

**WHITEMARSH TOWNSHIP  
ZONING HEARING BOARD AGENDA  
MARCH 4, 2020  
7:00 PM**

\_\_\_ Bacine \_\_\_ Behr \_\_\_ Casacio \_\_\_ Kramer \_\_\_ Weinstein \_\_\_ Rubin (Alt.)

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**1. CALL TO ORDER**

**2. ANNOUNCEMENTS & CORRESPONDENCE**

- Applicants are requested to remove all signs after the hearing has concluded and dispose of them.

**3. ZONING HEARING BOARD APPLICATIONS**

- **ZHB#2020-01:** William and Colleen Ward, 3181 Mayflower Road, Plymouth Meeting, PA; Parcel #65-00-07738-00-9; Block 029A; Unit 059; A-Residential District. The Applicants are proposing to reconstruct an enclosed porch to improve structural integrity and add heat and air conditioning. The following relief is requested: Variance from Section 116-202.B. to allow less than the required 35' aggregate side yard; 26'-9" is proposed. Original variances were granted for an unenclosed porch (with different side yard requirements). The side yard setback is regulated by this section of the Zoning Ordinance because this house was built prior to June 23, 1966 (it was originally built in 1950).
- **ZHB#2020-02:** Edward A. Gross IV and Shannon D. Gross, 4023 Fairway Road, Lafayette Hill, PA; Parcel #65-00-03487-00-3; Block 043D; Unit 026; A-Residential District. The Applicants are proposing to construct an addition with a 2-car garage and master suite above. The following relief is requested: Variance from Section 116-169.A. which allows a maximum of 18% impervious ground cover based on the Property's location in the A-Residential District and having a steep slope ratio between 15% to 50% (this property has a steep slope ratio of 34%). An impervious ground cover of 34.6% is proposed; and a Variance from Section 116-194.A. to allow an increase in nonconforming impervious ground cover of 29.9% (to the proposed 34.6%). This section permits expansions/alterations as long as existing nonconformities are not increased.
- **ZHB#2020-03:** Duane and Bernadette McCarthy, 4024 Fairway Road, Lafayette Hill, PA; Parcel #65-00-03418-00-9; Block 043D; Unit 034; A-Residential District. The Applicants are proposing to remove an existing covered porch and crumbling foundation and replace with a new enclosed space to occupy an expanded kitchen. The following relief is requested: Variance from Section 116-202.B. to allow less than the 12' minimum/35' required aggregate side yard; 4' minimum/25' aggregate side yard is proposed. The side yard setback is regulated by this section of the Zoning Ordinance because this house was built prior to June 23, 1966 (it was originally built in 1954).
- **ZHB#2020-04:** Whitmarsh Valley Country Club, 815 Thomas Road, Lafayette Hill, PA; Parcel #65-00-1168-00-9; Block 023; Unit 002; AAA-Residential District; Recreational District Overlay. The applicant is proposing to build two replacement golf cart/pedestrian bridges in the floodplain and floodway of the Wissahickon Creek, one of which was destroyed in a storm and the other which is in deteriorated condition. The following is being requested: Variance from Section 116-165.B.(2) for structures other than the bridges (e.g., cart path, abutments, wingwalls, piers, etc.) which are not included as permitted uses as part of a recreational use in the Floodplain Conservation Overlay District; Special Exception from Section 116-166.A.(2). Bridges are permitted in a floodway by Special Exception provided that they are in compliance with provisions of the underlying districts, they cause no increase in flood heights or velocities; and are not prohibited by any other ordinance; Variance from Section 116-264.A. is sought to not reestablish forest cover and woodland habitat as none exists now and the Creek is flanked by golf course. Introducing this vegetation would restrict the play of golf; and a Variance from Section 116-265.C. is sought to permit crossings at a distance with less than 1,000 feet of buffer length. Existing bridges do not have such separation and are being replaced in the same location. Bridge separation is approximately 400 feet.

**4. ADJOURNMENT**

ZHB APPEAL #2020-01  
SUMMARY

**APPLICANTS:** William and Colleen Ward

**PROPERTY LOCATION:** Parcel #65-00-07738-00-9  
Block 029A, Unit 059  
3181 Mayflower Road  
Plymouth Meeting, PA 19462

**ZONING DISTRICT:** A-Residential District

**SUMMARY OF RELIEF REQUEST:**

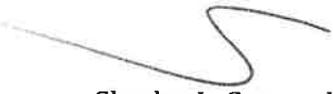
The Applicants are proposing to reconstruct an enclosed porch to improve structural integrity and add heat and air conditioning. The following relief is requested:

1. **Variance from Section 116-202.B.** to allow less than the required 35' aggregate side yard; 26'-9" is proposed. Original variances were granted for an unenclosed porch (with different side yard requirements). The side yard setback is regulated by this section of the Zoning Ordinance because this house was built prior to June 23, 1966 (it was originally built in 1950).

**PRIOR DECISIONS:**

ZHB#1956-27 Variance / Side Yard / Garage  
ZHB#1953-33 Variance / Side Yard / Patio & Porch

Respectfully Submitted,



Charles L. Guttenplan, AICP  
Director of Planning and Zoning/Zoning Officer

APPEAL TO ZONING HEARING BOARD  
WHITEMARSH TOWNSHIP  
COMMONWEALTH OF PENNSYLVANIA

APPEAL NO: 2020-01

Applicant/Appellant: Colleen and William Ward

Address: 3181 Mayflower Road

Phone #: [REDACTED] Cell Number: [REDACTED] E-Mail: [REDACTED]

Owner: William Ward

Address: same

Phone #: [REDACTED] Cell Number: [REDACTED] E-Mail: [REDACTED]

Location of the Property Involved:

Block #: 029A Unit #: 059 Parcel #: 650007738009

NATURE OF APPLICATION (Describe proposed use and/or construction: type of appeal requested and specific section(s) of Whitmarsh Township Zoning Code which is (are) relied upon):

Variance from section 116-202 B, for less than 35' aggregate side yard

GROUND(S) FOR APPEAL (State reasons for appeal and nature of hardship, if claimed):

\*\*Attach additional sheets if necessary

Improved structural integrity with heat & air conditioning

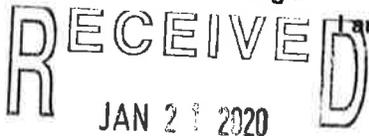
Legal Counsel (if represented):

Address: \_\_\_\_\_

Phone #: \_\_\_\_\_ E-Mail: \_\_\_\_\_

My (Our) signature(s) authorize(s) permission to pose my (our) property and permission to the Zoning Hearing Board and their representative to enter thereon for inspection purposes.

I (We) certify the information provided on this application and supporting documentation and plans are true and correct to the best of my (our) knowledge, information, and belief. You are required to submit proof that you are one of the following:



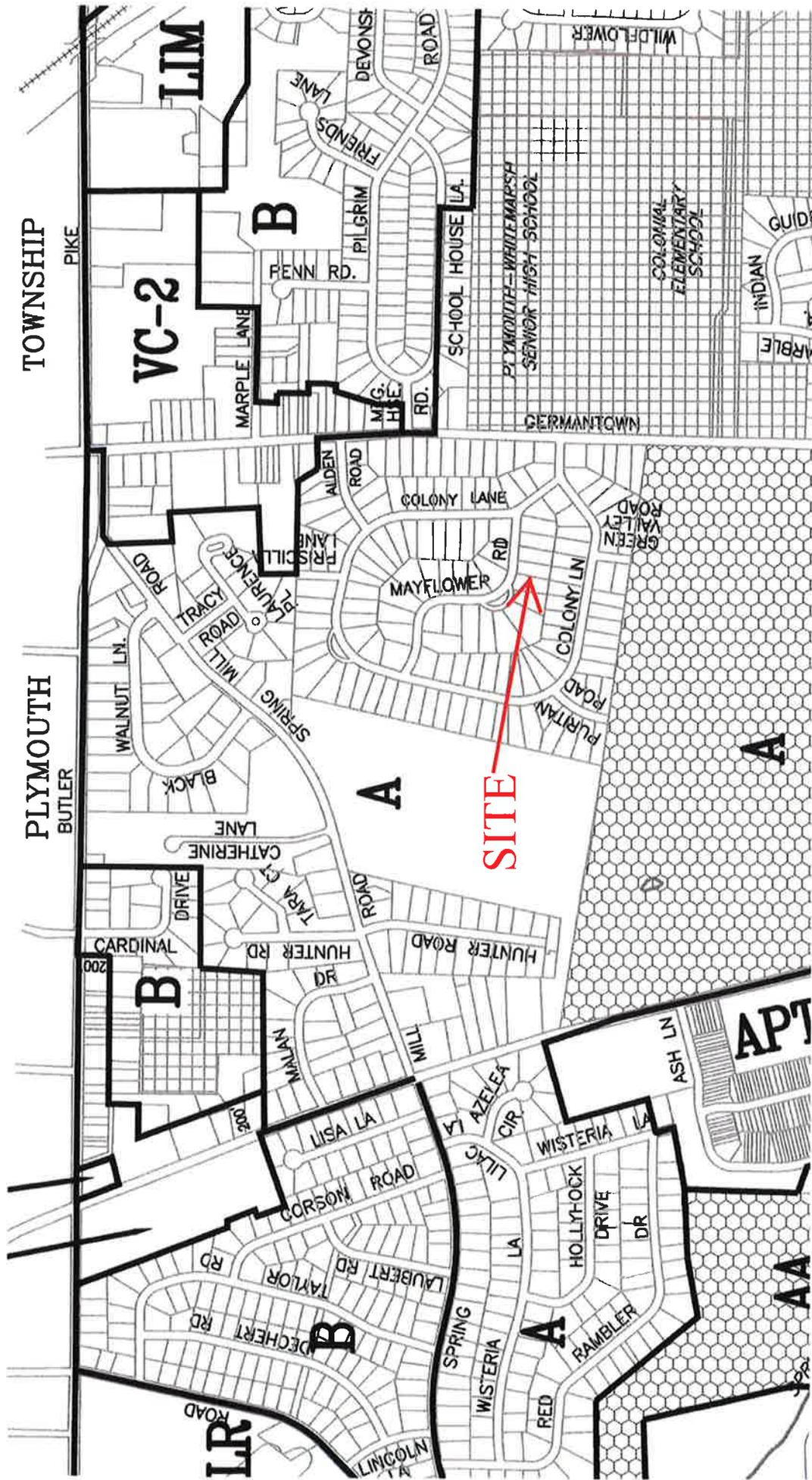
I am (We are)

- Owner(s) of Legal Title
- Owner(s) of Equitable Title
- Tenant(s) with permission of Owner(s) of Title (Enclose letter attesting to same)

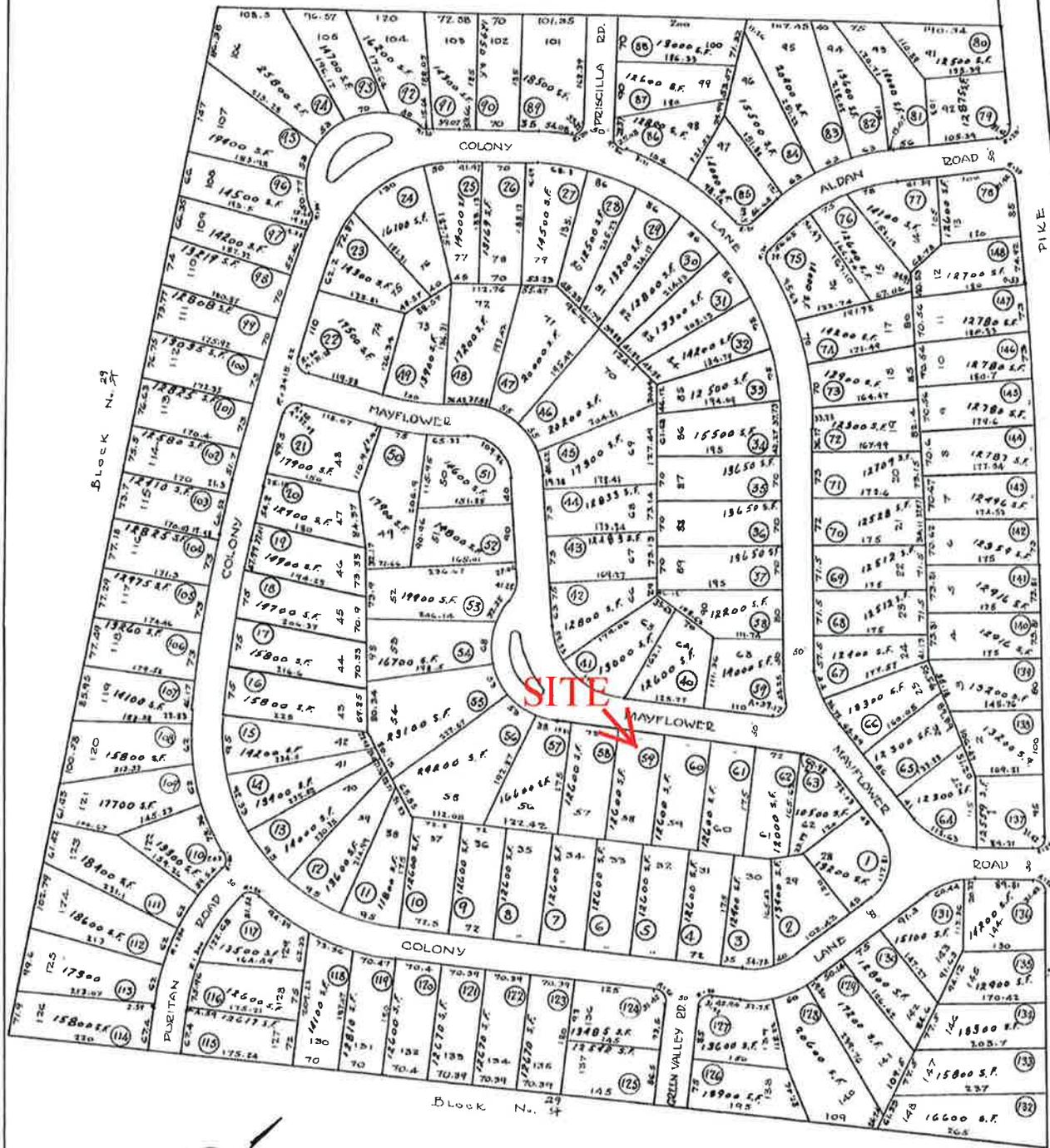
WHITEMARSH TOWNSHIP  
ZONING & ENGINEERING  
Date: 1/21/2020

William Ward  
Signature of Applicant/Appellant:

Colleen Ward  
Signature of Applicant/Appellant:

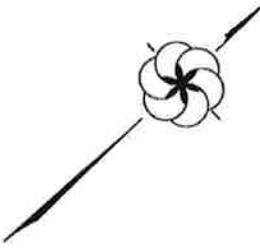


Block N. 28



Block N. 29

Block N. 29



WHITEMARSH TOWNSHIP

BLOCK N<sup>o</sup> 29-A

SCALE 1" = 100'

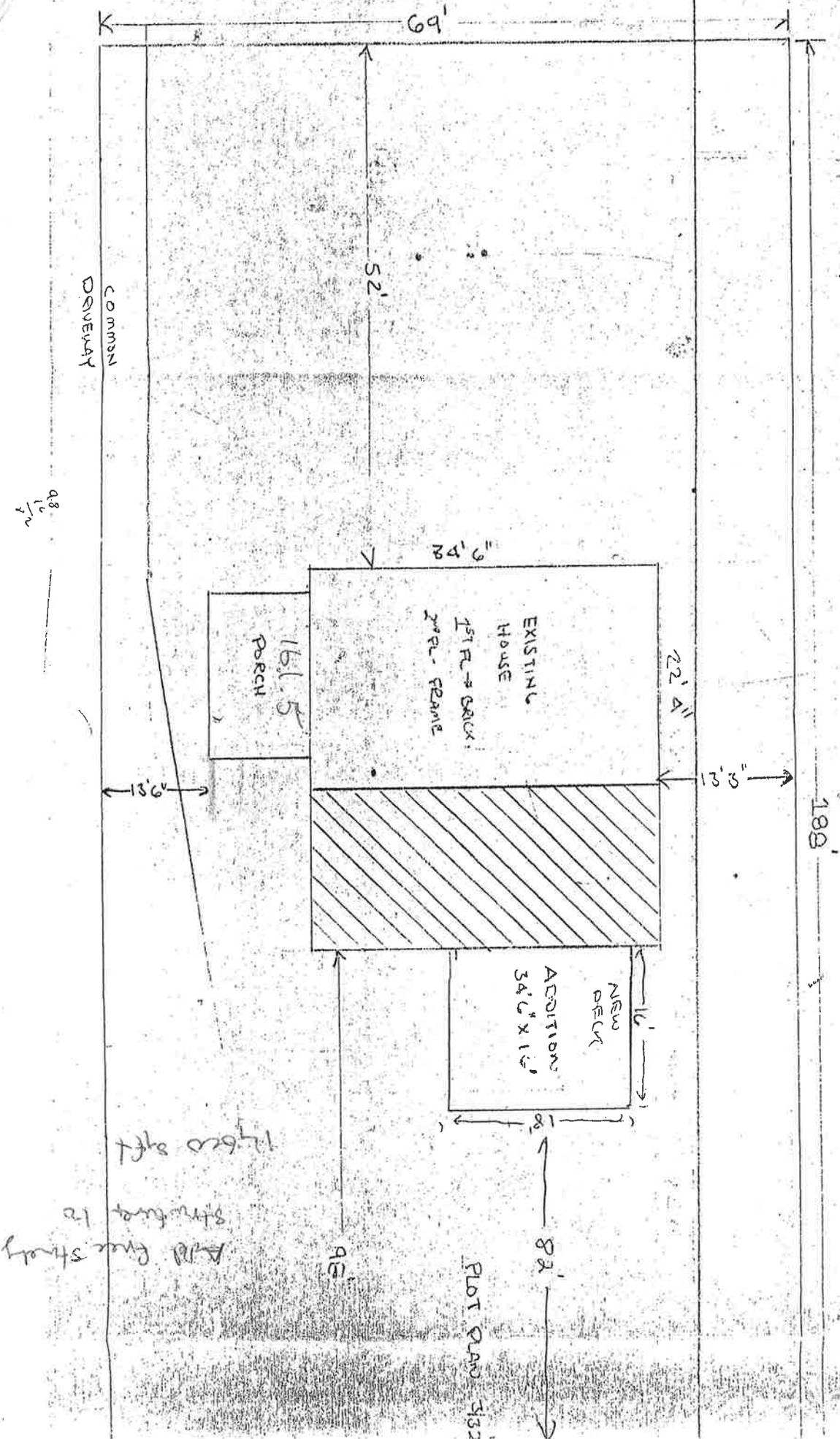
HEYWOOD-HALL CONST. CO. PLAN

29A

12.75 sq ft

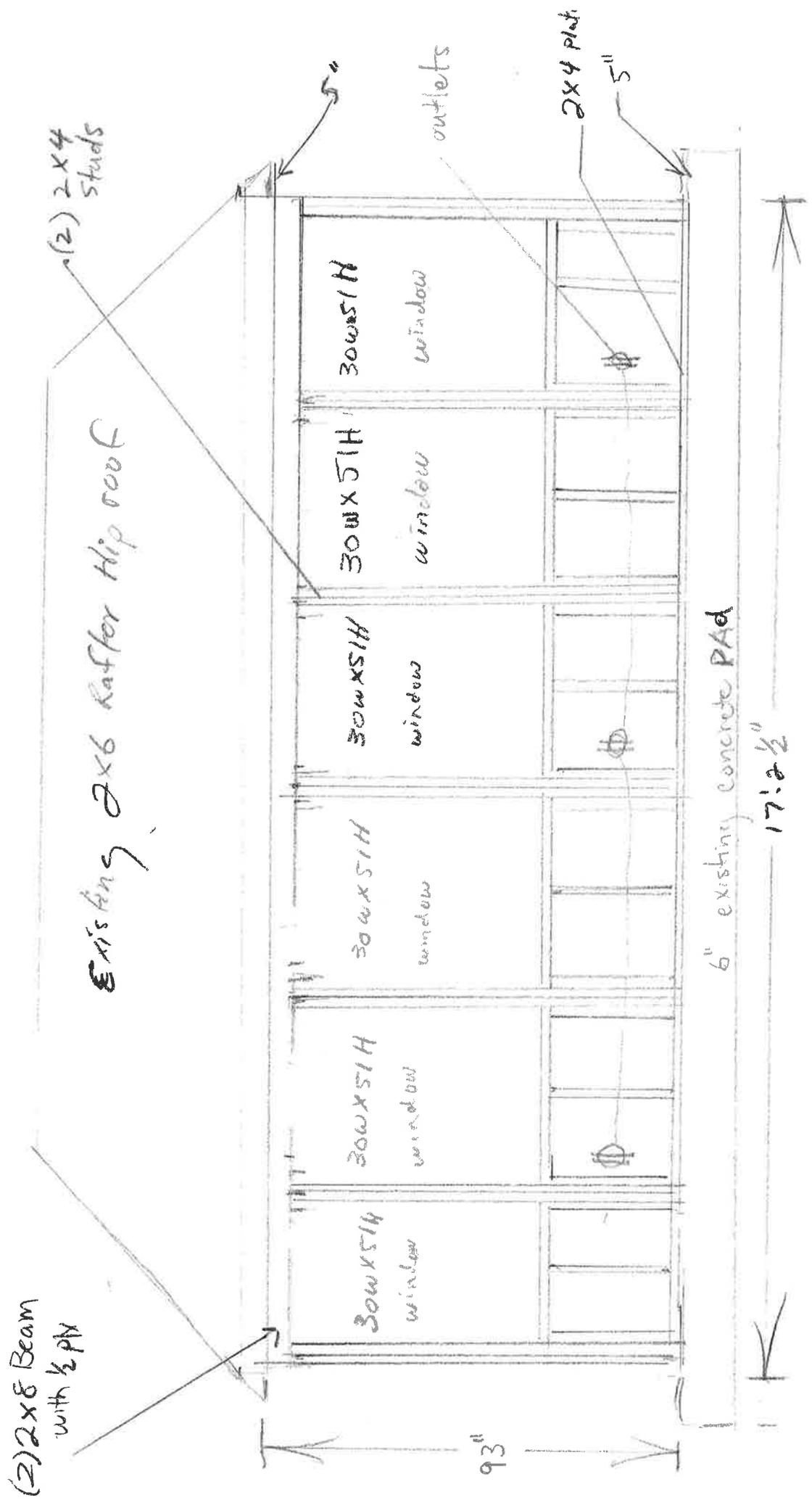
TOTAL GOLF PRINT OF HOUSE  
1777.75 sq ft      GOLF PRINT 13.75% OF LOT

12.75 sq ft



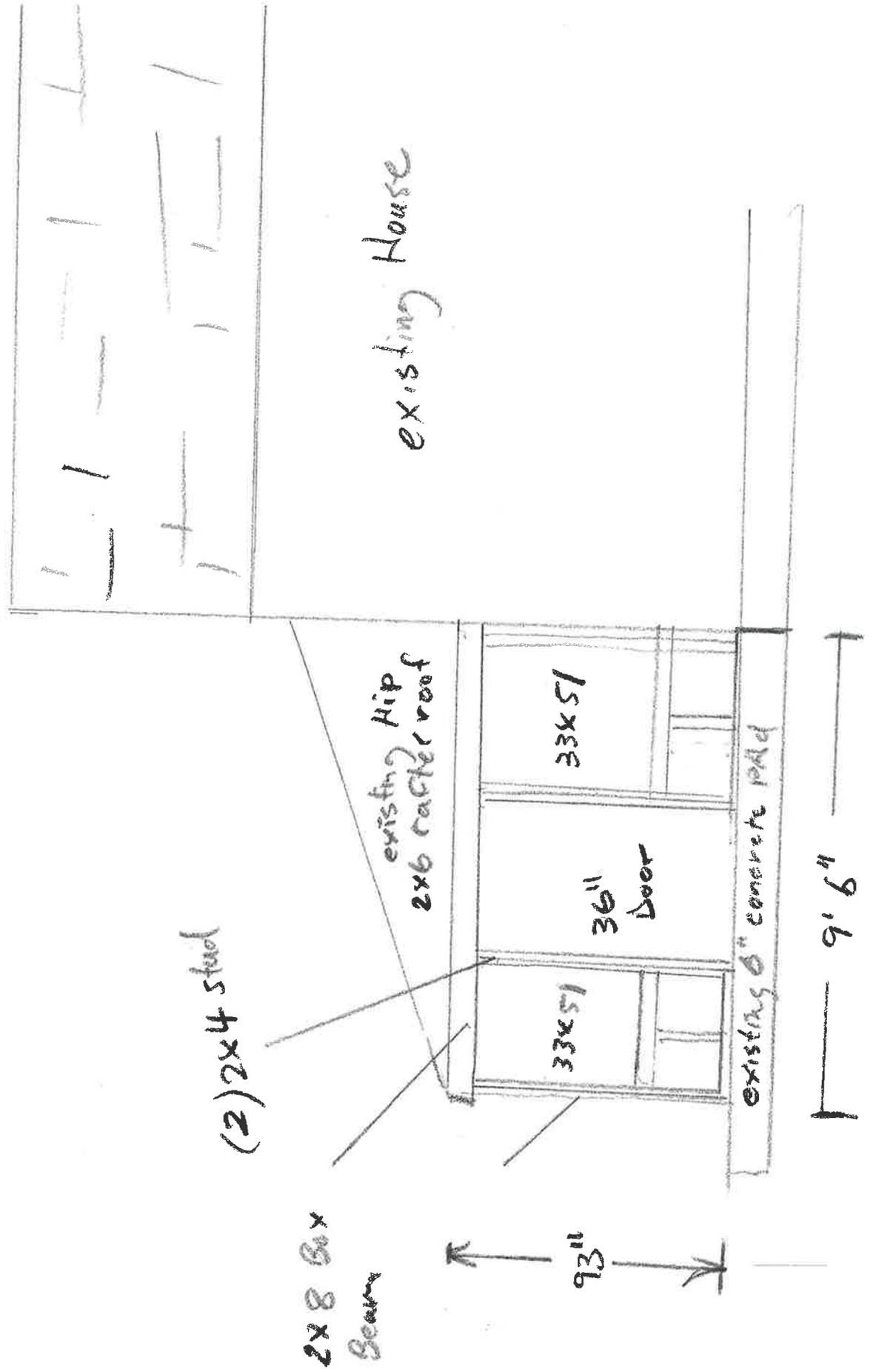
Add Enc. Sheds  
structure to  
12.75 sq ft

Side View



3181 mayflower rd Tear View

Colleen word



Street view

existing Hip 2x6 Rafter

(2) 2x4 studs

(2) 2x8 Box Beam

1609  
2x4 stud 93"

2x4 plate

5"

33WXS1H

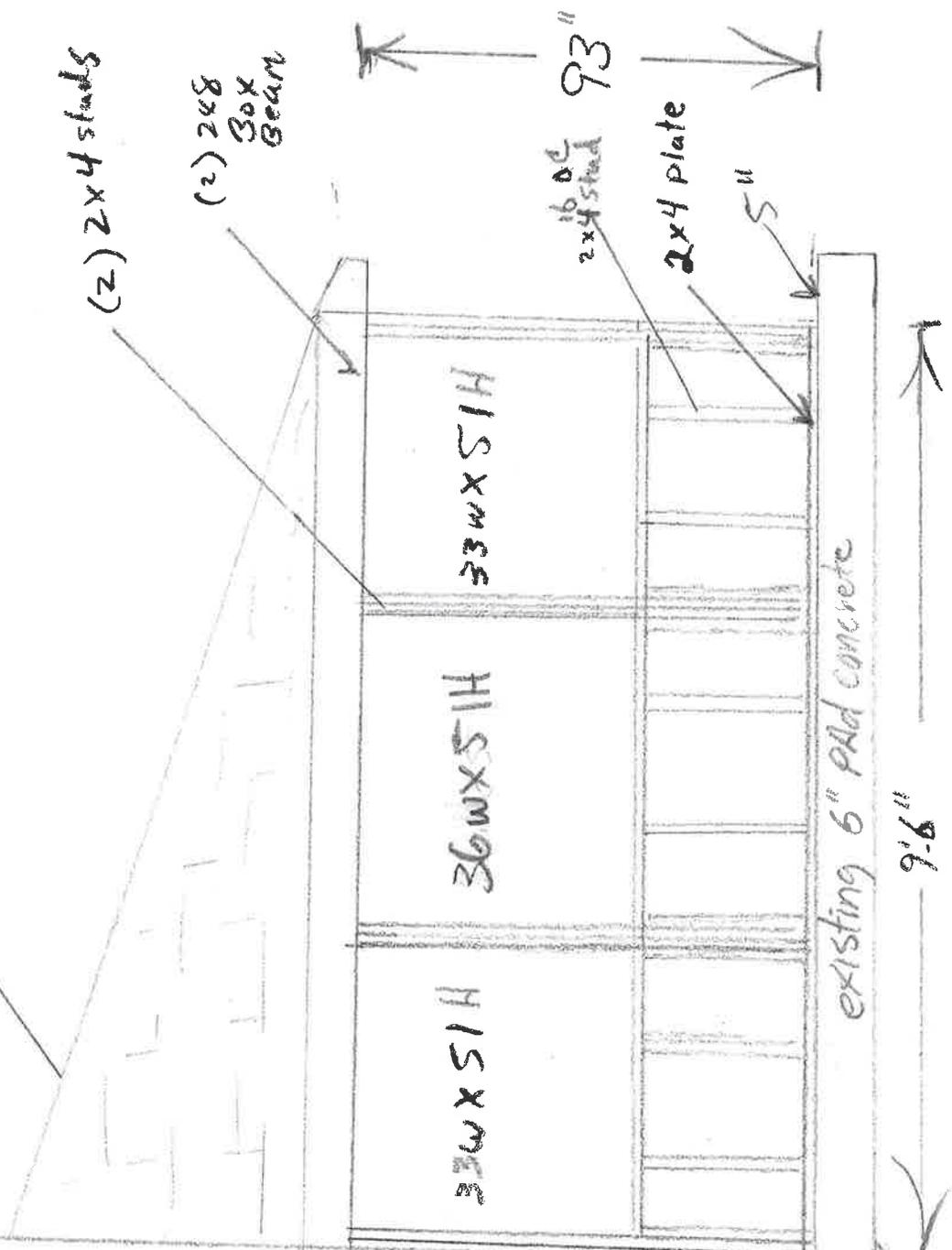
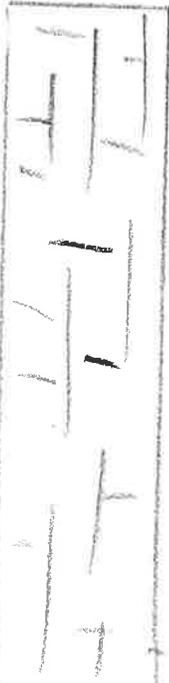
36WXS1H

33WXS1H

existing 6" PAD concrete

9'-6"

existing house









Whitemarsh Township Zoning Board  
RE: Variance for 3181 Mayflower Road  
January 21, 2020

To Whom it may concern,

I have shared a driveway with the Ward family for the past 22 years. It is my understanding that they wish to redo the existing porch and incorporate it as a formal structure to be part of their home.

I have no concerns as the new structure will occupy the same footprint as the existing structure.

Sincerely,

A handwritten signature in cursive script that reads "Florence J. Peterson". The signature is written in dark ink and is positioned below the word "Sincerely,".

Florence J. Peterson  
3179 Mayflower Road  
Plymouth Meeting PA 19462

**WHITEMARSH TOWNSHIP  
BOARD OF SUPERVISORS**

**LAFAYETTE HILL, PA.**

TAYLOR 8-3244

**BOARD**

**MORTON H. FETTEROLF, JR. CHAIRMAN  
THOMAS J. WHITE, SR. VICE-CHAIRMAN  
R. LINCOLN HAIN**

**MICHAEL J. LAPUTKA, SEC.-TREAS.  
ELMER L. MENGES, SOLICITOR  
EDGAR E. MITCHELL, CHIEF OF POLICE  
DONALD R. KOONTZ, REC. DIRECTOR**

**May 4, 1956**

**Mr. Lawrence K. Thomas  
3181 Mayflower Road  
Plymouth Meeting, Pa.**

**Dear Mr. Thomas:**

**Your petition before the Whitemarsh  
Zoning Board of A<sup>D</sup>justment is hereby granted.**

**Before construction can begin, it  
will be necessary for you to secure a building permit  
from this office.**

**Very truly yours,**

**MICHAEL J. LAPUTKA  
Secretary  
Zoning Board of Adjustment  
Whitemarsh Township**

**MJL/ag**



WHITEMARSH TOWNSHIP  
BOARD OF SUPERVISORS  
LAFAYETTE HILL, PA.

CONSHOHOCKEN 6-3244

BOARD

MORTON H. FETTEROLF, JR., CHAIRMAN  
THOMAS J. WHITE, SR., VICE-CHAIRMAN  
R. LINCOLN HAIN

MICHAEL J. LAPUTKA, SEC.-TREAS.  
ELMER L. MENGES, SOLICITOR  
EDGAR E. MITCHELL, CHIEF OF POLICE

October 2, 1953

Mr. Lawrence K. Thomas  
3181 Mayflower Road  
Plymouth Meeting, Pa.

Dear Mr. Thomas:

Your petition before the Whitemarsh Township Zoning Board of Adjustment is hereby granted.

Before construction can begin it will be necessary for you to secure a building permit from this office.

Very truly yours,

MICHAEL J. LAPUTKA  
Secretary Treasurer

MJL/ag

# NOTICE OF PUBLIC HEARING

Before Zoning Board of Adjustment  
of Whitemarsh Twp., Montg. Co., Pa.

A hearing will be held on the application of.....LAWRENCE K. THOMAS.....

at the Township Building, Ridge Pike and Crescent Avenue, on.....MONDAY.....  
.....SEPTEMBER 28, 1953 AT 8:00 P.M. ....

The property involved is.....3181 MAYFLOWER ROAD, PLYMOUTH MEETING, PA.....

The applicant requests.....TO BUILD PATIO AND PORCH WITH LESSER SIDE YARD THAN  
.....MINIMUM REQUIREMENTS UNDER THE ZONING ORDINANCE.....

All interested persons may appear at such hearing.

By Order of Zoning Board of Adjustment,  
Whitemarsh Twp., Montg. Co., Pa.

ZHB APPEAL #2020-02  
SUMMARY

**APPLICANTS:** Edward A. Gross IV and Shannon D. Gross

**PROPERTY LOCATION:** Parcel #65-00-03487-00-3  
Block 043D, Unit 026  
4023 Fairway Road  
Lafayette Hill, PA 19444

**ZONING DISTRICT:** A-Residential District

**SUMMARY OF RELIEF REQUEST:**

The Applicants are proposing to construct an addition with a 2-car garage and master suite above. The following relief is requested:

- 1. Variance from Section 116-169.A.** which allows a maximum of 18% impervious ground cover based on the Property's location in the A-Residential District and having a steep slope ratio between 15% to 50% (this property has a steep slope ratio of 34%). An impervious ground cover of 34.6% is proposed.
- 2. Variance from Section 116-194.A.** to allow an increase in nonconforming impervious ground cover of 29.9% (to the proposed 34.6%). This section permits expansions/alterations as long as existing nonconformities are not increased.

**PRIOR DECISIONS:**

NONE

Respectfully Submitted,



Charles L. Guttenplan, AICP  
Director of Planning and Zoning/Zoning Officer

APPEAL TO ZONING HEARING BOARD  
WHITEMARSH TOWNSHIP  
COMMONWEALTH OF PENNSYLVANIA

APPEAL NO: 2020-02

Applicant/Appellant: Edward and Shannon Gross  
Address: 4023 Fairway Road Lafayette Hill PA 19444  
Phone #: \_\_\_\_\_ Cell Number: \_\_\_\_\_ E-Mail: \_\_\_\_\_

Owner: Edward and Shannon Gross  
Address: 4023 Fairway Road Lafayette Hill PA 19444  
Phone #: \_\_\_\_\_ Cell Number: \_\_\_\_\_ E-Mail: \_\_\_\_\_

Location of the Property Involved: 4023 Fairway Road Lafayette Hill PA 19444  
Block #: 043D Unit #: 026 Parcel #: 65-00-03481-00-3

NATURE OF APPLICATION (Describe proposed use and/or construction: type of appeal requested and specific section(s) of Whitemarsh Township Zoning Code which is (are) relied upon):

Two car garage and master suite.  
116.194A and 116.169A

GROUND(S) FOR APPEAL (State reasons for appeal and nature of hardship, if claimed):  
\*\*Attach additional sheets if necessary

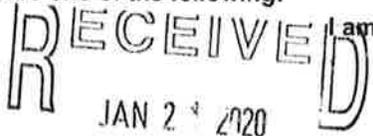
Due to our steep slope ratio, we are asking for a variance for our already non-conforming impervious coverage. Also, we are claiming a hardship due to space, as our family continues to grow and we need a little more room.

Legal Counsel (if represented): N/A

Address: \_\_\_\_\_  
Phone #: \_\_\_\_\_ E-Mail: \_\_\_\_\_

My (Our) signature(s) authorize(s) permission to pose my (our) property and permission to the Zoning Hearing Board and their representative to enter thereon for inspection purposes.

I (We) certify the information provided on this application and supporting documentation and plans are true and correct to the best of my (our) knowledge, information, and belief. You are required to submit proof that you are one of the following:



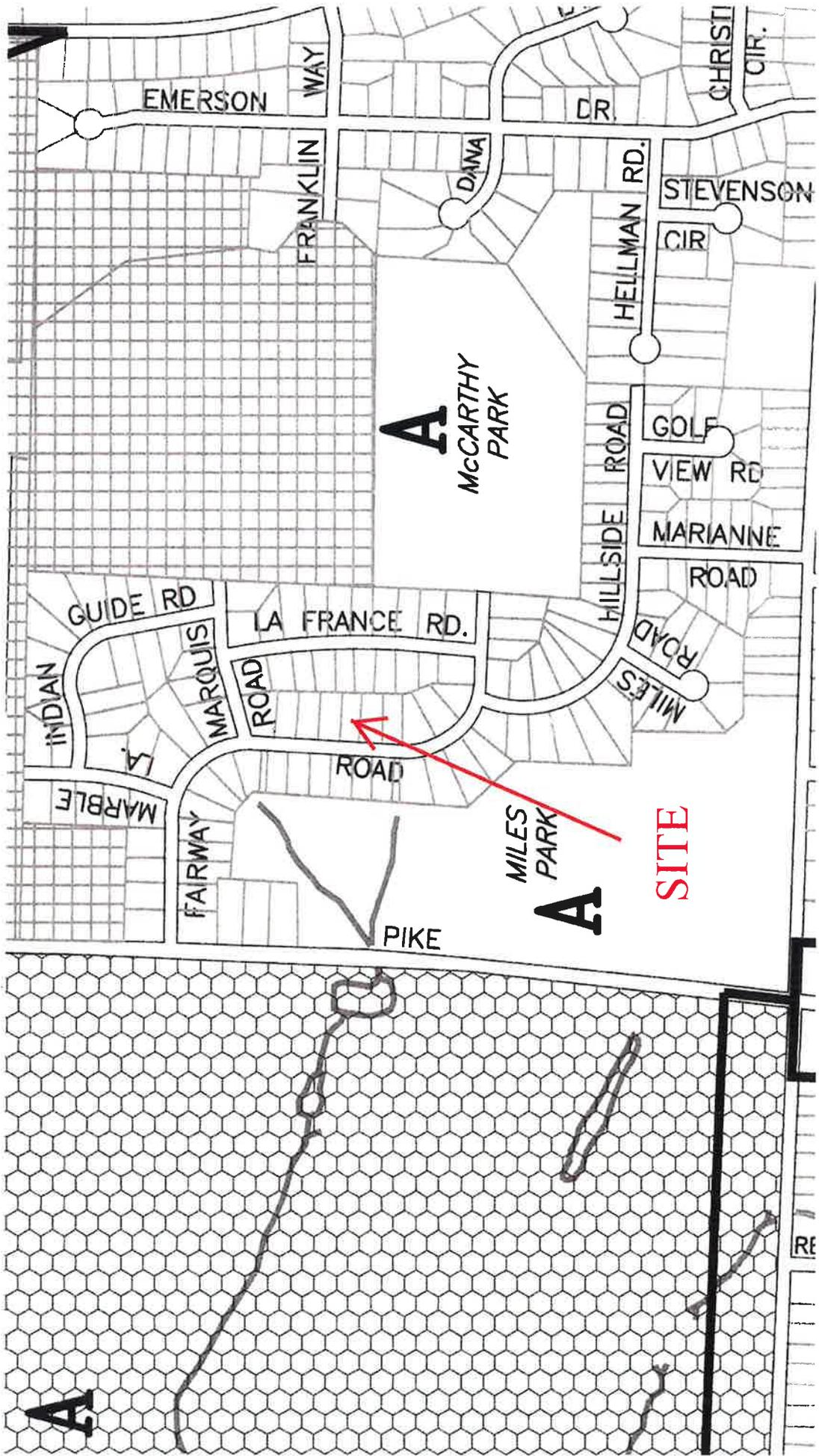
I am (We are)

- Owner(s) of Legal Title
- Owner(s) of Equitable Title
- Tenant(s) with permission of Owner(s) of Title (Enclose letter attesting to same)

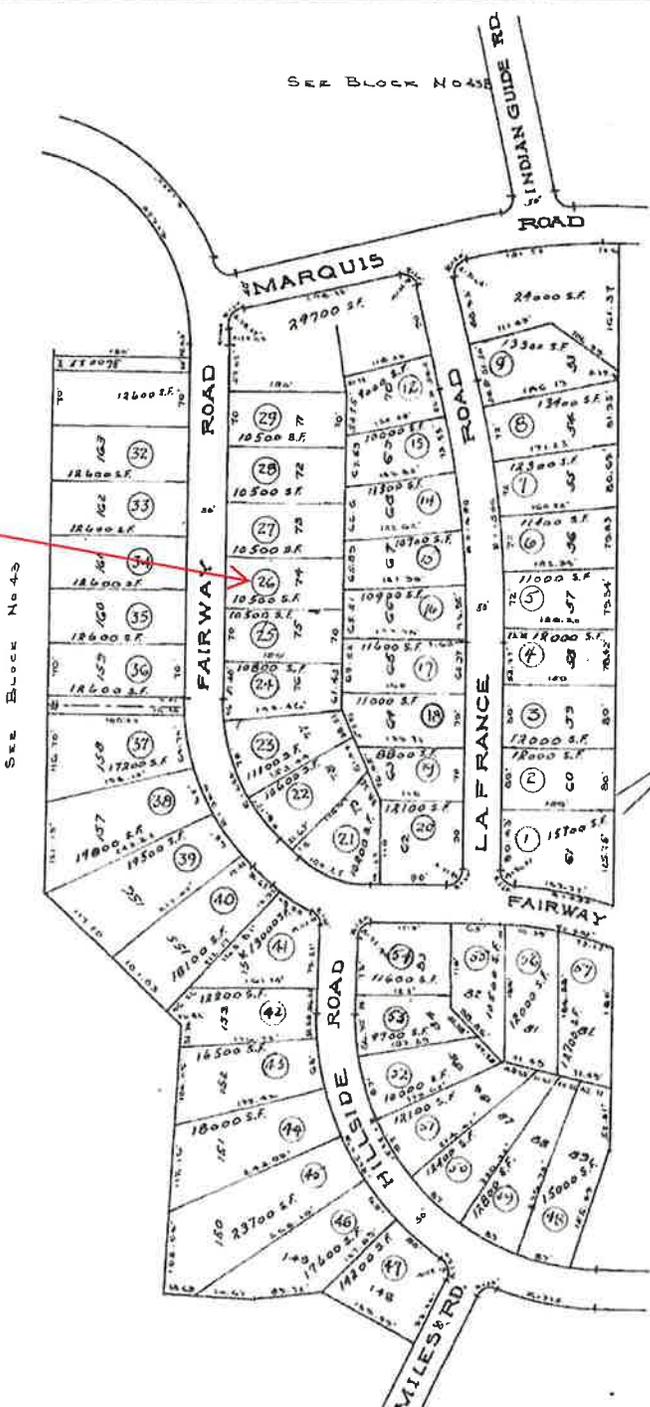
WHITEMARSH TOWNSHIP  
ZONING & ENGINEERING  
Date: 1/14/2020

E. Gross  
Signature of Applicant/Appellant:

Shannon Gross  
Signature of Applicant/Appellant:



SITE



SEE BLOCK NO 43B

SEE BLOCK NO 43

SEE BLOCK NO 43

SEE BLOCK NO 43 + 43C

WHITEMARSH TOWNSHIP  
 BLOCK NO 43D  
 SCALE 1"=100'

WHITEMARSH GREEN

# 116-169 STEEP SLOPE OVERLAY



2 FOOT CONTOURS

PLAN VIEW  
SCALE: 1"=50'

## 116-169A (STEEP SLOPES TABLE)

### Maximum Impervious Ground Cover (per lot) Steep Slope Ratio

District	15% to 50%	50% to 75%	75% or More
AAAA	0.08	0.07	0.06
AAA	0.09	0.09	0.08
AA	0.12	0.11	0.10
<b>A</b>	<b>0.18</b>	0.17	0.16
B	0.24	0.22	0.19

ZONING DISTRICT:	A
LOT AREA:	10,500 SF
AREA WITH SLOPES > 8%:	3,556 SF
STEEP SLOPE RATIO: (PERCENT OF SLOPES > 8%)	34%
MAXIMUM IMPERVIOUS GROUND COVER REQUIREMENT FROM TABLE 116-169A:	18%

### PROPERTY ADDRESS:

4023 FAIRWAY ROAD  
LAFAYETTE HILL, PA 19444

### NOTE:

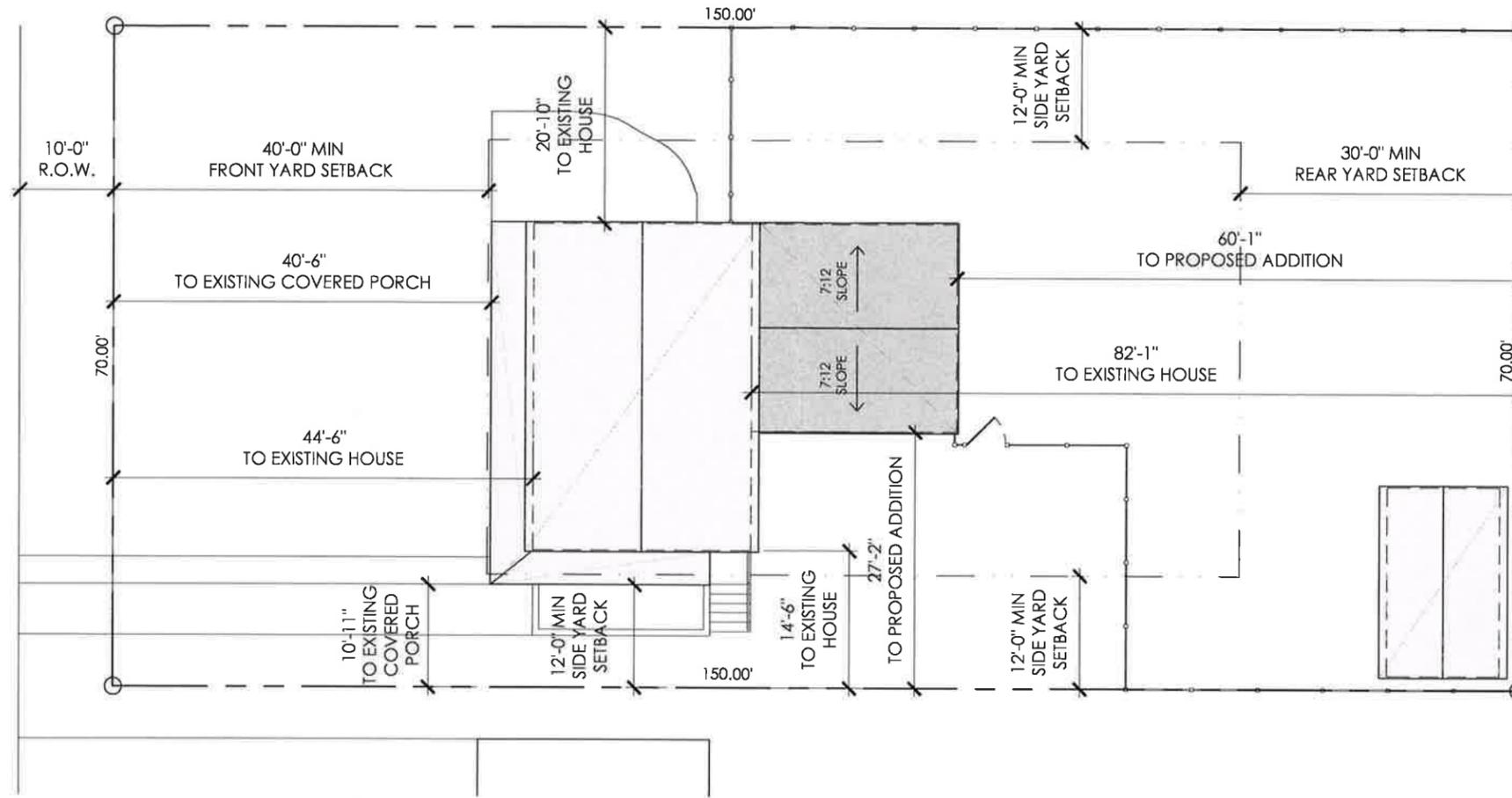
DEPICTION OF EXISTING FEATURES BASED ON INFORMATION GATHERED FROM TAX MAPS, AERIAL PHOTOGRAPHY, AND FIELD INSPECTIONS. NO TOPOGRAPHIC OR BOUNDARY SURVEY WAS PERFORMED AS PART OF THIS PROJECT.

**CHERYL  
POULOS  
ARCHITECT**

1014 County Line Road,  
Philadelphia PA 19116  
p: 215.570.5056  
cpoulosarchitect@gmail.com

**4023 FAIRWAY ROAD**  
**LAFAYETTE HILL, PA 19444**

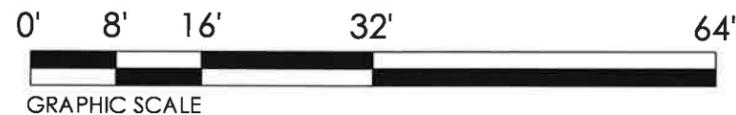
**FAIRWAY ROAD**



**LEGEND**

- PROPERTY LINE
- SETBACK LINE
- DENOTES EXISTING BUILDING AREA
- DENOTES PROPOSED BUILDING AREA

**1** PROPOSED SITE PLAN  
SCALE: 1/16" = 1'-0"



**ZONING CODE**

CODE: WHITEMARSH TOWNSHIP ZONING CODE

**ZONING REQUIREMENTS AND ANALYSIS**

TOPIC	CODE REQUIREMENT	EXISTING	PROPOSED	NOTES
ZONING CLASSIFICATION	A	A	NO CHANGE	---
PERMITTED USE	SINGLE FAMILY DWELLING	SINGLE FAMILY DWELLING	NO CHANGE	---
PERMITTED BUILDING TYPE	DETACHED	DETACHED	NO CHANGE	---
MINIMUM LOT AREA	15,000 SF	10,500 SF	NO CHANGE	---
MINIMUM LOT WIDTH	90'-0"	70'-0"	NO CHANGE	---
MINIMUM FRONT YARD SETBACK	40'-0"	40'-6" TO EXG PORCH 44'-6" TO EXG HOUSE 54'-6" TO EXG STREET	NO CHANGE NO CHANGE NO CHANGE	---
MINIMUM SIDE YARD SETBACK	12'-0" EA SIDE/35'-0" AGG	10'-11" TO EXG PORCH 31'-9" AGG TO EXG PORCH 14'-6" TO EXG HOUSE 35'-4" AGG TO EXG HOUSE	NO CHANGE NO CHANGE NO CHANGE NO CHANGE	---
MINIMUM REAR YARD SETBACK	30'-0"	82'-1"	60'-1"	---
MAXIMUM BUILDING HEIGHT	35'-0"	28'-10" EXISTING HOUSE	NO CHANGE	---
MAXIMUM BUILDING COVERAGE	20.0%	10.3%	14.9%	---
MAXIMUM IMPERVIOUS COVERAGE	18.0%	29.9%	34.6%	---

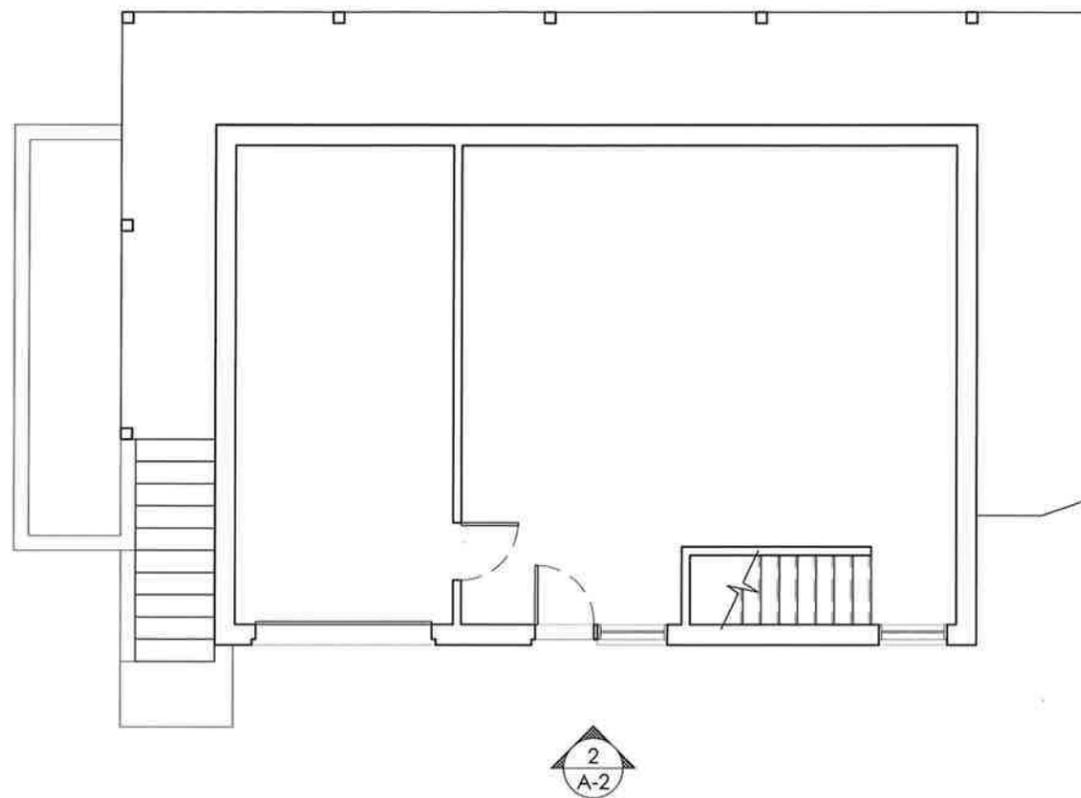
DATE: 01.20.20  
SCALE: AS NOTED  
DRAWN BY: CP

**A-1**

**CHERYL  
POULOS  
ARCHITECT**

1014 County Line Road,  
Philadelphia PA 19116  
p: 215.570.5056  
cpoulosarchitect@gmail.com

**4023 FAIRWAY ROAD  
LAFAYETTE HILL, PA 19444**



**1** EXISTING BASEMENT FLOOR PLAN  
SCALE: 1/8" = 1'-0"



**2** EXISTING REAR ELEVATION  
SCALE: 1/8" = 1'-0"

DATE	01.20.20
SCALE	AS NOTED
DRAWN BY	CP

**A-2**

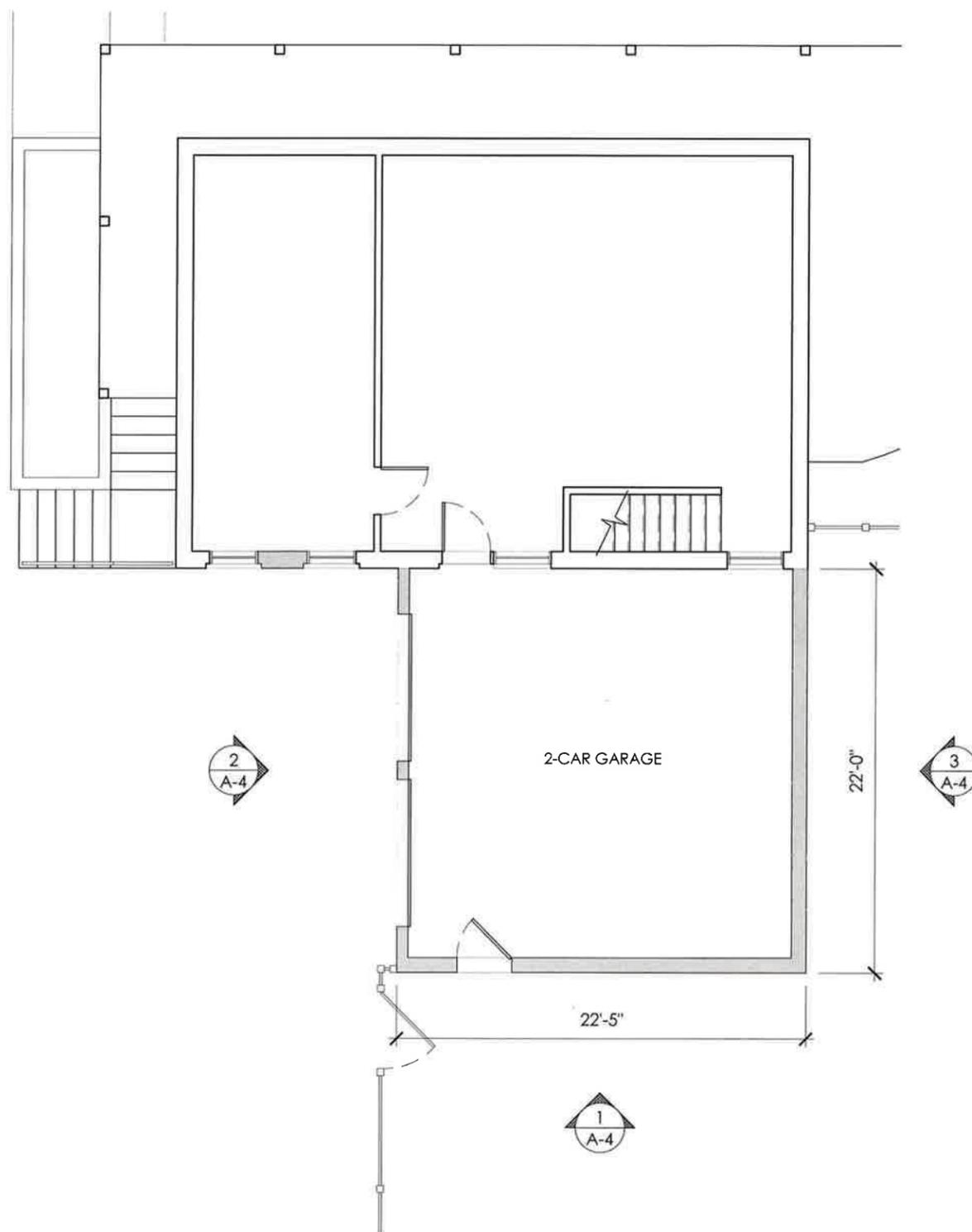
**CHERYL  
POULOS  
ARCHITECT**

1014 County Line Road,  
Philadelphia PA 19116  
p: 215.570.5056  
cpoulosarchitect@gmail.com

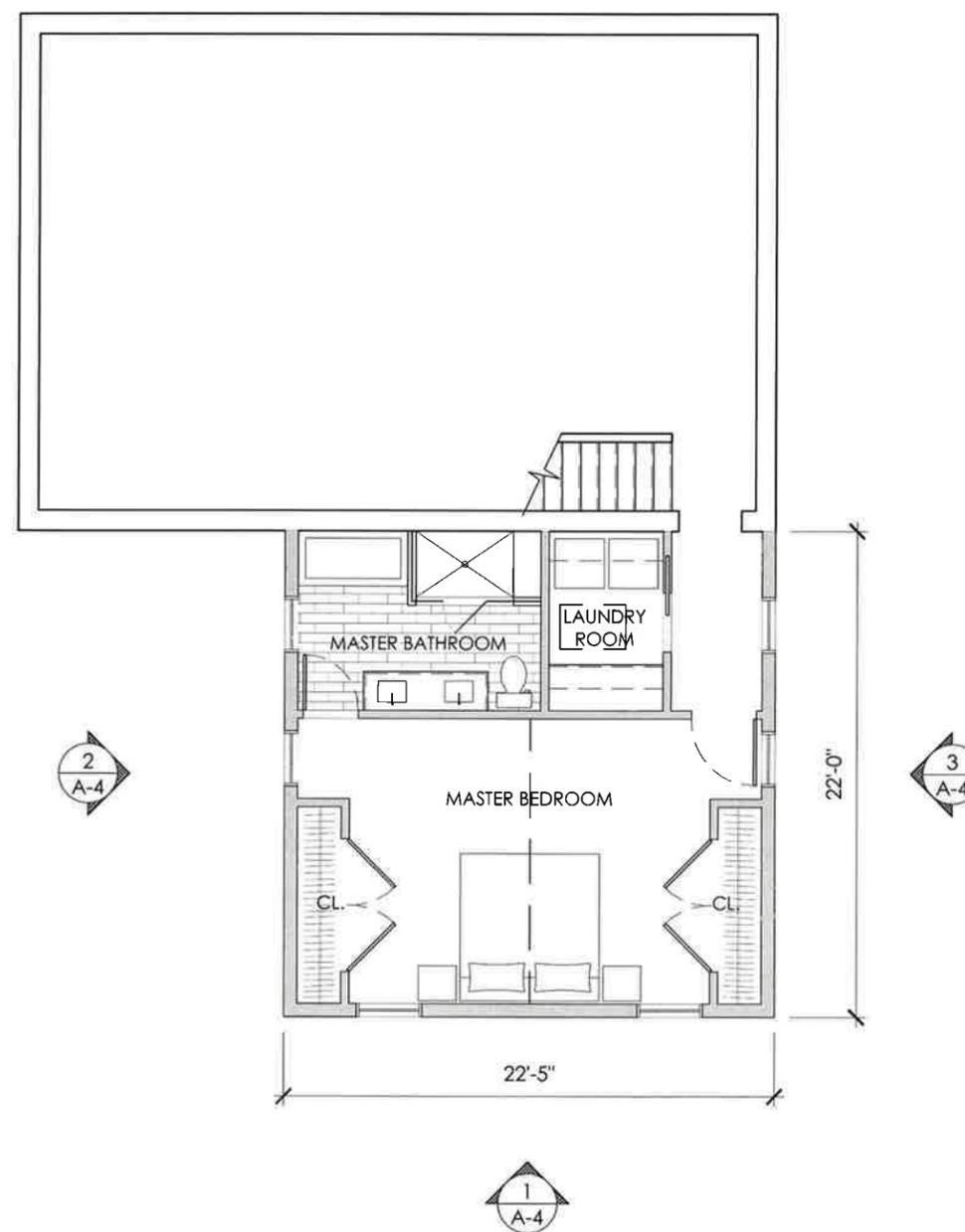
**4023 FAIRWAY ROAD  
LAFAYETTE HILL, PA 19444**

DATE	01.20.20
SCALE	AS NOTED
DRAWN BY	CP

**A-3**



**1** PROPOSED BASEMENT FLOOR PLAN  
SCALE: 1/8" = 1'-0"



**2** PROPOSED FIRST FLOOR PLAN  
SCALE: 1/8" = 1'-0"

**CHERYL  
POULOS  
ARCHITECT**

1014 County Line Road,  
Philadelphia PA 19116  
p: 215.570.5056  
cpoulosarchitect@gmail.com

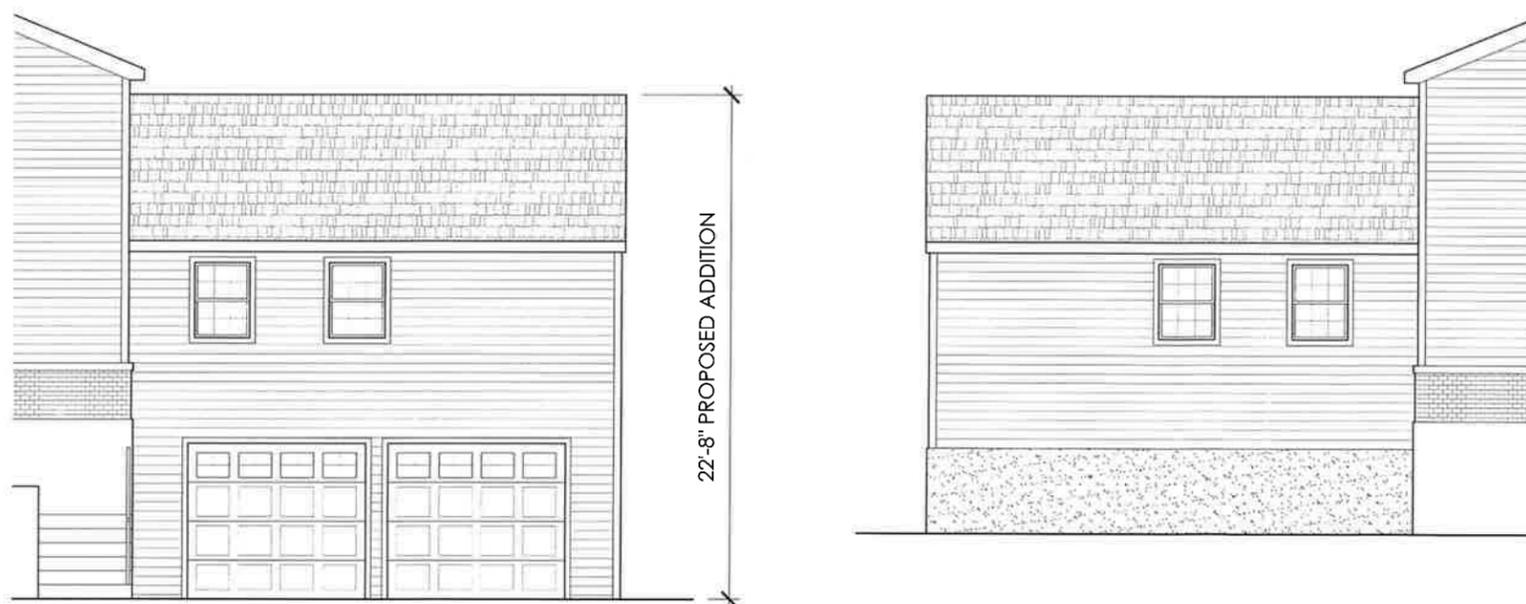
**4023 FAIRWAY ROAD  
LAFAYETTE HILL, PA 19444**

DATE	01.20.20
SCALE	AS NOTED
DRAWN BY	CP

**A-4**



**1** PROPOSED REAR ELEVATION  
SCALE: 1/8" = 1'-0"



**2** PROPOSED SIDE ELEVATION  
SCALE: 1/8" = 1'-0"

**3** PROPOSED SIDE ELEVATION  
SCALE: 1/8" = 1'-0"

**CHERYL  
POULOS  
ARCHITECT**

1014 County Line Road,  
Philadelphia PA 19116  
p: 215.570.5056  
cpoulosarchitect@gmail.com

**4023 FAIRWAY ROAD  
LAFAYETTE HILL, PA 19444**



**1** EXISTING FRONT ELEVATION  
SCALE: N.T.S.



**2** EXISTING FRONT ELEVATION  
SCALE: N.T.S.



**3** EXISTING REAR ELEVATION  
SCALE: N.T.S.



**4** EXISTING REAR ELEVATION  
SCALE: N.T.S.

DATE	01.20.20
SCALE	AS NOTED
DRAWN BY	CP

**A-5**

01/15/2020

Dear Neighbors,

My family and I have lived here now for 4 years and we are starting to outgrow our home. We love our neighborhood and have become friends with you all. As you know, we just had our third child and we are looking to add a little more space to our home. We will be proposing to build a small addition onto the rear of our existing home and are hoping to receive your support in this matter. The township has asked for multiple steps to be completed as a part of the process and we are doing our best to comply with those steps, this being an optional step. If you are in support of us building this addition, please kindly sign below with your name and address. Again, we really love it here and would like to be able to complete this addition so we can stay in the neighborhood that we've come to love.

Thank you for your support,

The Gross Family

\* MOON SHIN 4025 Fairway Rd  
GREG KEENAN 4022 Fairway Rd  
Bernadette M McCarthy 4024 Fairway Rd.  
Patsy L 4021 Fairway Rd.  
~~Mike~~ Mike 4026 Fairway Rd

**ZHB APPEAL #2020-03  
SUMMARY**

**APPLICANTS:** Duane and Bernadette McCarthy

**PROPERTY LOCATION:** Parcel #65-00-03418-00-9  
Block 043D, Unit 034  
4024 Fairway Road  
Lafayette Hill, PA 19444

**ZONING DISTRICT:** A-Residential District

**SUMMARY OF RELIEF REQUEST:**

The Applicants are proposing to remove an existing covered porch and crumbling foundation and replace with a new enclosed space to occupy an expanded kitchen. The following relief is requested:

1. **Variance from Section 116-202.B.** to allow less than the 12' minimum/35' required aggregate side yard; 4' minimum/25' aggregate side yard is proposed. The side yard setback is regulated by this section of the Zoning Ordinance because this house was built prior to June 23, 1966 (it was originally built in 1954).

**PRIOR DECISIONS:**

None

Respectfully Submitted,

  
Charles L. Guttenplan, AICP  
Director of Planning and Zoning/Zoning Officer

APPEAL TO ZONING HEARING BOARD  
WHITEMARSH TOWNSHIP  
COMMONWEALTH OF PENNSYLVANIA

APPEAL NO: 2020-03

Applicant/Appellant: BERNADETTE & DUANE MCCARTHY  
Address: 4024 FAIRWAY RD. LAFAYETTE HILL PA 19444  
Phone #: [REDACTED] Cell Number: [REDACTED] E-Mail: [REDACTED]

Owner: BERNADETTE & DUANE MCCARTHY  
Address: 4024 FAIRWAY RD LAFAYETTE HILL PA 19444  
Phone #: [REDACTED] Cell Number: [REDACTED] E-Mail: [REDACTED]

Location of the Property Involved: [REDACTED]  
Block #: 043D Unit #: 034 Parcel #: 65-00-03418-00-9

NATURE OF APPLICATION (Describe proposed use and/or construction: type of appeal requested and specific section(s) of Whitemarsh Township Zoning Code which is (are) relied upon):

WE ARE REMOVING A CRUMBLING FOUNDATION OF OVER 35 YRS OF OUR SIDE COVERED PORCH WHICH ENCRACHES ON SIDE YARD SETBACK RESTRICTIONS. THIS NEW ENCLOSED SPACE WILL OCCUPY AN EXPANDED KITCHEN. THIS WILL BE ONE STORY OVER BASEMENT FOUNDATION - SEEKING VARIANCE FROM 116-202.B. SIDEWARD SETBACK. (12/35 REQUIRED GROUNDS FOR APPEAL (State reasons for appeal and nature of hardship, if claimed): (12/35 REQUIRED 4/25 PROPOSED))

\*\*Attach additional sheets if necessary

OUR EXISTING PORCH BUILT PRIOR TO OUR PURCHASE DOES NOT MEET CURRENT SIDE YARD SETBACKS OR COMBINED AGGREGATE SIDE YARD REQUIREMENTS. A NARROW LOT INHIBITS THE USE OF THESE REQUIREMENTS.

Legal Counsel (if represented): \_\_\_\_\_  
Address: \_\_\_\_\_  
Phone #: \_\_\_\_\_ E-Mail: \_\_\_\_\_

My (Our) signature(s) authorize(s) permission to pose my (our) property and permission to the Zoning Hearing Board and their representative to enter thereon for inspection purposes.

I (We) certify the information provided on this application and supporting documentation and plans are true and correct to the best of my (our) knowledge, information, and belief. You are required to submit proof that you are one of the following:

- I am (We are)
- Owner(s) of Legal Title
  - Owner(s) of Equitable Title
  - Tenant(s) with permission of Owner(s) of Title (Enclose letter attesting to same)

RECEIVED  
JAN 24 2020

WHITEMARSH TOWNSHIP  
ZONING & ENGINEERING

[Signature]  
Signature of Applicant/Appellant:  
[Signature]  
Signature of Applicant/Appellant:



SITE →

SEE BLOCK No 43

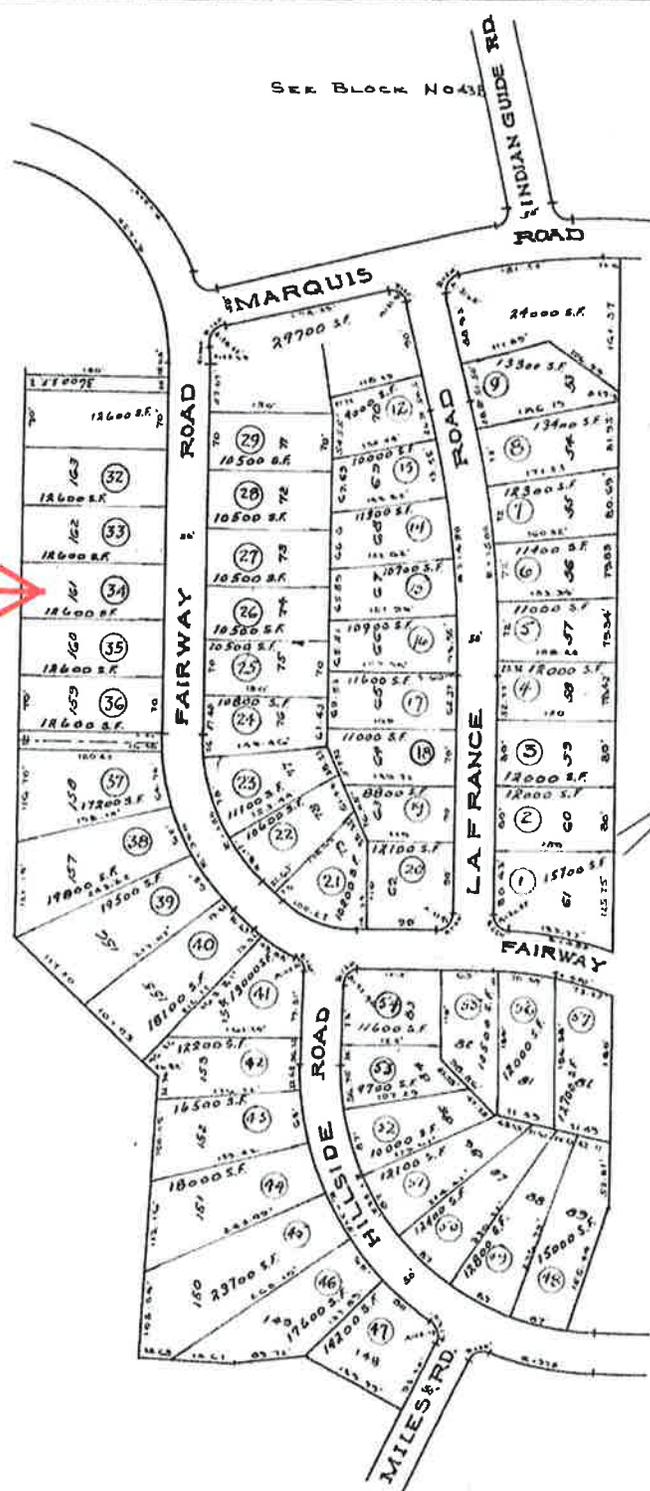
SEE BLOCK No 43

SEE BLOCK No 43 + 43C

WHITEMARSH TOWNSHIP  
BLOCK No 43D

SCALE 1" = 100'

WHITEMARSH GREEN





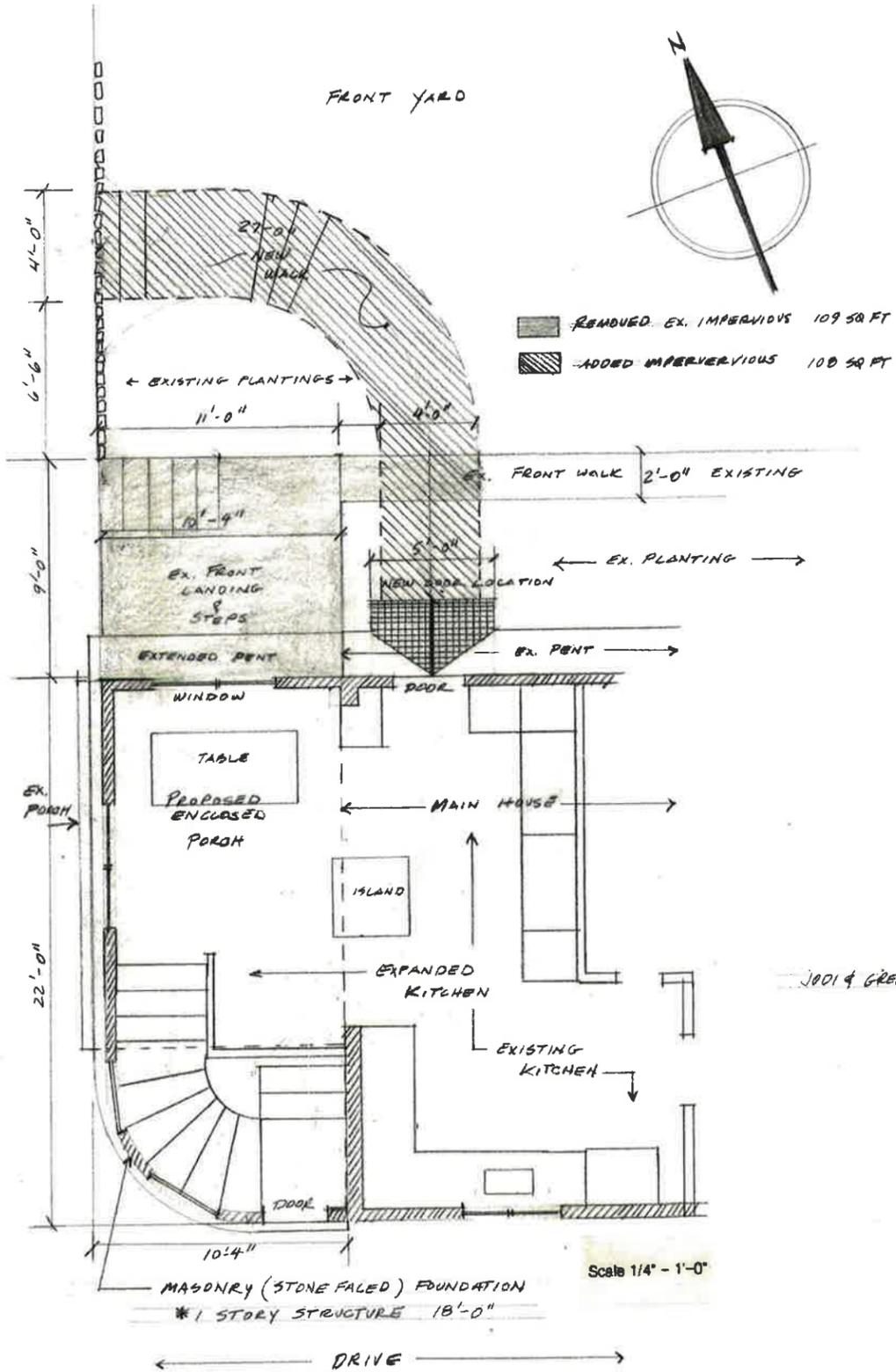
Existing Front View



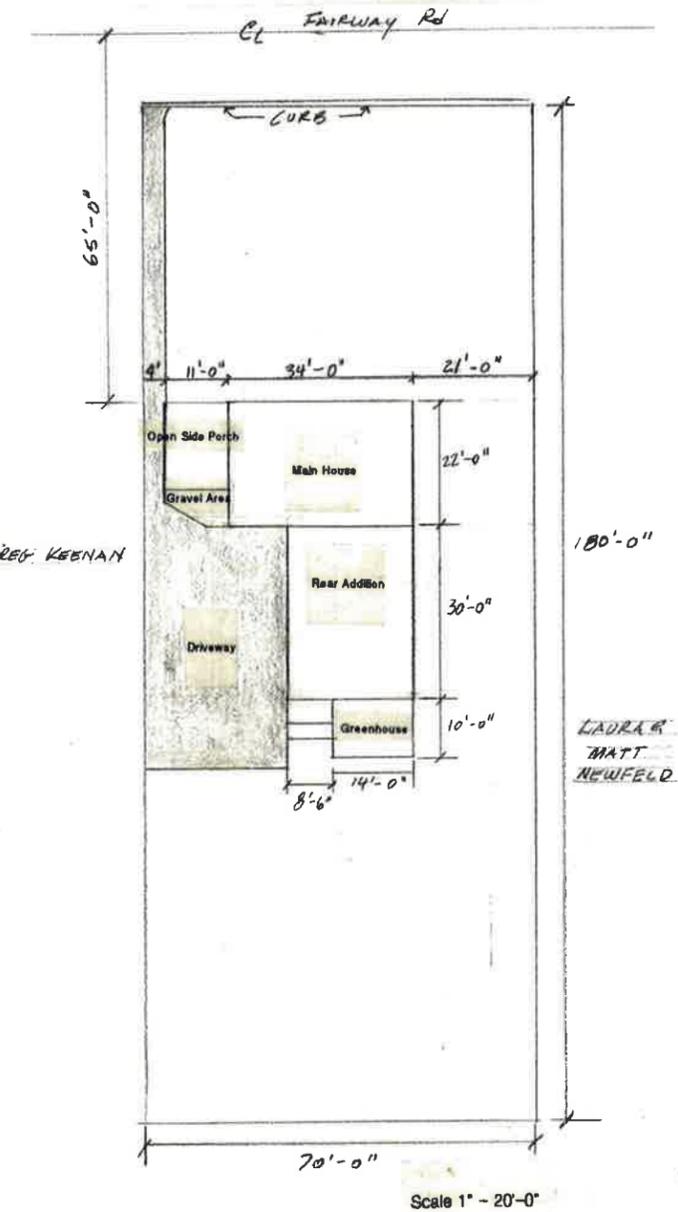
Existing Side View



Existing Rear View



Block 034D Unit 034 Parcel #65-00-0341B-00-9



**McCarthy Residence 4024 Fairway Road Lafayette Hill, PA**

Bernadette & Duane McCarthy January 2020 Prepared By: Duane McCarthy

ZHB APPEAL #2020-04  
SUMMARY

**APPLICANTS:** Whitemarsh Valley Country Club

**PROPERTY LOCATION:** Parcel #65-00-11680-00-9  
Block 023, Unit 002  
815 Thomas Road  
Lafayette Hill, PA 19444

**ZONING DISTRICT:** AAA-Residential District  
Recreational District Overlay  
Floodplain Conservation Overlay District  
Riparian Corridor Conservation Overlay District

**SUMMARY OF RELIEF REQUEST:**

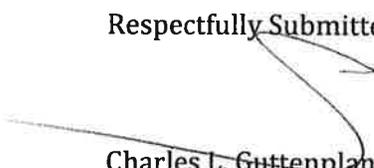
The applicant is proposing to build two replacement golf cart/pedestrian bridges in the floodplain and floodway of the Wissahickon Creek, one of which was destroyed in a storm and the other which is in deteriorated condition. The following is being requested:

1. **Variance from Section 116-165.B.(2)** for structures other than the bridges (e.g., cart path, abutments, wingwalls, piers, etc.) which are not included as permitted uses as part of a recreational use in the Floodplain Conservation Overlay District.
2. **Special Exception from Section 116-166.A.(2)**. Bridges are permitted in a floodway by Special Exception provided that they are in compliance with provisions of the underlying districts, they cause no increase in flood heights or velocities; and are not prohibited by any other ordinance.
3. **Variance from Section 116-264.A.** is sought to not reestablish forest cover and woodland habitat as none exists now and the Creek is flanked by golf course. Introducing this vegetation would restrict the play of golf.
4. **Variance from Section 116-265.C.** is sought to permit crossings at a distance with less than 1,000 feet of buffer length. Existing bridges do not have such separation and are being replaced in the same location. Bridge separation is approximately 400 feet.

**PRIOR DECISIONS:**

ZHB#2010-12 Special Exception/Variiances (3 new bridges)  
ZHB#1995-17 Special Exception (Cellular Telephone Equipment & Chimney Structure)

Respectfully Submitted,

  
Charles L. Guttenplan, AICP  
Director of Planning and Zoning/Zoning Officer

APPEAL TO ZONING HEARING BOARD  
WHITEMARSH TOWNSHIP  
COMMONWEALTH OF PENNSYLVANIA

APPEAL NO: 2626-84

**Applicant/Appellant:** Whitemarsh Valley Country Club c/o Jim Coffey, General Manager

**Address:** 815 Thomas Road, Lafayette Hill, PA 19444

**Phone #:** [REDACTED]      **Cell Number:** [REDACTED]      **E-Mail:** [REDACTED]

**Owner:** Whitemarsh Valley Country Club

**Address:** same

**Phone #:** same      **Cell Number:** same      **E-Mail:** same

**Location of the Property Involved:** 815 Thomas Road

**Block #:** 023      **Unit #:** 002      **Parcel #:** 65-00-11680-00-9

**NATURE OF APPLICATION (Describe proposed use and/or construction: type of appeal requested and specific section(s) of Whitemarsh Township Zoning Code which is (are) relied upon):**

Applicant seeks to build two replacement golf cart/pedestrian bridges in the floodplain and floodway of the Wissahickon Creek and requires variances under Section 116-165 and 116-257 et al and Special Exception under 116-166.

See attachment for further descriptions and details.

**GROUND(S) FOR APPEAL (State reasons for appeal and nature of hardship, if claimed):**

**\*\*Attach additional sheets if necessary**

See attached statement "Grounds for Appeal"

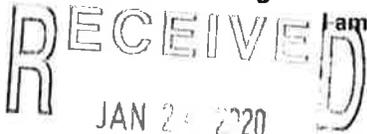
**Legal Counsel (if represented):** Timothy Lawn

**Address:** 1845 Walnut Street, Suite 2000, Philadelphia, PA 19103

**Phone #:** 215 568-6190      **E-Mail:** trlawn@rayneslaw.com

My (Our) signature(s) authorize(s) permission to pose my (our) property and permission to the Zoning Hearing Board and their representative to enter thereon for inspection purposes.

I (We) certify the information provided on this application and supporting documentation and plans are true and correct to the best of my (our) knowledge, information, and belief. You are required to submit proof that you are one of the following:



I am (We are)

- Owner(s) of Legal Title
- Owner(s) of Equitable Title
- Tenant(s) with permission of Owner(s) of Title (Enclose letter attesting to same)

WHITEMARSH TOWNSHIP  
ZONING & ENGINEERING

Date: 1/24/2020

*Jim Coffey*  
Signature of Applicant/Appellant:

Signature of Applicant/Appellant:

## Application Attachment

Appeal to Zoning Hearing Board  
Whitemarsh Township  
Whitemarsh Valley Country Club  
Bridge Replacements

### Nature of Application

Seek to replace two cart path/pedestrian bridges (#4b and 5) in the floodplain and floodway of the Wissahickon Creek. One was destroyed when a tree fell on it during a fall storm. The second is in deteriorated condition and needs replacement. Both are needed for golfers to use the full course. The construction is within the floodway and the Riparian Corridor Zones 1 and 2. The bridges will be constructed off site in pieces and assembled on site and have been fully designed, engineered and certified by Contech Engineered Solutions, LLC. The support infrastructure (concrete abutments, wingwalls, & helical pier foundations) have been designed and certified by CBC Engineers. Structures to support these bridges will be built on site and will include asphalt approach paths, wing walls, helical piers, abutments, and such other appurtenant components. The new bridges are replacements at the same location as the existing crossings and perpendicular to the Creek. They will be longer (70' x 6' and 70' x 10') and will be higher elevation to span the Creek and create less obstruction during normal and smaller storm flow. The replacements will be an improvement over the prior bridges. In major storms, the structures will be submerged.

### Grounds for Appeal and Justification

Relief is sought as follows:

**Section 116-165. B. (2)** Variance for structures other than the bridges (e.g., cart path, abutments, wingwalls, piers, etc.) which are not permitted. Note: Golf course is a permitted use.

**Section 116-166 A.(2)** Special Exception - Bridges are permitted in floodways by Special Exception provided that they are in compliance with provisions of the underlying districts (AAA-Residential and Recreation Overlay); they cause no increase in flood heights or velocities; and are not prohibited by any other ordinance. The underlying district is Residential AAA/Golf Course; the higher/wider bridges will permit improved flow; no ordinance prohibits them. Note that they are a permitted use in the Riparian Corridor Overlay District under Section 116-259 B. & C. and 116-260. F. Variances (2) are sought for code sections pertaining to Management and Corridor Crossing Standards per below.

**Section 116-264 A.** – Management - Variance is sought to not reestablish forest cover and woodland habitat as none exists now and the Creek is flanked by golf course. Introducing this vegetation would restrict the play of golf. The disturbed areas will be stabilized for erosion control.

**Section 116-265 C.** Corridor Crossing Standards – Variance is sought to permit crossings at a distance with less than 1,000 feet of buffer length. Existing bridges do not have such separation and are being replaced in the same location. As positioned, they allow golfer to move among contiguous golf holes. Bridge separation is ~400 feet.



**PARID: 650011680009**

**WHITEMARSH VALLEY COUNTRY CLUB**

**815 THOMAS RD**

**Parcel**

---

TaxMapID	65023 002
Parid	65-00-11680-00-9
Land Use Code	0515
Land Use Description	C - PREFERENTIAL ASSESSMENT
Property Location	815 THOMAS RD
Lot #	
Lot Size	78.82 ACRES
Front Feet	3391
Municipality	WHITEMARSH
School District	COLONIAL
Utilities	ALL PUBLIC//

**Owner**

---

Name(s)	WHITEMARSH VALLEY COUNTRY CLUB
Name(s)	
Mailing Address	THOMAS RD
Care Of	
Mailing Address	
Mailing Address	LAFAYETTE HILL PA 19444

**Current Assessment**

---

Appraised Value	Assessed Value	Restrict Code
4,464,000	4,089,470	515

**Estimated Taxes**

---

County	14,145
Montco Community College	1,595
Municipality	8,334
School District	93,125
Total	117,199
Tax Lien	<a href="#">Tax Claim Bureau Parcel Search</a>

**Last Sale**

---

Sale Date	01-JAN-00
Sale Price	\$0
Tax Stamps	
Deed Book and Page	0619-00367
Grantor	WHITEMARSH VALLEY COUNTRY CLUB

- Home
- Agency Structure
- Assessment
- Map/Draw
- Assessment History
- Commercial
- Lot
- Map
- Home
- Notes
- Record
- Sales
- Stories
- Spots and
- Global Tools

PARID: 650011680009  
WHITEMARSH VALLEY COUNTRY CLUB  
815 THOMAS RD

The map interface displays a property boundary in grey. A 'Record Navigator' overlay is present, containing a '+' icon, a '1 of 1' indicator, a 'Return to Search Results' button, and an 'Actions' section with a 'Buffer Search' option. A scale bar at the bottom left shows 0, 0.15, and 0.3 miles. The word 'Springfield' is visible on the map.



(./)

Address Search Parcel Search

Parcel Search

815 THOMAS RD

Clear Location

ASSET CENTRL

Add | Search | Reports

Parcels

hyd073102\_s83



Historic District

Zoning2019

Labels / Lot Measurement

Boundary Point

Assets

Streets

Traffic Signals

Street Lights

Township Boundary

5 Foot Contours

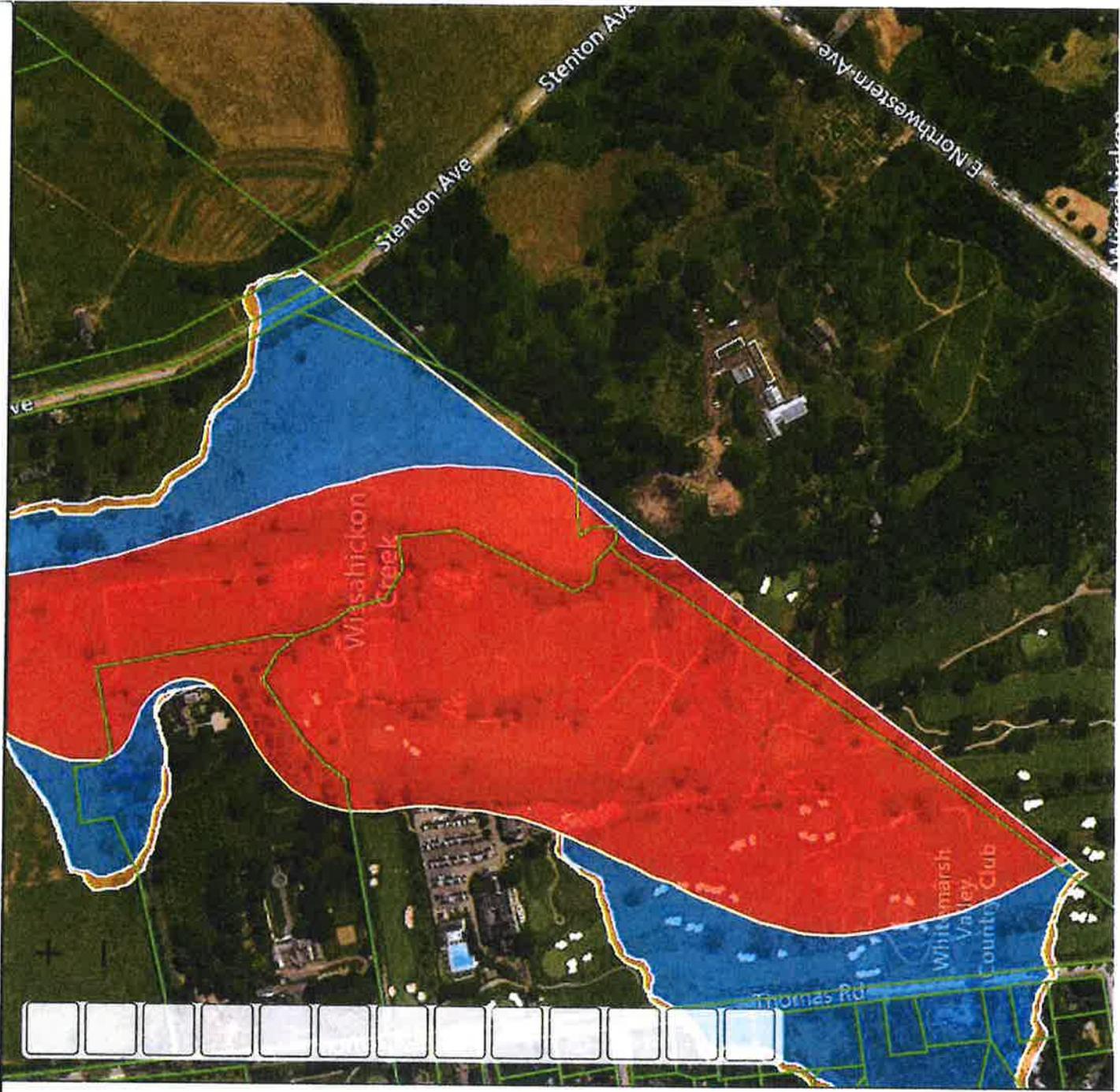
Streams

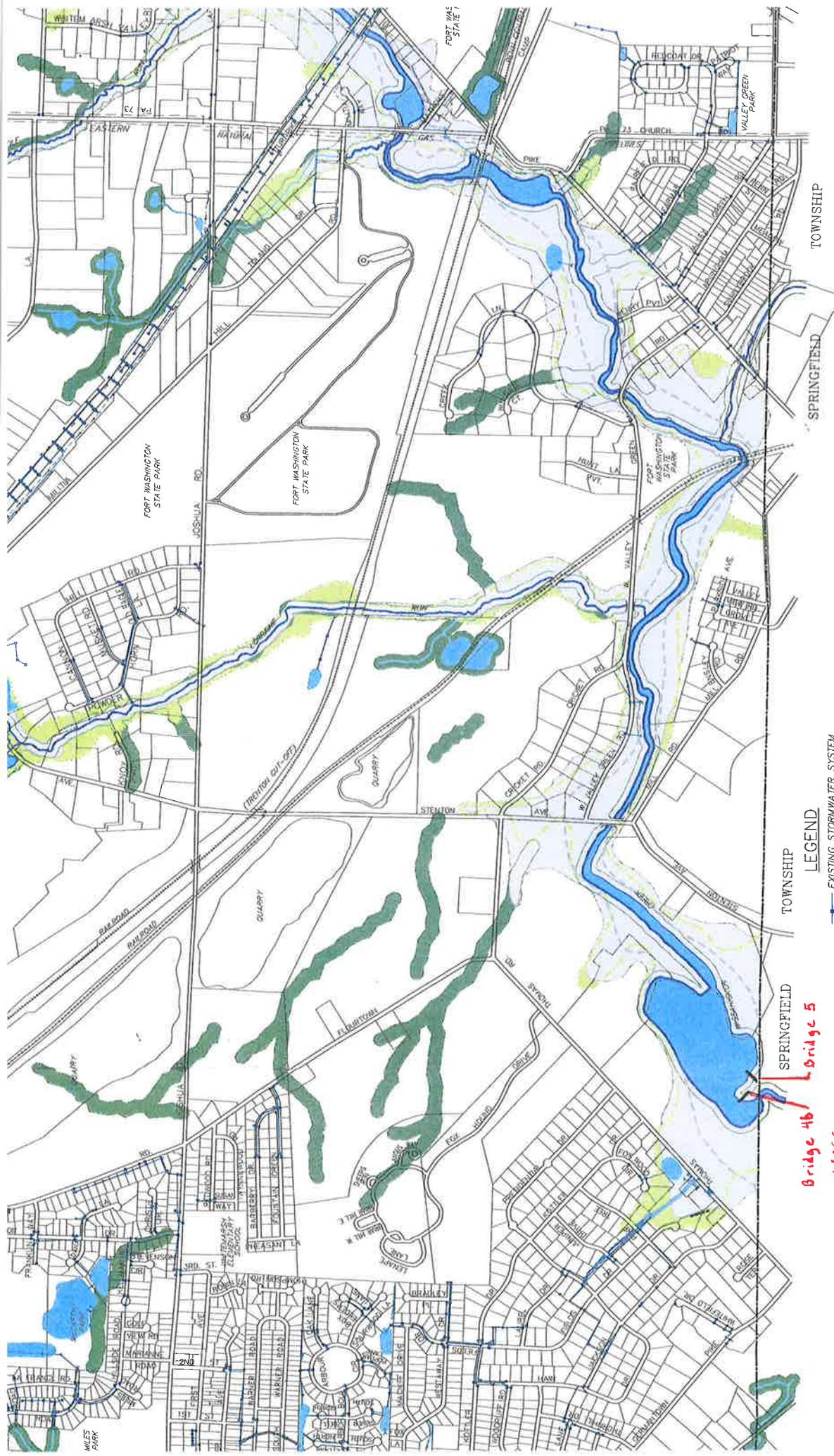
FEMA Flood Zones

1% Annual Chance Flood Ha

0.2% Annual Chance Flood I

Regulatory Floodway





**LEGEND**

- EXISTING STORMWATER SYSTEM
- EXISTING STORMWATER BASIN
- RIPARIAN CORRIDOR
- FLOODPLAIN CONSERVATION DISTRICT
- FLOODPLAIN SOILS

**SCALE**

0 300 600 900 1200

GRAPHIC SCALE OF FEET

**NOTES:**

1. THIS MAP WAS PREPARED BY THE TOWNSHIP ENGINEER AND IS SUBJECT TO THE TOWNSHIP ENGINEER'S REVIEW AND APPROVAL.

2. THE TOWNSHIP ENGINEER'S REVIEW AND APPROVAL DOES NOT CONSTITUTE A GUARANTEE OF THE ACCURACY OF THE INFORMATION SHOWN ON THIS MAP.

3. THE TOWNSHIP ENGINEER'S REVIEW AND APPROVAL DOES NOT CONSTITUTE A GUARANTEE OF THE ACCURACY OF THE INFORMATION SHOWN ON THIS MAP.

4. THE TOWNSHIP ENGINEER'S REVIEW AND APPROVAL DOES NOT CONSTITUTE A GUARANTEE OF THE ACCURACY OF THE INFORMATION SHOWN ON THIS MAP.

5. THE TOWNSHIP ENGINEER'S REVIEW AND APPROVAL DOES NOT CONSTITUTE A GUARANTEE OF THE ACCURACY OF THE INFORMATION SHOWN ON THIS MAP.

BRIDGE 4b  
BRIDGE 5  
WVCC

**Whitemarsh Valley Country Club**  
Bridge Replacements  
Bridge #4b



Bridge #4b (con't)



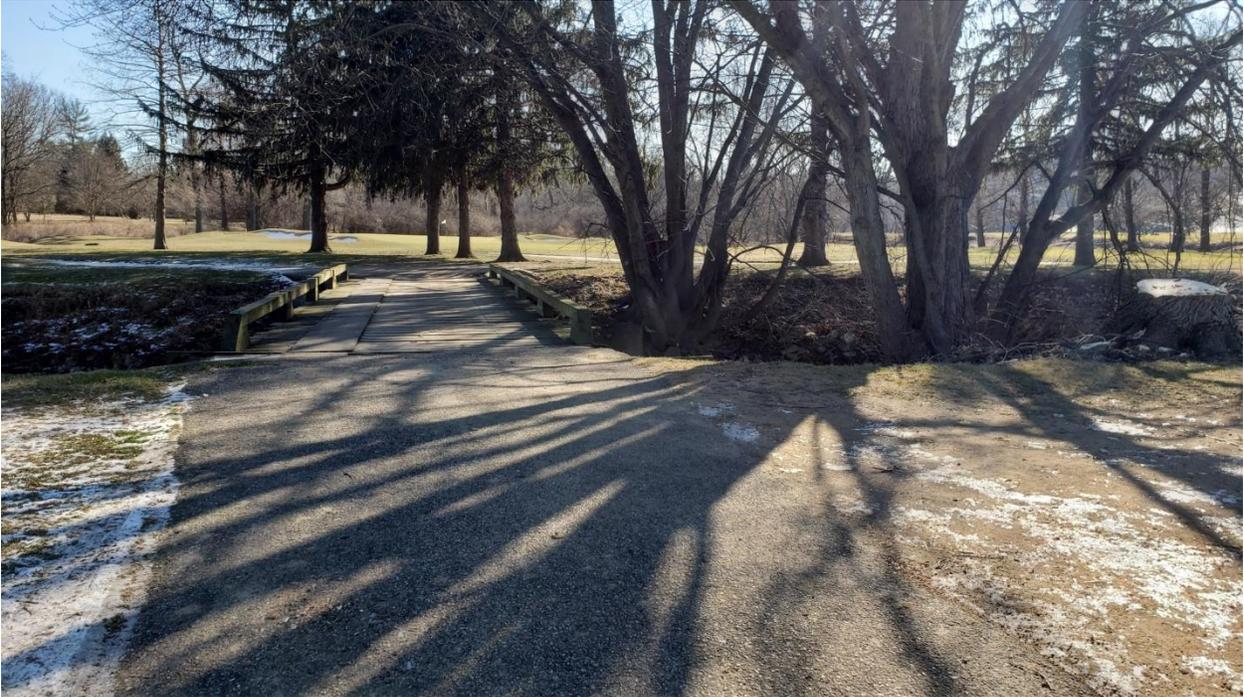
Bridge #4b (con't)



Bridge #5



Bridge #5 (con't)





WHITEMARSH TOWNSHIP  
ZONING HEARING BOARD

APPLICATION 95-17 of AWACS, Inc d/b/a Comcast Metrophone

First Hearing Date 8/2/95 Date Decided 8/2/95 Copy Mailed 8/3/95

At a public hearing of the above application, the Zoning Hearing Board decides and orders as follows:

1. The Special Exception in accordance with Section 116-35.C(1) of the Whitmarsh Township Code necessary to allow cellular telephone equipment to be located in the clubhouse and a proposed chimney structure of the Whitmarsh Country Club at 815 Thomas Road is hereby granted / ~~denied~~.

THIS DECISION IS SUBJECT TO THE FOLLOWING CONDITIONS:

1. All use and development allowed by any granted application shall conform to the exhibits and testimony presented at the hearing unless inconsistent with these conditions in which case these conditions shall take precedence.

2. Applicant has agreed that the equipment shall be for its exclusive use and this Decision is subject to that condition.

3. Each channel shall broadcast at no more than 25 watts.

Robert A. Beebe Gene Pleas  
John O. McCord Garland W. Gentry  
R. J. [Signature]

This Decision and Order of the Board is final and any appeal of it must be filed with the Court of Common Pleas of Montgomery County within 30 days following the copy mailing date set out above.

Section 116-223 of the Whitmarsh Township Code provides that all applications granted by the Board shall automatically expire 365 days after the expiration of the last day to appeal to the Court of Common Pleas of Montgomery County or to an Appellate Court, if, during that time, the applicant has not acted upon the granted application by obtaining the granted permit and paying the required fee for same. Any request for an extension must be submitted in writing to the Board at least thirty (30) days prior to the expiration date.

## WHITEMARSH TOWNSHIP ZONING HEARING BOARD

### DECISION AND ORDER

APPLICATION NO.: 2010-12

FIRST HEARING DATE: 08/04/10

APPLICANT: Whitemarsh Valley Country Club  
Block 023, Unit 002  
815 Thomas Road  
Lafayette Hill, PA 19444  
AAA - Residential District  
REC - Recreational Overlay

DECISION: 08/04/10

COPY MAILED: 08/05/10

After completion of a public hearing on the above-referenced Application, pursuant to public notice as required by law, the Zoning Hearing Board of Whitemarsh Township decided and orders as follows:

1. Special Exceptions under Section 116-166.A(2) and Section 116-166.B(1) and (2) to permit the installation of three new bridges within the floodway and floodway fringe are **GRANTED**.

2. Variances from Sections 116-260.A and Section 116-264.A related to riparian corridor vegetation clearing and planting requirements are **GRANTED**.

3. A variance from Section 116-265.C which requires a minimum distance of 1,000 feet between crossings in a riparian corridor is **GRANTED**.

**THIS DECISION IS SUBJECT TO THE FOLLOWING CONDITIONS:**

1. All use and development permitted by this Decision shall conform to the exhibits and testimony presented by the Applicant, unless inconsistent with any specific conditions imposed by this Board, in which case these specific conditions shall take precedence.
2. The Applicant shall apply for and obtain all permits required by the Township Codes in a timely manner.

This Decision and Order of the Board is final and any appeal of it must be filed with the Court of Common Pleas of Montgomery County within thirty (30) days following the copy mailing date set out above.

Section 116-223 of the Zoning Ordinance provides as follows:

Expiration of granted appeals. Unless otherwise specified by the Board, all approvals granted by the Zoning Hearing Board shall automatically expire 365 days after the date of the decision unless: (1) the applicant has acted upon the approval by obtaining the required permit(s) and paying the prescribed fees for same, or (2) the Zoning Hearing Board decision is on appeal to the courts, at which point, the approval, if upheld on appeal, shall expire 365 days after final determination on appeal.

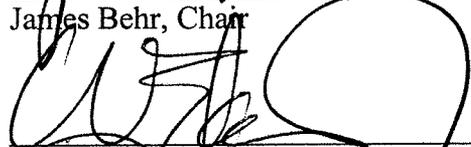
The Zoning Hearing Board may extend the expiration date of approvals for a 180 day period upon request by the applicant, provided that the applicant is, in the opinion of the Zoning Hearing Board, diligently pursuing governmental and/or regulatory approvals as required. Requests for extensions shall be in writing and submitted to the Zoning Hearing Board at least 30 days before any applicable expiration date. Only one (1) extension may be provided for any application.

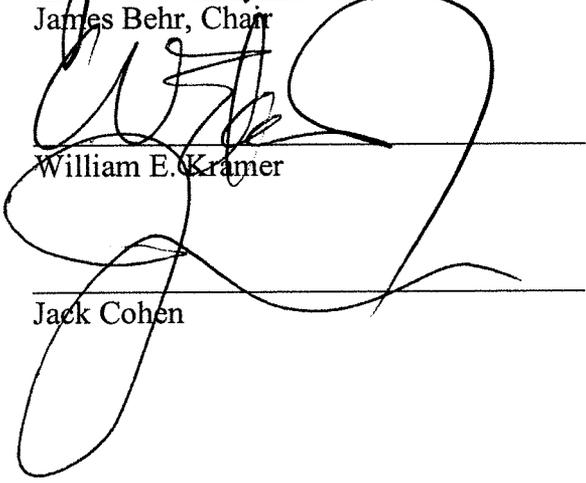
However, note:

Act 46 of 2010 provides for a suspension of the expiration of governmental approvals under the Pennsylvania Municipalities Planning Code until July 1, 2013.

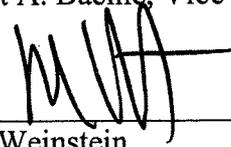
**WHITEMARSH TOWNSHIP ZONING HEARING BOARD:**

  
\_\_\_\_\_  
James Behr, Chair

  
\_\_\_\_\_  
William E. Kramer

  
\_\_\_\_\_  
Jack Cohen

  
\_\_\_\_\_  
Robert A. Bacine, Vice Chair

  
\_\_\_\_\_  
Marc Weinstein

*(ALTERNATE)*  
\_\_\_\_\_  
Randi Rubin Goldstein



Dayton Office

January 16, 2020

Contech Engineered Solutions LLC  
71 US Route 1  
Suite F  
Scarborough, Maine 04074

Attn: Mr. Justin Reardon, P.E.  
Truss Consultant

Re: Design of Concrete Abutments and Wingwalls on Helical Pier Foundations for Two (2) Proposed Pedestrian Bridges (613585); Whitmarsh Valley Country Club, Lafayette, Pennsylvania; CBC Report No. 22963D-1-0120-05

Ladies & Gentlemen:

We are pleased to submit our report for the above referenced project. The purpose of this project is to provide the design of the abutments and wingwalls on helical pier foundations for the above referenced structures. All other aspects of this project including the bridges themselves are being designed by others, and the loads for the bridges have been furnished to CBC for our use in design of the above items.

This report contains the design of the above referenced components. If you have any questions, please contact us.

Respectfully submitted,

CBC Engineers & Associates, Ltd.

Deepa Nair, M.S., P.E.  
Project Engineer



Mitchell T. Hardert, P.E.  
Chief Engineer

DN/MTH/leh  
ec: Client (jreardon@conteches.com)  
ec: Bill Gray (wgray@conteches.com)  
ec: Ben Hurst (bhurst@conteches.com)  
ec: Melinda Fugate (mfugate@conteches.com)  
1-File

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<b>I</b>	<b>TEXT</b>
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2.0	STRUCTURE DESCRIPTION .....1
3.0	SOIL FOUNDATION EVALUATION .....2
4.0	DESIGN OF BACKFILL AROUND THE ABUTMENTS .....3
5.0	DESIGN OF ABUTMENTS .....4
6.0	FOUNDATIONS .....6
7.0	PILE CAPS .....7
8.0	DESIGN OF WINGWALLS .....8
9.0	SCOUR .....8
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<b>II</b>	<b>SPECIFICATIONS</b>
<b>APPENDIX A – CALCULATIONS</b>	
<b>APPENDIX B - PRINTS</b>	

**SECTION I**

**TEXT**

## 1.0 AUTHORIZATION

Authorization to proceed with this project was given by Mr. Justin Reardon of Contech Engineered Solutions LLC. Work was to proceed in accordance with CBC Engineers & Associates, Ltd. Quotation No. 20-003-05, dated January 2, 2020, and the terms and conditions of the Master Agreement for Engineering Services dated July 30, 2009.

## 2.0 STRUCTURE DESCRIPTION

The structures to be constructed at this location are two (2) pedestrian bridges – Bridge #4B (613585-020) with a width of 5'-3 5/8" (center to center of anchor bolts) and length of 70'-2" (backwall to backwall), and Bridge #5 (613585-010) with a width of 9'-3 5/8" (center to center of anchor bolts) and length of 70'-2" (backwall to backwall). The structures are supported on girders which bear on abutments on either side of the structures. The purpose of this report is to provide the design of the abutments for the structures. It is necessary to support the bridge on abutments supported by helical piers. The loads on the abutments are both vertical and horizontal. Each abutment acts as a retaining wall to retain the soil behind it as well as supporting the weight of the bridge. Figure 1 shows a conceptual view of the loads on the abutment.

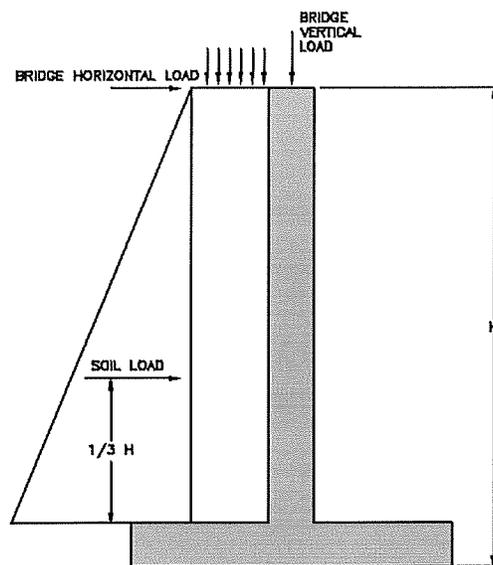


Figure 1

The abutments act as concrete retaining walls that will hold back the fill in the approaches to the bridges. The abutments have extended wingwalls to contain the slope of the

fill. The locations and geometry of the abutments and wingwalls have been determined based on the project drawings dated December 9, 2019 (Project No. 19-51) from Irick Eberhardt & Mientus Inc. Others are responsible for the bridge design.

### 3.0 SOIL FOUNDATION EVALUATION

We have been provided a geotechnical engineering report prepared by Advanced GeoServices Corp., a Montrose Environmental Group Company; their Project No. 2019-3991-01 dated November 11, 2019. The following is an excerpt from the geotechnical report.

*“Foundations (Helical Piles)*

*Helical piles should consist of galvanized steel multiple-helix units with a 1 ½-inch square shaft. The piles should bear within the stiff silts/medium dense sands encountered below 10 feet. The estimated allowable capacities for various helix configurations for each bridge location are shown below.*

<u>Helix Configuration</u>	<u>Pile Tip Depth</u>	<u>Bridge 4</u>	<u>Bridge 5</u>
6"-8"-10"	15 ft.	16.5 kips	10 kips
8"-10"	15 ft.	13.5 kips	8 kips
8"-10"-12"	15 ft.	26.0 kips	15 kips
10"-12"-14"	15 ft.	37.0 kips	22 kips

We have designed the foundations for the abutments for #4B bridge utilizing helical piers to be advanced to a minimum embedment depth of 15 ft. below the bottom of the pile caps to achieve a minimum allowable axial compressive capacity of 26 kips/pier and a minimum allowable flexural capacity (ASD) of 1750 ft.-lbs. Helical piers have been analyzed considering 1 ½-inch square shaft with 8"-10"-12" helix configuration and piers spaced longitudinally at 36 inches (3 x 12" max. helix plate diameter). We have designed the foundations for the abutments

for #5 bridge utilizing helical piers to be advanced to a minimum embedment depth of 15 ft. below the bottom of the pile caps to achieve a minimum allowable axial compressive capacity of 22 kips/pier and a minimum allowable flexural capacity (ASD) of 900 ft.-lbs. Helical piers have been analyzed considering 1 ½-inch square shaft with 10"-12"-14" helix configuration and piers spaced longitudinally at 42 inches (3 x 14" max. helix plate diameter). The final design of the helical piers (i.e. shaft properties, number and size of helices, top bracket, etc.) to achieve the above required allowable vertical loads and flexural capacities is the responsibility of the special contractor chosen for the project. It should be noted that CBC Engineers and Associates, Ltd. has not made any independent evaluation of the foundation conditions. We are relying totally on the information provided relative to the foundation conditions at the locations of the structures. The pier vertical loads and flexural capacities should be confirmed by a geotechnical engineer in the field at the time piers are installed. If the actual capacities are less than design, then problems to the structures could develop. The evaluation of scour is the responsibility of others than CBC Engineers and Associates, Ltd.

#### **4.0 DESIGN OF BACKFILL AROUND THE ABUTMENTS**

Any backfill immediately around the abutments and wingwalls should consist of a free draining granular material so that water is not built up around the abutments. The material should be placed in accordance with the plans and specifications in this report. The backfill material should be AASHTO A-1 material compacted to 95% of the maximum modified Proctor dry unit weight and placed in accordance with the specifications for backfill included in Section II of this report. We have also utilized a maximum unit weight of 120 pcf and a minimum angle of internal friction of 34 degrees for the soil in the select backfill zone around the abutments and wingwalls, and these parameters should be verified in the field by a geotechnical engineer prior to construction. Please note: it is essential to use good granular backfill to prevent water from building up around the wall, and for the filter fabric to be installed properly so as to ensure the backfill pores do not become clogged. It is recommended that the select backfill be extended to a distance of at least 10 feet laterally from the edge of the walls and a filter fabric should be placed between the backfill and any soil. Figure 2 shows the recommended extent of the granular fill and the filter fabric.

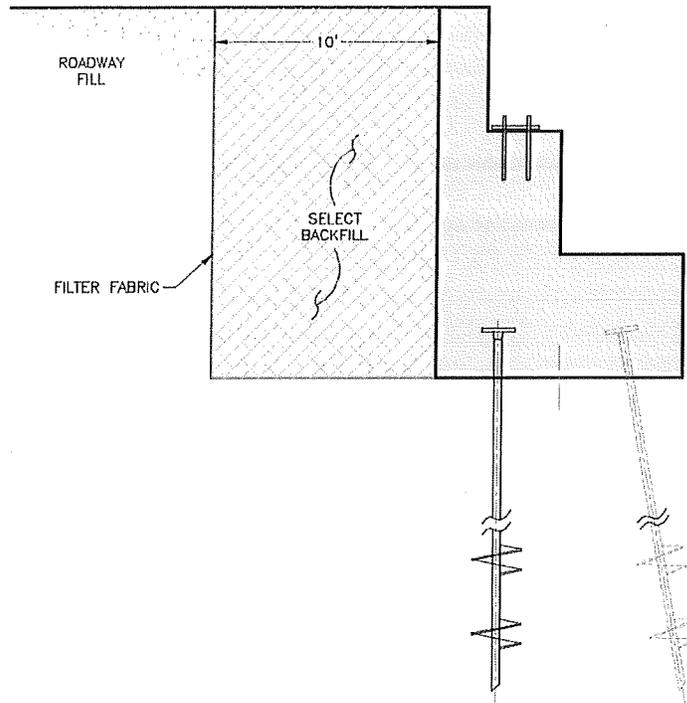


Figure 2

The backfill slope behind the abutments has been assumed to be approximately level. CBC should be contacted if actual backfill slope requirements differ from those described.

## 5.0 DESIGN OF ABUTMENTS

The bridge loading on each of the abutments as per the Contech drawings is as follows:

TABLE 1  
 ABUTMENT REACTIONS (PER BRIDGE ABUTMENT)

Bridge Type	Bridge 4B (613585-020)	Bridge 5 (613585-010)
Backwall to Backwall Bridge Span	70'-2"	70'-2"
Total Vertical Dead Load (DC)	36.0 kips	43.0 kips
Vertical Live Load (LL)	21.0 kips	35.0 kips
Longitudinal Thermal Load (TU)	5.3 kips	6.5 kips
Wind Load (Horizontal)	8.5 kips	8.5 kips

The height of the abutments for the proposed bridge #4B and #5 is approximately 5.27 feet and 5.5 feet respectively above the top of the 3.0' thick pile cap footings. The bridge geometry has been prepared based on the information provided to us by Contech (Project Drawings # 613585-010 and 613585-020) dated December 16, 2019. All elevations, geometry and locations of the abutments must be field verified prior to construction. The design of the abutments has been performed as per AASHTO LRFD design methodology.

The total maximum vertical Service load on the abutment for Bridge 4B (613585-020) is about 95.3 kips including abutment weight. The maximum total Service horizontal load on the abutment for Bridge 4B (613585-020) in the longitudinal direction is about 26.6 kips which includes lateral soil loading from active soil pressure, live load surcharge, and thermal bridge loads. The total maximum vertical Service load on the abutment for Bridge 5 (613585-010) is about 134 kips including abutment weight. The maximum total Service horizontal load on the abutment for Bridge 5 (613585-010) in the longitudinal direction is about 36.7 kips which includes lateral soil loading from active soil pressure, live load surcharge, and thermal bridge loads. Figure 3 shows the three-dimensional loading on each abutment.

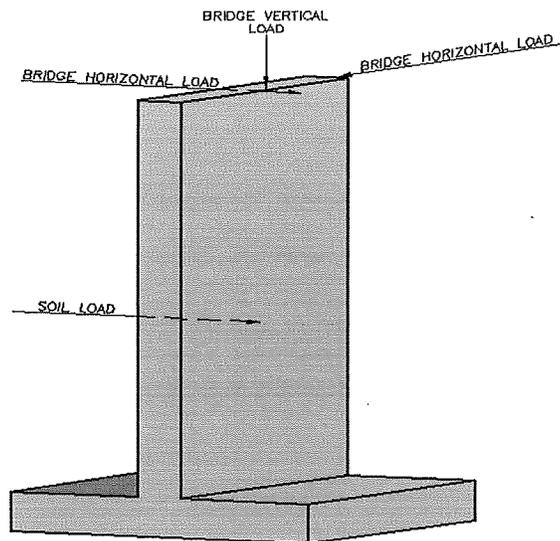


Figure 3

The amount of steel and concrete has been designed for these loads based on AASHTO LRFD criteria and the foundations have been designed for both the vertical and horizontal loads. The calculations are included in Appendix A.

Each abutment must be stable against sliding and overturning due to the vertical and horizontal loads. Based on the loading conditions each abutment must be the dimensions and contain the reinforcing steel shown on the drawings.

## **6.0 FOUNDATIONS**

The foundations for the abutments must be designed to take the horizontal as well as the vertical loads. In addition to the above, the foundations must be designed for scour protection, so they are not scoured out by high water. We have designed the foundations for the abutments for #4B bridge utilizing helical piers to be advanced to a minimum embedment depth of 15 ft. below the bottom of the pile caps to achieve a minimum allowable axial compressive capacity of 26 kips/pier and a minimum allowable flexural capacity (ASD) of 1750 ft.-lbs. Helical piers have been analyzed considering 1 ½-inch square shaft with 8"-10"-12" helix configuration and piers spaced longitudinally at 36 inches (3 x 12" max. helix plate diameter). We have designed the foundations for the abutments for #5 bridge utilizing helical piers to be advanced to a minimum embedment depth of 15 ft. below the bottom of the pile caps to achieve a minimum allowable axial compressive capacity of 22 kips/pier and a minimum allowable flexural capacity (ASD) of 900 ft.-lbs. Helical piers have been analyzed considering 1 ½-inch square shaft with 10"-12"-14" helix configuration and piers spaced longitudinally at 42 inches (3 x 14" max. helix plate diameter). As stated, the final design of the helical piers (i.e. shaft properties, number and size of helices, top bracket, etc.) to achieve the above required allowable vertical loads and flexural capacities is the responsibility of the special contractor chosen for the project.

The helical piers must also be designed for the horizontal loads placed upon them. The horizontal loads place a moment at the top of the pile. Figure 4 shows the loading at the top of the pile.

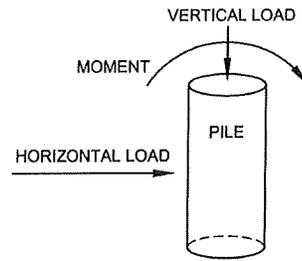


Figure 4

The pile cap foundation has been analyzed using the computer program Group 4. The helical piers must be designed for the horizontal loads, vertical loads and moments placed upon them. The horizontal loads at the top of the pile distribute the vertical load in the pile group and require a lateral pile capacity. The GROUP4 model accounts for pile location and loading. The soil parameters (soil-modulus parameter (k) and friction angle/strength parameters) utilized in GROUP4 analysis have been obtained from the boring log data in the geotechnical report (borings B-4A and B-4B for Bridge #4B, and B-5A and B-5B for Bridge 5).

The structure foundation has been analyzed as a typical group of six (6) helical piers-two (2) rows of 3 helical piers each (three (3) vertical helical piers in the back row and three (3) battered helical piers (10 degree batter) in the front row each at 3'-0" o.c.) using the computer program GROUP4 for Bridge #4B. The structure foundation has been analyzed as a typical group of eight (8) helical piers-two (2) rows of four helical piers each (four (4) vertical helical piers in the back row and four (4) battered helical piers (10 degree batter) in the front row each at 3'-6" o.c.) using the computer program GROUP4 for Bridge #5. The calculations are attached in Appendix A. The helical piers should be installed in strict conformance with the project specifications and the manufacturer's recommendations by a licensed contractor approved by the manufacturer. The design drawings are attached in Appendix B of this report.

## 7.0 PILE CAPS

The pile caps must be designed as a beam to transfer the load of the structure onto the helical piers. Based on the loadings on the abutments and the pile positions, the pile caps must be 5'-0" wide and 36" deep. The minimum embedment of the helical piers into the pile cap must be

1'-6". The reinforcing bars in the pile cap must be as shown on the drawings. The pile cap is reinforced with #5 stirrups at 12" on center for shear and torsion.

## **8.0 DESIGN OF WINGWALLS**

The wingwalls will be connected to the abutments to retain the approach embankments. Each wingwall will extend for 7.0 ft. length at 45 degree angles to the abutments as shown on the attached drawings. There is a maximum of about 5'-0" of fill behind the wingwalls. The required geometry of the wingwalls should be verified (by others) prior to construction. The thickness of the wingwalls is 12 inches. The design of the wingwalls and the reinforcing steel required is included on the drawings.

## **9.0 SCOUR**

It is beyond the scope of this report to evaluate scour. The depth of the bottom of the pile caps for the structures and the depth of the piers should be evaluated for scour before foundations are constructed.

## **10.0 WARRANTY**

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. No other warranty, expressed or implied, is made.

This report has been prepared for the exclusive use of Contech Engineered Solutions LLC, for specific application to the structure herein described. Specific recommendations have been provided in the various sections of the report. The report shall, therefore, be used in its entirety. This report is not a bidding document and shall not be used for that purpose. Anyone reviewing this report must interpret and draw their own conclusions regarding specific construction techniques and methods chosen. CBC Engineers & Associates, Ltd. is not responsible for the independent conclusions, opinions or recommendations made by others.

**SECTION II**  
**SPECIFICATIONS**

## I – GENERAL

### 1.0 STANDARDS AND DEFINITIONS

**1.1 STANDARDS** - All standards refer to latest edition unless otherwise noted.

**1.1.1** ASTM D-698-70 (Method C) "Standard Test Methods for Moisture, Density Relations of Soils and Soil Aggregate Mixtures Using 5.5-lb (2.5 kg.) Rammer and 12-inch (305-mm) Drop".

**1.1.2** ASTM D-2922 "Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear methods (Shallow Depth)".

**1.1.3** ASTM D-1556 "Standard Test Method for Density of Soil in place by the Sand-Cone Method".

**1.1.4** ASTM D-1557 "Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort."

**1.1.5** All construction and materials shall be in accordance with the latest AASHTO LRFD Bridge Design Specifications.

### 1.2 DEFINITIONS

**1.2.1** Owner - In these specifications the word "Owner" shall mean Whitemarsh Valley Country Club, PA.

**1.2.2** Engineer - In these specifications the word "Engineer" shall mean the Owner designated engineer.

**1.2.3** Design Engineer - In these specifications the words "Design Engineer" shall mean CBC Engineers and Associates, Ltd.

**1.2.4** Contractor - In these specifications the word "Contractor" shall mean the firm or corporation undertaking the execution of any work under the terms of these specifications.

**1.2.5** Approved - In these specifications the word "approved" shall refer to the approval of the Engineer or his designated representative.

**1.2.6** As Directed - In these specifications the words "as directed" shall refer to the directions to the Contractor from the Owner or his designated representative.

## **2.0 GENERAL CONDITIONS**

- 2.1** The Contractor shall furnish all labor, material and equipment and perform all work and services except those set out and furnished by the Owner, necessary to complete in a satisfactory manner the site preparation, excavation, filling, compaction, grading as shown on the plans and as described therein.

This work is to be accomplished under the observation of the Owner or his designated representative.

- 2.2** Prior to bidding the work, the Contractor shall examine, investigate and inspect the construction site as to the nature and location of the work, and the general and local conditions at the construction site, including, without limitation, the character of surface or subsurface conditions and obstacles to be encountered on and around the construction site; and shall make such additional investigation as he may deem necessary for the planning and proper execution of the work.

If conditions other than those indicated are discovered by the Contractor, the Owner should be notified immediately. The material which the Contractor believes to be a changed condition should not be disturbed so that the owner can investigate the condition.

- 2.3** The construction shall be performed under the direction of an experienced engineer who is familiar with the design plan.

## II – PILE CAP FOOTINGS

- 1.0 The dimension of the pile caps shall be 60" wide and 36" deep.
- 2.0 The concrete and steel in the pile caps shall meet the requirements of Section IV of these specifications.
- 3.0 The pile caps shall be reinforced as shown on the construction drawings.
- 4.0 Foundation excavation shall consist of the removal of all material, of whatever nature, necessary for the construction of foundations.
  - 4.1 It shall be the responsibility of the Contractor to identify and relocate all existing utilities which conflict with the proposed foundation locations shown on the plan. The Contractor must call the appropriate utility company at least 48 hours before any excavation to request exact field location of utilities, and coordinate removal and installation of all utilities with the respective utility company.
  - 4.2 All federal, state, and local regulations should be strictly adhered to relative to excavation side-slope geometry. The adoption of suitable excavation techniques is the responsibility of the Contractor.
  - 4.3 Excavated material shall be disposed in accordance with the plan established by the Engineer.

### **III – HELICAL PIERS**

**1.0** The final design of the helical piers (i.e. shaft properties, number and size of helices, top bracket, etc.) to achieve a minimum allowable axial compressive capacity of 26 kips/pier and a minimum allowable flexural capacity (ASD) of 1750 ft.-lbs for Bridge #4B and a minimum allowable axial compressive capacity of 22 kips/pier and a minimum allowable flexural capacity (ASD) of 900 ft.-lbs for Bridge #5 is the responsibility of the special contractor chosen for the project.

## IV – CONCRETE

### 1.0 CODES AND STANDARDS

- 1.1 Reinforced concrete shall conform to the requirements of AASHTO Standard Specifications for Highway Bridges, Division II - Construction, Section 8, "Concrete Structures", for Class A concrete, having a minimum compressive strength of 4,000 psi.

### 2.0 STANDARDS FOR MATERIALS

- 2.1 Portland Cement - Conforming to ASTM Specification C-150, Type I or II.
- 2.2 Water - The water shall be drinkable, clean free from injurious amounts of oils, acids, alkalis, organic materials, or deleterious substances.
- 2.3 Aggregates - Fine and coarse aggregates shall conform to current ASTM Specification C-33 "Specification for Concrete Aggregates" except that local aggregates which have been shown by tests and by actual service to produce satisfactory qualities may be used when approved by the Engineer.
- 2.4 Submittals - Test data and/or certifications to the Owner shall be furnished upon request.

### 3.0 PROPORTIONING OF CONCRETE

#### 3.1 COMPOSITION

- 3.1.1 The concrete shall be composed of cement, fine aggregate, coarse aggregate and water.
- 3.1.2 The concrete shall be homogeneous, readily placeable and uniformly workable and shall be proportioned in accordance with ACI-211.1.
- 3.1.3 Proportions shall be established on the basis of field experience with the materials to be employed. The amount of water used shall not exceed the maximum 0.49 water/cement ratio, and shall be reduced as necessary to produce concrete of the specified consistency at the time of placement.
- 3.1.4 An air-entraining admixture, conforming to the requirements of ASTM C260, shall be used in all concrete furnished under this contract. The quantity of admixture shall be such as to produce an air content in the freshly mixed concrete of 6 percent plus or minus 1 percent as determined in accordance with ASTM C231 or C173.

**3.2** Qualities Required - As indicated in the table below:

TABLE IV-1  
QUALITIES REQUIRED

ITEM	QUALITY REQUIRED
AASHTO Class	A
Type of Cement	I or II
Compressive Strength $f_c$ @ 28 days	4,000 psi
Slump, inches	2 - 4 in.

**3.3** Maximum Size of Coarse Aggregates - Maximum size of coarse aggregates shall not be larger than 19 mm (3/4 inches).

**3.4** Rate of Hardening of Concrete - Concrete mix shall be adjusted to produce the required rate of hardening for varied climatic conditions:

Under 40°F Ambient Temperature – All work to be performed in strict conformance with the recommendations of ACI-306R "Cold Weather Concreting."

**4.0** **MIXING AND PLACING**

**4.1** Equipment - Ready Mix Concrete shall be used and shall conform to the "Specifications for Ready-Mix Concrete," ASTM C-94. Approval is required prior to using job mixed concrete.

**4.2** Preparation - All work shall be in accordance with ACI-304, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete." All construction debris and extraneous matter shall be removed from within the forms. Concrete shall be placed on clean surfaces, free from water. Concrete that has to be dropped four (4) feet or more shall be placed through a tremie.

**4.3** All concrete shall be consolidated by internal mechanical vibration immediately after placement. Vibrators shall be of a size appropriate for the work, capable of transmitting vibration to concrete at frequencies of not less than 4,500 impulses per minute.

**5.0** **FORM WORK**

**5.1** Forms shall be of wood, steel or other approved material and shall be set and held true to the dimensions, lines and grades of the structure prior to and during the placement of concrete.

**5.2** Forms shall not be removed until the concrete has sufficient strength to prevent concrete drainage and/or damage.

- 5.2 Forms shall not be removed until the concrete has sufficient strength to prevent concrete drainage and/or damage.

## 6.0 CURING

- 6.1 Fresh concrete shall be protected from rains, flowing water and mechanical injury for a period of at least four (4) days. No loads shall be placed on the concrete until it has reached its design strength.

## 7.0 REINFORCING STEEL

### 7.1 MATERIAL

- 7.1.1 All reinforcing bars shall be deformed bars (ASTM-A615) Grade 60.

### 7.2 BENDING AND SPLICING

- 7.2.1 Bar reinforcement shall be cut and bent to the shapes shown on the plans. Fabrication tolerances shall be in accordance with ACI 315. All bars shall be bent cold, unless otherwise permitted.

- 7.2.2 All reinforcement shall be furnished in the full lengths indicated on the plans unless otherwise permitted. Except for splices shown on the plans and splices for No. 5 or smaller bars, splicing of bars will not be permitted without written approval. Splices shall be staggered as far as possible.

- 7.2.3 In lapped splices, the bars shall be placed and wired in such a manner as to maintain the minimum distance to the surface of the concrete shown on the plans.

- 7.2.4 Substitution of different size bars will be permitted only when authorized by the engineer. The substituted bars shall have an area equivalent to the design area, or larger.

### 7.3 PLACING AND FASTENING

- 7.3.1 Steel reinforcement shall be accurately placed as shown on the plans and firmly held in position during the placing and setting of concrete. Bars shall be tied at all intersections around the perimeter of each mat and at not less than 2 foot centers or at every intersection, whichever is greater, elsewhere. Welding of cross bars (tack welding) will not be permitted for assembly of reinforcement.

- 7.3.2 Reinforcing steel shall be supported in its proper position by use of mortar blocks, wire bar supports, supplementary bars or other approved devices. Such devices shall be of such height and placed at sufficiently frequent

intervals so as to maintain the distance between the reinforcing and the formed surface or the top surface within 1/4 inch of that indicated on the plans.

## V – FILTER FABRIC

- 1.0 Filter fabric shall be placed at all locations shown on the construction drawings and as necessary to maintain a soil-tight system.
- 2.0 Filter fabric cloth shall conform to Contech specification for C60-NW or equivalent and shall meet the following ASTM tests:
  - 2.1 ASTM D4751 - Apparent opening size equal to #70 U.S. Standard Sieve Size.
  - 2.2 ASTM D4632 (Grab Tensile Test) - Minimum Strength = 160 pounds.
  - 2.3 ASTM D4632 (Grab Elongation) - 30-70%.
  - 2.4 ASTM D4533 (Trapezoidal Tear) - Minimum Strength = 60 pounds.
  - 2.5 ASTM D4355 (Stabilized for Heat and Ultra-Violet Degradation) - 70% strength retained.
- 3.0 The minimum fabric coefficient of permeability (ASTM D4491) shall be 0.24 cm/sec.
- 4.0 The fabric shall be non-woven with a minimum thickness (ASTM D5199) of 60 mils.
- 5.0 Fabric shall not be placed over sharp or angular rocks that could tear or puncture it.
- 6.0 Care should be exercised to prevent any puncturing or rupture of the filter fabric. Should such rupture occur the damaged area should be covered with a patch of filter fabric using an overlap minimum of one (1) foot.

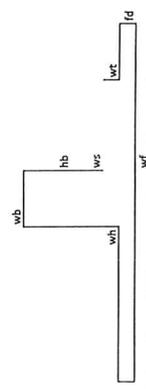
**APPENDIX A**  
**CALCULATIONS**

#4 B

ABUTMENT DESIGN, Whitemarsh Valley County, Clark, PA  
 Service Case: L0D1+L0L+Thermal  
 Considered loads: Bridge Weight+ Live load+Thermal  
 FOUNDATION AND BACKFILL SOIL PROPERTIES

BACKFILL SOIL UNIT WEIGHT $\gamma$	120	pcf
FOUNDATION SOIL UNIT WEIGHT $\gamma$	120	pcf
$k_a$ (active pressure coefficient)	34.0	psi/ft

BRIDGE LOADS:	
Dead Weight (lbs)	35000
Live load (lbs)	21000
Length of the abutment (ft)	8
Dead Weight (lbs/ft)	4375.0
Live load (lbs/ft)	2625.0
Thermal load (lbs)	5300.0



BRIDGE DIMENSIONS:	
Length (ft)	8
Height above bridge seat-hb (ft)	2.76
Height below bridge seat-hb (ft)	2.5
Width above bridge seat-wh (ft)	1
Width below bridge seat-wh (ft)	2.5
Footing toe-wt (ft)	2.5
Footing heel-wh (ft)	0

LOADS:			
VERTICAL			
Load from bridge back wall (lbs)	3312.0	Moment arm (ft) from toe	-14904.0
Load from below the bridge back wall (lbs)	7500.0		-28125.0
Weight of winwalls (lbs)	10500.0		-78486.2
Footing weight (lbs)	18000.0		-65000.0
Load from bridge (lbs)	56000.0		-191333.3
Soil backfill weight (lbs)	0.0		0.0
Braking Load (lbs)	0.0		0.0
Total vertical load (lbs)	95312.0		
HORIZONTAL			
Lateral Load from soil (lbs)	9279.0		25548.1
Live load surcharge load (lbs)	4493.4		18557.9
Lateral Load from soil-winnwalls (lbs)	4207.3		18514.0
live load surcharge-winnwalls (lbs)	3365.8		18512.1
Thermal load (lbs)	5300.0		29150.0
Braking Load (lbs)	0.0		0.0
Total moment about toe (lbs-ft)			-246646.5
Moment about c.g.			
Total W (kips)	95.3		
Total H (kips)	26.6		
Total M (kip-ft)			

Maximum moment (ft-k) in the abutment (k-ft)  
 Maximum moment (serv) in the abutment (k-ft)

HELIX CONFIGURATION = 8'-10"-12"  
 Allowable load (compression) = 26 kips

$$H_{net} = 26.6 - P_{passive}$$

$$P_{passive} = \frac{1}{2} (3.0)(0.12) (3.0)^2 (8.0) = 12.96 k$$

$$\Sigma H = 26.6 - 12.96 = 13.64 k$$

FILE GROUP ANALYSIS PROGRAM-GROUP  
PC VERSION 4.0 (C) COPYRIGHT ENSOFT, INC. 1996

THE PROGRAM WAS COMPILED USING MICROSOFT FORTRAN  
POWERSTATION 4.0 (C) COPYRIGHT MICROSOFT CORPORATION, 1991.

WHITEMARSH VALLEY COUNTRY CLUB LAFAYETTE, PA

\*\*\*\*\* INPUT INFORMATION \*\*\*\*\*

### Bridge #4

\* TABLE C \* LOAD AND CONTROL PARAMETERS

UNITS--ENGL

V LOAD, LBS	H LOAD, LBS	MOMENT, LBS-IN
.9530E+05	.1364E+05	-.9800E+05

\* THE LOADING IS STATIC \*

KPYOP = 1 (CODE TO GENERATE P-Y CURVES)  
( KPYOP = 1 IF P-Y YES; = 0 IF P-Y NO; = -1 IF P-Y ONLY )

\* CONTROL PARAMETERS \*

TOLERANCE ON CONVERGENCE OF FOUNDATION REACTION	=	.100E-02 IN
TOLERANCE ON DETERMINATION OF DEFLECTIONS	=	.100E-02 IN
MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS	=	300
MAXIMUM NO. OF ITERATIONS ALLOWED FOR PILE ANALYSIS	=	300

\* TABLE D \* ARRANGEMENT OF PILE GROUPS

GROUP	CONNECT	NO OF PILE	PILE NO	L-S CURVE	P-Y CURVE
1	FIX	3	1	1	0
2	FIX	3	1	1	0

GROUP	VERT, IN	HOR, IN	SLOPE, IN/IN	GROUND, IN	SPRING, LBS-IN
1	.0000E+00	.1500E+02	.1745E+00	.0000E+00	.0000E+00
2	.0000E+00	-.1500E+02	.0000E+00	.0000E+00	.0000E+00

\* TABLE E \* PILE GEOMETRY AND PROPERTIES

PILE	SEC	INC	LENGTH, IN	E, LBS/IN**2
1	1	100	.1800E+03	.2900E+08
2	1	100	.1800E+03	.2900E+08

PILE	FROM, IN	TO, IN	DIAM, IN	AREA, IN**2	I, IN**4
1	.0000E+00	.1800E+03	.1500E+01	.2250E+01	.4200E+00

\* THE PILE ABOVE IS OF LINEARLY ELASTIC MATERIAL \*

2	.0000E+00	.1800E+03	.1500E+01	.2250E+01	.4200E+00
---	-----------	-----------	-----------	-----------	-----------

\* THE PILE ABOVE IS OF LINEARLY ELASTIC MATERIAL \*

\* TABLE F \* AXIAL LOAD VS SETTLEMENT

(THE LOAD-SETTLEMENT CURVE IS GENERATED INTERNALLY)

NUM OF CURVES 2

CURVE 1                    NUM OF POINTS 19

POINT	AXIAL LOAD, LBS	SETTLEMENT, IN
1	-.2795E+06	-.2406E+01
2	-.2658E+06	-.1358E+01
3	-.2589E+06	-.8340E+00
4	-.2567E+06	-.4200E+00
5	-.2561E+06	-.3650E+00
6	-.1632E+06	-.1506E+00
7	-.1100E+06	-.8220E-01
8	-.2233E+05	-.1575E-01
9	-.2144E+04	-.1547E-02
10	.0000E+00	.0000E+00
11	.1132E+05	.8053E-02
12	.3730E+05	.2592E-01
13	.1309E+06	.1053E+00
14	.1764E+06	.1725E+00
15	.2583E+06	.3729E+00
16	.2578E+06	.4262E+00
17	.2615E+06	.8456E+00
18	.2689E+06	.1372E+01
19	.2833E+06	.2424E+01

CURVE 2                    NUM OF POINTS 19

POINT	AXIAL LOAD, LBS	SETTLEMENT, IN
1	-.2795E+06	-.2406E+01
2	-.2658E+06	-.1358E+01
3	-.2589E+06	-.8340E+00
4	-.2567E+06	-.4200E+00
5	-.2561E+06	-.3650E+00
6	-.1632E+06	-.1506E+00
7	-.1100E+06	-.8220E-01
8	-.2233E+05	-.1575E-01
9	-.2144E+04	-.1547E-02
10	.0000E+00	.0000E+00
11	.1132E+05	.8053E-02
12	.3730E+05	.2592E-01
13	.1309E+06	.1053E+00
14	.1764E+06	.1725E+00
15	.2583E+06	.3729E+00
16	.2578E+06	.4262E+00
17	.2615E+06	.8456E+00
18	.2689E+06	.1372E+01
19	.2833E+06	.2424E+01

\* TABLE H \*    SOIL DATA FOR AUTO P-Y CURVES

SOILS INFORMATION

AT THE GROUND SURFACE                    =                    .00 IN

2 LAYER(S) OF SOIL

LAYER 1

THE SOIL IS A SOFT CLAY

X AT THE TOP OF THE LAYER                    =                    .00 IN

X AT THE BOTTOM OF THE LAYER                    =                    96.00 IN

MODULUS OF SUBGRADE REACTION                    =                    .200E+02 LBS/IN\*\*3

LAYER 2

THE SOIL IS A SAND

X AT THE TOP OF THE LAYER                    =                    96.00 IN

X AT THE BOTTOM OF THE LAYER                    =                    240.00 IN

MODULUS OF SUBGRADE REACTION                    =                    .600E+02 LBS/IN\*\*3

DISTRIBUTION OF EFFECTIVE UNIT WEIGHT WITH DEPTH  
4 POINTS

X, IN	WEIGHT, LBS/IN**3
.0000	.3300E-01
96.0000	.3300E-01
96.0000	.3300E-01
240.0000	.3300E-01

DISTRIBUTION OF STRENGTH PARAMETERS WITH DEPTH

4 POINTS

X IN	C LBS/IN**2	PHI, DEGREES	E50	FMAX LBS/IN**2	TIPMAX LBS/IN**2
.00	.2000E+01	.000	.2000E-01	.1000E+04	.1000E+04
96.00	.2000E+01	.000	.2000E-01	.1000E+04	.1000E+04
96.00	.0000E+00	32.000	.0000E+00	.1000E+04	.1000E+04
240.00	.0000E+00	32.000	.0000E+00	.1000E+04	.1000E+04

REDUCTION FACTORS FOR CLOSELY-SPACED PILE GROUPS

GROUP NO	P-FACTOR	Y-FACTOR
1	1.00	1.00
2	1.00	1.00

WHITEMARSH VALLEY COUNTRY CLUB LAFAYETTE, PA

\*\*\*\*\* COMPUTATION RESULTS \*\*\*\*\*

VERT. LOAD, LBS	HORI. LOAD, LBS	MOMENT, IN-LBS
.9530E+05	.1364E+05	-.9800E+05

DISPLACEMENT OF GROUPED PILE FOUNDATION

VERTICAL, IN	HORIZONTAL, IN	ROTATION, RAD
-.5078E-01	.7057E+00	-.4118E-02

NUMBER OF ITERATIONS = 7

\* TABLE I \* COMPUTATION ON INDIVIDUAL PILE

\* PILE GROUP \* 1

PILE TOP DISPLACEMENTS AND REACTIONS

THE GLOBAL STRUCTURE COORDINATE SYSTEM

XDISPL, IN	YDISPL, IN	SLOPE	AXIAL, LBS	LAT, LBS	BM, LBS-IN	STRESS, LBS/IN**2
-.113E+00	.705E+00	-.412E-02	.162E+05	.370E+04	-.209E+05	.447E+05

THE LOCAL MEMBER COORDINATE SYSTEM

XDISPL, IN	YDISPL, IN	SLOPE	AXIAL, LBS	LAT, LBS	BM, LBS-IN	STRESS, LBS/IN**2
.117E-01	.714E+00	-.412E-02	.166E+05	.835E+03	-.209E+05	.447E+05

1742 lbs-ft

< 26 kips

LATERALLY LOADED PILE

X IN	DEFLECTION IN	MOMENT LBS-IN	SHEAR LBS	SOIL REACTION LBS/IN	TOTAL STRESS LBS/IN**2	FLEXURAL RIGIDITY LBS-IN**2
.00	.714E+00	-.209E+05	.835E+03	.900E+01	.447E+05	.122E+08
1.80	.719E+00	-.195E+05	.827E+03	.109E+02	.422E+05	.122E+08

3.60	.718E+00	-.180E+05	.808E+03	.128E+02	.396E+05	.122E+08
5.40	.713E+00	-.165E+05	.785E+03	.147E+02	.369E+05	.122E+08
7.20	.703E+00	-.150E+05	.758E+03	.166E+02	.342E+05	.122E+08
9.00	.690E+00	-.135E+05	.728E+03	.184E+02	.314E+05	.122E+08
10.80	.672E+00	-.119E+05	.695E+03	.203E+02	.287E+05	.122E+08
12.60	.652E+00	-.104E+05	.659E+03	.222E+02	.259E+05	.122E+08
14.40	.628E+00	-.890E+04	.619E+03	.241E+02	.233E+05	.122E+08
16.20	.603E+00	-.744E+04	.575E+03	.260E+02	.206E+05	.122E+08
18.00	.575E+00	-.603E+04	.528E+03	.266E+02	.181E+05	.122E+08
19.80	.546E+00	-.468E+04	.480E+03	.262E+02	.157E+05	.122E+08
21.60	.516E+00	-.339E+04	.433E+03	.257E+02	.134E+05	.122E+08
23.40	.484E+00	-.218E+04	.387E+03	.251E+02	.113E+05	.122E+08
25.20	.452E+00	-.103E+04	.342E+03	.246E+02	.921E+04	.122E+08
27.00	.420E+00	.373E+02	.298E+03	.240E+02	.744E+04	.122E+08
28.80	.388E+00	.103E+04	.254E+03	.234E+02	.921E+04	.122E+08
30.60	.356E+00	.194E+04	.212E+03	.227E+02	.108E+05	.122E+08
32.40	.325E+00	.277E+04	.171E+03	.220E+02	.123E+05	.122E+08
34.20	.294E+00	.352E+04	.132E+03	.213E+02	.136E+05	.122E+08
36.00	.264E+00	.418E+04	.935E+02	.206E+02	.148E+05	.122E+08
37.80	.236E+00	.475E+04	.565E+02	.198E+02	.159E+05	.122E+08
39.60	.208E+00	.524E+04	.208E+02	.190E+02	.167E+05	.122E+08
41.40	.182E+00	.565E+04	-.134E+02	.182E+02	.175E+05	.122E+08
43.20	.158E+00	.597E+04	-.461E+02	.173E+02	.180E+05	.122E+08
45.00	.135E+00	.621E+04	-.774E+02	.165E+02	.185E+05	.122E+08
46.80	.114E+00	.637E+04	-.107E+03	.156E+02	.187E+05	.122E+08
48.60	.943E-01	.645E+04	-.135E+03	.146E+02	.189E+05	.122E+08
50.40	.765E-01	.646E+04	-.161E+03	.137E+02	.189E+05	.122E+08
52.20	.604E-01	.639E+04	-.186E+03	.126E+02	.188E+05	.122E+08
54.00	.460E-01	.625E+04	-.209E+03	.116E+02	.185E+05	.122E+08
55.80	.333E-01	.605E+04	-.230E+03	.104E+02	.182E+05	.122E+08
57.60	.222E-01	.579E+04	-.248E+03	.916E+01	.177E+05	.122E+08
59.40	.126E-01	.547E+04	-.265E+03	.769E+01	.171E+05	.122E+08
61.20	.446E-02	.510E+04	-.279E+03	.579E+01	.165E+05	.122E+08
63.00	-.230E-02	.469E+04	-.289E+03	-.365E+01	.158E+05	.122E+08
64.80	-.781E-02	.428E+04	-.283E+03	-.607E+01	.150E+05	.122E+08
66.60	-.122E-01	.386E+04	-.272E+03	-.717E+01	.143E+05	.122E+08
68.40	-.155E-01	.345E+04	-.259E+03	-.782E+01	.135E+05	.122E+08
70.20	-.180E-01	.305E+04	-.245E+03	-.824E+01	.128E+05	.122E+08
72.00	-.196E-01	.266E+04	-.230E+03	-.850E+01	.121E+05	.122E+08
73.80	-.205E-01	.229E+04	-.214E+03	-.865E+01	.115E+05	.122E+08
75.60	-.208E-01	.194E+04	-.199E+03	-.870E+01	.108E+05	.122E+08
77.40	-.206E-01	.161E+04	-.183E+03	-.868E+01	.102E+05	.122E+08
79.20	-.199E-01	.129E+04	-.168E+03	-.859E+01	.968E+04	.122E+08
81.00	-.189E-01	.100E+04	-.152E+03	-.845E+01	.916E+04	.122E+08
82.80	-.177E-01	.737E+03	-.137E+03	-.827E+01	.869E+04	.122E+08
84.60	-.162E-01	.493E+03	-.122E+03	-.804E+01	.825E+04	.122E+08
86.40	-.146E-01	.273E+03	-.108E+03	-.777E+01	.786E+04	.122E+08
88.20	-.130E-01	.776E+02	-.936E+02	-.747E+01	.751E+04	.122E+08
90.00	-.113E-01	-.944E+02	-.802E+02	-.713E+01	.754E+04	.122E+08
91.80	-.964E-02	-.243E+03	-.673E+02	-.677E+01	.780E+04	.122E+08
93.60	-.805E-02	-.368E+03	-.551E+02	-.638E+01	.803E+04	.122E+08
95.40	-.656E-02	-.472E+03	-.437E+02	-.596E+01	.821E+04	.122E+08
97.20	-.520E-02	-.554E+03	-.329E+02	-.116E+02	.836E+04	.122E+08
99.00	-.398E-02	-.595E+03	-.121E+02	-.930E+01	.843E+04	.122E+08
100.80	-.292E-02	-.604E+03	.466E+01	-.714E+01	.845E+04	.122E+08
102.60	-.202E-02	-.588E+03	.175E+02	-.516E+01	.842E+04	.122E+08
104.40	-.128E-02	-.552E+03	.268E+02	-.341E+01	.835E+04	.122E+08
106.20	-.685E-03	-.502E+03	.329E+02	-.190E+01	.827E+04	.122E+08
108.00	-.223E-03	-.444E+03	.364E+02	-.642E+00	.816E+04	.122E+08
109.80	.120E-03	-.382E+03	.375E+02	.359E+00	.805E+04	.122E+08
111.60	.362E-03	-.320E+03	.369E+02	.112E+01	.794E+04	.122E+08
113.40	.518E-03	-.260E+03	.349E+02	.166E+01	.783E+04	.122E+08
115.20	.606E-03	-.204E+03	.319E+02	.201E+01	.773E+04	.122E+08
117.00	.639E-03	-.153E+03	.283E+02	.218E+01	.764E+04	.122E+08
118.80	.632E-03	-.109E+03	.243E+02	.223E+01	.756E+04	.122E+08
120.60	.595E-03	-.721E+02	.203E+02	.216E+01	.750E+04	.122E+08
122.40	.539E-03	-.416E+02	.164E+02	.202E+01	.744E+04	.122E+08
124.20	.472E-03	-.173E+02	.128E+02	.182E+01	.740E+04	.122E+08
126.00	.401E-03	.106E+01	.952E+01	.159E+01	.737E+04	.122E+08
127.80	.330E-03	.143E+02	.667E+01	.134E+01	.739E+04	.122E+08
129.60	.262E-03	.232E+02	.425E+01	.109E+01	.741E+04	.122E+08
131.40	.201E-03	.284E+02	.228E+01	.860E+00	.742E+04	.122E+08
133.20	.147E-03	.307E+02	.736E+00	.646E+00	.742E+04	.122E+08
135.00	.102E-03	.307E+02	-.427E+00	.457E+00	.742E+04	.122E+08
136.80	.643E-04	.292E+02	-.125E+01	.296E+00	.742E+04	.122E+08
138.60	.347E-04	.266E+02	-.178E+01	.164E+00	.742E+04	.122E+08
140.40	.122E-04	.233E+02	-.208E+01	.589E-01	.741E+04	.122E+08
142.20	-.412E-05	.197E+02	-.218E+01	-.203E-01	.740E+04	.122E+08
144.00	-.152E-04	.161E+02	-.215E+01	-.767E-01	.740E+04	.122E+08
145.80	-.220E-04	.127E+02	-.201E+01	-.113E+00	.739E+04	.122E+08
147.60	-.255E-04	.955E+01	-.181E+01	-.134E+00	.739E+04	.122E+08

149.40	-.264E-04	.683E+01	-.156E+01	-.142E+00	.738E+04	.122E+08
151.20	-.255E-04	.454E+01	-.131E+01	-.139E+00	.738E+04	.122E+08
153.00	-.234E-04	.267E+01	-.106E+01	-.130E+00	.737E+04	.122E+08
154.80	-.206E-04	.123E+01	-.824E+00	-.117E+00	.737E+04	.122E+08
156.60	-.174E-04	.149E+00	-.614E+00	-.101E+00	.737E+04	.122E+08
158.40	-.142E-04	-.602E+00	-.432E+00	-.839E-01	.737E+04	.122E+08
160.20	-.112E-04	-.108E+01	-.281E+00	-.672E-01	.737E+04	.122E+08
162.00	-.845E-05	-.133E+01	-.160E+00	-.517E-01	.737E+04	.122E+08
163.80	-.606E-05	-.141E+01	-.672E-01	-.377E-01	.737E+04	.122E+08
165.60	-.404E-05	-.136E+01	.716E-03	-.256E-01	.737E+04	.122E+08
167.40	-.239E-05	-.123E+01	.468E-01	-.154E-01	.737E+04	.122E+08
169.20	-.107E-05	-.103E+01	.746E-01	-.700E-02	.737E+04	.122E+08
171.00	-.188E-07	-.813E+00	.872E-01	-.125E-03	.737E+04	.122E+08
172.80	.815E-06	-.589E+00	.874E-01	.551E-02	.737E+04	.122E+08
174.60	.149E-05	-.380E+00	.775E-01	.103E-01	.737E+04	.122E+08
176.40	.207E-05	-.203E+00	.590E-01	.144E-01	.737E+04	.122E+08
178.20	.259E-05	-.721E-01	.330E-01	.184E-01	.737E+04	.122E+08
180.00	.309E-05	.159E-14	.000E+00	.222E-01	.737E+04	.122E+08

NUMBER OF ITERATIONS IN LLP = 9

\* PILE GROUP \* 2

PILE TOP DISPLACEMENTS AND REACTIONS

THE GLOBAL STRUCTURE COORDINATE SYSTEM

XDISPL, IN	YDISPL, IN	SLOPE	AXIAL, LBS	LAT, LBS	BM, LBS-IN	STRESS, LBS/IN**2
.110E-01	.705E+00	-.412E-02	.156E+05	.845E+03	-.208E+05	.441E+05

THE LOCAL MEMBER COORDINATE SYSTEM

XDISPL, IN	YDISPL, IN	SLOPE	AXIAL, LBS	LAT, LBS	BM, LBS-IN	STRESS, LBS/IN**2
.110E-01	.705E+00	-.412E-02	156E+05	.845E+03	-.208E+05	.441E+05

LATERALLY LOADED PILE

*< 26 kips      1733 lbs-ft*

X	DEFLECTION	MOMENT	SHEAR	SOIL REACTION	TOTAL STRESS	FLEXURAL RIGIDITY
IN	IN	LBS-IN	LBS	LBS/IN	LBS/IN**2	LBS-IN**2
****	*****	*****	*****	*****	*****	*****
.00	.705E+00	-.208E+05	.845E+03	.900E+01	.441E+05	.122E+08
1.80	.710E+00	-.194E+05	.837E+03	.109E+02	.415E+05	.122E+08
3.60	.710E+00	-.179E+05	.818E+03	.128E+02	.389E+05	.122E+08
5.40	.704E+00	-.164E+05	.795E+03	.147E+02	.362E+05	.122E+08
7.20	.695E+00	-.148E+05	.768E+03	.166E+02	.334E+05	.122E+08
9.00	.681E+00	-.133E+05	.738E+03	.184E+02	.307E+05	.122E+08
10.80	.664E+00	-.118E+05	.705E+03	.203E+02	.279E+05	.122E+08
12.60	.644E+00	-.102E+05	.669E+03	.222E+02	.252E+05	.122E+08
14.40	.621E+00	-.875E+04	.629E+03	.241E+02	.225E+05	.122E+08
16.20	.596E+00	-.730E+04	.585E+03	.259E+02	.200E+05	.122E+08
18.00	.568E+00	-.591E+04	.538E+03	.265E+02	.175E+05	.122E+08
19.80	.540E+00	-.458E+04	.491E+03	.261E+02	.151E+05	.122E+08
21.60	.510E+00	-.331E+04	.444E+03	.256E+02	.128E+05	.122E+08
23.40	.479E+00	-.211E+04	.398E+03	.251E+02	.107E+05	.122E+08
25.20	.447E+00	-.988E+03	.353E+03	.245E+02	.869E+04	.122E+08
27.00	.416E+00	-.613E+02	.309E+03	.239E+02	.704E+04	.122E+08
28.80	.384E+00	-.103E+04	.266E+03	.233E+02	.877E+04	.122E+08
30.60	.352E+00	-.193E+04	.224E+03	.226E+02	.104E+05	.122E+08
32.40	.322E+00	-.274E+04	.183E+03	.220E+02	.118E+05	.122E+08
34.20	.291E+00	-.346E+04	.143E+03	.212E+02	.131E+05	.122E+08
36.00	.262E+00	-.411E+04	.105E+03	.205E+02	.143E+05	.122E+08
37.80	.234E+00	-.467E+04	.682E+02	.198E+02	.153E+05	.122E+08
39.60	.207E+00	-.515E+04	.326E+02	.190E+02	.161E+05	.122E+08
41.40	.181E+00	-.555E+04	-.151E+01	.182E+02	.168E+05	.122E+08
43.20	.157E+00	-.586E+04	-.342E+02	.173E+02	.174E+05	.122E+08
45.00	.135E+00	-.609E+04	-.654E+02	.165E+02	.178E+05	.122E+08

46.80	.114E+00	.625E+04	-.950E+02	.156E+02	.181E+05	.122E+08
48.60	.947E-01	.633E+04	-.123E+03	.147E+02	.182E+05	.122E+08
50.40	.771E-01	.633E+04	-.149E+03	.137E+02	.182E+05	.122E+08
52.20	.613E-01	.626E+04	-.174E+03	.127E+02	.181E+05	.122E+08
54.00	.471E-01	.613E+04	-.197E+03	.117E+02	.179E+05	.122E+08
55.80	.345E-01	.593E+04	-.218E+03	.106E+02	.175E+05	.122E+08
57.60	.235E-01	.568E+04	-.237E+03	.934E+01	.171E+05	.122E+08
59.40	.140E-01	.537E+04	-.254E+03	.796E+01	.165E+05	.122E+08
61.20	.595E-02	.501E+04	-.268E+03	.624E+01	.159E+05	.122E+08
63.00	-.769E-03	.462E+04	-.279E+03	-.200E+01	.152E+05	.122E+08
64.80	-.626E-02	.420E+04	-.276E+03	-.557E+01	.144E+05	.122E+08
66.60	-.106E-01	.379E+04	-.266E+03	-.681E+01	.137E+05	.122E+08
68.40	-.140E-01	.339E+04	-.253E+03	-.753E+01	.130E+05	.122E+08
70.20	-.165E-01	.300E+04	-.240E+03	-.799E+01	.123E+05	.122E+08
72.00	-.181E-01	.262E+04	-.226E+03	-.828E+01	.116E+05	.122E+08
73.80	-.191E-01	.225E+04	-.211E+03	-.844E+01	.109E+05	.122E+08
75.60	-.195E-01	.191E+04	-.195E+03	-.850E+01	.103E+05	.122E+08
77.40	-.193E-01	.158E+04	-.180E+03	-.849E+01	.975E+04	.122E+08
79.20	-.188E-01	.128E+04	-.165E+03	-.842E+01	.920E+04	.122E+08
81.00	-.179E-01	.992E+03	-.150E+03	-.829E+01	.870E+04	.122E+08
82.80	-.167E-01	.731E+03	-.135E+03	-.811E+01	.823E+04	.122E+08
84.60	-.154E-01	.494E+03	-.120E+03	-.789E+01	.781E+04	.122E+08
86.40	-.139E-01	.280E+03	-.106E+03	-.763E+01	.743E+04	.122E+08
88.20	-.123E-01	.898E+02	-.923E+02	-.733E+01	.709E+04	.122E+08
90.00	-.107E-01	-.772E+02	-.791E+02	-.701E+01	.706E+04	.122E+08
91.80	-.919E-02	-.221E+03	-.665E+02	-.665E+01	.732E+04	.122E+08
93.60	-.768E-02	-.343E+03	-.545E+02	-.627E+01	.754E+04	.122E+08
95.40	-.627E-02	-.442E+03	-.432E+02	-.586E+01	.772E+04	.122E+08
97.20	-.497E-02	-.521E+03	-.326E+02	-.111E+02	.786E+04	.122E+08
99.00	-.382E-02	-.562E+03	-.127E+02	-.892E+01	.793E+04	.122E+08
100.80	-.281E-02	-.571E+03	.337E+01	-.687E+01	.795E+04	.122E+08
102.60	-.195E-02	-.556E+03	.157E+02	-.499E+01	.792E+04	.122E+08
104.40	-.124E-02	-.523E+03	.247E+02	-.331E+01	.786E+04	.122E+08
106.20	-.676E-03	-.476E+03	.307E+02	-.187E+01	.778E+04	.122E+08
108.00	-.235E-03	-.422E+03	.340E+02	-.675E+00	.768E+04	.122E+08
109.80	.947E-04	-.364E+03	.353E+02	.283E+00	.757E+04	.122E+08
111.60	.327E-03	-.305E+03	.347E+02	.101E+01	.747E+04	.122E+08
113.40	.479E-03	-.248E+03	.329E+02	.153E+01	.737E+04	.122E+08
115.20	.565E-03	-.195E+03	.302E+02	.187E+01	.727E+04	.122E+08
117.00	.599E-03	-.147E+03	.268E+02	.205E+01	.719E+04	.122E+08
118.80	.594E-03	-.105E+03	.231E+02	.209E+01	.711E+04	.122E+08
120.60	.561E-03	-.697E+02	.193E+02	.204E+01	.705E+04	.122E+08
122.40	.509E-03	-.406E+02	.157E+02	.191E+01	.700E+04	.122E+08
124.20	.447E-03	-.175E+02	.122E+02	.172E+01	.696E+04	.122E+08
126.00	.380E-03	.112E+00	.915E+01	.150E+01	.693E+04	.122E+08
127.80	.313E-03	.128E+02	.644E+01	.127E+01	.695E+04	.122E+08
129.60	.250E-03	.213E+02	.415E+01	.104E+01	.696E+04	.122E+08
131.40	.192E-03	.264E+02	.227E+01	.822E+00	.697E+04	.122E+08
133.20	.141E-03	.287E+02	.791E+00	.619E+00	.698E+04	.122E+08
135.00	.980E-04	.289E+02	-.324E+00	.441E+00	.698E+04	.122E+08
136.80	.625E-04	.275E+02	-.112E+01	.288E+00	.697E+04	.122E+08
138.60	.343E-04	.251E+02	-.164E+01	.162E+00	.697E+04	.122E+08
140.40	.128E-04	.220E+02	-.193E+01	.617E-01	.696E+04	.122E+08
142.20	-.286E-05	.187E+02	-.204E+01	-.141E-01	.696E+04	.122E+08
144.00	-.136E-04	.153E+02	-.201E+01	-.683E-01	.695E+04	.122E+08
145.80	-.202E-04	.120E+02	-.189E+01	-.104E+00	.695E+04	.122E+08
147.60	-.236E-04	.911E+01	-.170E+01	-.124E+00	.694E+04	.122E+08
149.40	-.246E-04	.654E+01	-.148E+01	-.132E+00	.694E+04	.122E+08
151.20	-.239E-04	.437E+01	-.124E+01	-.131E+00	.693E+04	.122E+08
153.00	-.220E-04	.261E+01	-.101E+01	-.123E+00	.693E+04	.122E+08
154.80	-.194E-04	.123E+01	-.786E+00	-.110E+00	.693E+04	.122E+08
156.60	-.165E-04	.201E+00	-.588E+00	-.953E-01	.693E+04	.122E+08
158.40	-.135E-04	-.518E+00	-.416E+00	-.795E-01	.693E+04	.122E+08
160.20	-.106E-04	-.978E+00	-.273E+00	-.639E-01	.693E+04	.122E+08
162.00	-.806E-05	-.123E+01	-.158E+00	-.493E-01	.693E+04	.122E+08
163.80	-.581E-05	-.131E+01	-.691E-01	-.362E-01	.693E+04	.122E+08
165.60	-.390E-05	-.127E+01	-.400E-02	-.247E-01	.693E+04	.122E+08
167.40	-.234E-05	-.115E+01	.405E-01	-.151E-01	.693E+04	.122E+08
169.20	-.108E-05	-.969E+00	.676E-01	-.706E-02	.693E+04	.122E+08
171.00	-.751E-07	-.764E+00	.803E-01	-.500E-03	.693E+04	.122E+08
172.80	.724E-06	-.555E+00	.812E-01	.490E-02	.693E+04	.122E+08
174.60	.138E-05	-.359E+00	.724E-01	.946E-02	.693E+04	.122E+08
176.40	.193E-05	-.192E+00	.554E-01	.135E-01	.693E+04	.122E+08
178.20	.244E-05	-.682E-01	.311E-01	.173E-01	.693E+04	.122E+08
180.00	.292E-05	.000E+00	.000E+00	.210E-01	.693E+04	.122E+08

NUMBER OF ITERATIONS IN LLP = 9

GENERATED P-Y CURVES FOR PILE GROUP NO. 2

NUMBER OF CURVES = 3  
 NUMBER OF POINTS ON EACH CURVE = 17

DEPTH BELOW GS IN	DIAM IN	C LBS/IN**2	GAMMA LBS/IN**3	E50
60.00	1.500	.2000D+01	.3300D-01	.2000D-01

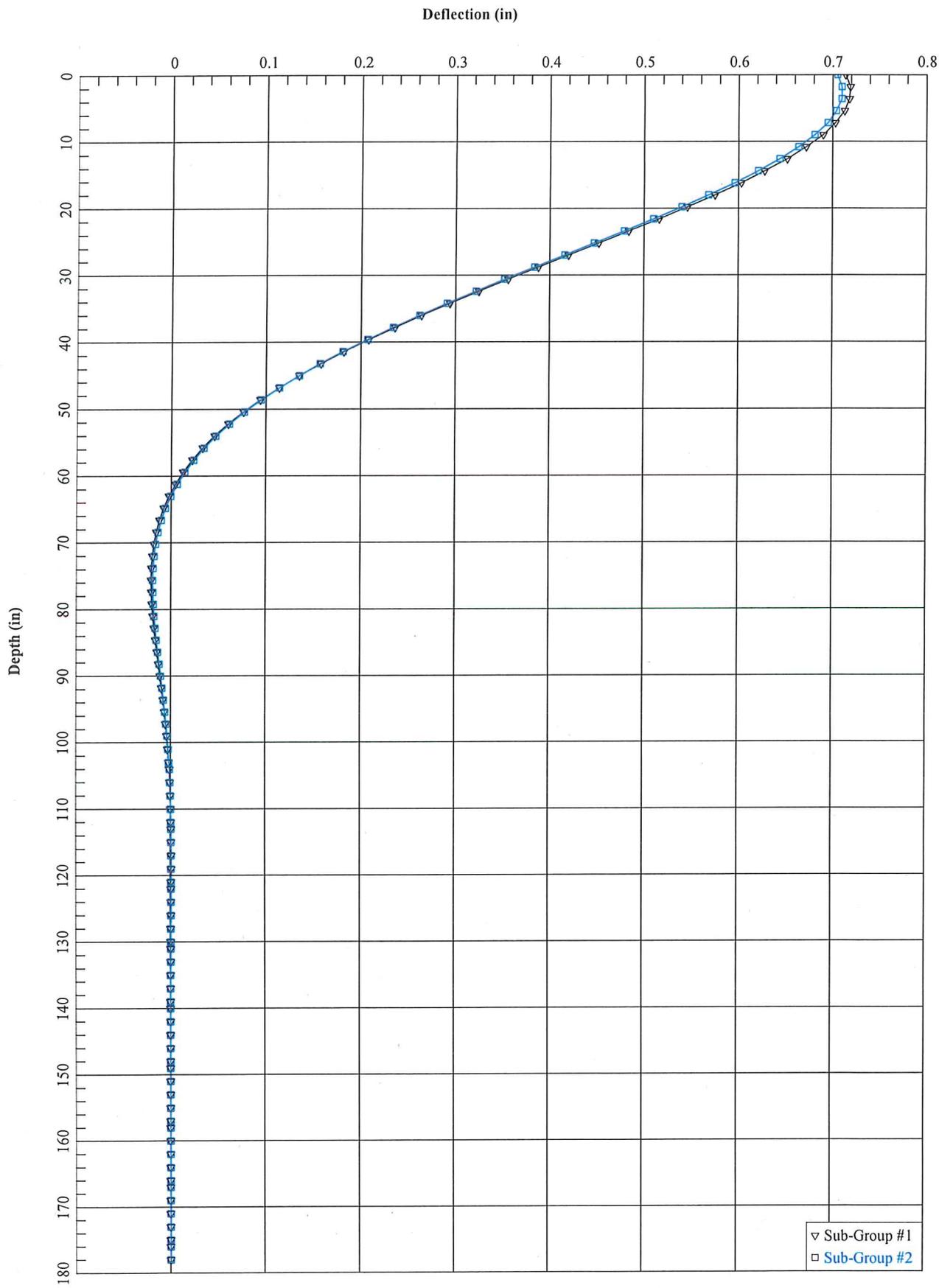
Y, IN	P, LBS/IN
.000	.000
.001	2.700
.019	8.504
.037	10.715
.056	12.266
.075	13.500
.094	14.542
.113	15.454
.131	16.268
.150	17.009
.169	17.690
.187	18.322
.206	18.914
.225	19.470
.600	27.000
1.125	27.000
1.500	27.000

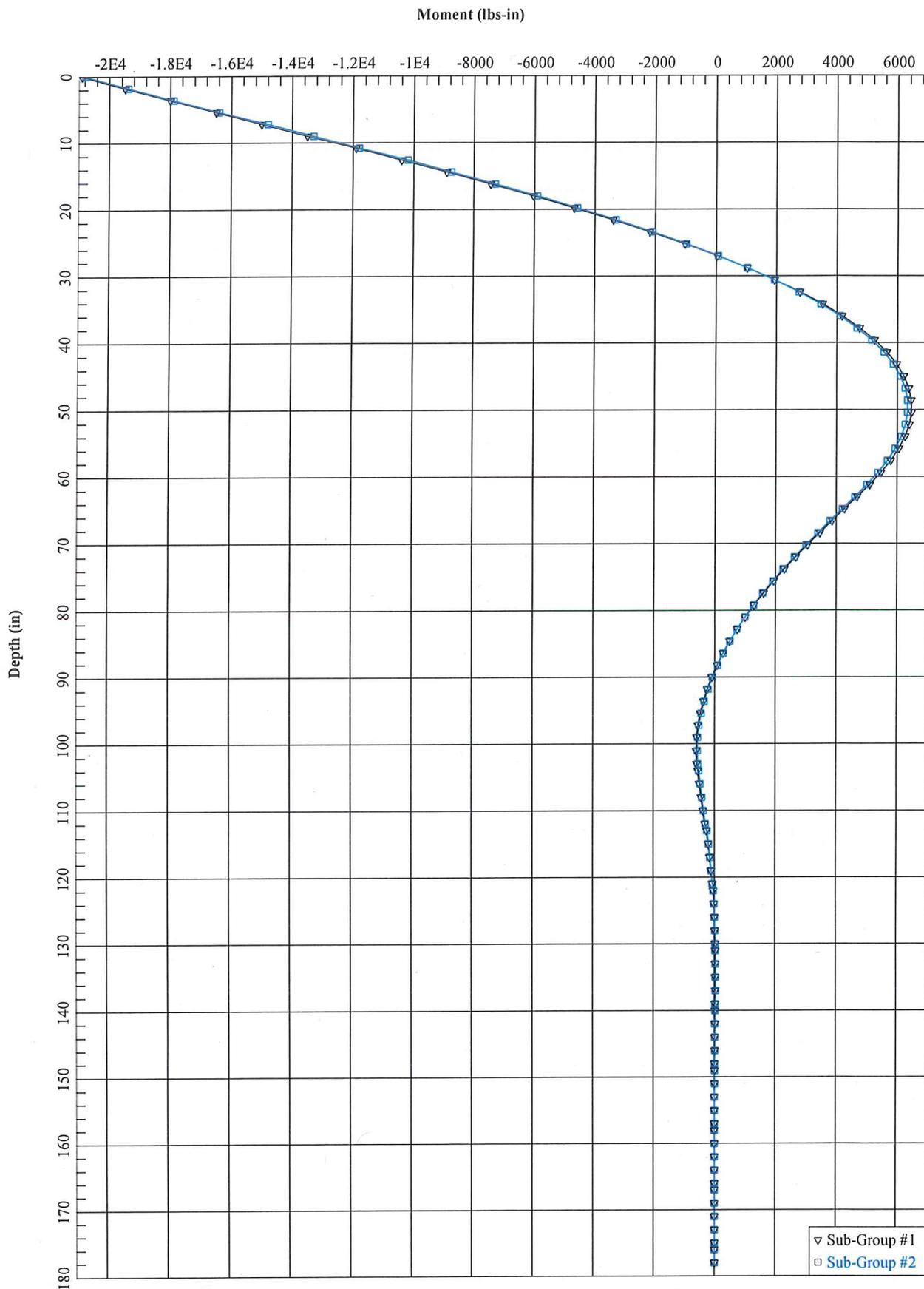
DEPTH BELOW GS IN	DIAM IN	PHI	GAMMA LBS/IN**3	A	B	PCT	PCD
108.00	1.50	32.00	.33D-01	.88	.50	.18D+03	.20D+03

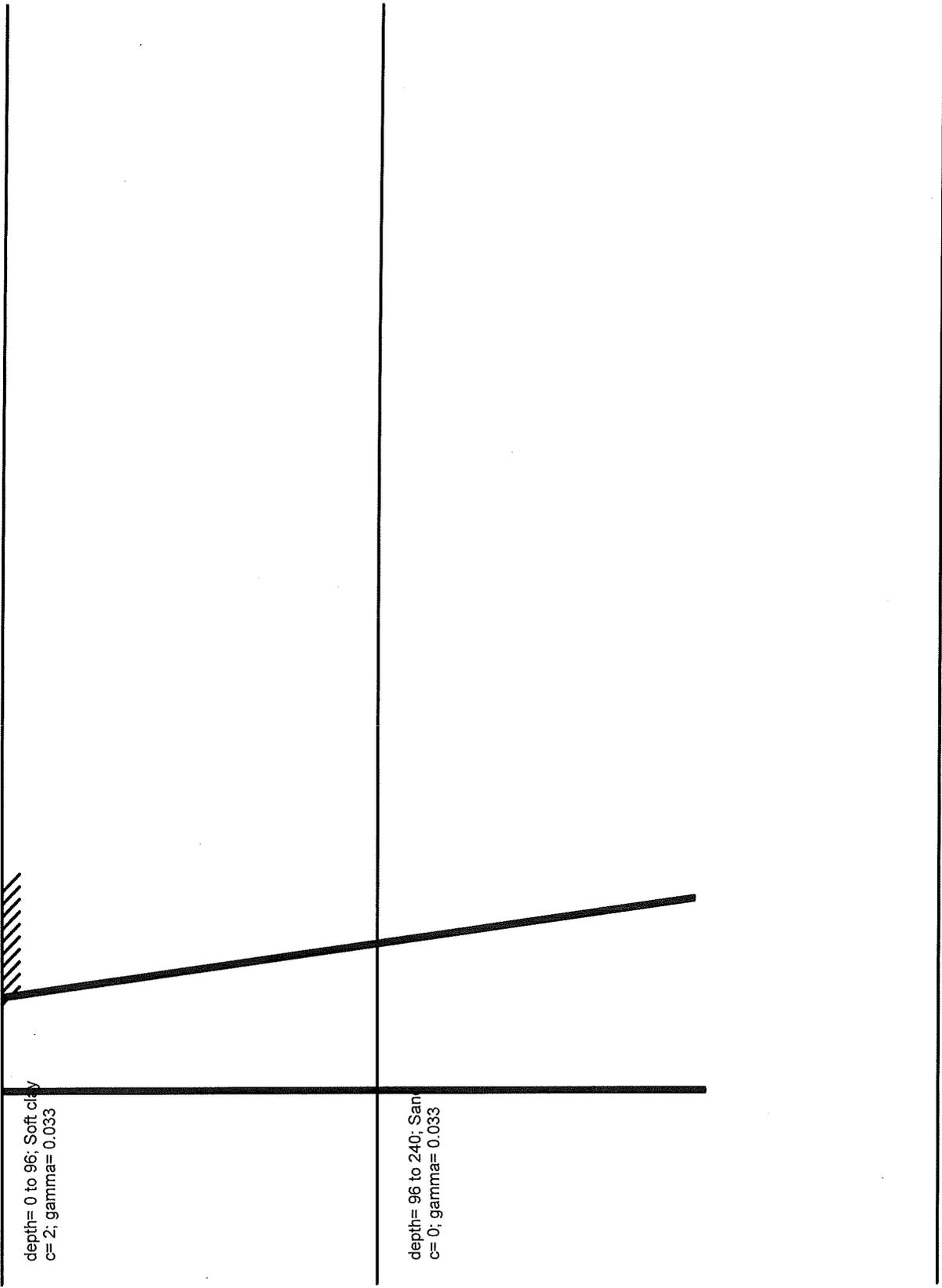
Y IN	P LBS/IN
.000	.000
.002	5.995
.004	11.991
.006	17.986
.008	23.982
.010	29.977
.012	35.973
.015	41.968
.017	47.963
.019	53.959
.021	59.954
.023	65.950
.025	71.945
.056	158.565
1.556	158.565
3.056	158.565
4.556	158.565

DEPTH BELOW GS IN	DIAM IN	PHI	GAMMA LBS/IN**3	A	B	PCT	PCD
126.00	1.50	32.00	.33D-01	.88	.50	.34D+03	.23D+03

Y IN	P LBS/IN
.000	.000
.002	8.245
.004	16.491
.006	24.736
.008	32.982
.010	41.227
.012	49.473
.015	57.718
.017	65.963
.019	74.209
.021	82.454
.023	90.700
.025	98.945
.056	202.052
1.556	202.052
3.056	202.052
4.556	202.052







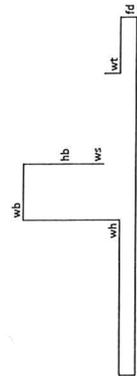
depth= 0 to 96; Soft clay  
c= 2; gamma= 0.033

depth= 96 to 240; Sand  
c= 0; gamma= 0.033

ABUTMENT DESIGN, Whitmarsh Valley, County, Chib, PA  
 Service Case: 1.0DI+1.0L+Thermal (Factored)  
 Considered loads: Bridge Weight+ Live load+Thermal  
 FOUNDATION AND BACKFILL SOIL PROPERTIES

BACKFILL SOIL UNIT WEIGHT $\gamma_b$	120	pcf
FOUNDATION SOIL UNIT WEIGHT $\gamma_f$	120	pcf
Soil active pressure coefficient	34.0	psf/ft

( $\phi=34$  backfill)



BRIDGE DIMENSIONS:	
Length (ft)	8
Height above bridge seat-hb (ft)	2.76
Height below bridge seat-hs (ft)	2.5
Width above bridge seat-wb (ft)	1
Width below bridge seat-ws-wb (ft)	2.5
Footling toe-wt (ft)	2.5
Footling heel-wh (ft)	0

Bridge seat-ws-wb (ft)	2.5
Footling width-wf (ft)	5.00
Footling depth-fd (ft)	3
Footling length (ft)	8

	Moment arm (ft) from toe	Moment about toe (lbs-ft)
Dead Weight (lbs)	4140.0	-18630.0
Live load (lbs)	9375.0	-35156.3
Weight of wingwalls (lbs)	13125.0	-98107.7
Footling weight (lbs)	22500.0	-56250.0
Load from bridge (lbs)	89500.0	-275941.7
Soil backfill weight (lbs)	0.0	0.0
Braking Load (lbs)	0.0	0.0
Total vertical load (lbs)	179540.0	
HORIZONTAL		
Lateral Load from soil (lbs)	13918.4	38322.1
Live load surcharge load (lbs)	7863.5	32476.3
Lateral Load from soil-wingwalls (lbs)	6310.9	29451.0
live load surcharge-wingwalls (lbs)	5890.2	32396.1
Thermal load (lbs)	6360.0	34980.0
Braking Load (lbs)	0.0	0.0
Total moment about toe (lbs-ft)		$\Sigma M = -315560.1$
Moment about c.g.	8539.9	
Total V (kips)	179.6	
Total H (kips)	40.3	
Total M (kips-ft)	8539.9	

**DESIGN OF PILE CAP: (ABUTMENT 4)**

Maximum load on the pile cap (kips)/ft  
 Spacing between piles (ft)  
 Maximum factored moment (kips-ft)  
 Maximum service moment (kips-ft)  
**CHECK FOR PILE CAP SHEAR:**

Maximum shear (kips)  
 d (inches)

**CHECK FOR PILE CAP TORSION:**

Shear capacity of the pile cap (kips)

$A_v/sreq (in^2/in.) (V_u - \phi V_c) / 0.85 f_y d_v$

$sreq = A_v / (A_v req / sreq)$

Shear capacity of pile cap =

**FACTORED DESIGN**

16.2

3.0

18.2

13.4

48.6

28.8

(see below)  $(V_u^2 + (0.9 ph. T_u / 2.4 \phi)^2)^{0.5}$

0.00

0.0

$0.85 \phi 0.0316 \beta^* \tau^* c^* 0.5^* b_v d_v$

3.10

7.77

0.0007

287.35

#5 stirrups

287.35 kips >

o.k

o.k

sx= spacing of the reinforcement (in)

12

kips. Provide stirrups #5@12" o.c

$\beta = 4.8 / (1 + 750 \cdot es) \cdot 51 / (39 + sxe)$

$sxe = sx \cdot 1.38 / (ag + 0.63)$

$es = (M_u / d_v + V_u) / (Es \cdot As)$

ABUTMENT DESIGN, Whitemarsh Valley, County: Clark, PA

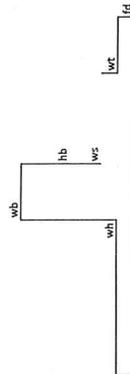
Service Case: 1.0D1+1.0LL+Thermal

Considered loads: Bridge, Weight, Live load, Thermal

FOUNDATION AND BACKFILL SOIL PROPERTIES

BACKFILL SOIL UNIT WEIGHT	120	pcf
FOUNDATION SOIL UNIT WEIGHT	120	pcf
ka (active pressure coefficient)	34.0	pcf/ft

(4-34 backfill)



BRIDGE DIMENSIONS:	
Length (ft)	12.5
Height above bridge seat-hb (ft)	3
Height below bridge seat-hc (ft)	2.5
Width above bridge seat-wb (ft)	1
Width below bridge seat-wc-wd (ft)	2.5
Footing top-wd (ft)	2.5
Footing heel-wh (ft)	0

Bridge seat-wc-wb (ft)	2.5
Footing width-wf (ft)	5.00
Footing depth-df (ft)	3
Footing length (ft)	12.5

	Moment arm (ft) from toe	Moment about toe (lbs-ft)
<b>VERTICAL</b>		
Load from bridge back wall (lb)	4.50	-23312.5
Load from below the bridge back-wall (lb)	3.25	-49745.3
Weight of wingwalls (lb)	7.47	-74485.2
Footing weight (lb)	2.50	-79312.5
Load from bridge (lb)	3.42	-265000.0
Soil backfill weight (lb)	5.000	0.0
Breaking load (lb)	3.417	0.0
Total vertical load (lb)		0.0
<b>HORIZONTAL</b>		
Lateral load from soil (lb)	2.83	63500.5
Live load surcharge load (lb)	4.35	87066.3
Lateral load from soil-wingwall (lb)	4.57	19594.0
Live load surcharge-wingwalls (lb)	5.50	18327.1
Thermal load (lb)	5.50	35750.0
Breaking load (lb)	5.50	0.0
Total lateral load about toe (lb-ft)		-336453.7
Moment about toe		
Total W (lb)		
Total L (lb-ft)		
Total M (lb-ft)		

$H_{net} = 36.7 - P_{passive}$   
 $P_{passive} = \frac{1}{2}(3.0)(0.12)(3.0)^2 (12.5) = 20.25k$   
 $\Sigma H = 36.7 - 20.25 = 16.45k$

HELIX CONFIGURATION -10"-12"-14"  
 Allowable load (comp) = 22k

Maximum moment (ft-k) in the abutment (k-ft/H) 17.9  
 Maximum moment (serv) in the abutment (k-ft/H) 11.8

PILE GROUP ANALYSIS PROGRAM-GROUP  
PC VERSION 4.0 (C) COPYRIGHT ENSOFT, INC. 1996

THE PROGRAM WAS COMPILED USING MICROSOFT FORTRAN  
POWERSTATION 4.0 (C) COPYRIGHT MICROSOFT CORPORATION, 1991.

WHITEMARSH VALLEY COUNTRY CLUB LAFAYETTE, PA

\*\*\*\*\* INPUT INFORMATION \*\*\*\*\*

## Bridge #5

\* TABLE C \* LOAD AND CONTROL PARAMETERS

UNITS--ENGL

V LOAD, LBS	H LOAD, LBS	MOMENT, LBS-IN
.1340E+06	.1645E+05	-.1838E+05

\* THE LOADING IS STATIC \*

KPYOP = 1 (CODE TO GENERATE P-Y CURVES)  
( KPYOP = 1 IF P-Y YES; = 0 IF P-Y NO; = -1 IF P-Y ONLY )

\* CONTROL PARAMETERS \*

TOLERANCE ON CONVERGENCE OF FOUNDATION REACTION	=	.100E-02 IN
TOLERANCE ON DETERMINATION OF DEFLECTIONS	=	.100E-02 IN
MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS	=	300
MAXIMUM NO. OF ITERATIONS ALLOWED FOR PILE ANALYSIS	=	300

\* TABLE D \* ARRANGEMENT OF PILE GROUPS

GROUP	CONNECT	NO OF PILE	PILE NO	L-S CURVE	P-Y CURVE
1	FIX	4	1	1	0
2	FIX	4	1	1	0

GROUP	VERT, IN	HOR, IN	SLOPE, IN/IN	GROUND, IN	SPRING, LBS-IN
1	.0000E+00	.1500E+02	.1745E+00	.0000E+00	.0000E+00
2	.0000E+00	-.1500E+02	.0000E+00	.0000E+00	.0000E+00

\* TABLE E \* PILE GEOMETRY AND PROPERTIES

PILE	SEC	INC	LENGTH, IN	E ,LBS/IN**2
1	1	100	.1800E+03	.2900E+08
2	1	100	.1800E+03	.2900E+08

PILE	FROM, IN	TO, IN	DIAM, IN	AREA, IN**2	I, IN**4
1	.0000E+00	.1800E+03	.1500E+01	.2250E+01	.4200E+00

\* THE PILE ABOVE IS OF LINEARLY ELASTIC MATERIAL \*

2	.0000E+00	.1800E+03	.1500E+01	.2250E+01	.4200E+00
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\* THE PILE ABOVE IS OF LINEARLY ELASTIC MATERIAL \*

\* TABLE F \* AXIAL LOAD VS SETTLEMENT

(THE LOAD-SETTLEMENT CURVE IS GENERATED INTERNALLY)

NUM OF CURVES 2

CURVE 1		NUM OF POINTS 19
POINT	AXIAL LOAD, LBS	SETTLEMENT, IN
1	-.4444E+06	-.2960E+01
2	-.4424E+06	-.1951E+01
3	-.4414E+06	-.1446E+01
4	-.4448E+06	-.1059E+01
5	-.4443E+06	-.1004E+01
6	-.3506E+06	-.6180E+00
7	-.2998E+06	-.4568E+00
8	-.1811E+06	-.1794E+00
9	-.2837E+05	-.1984E-01
10	.0000E+00	.0000E+00
11	.7502E+05	.5190E-01
12	.1962E+06	.2070E+00
13	.3075E+06	.4797E+00
14	.3556E+06	.6354E+00
15	.4457E+06	.1011E+01
16	.4462E+06	.1066E+01
17	.4439E+06	.1458E+01
18	.4455E+06	.1965E+01
19	.4481E+06	.2977E+01

CURVE 2		NUM OF POINTS 19
POINT	AXIAL LOAD, LBS	SETTLEMENT, IN
1	-.4444E+06	-.2960E+01
2	-.4424E+06	-.1951E+01
3	-.4414E+06	-.1446E+01
4	-.4448E+06	-.1059E+01
5	-.4443E+06	-.1004E+01
6	-.3506E+06	-.6180E+00
7	-.2998E+06	-.4568E+00
8	-.1811E+06	-.1794E+00
9	-.2837E+05	-.1984E-01
10	.0000E+00	.0000E+00
11	.7502E+05	.5190E-01
12	.1962E+06	.2070E+00
13	.3075E+06	.4797E+00
14	.3556E+06	.6354E+00
15	.4457E+06	.1011E+01
16	.4462E+06	.1066E+01
17	.4439E+06	.1458E+01
18	.4455E+06	.1965E+01
19	.4481E+06	.2977E+01

\* TABLE H \* SOIL DATA FOR AUTO P-Y CURVES

SOILS INFORMATION

AT THE GROUND SURFACE = .00 IN

2 LAYER(S) OF SOIL

LAYER 1  
 THE SOIL IS A SOFT CLAY  
 X AT THE TOP OF THE LAYER = .00 IN  
 X AT THE BOTTOM OF THE LAYER = 168.00 IN  
 MODULUS OF SUBGRADE REACTION = .200E+02 LBS/IN\*\*3

LAYER 2  
 THE SOIL IS A SAND  
 X AT THE TOP OF THE LAYER = 168.00 IN  
 X AT THE BOTTOM OF THE LAYER = 240.00 IN  
 MODULUS OF SUBGRADE REACTION = .600E+02 LBS/IN\*\*3

DISTRIBUTION OF EFFECTIVE UNIT WEIGHT WITH DEPTH  
 4 POINTS

X, IN	WEIGHT, LBS/IN**3
.0000	.3300E-01
168.0000	.3300E-01
168.0000	.3300E-01
240.0000	.3300E-01

DISTRIBUTION OF STRENGTH PARAMETERS WITH DEPTH

4 POINTS

X IN	C LBS/IN**2	PHI, DEGREES	E50	FMAX LBS/IN**2	TIPMAX LBS/IN**2
.00	.2000E+01	.000	.2000E-01	.1000E+04	.1000E+04
168.00	.2000E+01	.000	.2000E-01	.1000E+04	.1000E+04
168.00	.0000E+00	32.000	.0000E+00	.1000E+04	.1000E+04
240.00	.0000E+00	32.000	.0000E+00	.1000E+04	.1000E+04

REDUCTION FACTORS FOR CLOSELY-SPACED PILE GROUPS

GROUP NO	P-FACTOR	Y-FACTOR
1	1.00	1.00
2	1.00	1.00

WHITEMARSH VALLEY COUNTRY CLUB LAFAYETTE, PA

\*\*\*\*\* COMPUTATION RESULTS \*\*\*\*\*

VERT. LOAD, LBS	HORI. LOAD, LBS	MOMENT, IN-LBS
.1340E+06	.1645E+05	-.1838E+05

DISPLACEMENT OF GROUPED PILE FOUNDATION

VERTICAL, IN	HORIZONTAL, IN	ROTATION, RAD
-.1173E-01	.2670E+00	-.1530E-02

NUMBER OF ITERATIONS = 4

\* TABLE I \* COMPUTATION ON INDIVIDUAL PILE

\* PILE GROUP \* 1

PILE TOP DISPLACEMENTS AND REACTIONS

THE GLOBAL STRUCTURE COORDINATE SYSTEM

XDISPL, IN	YDISPL, IN	SLOPE	AXIAL, LBS	LAT, LBS	BM, LBS-IN	STRESS, LBS/IN**2
-.347E-01	.267E+00	-.153E-02	.173E+05	.359E+04	-.107E+05	.269E+05

THE LOCAL MEMBER COORDINATE SYSTEM

XDISPL, IN	YDISPL, IN	SLOPE	AXIAL, LBS	LAT, LBS	BM, LBS-IN	STRESS, LBS/IN**2
.122E-01	.269E+00	-.153E-02	177E+05	.527E+03	-.107E+05	.269E+05

< 22 kips      892 lbs-ft

LATERALLY LOADED PILE

X IN	DEFLECTION IN	MOMENT LBS-IN	SHEAR LBS	SOIL REACTION LBS/IN	TOTAL STRESS LBS/IN**2	FLEXURAL RIGIDITY LBS-IN**2
.00	.269E+00	-.107E+05	.527E+03	.689E+01	.269E+05	.122E+08
1.80	.270E+00	-.977E+04	.521E+03	.835E+01	.253E+05	.122E+08

3.60	.269E+00	-.884E+04	.506E+03	.978E+01	.236E+05	.122E+08
5.40	.266E+00	-.789E+04	.489E+03	.112E+02	.219E+05	.122E+08
7.20	.260E+00	-.695E+04	.468E+03	.125E+02	.203E+05	.122E+08
9.00	.252E+00	-.601E+04	.446E+03	.138E+02	.186E+05	.122E+08
10.80	.243E+00	-.509E+04	.421E+03	.151E+02	.169E+05	.122E+08
12.60	.233E+00	-.420E+04	.394E+03	.162E+02	.153E+05	.122E+08
14.40	.221E+00	-.334E+04	.365E+03	.173E+02	.138E+05	.122E+08
16.20	.208E+00	-.252E+04	.334E+03	.183E+02	.123E+05	.122E+08
18.00	.195E+00	-.174E+04	.301E+03	.186E+02	.110E+05	.122E+08
19.80	.182E+00	-.102E+04	.267E+03	.181E+02	.967E+04	.122E+08
21.60	.168E+00	-.351E+03	.235E+03	.177E+02	.848E+04	.122E+08
23.40	.154E+00	.262E+03	.203E+03	.172E+02	.832E+04	.122E+08
25.20	.140E+00	.818E+03	.172E+03	.166E+02	.931E+04	.122E+08
27.00	.126E+00	.132E+04	.142E+03	.161E+02	.102E+05	.122E+08
28.80	.113E+00	.176E+04	.113E+03	.155E+02	.110E+05	.122E+08
30.60	.996E-01	.214E+04	.850E+02	.149E+02	.117E+05	.122E+08
32.40	.872E-01	.246E+04	.582E+02	.143E+02	.122E+05	.122E+08
34.20	.756E-01	.272E+04	.325E+02	.136E+02	.127E+05	.122E+08
36.00	.646E-01	.293E+04	.806E+01	.129E+02	.131E+05	.122E+08
37.80	.544E-01	.309E+04	-.152E+02	.122E+02	.134E+05	.122E+08
39.60	.450E-01	.318E+04	-.372E+02	.115E+02	.135E+05	.122E+08
41.40	.365E-01	.323E+04	-.579E+02	.107E+02	.136E+05	.122E+08
43.20	.288E-01	.323E+04	-.772E+02	.996E+01	.136E+05	.122E+08
45.00	.220E-01	.318E+04	-.952E+02	.915E+01	.135E+05	.122E+08
46.80	.161E-01	.308E+04	-.112E+03	.829E+01	.133E+05	.122E+08
48.60	.109E-01	.294E+04	-.127E+03	.738E+01	.131E+05	.122E+08
50.40	.657E-02	.277E+04	-.140E+03	.638E+01	.128E+05	.122E+08
52.20	.294E-02	.256E+04	-.151E+03	.528E+01	.124E+05	.122E+08
54.00	.315E-05	.232E+04	-.161E+03	.155E-01	.120E+05	.122E+08
55.80	-.232E-02	.207E+04	-.161E+03	-.373E+01	.116E+05	.122E+08
57.60	-.409E-02	.183E+04	-.154E+03	-.477E+01	.111E+05	.122E+08
59.40	-.538E-02	.159E+04	-.146E+03	-.534E+01	.107E+05	.122E+08
61.20	-.624E-02	.136E+04	-.136E+03	-.567E+01	.103E+05	.122E+08
63.00	-.675E-02	.114E+04	-.126E+03	-.586E+01	.989E+04	.122E+08
64.80	-.694E-02	.937E+03	-.115E+03	-.594E+01	.952E+04	.122E+08
66.60	-.689E-02	.748E+03	-.105E+03	-.595E+01	.919E+04	.122E+08
68.40	-.664E-02	.575E+03	-.938E+02	-.589E+01	.888E+04	.122E+08
70.20	-.624E-02	.418E+03	-.832E+02	-.579E+01	.860E+04	.122E+08
72.00	-.573E-02	.278E+03	-.728E+02	-.564E+01	.835E+04	.122E+08
73.80	-.514E-02	.154E+03	-.627E+02	-.545E+01	.813E+04	.122E+08
75.60	-.451E-02	.482E+02	-.528E+02	-.524E+01	.794E+04	.122E+08
77.40	-.387E-02	-.413E+02	-.434E+02	-.499E+01	.792E+04	.122E+08
79.20	-.324E-02	-.114E+03	-.344E+02	-.472E+01	.805E+04	.122E+08
81.00	-.265E-02	-.172E+03	-.259E+02	-.443E+01	.816E+04	.122E+08
82.80	-.209E-02	-.214E+03	-.180E+02	-.412E+01	.823E+04	.122E+08
84.60	-.159E-02	-.242E+03	-.105E+02	-.380E+01	.828E+04	.122E+08
86.40	-.116E-02	-.256E+03	-.372E+01	-.345E+01	.831E+04	.122E+08
88.20	-.798E-03	-.258E+03	.250E+01	-.310E+01	.831E+04	.122E+08
90.00	-.502E-03	-.249E+03	.808E+01	-.274E+01	.829E+04	.122E+08
91.80	-.272E-03	-.229E+03	.130E+02	-.238E+01	.826E+04	.122E+08
93.60	-.103E-03	-.201E+03	.173E+02	-.225E+01	.821E+04	.122E+08
95.40	.121E-04	-.165E+03	.213E+02	.272E+00	.814E+04	.122E+08
97.20	.835E-04	-.128E+03	.208E+02	.110E+01	.808E+04	.122E+08
99.00	.121E-03	-.952E+02	.189E+02	.137E+01	.802E+04	.122E+08
100.80	.133E-03	-.659E+02	.164E+02	.147E+01	.797E+04	.122E+08
102.60	.127E-03	-.410E+02	.138E+02	.148E+01	.792E+04	.122E+08
104.40	.111E-03	-.208E+02	.111E+02	.143E+01	.789E+04	.122E+08
106.20	.888E-04	-.506E+01	.852E+01	.135E+01	.786E+04	.122E+08
108.00	.654E-04	.631E+01	.609E+01	.124E+01	.786E+04	.122E+08
109.80	.437E-04	.137E+02	.387E+01	.110E+01	.787E+04	.122E+08
111.60	.257E-04	.174E+02	.188E+01	.955E+00	.788E+04	.122E+08
113.40	.123E-04	.179E+02	.164E+00	.809E+00	.788E+04	.122E+08
115.20	.362E-05	.157E+02	-.129E+01	.841E+00	.788E+04	.122E+08
117.00	-.861E-06	.108E+02	-.281E+01	-.146E+00	.787E+04	.122E+08
118.80	-.248E-05	.620E+01	-.254E+01	-.331E+00	.786E+04	.122E+08
120.60	-.245E-05	.269E+01	-.195E+01	-.363E+00	.785E+04	.122E+08
122.40	-.170E-05	.342E+00	-.130E+01	-.340E+00	.785E+04	.122E+08
124.20	-.867E-06	-.904E+00	-.684E+00	-.285E+00	.785E+04	.122E+08
126.00	-.272E-06	-.122E+01	-.170E+00	-.206E+00	.785E+04	.122E+08
127.80	-.123E-08	-.866E+00	.200E+00	-.816E-01	.785E+04	.122E+08
129.60	.391E-07	-.241E+00	.347E+00	.108E+00	.785E+04	.122E+08
131.40	.152E-07	.345E-01	.153E+00	.794E-01	.785E+04	.122E+08
133.20	.535E-09	.529E-01	.101E-01	.211E-01	.785E+04	.122E+08
135.00	-.103E-09	.279E-02	-.278E-01	-.145E-01	.785E+04	.122E+08
136.80	-.751E-12	-.383E-03	-.176E-02	-.109E-02	.785E+04	.122E+08
138.60	.169E-14	-.284E-05	.211E-03	.116E-03	.785E+04	.122E+08
140.40	.127E-16	.625E-08	.158E-05	.879E-06	.785E+04	.122E+08
142.20	-.275E-19	.481E-10	-.344E-08	-.190E-08	.785E+04	.122E+08
144.00	-.216E-21	-.102E-12	-.268E-10	-.149E-10	.785E+04	.122E+08
145.80	.448E-24	-.816E-15	.561E-13	.309E-13	.785E+04	.122E+08
147.60	.367E-26	.166E-17	.454E-15	.253E-15	.785E+04	.122E+08

149.40	-.730E-29	.138E-19	-.913E-18	-.503E-18	.785E+04	.122E+08
151.20	-.622E-31	-.270E-22	-.771E-20	-.429E-20	.785E+04	.122E+08
153.00	.119E-33	-.235E-24	.148E-22	.818E-23	.785E+04	.122E+08
154.80	.105E-35	.438E-27	.131E-24	.727E-25	.785E+04	.122E+08
156.60	-.192E-38	.398E-29	-.241E-27	-.133E-27	.785E+04	.122E+08
158.40	-.179E-40	-.710E-32	-.221E-29	-.123E-29	.785E+04	.122E+08
160.20	.312E-43	-.674E-34	.391E-32	.215E-32	.785E+04	.122E+08
162.00	.303E-45	.115E-36	.375E-34	.209E-34	.785E+04	.122E+08
163.80	-.504E-48	.114E-38	-.632E-37	-.347E-37	.785E+04	.122E+08
165.60	-.512E-50	-.186E-41	-.635E-39	-.353E-39	.785E+04	.122E+08
167.40	.828E-53	-.362E-44	.103E-41	.571E-42	.785E+04	.122E+08
169.20	.418E-50	-.290E-44	.319E-45	.965E-47	.785E+04	.122E+08
171.00	.758E-50	-.220E-44	.301E-45	.183E-46	.785E+04	.122E+08
172.80	.104E-49	-.155E-44	.268E-45	.262E-46	.785E+04	.122E+08
174.60	.128E-49	-.984E-45	.221E-45	.337E-46	.785E+04	.122E+08
176.40	.149E-49	-.517E-45	.160E-45	.409E-46	.785E+04	.122E+08
178.20	.169E-49	-.181E-45	.868E-46	.482E-46	.785E+04	.122E+08
180.00	.189E-49	-.892E-59	.000E+00	.558E-46	.785E+04	.122E+08

NUMBER OF ITERATIONS IN LLP = 7

\* PILE GROUP \* 2

PILE TOP DISPLACEMENTS AND REACTIONS

THE GLOBAL STRUCTURE COORDINATE SYSTEM

XDISPL, IN	YDISPL, IN	SLOPE	AXIAL, LBS	LAT, LBS	BM, LBS-IN	STRESS, LBS/IN**2
.112E-01	.267E+00	-.153E-02	.162E+05	.536E+03	-.107E+05	.264E+05

THE LOCAL MEMBER COORDINATE SYSTEM

XDISPL, IN	YDISPL, IN	SLOPE	AXIAL, LBS	LAT, LBS	BM, LBS-IN	STRESS, LBS/IN**2
.112E-01	.267E+00	-.153E-02	.162E+05	.536E+03	-.107E+05	.264E+05

*<22k*                      *892 lbs.ft*

LATERALLY LOADED PILE

X	DEFLECTION	MOMENT	SHEAR	SOIL REACTION	TOTAL STRESS	FLEXURAL RIGIDITY
IN	IN	LBS-IN	LBS	LBS/IN	LBS/IN**2	LBS-IN**2
*****	*****	*****	*****	*****	*****	*****
.00	.267E+00	-.107E+05	.536E+03	.697E+01	.264E+05	.122E+08
1.80	.268E+00	-.980E+04	.530E+03	.833E+01	.247E+05	.122E+08
3.60	.267E+00	-.886E+04	.515E+03	.976E+01	.230E+05	.122E+08
5.40	.264E+00	-.790E+04	.498E+03	.112E+02	.213E+05	.122E+08
7.20	.258E+00	-.695E+04	.477E+03	.125E+02	.196E+05	.122E+08
9.00	.250E+00	-.601E+04	.455E+03	.138E+02	.179E+05	.122E+08
10.80	.241E+00	-.508E+04	.430E+03	.150E+02	.163E+05	.122E+08
12.60	.230E+00	-.419E+04	.403E+03	.162E+02	.147E+05	.122E+08
14.40	.219E+00	-.333E+04	.374E+03	.172E+02	.131E+05	.122E+08
16.20	.206E+00	-.251E+04	.343E+03	.182E+02	.117E+05	.122E+08
18.00	.193E+00	-.173E+04	.310E+03	.185E+02	.103E+05	.122E+08
19.80	.179E+00	-.101E+04	.277E+03	.181E+02	.901E+04	.122E+08
21.60	.165E+00	-.348E+03	.244E+03	.176E+02	.782E+04	.122E+08
23.40	.151E+00	.262E+03	.213E+03	.171E+02	.767E+04	.122E+08
25.20	.137E+00	.815E+03	.182E+03	.166E+02	.865E+04	.122E+08
27.00	.124E+00	.131E+04	.152E+03	.160E+02	.954E+04	.122E+08
28.80	.110E+00	.175E+04	.123E+03	.154E+02	.103E+05	.122E+08
30.60	.974E-01	.213E+04	.954E+02	.148E+02	.110E+05	.122E+08
32.40	.851E-01	.246E+04	.688E+02	.142E+02	.116E+05	.122E+08
34.20	.734E-01	.272E+04	.432E+02	.135E+02	.121E+05	.122E+08
36.00	.624E-01	.293E+04	.189E+02	.128E+02	.124E+05	.122E+08
37.80	.522E-01	.309E+04	-.414E+01	.121E+02	.127E+05	.122E+08
39.60	.428E-01	.320E+04	-.259E+02	.114E+02	.129E+05	.122E+08
41.40	.343E-01	.325E+04	-.464E+02	.106E+02	.130E+05	.122E+08
43.20	.266E-01	.326E+04	-.655E+02	.980E+01	.130E+05	.122E+08
45.00	.198E-01	.322E+04	-.831E+02	.896E+01	.129E+05	.122E+08

46.80	.139E-01	.314E+04	-.993E+02	.808E+01	.128E+05	.122E+08
48.60	.877E-02	.301E+04	-.114E+03	.713E+01	.126E+05	.122E+08
50.40	.446E-02	.286E+04	-.127E+03	.615E+01	.123E+05	.122E+08
52.20	.920E-03	.267E+04	-.138E+03	.209E+02	.120E+05	.122E+08
54.00	-.192E-02	.240E+04	-.175E+03	-.315E+01	.115E+05	.122E+08
55.80	-.411E-02	.213E+04	-.170E+03	-.461E+01	.110E+05	.122E+08
57.60	-.574E-02	.186E+04	-.161E+03	-.535E+01	.105E+05	.122E+08
59.40	-.688E-02	.161E+04	-.152E+03	-.579E+01	.101E+05	.122E+08
61.20	-.759E-02	.136E+04	-.141E+03	-.606E+01	.964E+04	.122E+08
63.00	-.794E-02	.114E+04	-.130E+03	-.621E+01	.923E+04	.122E+08
64.80	-.798E-02	.921E+03	-.119E+03	-.627E+01	.884E+04	.122E+08
66.60	-.778E-02	.724E+03	-.108E+03	-.625E+01	.849E+04	.122E+08
68.40	-.739E-02	.543E+03	-.967E+02	-.618E+01	.817E+04	.122E+08
70.20	-.685E-02	.380E+03	-.856E+02	-.607E+01	.788E+04	.122E+08
72.00	-.621E-02	.236E+03	-.747E+02	-.591E+01	.762E+04	.122E+08
73.80	-.551E-02	.109E+03	-.640E+02	-.571E+01	.739E+04	.122E+08
75.60	-.478E-02	.330E+00	-.538E+02	-.549E+01	.720E+04	.122E+08
77.40	-.404E-02	-.905E+02	-.439E+02	-.524E+01	.736E+04	.122E+08
79.20	-.334E-02	-.164E+03	-.344E+02	-.497E+01	.749E+04	.122E+08
81.00	-.267E-02	-.221E+03	-.255E+02	-.468E+01	.759E+04	.122E+08
82.80	-.207E-02	-.261E+03	-.171E+02	-.437E+01	.766E+04	.122E+08
84.60	-.154E-02	-.286E+03	-.919E+01	-.405E+01	.771E+04	.122E+08
86.40	-.108E-02	-.297E+03	-.190E+01	-.373E+01	.773E+04	.122E+08
88.20	-.697E-03	-.295E+03	.481E+01	-.342E+01	.772E+04	.122E+08
90.00	-.395E-03	-.280E+03	.110E+02	-.322E+01	.770E+04	.122E+08
91.80	-.168E-03	-.253E+03	.168E+02	-.422E+01	.765E+04	.122E+08
93.60	-.811E-05	-.212E+03	.244E+02	-.130E+00	.758E+04	.122E+08
95.40	.953E-04	-.169E+03	.246E+02	.994E+00	.750E+04	.122E+08
97.20	.154E-03	-.129E+03	.228E+02	.140E+01	.743E+04	.122E+08
99.00	.178E-03	-.931E+02	.203E+02	.158E+01	.736E+04	.122E+08
100.80	.177E-03	-.616E+02	.174E+02	.165E+01	.731E+04	.122E+08
102.60	.160E-03	-.353E+02	.145E+02	.164E+01	.726E+04	.122E+08
104.40	.133E-03	-.141E+02	.115E+02	.159E+01	.722E+04	.122E+08
106.20	.103E-03	.193E+01	.866E+01	.149E+01	.720E+04	.122E+08
108.00	.733E-04	.132E+02	.597E+01	.137E+01	.722E+04	.122E+08
109.80	.471E-04	.199E+02	.351E+01	.122E+01	.723E+04	.122E+08
111.60	.261E-04	.226E+02	.132E+01	.104E+01	.724E+04	.122E+08
113.40	.112E-04	.219E+02	-.553E+00	.848E+00	.724E+04	.122E+08
115.20	.202E-05	.183E+02	-.208E+01	.897E+00	.723E+04	.122E+08
117.00	-.226E-05	.117E+02	-.369E+01	-.356E+00	.722E+04	.122E+08
118.80	-.343E-05	.621E+01	-.305E+01	-.468E+00	.721E+04	.122E+08
120.60	-.294E-05	.222E+01	-.221E+01	-.466E+00	.720E+04	.122E+08
122.40	-.187E-05	-.263E+00	-.137E+01	-.414E+00	.720E+04	.122E+08
124.20	-.864E-06	-.141E+01	-.627E+00	-.332E+00	.720E+04	.122E+08
126.00	-.234E-06	-.147E+01	-.293E-01	-.228E+00	.720E+04	.122E+08
127.80	.481E-08	-.787E+00	.382E+00	.297E-01	.720E+04	.122E+08
129.60	.343E-07	-.196E+00	.328E+00	.109E+00	.720E+04	.122E+08
131.40	.116E-07	.430E-01	.133E+00	.744E-01	.720E+04	.122E+08
133.20	.230E-09	.413E-01	-.103E-02	.117E-01	.720E+04	.122E+08
135.00	-.103E-09	.164E-02	-.220E-01	-.116E-01	.720E+04	.122E+08
136.80	-.241E-12	-.385E-03	-.112E-02	-.743E-03	.720E+04	.122E+08
138.60	.148E-13	-.102E-05	.214E-03	.118E-03	.720E+04	.122E+08
140.40	.504E-17	.555E-07	.595E-06	.347E-06	.720E+04	.122E+08
142.20	-.248E-18	.208E-10	-.308E-07	-.171E-07	.720E+04	.122E+08
144.00	-.101E-21	-.931E-12	-.121E-10	-.699E-11	.720E+04	.122E+08
145.80	.416E-23	-.413E-15	.517E-12	.287E-12	.720E+04	.122E+08
147.60	.199E-26	.156E-16	.238E-15	.137E-15	.720E+04	.122E+08
149.40	-.699E-28	.799E-20	-.868E-17	-.482E-17	.720E+04	.122E+08
151.20	-.381E-31	-.263E-21	-.458E-20	-.263E-20	.720E+04	.122E+08
153.00	.117E-32	-.152E-24	.146E-21	.809E-22	.720E+04	.122E+08
154.80	.720E-36	.441E-26	.869E-25	.497E-25	.720E+04	.122E+08
156.60	-.197E-37	.285E-29	-.245E-26	-.136E-26	.720E+04	.122E+08
158.40	-.134E-40	-.739E-31	-.163E-29	-.926E-30	.720E+04	.122E+08
160.20	.330E-42	-.530E-34	.410E-31	.228E-31	.720E+04	.122E+08
162.00	.248E-45	.124E-35	.301E-34	.171E-34	.720E+04	.122E+08
163.80	-.554E-47	.975E-39	-.688E-36	-.382E-36	.720E+04	.122E+08
165.60	-.455E-50	-.208E-40	-.553E-39	-.314E-39	.720E+04	.122E+08
167.40	.930E-52	-.329E-44	.116E-40	.642E-41	.720E+04	.122E+08
169.20	.386E-50	-.263E-44	.290E-45	.891E-47	.720E+04	.122E+08
171.00	.692E-50	-.200E-44	.274E-45	.167E-46	.720E+04	.122E+08
172.80	.946E-50	-.141E-44	.244E-45	.239E-46	.720E+04	.122E+08
174.60	.116E-49	-.891E-45	.201E-45	.306E-46	.720E+04	.122E+08
176.40	.135E-49	-.468E-45	.145E-45	.371E-46	.720E+04	.122E+08
178.20	.153E-49	-.164E-45	.787E-46	.437E-46	.720E+04	.122E+08
180.00	.171E-49	.892E-59	.000E+00	.505E-46	.720E+04	.122E+08

NUMBER OF ITERATIONS IN LLP = 6

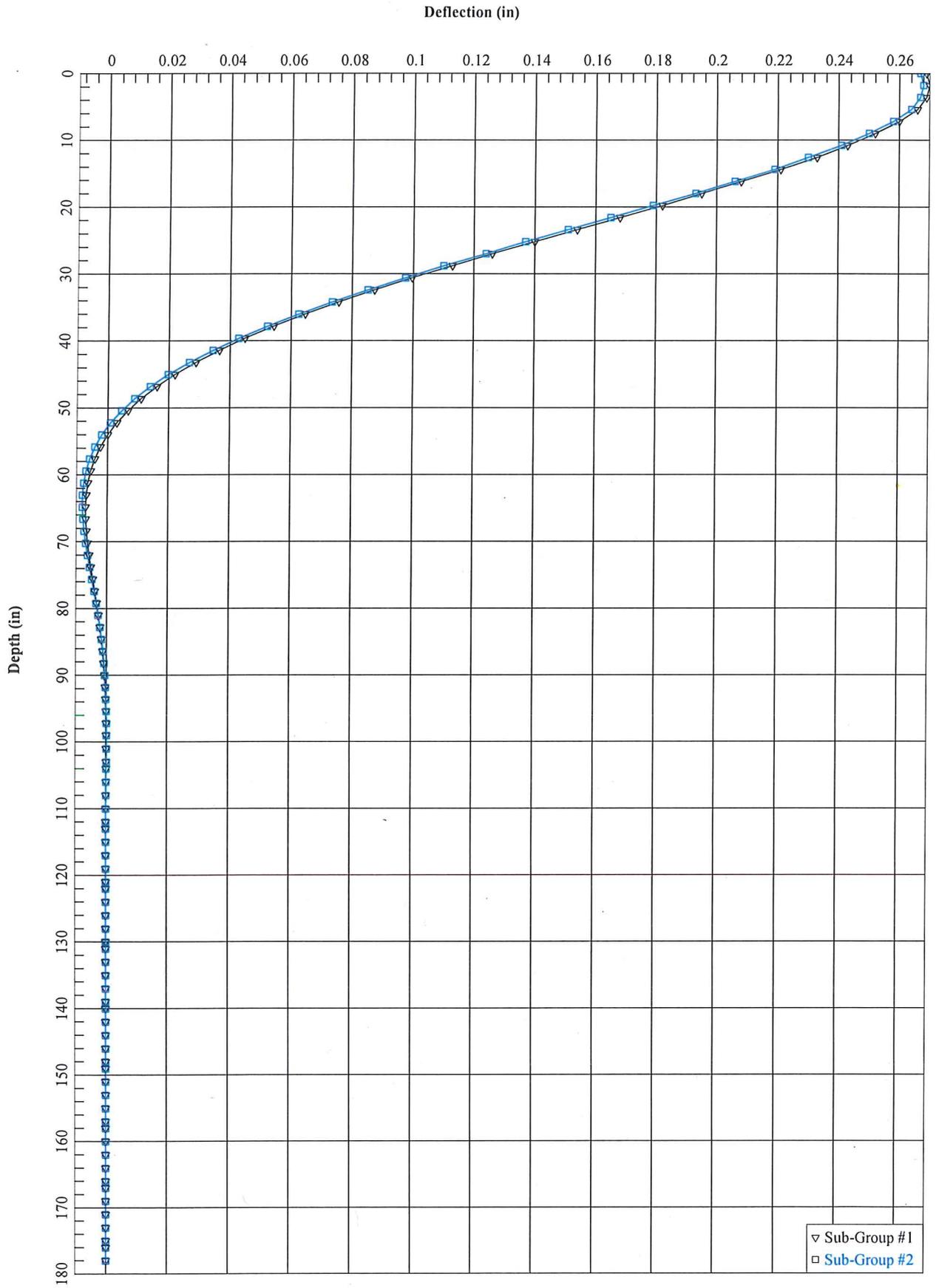
GENERATED P-Y CURVES FOR PILE GROUP NO. 2

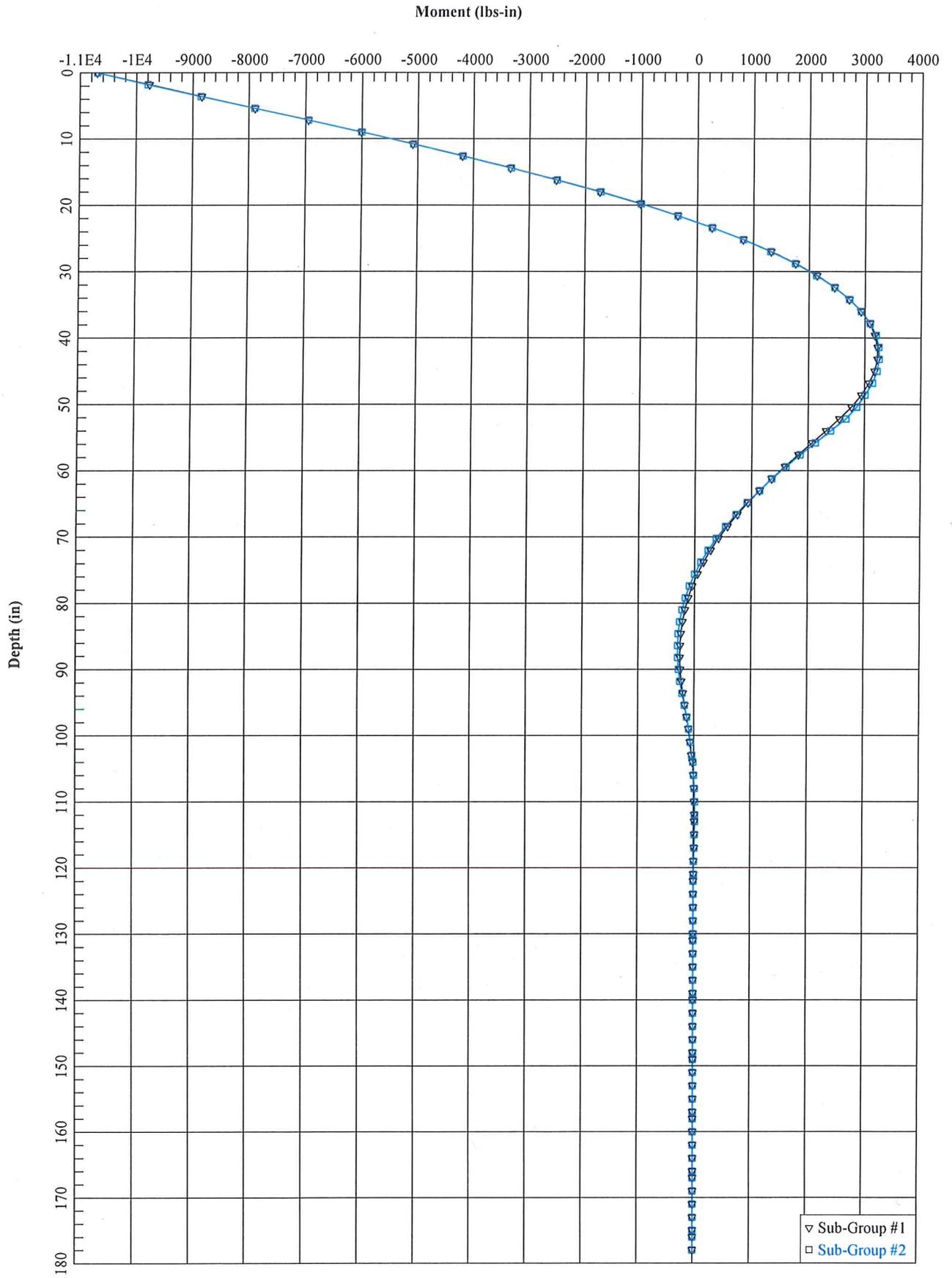
NUMBER OF CURVES = 3  
 NUMBER OF POINTS ON EACH CURVE = 17

DEPTH BELOW GS IN	DIAM IN	C LBS/IN**2	GAMMA LBS/IN**3	E50
60.00	1.500	.2000D+01	.3300D-01	.2000D-01
	Y, IN		P, LBS/IN	
	.000		.000	
	.001		2.700	
	.019		8.504	
	.037		10.715	
	.056		12.266	
	.075		13.500	
	.094		14.542	
	.113		15.454	
	.131		16.268	
	.150		17.009	
	.169		17.690	
	.187		18.322	
	.206		18.914	
	.225		19.470	
	.600		27.000	
	1.125		27.000	
	1.500		27.000	

DEPTH BELOW GS IN	DIAM IN	C LBS/IN**2	GAMMA LBS/IN**3	E50
108.00	1.500	.2000D+01	.3300D-01	.2000D-01
	Y, IN		P, LBS/IN	
	.000		.000	
	.001		2.700	
	.019		8.504	
	.037		10.715	
	.056		12.266	
	.075		13.500	
	.094		14.542	
	.113		15.454	
	.131		16.268	
	.150		17.009	
	.169		17.690	
	.187		18.322	
	.206		18.914	
	.225		19.470	
	.600		27.000	
	1.125		27.000	
	1.500		27.000	

DEPTH BELOW GS IN	DIAM IN	C LBS/IN**2	GAMMA LBS/IN**3	E50
126.00	1.500	.2000D+01	.3300D-01	.2000D-01
	Y, IN		P, LBS/IN	
	.000		.000	
	.001		2.700	
	.019		8.504	
	.037		10.715	
	.056		12.266	
	.075		13.500	
	.094		14.542	
	.113		15.454	
	.131		16.268	
	.150		17.009	
	.169		17.690	
	.187		18.322	
	.206		18.914	
	.225		19.470	
	.600		27.000	
	1.125		27.000	
	1.500		27.000	

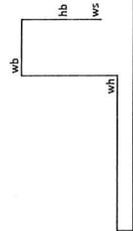




ABUTMENT DESIGN, Whittemansh Valley, Country Club, PA  
 Service Case: 1.0DL+1.0LL+Thermal (factored)  
 Considered loads: Bridge Weight+ Live load+Thermal  
 FOUNDATION AND BACKFILL SOIL PROPERTIES

BACKFILL SOIL UNIT WEIGHT =	120	pcf
FOUNDATION SOIL UNIT WEIGHT =	120	pcf
ka (active pressure coefficient)	34.0	psf/ft

(φ=34 backfill)



BRIDGE LOADS:	
Dead Weight (lbs)	43000
Live load (lbs)	35000
Length of the abutment (ft)	12
Dead Weight (lbs/ft)	3583.3
Live load (lbs/ft)	2916.7
Thermal load (lbs)	6500.0

BRIDGE DIMENSIONS:	
Length (ft)	12.5
Height above bridge seat-hb (ft)	3
Height below bridge seat-hs (ft)	2.5
Width above bridge seat-wb (ft)	1
Width below bridge seat-ws-wb(ft)	2.5
Footling toe-wt(ft)	2.5
Footling heel-wh(ft)	0

		Moment arm (ft) from toe	Moment about toe (lbs-ft)
Load from bridge back wall (lbs)	7031.3	4.50	-31640.6
Load from below the bridge back wall (lbs)	14648.4	3.75	-54931.6
Weight of wingwalls (lbs)	13125.0	7.47	-98107.7
Footling weight (lbs)	35156.3	2.50	-87890.6
Load from bridge (lbs)	115000.0	3.42	-392916.7
Soil backfill weight (lbs)	0.0	5.000	0.0
Braking Load (lbs)	0.0	3.417	0.0
Total vertical load (lbs)	184560.9		
HORIZONTAL			
Lateral Load from soil (lbs)	23029.7	2.83	65250.8
Live load surcharge load (lbs)	12643.8	4.25	53735.9
Lateral Load from soil-wingwalls(lbs)	6310.9	4.67	29451.0
live load surcharge-wingwalls (lbs)	5890.2	5.50	32396.1
Thermal load (lbs)	7800.0	5.50	42900.0
Braking Load (lbs)	0.0	5.50	0.0
Total moment about toe(lbs-ft)			ΣM= -441753.5
Moment about c.g.			
Total V(kips)	184.56		
Total H (kips)	55.7		
Total M (kips-ft)	206548.9		

**DESIGN OF PILE CAP: (ABUTMENT 5)**

Maximum load on the pile cap (kips)/ft  
 Spacing between piles (ft)  
 Maximum factored moment (kips-ft)  
 Maximum service moment (kips-ft)

**CHECK FOR PILE CAP SHEAR:**

Maximum shear (Kips)  
 d (inches)

**CHECK FOR PILE CAP TORSION:**

Shear capacity of the pile cap (kips)  
 $A_v/sreq (in^2/in.) (V_u - \phi V_c)/0.85 f_y d_v$   
 $sreq = A_v / (A_v req / sreq)$   
 Shear capacity of pile cap =

**FACTORED DESIGN**

14.8  
 3.5  
 22.7  
 16.4  
 51.8  
 28.8

*Abutment footing design moment*

(see below)  $(V_u)^2 + (0.9 p_h T_u / 2 A_o)^2 > 0.5$       278.52      Kips. Provide stirrups #5@12" o.c  
 0.00  
 0.0      o.k      #5 stirrups  
 0.85 \* 0.0316 \*  $\beta^2$  \*  $d^3$  \* 0.5 \*  $\rho_v$  \*  $d_v$       278.52 kips >

$\beta = 4.8 / (1 + 750 \cdot e_s) \cdot 51 / (39 + s_x e)$   
 $s_x e = s_x \cdot 1.36 / (a_g + 0.63)$   
 $e_s = (M_u / d_v + V_u) / (E_s \cdot A_s)$

3.00      sx = spacing of the reinforcement (in)      12  
 7.77  
 0.0008

## ABUTMENT FOOTING DESIGN:

### 1.0 CHECK FOR THE DISTRIBUTION OF REINFORCEMENT FOR FLEXURAL CRACKING CONTROL:

#### AASHTO LRFD SPECIFICATIONS SECTION 5.7.3.4

Size of the bar #	#6
Width of the beam, b (in)	12.0
Net design depth, d (in)	32.00
dc(in)	4.00
bar diameter (in)	0.75
c/s area of the bar(in <sup>2</sup> )	0.44
spacing(in)	12.0
no: of bars (n)	1.00
Area of steel, As(in <sup>2</sup> )	0.44
fy(kips/in <sup>2</sup> )	60
f'c(kips/in <sup>2</sup> )	4000
M( ft-kips) (service load moment)	16.40
M( ft-kips) (factored load moment)	22.7
γ <sub>e</sub> (exposure factor)	0.75
f <sub>ss</sub> (ksi)	14.0
$\beta_s = 1 + \frac{dc}{0.7(h-dc)}$	1.179

Note: $s_{act} < 700\gamma_e / \beta_s \cdot f_{ss} - 2 d_e$	
$700\gamma_e / \beta_s \cdot f_{ss} - 2 d_e$	23.7 O.K

### 2.0 CHECK FOR MINIMUM REINFORCEMENT FOR CRACKING CONTROL: AASHTO LRFD SPECIFICATION 5.7.3.3.2

Total Depth (in)	36		
f <sub>cr</sub> (psi)	I <sub>g</sub> (in <sup>4</sup> )	γ <sub>t</sub>	M <sub>cr</sub> (ft-k)
480.0	46656.0	18.0	103.7

Criterion:

$\phi M_n \geq$  the lesser of M<sub>cr</sub> and 1.33 M<sub>u</sub>

3.0	M <sub>u</sub> (ft-kips)	a(in)(assumed)	b(in)	d(in)	As (in <sup>2</sup> )	a cal(in)
(1.33M <sub>u</sub> )	30.19	0.31	12.0	32.0	0.21	0.31
	As provided =	0.44 sq.in				
	$\phi M_n$ (ft-kips)	> 1.33 M <sub>u</sub> (ft-Kips)				O.K

**ABUTMENT WALL DESIGN:**

**1.0 CHECK FOR THE DISTRIBUTION OF REINFORCEMENT FOR FLEXURAL CRACKING CONTROL:**

**AASHTO LRFD SPECIFICATIONS SECTION 5.7.3.4**

Size of the bar #	#6
Width of the wall, b (in)	12.0
Net design depth, d (in)	26.63
dc(in)	3.38
bar diameter (in)	0.75
c/s area of the bar(in^2)	0.44
spacing(in)	12.0
no: of bars (n)	1.00
Area of steel, As(in^2)	0.44
fy(kips/in^2)	60
f'c(kips/in^2)	4000
M( ft-kips) (service load moment)	13.93
M( ft-kips) (factored load moment)	21.0
γe (exposure factor)	0.75
fss (ksi)	14.4
$\beta_s = 1 + \frac{dc}{0.7(h - dc)}$	1.181

Note:  $s_{act} < 700\gamma_e / \beta_s \cdot f_{ss} - 2 d_e$   
 700γe/βs.fss - 2 de                      24.2                      O.K

**2.0 CHECK FOR MINIMUM REINFORCEMENT FOR CRACKING CONTROL:**  
**AASHTO LRFD SPECIFICATION 5.7.3.3.2**

Total Depth (in)	30		
fcr(psi)	lg(in^4)	yt	Mcr (ft-k)
480.0	27000.0	15.0	72.0

Criterion:  
 $\phi M_n \geq$  the lesser of Mcr and 1.33 Mu

3.0	Mu(ft-kips)	a(in)(assumed)	b(in)	d(in)	As (in^2)	a cal(in)
(1.33Mu)	27.87	0.34	12.0	26.6	0.23	0.34
	As provided =		0.44 sq.in			
	$\phi M_n$ (ft-kips)		> 1.33 Mu(ft-Kips)			O.K

WINGWALL DESIGN, Whitemarsh Valley Country Club, PA  
 FOUNDATION AND BACKFILL SOIL PROPERTIES

BACKFILL SOIL UNIT WEIGHT =	120	pcf
FOUNDATION SOIL UNIT WEIGHT =	120	pcf
ka (active pressure coefficient)	34.0	psf/ft
(φ=34 backfill)		
Consider 1.0 ft. strip of wingwall. (horizontal)		
Cantilevered wingwall length (ft.)	5	
Maximum exposed height of wing wall (ft)	5	
Maximum load on the wingwall (k/ft)	0.26	
Maximum moment in the wingwall (k-ft/ft) (serv)	6.47	
Maximum moment in the wingwall (k-ft/ft) (serv)	4.95	

## WING WALL DESIGN:

### 1.0 CHECK FOR THE DISTRIBUTION OF REINFORCEMENT FOR FLEXURAL CRACKING CONTROL:

#### AASHTO LRFD SPECIFICATIONS SECTION 5.7.3.4

Size of the bar #	#5
Width of the wall, b (in)	12.0
Net design depth, d (in)	9.69
dc (in)	2.31
bar diameter (in)	0.625
c/s area of the bar (in <sup>2</sup> )	0.31
spacing (in)	12.0
no: of bars (n)	1.00
Area of steel, As (in <sup>2</sup> )	0.31
fy (kips/in <sup>2</sup> )	60
f'c (kips/in <sup>2</sup> )	4000
M (ft-kips) (service load moment)	4.95
M (ft-kips) (factored load moment)	6.5
γe (exposure factor)	0.75
fss (ksi)	20.1
$\beta_s = 1 + \frac{dc}{0.7(h - dc)}$	1.341

Note: $s_{act} < 700\gamma_e / \beta_s f_{ss} - 2 d_e$	14.9	O.K
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### 2.0 CHECK FOR MINIMUM REINFORCEMENT FOR CRACKING CONTROL: AASHTO LRFD SPECIFICATION 5.7.3.3.2

Total Depth (in)	12		
fcr (psi)	lg (in <sup>4</sup> )	yt	Mcr (ft-k)
480.0	1728.0	6.0	11.5

Criterion:

$\phi M_n \geq$  the lesser of Mcr and 1.33 Mu

3.0	Mu (ft-kips)	a (in) (assumed)	b (in)	d (in)	As (in <sup>2</sup> )	a cal (in)
(1.33Mu)	8.60	0.29	12.0	9.7	0.20	0.29
As provided =		0.31 sq.in				
$\phi M_n$ (ft-kips)		> 1.33 Mu (ft-Kips)		O.K		

**APPENDIX B**  
**PRINTS**

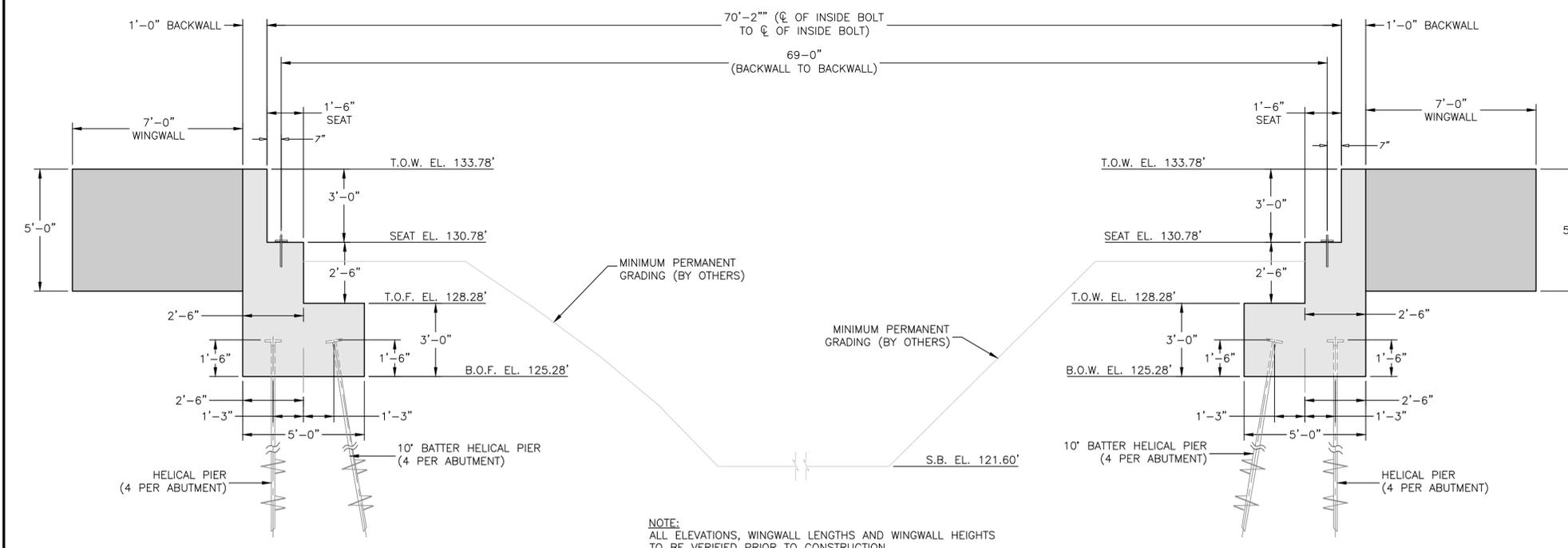
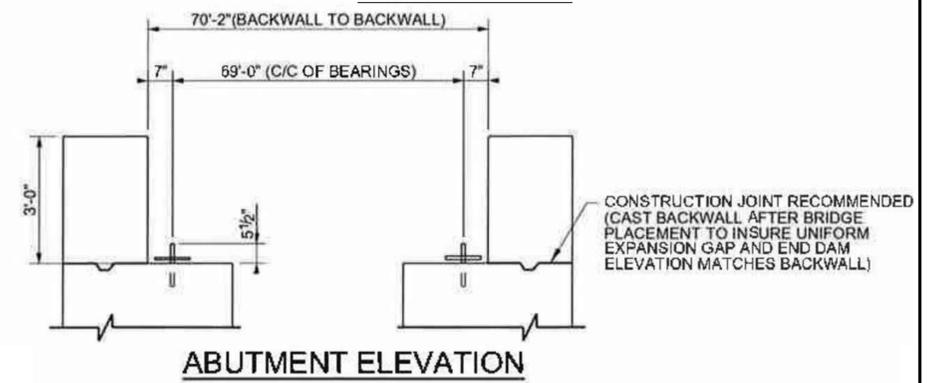
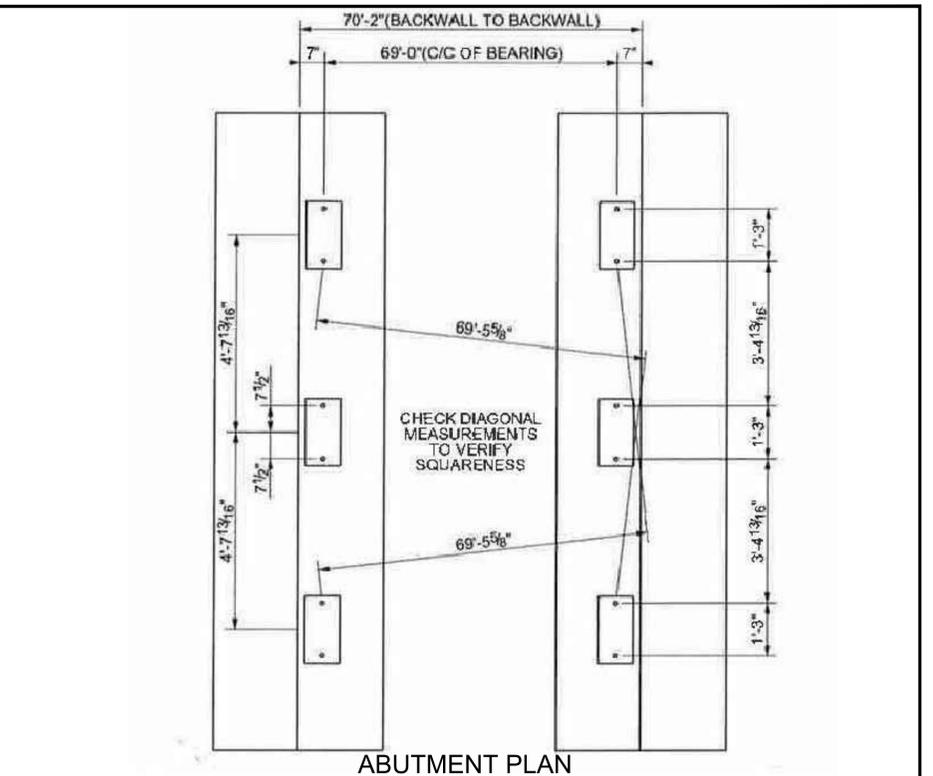
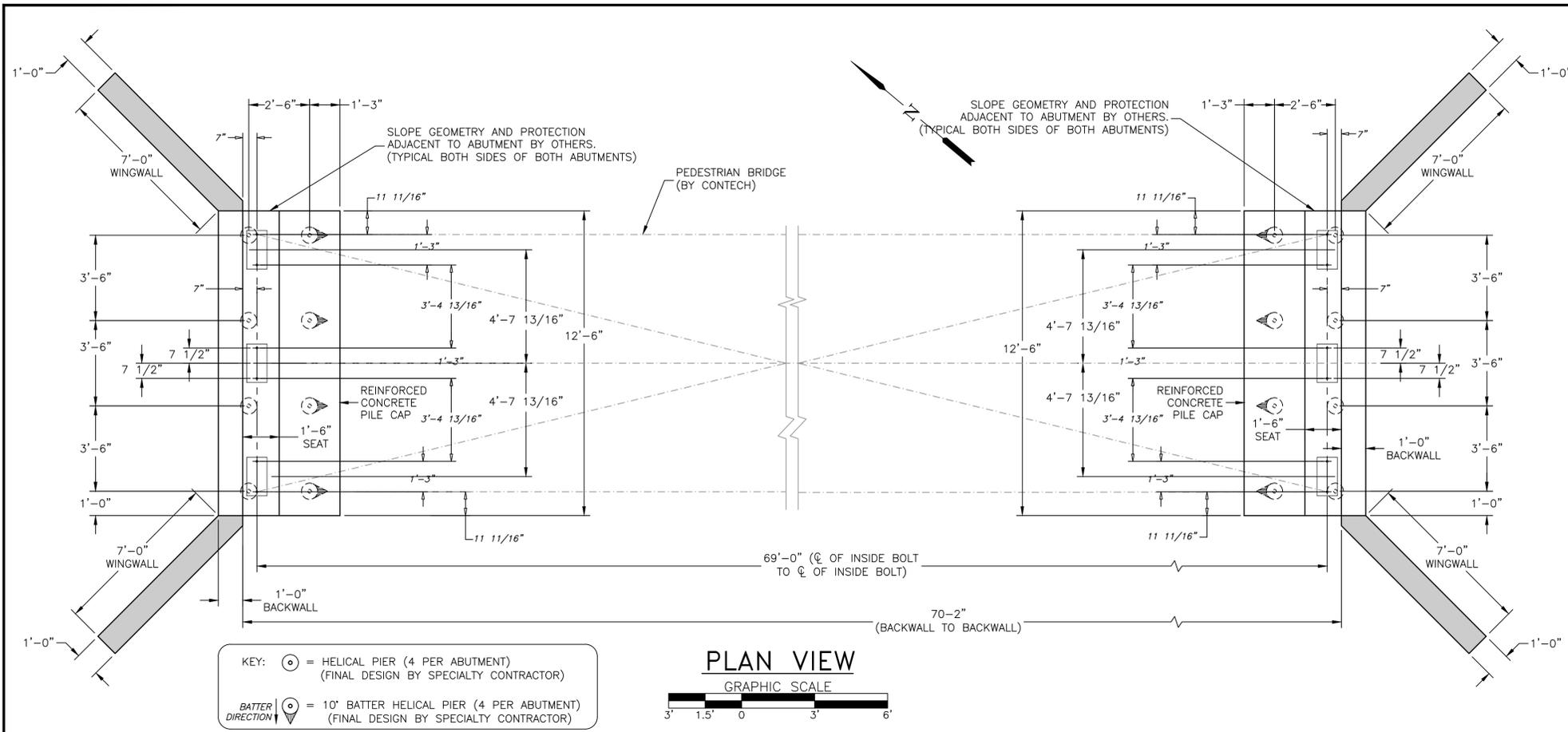
# CONTECH ENGINEERED SOLUTIONS, LLC DESIGN OF CONCRETE ABUTMENTS & WINGWALLS ON HELICAL PIER FOUNDATIONS FOR TWO (2) PROPOSED PEDESTRIAN BRIDGES (613585); WHITEMARSH VALLEY COUNTRY CLUB, LAFAYETTE, PENNSYLVANIA

INDEX	
1.	TITLE SHEET/INDEX
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3.	PLAN, PROFILE & DETAILS (BRIDGE #5)
4.	TYPICAL BRIDGE & WINGWALL DETAILS
5.	SPECIFICATIONS



<b>CBC</b> Engineers			
<b>TITLE SHEET / INDEX</b>			
Drawn By	Date	CONTECH ENGINEERED SOLUTIONS, LLC DESIGN OF CONCRETE ABUTMENTS & WINGWALLS ON HELICAL PIER FOUNDATIONS FOR TWO (2) PROPOSED PEDESTRIAN BRIDGES (613585); WHITEMARSH VALLEY COUNTRY CLUB, LAFAYETTE, PENNSYLVANIA	
JBE	1/17/20		
Approved By	Date		
Scale	Project No.	Rev.	Sheet
GRAPHIC	CBC-22963	-	1 OF 5





COMBINE REACTIONS AS PER LOCAL OR GOVERNING BUILDING CODES AS REQUIRED

BRIDGE REACTIONS	FIXED END			EXPANSION END		
	VERT (KIPS)	HORZ (KIPS)	LONG (KIPS)	VERT (KIPS)	HORZ (KIPS)	LONG (KIPS)
DEAD LOAD	43.0			43.0		
LIVE LOAD	35.0			35.0		
VEHICLE LOAD	20.0			20.0		
WIND LOAD		8.8			8.8	
THERMAL LOAD			6.5			6.6

- NOTE:
- STRUCTURAL DESIGN, SPECIFICATIONS AND DETAILS FOR HELICAL PIERS ARE TO BE PROVIDED BY SPECIALTY CONTRACTOR
  - HELICAL PIERS TO BE ADVANCED TO A MINIMUM DEPTH OF 15.0 FEET BELOW THE BOTTOM OF PILE CAP TO ACHIEVE A MINIMUM ALLOWABLE AXIAL COMPRESSIVE CAPACITY OF 22 KIPS AND MINIMUM ALLOWABLE FLEXURAL CAPACITY OF 900 FT-LBS. HELICAL PIERS ANALYZED CONSIDERING 1.5 INCH SQUARE SHAFT WITH 10"-12"-14" HELICAL CONFIGURATION WITH PIERS SPACED LONGITUDINALLY AT A MINIMUM REQUIRED SPACING OF 42" (3 X 14" MAX. HELIX PLATE DIAMETER ASSUMED.)

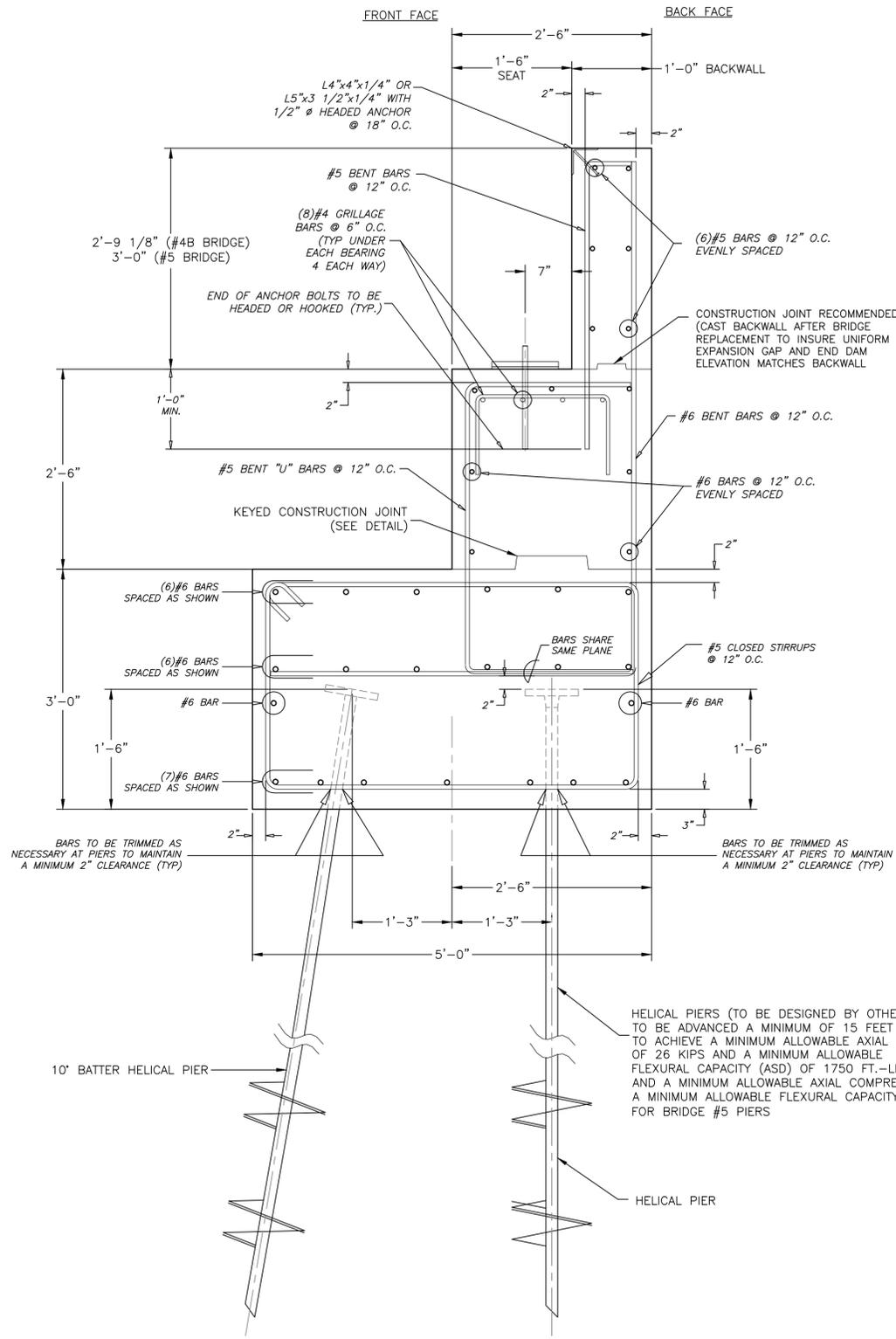
- NOTES:
- CONCRETE SHALL BE  $f'_c = 4,000$  psi.
  - ALL REINFORCEMENT SHALL BE ASTM A-615, GRADE 60
  - SCOUR IS NOT ADDRESSED HEREIN AND IS THE RESPONSIBILITY OF OTHERS THAN CBC ENGINEERS.



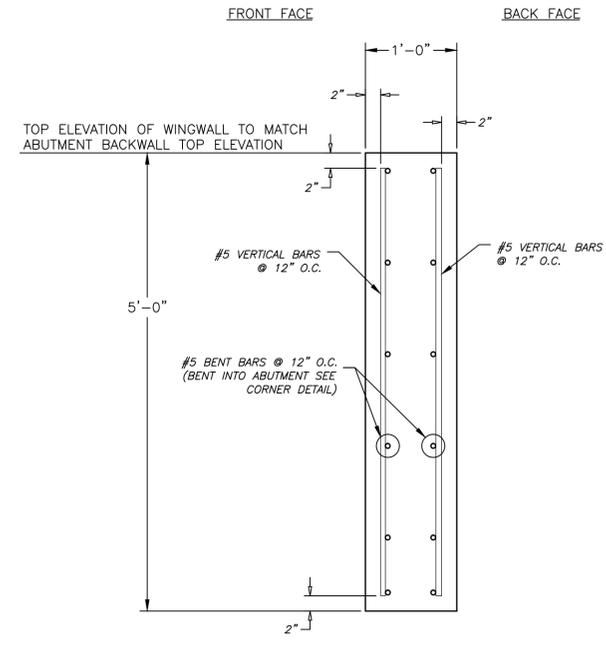
**CBC Engineers**

PLAN, PROFILE & DETAILS (BRIDGE #5)

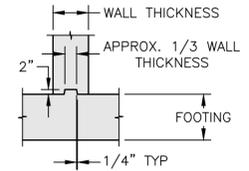
Drawn By: JBE	Date: 1/17/20	CONTECH ENGINEERED SOLUTIONS, LLC DESIGN OF CONCRETE ABUTMENTS & WINGWALLS ON HELICAL PIER FOUNDATIONS FOR TWO (2) PROPOSED PEDESTRIAN BRIDGES (613585); WHITEMARSH VALLEY COUNTRY CLUB, LAFAYETTE, PENNSYLVANIA	
Approved By:	Date:	Project No.: CBC-22963	Rev. Sheet: 3 OF 5
Scale: GRAPHIC			



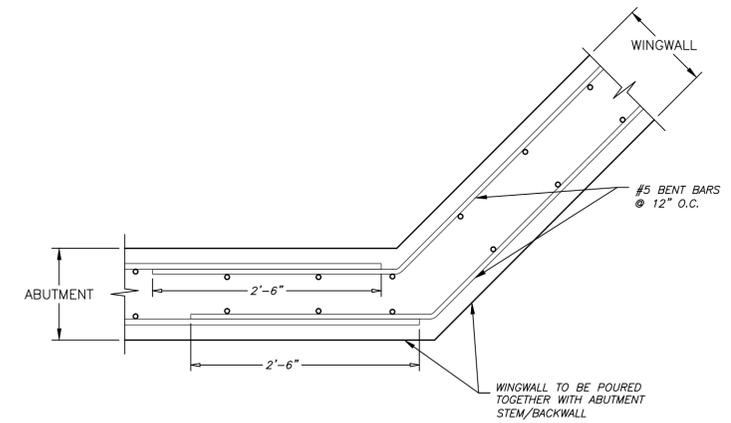
**TYPICAL ABUTMENT SECTION**



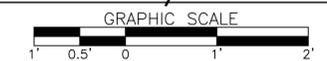
**TYPICAL WINGWALL SECTION**



**KEYED CONSTRUCTION JOINT DETAIL**  
NOT TO SCALE



**TYPICAL ABUTMENT/WINGWALL CORNER**



- NOTE:**
- STRUCTURAL DESIGN, SPECIFICATIONS AND DETAILS FOR HELICAL PIERS ARE TO BE PROVIDED BY SPECIALTY CONTRACTOR
  - HELICAL PIERS (TO BE DESIGNED BY OTHERS) TO BE ADVANCED A MINIMUM OF 15 FEET BELOW PILE CAP TO ACHIEVE A MINIMUM ALLOWABLE AXIAL COMPRESSIVE CAPACITY OF 26 KIPS AND A MINIMUM ALLOWABLE FLEXURAL CAPACITY (ASD) OF 1750 FT.-LBS (TYPICAL) FOR BRIDGE #4B PIERS AND A MINIMUM ALLOWABLE AXIAL COMPRESSIVE CAPACITY OF 22 KIPS AND A MINIMUM ALLOWABLE FLEXURAL CAPACITY (ASD) OF 900 FT.-LBS (TYPICAL) FOR BRIDGE #5 PIERS



- NOTES:**
- CONCRETE SHALL BE  $f'c = 4,000$  psi.
  - ALL REINFORCEMENT SHALL BE ASTM A-615, GRADE 60.
  - SCOUR IS NOT ADDRESSED HEREIN AND IS THE RESPONSIBILITY OF OTHERS THAN CBC ENGINEERS.

Drawn By		Date		CONTECH ENGINEERED SOLUTIONS, LLC			
JBE		1/17/20		DESIGN OF CONCRETE ABUTMENTS & WINGWALLS ON HELICAL PIER FOUNDATIONS FOR TWO (2) PROPOSED PEDESTRIAN BRIDGES (613585); WHITEMARSH VALLEY COUNTRY CLUB, LAFAYETTE, PENNSYLVANIA			
Approved By		Date		Project No.			
				CBC-22963		Rev.	
Scale		Project No.		Rev.		Sheet	
GRAPHIC		CBC-22963		-		4 OF 5	

**I – GENERAL**

**1.0 STANDARDS AND DEFINITIONS**

**1.1 STANDARDS** - All standards refer to latest edition unless otherwise noted.

**1.1.1** ASTM D-698-70 (Method C) "Standard Test Methods for Moisture, Density Relations of Soils and Soil Aggregate Mixtures Using 5.5-lb (2.5 kg.) Rammer and 12-inch (305-mm) Drop".

**1.1.2** ASTM D-2922 "Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear methods (Shallow Depth)".

**1.1.3** ASTM D-1556 "Standard Test Method for Density of Soil in place by the Sand-Cone Method".

**1.1.4** ASTM D-1557 "Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort."

**1.1.5** All construction and materials shall be in accordance with the latest AASHTO LRFD Bridge Design Specifications.

**1.2 DEFINITIONS**

**1.2.1** Owner - In these specifications the word "Owner" shall mean Whitemarsh Valley Country Club, PA.

**1.2.2** Engineer - In these specifications the word "Engineer" shall mean the Owner designated engineer.

**1.2.3** Design Engineer - In these specifications the words "Design Engineer" shall mean CBC Engineers and Associates, Ltd.

**1.2.4** Contractor - In these specifications the word "Contractor" shall mean the firm or corporation undertaking the execution of any work under the terms of these specifications.

**1.2.5** Approved - In these specifications the word "approved" shall refer to the approval of the Engineer or his designated representative.

**1.2.6** As Directed - In these specifications the words "as directed" shall refer to the directions to the Contractor from the Owner or his designated representative.

**2.0 GENERAL CONDITIONS**

**2.1** The Contractor shall furnish all labor, material and equipment and perform all work and services except those set out and furnished by the Owner, necessary to complete in a satisfactory manner the site preparation, excavation, filling, compaction, grading as shown on the plans and as described therein.

This work is to be accomplished under the observation of the Owner or his designated representative.

**2.2** Prior to bidding the work, the Contractor shall examine, investigate and inspect the construction site as to the nature and location of the work, and the general and local conditions at the construction site, including, without limitation, the character of surface or subsurface conditions and obstacles to be encountered on and around the construction site; and shall make such additional investigation as he may deem necessary for the planning and proper execution of the work.

If conditions other than those indicated are discovered by the Contractor, the Owner should be notified immediately. The material which the Contractor believes to be a changed condition should not be disturbed so that the owner can investigate the condition.

**2.3** The construction shall be performed under the direction of an experienced engineer who is familiar with the design plan.

**II – PILE CAP FOOTINGS**

**1.0** The dimension of the pile caps shall be 60" wide and 36" deep.

**2.0** The concrete and steel in the pile caps shall meet the requirements of Section IV of these specifications.

**3.0** The pile caps shall be reinforced as shown on the construction drawings.

**4.0** Foundation excavation shall consist of the removal of all material, of whatever nature, necessary for the construction of foundations.

**4.1** It shall be the responsibility of the Contractor to identify and relocate all existing utilities which conflict with the proposed foundation locations shown on the plan. The Contractor must call the appropriate utility company at least 48 hours before any excavation to request exact field location of utilities, and coordinate removal and installation of all utilities with the respective utility company.

**4.2** All federal, state, and local regulations should be strictly adhered to relative to excavation side-slope geometry. The adoption of suitable excavation techniques is the responsibility of the Contractor.

**4.3** Excavated material shall be disposed in accordance with the plan established by the Engineer.

**III – HELICAL PIERS**

**1.0** The final design of the helical piers (i.e. shaft properties, number and size of helices, top bracket, etc.) to achieve a minimum allowable axial compressive capacity of 26 kips/ pier and a minimum allowable flexural capacity (ASD) of 1750 ft.-lbs for Bridge #4B and a minimum allowable axial compressive capacity of 22 kips/ pier and a minimum allowable flexural capacity (ASD) of 900 ft.-lbs for Bridge #5 is the responsibility of the special contractor chosen for the project.

**IV – CONCRETE**

**1.0 CODES AND STANDARDS**

**1.1** Reinforced concrete shall conform to the requirements of AASHTO Standard Specifications for Highway Bridges, Division II - Construction, Section 8, "Concrete Structures", for Class A concrete, having a minimum compressive strength of 4,000 psi.

**2.0 STANDARDS FOR MATERIALS**

**2.1** Portland Cement - Conforming to ASTM Specification C-150, Type I or II.

**2.2** Water - The water shall be drinkable, clean free from injurious amounts of oils, acids, alkalis, organic materials, or deleterious substances.

**2.3** Aggregates - Fine and coarse aggregates shall conform to current ASTM Specification C-33 "Specification for Concrete Aggregates" except that local aggregates which have been shown by tests and by actual service to produce satisfactory qualities may be used when approved by the Engineer.

**2.4** Submittals - Test data and/or certifications to the Owner shall be furnished upon request.

**3.0 PROPORTIONING OF CONCRETE**

**3.1 COMPOSITION**

**3.1.1** The concrete shall be composed of cement, fine aggregate, coarse aggregate and water.

**3.1.2** The concrete shall be homogeneous, readily placeable and uniformly workable and shall be proportioned in accordance with ACI-211.1.

**3.1.3** Proportions shall be established on the basis of field experience with the materials to be employed. The amount of water used shall not exceed the maximum 0.49 water/cement ratio, and shall be reduced as necessary to produce concrete of the specified consistency at the time of placement.

**3.1.4** An air-entraining admixture, conforming to the requirements of ASTM C260, shall be used in all concrete furnished under this contract. The quantity of admixture shall be such as to produce an air content in the freshly mixed concrete of 6 percent plus or minus 1 percent as determined in accordance with ASTM C231 or C173.

**3.2** Qualities Required - As indicated in the table below:

TABLE IV-1 QUALITIES REQUIRED	
ITEM	QUALITY REQUIRED
AASHTO Class	A
Type of Cement	I or II
Compressive Strength $f_c$ @ 28 days	4,000 psi
Slump, inches	2 - 4 in.

**3.3** Maximum Size of Coarse Aggregates - Maximum size of coarse aggregates shall not be larger than 19 mm (3/4 inches).

**3.4** Rate of Hardening of Concrete - Concrete mix shall be adjusted to produce the required rate of hardening for varied climatic conditions:

Under 40°F Ambient Temperature – All work to be performed in strict conformance with the recommendations of ACI-306R "Cold Weather Concreting."

**4.0 MIXING AND PLACING**

**4.1** Equipment - Ready Mix Concrete shall be used and shall conform to the "Specifications for Ready-Mix Concrete," ASTM C-94. Approval is required prior to using job mixed concrete.

**4.2** Preparation - All work shall be in accordance with ACI-304, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete." All construction debris and extraneous matter shall be removed from within the forms. Concrete shall be placed on clean surfaces, free from water. Concrete that has to be dropped four (4) feet or more shall be placed through a tremie.

**4.3** All concrete shall be consolidated by internal mechanical vibration immediately after placement. Vibrators shall be of a size appropriate for the work, capable of transmitting vibration to concrete at frequencies of not less than 4,500 impulses per minute.

**5.0 FORM WORK**

**5.1** Forms shall be of wood, steel or other approved material and shall be set and held true to the dimensions, lines and grades of the structure prior to and during the placement of concrete.

**5.2** Forms shall not be removed until the concrete has sufficient strength to prevent concrete drainage and/or damage.

**6.0 CURING**

**6.1** Fresh concrete shall be protected from rains, flowing water and mechanical injury for a period of at least four (4) days. No loads shall be placed on the concrete until it has reached its design strength.

**7.0 REINFORCING STEEL**

**7.1 MATERIAL**

**7.1.1** All reinforcing bars shall be deformed bars (ASTM-A615) Grade 60.

**7.2 BENDING AND SPLICING**

**7.2.1** Bar reinforcement shall be cut and bent to the shapes shown on the plans. Fabrication tolerances shall be in accordance with ACI 315. All bars shall be bent cold, unless otherwise permitted.

**7.2.2** All reinforcement shall be furnished in the full lengths indicated on the plans unless otherwise permitted. Except for splices shown on the plans and splices for No. 5 or smaller bars, splicing of bars will not be permitted without written approval. Splices shall be staggered as far as possible.

**7.2.3** In lapped splices, the bars shall be placed and wired in such a manner as to maintain the minimum distance to the surface of the concrete shown on the plans.

**7.2.4** Substitution of different size bars will be permitted only when authorized by the engineer. The substituted bars shall have an area equivalent to the design area, or larger.

**7.3 PLACING AND FASTENING**

**7.3.1** Steel reinforcement shall be accurately placed as shown on the plans and firmly held in position during the placing and setting of concrete. Bars shall be tied at all intersections around the perimeter of each mat and at not less than 2 foot centers or at every intersection, whichever is greater, elsewhere. Welding of cross bars (tack welding) will not be permitted for assembly of reinforcement.

**7.3.2** Reinforcing steel shall be supported in its proper position by use of mortar blocks, wire bar supports, supplementary bars or other approved devices. Such devices shall be of such height and placed at sufficiently frequent intervals so as to maintain the distance between the reinforcing and the formed surface or the top surface within 1/4 inch of that indicated on the plans.

**V – FILTER FABRIC**

**1.0** Filter fabric shall be placed at all locations shown on the construction drawings and as necessary to maintain a soil-tight system.

**2.0** Filter fabric cloth shall conform to Contech specification for C60-NW or equivalent and shall meet the following ASTM tests:

**2.1** ASTM D4751 - Apparent opening size equal to #70 U.S. Standard Sieve Size.

**2.2** ASTM D4632 (Grab Tensile Test) - Minimum Strength = 160 pounds.

**2.3** ASTM D4632 (Grab Elongation) - 30-70%.

**2.4** ASTM D4533 (Trapezoidal Tear) - Minimum Strength = 60 pounds.

**2.5** ASTM D4355 (Stabilized for Heat and Ultra-Violet Degradation) - 70% strength retained.

**3.0** The minimum fabric coefficient of permeability (ASTM D4491) shall be 0.24 cm/sec.

**4.0** The fabric shall be non-woven with a minimum thickness (ASTM D5199) of 60 mils.

**5.0** Fabric shall not be placed over sharp or angular rocks that could tear or puncture it.

**6.0** Care should be exercised to prevent any puncturing or rupture of the filter fabric. Should such rupture occur the damaged area should be covered with a patch of filter fabric using an overlap minimum of one (1) foot.



		<b>SPECIFICATIONS</b>	
Drawn By <b>JBE</b>	Date <b>1/17/20</b>	CONTECH ENGINEERED SOLUTIONS, LLC DESIGN OF CONCRETE ABUTMENTS & WINGWALLS ON HELICAL PIER FOUNDATIONS FOR TWO (2) PROPOSED PEDESTRIAN BRIDGES (613585); WHITEMARSH VALLEY COUNTRY CLUB, LAFAYETTE, PENNSYLVANIA	
Approved By	Date	Scale <b>GRAPHIC</b>	Project No. <b>CBC-22963</b>
		Rev. -	Sheet <b>5 OF 5</b>

**TITLE: PEDESTRIAN BRIDGE 70'-0" x 10'-0"**  
**LOCATION: LAFAYETTE HILL, PA**  
**CONTECH BRIDGE NO. 613858-10**

- 1) Design Code
  - a. AISC - LRFD - All design stresses shall be in accordance with the Manual of Steel Construction for Load and Resistance Factor Design (14th Ed.) as adopted by the American Institute of Steel Construction ( AISC ).
  
- 2) Bridge Loading:
  - a. DL = Bridge Steel Weight
  - b. DK = Bridge Deck Weight
  - c. LL = Live Load – 100 psf uniform load reduced to 82 psf
  - d. WL = Wind Load – 40 psf against the full vertical projection of the bridge, as if enclosed.
  - e. VL = Vehicle Load – 20,000 lb. vehicle load
  
- 3) Load Combinations
  - a. TD – Total Dead Load = DL + DK
  - b. 1.2TD + 1.6LL
  - c. 1.2TD + 1.0WL + 1.0LL
  - d. 1.2TD + 1.0LL
  - e. 0.9TD + 1.0WL
  - f. 1.2TD + 1.6VL1
  - g. 1.2TD + 1.6VL2
  
- 4) Contech used STAAD for analysis and Excel for design of its bridges. Input for the program is shown; where as analysis print out is not included due to its great length. Design checks are shown for the indicated critical member and their controlling load combinations. Connection checks are per AWS using E70XX electrodes. Actual electrodes used are the E80XX.
  
- 5) Deflection
  - a. AISC – LRFD – Live Load deflection is limited to span length x 1/400. Wind Load deflection limited to span length x 1/500.



*Jan 3 2020*  
1/11/2020

**TITLE: PEDESTRIAN BRIDGE 70'- 0" x 6'- 0"**  
**LOCATION: LAFAYETTE HILL, PA**  
**CONTECH BRIDGE NO. 613858-20**

- 1) Design Code
  - a. AISC - LRFD - All design stresses shall be in accordance with the Manual of Steel Construction for Load and Resistance Factor Design (14th Ed.) as adopted by the American Institute of Steel Construction ( AISC ).
  
- 2) Bridge Loading:
  - a. DL = Bridge Steel Weight
  - b. DK = Bridge Deck Weight
  - c. LL = Live Load – 100 psf uniform load
  - d. WL = Wind Load – 40 psf against the full vertical projection of the bridge, as it enclosed.
  - e. VL = Vehicle Load – 4,000 lb. vehicle load
  
- 3) Load Combinations
  - a. TD – Total Dead Load = DL + DK
  - b. 1.2TD + 1.6LL
  - c. 1.2TD + 1.0WL + 1.0LL
  - d. 1.2TD + 1.0LL
  - e. 0.9TD + 1.0WL
  - f. 1.2TD + 1.6VL1
  - g. 1.2TD + 1.6VL2
  
- 4) Contech used STAAD for analysis and Excel for design of its bridges. Input for the program is shown; where as analysis print out is not included due to its great length. Design checks are shown for the indicated critical member and their controlling load combinations. Connection checks are per AWS using E70XX electrodes. Actual electrodes used are the E80XX.
  
- 5) Deflection
  - a. AISC – LRFD – Live Load deflection is limited to span length x 1/400. Wind Load deflection limited to span length x 1/500.



*James B. Ghill*  
1/11/2020











MARK	DATE	REVISION DESCRIPTION
BY		

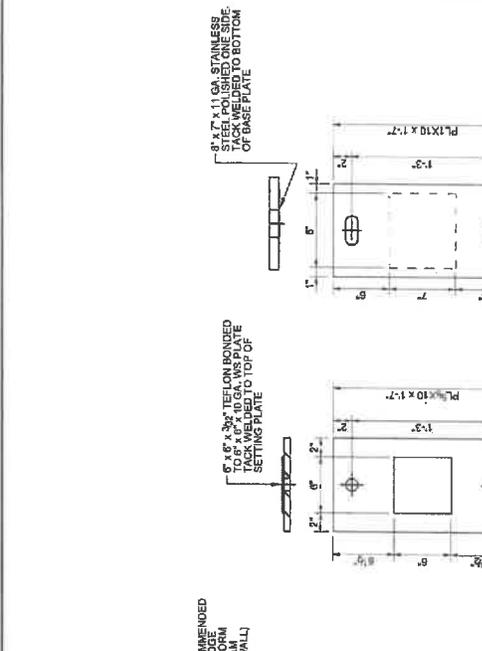
70'-0" x 10'-0"  
 PEDESTRIAN BRIDGE  
 LAFAYETTE, PA

CONTECH ENGINEERING SOLUTIONS LLC  
 1001 South Valley Drive, Suite 100, Fayetteville, PA 17315  
 717-335-1234  
 www.contech.com

DATE: 12/10/18  
 DESIGNED: GM  
 CHECKED: GM  
 T.L.W. APPROVED: SEC  
 PROJECT NO: 015065  
 DRAWING NO: 010  
 SHEET: 3 OF 4

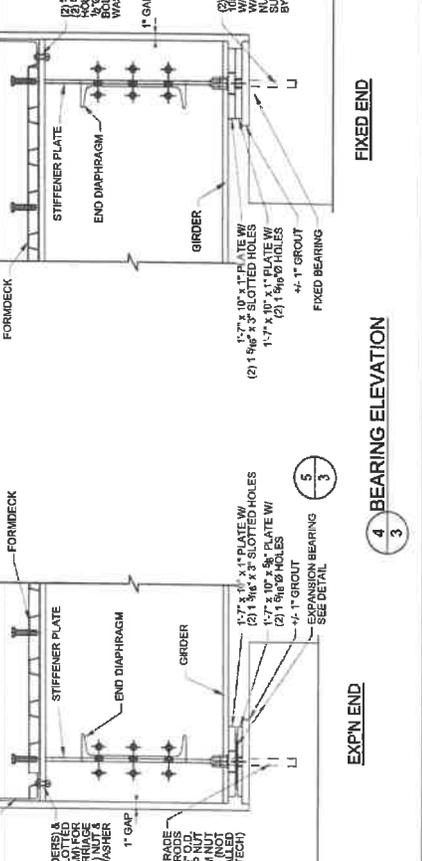
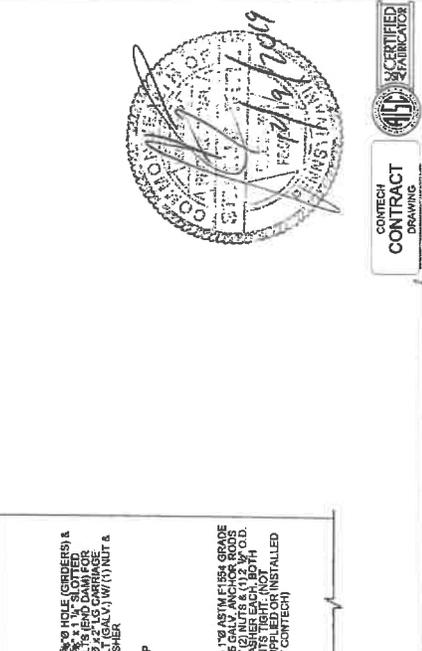
CONTECH CONTRACT DRAWING

CERTIFIED PROFESSIONAL ENGINEER



BRIDGE REACTIONS AS PER LOCAL OR GOVERNING BUILDING CODES AS REQUIRED

	FIXED END		EXPANSION END	
	VERT. (KIPS)	LONG. (KIPS)	VERT. (KIPS)	LONG. (KIPS)
DEAD LOAD	41.0		41.0	
LIVE LOAD	25.0		25.0	
VEHICLE LOAD	20.0		20.0	
WIND LOAD		8.8		8.8
THERMAL LOAD		6.6		6.6



70'-0" x 10'-0"  
 PEDESTRIAN BRIDGE  
 LAFAYETTE, PA

1/11/2020  
 James B. O'Connell  
 White Marsh Valley CC



BY: [REDACTED]  
 REVISION DESCRIPTION  
 DATE  
 MARK

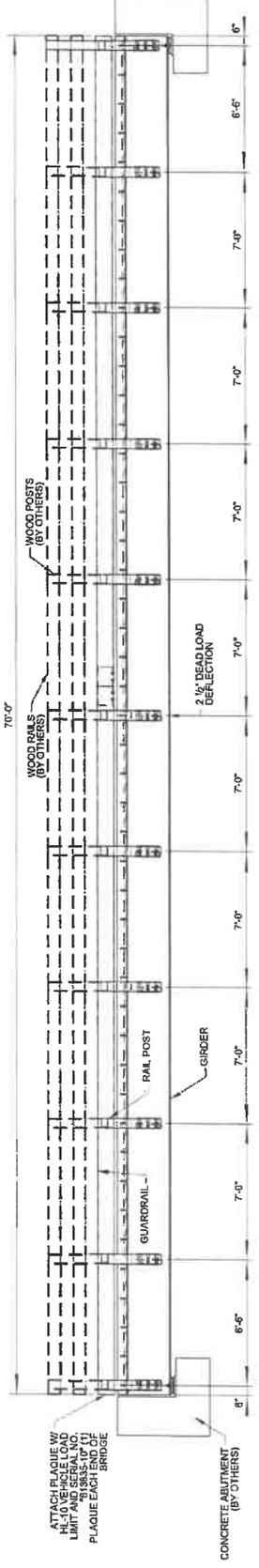
70'-0" x 10'-0"  
 PEDESTRIAN BRIDGE  
 LAFAYETTE, PA

**CONTECH**  
 ENGINEERS SOLUTIONS LLC  
 DATE: 12/08/18  
 DESIGNED: GJM  
 CHECKED: GJM  
 PROJECT NO: 615685  
 SHEET: 1 OF 4

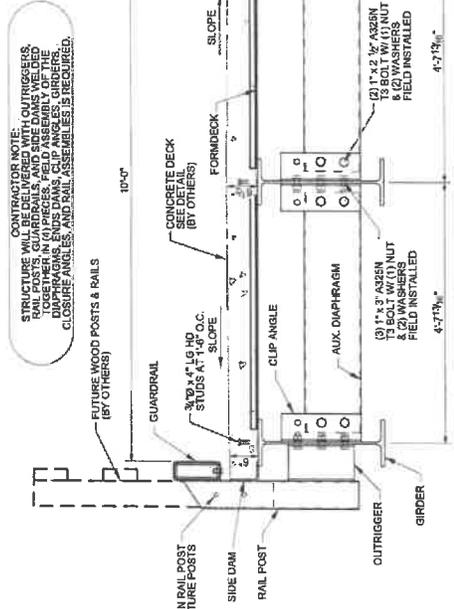


CERTIFIED FABRICATOR  
 CONTRACT DRAWING

*James B. G...*  
 1/11/2020  
 Whitemarsh Valley CC



BRIDGE ELEVATION



BRIDGE SECTION

**GENERAL NOTES**

- DESIGN STRESSES ARE IN ACCORDANCE WITH THE MANUAL OF STEEL CONSTRUCTION, FOURTEENTH EDITION, AS ADOPTED BY THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC).
- BRIDGE MEMBERS ARE FABRICATED FROM HIGH STRENGTH, LOW ALLOY, ENHANCED ATMOSPHERIC CORROSION RESISTANT ASTM A572 COLD-FORMED WELDED SQUARE AND RECTANGULAR TUBING, AND ASTM A588, ASTM A589, OR ASTM A509-S50W PLATE AND STRUCTURAL SHAPES (F<sub>y</sub>=50,000 PSI).
- CONCRETE DECK: GALVANIZED FORM DECK SUPPLIED BY CONTECH. CONCRETE, REINFORCING AND EXPANSION MATERIAL SUPPLIED BY OTHERS. SEE CONCRETE DECK SHEET.
- THE GAS METAL ARC WELDING PROCESS OR FLUX CORED ARC WELDING PROCESS WILL BE USED. WELDING TO BE IN ACCORDANCE WITH AWS D1.1.
- UNLESS OTHERWISE NOTED, WELDED CONNECTIONS SHALL BE FILLET WELDS (OR HAVE THE EFFECTIVE THROAT BEING WELDED) AND THE THICKNESS OF THE LIGHTEST GAUGE MEMBER IN THE CONNECTION. WELDS SHALL BE FULL PENETRATION.
- ALL MISCELLANEOUS STRUCTURAL MEMBERS, (NAMED AS MEMBERS WITH CONNECTION WELDS NOT SPECIFICALLY INSTALLED) WILL BE STITCH WELDED TO THEIR SUPPORTING MEMBERS, BUT WELDED AT SHOP SPICE LOCATIONS, AND ARE TO BE EXEMPT FROM THE REQUIREMENTS OF AWS D1.1.
- BRIDGE DESIGN WAS ONLY BASED ON COMBINATIONS OF THE FOLLOWING LOADS WHICH WILL PRODUCE MAXIMUM CRITICAL MEMBER STRESSES.
  - 100 PSF UNIFORM LIVE LOADING ON THE FULL DECK AREA OR ONE 20,000 LB VEHICLE LOAD. THE UNIFORM LIVE LOAD SHALL BE REDUCED TO 80 PSF FOR THE DESIGN OF THE MAIN MEMBERS ONLY. THE VEHICLE LOAD SHALL BE DISTRIBUTED AS A FOUR WHEEL VEHICLE WITH 80% OF THE LOAD ON THE REAR WHEELS. THE WHEEL TRACK WIDTH OF THE VEHICLE SHALL BE 6'-0" AND THE WHEEL BASE SHALL BE 1'-6". THE VEHICLE SHALL BE POSITIONED SO AS TO PRODUCE THE MAXIMUM STRESSES IN EACH MEMBER, INCLUDING DECKING.
  - 20 PLF EACH SIDE/FUTURE WOOD RAIL ASSEMBLY.
  - 40 PSF WIND LOAD ON THE FULL HEIGHT OF THE BRIDGE, AS IF ENCLOSED.
  - 40 PSF WIND LOAD UPWARD FORCE APPLIED AT THE WINDOW QUARTER POINT OF THE TRANSVERSE BRIDGE WIDTH (AS SHOWN 3.2.2).
- CLEANING: ALL EXPOSED SURFACES OF STEEL SHALL BE CLEANED IN ACCORDANCE WITH STEEL STRUCTURES SSPC-SP7 LATEST EDITION. EXPOSED SURFACES BE DEFINED AS THOSE VISIBLE FROM THE DECK AND FROM THE OUTSIDE OF THE STRUCTURE. FLOOR BEAMS, BRACE DIAGONALS AND THE INSIDE AND BOTTOM OF SIDE DAM WILL NOT BE BLAST CLEANED.

**QUALITY ASSURANCE NOTES**

- ALL WELDS TO BE VISUALLY INSPECTED.
- CERTIFIED ABC SHOP REQUIRED.
- WELDER CERTIFICATIONS REQUIRED.

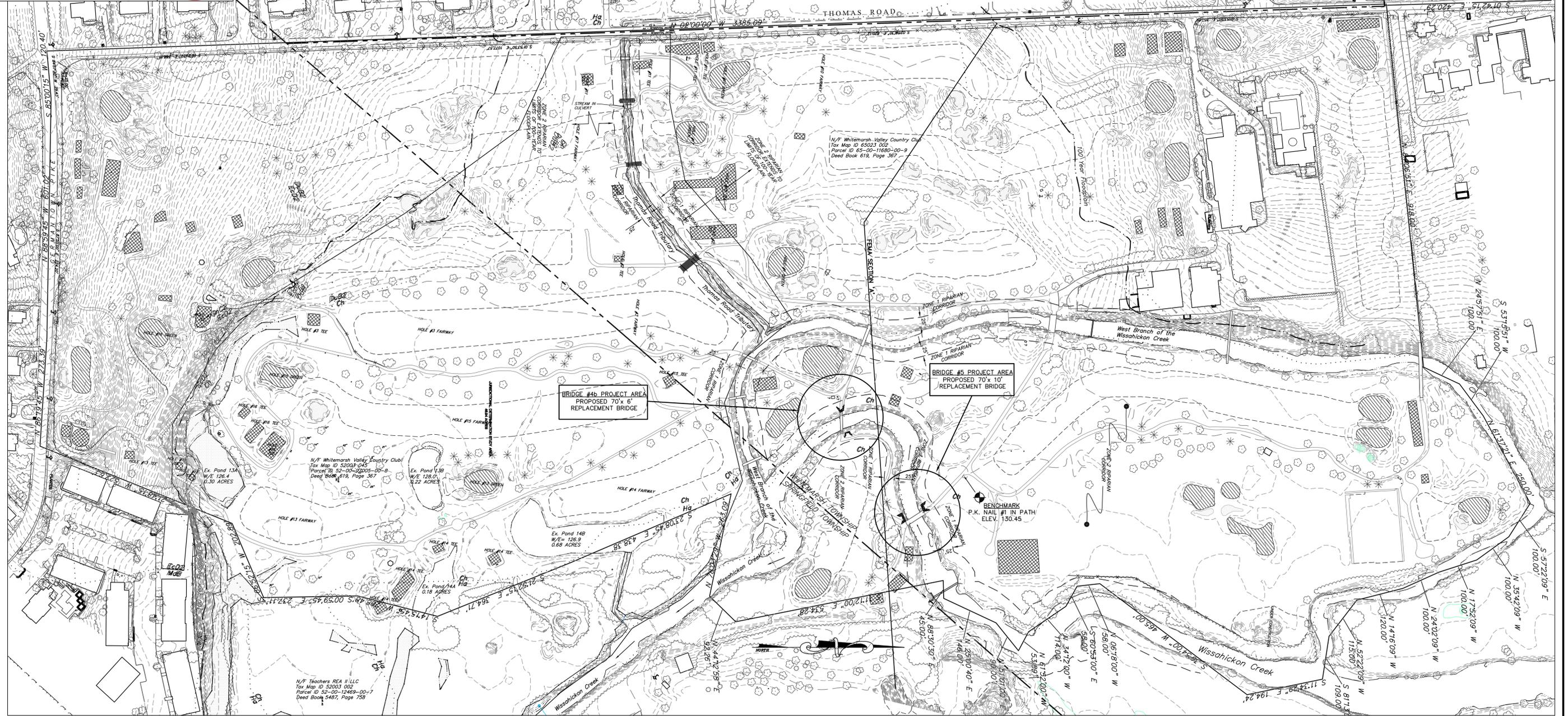
SCHEDULE OF MEMBERS	
GIRDER - g	W 27 x 54
END DIAPHRAGM - ed	C 10 x 33.9
MAIN DIAPHRAGM - md	C 15 x 33.9
AUX DIAPHRAGM - ad	C 12 x 20.7
OUTRIGGER - o	W 8 x 24
RAIL POST - rp	HSS 6 x 6 x 1/4
SIDE DAM - sd	L 6 x 4 x 1/2
END DAM ANGLE - eda	L 6 x 4 x 1/2
CLIP ANGLE - ca	L 6 x 4 x 1/2
GUARDRAIL	HSS 10 x 10 x 1/4

**STOP-CALL BEFORE YOU DIG!**

LOCATION OF EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM EXISTING RECORDS AND/OR ABOVE-GROUND INSPECTION OF THE SITE. COMPLETENESS OR ACCURACY OF LOCATION AND DEPTH CANNOT BE GUARANTEED. CONTRACTOR MUST VERIFY LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES AND FACILITIES BEFORE START OF WORK BY CALLING PA ONE CALL SYSTEM THREE DAYS PRIOR TO EXCAVATION. REFERENCE PENNSYLVANIA ACT 287 AS AMENDED BY ACT 181 (2006). TELE. # 1-800-242-1776 OR 811.



WORK LOCATION NO.:



**BRIDGE #4B PROJECT AREA**  
PROPOSED 70'x 6'  
REPLACEMENT BRIDGE

**BRIDGE #5 PROJECT AREA**  
PROPOSED 70'x 10'  
REPLACEMENT BRIDGE

**NOTES:**

- MAPPING COMPILED BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY EXPOSED 11/25/06. THIS MAP WAS NOT SUBJECTED TO A FIELD EDIT. AREAS OF MAPPING WHICH MAY NOT MEET ACCURACY STANDARDS ARE OUTLINED AND MARKED AS SUCH. CONTOURS LOCATED FROM MAP LIMITS OUTLINE TO OUTER EDGE OF MAPPING MAY NOT MEET ACCURACY STANDARDS DUE TO TERRAIN MODELING PROCESS. MAP CONTROL WAS DERIVED FROM CONVENTIONAL AND GLOBAL POSITION FIELD SURVEY TECHNIQUES PROVIDED BY LAND & MAPPING SERVICES. COPYRIGHT 03/2007; LAND & MAPPING SERVICES 300 NORTH SECOND STREET CLEARFIELD, PA 16830 1-888-LMS-0027.
- CONTRACTOR MUST REPLACE DAMAGE TO ROAD, GREENS, PATHWAYS AND UTILITIES.
- STREETS MUST BE KEPT FREE OF MUD AND DIRT DURING CONSTRUCTION.
- SITE IS WITHIN THE WISSAHICKON CREEK WATERSHED (PA DEP CHAPTER 93 CLASSIFICATION: TSF, MF).
- PROJECT IS WITHIN THE DEFINED FLOODWAY OF THE WISSAHICKON CREEK PER FEMA PANEL 42091CO376 G, EFFECTIVE DATE 03/02/2016. 1% FREQUENCY (100-YEAR) ELEVATION 140.2 WITHIN PROJECT AREA.
- CONSTRUCTION SHALL BE IN ACCORDANCE WITH PA DEP & WHITEMARSH TOWNSHIP DETAILS AND SPECIFICATIONS.

**OWNER/APPLICANT**

AAA-RESIDENTIAL DISTRICT RECREATIONAL DISTRICT

EXISTING USE: 116-182.B. COUNTRY CLUB-GOLF COURSE  
 REQUIRED  
 MINIMUM LOT AREA 60 ACRES  
 MINIMUM LOT WIDTH 500'  
 FRONT YARD 150'  
 SIDE YARD 100'  
 REAR YARD 100'  
 BUILDING HEIGHT 40'

PROJECT DESCRIPTION  
 REPLACEMENT OF EXISTING BRIDGES #4 & #5 WITHIN THE FLOODWAY OF THE WISSAHICKON CREEK AND WITHIN ZONE 1 & 2 OF THE WHITEMARSH TOWNSHIP RIPARIAN CORRIDOR

ADDITIONAL APPLICABLE ZONING:  
 ARTICLE XXII- FLOODPLAIN CONSERVATION OVERLAY DISTRICT  
 SECTION 116-165.B. STRUCTURES ARE WITHIN THE FLOODPLAIN CONSERVATION DISTRICT (VARIANCE REQUESTED)  
 SECTION 116-166 SPECIAL EXCEPTION USES:  
 A.(2) DAMS, CULVERTS AND BRIDGES APPROVED BY THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION (SPECIAL EXCEPTION REQUESTED)

ARTICLE XXXV: RIPARIAN CORRIDOR (APPLICANT IS SEEKING VARIANCES)  
 SECTION 116-264.A RIPARIAN CORRIDOR PLANTING REQUIREMENTS  
 SECTION 116-625.C. REQUIRES A MINIMUM DISTANCE OF 1000 FEET BETWEEN CROSSINGS IN A RIPARIAN CORRIDOR

**OWNER OF RECORD**

WHITEMARSH VALLEY COUNTRY CLUB  
 815 THOMAS ROAD  
 LAFAYETTE HILL, PA 19444

**SITE STATISTICS**

Tax Map ID 65023 002 (Whitemarsh Township)  
 Parcel ID 65-00-11680-00-9  
 Deed Book 619, Page 367  
 Tax Map ID 52003 045 (Springfield Township)  
 Parcel ID 52-00-07005-00-8  
 Deed Book 619, Page 367  
 Total Area: 113.4 AC

**PLAN INDEX**

- EXISTING FEATURES & PROJECT AREA PLAN
- SITE PLAN & CROSS SECTIONS
- EROSION CONTROL PLAN

REFER TO SPECIFICATIONS & PLANS TITLED "CONTECH ENGINEERED SOLUTION LLC DESIGN OF CONCRETE ABUTMENTS & WINGWALLS ON HELICAL PIER FOUNDATIONS FOR TWO (2) PROPOSED PEDESTRIAN BRIDGES (613585); WHITEMARSH VALLEY COUNTRY CLUB, LAFAYETTE, PA" (5 SHEETS, DATED 1/17/2020) BY CBC ENGINEERS

REFER ALSO TO CONTECH ENGINEERED SOLUTIONS SPECIFICATIONS AND PLANS PREPARED FOR WHITEMARSH VALLEY PEDESTRIAN BRIDGES (10 PAGES), DATED 12/10/2019, CONTECH BRIDGE #613858-10 & #613858-20

**REPLACEMENT BRIDGES #4B & #5**



REVISION DATE:	DESCRIPTION:

		<b>EXISTING FEATURES &amp; PREPARED FOR PROJECT AREA PLAN</b> WHITEMARSH VALLEY COUNTRY CLUB SITUATE WHITEMARSH TOWNSHIP MONTGOMERY COUNTY PENNSYLVANIA
DATE: JANUARY 20, 2020 MANAGER: ETE DRAWN BY: ETE SCALE: 1" = 120' SHEET: 1 OF 3		

	Land Use Consultants Estelle T. Eberhardt MENTUS INCORPORATED
--	---

**LEGEND**

EXISTING STORM SEWER	---
PROPOSED STORM SEWER	---
EXISTING SANITARY SEWER	---
PROPOSED SANITARY SEWER	---
PROPOSED SANITARY SEWER FORCE MAIN	S---
EXISTING WATER LINE	W---
PROPOSED WATER LINE	W---
EXISTING CONTOUR	84
PROPOSED CONTOUR	80
POSITIVE DRAINAGE INDICATOR	X
EXISTING ELEV.	(331.68) OR 331.68
PROPOSED ELEV.	334.50

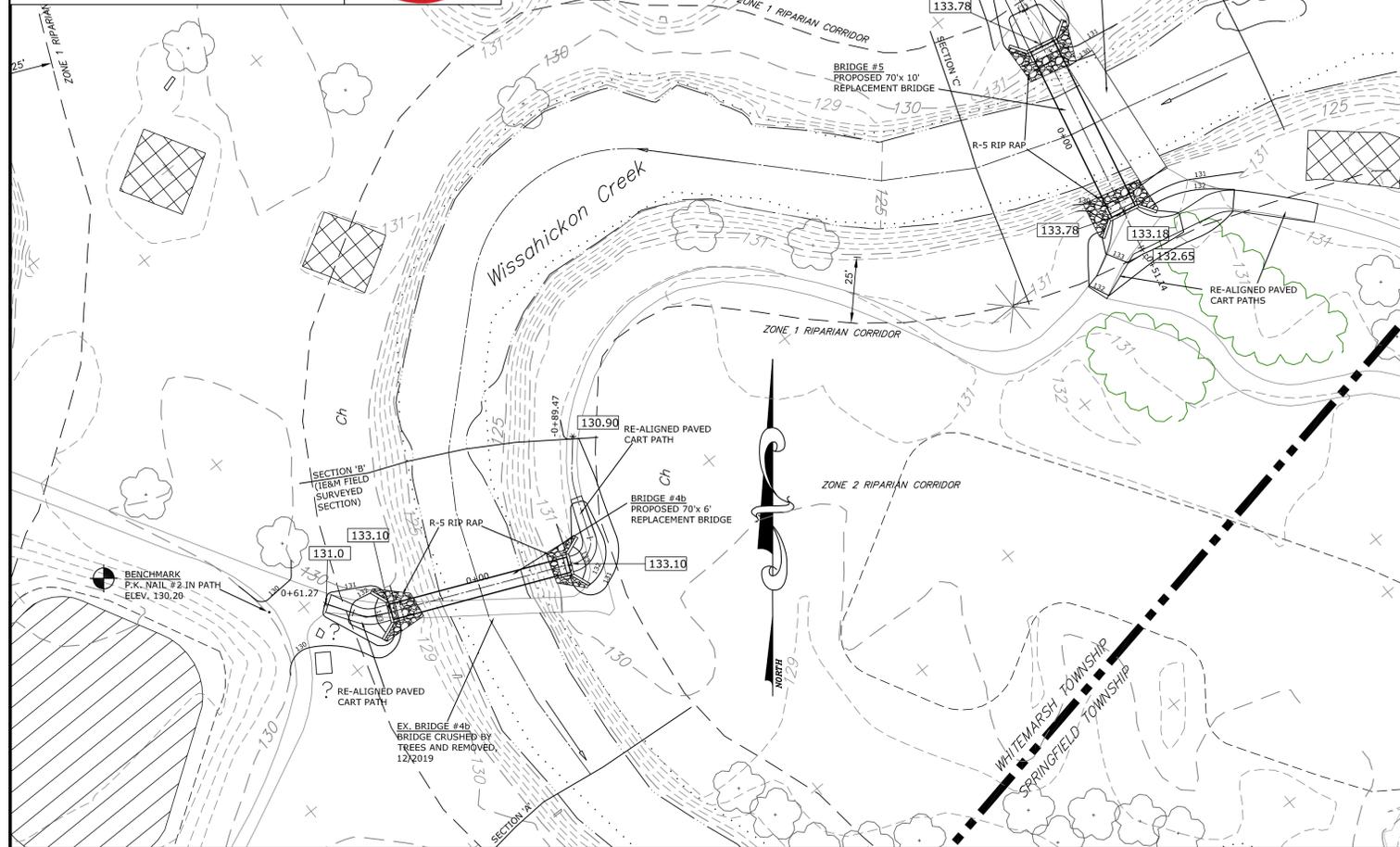
**USDA SOIL LEGEND**  
 Ch - CODORUS SILT LOAM  
 W - WATER

**STOP-CALL BEFORE YOU DIG!**

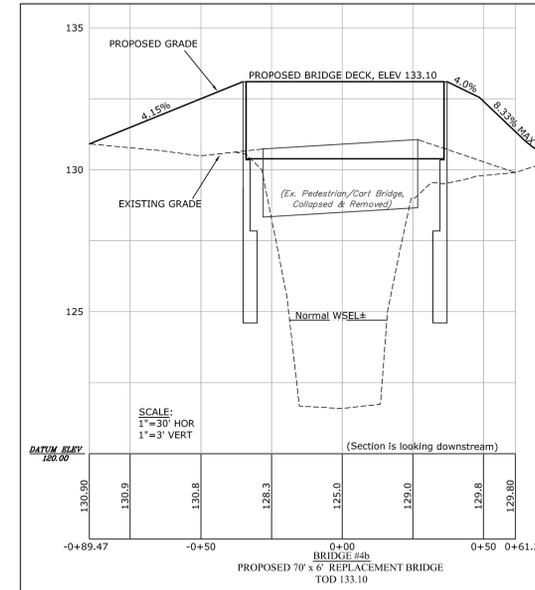
LOCATION OF EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM EXISTING RECORDS AND/OR ABOVE-GROUND INSPECTION OF THE SITE. COMPLETENESS OR ACCURACY OF LOCATION AND DEPTH CANNOT BE GUARANTEED. CONTRACTOR MUST VERIFY LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES AND FACILITIES BEFORE START OF WORK BY CALLING PA. ONE CALL SYSTEM THREE DAYS PRIOR TO EXCAVATION. REFERENCE PENNSYLVANIA ACT 287 AS AMENDED BY ACT 181 (2006). TELE. #: 1-800-242-1776 OR 811.



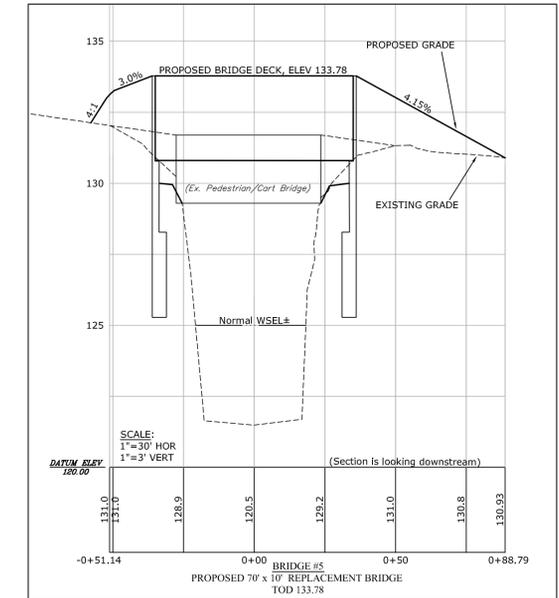
WORK LOCATION NO.:



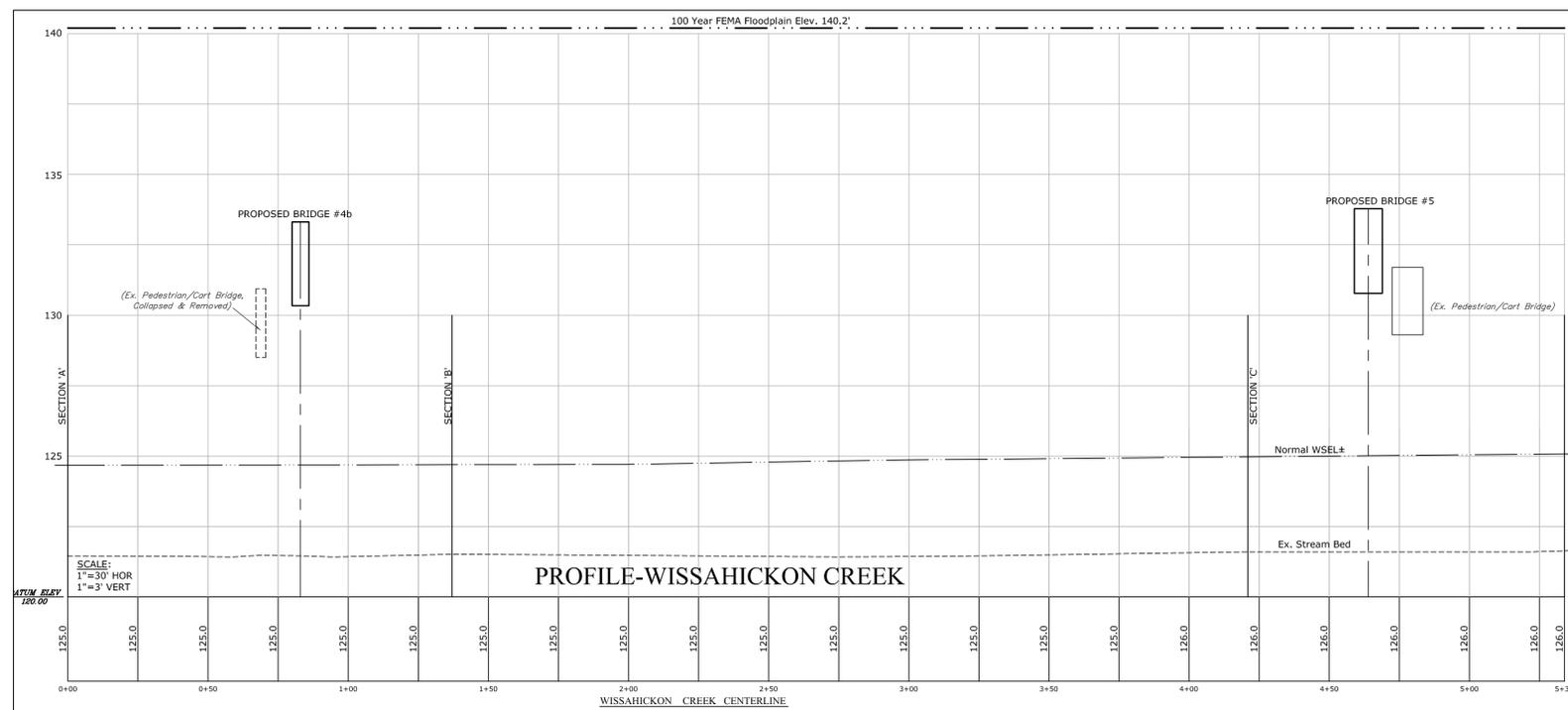
PLAN VIEW



SECTION-BRIDGE #4b



SECTION-BRIDGE #5



PROFILE-WISSAHICKON CREEK

**LEGEND**

- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING SANITARY SEWER
- PROPOSED SANITARY SEWER
- PROPOSED SANITARY SEWER FORCE MAIN
- EXISTING WATER LINE
- PROPOSED WATER LINE
- EXISTING CONTOUR
- PROPOSED CONTOUR
- POSITIVE DRAINAGE INDICATOR
- EXISTING ELEV. (333.68) OR 333.68
- PROPOSED ELEV. 334.50

**REPLACEMENT BRIDGES #4B & #5**



**NOTE:**

1. REFER TO SPECIFICATIONS & PLANS TITLED 'CONTECH ENGINEERED SOLUTION LLC DESIGN OF CONCRETE ABUTMENTS & WINGWALLS ON HELICAL PIER FOUNDATIONS FOR TWO (2) PROPOSED PEDESTRIAN BRIDGES (613585); WHITEMARSH VALLEY COUNTRY CLUB, LAFAYETTE, PA' (5 SHEETS, DATED 1/17/2020) BY CBC ENGINEERS
2. REFER ALSO TO CONTECH ENGINEERED SOLUTIONS SPECIFICATIONS AND PLANS PREPARED FOR WHITEMARSH VALLEY PEDESTRIAN BRIDGES (10 PAGES), DATED 12/10/2019, CONTECH BRIDGE #613858-10 & #613858-20

REVISION DATE:		DESCRIPTION:	
		<b>SITE PLAN &amp; CROSS SECTIONS</b> PREPARED FOR WHITEMARSH VALLEY COUNTRY CLUB SITUATE WHITEMARSH TOWNSHIP MONTGOMERY COUNTY PENNSYLVANIA	
DATE: JANUARY 20, 2020			
MANAGER: ETE	JOB NUMB: 19-51	Land Use Consultants Land Planning • Engineering • Landscape Architecture • Land Surveying Suite Three 2171 Gayville Pike Pottsville, PA 18673 717-541-4626 215-541-4627 (fax) E-Mail: info@EANDM.com	
DRAWN BY: ETE	FILE NAME: 19-51BASE		
SCALE: 1" = 30'	SHEET: 2 OF 3		

