT

ABUT 1 (West) - EXPANSION LENGTH LIMIT CHART - 22.2 DEG. SKEW



= Estimated expansion length for the indicated abutment. Piles with an expansion length greater than this are suitable for consideration.

East Abutment, Using Boring SB-1			West Abutment, Using Boring SB-3		
Maximum Nominal Required Bearing (Kips)	Maximum Factored Resistance Available (Kips)	Maximum Estimated Pile Length (Ft.)	Maximum Nominal Required Bearing (Kips)	Maximum Factored Resistance Available (Kips)	Maximum Estimated Pile Length (Ft.)
HP 10 x 42			**HP 10 x 42**		
236	130	57	243	134	57
315	173	62	262	144	62
292	161	67	285	157	67
335	184	72	335	184	73
HP 12 x 53			**HP 12 x 53**		
290	160	57	299	165	57
398	219	62	321	177	62
356	196	67	348	191	67
418	230	74	418	230	74
HP 12 x 63			**HP 12 x 63**		
438	241	75	314	173	60
465	256	80	338	186	65
479	269	82	367	202	70
497	273	**	497	273	76
HP 14 x 73			**HP 14 x 73**		
429	236	67	377	207	60
459	252	72	404	222	65
529	291	75	439	242	70
578	318	82*	578	318	76
HP 14x89			**HP 14x89**		
464	255	72	445	245	70
565	311	77	563	310	75
605	333	82	627	345	80
705	388	**	705	388	95*
Metal Shell 12” 0.25” walls			**Metal Shell 12” 0.25” walls**		
194	107	28	232	128	42
230	126	33	274	151	47
257	141	38	305	168	52
353	194	43	353	194	59
Metal Shell 14” 0.25” walls			**Metal Shell 14” 0.25” walls**		
232	128	28	275	151	42
273	150	33	324	178	47
303	167	38	360	198	52
413	227	43	413	227	58
Metal Shell 14” 0.312” walls			**Metal Shell 14” 0.312” walls**		
232	128	28	383	210	55
273	150	33	427	235	60
303	167	38	463	255	65
513	282	49	513	282	71

*Below the bottom of the boring

**Well below the bottom of the boring

Pier, Using Boring SB-2		
Maximum Nominal Required Bearing (Kips)	Maximum Factored Resistance Available (Kips)	Maximum Estimated Pile Length (Ft.)
HP 10 x 42		
185	102	50
272	150	56
299	164	61
335	184	65
HP 12 x 53		
227	125	50
344	189	56
375	206	61
418	230	66*
HP 12 x 63		
229	126	50
362	199	59
427	235	66
497	273	81*
HP 14 x 73		
399	219	54
434	239	59
475	261	64
578	318	73*
HP 14x89		
406	223	54
441	243	59
484	266	64
705	388	**
Metal Shell 12” 0.25” walls		
218	120	42
246	135	47
265	146	50
353	194	54
Metal Shell 14” 0.25” walls		
257	141	42
290	159	47
313	172	50
413	227	54
Metal Shell 14” 0.312” walls		
257	141	42
290	159	47
313	172	50
513	282	53

*Below the bottom of the boring

**Well below the bottom of the boring

I D O T S T A T I C M E T H O D O F E S T I M A T I N G P I L E L E N G T H

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== SN 010-0294 west abut.
REFERENCE BORING ========== SB-3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 756.85 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 744.85 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== None ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) === None ft

TOTAL FACTORED SUBSTRUCTURE LOAD ======== 1260 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)=== 51.84 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE = 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 194.44 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 72.92 KIPS

PILE TYPE AND SIZE ========== Metal Shell 14"Φ w/.312" walls
Pile Perimeter========== 3.665 FT.
Pile End Bearing Area========== 1.069 SQFT.

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
513 KIPS	**504** KIPS	**277** KIPS	**70** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)				NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
742.41	2.44	4.30	13		28.1		***76.2***				76	0	0	42	14
739.91	2.50	4.10	14		27.7	48.1	***69.9***				70	0	0	38	17
737.41	2.50	1.20	10		11.8	14.1	***82.8***				83	0	0	46	19
735.41	2.00	1.30	13		10.0	15.2	***95.1***				95	0	0	52	21
733.91	1.50	1.50	15		8.3	17.6	***119.8***				120	0	0	66	23
731.41	2.50	2.90	13		21.4	34.0	***145.9***				146	0	0	80	25
729.41	2.00	3.30	17		18.8	38.7	***155.3***				155	0	0	85	27
726.91	2.50	2.50	16		19.3	29.3	***186.4***				186	0	0	103	30
724.41	2.50	3.50	15		24.6	41.0	***203.9***				204	0	0	112	32
722.41	2.00	2.90	23		17.1	34.0	***221.1***				221	0	0	122	34
720.91	1.50	2.90	13		12.9	34.0	***229.2***				229	0	0	126	36
718.91	2.00	2.50	13		15.5	29.3	***244.7***				245	0	0	135	38
716.41	2.50	2.50	13		19.3	29.3	***264.0***				264	0	0	145	40
714.41	2.00	2.50	13		15.5	29.3	***274.8***				275	0	0	151	42
711.91	2.50	2.10	13		17.2	24.6	***314.3***				314	0	0	173	45
709.41	2.50	4.00	15		27.2	46.9	***323.9***				324	0	0	178	47
706.91	2.50	2.50	12		19.3	29.3	***342.0***				342	0	0	188	50
704.41	2.50	2.40	13		18.8	28.1	***359.6***				360	0	0	198	52
701.91	2.50	2.30	15		18.3	27.0	***382.6***				383	0	0	210	55
699.41	2.50	2.70	18		20.4	31.7	***407.6***				408	0	0	224	57
696.91	2.50	3.10	21		22.5	36.3	***426.6***				427	0	0	235	60
694.41	2.50	2.80	17		20.9	32.8	***444.0***				444	0	0	244	62
691.91	2.50	2.50	14		19.3	29.3	***463.3***				463	0	0	255	65
689.41	2.50	2.50	16		19.3	29.3	***482.6***				483	0	0	265	67
686.91	2.50	2.50	18		19.3	29.3	***504.3***				504	0	0	277	70
684.41	2.50	2.70	22		20.4	31.7	***527.0***				~~527~~	~~*0*~~	~~*0*~~	~~*290*~~	~~*72*~~
681.91	2.50	2.90	24		21.4	34.0	***776.9***				~~777~~	~~*0*~~	~~*0*~~	~~*427*~~	~~*75*~~
679.41	2.50		52	Hard Till	31.3	262.4	***949.5***				~~950~~	~~*0*~~	~~*0*~~	~~*522*~~	~~*77*~~
676.91	2.50		80	Hard Till	65.8	403.8	***949.7***				~~950~~	~~*0*~~	~~*0*~~	~~*522*~~	~~*80*~~
674.41	2.50		67	Hard Till	47.9	338.2	***931.9***				~~932~~	~~*0*~~	~~*0*~~	~~*513*~~	~~*82*~~
671.91	2.50		54	Hard Till		272.5									

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== Bradley Ave. Pier
REFERENCE BORING ========== SB-2
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 733.51 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 731.51 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== None ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ===: None ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========: 3640 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)===: 51.84 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =: 3
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 187.24 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 70.22 KIPS

PILE TYPE AND SIZE ==========: Metal Shell 12"Φ w/.25" walls
Pile Perimeter========== 3.142 FT.
Pile End Bearing Area========== 0.785 SQFT.

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
353 KIPS	**279** KIPS	**154** KIPS	**53** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)				NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
730.07	1.44	1.70	10		7.4		***25.5***				26	0	0	14	3
728.57	1.50	2.10	18		8.9	18.1	***34.4***				34	0	0	19	5
726.07	2.50	2.10	14		14.8	18.1	***57.7***				58	0	0	32	7
723.57	2.50	3.10	17		19.3	26.7	***66.7***				67	0	0	37	10
721.07	2.50	1.90	10		13.9	16.4	***79.6***				80	0	0	44	12
718.57	2.50	1.80	11		13.4	15.5	***87.8***				88	0	0	48	15
716.07	2.50	1.20	9		10.1	10.3	***101.4***				101	0	0	56	17
713.57	2.50	1.60	12		12.4	13.8	***112.0***				112	0	0	62	20
711.07	2.50	1.40	9		11.3	12.1	***123.3***				123	0	0	68	22
708.57	2.50	1.40	9		11.3	12.1	***134.6***				135	0	0	74	25
706.07	2.50	1.40	9		11.3	12.1	***145.8***				146	0	0	80	27
703.57	2.50	1.40	9		11.3	12.1	***158.0***				158	0	0	87	30
701.57	2.00	1.50	8		9.5	12.9	***167.4***				167	0	0	92	32
699.07	2.50	1.50	8		11.8	12.9	***181.0***				181	0	0	100	34
696.57	2.50	1.70	13		12.9	14.6	***193.8***				194	0	0	107	37
694.07	2.50	1.70	13		12.9	14.6	***205.9***				206	0	0	113	39
691.57	2.50	1.60	16		12.4	13.8	***218.2***				218	0	0	120	42
689.07	2.50	1.60	16		12.4	13.8	***232.3***				232	0	0	128	44
686.57	2.50	1.80	18		13.4	15.5	***245.7***				246	0	0	135	47
684.07	2.50	1.80	18		13.4	15.5	***259.0***				259	0	0	142	49
683.07	1.00	1.80	18		5.3	15.5	***265.3***				265	0	0	146	50
680.57	2.50	1.90	15		13.9	16.4	***279.1***				279	0	0	154	53
679.57	1.00	1.90	15		5.5	16.4	***513.0***				~~513~~	~~0~~	~~0~~	~~282~~	~~54~~
677.07	2.50		66	Hard Till	40.0	244.7	***553.0***				~~553~~	~~0~~	~~0~~	~~304~~	~~56~~
674.57	2.50		66	Hard Till	40.0	244.7	***593.0***				~~593~~	~~0~~	~~0~~	~~326~~	~~59~~
672.07	2.50		66	Hard Till	40.0	244.7	***662.6***				~~663~~	~~0~~	~~0~~	~~364~~	~~61~~
669.57	2.50		74	Hard Till	48.9	274.4	***711.5***				~~712~~	~~0~~	~~0~~	~~391~~	~~64~~
667.07	2.50		74	Hard Till	48.9	274.4	***882.9***				~~883~~	~~0~~	~~0~~	~~486~~	~~66~~
665.07	2.00		107	Hard Till		396.8									

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 10/18/2011

SUBSTRUCTURE========== SN 010-0294 east abut.
REFERENCE BORING ========== SB-1
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 756.39 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DR 754.39 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ======== None ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ===: None ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========: 1260 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)===: 51.84 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =: 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 194.44 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 72.92 KIPS

PILE TYPE AND SIZE ==========: Metal Shell 12"Φ w/.25" walls
Pile Perimeter========== 3.142 FT.
Pile End Bearing Area========== 0.785 SQFT.

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
353 KIPS	**336** KIPS	**185** KIPS	**43** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)				NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
751.80	2.59	2.00	9		14.8		***32.1***				32	0	0	18	5
749.80	2.00	2.00	9		11.4	17.2	***46.1***				46	0	0	25	7
747.30	2.50	2.30	11		15.7	19.8	***61.7***				62	0	0	34	9
744.80	2.50	2.30	11		15.7	19.8	***77.4***				77	0	0	43	12
742.30	2.50	2.30	13		15.7	19.8	***93.1***				93	0	0	51	14
739.80	2.50	2.30	13		15.7	19.8	***108.7***				109	0	0	60	17
737.80	2.00	2.30	13		12.5	19.8	***170.7***				171	0	0	94	19
735.80	2.00		14	Medium Sand	8.1	69.2	***135.4***				135	0	0	74	21
733.30	2.50	3.00	27		18.8	25.8	***178.3***				178	0	0	98	23
731.30	2.00	5.80	14		20.4	50.0	***166.9***				167	0	0	92	25
728.80	2.50	2.10	11		14.8	18.1	***193.7***				194	0	0	107	28
726.30	2.50	3.50	14		21.1	30.2	***206.1***				206	0	0	113	30
723.80	2.50	2.50	11		16.6	21.5	***229.6***				230	0	0	126	33
721.30	2.50	3.30	12		20.2	28.4	***249.8***				250	0	0	137	35
718.80	2.50	3.30	11		20.2	28.4	***257.0***				257	0	0	141	38
716.30	2.50	1.80	14		13.4	15.5	***276.4***				276	0	0	152	40
713.80	2.50	2.50	9		16.6	21.5	***335.7***				336	0	0	185	43
711.30	2.50		13	Fine Sand	8.8	64.3	***379.1***				~~379~~	~~0~~	~~0~~	~~209~~	~~45~~
708.80	2.50		20	Fine Sand	13.6	98.9	***392.7***				~~393~~	~~0~~	~~0~~	~~216~~	~~48~~
707.80	1.00		20	Fine Sand	5.4	98.9	***457.5***				~~457~~	~~0~~	~~0~~	~~252~~	~~49~~
704.80	3.00		32	Medium Sand	29.9	158.2	***350.8***				351	0	0	193	52
702.30	2.50	2.50	11		16.6	21.5	***367.3***				~~367~~	~~0~~	~~0~~	~~202~~	~~54~~
699.80	2.50	2.50	11		16.6	21.5	***383.9***				~~384~~	~~0~~	~~0~~	~~211~~	~~57~~
697.30	2.50	2.50	11		16.6	21.5	***601.4***				~~601~~	~~0~~	~~0~~	~~331~~	~~59~~
694.80	2.50		45	Sandy Gravel	74.2	222.5	***675.5***				~~676~~	~~0~~	~~0~~	~~372~~	~~62~~
692.30	2.50		45	Sandy Gravel	74.2	222.5	***749.7***				~~750~~	~~0~~	~~0~~	~~412~~	~~64~~
689.80	2.50		45	Sandy Gravel	74.2	222.5	***621.2***				~~621~~	~~0~~	~~0~~	~~342~~	~~67~~
687.30	2.50	2.30	20		15.7	19.8	***636.9***				~~637~~	~~0~~	~~0~~	~~350~~	~~69~~
684.80	2.50	2.30	20		15.7	19.8	***652.5***				~~653~~	~~0~~	~~0~~	~~359~~	~~72~~
682.80	2.00	2.30	20		12.5	19.8	***786.1***				~~786~~	~~0~~	~~0~~	~~432~~	~~74~~
681.80	1.00		38	Hard Till	6.8	140.9	***796.7***				~~797~~	~~0~~	~~0~~	~~438~~	~~75~~
679.30	2.50		39	Hard Till	17.6	144.6	***847.7***				~~848~~	~~0~~	~~0~~	~~466~~	~~77~~
676.80	2.50		48	Hard Till	23.7	178.0	***871.4***				~~871~~	~~0~~	~~0~~	~~479~~	~~80~~
674.30	2.50		48	Hard Till	23.7	178.0	***932.2***				~~932~~	~~0~~	~~0~~	~~513~~	~~82~~
671.80	2.50		58	Hard Till		215.1									