N|V|5

Imperial County Dept. of Public Works
155 S. 11th Street
El Centro, California 92243

October 21, 2021
NV5 Project No.: 227521-0001139.00

Attention: Mr. John Gay, PE – Director of Public Works/Road Commissioner

Project: **Revised Foundation Recommendations - Addendum Letter Report**
Dogwood Road Bridge Over Central Main Canal
Bridge No. 58C-0042
Imperial County, CA

References:
1: Geotechnical Investigation, "*Dogwood Road Bridge Replacement Project",* dated September 30, 2016 Revised August 9, 2017, prepared by NV5, Inc., NV5 Project No. 226816-0000103.02

2: Preliminary Structural Plans, "*Dogwood Road Bridge Replacement Over Central Main Canal, Bridge No 58C-0042,"* prepared by NV5, Inc., dated October 5, 2021.

Introduction

This addendum letter report presents NV5's revised foundation recommendations for the subject project. Reference is made to NV5's initial foundation report which presents the results of NV5's foundation investigation for the proposed replacement of the Dogwood Road Bridge (Bridge No. 58C-0042) located along Dogwood Road over Central Main Canal in Imperial County, California. The approximate location of the project area is shown on the attached *Geotechnical Map*.

The existing three (3) span bridge was constructed in the 1967, is approximately 82 feet in length and 32 feet 7 inches in width. Recent topographic surveys indicate that the existing bridge is lowering due to subsidence of the general area causing a loss of freeboard under the bridge and accumulation of debris at the upstream end of the bridge, causing a waterway restriction and potential for future immersion. This condition has prompted the County to replace the bridge with a 2 span concrete bridge structure, while removing the existing bridge deck and mid span bent supports, but leaving the existing abutments in place. A *General Plan* (Reference Sheet S-1) and *Foundation Plan (Reference sheet S-3)* are attached to this letter.

As noted in the referenced foundation report, the previously proposed replacement of the bridge included the proposed construction of new piles to support the new bridge. However subsequent to submission of the foundation report, the bridge design concept has been changed to accommodate construction of an approximate 92 foot long, single span steel bridge to be placed over the existing crossing. The new abutments (2 total) will be located outside of the existing bridge abutments, which will be left in place.

Project Concerns

Canal Liner Stability

As noted in the referenced report, the bridge crosses the unlined Central Main Canal. During earlier design meetings, Imperial Irrigation District (IID) voiced concerns that driving piles near the canal may disrupt the seal of the canal bottom, resulting in water loss. As a result, the new foundation piles should be installed within the top 30 feet by vibratory methods and then use traditional impact driving once pile reach 30 feet below the pile cut off elevation.

Sheet pile

Scour has been observed along the top of the Central Main Canal bank adjacent to the existing bridge abutments. To prevent additional scour from occurring, sheet pile walls are planned extending east and west roughly parallel to the channel bank from each existing abutment. Design recommendations are presented below.

Subsidence and Liquefaction

As noted in the referenced foundation report, potential total estimated seismic settlement (dry and liquefaction induced) for the project site is estimated to be on the order of 1.6 inches. In addition, the bridge has settled approximately 23 inches since 1981 due to subsidence of the area. It is anticipated that subsidence will continue at an average rate of 0.72 inches per year. The recommended proposed foundation system cannot be designed to mitigate the on-going soil subsidence. For the new bridge loads, 30-inch diameter, ½ inch thick Cast-in-steel-shell (CISS) pile are proposed to support the new substructures (Abutment 1 and Abutment 22) and associated bridge structure.

Revised Recommendations

Axial Pile Resistance

The following updated recommendations are for the proposed Dogwood Road Bridge Replacement. Based on the subsurface information gathered at the site by NV5 in 2016, 30-inch diameter, ½ inch CISS piles are recommended at the abutments. The following foundation recommendations were designed in accordance with the 2018 AASHTO LRFD Bridge Design Specification (8th Edition) with CA Amendments.

The following tables present the structural design information and factored design loads for the bridge.

Table 1: General Foundation Information

Support Location	Pile Type	Finished Grade Elevation (feet)	Cut-off Elevation (feet)	Pile Cap Size (feet)		Permissible Settlement Under Service Load (inches)	Number of Piles
				B	L		
Abut 1	CISS 30 x 0.5	997	994.7	46.5	7.16	1.0	6
Abut 2	CISS 30 x 0.5	997	995	46.5	7.16	1.0	6

Table 2: Foundation Factored Design Loads

Support Location	Services -1 Limit State (kips)		Strength/Construction Limit State (Controlling Group, kips)				Extreme Event Limit State (Controlling Group, kips)			
	Total Load per Support	Permanent Load per Support	Compression		Tension		Compression		Tension	
			Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile
Abut 1	697	410	1271	291	NA	20	690	130	NA	NA
Abut 2	697	410	1271	291	NA	20	690	130	NA	NA

Axial pile resistance for the abutments and bents were determined utilizing information obtained from NV5's field and laboratory investigation (2016). Laboratory data and SPT correlations per Caltrans California Geotechnical Manual, Soil Correlations (March 2021) was used to develop the subsurface profile.

Design loads presented in Table 2 above were used to assess the axial pile resistance required for each foundation support. Axial pile resistance was assessed using methodology presented in Federal Highway Administration (*FHWA)* with the software program *Allpile7* V7.21a, 2015 developed by CivilTech Corporation. End bearing support was neglected. At depths where pile installation is to be accomplished by vibratory methods (to depth of 30 feet below pile cut-off elevation) axial pile resistance for estimates were reduced by 50%. Input values and output data for pile capacity is attached to this letter.

Table 3 and 4 below show the Foundation Design Recommendations and Pile Data Table for the recommended foundation supports. *Allpile Vertical Analysis Reference Sheets*, *Factored Axial Pile Resistance Tables,* and *Factored Axial Pile Resistance Graphs* for the abutment locations are attached to this letter.

NV5

Table 3: Foundation Design Recommendations

Support Location	Pile Type	Cut-Off Elevation (feet)	Service-1 Limit State Load Per Support		Total Permissible Support Settlement (inches)	Required Nominal Resistance (kips)				Design Tip Elevation (feet)	Specified Tip Elevation (feet)	Required Nominal Driving Resistance (kips)
						Strength Limit (Per Pile)		Extreme Event (Per Pile)				
			Total Load per Support	Permanent Load Per Support		Compression (ϕ_{qs} = 0.7)	Tension (ϕ_{qs} = 0.7)	Compression (ϕ_{qs} = 1.0)	Tension (ϕ_{qs} = 1.0)			
Abut 1	CISS 30 x 0.5	994.7	697	410	1.0	420	30	190	NA	926 (a-1) 975 (a-2) 926 (c-1)	926	420
Abut 2	CISS 30 x 0.5	995	697	410	1.0	420	30	190	NA	934 (a-1) 957 (a-2) 934 (c-1)	934	420

- Total Permissible Support Settlement excludes settlement caused by long-term subsidence in the project area.
- Design tip elevations are controlled by (a-1) Compression (Strength), (a-2) Compression (Extreme) and (c-1) Settlement.
- The specified tip elevations shall not be raised above the design tip elevation for Settlement.
- Vibratory installation should be used for pile installation to elevation 965 feet (30 feet below cut-off elevation). Piles should be installed with driving/impact methods below elevation 965 to the specified pile tip elevation.
- To seal the bottom of CISS pile at Abutment 1 and Abutment 2, the top of soil plug should be at elevation 935 feet. A seal course thickness of 5 feet is required to counteract the hydrostatic forces of the groundwater and to allow for the pile reinforcement and concrete to be poured in the dry.

Table 4: Pile Data Table

Support Location	Pile Type	Nominal Resistance (kips)		Design Tip Elevation (feet)	Specified Tip Elevation (feet)	Required Nominal Driving Resistance (kips)
		Compression	Tension			
Abut 1	CISS 30 x 0.5	420	30	926 (a) 926 (c)	926	420
Abut 2	CISS 30 x 0.5	420	30	934 (a) 934 (c)	934	420

- Design tip elevations are controlled by (a) Compression (Strength), (c) Settlement.
- The specified tip elevations shall not be raised above the design tip elevation for Settlement.
- Vibratory installation should be used for pile installation to elevation 965 feet (30 feet below cut-off elevation). Piles should be installed with driving/impact methods below elevation 965 to the specified pile tip elevation.
- To seal the bottom of CISS piles, the top of soil plug should be at elevation 931 at Abutment 1 and 939 at Abutment 2. A seal course thickness of 5 feet is required to counteract the hydrostatic forces of the groundwater and to allow for the pile reinforcement and concrete to be poured in the dry.

Sheet Pile Recommendations

As noted above, scour is currently eroding away at the existing abutments at the channel top. Sheet piles are currently proposed to provide a lateral wall against further erosion and scour of the channel banks near the existing abutments (see project plans for locations). Based on recent channel data, the channel depth is approximately 16 feet deep (elevation 981 feet) below finished grade (elevation 997 feet). A general *Sheet Pile Layout* (Reference Sheet S-5) is attached to this letter.

For active and passive pressure coefficients, the following parameters are to be used for sheet pile design:

- K_a = 0.333 (used above the channel bottom elevation of 981 feet)
- K_p = 3.0 (used below channel bottom elevation of 981 feet)
- Unit weight (γ) = 120 pcf
- Passive pressure resistance is ignored in front of the sheet pile walls above the channel bottom elevation of 981 feet.

Closing and Limitation

NV5 appreciates the opportunity to be of service. We have prepared this letter in substantial accordance with the generally accepted geotechnical engineering practice as it exists in the site area at the time of our study. No warranty is expressed or implied. The limitations discussed in the referenced report apply to the recommendations contained in this letter. If you have any questions regarding this letter or need further assistance, please contact us at your convenience.

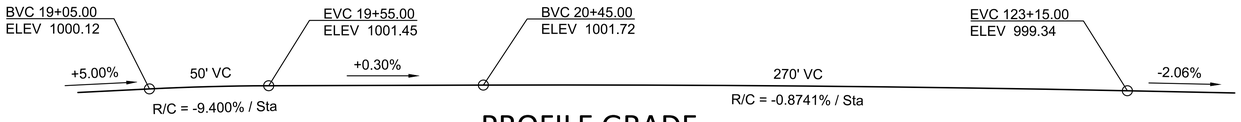
Respectfully Submitted,
NV5 Inc.

Paul Cunningham, PE No. 78292
Project Engineer

Carl Henderson, PhD, GE No. 2886
SoCal CQA Group Director

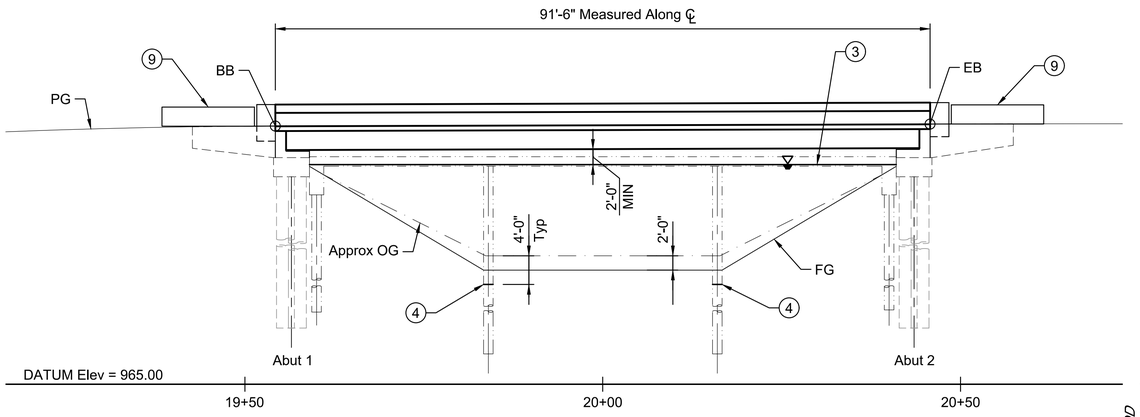
Attachments:
1 - General Plan – Reference S-1
2 - Foundation Plan – Reference Sheet S-3
3 - Sheet Pile Layout – Reference Sheet S-5
4 - Geotechnical Map
5 - Allpile Vertical Analysis Reference Sheet – Based on Boring Log B-2 Information
6 - Allpile Vertical Analysis Reference Sheet – Based on Boring Log B-3 Information
7 – Factored Axial Pile Resistance Data Table – Based on Boring Log B-2 Information
8 – Factored Axial Pile Resistance Data Table – Based on Boring Log B-3 Information
9 – Factored Axial Pile Resistance, Abutment 1 – Factored Axial Pile Resistance (kips) vs Pile Length (feet) based on Boring Log B-2
10 - Factored Axial Pile Resistance, Abutment 2 – Factored Axial Pile Resistance (kips) vs Pile Length (feet) based on Boring Log B-3

Distribution (1) addressee, via email



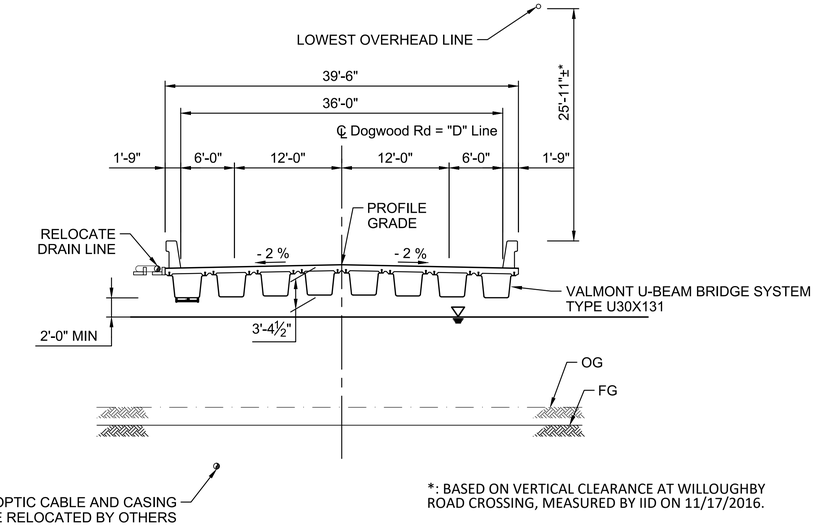
PROFILE GRADE

NO SCALE



ELEVATION

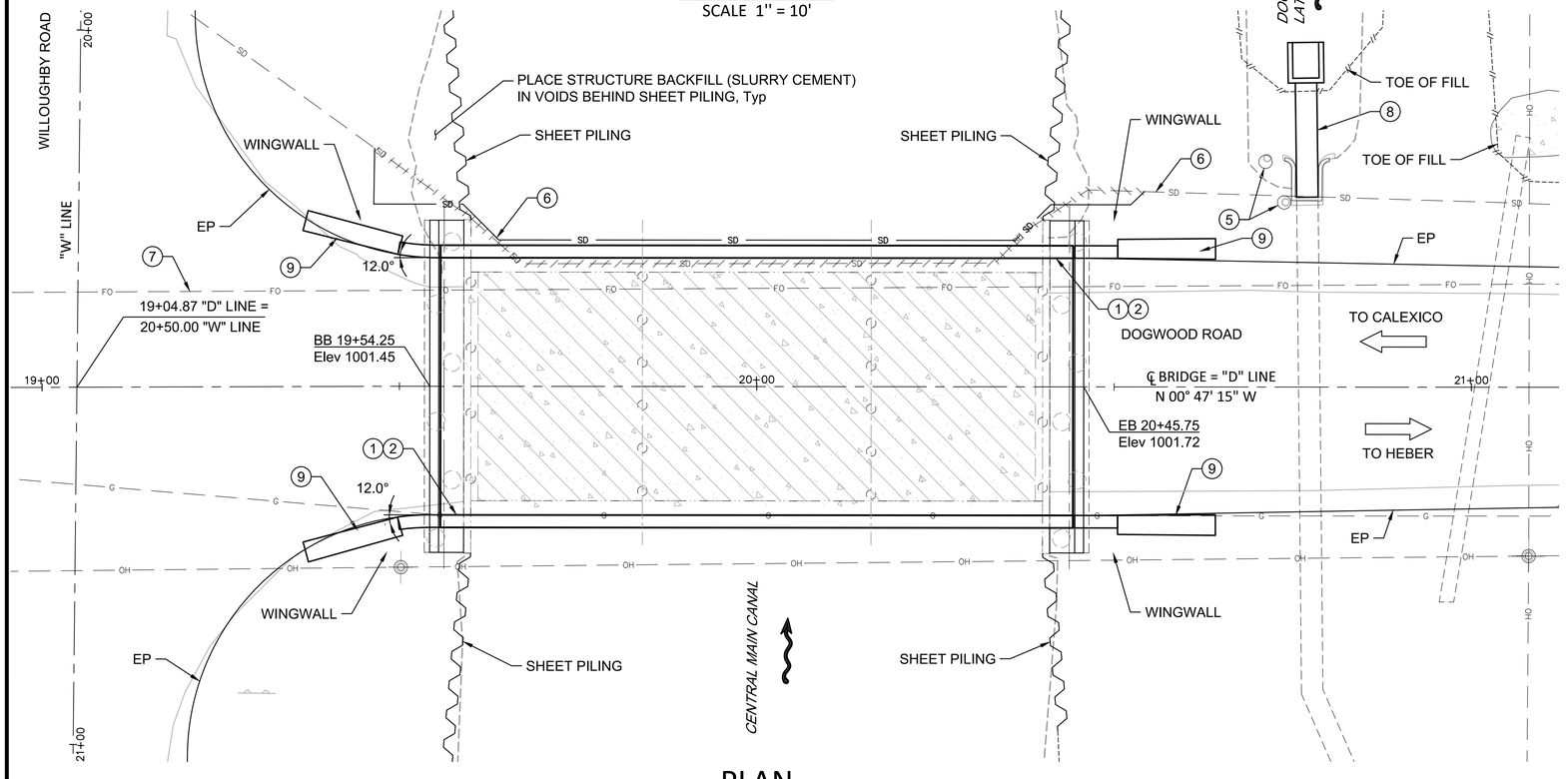
SCALE 1'' = 10'



*: BASED ON VERTICAL CLEARANCE AT WILLOUGHBY ROAD CROSSING, MEASURED BY IID ON 11/17/2016.

TYPICAL SECTION

SCALE $\frac{1}{8}$'' = 1'-0''



PLAN

SCALE 1'' = 10'

LEGEND

- Direction of Traffic
- Direction of Flow of Water
- Existing Structure
- Limits of Bridge Removal
- FO — Fiber Optic Cable in 4" Steel Duct
- G — 6" High Pressure Gas Line To Be Relocated By Others
- OH — Overhead Electrical/Telephone Facilities
- SD — Private Drain Line
- Power Pole

NOTES

1. Paint "BRIDGE NUMBER: 58C-0042"
2. Paint "DOGWOOD ROAD BRIDGE"
3. Water Surface Elevation = 995.7±
4. Extract Existing Piles Or Cutoff 4' Below OG Or 2' Below FG
5. Existing Bollards
6. Reconnect New Drain Line By Others
7. Existing AT&T Fiber Optic Cable in 4" Steel Duct
8. Existing Culverts To Be Extended By Others As Necessary
9. TL-2 Crash Cushion, See Roadway Plans

GRAPHIC SCALE
0' 5' 10' 15' 20' 30' 40'
SCALE 1"= 10'

REVISION	DATE	COMMENTS

REGISTERED PROFESSIONAL ENGINEER — C. DANIEL SUN — No. 40064 — CIVIL — STATE OF CALIFORNIA

PREPARED UNDER THE DIRECT SUPERVISION OF:

DANIEL SUN, P.E. NV5 — 40064 R.C.E. No.

DATE — 12/30/21 REG. EXP.

COUNTY OF IMPERIAL PUBLIC WORKS DEPARTMENT APPROVED FOR CONSTRUCTION BY:

JOHN A. GAY, P.E. ROAD COMMISSIONER — 62028 R.C.E. No.

DATE — REG. EXP.

PUBLIC WORKS DEPARTMENT
COUNTY OF IMPERIAL
EL CENTRO, CALIFORNIA

DATE 10/5/2021
DRAWN SRD
SCALE AS SHOWN
CHECKED CDS

DOGWOOD ROAD BRIDGE REPLACEMENT
OVER CENTRAL MAIN CANAL
BRIDGE NO. 58C-0042

GENERAL PLAN

REFERENCE S-1

SHEET OF 22

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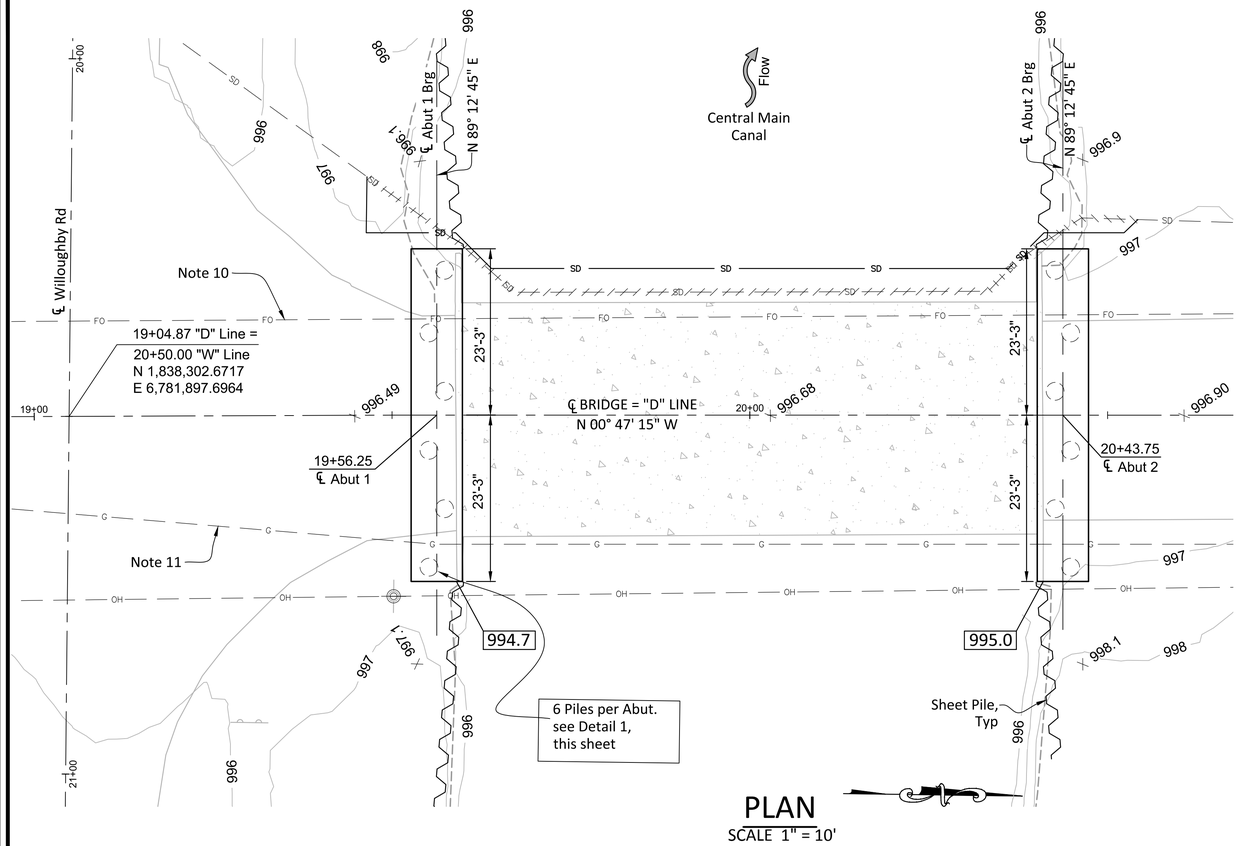


PLAN

SCALE 1" = 10'

PILE DATA TABLE

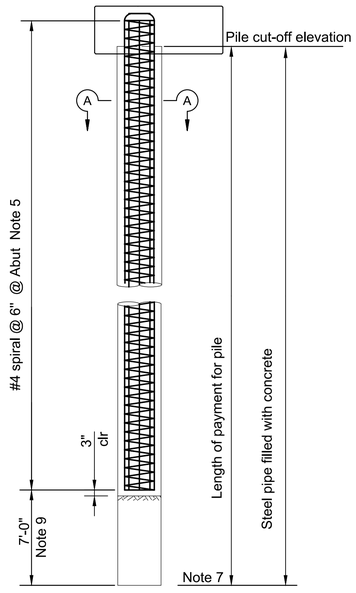
Location	Pile Type	Required Nominal Driving Resistance (kips)	Nominal Resistance (kips)		Cut-Off Elevations (ft)	Design Tip Elevations (ft)	Specified Tip Elevations (ft)
			Compression	Tension			
Abut 1	CISS 30x0.5	440	440	30	995.12	926(a) 926(c)	926
Abut 2	CISS 30x0.5	440	440	30	995.42	934(a) 934(c)	934

Pile Data Notes:

1. Design tip elevations are controlled by: (a) Compression, (c) Settlement.
2. Specified tip elevation shall not be raised above the design tip elevation for Settlement.
3. Vibratory installation should be used for pile installation to elevation 965 feet (30 feet below cut-off elevation). Piles should be installed with driving/impact methods below elevation 965 to the specified pile tip elevation.
4. To seal the bottom of CISS piles the top of soil plug should be at elevation 931 at Abutment 1 and 939 at Abutment 2. A seal course thickness of 5 feet is required to counteract the hydrostatic force of the groundwater and allow for pile reinforcement and concrete to poured in the dry.

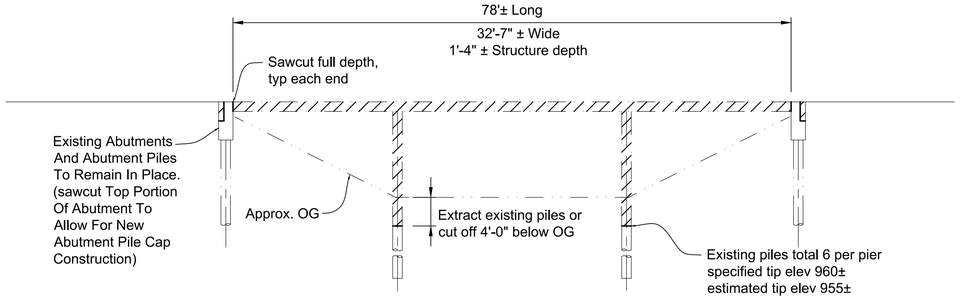
LEGEND

- Indicates limits of Bridge Removal (Portion)
- 999.9 — Indicates bottom of pile cap elevation
- X 999.9 — Indicates existing ground spot elevations
- SD — Indicates existing 12'' pressure storm water line (to be relocated)
- SD — Indicates new 12'' pressure storm water line relocation
- G — Indicates 6'' HP gas line (to be relocated by others)
- OH — Indicates high voltage overhead power lines
- FO — Indicates 4" fiber optic line (protect in place)
- Indicates Power Pole



NOTES:

1. Topographic lines indicate existing original ground elevations.
2. Contractor shall locate existing utilities prior to driving piles.
3. Centerline Abutments are perpendicular to centerline Dogwood Rd.
4. Design service level loading is 110 tons.
5. No splices allowed in main reinforcement.
6. Aggregate must be 1" maximum combined grading.
7. See pile data table for specified tip and pile cutoff elevation.
8. Spiral pile reinforcement at splices and at ends shall be terminated by a 135° hook with a 6" tail hooked around a longitudinal bars.
9. Limits of undisturbed soil plug to be maintained within steel shell.
10. AT&T Fiber Optic line to be protected in place.
11. Gas line to be relocated by others prior to pile driving operations.

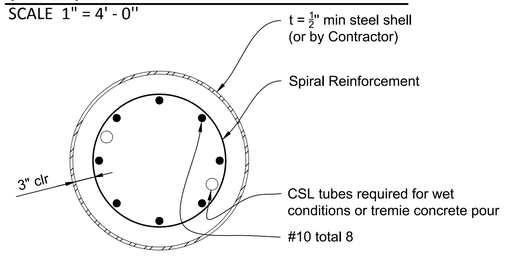


ELEVATION - EXISTING BRIDGE REMOVAL

SCALE 1" = 10'

1 / S3 30" CAST IN STEEL SHEEL (CISS) CONCRETE PILE DETAIL

SCALE 1" = 4' - 0"



SECTION A - A

SCALE 1" = 1' - 0"

GRAPHIC SCALE
0' 5' 10' 15' 20' 30' 40'
SCALE 1"= 10'

REVISION	DATE	COMMENTS

REGISTERED PROFESSIONAL ENGINEER — C. DANIEL SUN — No. 40064 — CIVIL — STATE OF CALIFORNIA

PREPARED UNDER THE DIRECT SUPERVISION OF:
DANIEL SUN, P.E. NV5 — 40064 R.C.E. No.
DATE — 12/30/21 REG. EXP.

COUNTY OF IMPERIAL PUBLIC WORKS DEPARTMENT
APPROVED FOR CONSTRUCTION BY:
JOHN A. GAY, P.E. ROAD COMMISSIONER — 62028 R.C.E. No.
DATE — REG. EXP.

PUBLIC WORKS DEPARTMENT
COUNTY OF IMPERIAL
EL CENTRO, CALIFORNIA

DATE 10/5/2021
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SCALE AS SHOWN
CHECKED CDS

DOGWOOD ROAD BRIDGE REPLACEMENT
OVER CENTRAL MAIN CANAL
BRIDGE NO. 58C-0042

FOUNDATION PLAN

REFERENCE S-3

SHEET 12 OF 22

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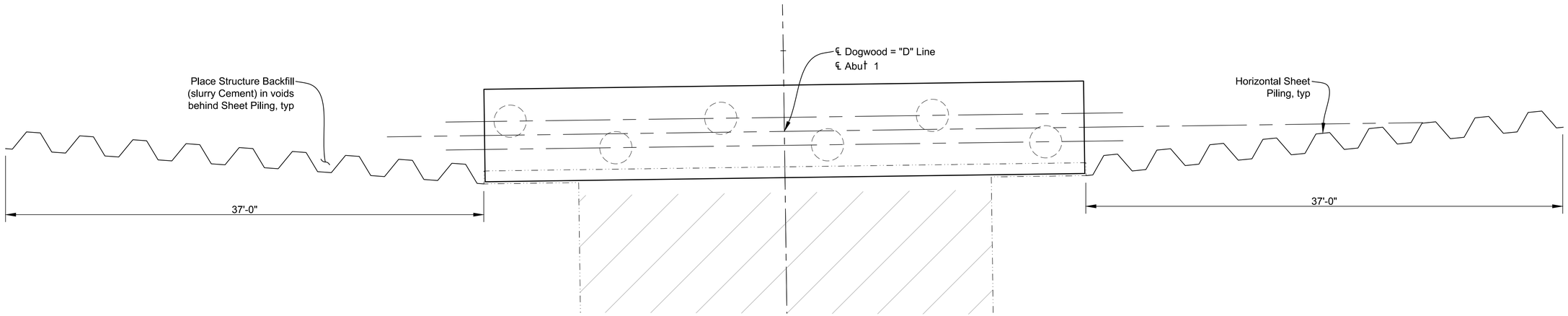
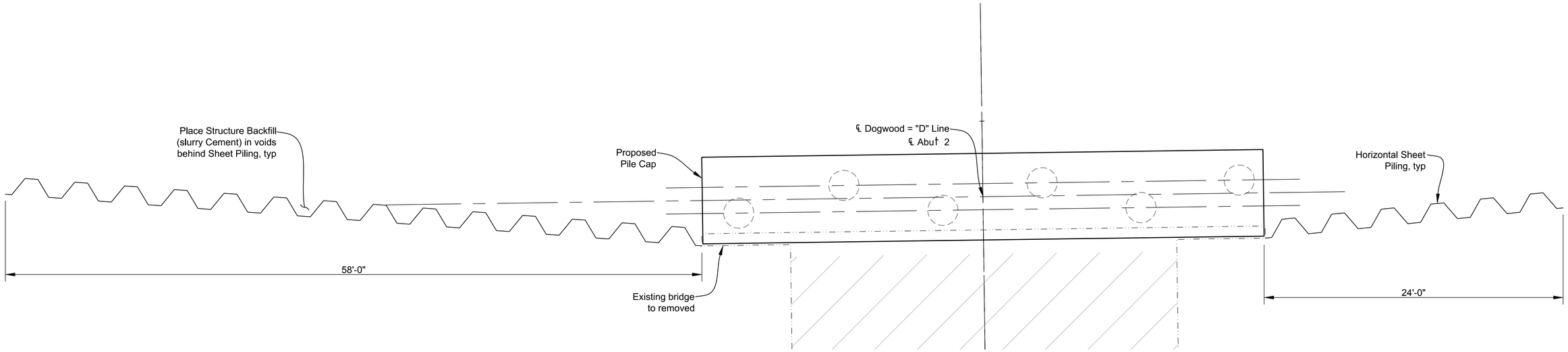


ABUTMENT 1 PLAN

SCALE 1/4'' = 1'-0''



ABUTMENT 2 PLAN

SCALE 1/4'' = 1'-0''

REVISION	DATE	COMMENTS

REGISTERED PROFESSIONAL ENGINEER — CHRISTOPHER J. KRIER — No. 71833 Exp. 12/31/17 — CIVIL — STATE OF CALIFORNIA

PREPARED UNDER THE DIRECT SUPERVISION OF:

CHRISTOPHER J. KRIER, P.E. NV5 — 71833 R.C.E. No.

9/25/17 DATE — 12/31/17 REG. EXP.

REGISTERED PROFESSIONAL ENGINEER — JOHN A. GAY — No. 62028 Exp. 9-30-17 — CIVIL — STATE OF CALIFORNIA

COUNTY OF IMPERIAL PUBLIC WORKS DEPARTMENT
APPROVED FOR CONSTRUCTION BY:

JOHN A. GAY, P.E.
ROAD COMMISSIONER — 62028 R.C.E. No.

DATE — 9/30/17 REG. EXP.

PUBLIC WORKS DEPARTMENT
COUNTY OF IMPERIAL
EL CENTRO, CALIFORNIA

DATE 9/25/2017
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DOGWOOD ROAD BRIDGE REPLACEMENT
OVER CENTRAL MAIN CANAL
BRIDGE NO. 58C-0042

SHEET PILE LAYOUT

REFERENCE S-5

SHEET 13 OF 22

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0 200 400 600 800 1000

Approximate scale in feet

MAP SYMBOLS

Approximate location of exploratory boring

B-4

GEOLOGIC UNITS

Ql Quaternary lake deposits

N

Base map adapted from Google Maps 2016

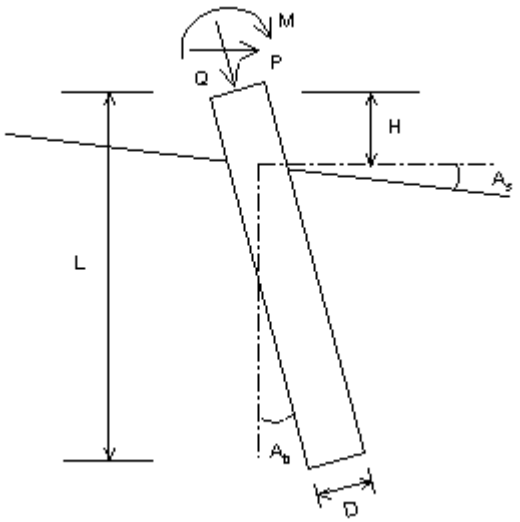
NV5
An NV5 West, Inc. Company – Offices Nationwide
10592 Avenue of Science, Suite 200
San Diego, CA
Tel: (858) 715-5800, Fax: (858) 715-5810

Project No: **226816-00103.02**
Drawn: **GC**
Date: **July 2016**

Geotechnical Map
Dogwood Road Bridge Replacement
Imperial County, California
Figure No. 2

VERTICAL ANALYSIS

Figure 1



Driving Steel Pile (Open end)

Loads:
Load Factor for Vertical Loads= 1.0
Load Factor for Lateral Loads= 1.0
Loads Supported by Pile Cap= 0 %
Shear Condition: Static

(with Load Factor)
Vertical Load, Q= 300.0 -kp

Profile:
Pile Length, L= 50.0 -ft
Top Height, H= 0 -ft
Slope Angle, As= 0
Batter Angle, Ab= 0

* Zero Tip Resistance *
The tip resistance is zeroFixed Head Condition

Soil Data:

Depth -ft	Gamma -lb/f3	Phi	C -kp/f2	K -lb/i3	e50 or Dr %	Nspt
0	120	33	.12	313.1	0.87	10
5	62.0	33	.12	313.1	0.87	10
70	62	33	.12	313.1	0.87	10

Pile Data:

Depth -ft	Width -in	Area -in2	Per. -in	I -in4	E -kp/i2	Weight -kp/f
0.0	30	124.8	94.2	9693.3	29000	0.871
50.0						

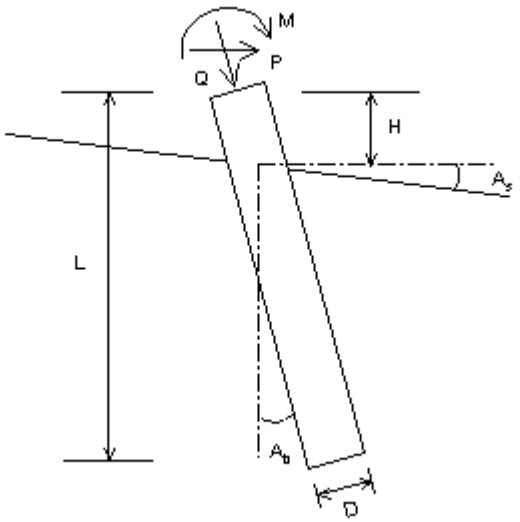
Vertical Capacity:
Weight above Ground= 0.00 Total Weight= 43.55-kp *Soil Weight is not included
Side Resistance (Down)= 308.337-kp Side Resistance (Up)= 177.719-kp
Tip Resistance (Down)= 0.000-kp Tip Resistance (Up)= 0.000-kp
Total Ultimate Capacity (Down) Qult= 308.337-kp Total Ultimate Capacity (Up)= 221.268-kp
Total Allowable Capacity (Down) Qallow= 308.337-kp Total Allowable Capacity (Up) Qallow= 221.268-kp
OK! Qallow > Q

Settlement Calculation:
At Q= 300.00-kp Settlement= 0.06159-in
At Xallow= 1.00-in Q= 99999.00000-kp

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

VERTICAL ANALYSIS

Figure 1



Driving Steel Pile (Open end)

Loads:
Load Factor for Vertical Loads= 1.0
Load Factor for Lateral Loads= 1.0
Loads Supported by Pile Cap= 0 %
Shear Condition: Static

(with Load Factor)
Vertical Load, Q= 289.0 -kp

Profile:
Pile Length, L= 50.0 -ft
Top Height, H= 0 -ft
Slope Angle, As= 0
Batter Angle, Ab= 0

* Zero Tip Resistance *
The tip resistance is zeroFixed Head Condition

Soil Data:

Depth -ft	Gamma -lb/f3	Phi	C -kp/f2	K -lb/i3	e50 or Dr %	Nspt
0	128.8	0.0	1.20	294.7	0.89	10
5	66.9	0.0	1.26	317.7	0.87	10
35	57.1	32.0	0.00	33.4	29.96	8
70	57.9	32.0	0.00	25.6	29.96	8

Pile Data:

Depth -ft	Width -in	Area -in2	Per. -in	I -in4	E -kp/i2	Weight -kp/f
0.0	30	114.7	94.2	8633.8	29000	0.845
50.0						

Vertical Capacity:
Weight above Ground= 0.00 Total Weight= 28.47-kp *Soil Weight is not included
Side Resistance (Down)= 476.166-kp Side Resistance (Up)= 410.341-kp
Tip Resistance (Down)= 0.000-kp Tip Resistance (Up)= 0.000-kp
Total Ultimate Capacity (Down) Qult= 476.166-kp Total Ultimate Capacity (Up)= 438.809-kp
Total Allowable Capacity (Down) Qallow= 476.166-kp Total Allowable Capacity (Up) Qallow= 438.809-kp
OK! Qallow > Q

Settlement Calculation:
At Q= 289.00-kp Settlement= 0.06550-in
At Xallow= 1.00-in Q= 404.48431-kp

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

Abutment 1
Factored Axial Pile Resistance Data

Depth (ft)	Factored Axial Pile Resistance (kips)
0	0.0
0.7	0.3
1.4	0.6
2.1	1.0
2.8	1.4
3.5	1.9
4.2	2.5
5.0	3.1
5.7	3.8
6.4	4.5
7.1	5.2
7.8	6.0
8.5	6.8
9.2	7.6
9.9	8.5
10.6	9.3
11.3	10.3
12.0	11.2
12.7	12.2
13.4	13.2
14.1	14.3
14.9	15.3
15.6	16.4
16.3	17.6
17.0	18.8
17.7	20.0
18.4	21.2
19.1	22.4
19.8	23.7
20.5	25.0
21.2	26.4
21.9	27.8
22.6	29.2
23.3	30.6
24.0	32.1
24.8	33.6
25.5	35.2
26.2	36.8
26.9	38.3
27.6	40.0
28.3	41.7

29.0	43.4
29.7	45.1
30.4	48.7
31.1	52.2
31.8	55.8
32.5	59.5
33.2	63.4
33.9	67.1
34.7	71.1
35.4	74.9
36.1	79.1
36.8	83.0
37.5	87.2
38.2	91.5
38.9	95.8
39.6	100.2
40.3	104.3
41.0	108.7
41.7	113.3
42.4	117.8
43.1	122.5
43.8	127.1
44.6	132.3
45.3	137.0
46.0	141.9
46.7	146.7
47.4	151.7
48.1	156.6
48.8	162.1
49.5	167.2
50.2	172.3
50.9	178.0
51.6	183.1
52.3	188.1
53.0	193.8
53.7	198.8
54.4	203.9
55.2	209.5
55.9	214.5
56.6	220.2
57.3	225.1
58.0	230.8
58.7	235.8
59.4	241.4
60.1	246.3
60.8	252.0
61.5	256.8

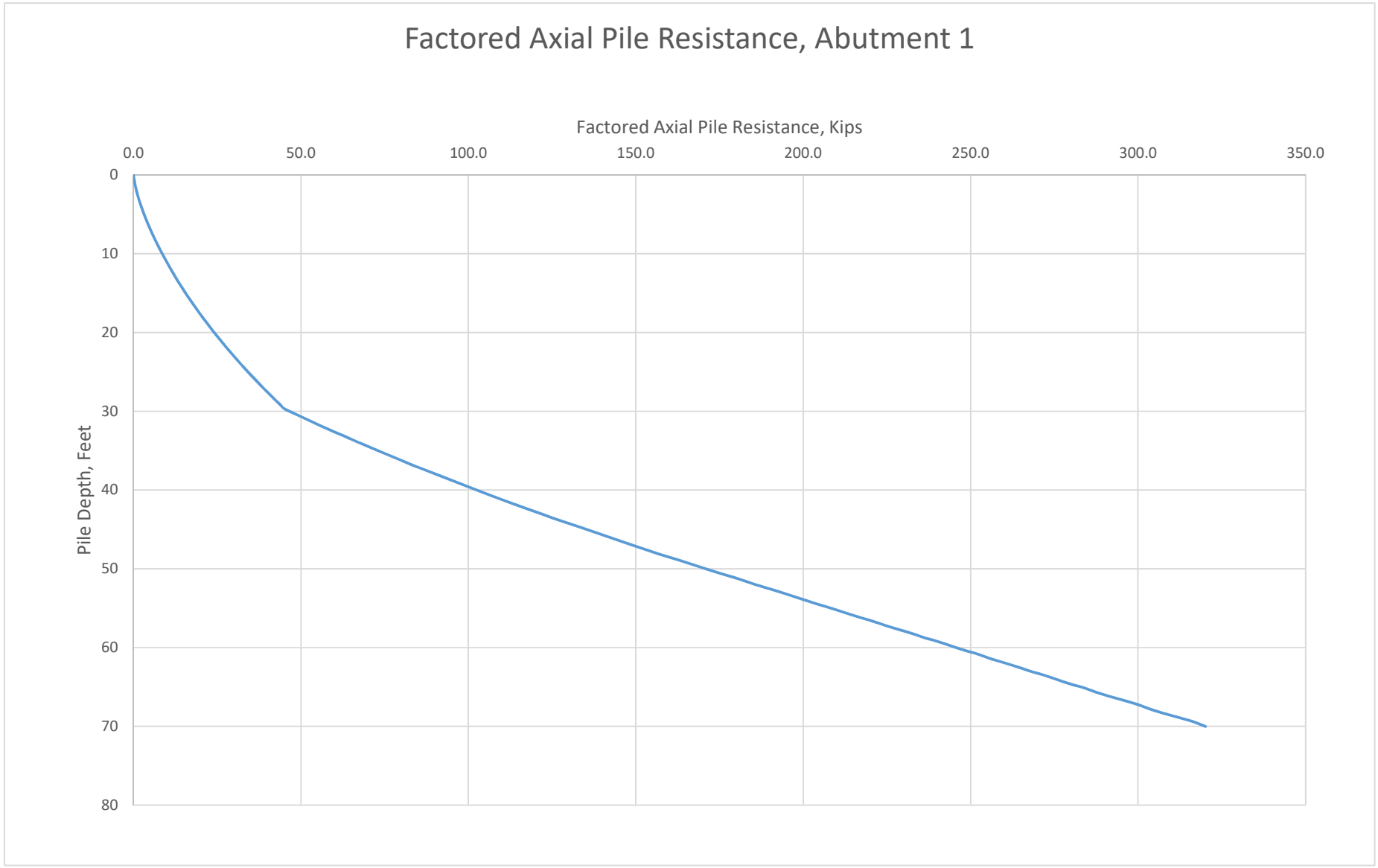
62.2	262.4
62.9	267.3
63.6	273.0
64.3	277.7
65.1	283.4
65.8	288.1
66.5	293.8
67.2	299.5
67.9	304.1
68.6	309.7
69.3	315.6
70.0	320.1

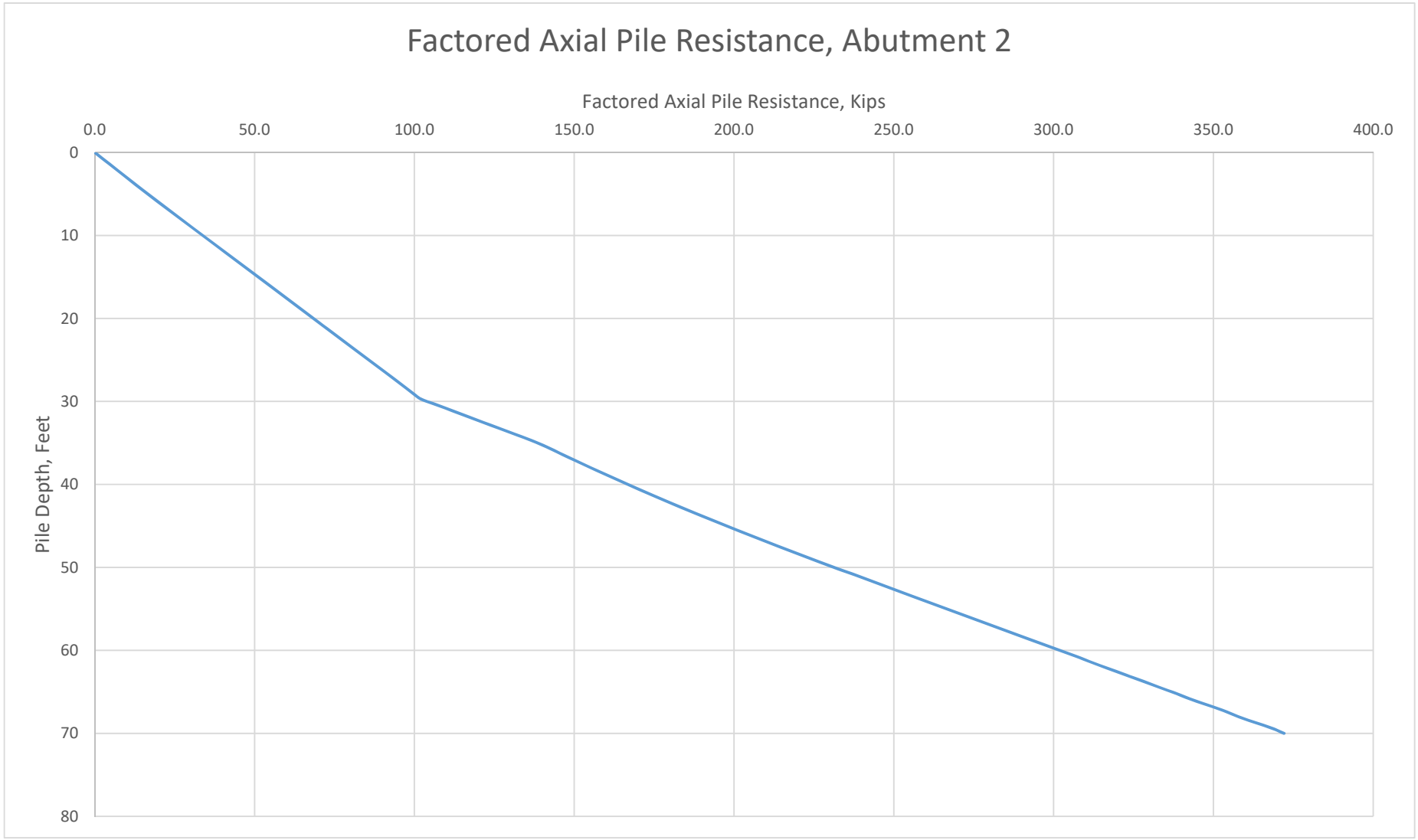
Abutment 2
Factored Axial Pile Resistance Data

Depth (ft)	Factored Axial Pile Resistance (kips)
0.0	0.0
0.7	2.3
1.4	4.7
2.1	7.0
2.8	9.3
3.5	11.7
4.2	14.0
5.0	16.3
5.7	18.8
6.4	21.2
7.1	23.7
7.8	26.1
8.5	28.5
9.2	31.0
9.9	33.4
10.6	35.9
11.3	38.3
12.0	40.8
12.7	43.2
13.4	45.7
14.1	48.1
14.9	50.6
15.6	53.0
16.3	55.5
17.0	57.9
17.7	60.4
18.4	62.8
19.1	65.3
19.8	67.7
20.5	70.2
21.2	72.6
21.9	75.1
22.6	77.5
23.3	80.0
24.0	82.4
24.8	84.8
25.5	87.3
26.2	89.7
26.9	92.2
27.6	94.6

28.3	97.1
29.0	99.5
29.7	102.0
30.4	106.9
31.1	111.8
31.8	116.7
32.5	121.6
33.2	126.5
33.9	131.4
34.7	136.2
35.4	140.7
36.1	144.5
36.8	148.4
37.5	152.3
38.2	156.3
38.9	160.3
39.6	164.4
40.3	168.6
41.0	172.7
41.7	177.0
42.4	181.3
43.1	185.7
43.8	190.2
44.6	194.8
45.3	199.2
46.0	204.0
46.7	208.6
47.4	213.2
48.1	218.1
48.8	222.9
49.5	227.8
50.2	232.7
50.9	237.9
51.6	242.8
52.3	247.6
53.0	252.8
53.7	257.8
54.4	262.5
55.2	267.6
55.9	272.5
56.6	277.6
57.3	282.4
58.0	287.7
58.7	292.5
59.4	297.8
60.1	302.5
60.8	307.7

61.5	312.3
62.2	317.4
62.9	322.3
63.6	327.6
64.3	332.2
65.1	337.4
65.8	342.1
66.5	347.2
67.2	352.6
67.9	357.1
68.6	362.2
69.3	367.7
70.0	372.1


Factored Axial Pile Resistance, Abutment 1
Factored Axial Pile Resistance, Kips
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
Pile Depth, Feet
0
10
20
30
40
50
60
70
80


Factored Axial Pile Resistance, Abutment 2
Factored Axial Pile Resistance, Kips
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Pile Depth, Feet
0
10
20
30
40
50
60
70
80