

Design Calculations

Design Input:

Capacity requirements

number of lots	1
bedrooms per lot	9
use rate per bedroom	150 gpd

Drainfield Requirements

Application Rate	1.2 gpd/sq ft
Trench width	3 ft
trench gravel depth	4 ft
number of trenches	4
trench spacing center-center	14 ft

Tanks and Capacities

BAT tank	1,000	gallons
2nd settling tank	NA	gallons
Equalization Tank	500	gallons
pump tank size	2,000	gallons

Distribution system

number of cells	1
trenches first system	4
lateral length per pump	164.4 ft
ID 1.5" SCH 40 PVC	1.59 inches
Max. Manifold length	280 ft
ID 2.0" SCH 40 PVC	2.047 inches

Static Hydraulic Profile

Ground Elev. At BAT tank	443.90 ft
Tank #1 invert in Cover	440.60 ft
Tank #1 top	2.30 ft
Fall in tanks	0.33 ft
Fall between tanks	0.10 ft
Ground Elev. at pump tank	444.00 ft
Pump Tank invert in inv. into pump tank to top	440.17 ft
Pump Tank top	0.84 ft
Pump Block Height	441.01 ft
Height of Intake	0.16 ft
Highest lateral	0.35 ft

Perforation Design:

Size of Perforation	5/16 inches
Design Separation	6.50 ft
Use Perforations	5
Perforations per field	20

Dosing volume, flow rates and Pressures

lateral flow rate per pump	32.57 gpm
Friction (C) for PVC	150
Miscellaneous Losses	0 ft
Estimated Run Time	4.00 Min.
Cells in simultaneous use	1
Pump tank Volume	58.08 Gal/in

Calculations:

Max. Daily Flow	1350 gpd
Average Daily Flow	675 gpd
Maximum Daily Flow	0.94 gpm
Average Daily Flow	0.47 gpm

Standard Trench Length	375.00 ft
Deep Trench Conversion Factor	41.67 %
Deep Trench Length for MDF	156.2625 ft
total trench length for 100% capacity	156.2625 ft
individual trench length	39.1 ft
Lateral Length	35.10 ft

minimum req. area	1875.15 sf
req. capacity (1125+(0.75*MDF))	2137.5 gal.
design settling capacity	NA gal.
min. pump tank capacity (ADF)	811 gal.

Total Number of Pumps	1
laterals served by pump	4
Vol./100 ft 1.5" SCH 40	10.6 gal.
Vol. of laterals served	17.4 gal.
Vol./100 ft 2.0" SCH 40	17.4 gal.
Max. Main volume	48.7 gal.

Tank #1 effluent elev	440.27 ft
Pump Tank effluent elev	440.17 ft
Invert of pump tank	435.92 ft
Inside Top of Tank	440.59
Pump Elevation	436.08 ft
pump intake elev.	436.43 ft

Distal Pressure = Flow	2.0 ft
Perforations per Lateral	1.63 gpm
Perforation Actual Spacing	6.02
Flow rate	7.82 ft
Manifold Velocity	32.57 gpm
Lateral Velocity	3.17 fps
Lateral Velocity	1.32 fps

Static Head	27.08 ft Cell 1
Friction Head	5.79 ft Cell 1
Distal Head	2 ft
Max. Total Dynamic Head	34.87 ft
Estimated Dose (5xLateral+1xMain) Vol.	135.85 gal.
Min. Runtime	6.91 min.
Minimum Dose Volume	225.00 gal.
Average Doses	3.00 per day

Tank and Float Design:

Ground over Tank =	444.00 ft
Top of Tank =	441.01 ft
Invert of Tank =	435.92 ft
Pump Block =	0.16 ft
Water End and Motor =	1.03 ft

Inside Tank Dimensions	
Height =	4.67 ft
Width =	5.58 ft
Length =	13.08 ft
Number of Tanks =	1

minimum Pump off =	437.12 ft
Pump Off Float =	437.12 ft

Dose =	30.08 cf
Area of Pit	72.99 sf

Use one 2,000 gallon pump tank

Pump on dist. =	0.41 ft
Pump on Elev. =	437.53 ft

Distance between Pump on and Highwater Alarm =	0.5 ft
Highwater Alarm Elevation =	438.03 ft

High Alarm to Tank Inside top =	2.56
Area of Pump & Eq. tanks =	72.99
Volume Above Alarm Float to Inlet =	186.93 cf or
One Day Flow =	1398 gallons

Pump Requirements:

Performance =	32.57 gpm
Head of Water =	34.87 feet of head

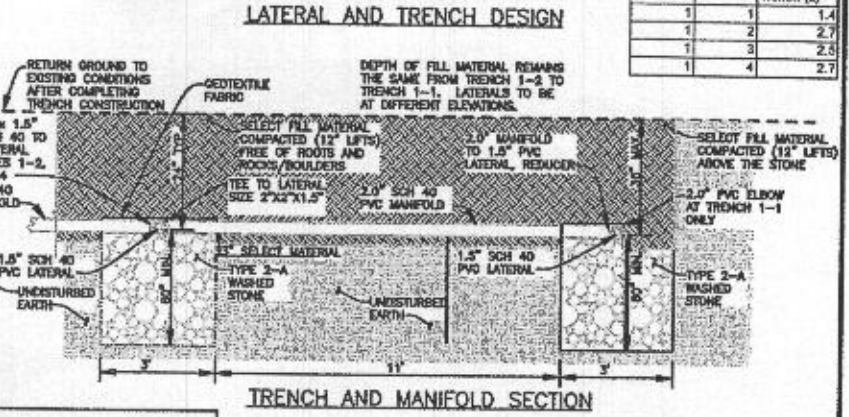
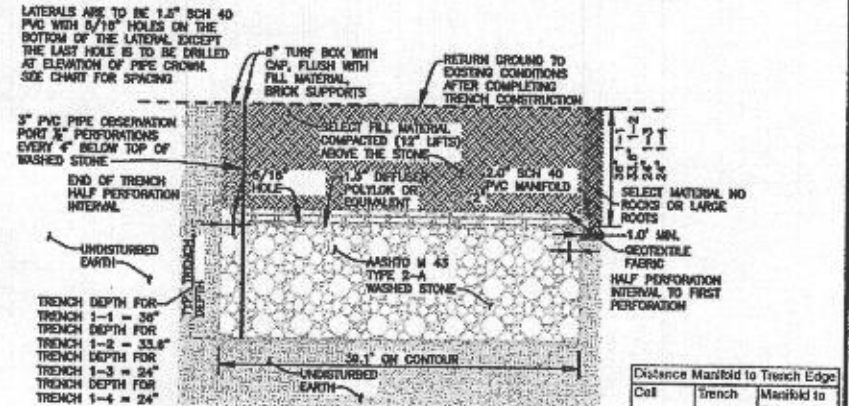
Pump Selection: Zoeller Pump BN140
1 horse power 115 Volts Single Phase

Cell	Trench	Pipe Inv. Elev.	Trench Bottom Elev.	Highest Ground Over	Lowest Ground Over	Lateral Pressure Head (ft)	Trench Length (ft)	Number of Perforations	Flow per Perforation (gpm)	Flow per Lateral (gpm)	Flow Differential
1	1	464.2	459.8	457.8	467.8	2.00	39.1	5	1.63	8.14	0.0%
	2	464.2	459.6	467.6	467.6	2.00	39.1	5	1.63	8.14	0.0%
	3	464.2	458.5	466.5	466.5	2.00	39.1	5	1.63	8.14	0.0%
	4	464.2	458.2	466.2	466.2	2.00	39.1	5	1.63	8.14	0.0%

Perforation Diameter =	5/16 inches	Target Flow =	8.14 gpm
Depth To Effective Sidewall		Depth to Inlet	
Trench 1	4.0 ft	8.0 ft	3.5 ft
Trench 2	4.0 ft	8.0 ft	3.4 ft
Trench 3	4.0 ft	8.0 ft	2.3 ft
Trench 4	4.0 ft	8.0 ft	2.0 ft

Cell	Trench	Number of Perforations	Manifold to Trench (ft)	Trench Length (ft)	Perforation Spacing (ft)	Dist. Manifold to First Perf. (ft)	Dist. Last Perf. to Trench Edge	Lateral Length (ft)
1	1	5	1.4	39.1	7.82	5.31	3.91	36.69
	2	5	2.7	39.1	7.82	6.61	3.91	37.69
	3	5	2.5	39.1	7.82	6.41	3.91	37.69
	4	5	2.7	39.1	7.82	6.61	3.91	37.69

Cell	Trench	Pipe Elev.	Beginning Manifold Loss	Manifold Bend 90D	Manifold Bends 45D	Manifold Length	Manifold velocity	Manifold Tee Loss	Delta Loss Manifold	Total Manifold Loss	Lateral 90 degree side tee loss	Sudden Reduction Loss	Lateral Bends 45 deg. Loss	Lateral Length to first perf. Loss	Lateral Loss Summation	Total Loss to First Perf.	Total Design Head (ft)	Lateral Pressure Head (ft)	Flow per Lateral (gpm)
1	4	464.2	0.00	1	4	263	32.6	0	5.16	5.16	0.01	0.00	0.00	0.03	0.05	5.21	34.29	2.00	8.14
	3	464.2	5.16	0	0	3	24.4	1	0.05	5.21	0.01	0.00	0.00	0.03	0.05	5.25	34.33	2.00	8.14
	2	464.2	5.21	0	0	11	16.3	1	0.07	5.28	0.01	0.00	0.00	0.03	0.05	5.32	34.40	2.00	8.14
	1	464.2	5.28	0	0	3	8.1	1	0.00	5.28	0.01	0.00	0.00	0.03	0.04	5.32	34.40	2.00	8.14



Cell	Trench	Manifold to Trench (ft)
1	1	1.4
	2	2.7
	3	2.5
	4	2.7

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 45577, Expiration Date, 06-08-2020.



BENCHMARK ENGINEERING, INC.
8480 BALTIMORE NATIONAL PIKE SUITE 315
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WWW.BEI-CVLENGINEERING.COM

SEE MANUFACTURERS SPECIFICATIONS FOR DETAILS.
WWW.MAYERPRECAST.COM
EQUIVALENT FROM OTHER MANUFACTURERS CAN BE SUBSTITUTED.

THIS PLAN IS FOR SEPTIC DESIGN ONLY

SIGNATURE AND SEAL ARE FOR SEPTIC PROFILE AND CALCULATIONS ONLY, TANK AND DETAILS WERE NOT DESIGNED OR REVIEWED BY THE ENGINEER:

BUILDER:
COMPETENT BUILDERS, INC.
HARI RAJ SINGH
FULTON, MD 20759
443-839-1930

OWNER:
HAJEET S. GILL
RAJDEEP K. GILL
8111 CHAPEL MANOR LANE
ELLICOTT CITY, MD 21043
PHONE: 443-509-4019

PROJECT: AJ GILL PROPERTY
JOHNS HOPKINS ROAD

LOCATION: TAX MAP: 41, GRID: 9, PARCEL: 259
ZONED: RR-DEO
5TH ELECTION DISTRICT
HOWARD COUNTY, MD, TAX ID #05-351731

TITLE: BAT SITE PLAN

HOUSE TYPE: CUSTOM

DATE: DECEMBER, 2019 **PROJECT NO.** 2627

SCALE: AS SHOWN **DRAWING** 4 **OF** 7

Trusted. Tested. Tough.™

Product information presented here reflects conditions at time of publication. Consult factory regarding discrepancies or inconsistencies.



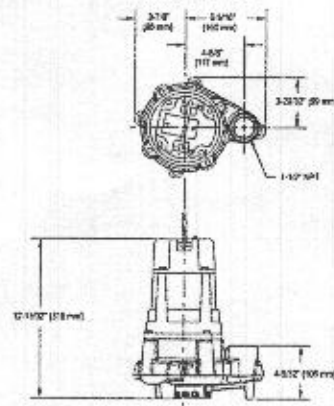
SECTION: 2.15.070
FM2783
0419
Supersedes
0017

TECHNICAL DATA SHEET
FLOW-MATE SERIES
Models 140/4140, 145/4145 Effluent/Dewatering Pumps

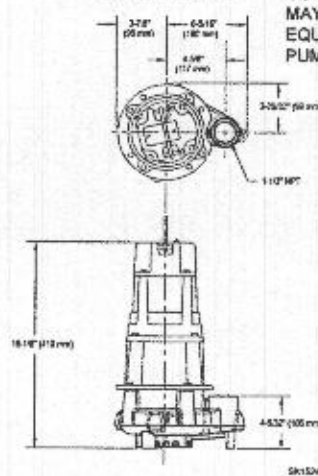
PRODUCT SPECIFICATIONS

MOTOR	Horse Power	3/4 - 1
	Voltage	115 or 230
	Phase	1 Ph
	Hz	60 Hz
	RPM	3450
PUMP	Type	Permanent split capacitor
	Insulation	Class B
	Amps	6.0 - 13.0
	Operation	Automatic or nonautomatic
	Discharge Size	1-1/2" NPT
MATERIALS	Solids Handling	1/2" (12 mm), 3/4" (19 mm) spherical solids
	Cord Length	20' (6 m)
	Cord Type	UL listed, neoprene cord
	Max. Head	50' (15.2 m) or 74' (22.6 m)
	Max. Flow Rate	86 GPM (326 LPM) or 61 GPM (232 LPM)
	Max. Operating Temp.	130 °F (54 °C)
	Cooling	Oil filled
	Motor Protection	Auto reset thermal overload
	Cap	Cast iron
	Motor Housing	Cast iron
	Pump Housing	Cast iron
	Base	Cast iron
Upper Bearing	Sleeve bearing	
Lower Bearing	Ball bearing	
Mechanical Seals	Carbon and ceramic	
Impeller Type	Single vane (145) or non-clogging vortex (140)	
Impeller	Engineered thermoplastic	
Hardware	Stainless steel	
Motor Shaft	JIS S45C steel	
Gasket	Neoprene	

SINGLE SEAL



DOUBLE SEAL



NOTE: See model comparison chart for specific details.



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TOTAL DYNAMIC HEAD
FLOW PER MINUTE

MODEL		140/4140		145/4145	
Feet	Meters	Gal.	Liters	Gal.	Liters
5	1.5	86	326	56	212
10	3.0	80	303	55	208
15	4.6	73	276	53	200
20	6.1	66	250	51	193
25	7.6	59	223	48	182
30	9.1	49	185	45	170
40	12.2	28	106	35	132
50	15.2	-	-	26	98
60	18.3	-	-	16	61

USE BN140.
CONTRACTOR
MAY USE
EQUIVALENT
PUMP

Model	MODEL COMPARISON										
	Seal	Mode	Volts	Ph	Amps	HP	Hz	Lbs	Kg	Simplex	Duplex
N140	Single	Non	115	1	12.0	1	60	46	21	1 or 2	3
E140	Single	Non	230	1	6.0	1	60	46	21	1 or 2	3
BN140	Single	Auto	115	1	12.0	1	60	47	21	*	---
BE140	Single	Auto	230	1	6.0	1	60	47	21	*	---
E145	Single	Non	230	1	6.0	3/4	60	46	21	1 or 2	3
N145	Single	Non	115	1	13.0	3/4	60	46	21	1 or 2	3
BN145	Single	Auto	115	1	13.0	3/4	60	48	22	*	---
N4140	Double	Non	115	1	12.0	1	60	65	29	*	---
E4140	Double	Non	230	1	6.0	1	60	65	29	1 or 2	3
BN4140	Double	Auto	115	1	12.0	1	60	66	30	*	---
BE4140	Double	Auto	230	1	6.0	1	60	66	30	*	---
N4145	Double	Non	115	1	13.0	3/4	60	64	29	1 or 2	3
BN4145	Double	Auto	115	1	13.0	3/4	60	64	29	*	---

* Single piggyback switch included.
BN and BE models include a 20' (6 m) piggyback variable level pump switch. Additional cord lengths are available in 15' (5 m), 25' (8 m), 35' (11 m) and 50' (15 m) cord length is for 230 V only.

SELECTION GUIDE

- For automatic, use single piggyback variable level float switch or double piggyback variable level float switch. Refer to FM0477.
- See FM1228 for correct model of simplex control panel.
- See FM0712 for correct model of duplex control panel.

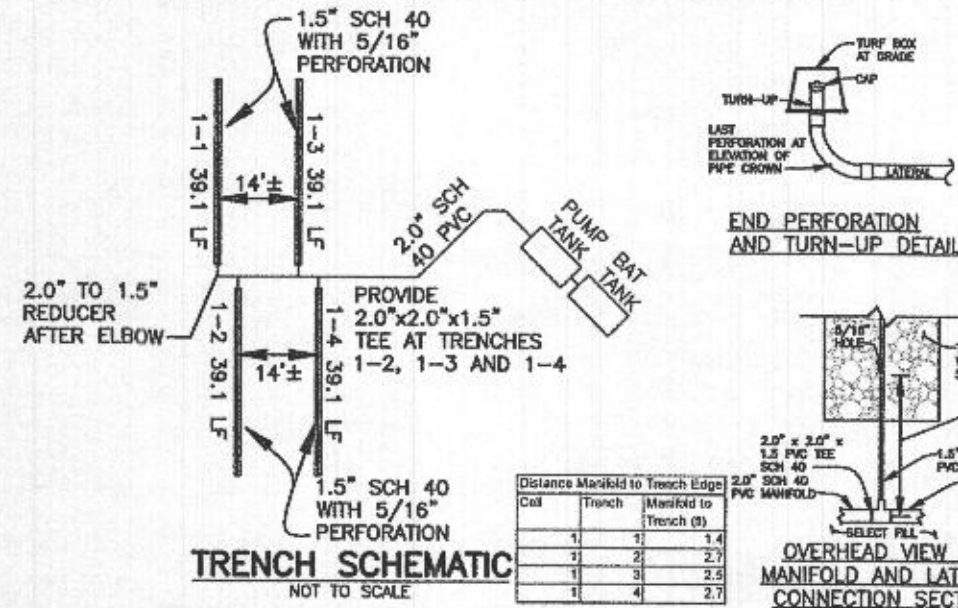
OPTIONAL PUMP STAND P/N 10-2421

- Reduces potential clogging by debris
 - Replaces rocks or bricks under the pump
 - Made of durable, noncorrosive ABS
 - Raises pump 2" (5 cm) off bottom of basin
 - Provides the ability to raise intake by adding sections of 1-1/2" or 2" (DN40 or DN50) PVC piping
 - Attaches securely to pump
 - Accommodates sump, dewatering and effluent applications
- NOTE: Make sure float is free from obstruction.

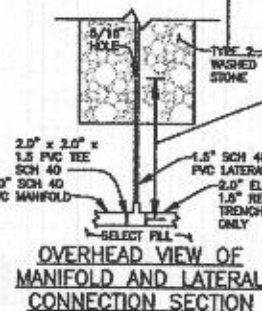


CAUTION All installation of controls, protection devices and wiring should be done by a qualified licensed electrician. All electrical and safety codes should be followed including the most recent National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).

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Cell	Trench	Manifold to Trench (ft)
1	1	1.4
1	2	2.7
1	3	2.9
1	4	2.7

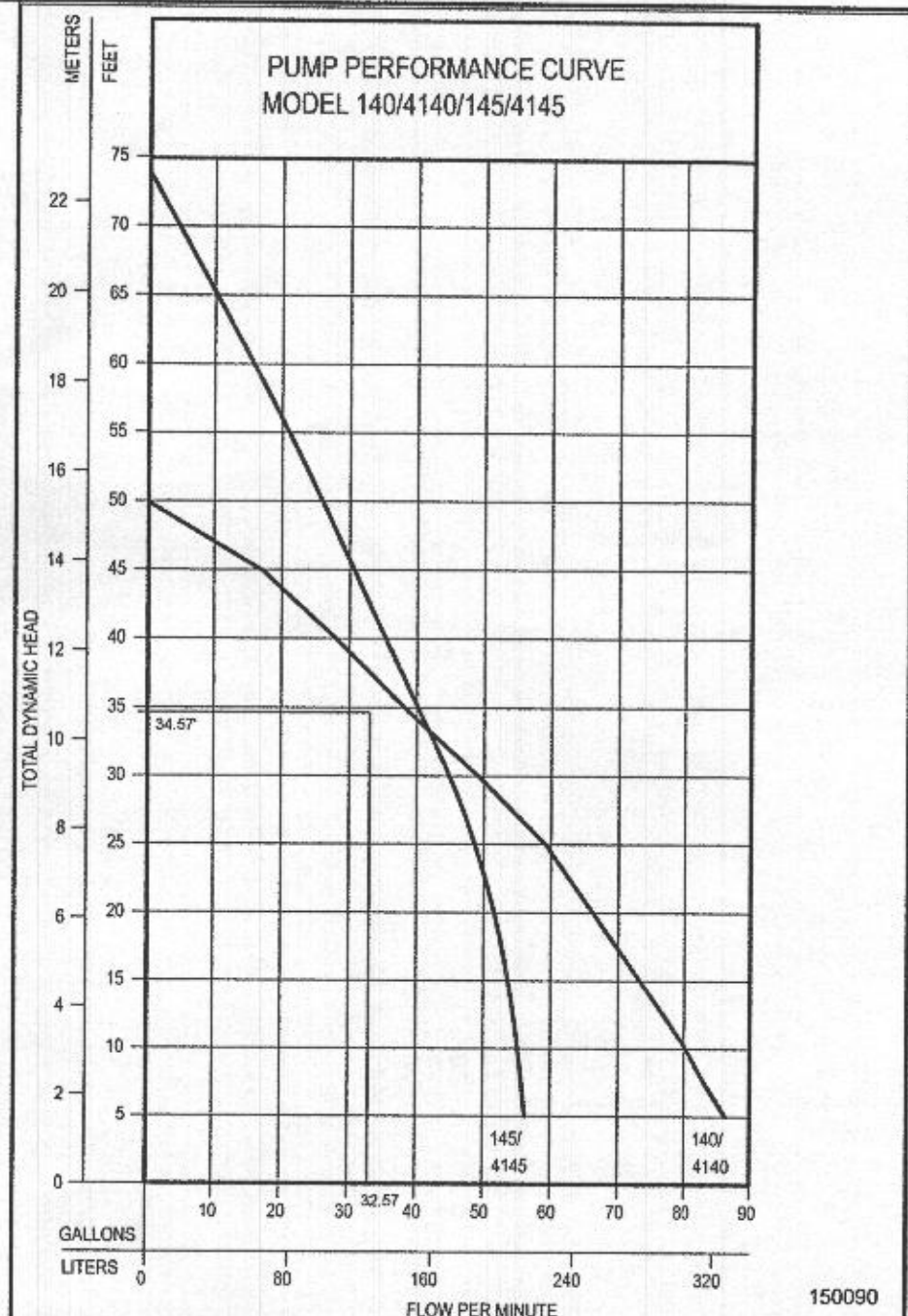


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BUILDER:
COMPETENT BUILDERS, INC.
HARI RAJ SINGH
FULTON, MD 20759
443-839-1930

OWNER:
HAJEET S. GILL
RAJDEEP K. GILL
8111 CHAPEL MANOR LANE
ELLCOTT CITY, MD 21043
PHONE: 443-509-4019

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 5577, Expiration Date: 06-08-2020.



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PROJECT: AJ GILL PROPERTY
JOHNS HOPKINS ROAD

LOCATION: TAX MAP: 41, GRID: 9, PARCEL: 259
ZONED: RR-DEO
5TH ELECTION DISTRICT
HOWARD COUNTY, MD, TAX ID #05-351731

TITLE: BAT SITE PLAN

HOUSE TYPE: CUSTOM

DATE: DECEMBER, 2019
PROJECT NO.: 2627

SCALE: AS SHOWN
DRAWING 5 OF 7

Friction Head
main

Friction Head = Head loss due to pipe friction

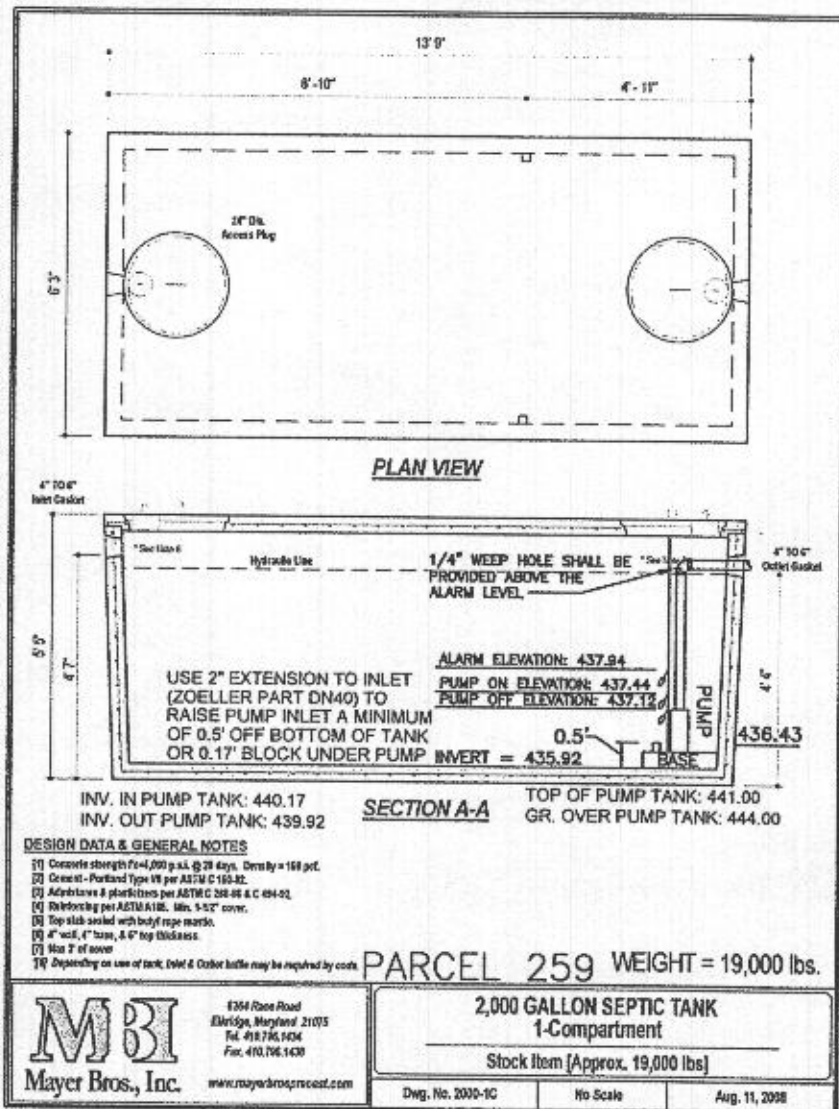
2.0" pipe = 280 feet

90° bends	1 loss for manifold bend	7.0 feet	per table 4.3
45° bends	4 loss for manifold bend	16.0 feet	per table 4.3
Str. Coupling	3 loss for straight tee	6.0 feet	per table 4.3
90 deg. Side tee	1 loss for tee bend	10.0 feet	per table 4.3 for smaller pipe
Sudden reduction	1 loss for reduction	1.0 feet	per Crane Co. technical paper
45° bends	0 loss for lateral bend	0.0 feet	per table 4.3
Gate Valve	0 loss for valve	0.0 feet	per table 4.3

Equivalent Manifold Length : 309.0 Friction loss = 5.57 feet

1.5" lateral 46.10 feet Friction loss = 0.22 feet

Total Friction Head = 5.79



BUILDER:
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PHONE: 443-509-4019

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Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 43577, Expiration Date: 06-08-2020.

John M. Carniel
1/17/20
PROFESSIONAL ENGINEER
No. 43577

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PROJECT: **AJ GILL PROPERTY
JOHNS HOPKINS ROAD**

LOCATION: TAX MAP: 41, GRID: 9, PARCEL: 259
ZONED: RR-DEO
5TH ELECTION DISTRICT
HOWARD COUNTY, MD, TAX ID #05-351731

TITLE: **BAT SITE PLAN**

HOUSE TYPE: **CUSTOM**

DATE: DECEMBER, 2019 PROJECT NO. 2627

SCALE: AS SHOWN DRAWING 6 OF 7

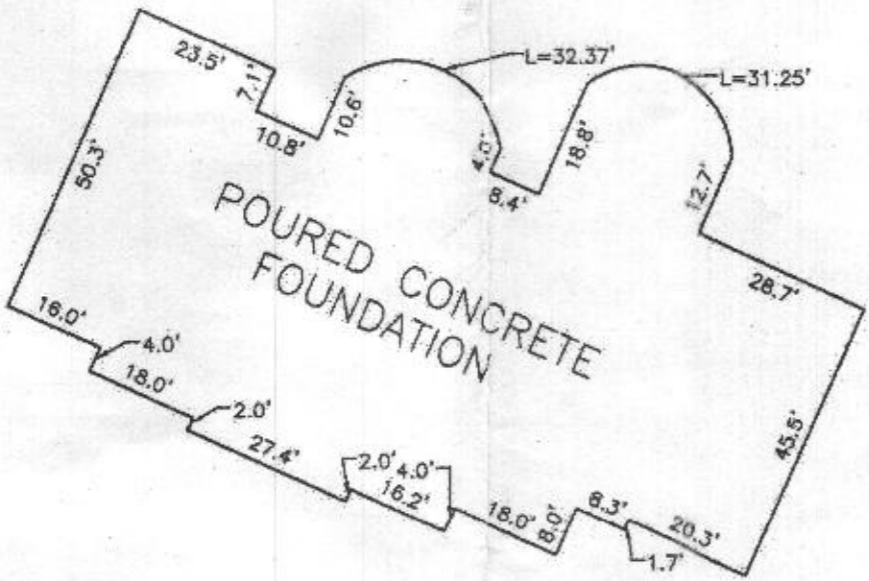
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**2,000 GALLON SEPTIC TANK
1-Compartment**
Stock Item (Approx. 19,000 lbs.)
Dwg. No. 2000-1C No Scale Aug. 11, 2008

SURVEYOR'S CERTIFICATE
 I HEREBY CERTIFY THAT THESE DOCUMENTS, WERE PREPARED BY ME OR UNDER MY RESPONSIBLE CHARGE, AND THAT I AM A DULY LICENSED PROFESSIONAL LAND SURVEYOR UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 21320, EXPIRATION DATE 1-7-2019 AND TO THE BEST OF MY PROFESSIONAL KNOWLEDGE, INFORMATION AND BELIEF, THAT THE DIMENSIONS OF THE BUILDING WALLS SHOWN HEREON ARE CORRECT; THAT THEY ARE BASED ON A FIELD SURVEY PERFORMED BY BENCHMARK ENGINEERING, INC. ON 10/01/2020.

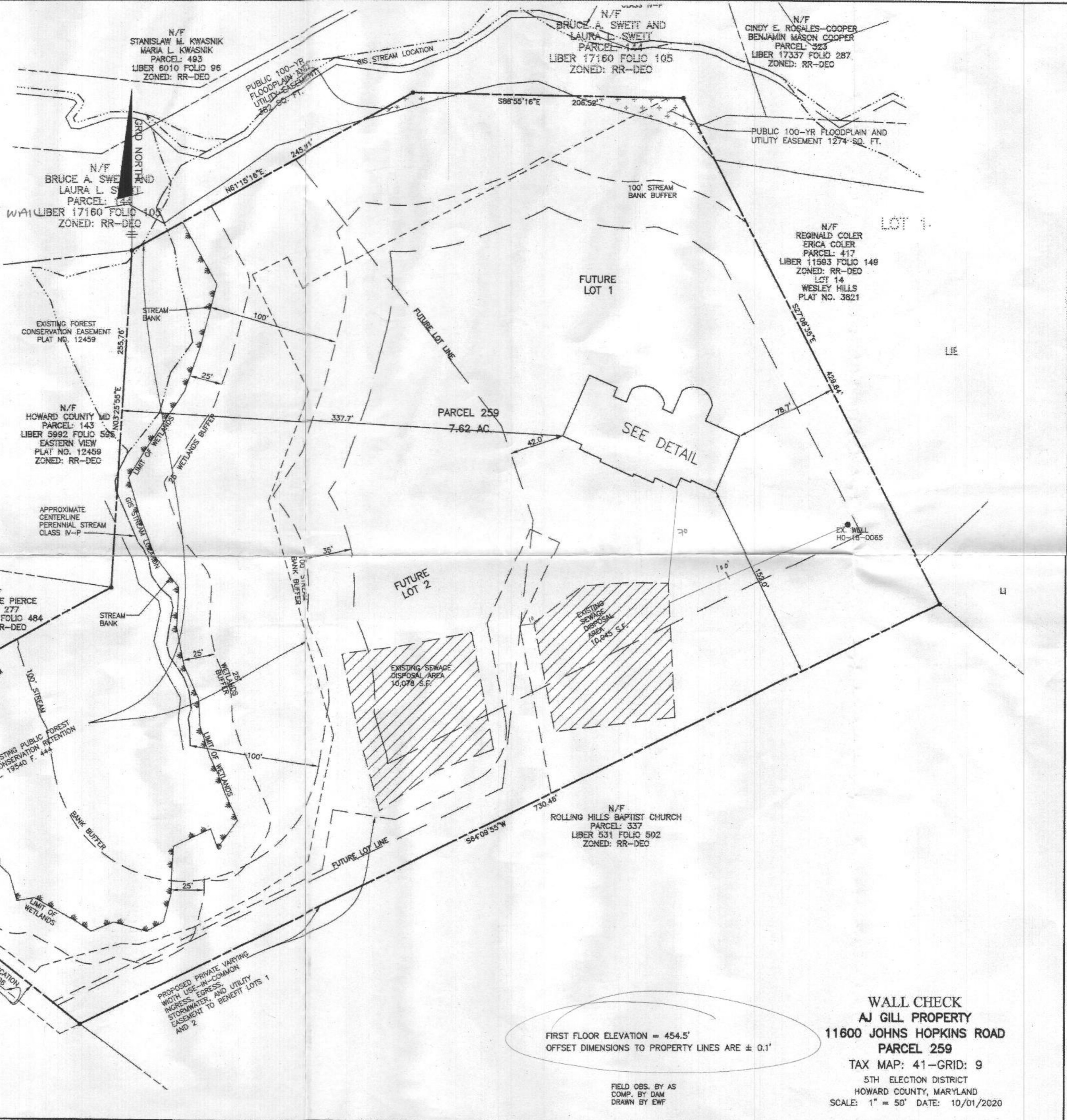
Donald A. Mason
 DONALD A. MASON
 PROFESSIONAL LAND SURVEYOR
 MARYLAND REG. NO. 21320
 FEMA FIRM No. 24027001450
 ZONE: X
 DATED: 11/6/2013

06/23/2021
 NEED TOP OF WALL
 ELEVATION
 NEED OSDS



FOUNDATION DETAIL
 SCALE: 1" = 30'

BENCHMARK
 ENGINEERING, INC.
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 ELICOTT CITY, MARYLAND 21043
 (P) 410-465-8105 A (F) 410-465-6844
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FIRST FLOOR ELEVATION = 454.5'
 OFFSET DIMENSIONS TO PROPERTY LINES ARE ± 0.1'

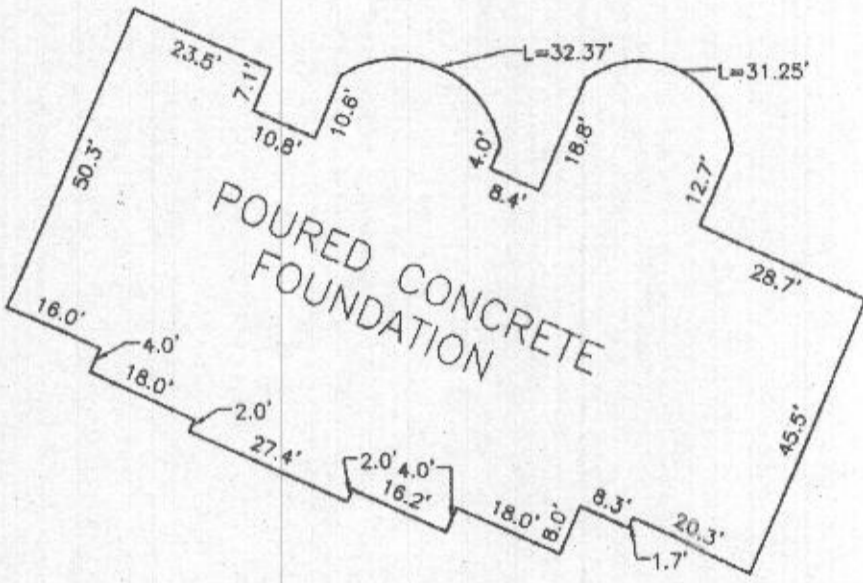
WALL CHECK
AJ GILL PROPERTY
11600 JOHNS HOPKINS ROAD
PARCEL 259
 TAX MAP: 41-GRID: 9
 5TH ELECTION DISTRICT
 HOWARD COUNTY, MARYLAND
 SCALE: 1" = 50' DATE: 10/01/2020

SURVEYOR'S CERTIFICATE

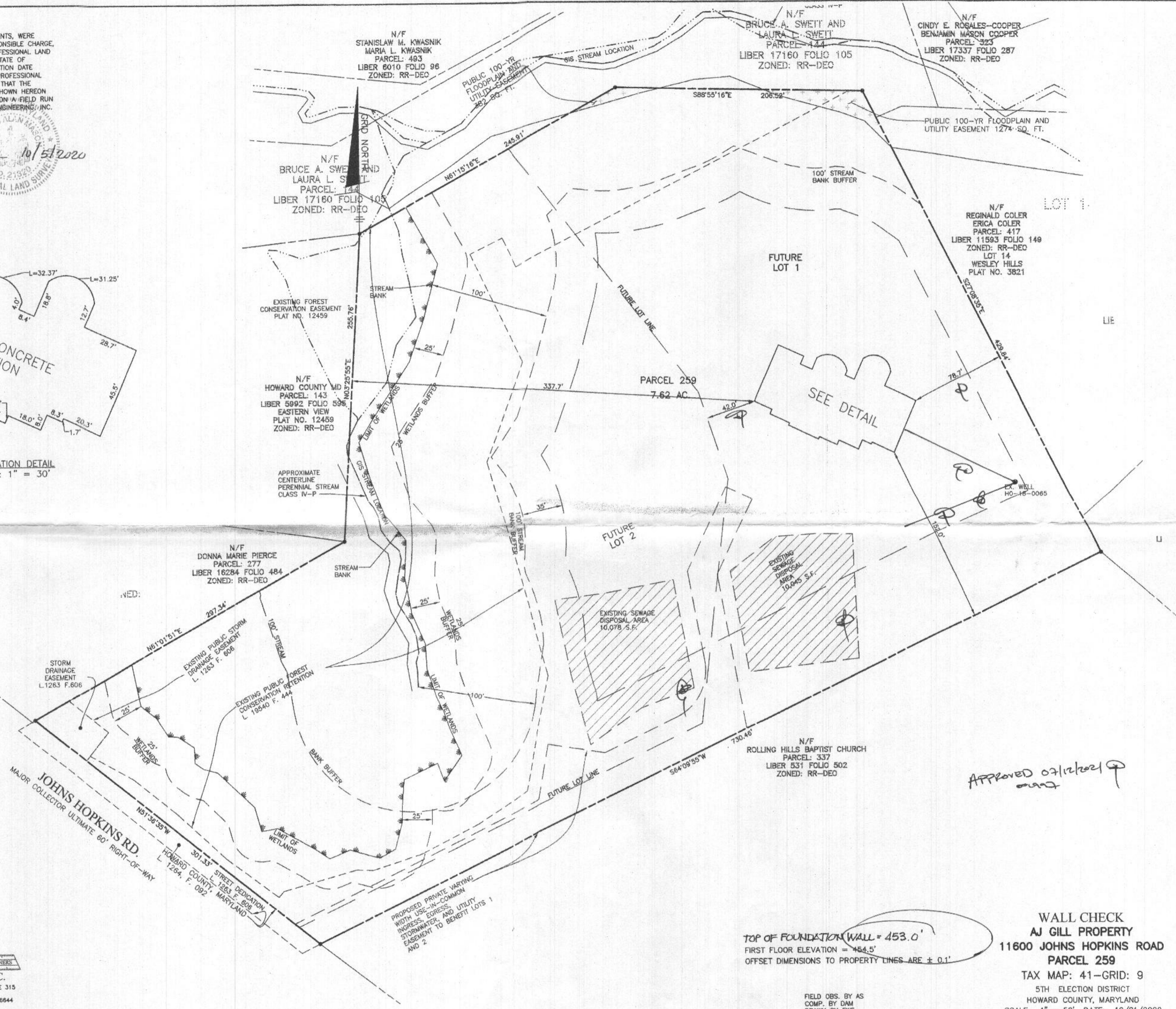
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Donald A. Mason
 DONALD A. MASON
 PROFESSIONAL LAND SURVEYOR
 MARYLAND REG. NO. 21320

FEMA FIRM No. 24027C0145D
 ZONE: X
 DATED: 11/6/2013



FOUNDATION DETAIL
 SCALE: 1" = 30'



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TOP OF FOUNDATION WALL = 453.0'
 FIRST FLOOR ELEVATION = 454.5'
 OFFSET DIMENSIONS TO PROPERTY LINES ARE ± 0.1'

Approved 07/12/2021

WALL CHECK
AJ GILL PROPERTY
11600 JOHNS HOPKINS ROAD
PARCEL 259
 TAX MAP: 41-GRID: 9
 5TH ELECTION DISTRICT
 HOWARD COUNTY, MARYLAND
 SCALE: 1" = 50' DATE: 10/01/2020

FIELD OBS. BY AS
 COMP. BY DAM
 DRAWN BY EWF

