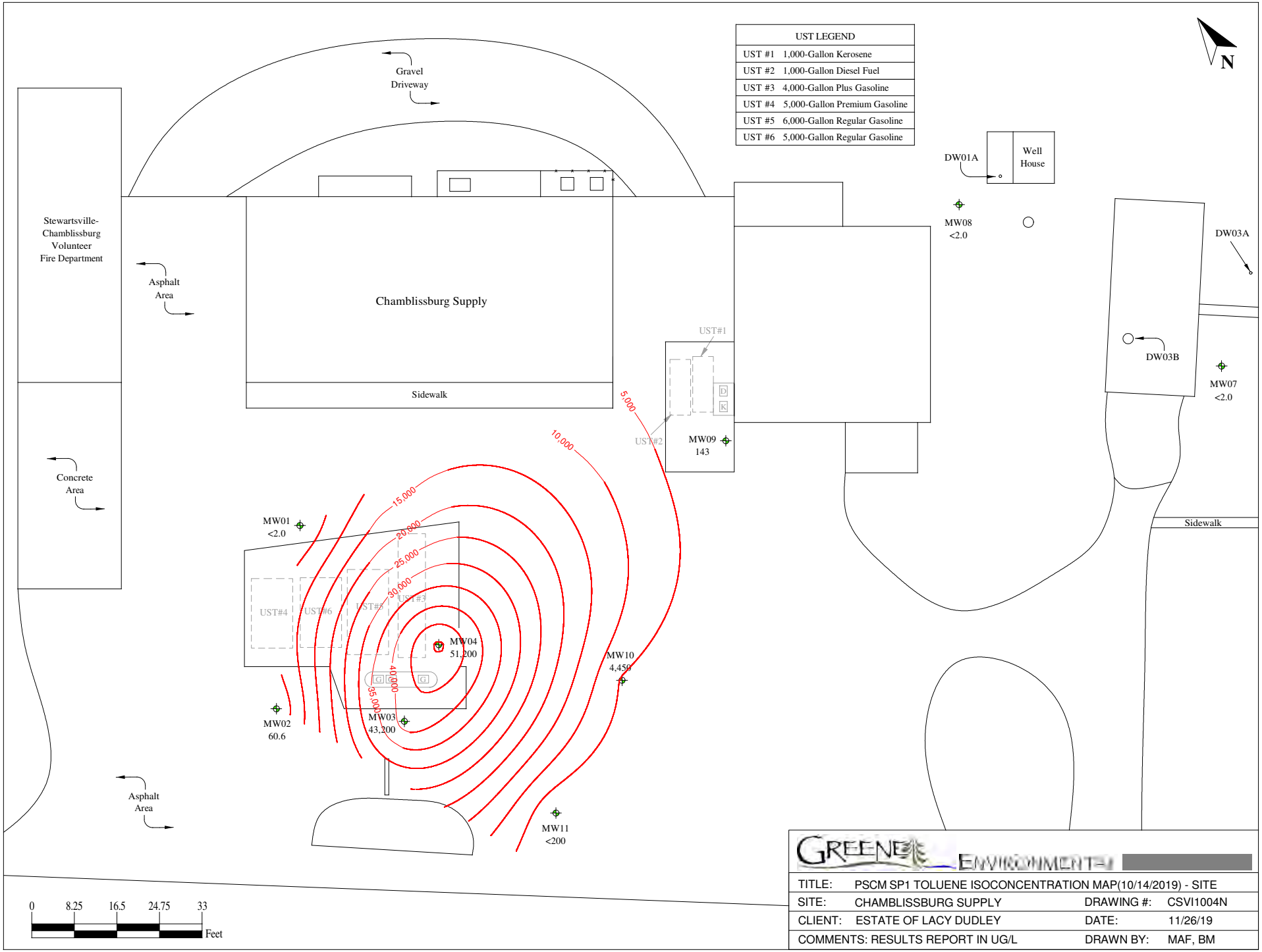
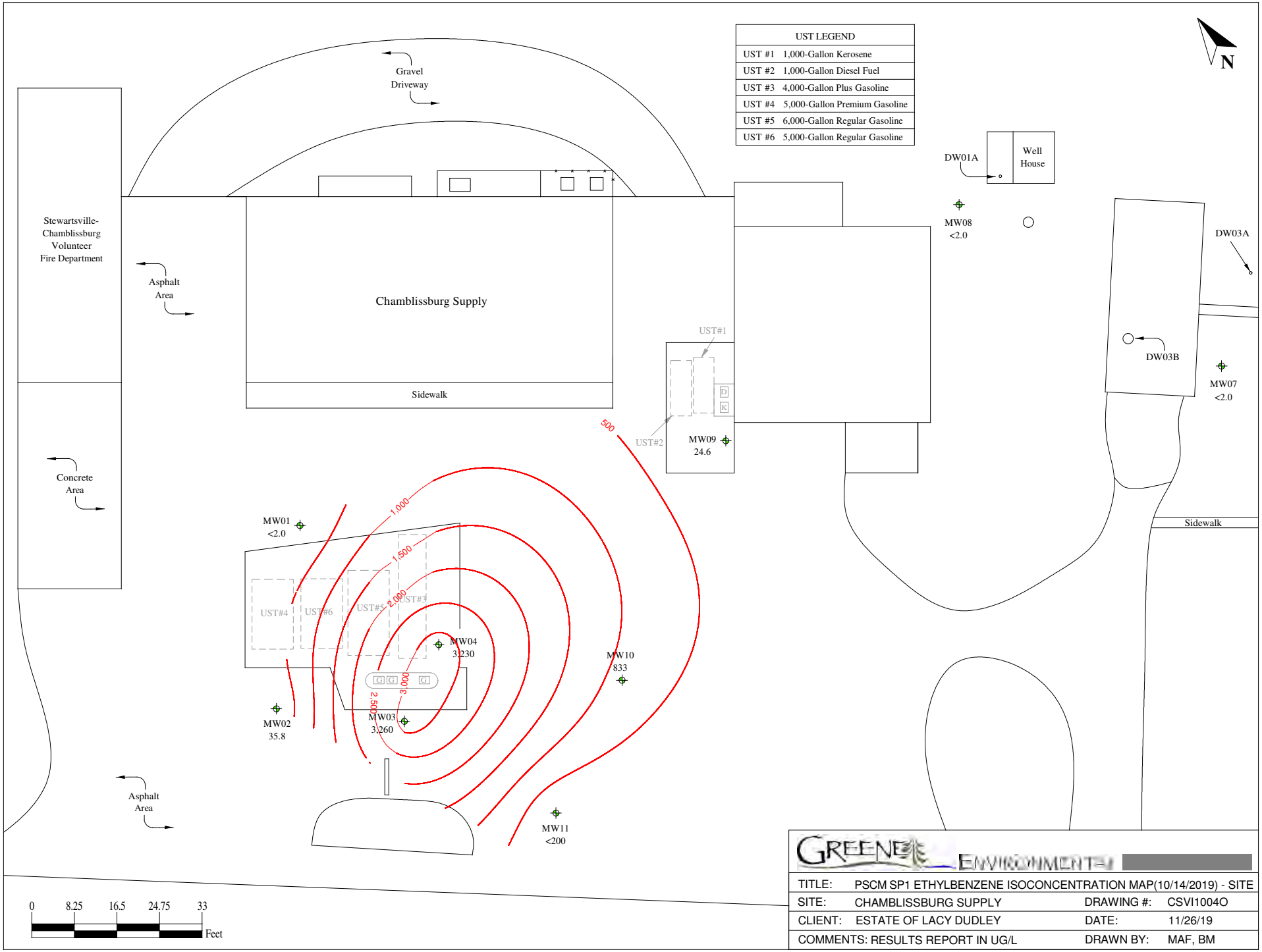
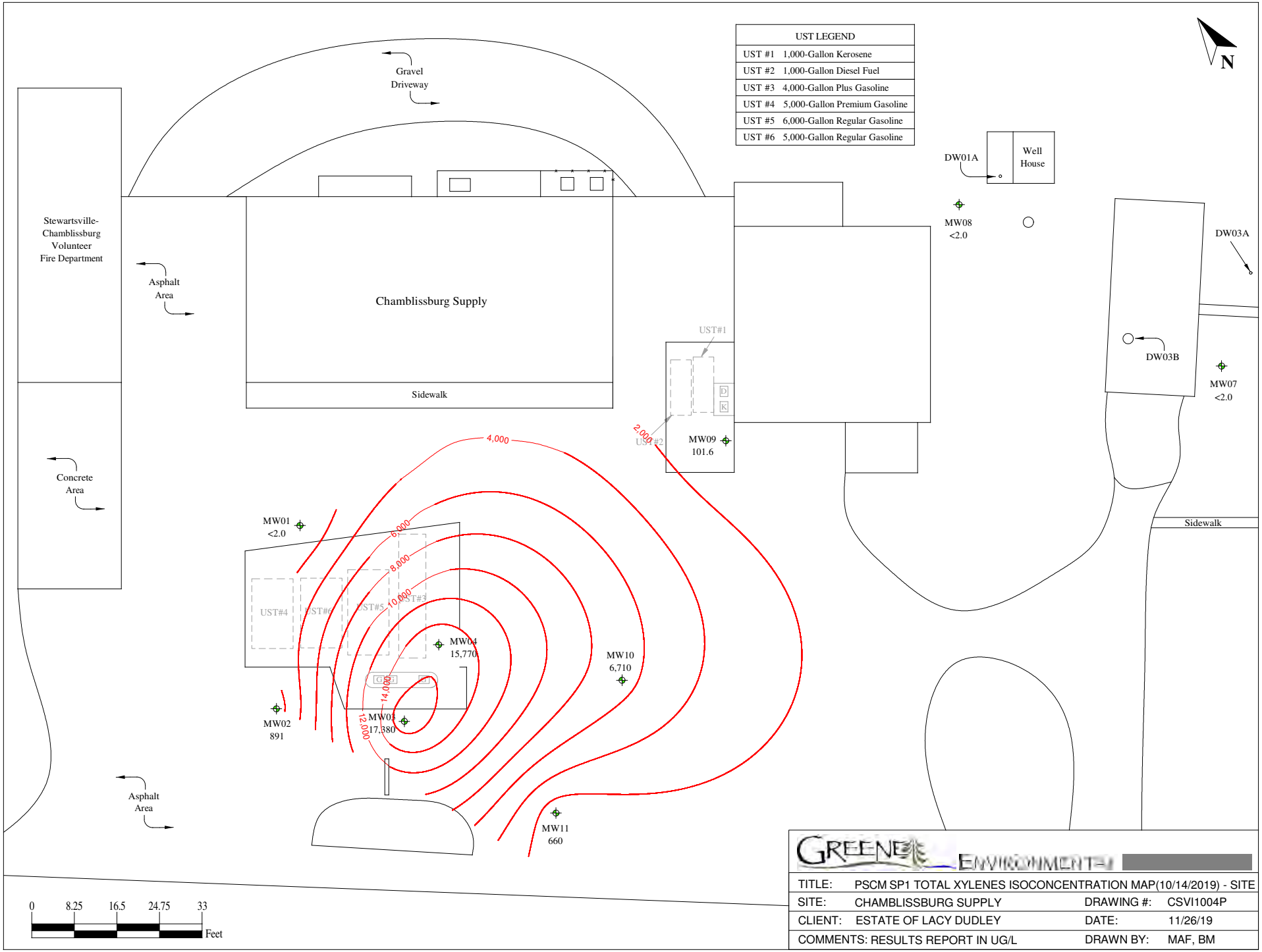
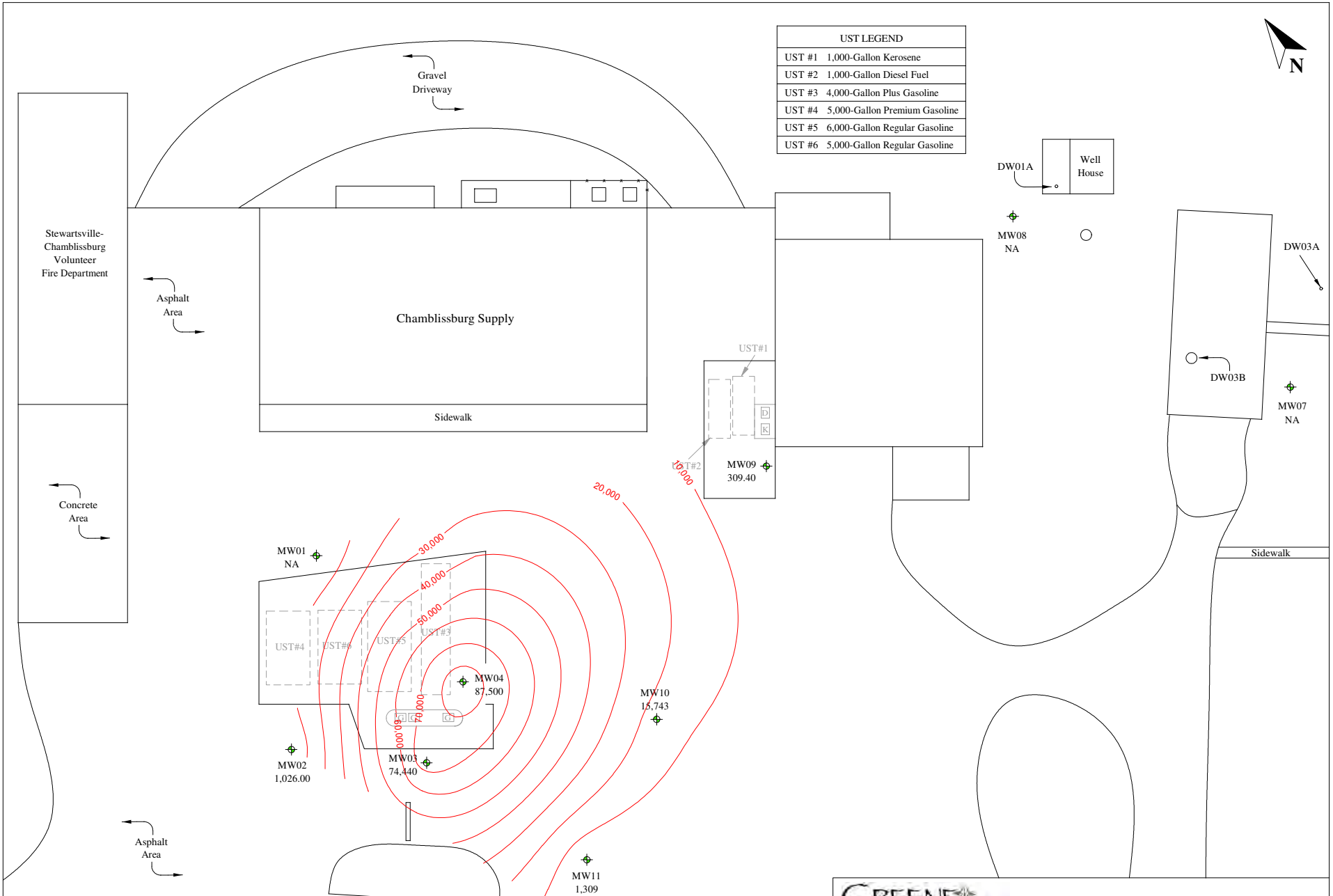

UST LEGEND
UST #1 1,000-Gallon Kerosene
UST #2 1,000-Gallon Diesel Fuel
UST #3 4,000-Gallon Plus Gasoline
UST #4 5,000-Gallon Premium Gasoline
UST #5 6,000-Gallon Regular Gasoline
UST #6 5,000-Gallon Regular Gasoline
N
Gravel Driveway
Stewartsville-Chamblissburg Volunteer Fire Department
Asphalt Area
Chamblissburg Supply
Sidewalk
Concrete Area
Asphalt Area
DW01A
Well House
MW08 <2.0
DW03A
DW03B
MW07 <2.0
Sidewalk
UST#1
UST#2
MW09 143
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
MW01 <2.0
UST#4
UST#6
UST#5
UST#3
MW04 51,200
MW10 4,450
MW02 60.6
MW03 43,200
MW11 <200
0 8.25 16.5 24.75 33
Feet
GREENE ENVIRONMENTAL
TITLE: PSCM SP1 TOLUENE ISOCONCENTRATION MAP(10/14/2019) - SITE
SITE: CHAMBLISSBURG SUPPLY
DRAWING #: CSVI1004N
CLIENT: ESTATE OF LACY DUDLEY
DATE: 11/26/19
COMMENTS: RESULTS REPORT IN UG/L
DRAWN BY: MAF, BM

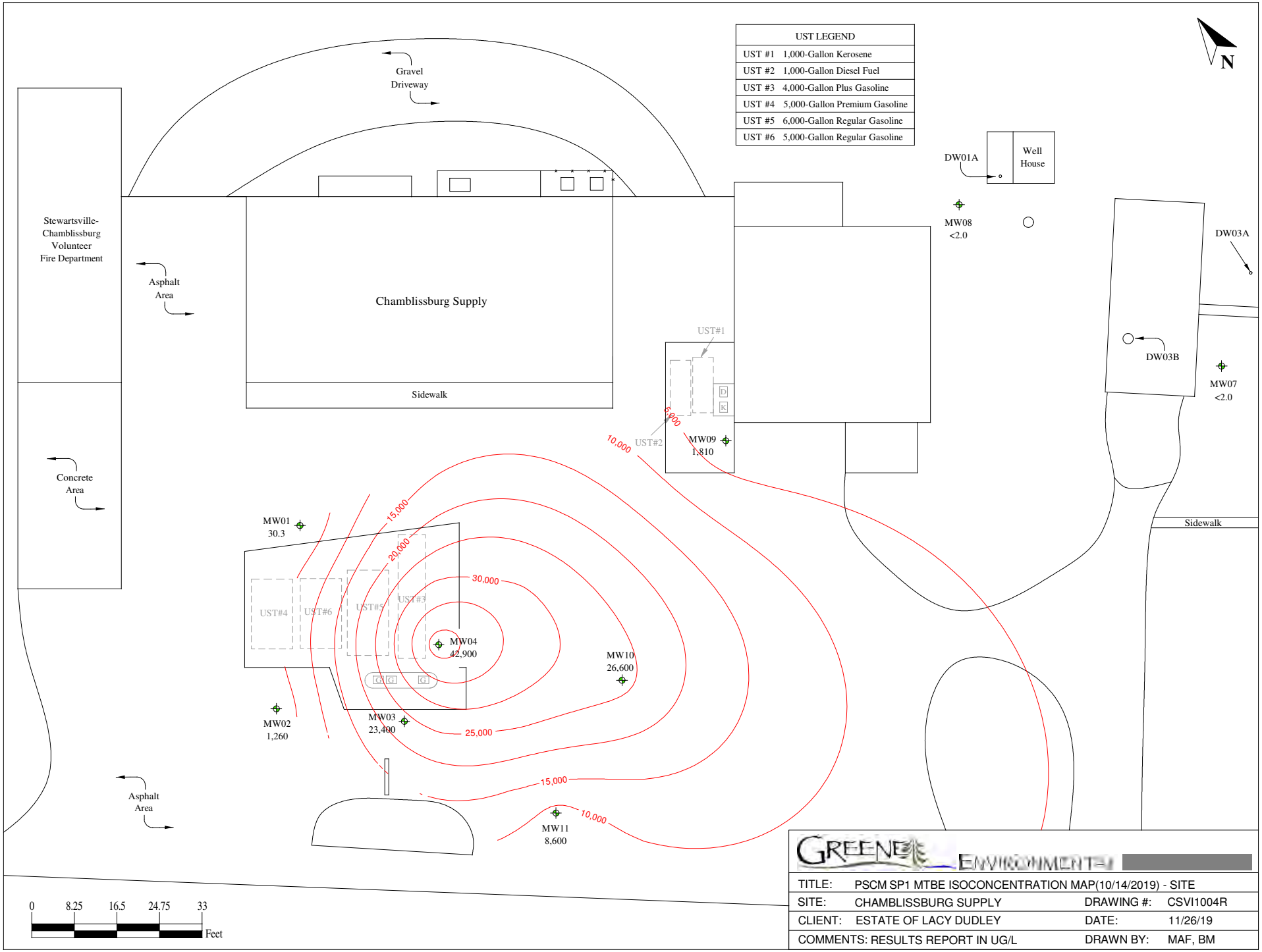

UST LEGEND
UST #1 1,000-Gallon Kerosene
UST #2 1,000-Gallon Diesel Fuel
UST #3 4,000-Gallon Plus Gasoline
UST #4 5,000-Gallon Premium Gasoline
UST #5 6,000-Gallon Regular Gasoline
UST #6 5,000-Gallon Regular Gasoline
N
Gravel Driveway
Stewartsville-Chamblissburg Volunteer Fire Department
Asphalt Area
Chamblissburg Supply
Sidewalk
Concrete Area
Asphalt Area
Well House
DW01A
MW08 <2.0
DW03A
DW03B
MW07 <2.0
Sidewalk
UST#1
UST#2
MW09 24.6
500
1,000
1,500
2,000
2,500
3,000
UST#4
UST#6
UST#5
UST#3
MW01 <2.0
MW02 35.8
MW03 3,260
MW04 3,230
MW10 833
MW11 <200
0 8.25 16.5 24.75 33 Feet
GREENE ENVIRONMENTAL
TITLE: PSCM SP1 ETHYLBENZENE ISOCONCENTRATION MAP(10/14/2019) - SITE
SITE: CHAMBLISSBURG SUPPLY
DRAWING #: CSVI1004O
CLIENT: ESTATE OF LACY DUDLEY
DATE: 11/26/19
COMMENTS: RESULTS REPORT IN UG/L
DRAWN BY: MAF, BM

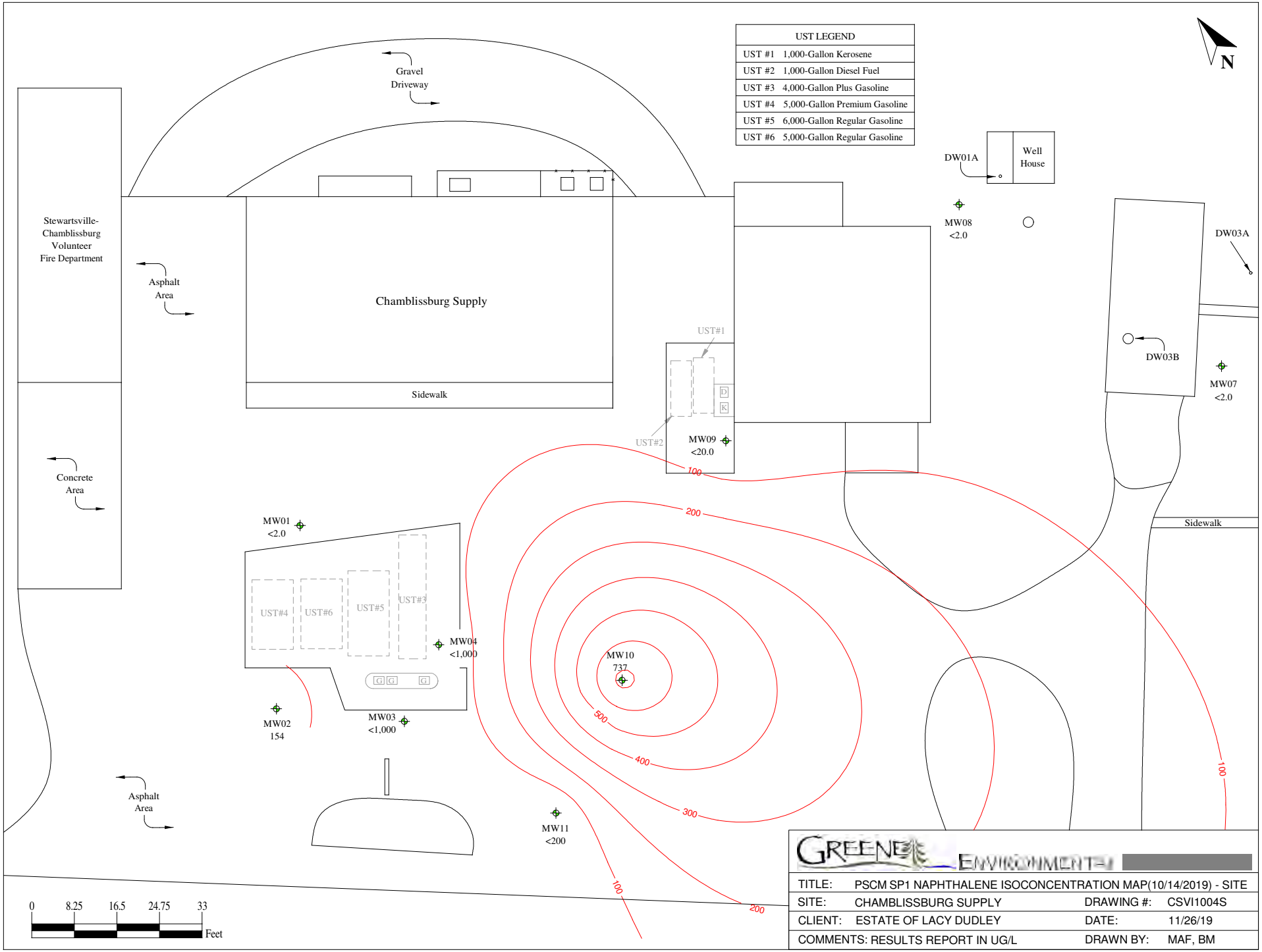

UST LEGEND
UST #1 1,000-Gallon Kerosene
UST #2 1,000-Gallon Diesel Fuel
UST #3 4,000-Gallon Plus Gasoline
UST #4 5,000-Gallon Premium Gasoline
UST #5 6,000-Gallon Regular Gasoline
UST #6 5,000-Gallon Regular Gasoline
N
Gravel Driveway
Stewartsville-Chamblissburg Volunteer Fire Department
Asphalt Area
Chamblissburg Supply
Sidewalk
Concrete Area
Asphalt Area
Well House
DW01A
MW08 <2.0
DW03A
DW03B
MW07 <2.0
Sidewalk
UST#1
UST#2
MW09 101.6
MW01 <2.0
UST#4
UST#6
UST#5
UST#3
MW04 15,770
MW10 6,710
MW02 891
MW03 17,380
MW11 660
2,000
4,000
6,000
8,000
10,000
12,000
14,000
0 8.25 16.5 24.75 33 Feet
GREENE ENVIRONMENTAL
TITLE: PSCM SP1 TOTAL XYLENES ISOCONCENTRATION MAP(10/14/2019) - SITE
SITE: CHAMBLISSBURG SUPPLY
DRAWING #: CSVI1004P
CLIENT: ESTATE OF LACY DUDLEY
DATE: 11/26/19
COMMENTS: RESULTS REPORT IN UG/L
DRAWN BY: MAF, BM

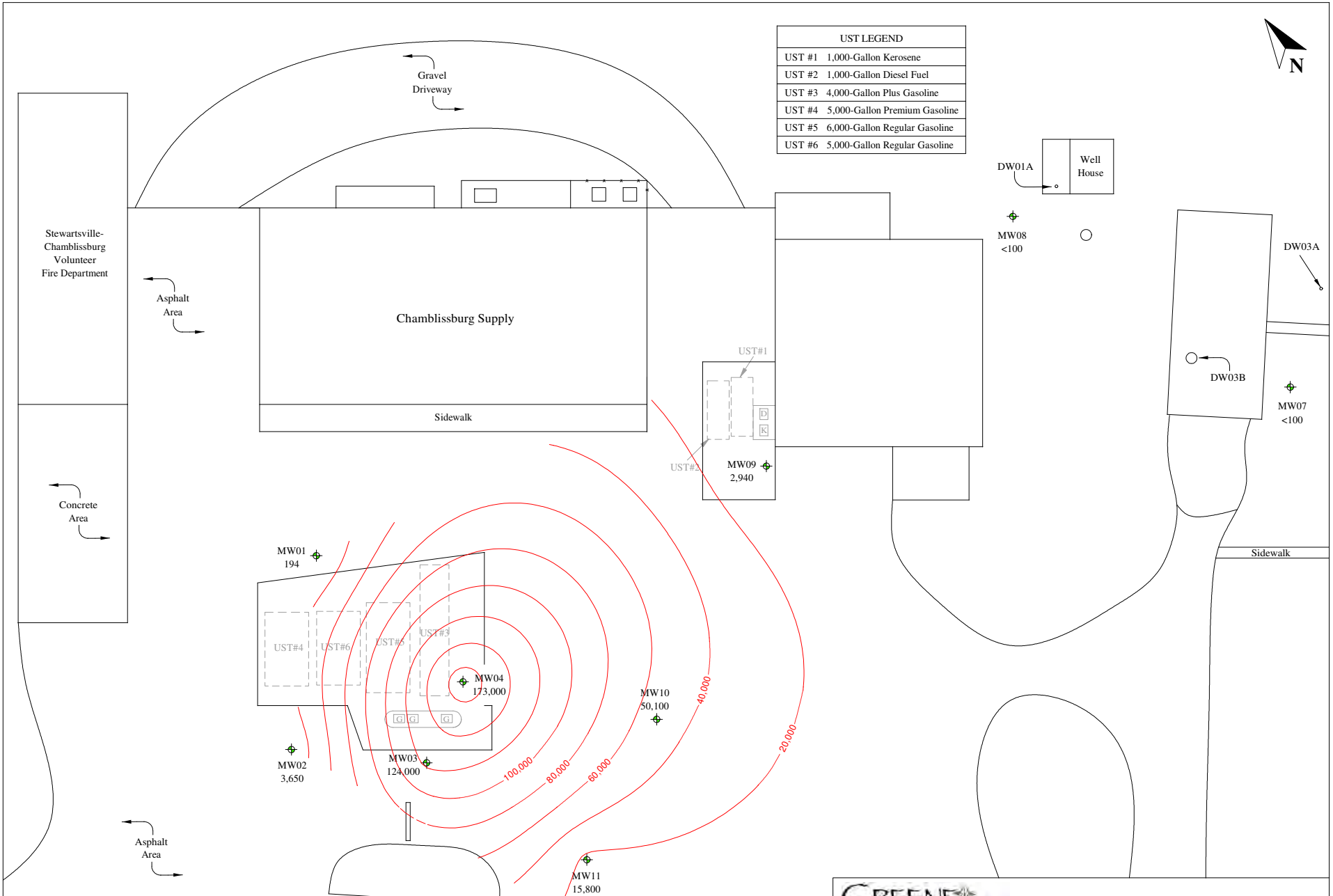


GREENE ENVIRONMENTAL

TITLE:	PSCM SP1 TOTAL BTEX ISOCONCENTRATION MAP(10/14/2019) - SITE		
SITE:	CHAMBLISSBURG SUPPLY	DRAWING #:	CSVI1004Q
CLIENT:	ESTATE OF LACY DUDLEY	DATE:	11/26/19
COMMENTS:	RESULTS REPORT IN UG/L	DRAWN BY:	MAF, BM

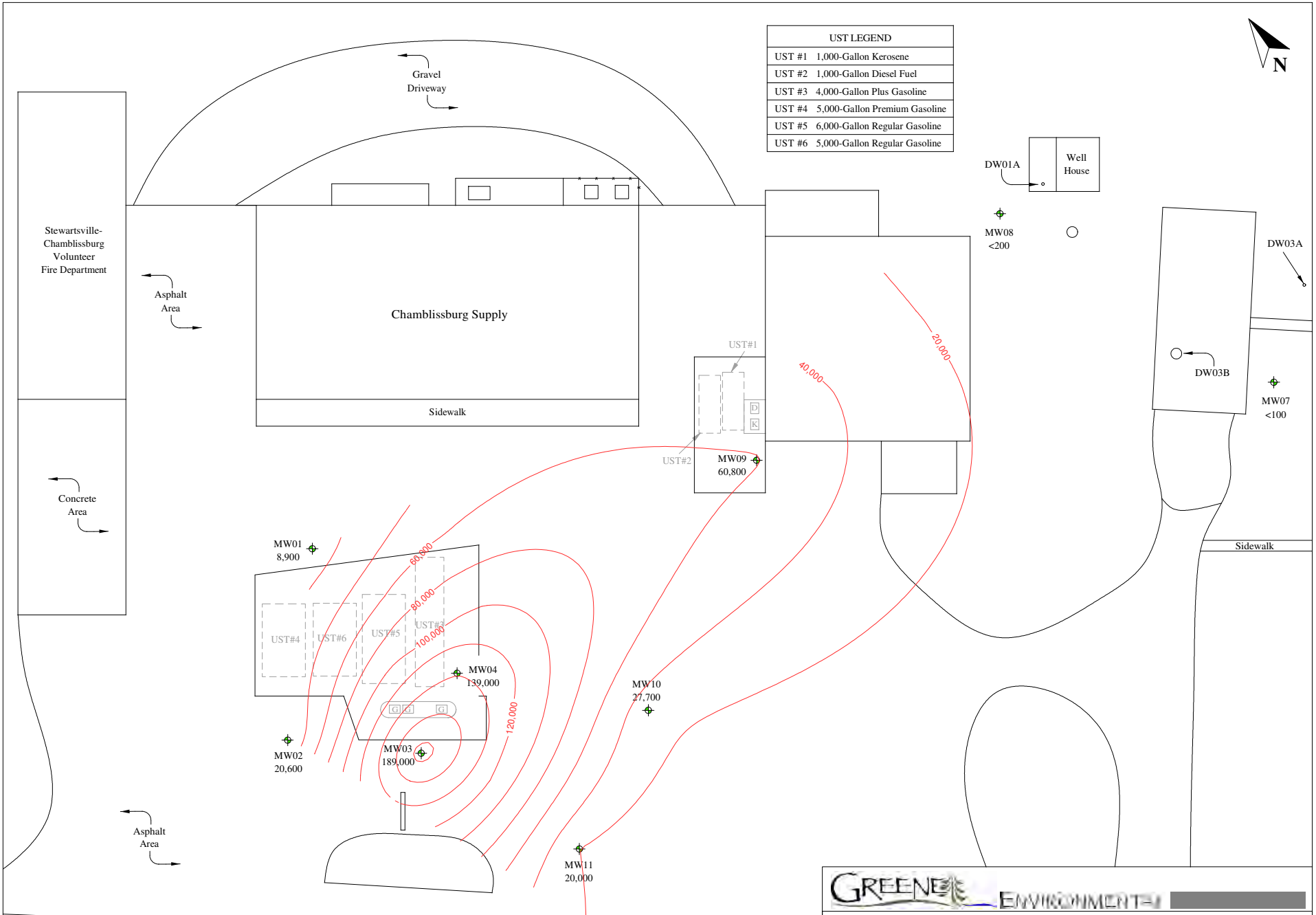

UST LEGEND
UST #1 1,000-Gallon Kerosene
UST #2 1,000-Gallon Diesel Fuel
UST #3 4,000-Gallon Plus Gasoline
UST #4 5,000-Gallon Premium Gasoline
UST #5 6,000-Gallon Regular Gasoline
UST #6 5,000-Gallon Regular Gasoline
N
Gravel Driveway
Stewartsville-Chamblissburg Volunteer Fire Department
Asphalt Area
Chamblissburg Supply
Sidewalk
Concrete Area
Asphalt Area
DW01A
Well House
MW08 <2.0
DW03A
DW03B
MW07 <2.0
UST#1
UST#2
MW09 1,810
5,000
10,000
15,000
20,000
30,000
25,000
15,000
10,000
MW01 30.3
UST#4
UST#6
UST#5
UST#3
MW04 42,900
MW10 26,600
MW02 1,260
MW03 23,400
MW11 8,600
Sidewalk
0 8.25 16.5 24.75 33 Feet
GREENE ENVIRONMENTAL
TITLE: PSCM SP1 MTBE ISOCONCENTRATION MAP(10/14/2019) - SITE
SITE: CHAMBLISSBURG SUPPLY
DRAWING #: CSVI1004R
CLIENT: ESTATE OF LACY DUDLEY
DATE: 11/26/19
COMMENTS: RESULTS REPORT IN UG/L
DRAWN BY: MAF, BM


UST LEGEND
UST #1 1,000-Gallon Kerosene
UST #2 1,000-Gallon Diesel Fuel
UST #3 4,000-Gallon Plus Gasoline
UST #4 5,000-Gallon Premium Gasoline
UST #5 6,000-Gallon Regular Gasoline
UST #6 5,000-Gallon Regular Gasoline
N
Gravel Driveway
Stewartsville-Chamblissburg Volunteer Fire Department
Asphalt Area
Chamblissburg Supply
Sidewalk
Concrete Area
Asphalt Area
DW01A
Well House
MW08 <2.0
DW03A
DW03B
MW07 <2.0
UST#1
UST#2
MW09 <20.0
MW01 <2.0
UST#4
UST#6
UST#5
UST#3
MW04 <1,000
MW02 154
MW03 <1,000
MW10 737
MW11 <200
100
200
300
400
500
0 8.25 16.5 24.75 33 Feet
GREENE ENVIRONMENTAL
TITLE: PSCM SP1 NAPHTHALENE ISOCONCENTRATION MAP(10/14/2019) - SITE
SITE: CHAMBLISSBURG SUPPLY
DRAWING #: CSVI1004S
CLIENT: ESTATE OF LACY DUDLEY
DATE: 11/26/19
COMMENTS: RESULTS REPORT IN UG/L
DRAWN BY: MAF, BM



GREENE ENVIRONMENTAL

TITLE:	PSCM SP1 TPH-GRO ISOCONCENTRATION MAP(10/14/2019) - SITE		
SITE:	CHAMBLISSBURG SUPPLY	DRAWING #:	CSVI1004T
CLIENT:	ESTATE OF LACY DUDLEY	DATE:	12/09/19
COMMENTS:		DRAWN BY:	MAF, BM



TITLE:	PSCM SP1 TPH-DRO ISOCONCENTRATION MAP(10/14/2019) - SITE		
SITE:	CHAMBLISSBURG SUPPLY	DRAWING #:	CSVI1004U
CLIENT:	ESTATE OF LACY DUDLEY	DATE:	12/09/19
COMMENTS:		DRAWN BY:	MAF, BM

*The arrows represent the direction of dip.

*The number represents the dip angle.

FOLIATIONS

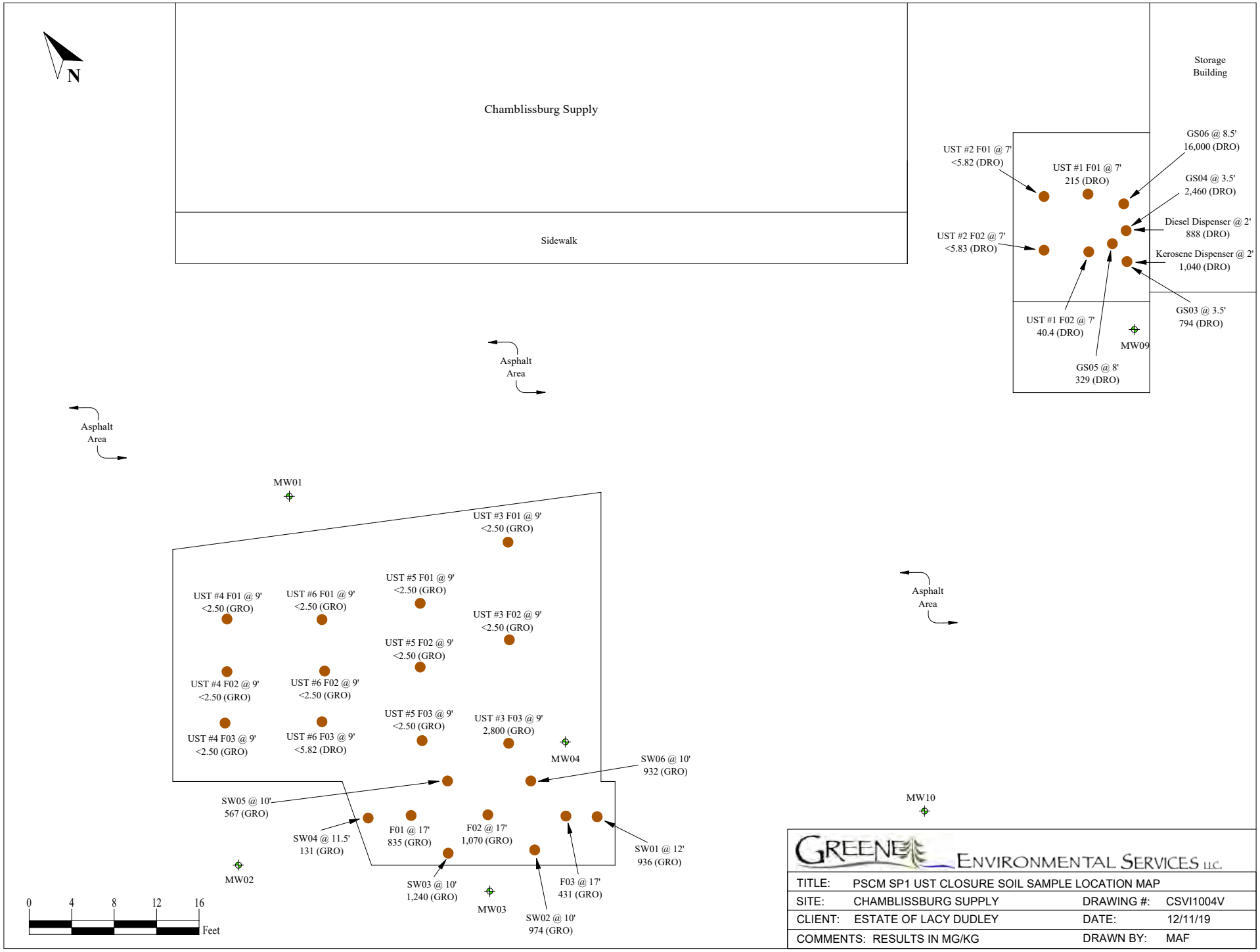
FRACTURE SET #1

FRACTURE SET #2

0 33 66 99 132 Feet

GREENE ENVIRONMENTAL SERVICES LLC.

TITLE:	SCR GEOPHYSICAL BOREHOLE LOGGING SUMMARY		
SITE:	CHAMBLISSBURG SUPPLY	DRAWING #:	CSVI1002AA
CLIENT:	ESTATE OF LACY DUDLEY	DATE:	01/31/18
COMMENTS:		DRAWN BY:	MAF


N
Chamblissburg Supply
Sidewalk
Storage Building
GS06 @ 8.5' 16,000 (DRO)
UST #2 F01 @ 7' <5.82 (DRO)
UST #1 F01 @ 7' 215 (DRO)
GS04 @ 3.5' 2,460 (DRO)
Diesel Dispenser @ 2' 888 (DRO)
UST #2 F02 @ 7' <5.83 (DRO)
Kerosene Dispenser @ 2' 1,040 (DRO)
GS03 @ 3.5' 794 (DRO)
UST #1 F02 @ 7' 40.4 (DRO)
MW09
GS05 @ 8' 329 (DRO)
Asphalt Area
Asphalt Area
Asphalt Area
MW01
UST #3 F01 @ 9' <2.50 (GRO)
UST #5 F01 @ 9' <2.50 (GRO)
UST #4 F01 @ 9' <2.50 (GRO)
UST #6 F01 @ 9' <2.50 (GRO)
UST #3 F02 @ 9' <2.50 (GRO)
UST #5 F02 @ 9' <2.50 (GRO)
UST #4 F02 @ 9' <2.50 (GRO)
UST #6 F02 @ 9' <2.50 (GRO)
UST #5 F03 @ 9' <2.50 (GRO)
UST #3 F03 @ 9' 2,800 (GRO)
UST #4 F03 @ 9' <2.50 (GRO)
UST #6 F03 @ 9' <5.82 (DRO)
MW04
SW06 @ 10' 932 (GRO)
SW05 @ 10' 567 (GRO)
SW04 @ 11.5' 131 (GRO)
F01 @ 17' 835 (GRO)
F02 @ 17' 1,070 (GRO)
SW01 @ 12' 936 (GRO)
MW02
SW03 @ 10' 1,240 (GRO)
MW03
F03 @ 17' 431 (GRO)
SW02 @ 10' 974 (GRO)
MW10
0 4 8 12 16
Feet
GREENE ENVIRONMENTAL SERVICES LLC.
TITLE: PSCM SP1 UST CLOSURE SOIL SAMPLE LOCATION MAP
SITE: CHAMBLISSBURG SUPPLY
DRAWING #: CSVI1004V
CLIENT: ESTATE OF LACY DUDLEY
DATE: 12/11/19
COMMENTS: RESULTS IN MG/KG
DRAWN BY: MAF

APPENDIX C

Geologic Information

Soil Boring Logs/Monitoring Well Construction Diagrams
Fracture Trace Analysis – Draper Aden Associates
Geophysical Borehole Logging – ARM Geophysical

Project No: CSVI1001

Project: RELEASE INVESTIGATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B01

Diagram of Monitoring Well: NA

Geologist: CALEB HARRISON

Generation Date: 07/03/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-DRO) (TPH-GRO)	VOC Concentration ppm (1250, 2500, 3750)	Well Completion Details
		Ground Surface	0.0					
		Asphalt	0.5					
		B01-1 (0.5-5') Fine grained; red clay, petroleum odor; no moisture.	5.0	B01-1		1,970 / 13,200	4,737	
		B01-2 (5'-10') Fine grained; red sandy clay with some organic material present; strong petroleum odor; moisture evident approximately 5' to 6' bgs only.	10.0	B01-2		NA	4,117	
		B01-3 (10'-15') Fine grained; red sandy clay with some organic material present; strong petroleum odor; no moisture.	15.0	B01-3		NA	3,583	
		B01-4 (15'-20') Fine grained; sandy brown clay; strong petroleum odor; no moisture.	20.0	B01-4		NA	3,302	
		B01-5 (20'-25') Fine grained; brown sandy clay; strong petroleum odor; no moisture.	25.0	B01-5		NA	2,957	
		B01-6 (25'-30') Fine grained; brown clay with organic material present; strong petroleum odor; no moisture.	30.0	B01-6		NA	2,559	
		B01-7 (30'-32.5') Fine grained; brown clay; strong petroleum odor; no moisture. Soil boring B01 was advanced to rod refusal at 32.5 feet bgs in an attempt to encounter groundwater; however, groundwater was not identified.	32.5	B01-7		390 / 4,220	2,250	
		End of Borehole						

Drill Method: DIRECT PUSH

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 06/30/2017

Hole Size: 2.5 INCHES

GREENE ENVIRONMENTAL SERVICES LLC
200 Buckwheat Lane
Rocky Mount, VA 24151

Project No: CSVI1001

Project: RELEASE INVESTIGATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B02

Diagram of Monitoring Well: NA

Geologist: CALEB HARRISON

Generation Date: 07/03/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-DRO) (TPH-GRO)	VOC Concentration ppm (750, 1500, 2250)	Well Completion Details
		Ground Surface	0.0					
		Asphalt	0.5					
		B02-1 (0.5-5') Fine grained; red clay, slight petroleum odor; no moisture.	5.0	B02-1		NA	1,818	
		B02-2 (5'-10') Fine grained; brown sandy clay with some larger rock fragments present; petroleum odor; no moisture.	10.0	B02-2		NA	643.9	
		B02-3 (10'-15') Fine grained; brown sandy clay with some larger rock fragments present; strong petroleum odor; no moisture.	15.0	B02-3		1,240 / 6,110	2,757	
		B02-4 (15'-20') Fine grained; gray to black sandy clay; strong petroleum odor; no moisture.	20.0	B02-4		511 / 4,600	2,115	
		End of Borehole						

Drill Method: DIRECT PUSH

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 06/30/2017

Hole Size: 2.5 INCHES

GREENE ENVIRONMENTAL SERVICES LLC
200 Buckwheat Lane
Rocky Mount, VA 24151

Project No: CSVI1001

Project: RELEASE INVESTIGATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B03

Diagram of Monitoring Well: NA

Geologist: CALEB HARRISON

Generation Date: 07/03/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-DRO) / (TPH-GRO)	VOC Concentration ppm (100, 200, 300)	Well Completion Details
		Ground Surface	0.0					
		Asphalt	0.5					
		B03-1 (0.5-5') Fine grained; brown to gray sandy clay, slight petroleum odor; no moisture.	5.0	B03-1		NA	163.3	
		B03-2 (5'-10') Fine grained; brown to gray weathered rock material (very hard), slight petroleum odor; no moisture.	10.0	B03-2		NA	198.5	
		B03-3 (10'-15') Fine grained; brown sandy clay; slight petroleum odor; no moisture.	15.0	B03-3		NA	118.8	
		B03-4 (15'-20') Fine grained; brown sandy clay; slight petroleum odor; no moisture.	20.0	B03-4		NA	141.0	
		End of Borehole						

Drill Method: DIRECT PUSH

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 06/30/2017

Hole Size: 2.5 INCHES

Project No: CSVI1001

Project: RELEASE INVESTIGATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B04

Diagram of Monitoring Well: NA

Geologist: CALEB HARRISON

Generation Date: 07/03/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-DRO) (TPH-GRO)	VOC Concentration ppm (25, 50, 75)	Well Completion Details
		Ground Surface	0.0					
		Asphalt	0.5					
		B04-1 (0.5-5') Fine grained; brown sandy clay, no petroleum odor; no moisture.	5.0	B04-1		NA	57.9	
		B04-2 (5'-10') Fine grained; brown sandy clay, no petroleum odor; no moisture.	10.0	B04-2		NA	70.9	
		B04-3 (10'-15') Fine grained; brown clay with organic material present; no petroleum odor; no moisture.	15.0	B04-3		NA	87.7	
		B04-4 (15'-20') Fine grained; red to brown clay; slight petroleum odor; no moisture.	20.0	B04-4		ND / ND	99.9	
		End of Borehole						

Drill Method: DIRECT PUSH

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 06/30/2017

Hole Size: 2.5 INCHES

Project No: CSVI1001

Project: RELEASE INVESTIGATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B05

Diagram of Monitoring Well: NA

Geologist: CALEB HARRISON

Generation Date: 07/03/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-DRO) (TPH-GRO)	VOC Concentration ppm (25, 50, 75)	Well Completion Details
0		Ground Surface	0.0					
		Asphalt	0.5					
1–4		**B05-1 (0.5-5')** Fine grained; red clay, no petroleum odor; no moisture.	5.0	B05-1		NA	65.0	
5–9		**B05-2 (5'-10')** Fine grained; brown clay, no petroleum odor; no moisture.	10.0	B05-2		NA	89.6	
10–14		**B05-3 (10'-15')** Fine grained; brown clay with white sand; no petroleum odor; no moisture.	15.0	B05-3		NA	30.2	
15–19		**B05-4 (15'-20')** Fine grained; white sand; no petroleum odor; no moisture.	20.0	B05-4		ND / ND	26.5	
20		End of Borehole						
21–25								

Drill Method: DIRECT PUSH

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 06/30/2017

Hole Size: 2.5 INCHES

Project No: CSVI1001

Project: RELEASE INVESTIGATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B06

Diagram of Monitoring Well: NA

Geologist: CALEB HARRISON

Generation Date: 07/03/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-DRO) (TPH-GRO)	VOC Concentration ppm (25, 50, 75)	Well Completion Details
		Ground Surface	0.0					
		Asphalt	0.5					
		B06-1 (0.5-5') Fine grained; red clay, no petroleum odor; no moisture.	5.0	B06-1		NA	32.7	
		B06-2 (5'-10') Fine grained; red clay, no petroleum odor; no moisture.	10.0	B06-2		NA	28.5	
		B06-3 (10'-15') Fine grained; dark brown sandy clay; no petroleum odor; no moisture.	15.0	B06-3		NA	21.8	
		B06-4 (15'-20') Fine grained; dark brown sandy clay; no petroleum odor; no moisture.	20.0	B06-4		NA	31.4	
		End of Borehole						

Drill Method: DIRECT PUSH

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 06/30/2017

Hole Size: 2.5 INCHES

Project No: CSVI1001

Project: RELEASE INVESTIGATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B07

Diagram of Monitoring Well: NA

Geologist: CALEB HARRISON

Generation Date: 07/03/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-DRO) (TPH-GRO)	VOC Concentration ppm (25, 50, 75)	Well Completion Details
		Ground Surface	0.0					
		Asphalt	0.5					
		B07-1 (0.5-5') Fine grained; red clay, no petroleum odor; no moisture.	5.0	B07-1		NA	19.1	
		B07-2 (5'-10') Fine grained; dark brown sandy clay; no petroleum odor; no moisture.	10.0	B07-2		NA	13.9	
		B07-3 (10'-15') Fine grained; dark brown sandy clay with organic material present; slight petroleum odor; no moisture.	15.0	B07-3		NA	9.3	
		B07-4 (15'-20') Fine grained; dark brown clay with white sand and organic material present; slight petroleum odor; no moisture.	20.0	B07-4		ND / ND	13.2	
		End of Borehole						

Drill Method: DIRECT PUSH

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 06/30/2017

Hole Size: 2.5 INCHES

Project No: CSVI1001

Project: RELEASE INVESTIGATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B08

Diagram of Monitoring Well: NA

Geologist: CALEB HARRISON

Generation Date: 07/03/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-DRO) (TPH-GRO)	VOC Concentration ppm (25, 50, 75)	Well Completion Details
		Ground Surface	0.0					
		Asphalt	0.5					
		B08-1 (0.5-5') Fine grained; red clay, no petroleum odor; no moisture.	5.0	B08-1		NA	5.5	
		B08-2 (5'-10') Fine grained; brown clay with organic material present; no petroleum odor; no moisture.	10.0	B08-2		NA	7.7	
		B08-3 (10'-15') Fine grained; brown clay with white sand; slight petroleum odor; no moisture.	15.0	B08-3		NA	5.8	
		B08-4 (15'-20') Fine grained; dark brown sandy clay; slight petroleum odor; no moisture.	20.0	B08-4		NA	0.1	
		End of Borehole						

Drill Method: DIRECT PUSH

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 06/30/2017

Hole Size: 2.5 INCHES

Project No: CSVI1001

Project: RELEASE INVESTIGATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B09

Diagram of Monitoring Well: NA

Geologist: CALEB HARRISON

Generation Date: 07/03/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-DRO) (TPH-GRO)	VOC Concentration ppm (25, 50, 75)	Well Completion Details
0		Ground Surface	0.0					
		Asphalt	0.5					
1–4		**B09-1 (0.5-5')** Fine grained; red clay, no petroleum odor; no moisture.	5.0	B09-1		NA	10.9	
5–9		**B09-2 (5'-10')** Fine grained; brown clay with layers of white sand; no petroleum odor; no moisture.	10.0	B09-2		NA	2.0	
10–14		**B09-3 (10'-15')** Fine grained; white sand; slight petroleum odor; no moisture.	15.0	B09-3		NA	3.2	
15–19		**B09-4 (15'-20')** Fine grained; dark brown sandy clay with organic material present; slight petroleum odor; no moisture.	20.0	B09-4		NA	0.0	
20–25		End of Borehole						

Drill Method: DIRECT PUSH

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 06/30/2017

Hole Size: 2.5 INCHES

Project No: CSVI1001

Project: RELEASE INVESTIGATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B10

Diagram of Monitoring Well: NA

Geologist: CALEB HARRISON

Generation Date: 07/03/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-DRO) / (TPH-GRO)	VOC Concentration ppm (100, 200, 300)	Well Completion Details
		Ground Surface	0.0					
		Asphalt	0.5					
		B10-1 (0.5-5') Fine grained; red clay, no petroleum odor; no moisture.	5.0	B10-1		NA	0.0	
		B10-2 (5'-10') Fine grained; brown clay with organic material present; slight petroleum odor; no moisture.	10.0	B10-2		NA	0.0	
		B10-3 (10'-15') (10'-14'): Fine grained; brown clay with organic material present; slight petroleum odor; no moisture. (14'-15'): Fine grained; white sand; slight petroleum odor; no moisture.	15.0	B10-3		NA	2.6	
		B10-4 (15'-20') Fine grained; brown sandy clay with organic material present; petroleum odor; no moisture.	20.0	B10-4		ND / 93.6	334.8	
		End of Borehole						

Drill Method: DIRECT PUSH

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 06/30/2017

Hole Size: 2.5 INCHES

Project No: CSVI1001

Project: RELEASE INVESTIGATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B11

Diagram of Monitoring Well: NA

Geologist: CALEB HARRISON

Generation Date: 07/03/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-DRO) (TPH-GRO)	VOC Concentration ppm (500, 1000, 1500)	Well Completion Details
		Ground Surface	0.0					
		Asphalt	0.5					
		B11-1 (0.5-5') Fine grained; red clay, strong petroleum odor; no moisture.	5.0	B11-1		1,100 / 3,400	1,092	
		B11-2 (5'-10') Fine grained; red clay; strong petroleum odor; no moisture.	10.0	B11-2		NA	1,408	
		B11-3 (10'-15') Fine grained; dark brown sandy clay with organic material present; strong petroleum odor; no moisture.	15.0	B11-3		NA	1,173	
		B11-4 (15'-20') Fine grained; brown sandy clay with organic material present; strong petroleum odor; no moisture.	20.0	B11-4		1,030 / 10,300	1,043	
		Soil boring B11 was advanced to rod refusal at 31.75 feet bgs in an attempt to encounter groundwater. Soil samples were not collected during these additional activities and groundwater was not identified.	31.8					
		End of Borehole						

Drill Method: DIRECT PUSH

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 06/30/2017

Hole Size: 2.5 INCHES

GREENE ENVIRONMENTAL SERVICES LLC
200 Buckwheat Lane
Rocky Mount, VA 24151

Project No: CSVI1001

Project: RELEASE INVESTIGATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B12

Diagram of Monitoring Well: NA

Geologist: CALEB HARRISON

Generation Date: 07/03/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-DRO) (TPH-GRO)	VOC Concentration ppm (500, 1000, 1500)	Well Completion Details
0		Ground Surface	0.0					
		Asphalt	0.5					
1–4		***B12-1 (0.5-5')*** Fine grained; red to brown sandy clay, petroleum odor; no moisture.	5.0	B12-1		23.9 / 381	1,127	
5–9		***B12-2 (5'-10')*** Fine grained; red to brown sandy clay, petroleum odor; no moisture	10.0	B12-2		NA	1,251	
10–14		***B12-3 (10'-15')*** Fine grained; white sand; strong petroleum odor; no moisture.	15.0	B12-3		NA	1,205	
15–19		***B12-4 (15'-20')*** Fine grained; brown to gray sandy clay; strong petroleum odor; no moisture.	20.0	B12-4		6,930 / 25,900	1,183	
20		End of Borehole						
21–25								

Drill Method: DIRECT PUSH

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 06/30/2017

Hole Size: 2.5 INCHES

GREENE ENVIRONMENTAL SERVICES LLC
200 Buckwheat Lane
Rocky Mount, VA 24151

Project No: CSVI1001

Project: RELEASE INVESTIGATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B13

Diagram of Monitoring Well: NA

Geologist: CALEB HARRISON

Generation Date: 07/03/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-DRO) (TPH-GRO)	VOC Concentration ppm (500, 1000, 1500)	Well Completion Details
0		Ground Surface	0.0					
		Asphalt	0.5					
1–4		***B13-1 (0.5-5')*** Fine grained; red clay, slight petroleum odor; no moisture.	5.0	B13-1		3,780 / 1,840	1,234	
5–9		***B13-2 (5'-10')*** Fine grained; brown sandy clay, slight petroleum odor; no moisture.	10.0	B13-2		NA	1,270	
10–14		***B13-3 (10'-15')*** Fine grained; brown sandy clay with organic material present; slight petroleum odor; no moisture.	15.0	B13-3		NA	515.7	
15–19		***B13-4 (15'-20')*** Fine grained; brown sandy clay with organic material present; petroleum odor; no moisture.	20.0	B13-4		6,880 / 1,420	367.0	
20–25		End of Borehole						

Drill Method: DIRECT PUSH

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 06/30/2017

Hole Size: 2.5 INCHES

GREENE ENVIRONMENTAL SERVICES LLC
200 Buckwheat Lane
Rocky Mount, VA 24151

Project No: CSVI1001

Project: RELEASE INVESTIGATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B14

Diagram of Monitoring Well: NA

Geologist: CALEB HARRISON

Generation Date: 07/03/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-DRO) (TPH-GRO)	VOC Concentration ppm (50, 100, 150)	Well Completion Details
		Ground Surface	0.0					
		Asphalt	0.5					
		B14-1 (0.5-5') Fine grained; red clay, no petroleum odor; no moisture.	5.0	B14-1		NA	104.8	
		B14-2 (5'-10') Fine grained; brown clayey sand, no petroleum odor; no moisture.	10.0	B14-2		NA	38.6	
		B14-3 (10'-15') Fine grained; brown clayey sand, no petroleum odor; no moisture.	15.0	B14-3		NA	22.0	
		B14-4 (15'-20') Fine grained; brown to gray clayey sand, no petroleum odor; no moisture.	20.0	B14-4		NA	16.6	
		End of Borehole						

Drill Method: DIRECT PUSH

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 06/30/2017

Hole Size: 2.5 INCHES

GREENE ENVIRONMENTAL SERVICES LLC
200 Buckwheat Lane
Rocky Mount, VA 24151

Project No: CSVI1001

Project: RELEASE INVESTIGATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B15

Diagram of Monitoring Well: NA

Geologist: CALEB HARRISON

Generation Date: 07/03/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-DRO) (TPH-GRO)	VOC Concentration ppm (25, 50, 75)	Well Completion Details
0		Ground Surface	0.0					
		Asphalt	0.5					
1–4		***B15-1 (0.5-5')*** Fine grained; red clay, no petroleum odor; no moisture.	5.0	B15-1		NA	14.3	
5–10		***B15-2 (5'-10')*** Fine grained; brown clayey sand, no petroleum odor; no moisture.	10.0	B15-2		NA	14.1	
10–15		***B15-3 (10'-15')*** Fine grained; brown clayey sand, slight petroleum odor; no moisture.	15.0	B15-3		NA	19.0	
15–20		***B15-4 (15'-20')*** Fine grained; brown to gray clayey sand, petroleum odor; no moisture.	20.0	B15-4		506 / ND	88.5	
20–25		End of Borehole						

Drill Method: DIRECT PUSH

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 06/30/2017

Hole Size: 2.5 INCHES

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B16

Diagram of Monitoring Well: MW01

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE

Depth	Symbol	Description	Depth
		Ground Surface	0.0
0		***Asphalt***	0.5
1–5		***B16-1 (0.5-5')*** Fine grained; red clay; no petroleum odor; no moisture.	5.0
5–10		***B16-2 (5'-10')*** Fine grained; brownish-red; silty/sandy clay; no petroleum odor; no moisture.	10.0
10–15		***B16-3 (10'-15')*** (10'-11.5'): Fine grained; light brown clay (11.5'-15'): Fine grained; light brown clay with white weathered rock material; no petroleum odor; no moisture.	15.0
15–20		***B16-4 (15'-20')*** Fine grained; light brown clay with white weathered rock material; some black organic material present; no petroleum odor; no moisture.	20.0
20–25		***B16-5 (20'-25')*** (20'-23.5'): Same as above. (23.5'-25'): Fine grained; light brown; silty/sandy clay with larger fragments of quartz present; slight petroleum odor; no moisture.	25.0
25–30		***B16-6 (25'-30')*** Fine grained; light brown clay with white weatherd rock material and black organic material present; slight petroleum odor; no moisture.	30.0

SAMPLE

Number	Type	Lab Results (TPH-GRO)
B16-1		NA
B16-2		NA
B16-3		NA
B16-4		NA
B16-5		NA
B16-6		NA

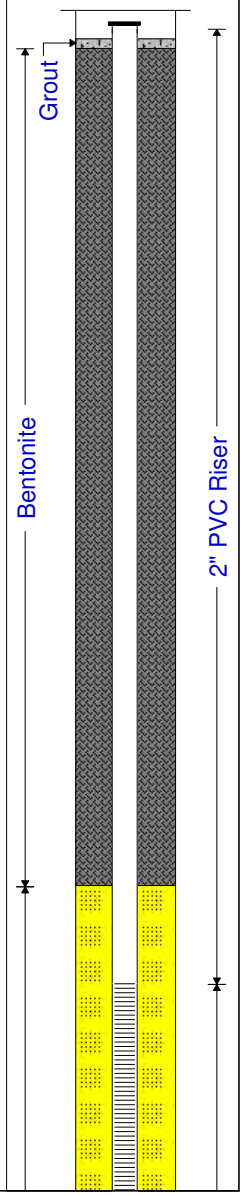
PID READINGS

VOC Concentration ppm (2.5, 5, 7.5)

Sample	PID (ppm)
B16-1	0.9
B16-2	0.0
B16-3	0.0
B16-4	0.0
B16-5	0.9
B16-6	2.8
	0.0

MONITORING WELL DIAGRAM

Well Completion Details



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/18/2017

Hole Size: 6.875 INCHES

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B16

Diagram of Monitoring Well: MW01

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE

Depth	Description	Depth
31–32	***B16-7 (30'-32')*** Fine grained; dark brown; weathered rock material; slight petroleum odor; no moisture.	32.0
32–33	Obtained rod refusal at approximately 32.0 feet bgs due to suspected weathered rock.	
33–35	***B16-8 (35')*** Converted drill rig to HSA.	35.0
35–36	Fine grained; dark brown; weathered rock material with mica present; slight to no petroleum odor; no moisture.	
36–40	***B16-9 (40')*** Fine grained; brown to dark brown; weathered rock material; slight petroleum odor; no moisture.	40.0
40–45	***B16-10 (45')*** Fine grained; dark brown to brown; weathered rock material; slight to no petroleum odor; no moisture.	45.0
45–50	***B16-11 (50')*** Fine grained; dark brown to brown; weathered rock material; no petroleum odor; no moisture.	50.0
50–55	***B16-12 (55')*** Fine grained; dark brown to brown; weathered rock material; no petroleum odor; no moisture. Terminated soil boring B16 approximately 55 feet bgs due to evidence of groundwater. Converted soil boring B16 to monitoring well MW01.	55.0
55–60	End of Borehole	

SAMPLE

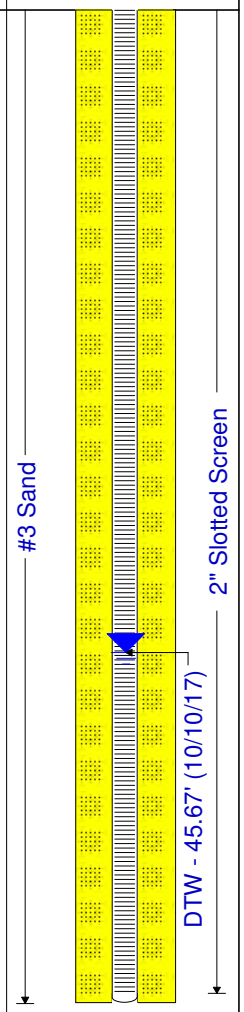
Number	Type	Lab Results (TPH-GRO)
B16-7		NA
B16-8		1.7
B16-9		NA
B16-10		ND
B16-11		NA
B16-12		NA

PID READINGS

VOC Concentration (ppm)

MONITORING WELL DIAGRAM

Well Completion Details



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/18/2017

Hole Size: 6.875 INCHES

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B17

Diagram of Monitoring Well: MW02

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE

Depth	Description	Depth
	Ground Surface	0.0
	Asphalt	0.5
	B17-1 (0.5-5') Fine to medium grained; mottled reddish brown to tan; silty/sandy clay with small rock fragments; no petroleum odor; no moisture.	5.0
	B17-2 (5'-10') (5'-9'): Same as above. (9'-10'): Medium to fine grained; white silt with rock fragments; no petroleum odor; no moisture.	10.0
	B17-3 (10'-15') Medium to fine grained; white silt with rock fragments; slight petroleum odor; no moisture.	15.0
	B17-4 (15'-20') Fine grained; mottled white to brown to reddish brown; silty/sandy clay with weathered material and rock fragments; petroleum odor; no moisture.	20.0
	B17-5 (20'-25') Fine grained; mottled white to brown to tan; silty/fine sand with some clay and rock fragments; petroleum odor; no moisture.	25.0
	B17-6 (25'-28') Fine graind; silty/fine sand with some clay and rock fragments; petroleum odor; no moisture. Obtained rod refusal at approximately 28.0 feet bgs due to suspected weathered rock.	28.0
		30.0

SAMPLE

Number	Lab Results (TPH-GRO)
B17-1	NA
B17-2	NA
B17-3	ND
B17-4	ND
B17-5	ND
B17-6	NA
B17-7	ND

PID READINGS

VOC Concentration ppm (12.5, 25, 37.5)

0.0, 6.4, 18.0, 33.8, 39.4, 41.6, 23.9, 10.4

MONITORING WELL DIAGRAM

Well Completion Details

Grout

Bentonite

2" PVC Riser

Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/18/2017

Hole Size: 6.875 INCHES

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B17

Diagram of Monitoring Well: MW02

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE

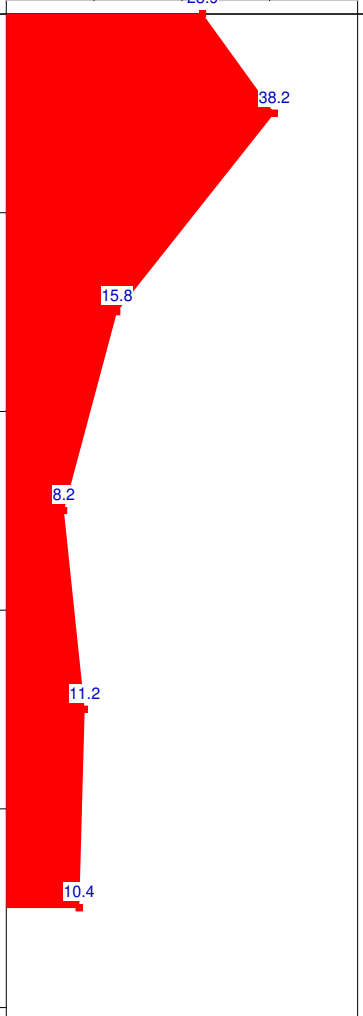
Depth	Symbol	Description	Depth
		B17-7 (28'-30') Converted drill rig to HSA. Fine grained; silty/fine sand and weathered rock material; petroleum odor; no moisture.	
		B17-8 (35') Fine grained; silty/fine sand and weathered rock material; strong petroleum odor; no moisture.	35.0
		B17-9 (40') Fine grained; dark brown; weathered rock material; strong petroleum odor; no moisture.	40.0
		B17-10 (45') Fine grained; dark brown; weathered rock material; strong petroleum odor; no moisture.	45.0
		B17-11 (50') Fine grained; dark brown; weathered rock material; strong petroleum odor; moisture evident.	50.0
		B17-12 (55') Fine grained; dark brown; weathered rock material; strong petroleum odor; moisture evident. Terminated soil boring B17 approximately 55 feet bgs due to evidence of groundwater. Converted soil boring B17 to monitoring well MW02.	55.0
		End of Borehole	

SAMPLE

Number	Type	Lab Results (TPH-GRO)
B17-8		ND
B17-9		ND
B17-10		ND
B17-11		NA
B17-12		NA

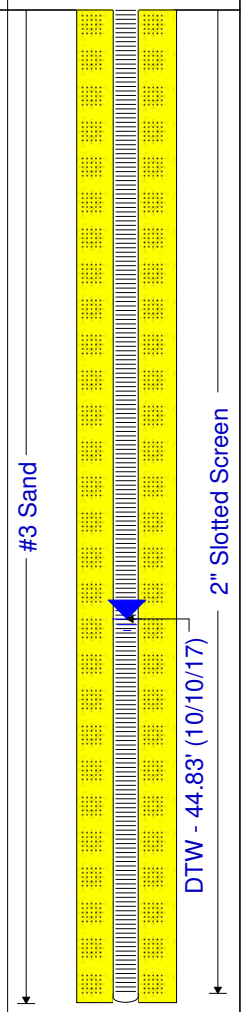
PID READINGS

VOC Concentration ppm



MONITORING WELL DIAGRAM

Well Completion Details



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/18/2017

Hole Size: 6.875 INCHES

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B18

Diagram of Monitoring Well: MW03

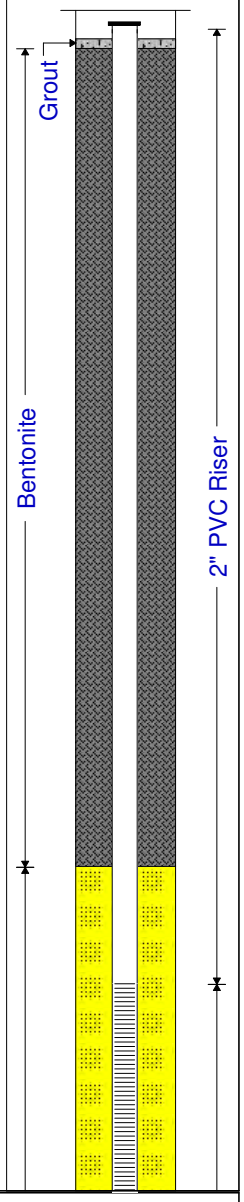
Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE / SAMPLE / PID READINGS / MONITORING WELL DIAGRAM

Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO)	VOC Concentration (ppm)
		Ground Surface	0.0				
		Asphalt	0.5				
		B18-1 (0.5-5') Fine-grained; reddish brown; silty/sandy clay; strong petroleum odor; no moisture.	5.0	B18-1		9,570	3,291
		B18-2 (5'-10') Fine-grained; reddish brown to brown; silty fine sand with rock fragments; strong petroleum odor; no moisture.	10.0	B18-2		15,700	2,067
		B18-3 (10'-15') Fine-grained; reddish brown to brown; silty fine sand with rock fragments; strong petroleum odor; no moisture.	15.0	B18-3		936	1,951
		B18-4 (15'-20') Fine-grained; reddish brown to tan; silty/sandy clay with mica present; strong petroleum odor; no moisture.	20.0	B18-4		3,170	1,957
		B18-5 (20'-25') Fine-grained; red to black to brown; weathered material with silty/fine sand and mica; strong petroleum odor; no moisture.	25.0	B18-5		8,510	1,458
		B18-6 (25'-30') Fine graind; silty/fine sand with some clay and rock fragments; petroleum odor; no moisture.	28.0	B18-6		3,910	1,631
			30.0				1,341

VOC Concentration ppm: 1000, 2000, 3000



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/18/2017 - 09/20/2017

Hole Size: 6.875 INCHES

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B18

Diagram of Monitoring Well: MW03

Geologist: ADAM FLORA

Generation Date: 11/09/2017

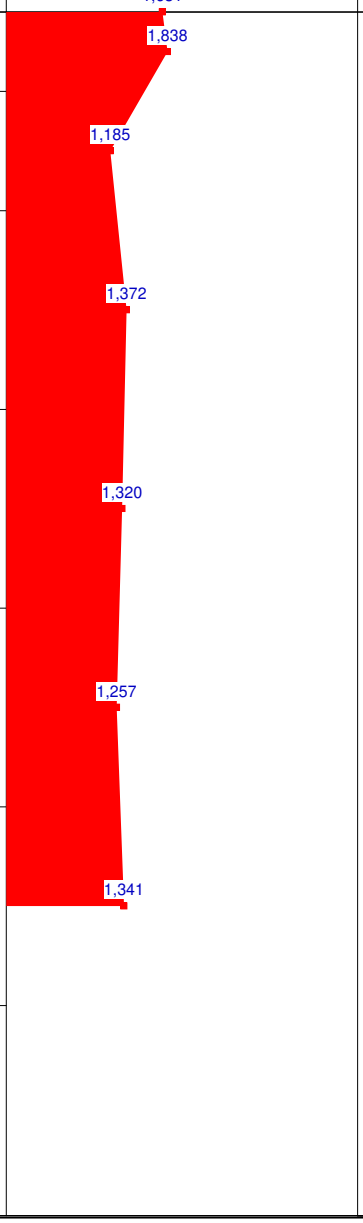
SUBSURFACE PROFILE

Depth	Description	Depth
31–34	***B18-7 (30'-32')*** Fine-grained; red to black to brown; weathered material with silty/fine sand and mica; strong petroleum odor; no moisture. Obtained rod refusal at approximately 32.0 feet bgs due to suspected weathered rock.	
34–35	***B18-8 (35')*** Converted drill rig to HSA.	35.0
35–40	Fine grained; brown to dark brown; silty/fine sand and weathered rock material; strong petroleum odor; no moisture. ***B18-9 (40')*** Fine grained; brown to dark brown; silty/fine sand and weathered rock material; smaller rock fragments present; strong petroleum odor; no moisture.	40.0
40–45	***B18-10 (45')*** Fine grained; brown to dark brown; silty/fine sand and weathered rock material; smaller rock fragments present; strong petroleum odor; no moisture.	45.0
45–50	***B18-11 (50')*** Fine grained; dark brown; silty fine sand; strong petroleum odor; moisture evident.	50.0
50–55	***B18-12 (55')*** Fine grained; dark brown; silty fine sand; strong petroleum odor; moisture evident. Terminated soil boring B18 approximately 55 feet bgs due to evidence of groundwater. Converted soil boring B18 to monitoring well MW03.	55.0
55	End of Borehole	

SAMPLE

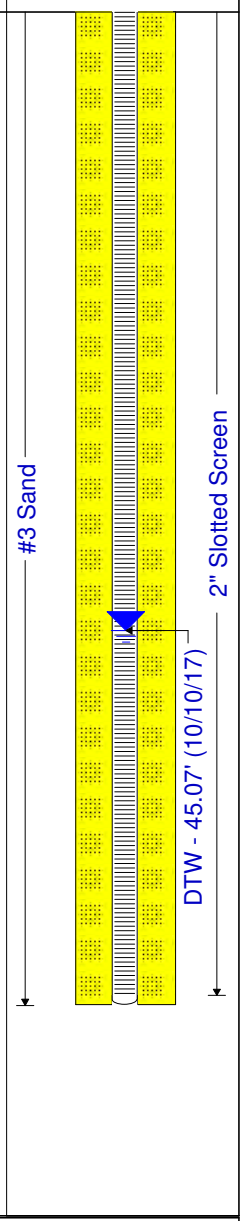
Number	Lab Results (TPH-GRO)
B18-7	NA
B18-8	2,830
B18-9	680
B18-10	3,610
B18-11	NA
B18-12	NA

PID READINGS



MONITORING WELL DIAGRAM

Well Completion Details



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/18/2017 - 09/20/2017

Hole Size: 6.875 INCHES

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B19

Diagram of Monitoring Well: MW04

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE

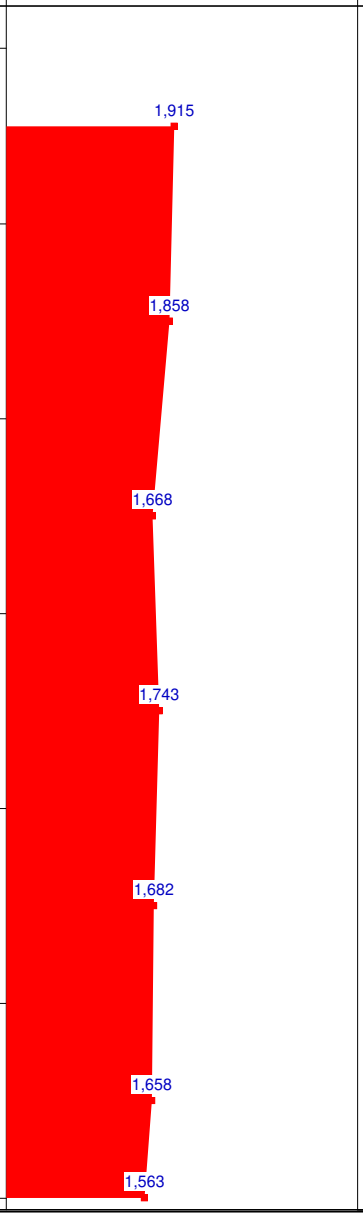
Depth	Symbol	Description	Depth
		Ground Surface	0.0
		Asphalt	0.5
		B19-1 (0.5-5') Fine-grained; reddish brown; silty/sandy clay; strong petroleum odor; no moisture.	5.0
		B19-2 (5'-10') Fine-grained; reddish brown to brown; silty/sandy clay with mica; strong petroleum odor; no moisture.	10.0
		B19-3 (10'-15') Fine-grained; reddish brown to brown; silty/sandy clay with mica; strong petroleum odor; no moisture.	15.0
		B19-4 (15'-20') Fine-grained; brown to reddish brown to black; silty/sandy clay with weathered material; strong petroleum odor; no moisture.	20.0
		B19-5 (20'-25') Fine-grained; brown to reddish brown to black; silty/sandy clay with weathered material; strong petroleum odor; no moisture.	25.0
		B19-6 (25'-30') Fine-grained; brown to reddish brown to black; silty/sandy clay with weathered material; strong petroleum odor; no moisture.	28.0
			30.0

SAMPLE

Number	Type	Lab Results (TPH-GRO)
B19-1		9,060
B19-2		4,580
B19-3		12,600
B19-4		8,100
B19-5		8,510
B19-6		5,450

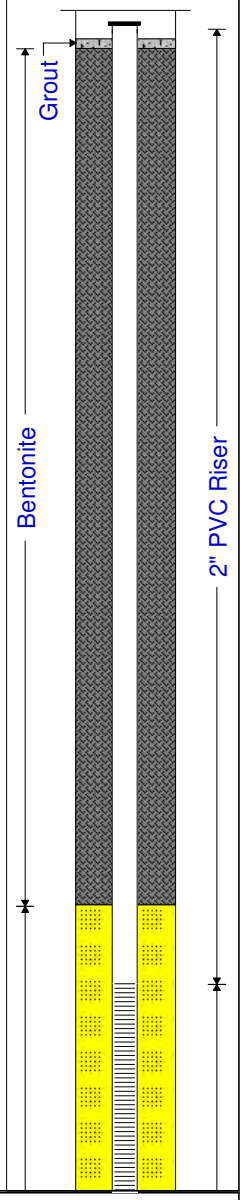
PID READINGS

VOC Concentration ppm



MONITORING WELL DIAGRAM

Well Completion Details



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/18/2017 - 09/21/2017

Hole Size: 6.875 INCHES

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B19

Diagram of Monitoring Well: MW04

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE

Depth	Description	Depth
31–33	***B19-7 (30'-34')*** Fine-grained; brown to black to tan; weathered material with quartz fragmetns evident; strong petroleum odor; no moisture. Obtained rod refusal at approximately 34.0 feet bgs due to suspected weathered rock.	
34–35	***B19-8 (35')*** Converted drill rig to HSA. Fine grained; brown; weathered material with silty fine sand; strong petroleum odor; no moisture.	35.0
36–39	***B19-9 (40')*** Fine grained; brown; weathered material with silty fine sand; strong petroleum odor; no moisture.	40.0
40–44	***B19-10 (45')*** Fine grained; dark brown; weathered material with small rock fragments; strong petroleum odor; slight moisture.	45.0
45–49	***B19-11 (50')*** Fine grained; dark brown; weathered material with small rock fragments; strong petroleum odor; moisture evident.	50.0
50–54	***B19-12 (55')*** Fine grained; dark brown; weathered material with silty fine sand; strong petroleum odor; moisture evident. Terminated soil boring B19 approximately 55 feet bgs due to evidence of groundwater. Converted soil boring B19 to monitoring well MW04.	55.0
55	End of Borehole	

SAMPLE

Number	Lab Results (TPH-GRO)
B19-7	5,830
B19-8	NA
B19-9	2,630
B19-10	637
B19-11	NA
B19-12	NA

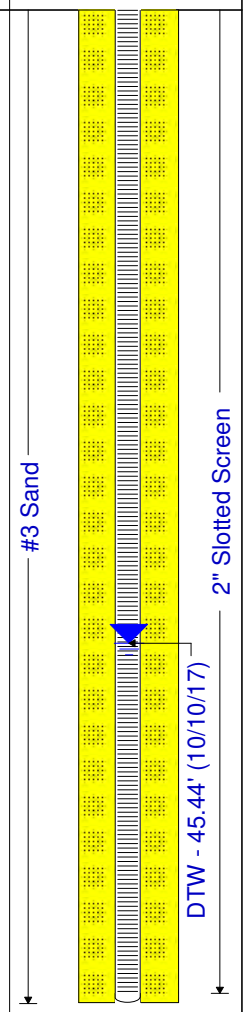
PID READINGS

VOC Concentration ppm (1000, 2000, 3000)

1,658 → 1,511 → 1,736 → 1,748 → 1,374 → 1,386 → 1,563

MONITORING WELL DIAGRAM

Well Completion Details



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/18/2017 - 09/21/2017

Hole Size: 6.875 INCHES

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B20

Diagram of Monitoring Well: MW05

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE

Depth	Description	Depth
	Ground Surface	0.0
	Asphalt	0.5
	B20-1 (0.5-5') Fine-grained; reddish brown clay; no petroleum odor; no moisture.	5.0
	B20-2 (5'-10') Fine-grained; mottled reddish brown to brown to black; silty/sandy clay with fine/silty sand; no petroleum odor; no moisture.	10.0
	B20-3 (10'-15') Fine-grained; mottled brown to reddish brown to tan; fine silty sand; no petroleum odor; no moisture.	15.0
	B20-4 (15'-20') Fine-grained; mottled brown to tan to white; fine silty/sandy clay; no petroleum odor; no moisture.	20.0
	B20-5 (20'-25') Fine-grained; mottled brown to white to gray; silty fine sand; no petroleum odor; no moisture.	25.0
	B20-6 (25'-28') Fine-grained; mottled brown to white to gray; silty fine sand with weathered material present; no petroleum odor; no moisture. Obtained rod refusal at approximately 28.0 feet bgs due to suspected weathered rock.	28.0
		30.0

SAMPLE

Number	Lab Results (TPH-GRO)
B20-1	NA
B20-2	NA
B20-3	NA
B20-4	NA
B20-5	NA
B20-6	NA
B20-7	NA

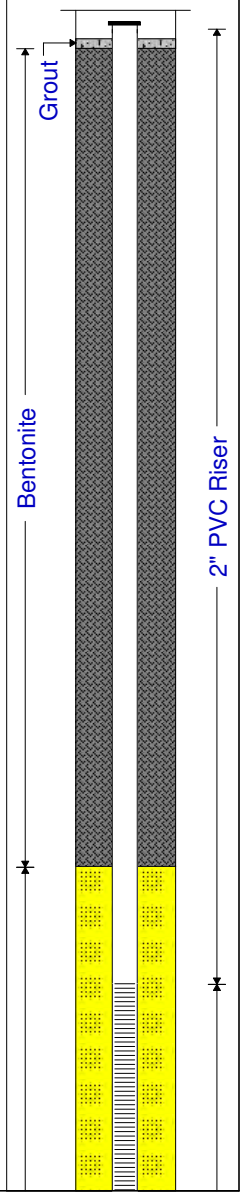
PID READINGS

VOC Concentration ppm (2.5, 5, 7.5)

0.0

MONITORING WELL DIAGRAM

Well Completion Details



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/19/2017

Hole Size: 6.875 INCHES

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

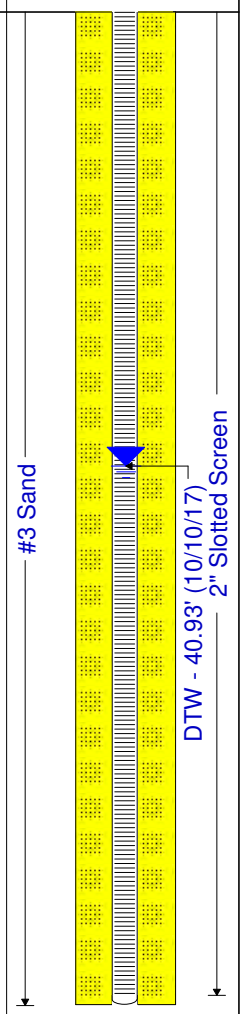
Log of Borehole: B20

Diagram of Monitoring Well: MW05

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO)	VOC Concentration ppm (2.5, 5, 7.5)	Well Completion Details
31, 32, 33, 34, 35		***B20-7 (30')*** Converted drill rig to HSA. Fine-grained; silty/fine sand with weathered material present; no petroleum odor; no moisture. ***B20-8 (35')*** Fine-grained; silty/fine sand with weathered material present; no petroleum odor; no moisture.	35.0	B20-8		1.34	0.0, 0.0, 0.0	
36, 37, 38, 39, 40		***B20-9 (40')*** Fine grained; brown; silty/fine sand with weathered material present; no petroleum odor; no moisture.	40.0	B20-9		NA	0.0	
41, 42, 43, 44, 45		***B20-10 (45')*** Fine grained; brown; silty/fine sand with weathered material present; no petroleum odor; slight moisture.	45.0	B20-10		ND	0.0	
46, 47, 48, 49, 50		***B20-11 (50')*** Fine grained; brown; silty/fine sand with weathered material present; no petroleum odor; moisture evident.	50.0	B20-11		NA	0.0	
51, 52, 53, 54, 55		***B20-12 (55')*** Fine grained; brown; silty/fine sand with weathered material present; no petroleum odor; moisture evident. Terminated soil boring B20 approximately 55 feet bgs due to evidence of groundwater. Converted soil boring B20 to monitoring well MW05.	55.0	B20-12		NA	0.0	
56, 57, 58, 59, 60		End of Borehole						



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/19/2017

Hole Size: 6.875 INCHES

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

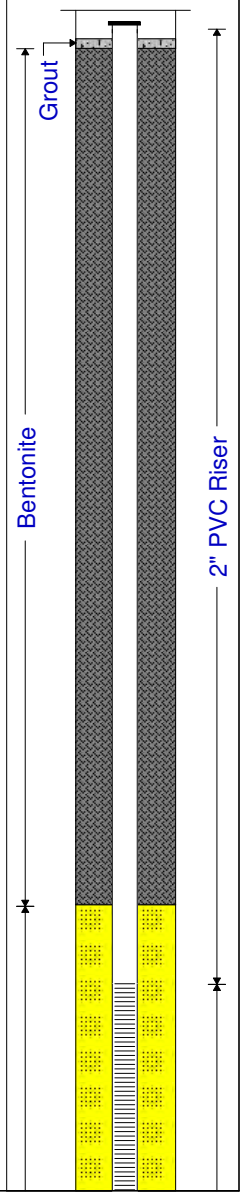
Log of Borehole: B21

Diagram of Monitoring Well: MW06

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO)	VOC Concentration ppm (2.5, 5, 7.5)	Well Completion Details
		Ground Surface	0.0					
		Asphalt	0.5					
		B21-1 (0.5-5') Fine-grained; reddish brown silty/sandy clay; no petroleum odor; no moisture.	5.0	B21-1		NA	0.0	
		B21-2 (5'-10') Fine-grained; brown to reddish brown; silty/sandy clay; no petroleum odor; no moisture.	10.0	B21-2		NA	0.0	
		B21-3 (10'-15') Fine-grained; mottled brown to tan to white; silty/fine sand with some weathered material and mica present; no petroleum odor; no moisture.	15.0	B21-3		NA	0.0	
		B21-4 (15'-20') Fine-grained; mottled brown to tan to white; silty/fine sand with some weathered material, mica and quartz fragments present; no petroleum odor; no moisture.	20.0	B21-4		NA	0.0	
		B21-5 (20'-25') Fine-grained; mottled brown to black to tan; silty/fine sand with weathered material and small rock fragments present; no petroleum odor; no moisture.	25.0	B21-5		NA	0.0	
		B21-6 (30') Obtained rod refusal at approximately 29.0 feet bgs due to suspected weathered rock. No recovery. Switched to HSA. Sample collected from auger cuttings. Fine-grained; brown; fine/silty sand with weathered material present; no petroleum odor; no	30.0	B21-6		NA	0.0 / 0.7	



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/19/2017

Hole Size: 6.875 INCHES

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

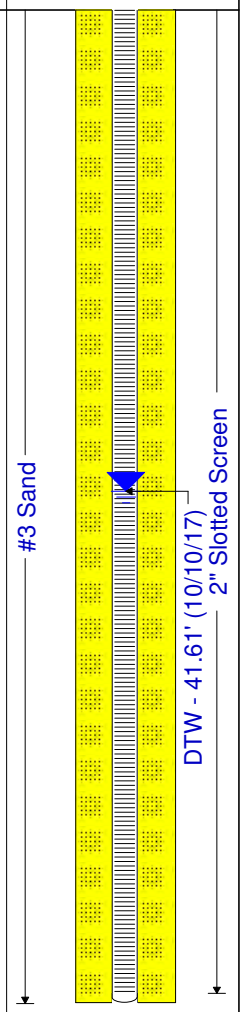
Log of Borehole: B21

Diagram of Monitoring Well: MW06

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO)	VOC Concentration ppm (2.5, 5, 7.5)	Well Completion Details
31–34		***B21-7 (35')*** Fine-grained; brown; fine/silty sand with weathered material present; no petroleum odor; no moisture.	35.0	B21-7		ND	0.0	
35–39		***B21-8 (40')*** Fine-grained; brown to dark brown; silty/fine sand with weathered material present; no petroleum odor; no moisture.	40.0	B21-8		NA	0.0	
40–44		***B21-9 (45')*** Fine-grained; brown to dark brown; silty/fine sand with weathered material present; no petroleum odor; slight moisture.	45.0	B21-9		ND	0.0	
45–49		***B21-10 (50')*** Fine grained; brown to dark brown; fine/silty sand with weathered material present; no petroleum odor; moisture evident.	50.0	B21-10		ND	0.0	
50–54		***B21-11 (55')*** Fine grained; brown to dark brown; fine/silty sand with weathered material present; no petroleum odor; moisture evident. Terminated soil boring B21 approximately 55 feet bgs due to evidence of groundwater. Converted soil boring B21 to monitoring well MW06.	55.0	B21-11		NA	0.7	
55–60		End of Borehole						



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/19/2017

Hole Size: 6.875 INCHES

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

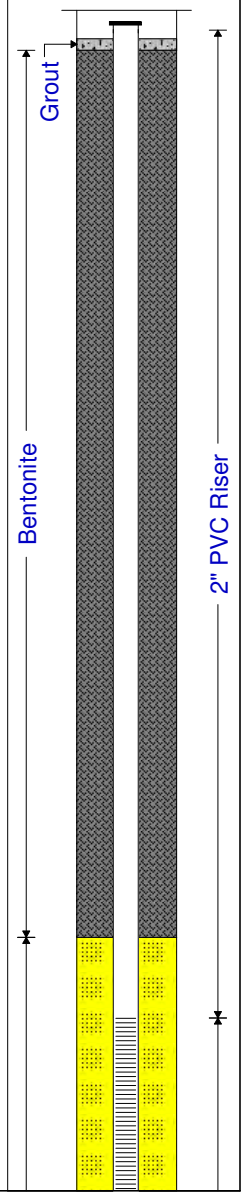
Log of Borehole: B22

Diagram of Monitoring Well: MW07

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO)	VOC Concentration ppm (2.5, 5, 7.5)	Well Completion Details
		Ground Surface	0.0					
0		**Asphalt**	0.5					
1–4		**B22-1 (0.5-5')** Fine-grained; reddish brown silty/sandy clay; no petroleum odor; no moisture.	5.0	B22-1		NA	0.0	
5–9		**B22-2 (5'-10')** Fine-grained; mottled brown to light brown to white; silty/sand with larger rock fragments present; no petroleum odor; no moisture.	10.0	B22-2		NA	0.0	
10–14		**B22-3 (10'-15')** Fine-grained; mottled brown to light brown to white; silty/sand with larger rock fragments present; no petroleum odor; no moisture.	15.0	B22-3		NA	0.0	
15–19		**B22-4 (15'-20')** Fine-grained; mottled brown to black to tan; silty/fine sand; no petroleum odor; no moisture.	20.0	B22-4		NA	0.0	
20–24		**B22-5 (20'-25')** Fine-grained; tan to brown silty/sand; no petroleum odor; no moisture.	25.0	B22-5		NA	0.0	
25–29		**B22-6 (25'-29')** Fine-grained; tan to brown silty sand; no petroleum odor; no moisture. Obtained rod refusal at approximately 29.0 feet bgs due to suspected weathered rock.	29.0	B22-6		NA	0.0	



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/19/2017

Hole Size: 6.875 INCHES

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

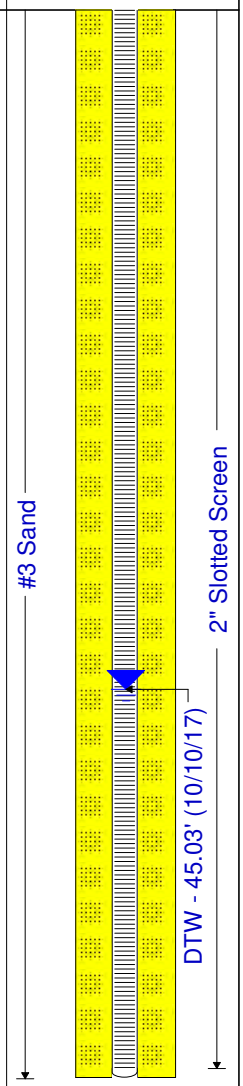
Log of Borehole: B22

Diagram of Monitoring Well: MW07

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO)	VOC Concentration ppm (2.5, 5, 7.5)	Well Completion Details
30		***B22-7 (30')*** Converted drill rig to HSA. Fine-grained; brown; silty sand with weathered material; no petroleum odor; no moisture.	30.0	B22-7		NA	0.0	
31							0.0	
32		***B22-8 (35')*** Fine-grained; brown; silty sand with weathered material; no petroleum odor; no moisture.		B22-8		ND		
33							0.0	
34								
35		***B22-9 (40')*** Fine-grained; brown; silty sand with weathered material; no petroleum odor; slight moisture.	35.0					
36								
37				B22-9		NA	0.0	
38								
39								
40		***B22-10 (45')*** Fine-grained; brown; silty/fine sand with weathered material present; no petroleum odor; slight moisture.	40.0					
41								
42				B22-10		ND	0.0	
43								
44								
45		***B22-11 (50')*** Fine-grained; brown; silty/fine sand with weathered material present; no petroleum odor; moisture evident.	45.0					
46								
47				B22-11		NA	0.0	
48								
49								
50		***B22-12 (55')*** Fine-grained; brown; silty/fine sand with weathered material present; no petroleum odor; moisture evident. Terminated soil boring B22 approximately 55 feet bgs due to evidence of groundwater. Converted soil boring B22 to monitoring well MW07.	50.0					
51								
52				B22-12		NA	0.0	
53								
54								
55		End of Borehole	55.0					
56								
57								
58								



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/19/2017

Hole Size: 6.875 INCHES

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B23

Diagram of Monitoring Well: MW08

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE

Depth	Description	Depth
	Ground Surface	0.0
	Asphalt	0.5
	B23-1 (0.5-5') Fine-grained; reddish brown; silty/sandy clay; no petroleum odor; no moisture.	5.0
	B23-2 (5'-10') Fine-grained; mottled brown to dark brown to tan; silty/sand; no petroleum odor; no moisture.	10.0
	B23-3 (10'-15') Fine-grained; mottled brown to tan to white; silty/fine sand; no petroleum odor; no moisture.	15.0
	B23-4 (15'-20') Fine-grained; mottled brown to tan to white; silty/fine sand; no petroleum odor; no moisture.	20.0
	B23-5 (20'-25') Fine-grained; brown to light brown; silty/fine sand; no petroleum odor; no moisture.	25.0
	B23-6 (25'-30') Fine-grained; brown to light brown; silty/fine sand with weathered material and small rock fragments present; no petroleum odor; no moisture. Obtained rod refusal at approximately 30.0 feet bgs due to suspected weathered rock.	30.0

SAMPLE

Number	Lab Results (TPH-GRO)
B23-1	NA
B23-2	NA
B23-3	NA
B23-4	NA
B23-5	NA
B23-6	NA

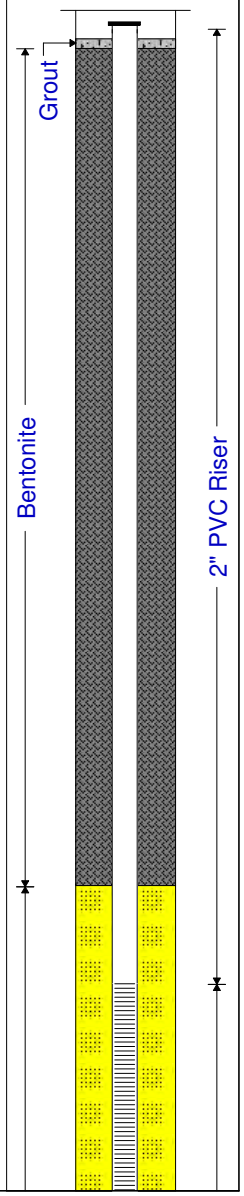
PID READINGS

VOC Concentration ppm (2.5, 5, 7.5)

Number	PID Reading
B23-1	0.0
B23-2	0.0
B23-3	0.4
B23-4	0.1
B23-5	0.0
B23-6	0.1
	0.0

MONITORING WELL DIAGRAM

Well Completion Details



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/20/2017

Hole Size: 6.875 INCHES

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

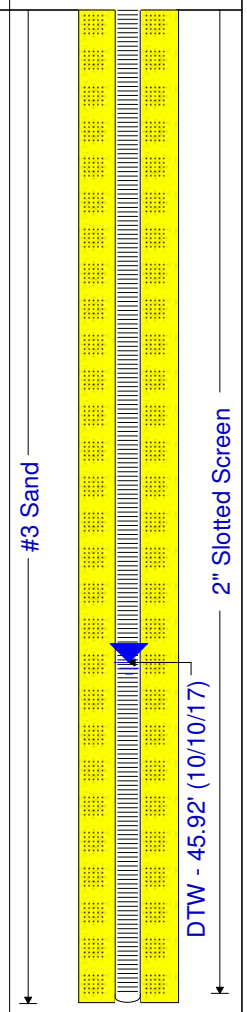
Log of Borehole: B23

Diagram of Monitoring Well: MW08

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO)	VOC Concentration ppm (2.5, 5, 7.5)	Well Completion Details
31–34		***B23-7 (35')*** Converted drill rig to HSA. Fine-grained; brown; silty fine sand; no petroleum odor; no moisture.	35.0	B23-7		ND	0.1, 0.0	
35–39		***B23-8 (40')*** Fine-grained; brown; silty fine sand; no petroleum odor; no moisture.	40.0	B23-8		NA	0.0	
40–44		***B23-9 (45')*** Fine-grained; brown to dark brown; silty/fine sand with small rock fragments; no petroleum odor; no moisture.	45.0	B23-9		ND	0.0	
45–49		***B23-10 (50')*** Fine-grained; brown to dark brown; silty/fine sand with small rock fragments; no petroleum odor; moisture evident.	50.0	B23-10		NA	0.0	
50–55		***B23-11 (55')*** Fine-grained; dark brown; silty/fine sand with weathered material present; no petroleum odor; moisture evident. Terminated soil boring B23 approximately 55 feet bgs due to evidence of groundwater. Converted soil boring B23 to monitoring well MW08.	55.0	B23-11		NA	0.0	
56–60		End of Borehole						



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/20/2017

Hole Size: 6.875 INCHES

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B24

Diagram of Monitoring Well: MW09

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE

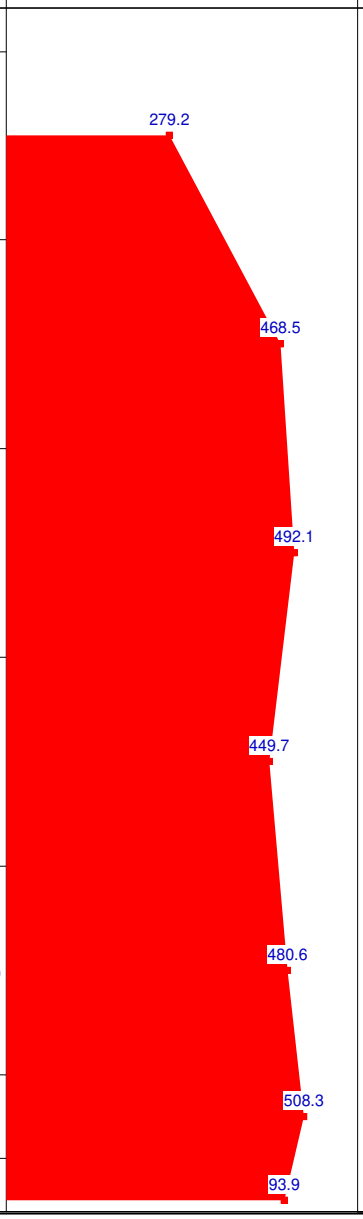
Depth	Description	Depth
	Ground Surface	0.0
	Asphalt	0.5
	B24-1 (0.5-5') Fine-grained; reddish brown; silty/sandy clay; slight petroleum odor; no moisture.	5.0
	B24-2 (5'-10') Fine-grained; mottled brown to tan to dark brown; silty/fine sand; strong petroleum odor; no moisture.	10.0
	B24-3 (10'-15') Fine-grained; mottled brown to light brown; silty/fine sand; strong petroleum odor; no moisture.	15.0
	B24-4 (15'-20') Fine-grained; mottled brown to orangish brown to tan; silty/fine sand; strong petroleum odor; no moisture.	20.0
	B24-5 (20'-25') Fine-grained; mottled brown to orangish brown to tan; silty/fine sand; strong petroleum odor; no moisture.	25.0
	B24-6 (25'-27') Fine-grained; mottled brown to orangish brown to tan; silty/fine sand; strong petroleum odor; no moisture.	27.0
	Obtained rod refusal at approximately 27.0 feet bgs due to suspected weathered rock.	

SAMPLE

Number	Lab Results (TPH-GRO) / (TPH-DRO)
B24-1	168 / 6,310
B24-2	126 / 9,130
B24-3	88.9 / 6,690
B24-4	112 / 7,910
B24-5	1,740 / 18,900
B24-6	NA / NA

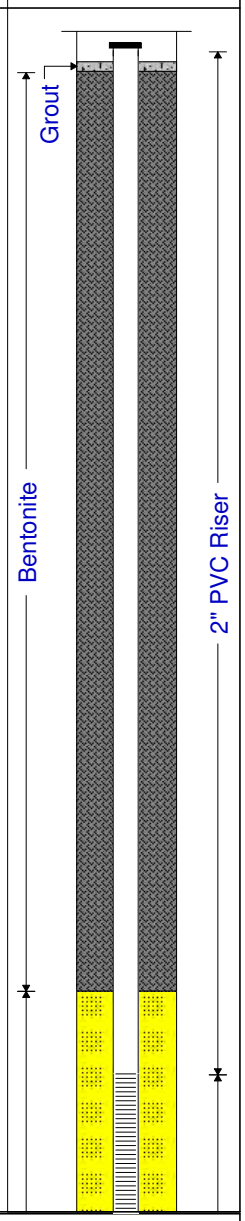
PID READINGS

VOC Concentration ppm (150, 300, 450)



MONITORING WELL DIAGRAM

Well Completion Details



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/20/2017

Hole Size: 6.875 INCHES

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B24

Diagram of Monitoring Well: MW09

Geologist: ADAM FLORA

Generation Date: 11/09/2017

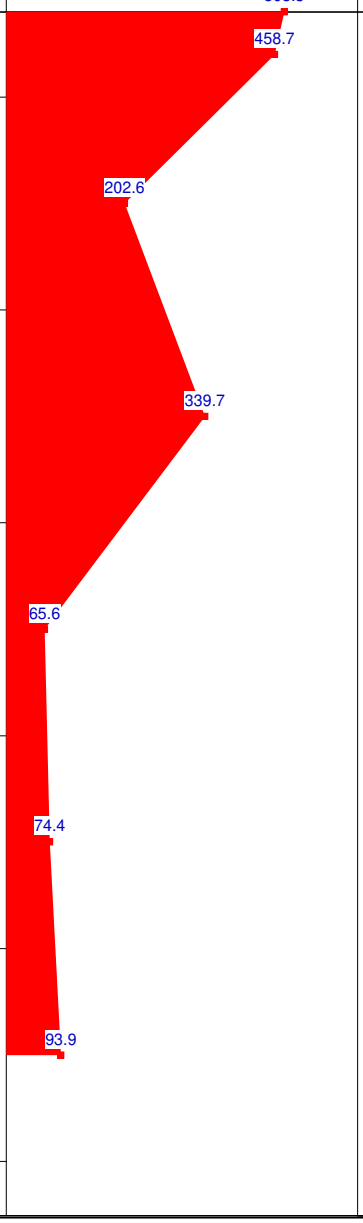
SUBSURFACE PROFILE

Depth	Description	Depth
29–30	***B24-7 (30')*** Converted drill rig to HSA. Fine-grained; brown to orangish brown; silty/fine sand with weathered material present; petroleum odor; no moisture.	30.0
30–35	***B24-8 (35')*** Fine-grained; brown to orangish brown; silty/fine sand; petroleum odor; no moisture.	35.0
35–40	***B24-9 (40')*** Fine-grained; brown to orangish brown; silty/fine sand; petroleum odor; no moisture.	40.0
40–45	***B24-10 (45')*** Fine-grained; brown to dark brown; silty/fine sand; petroleum odor; slight moisture.	45.0
45–50	***B24-11 (50')*** Fine-grained; brown to dark brown; silty/fine sand; petroleum odor; moisture evident.	50.0
50–55	***B24-12 (55')*** Fine-grained; brown to dark brown; silty/fine sand with weathered material present; strong petroleum odor; moisture evident. Terminated soil boring B24 approximately 55 feet bgs due to evidence of groundwater. Converted soil boring B27 to monitoring well MW09.	55.0
55–56	End of Borehole	

SAMPLE

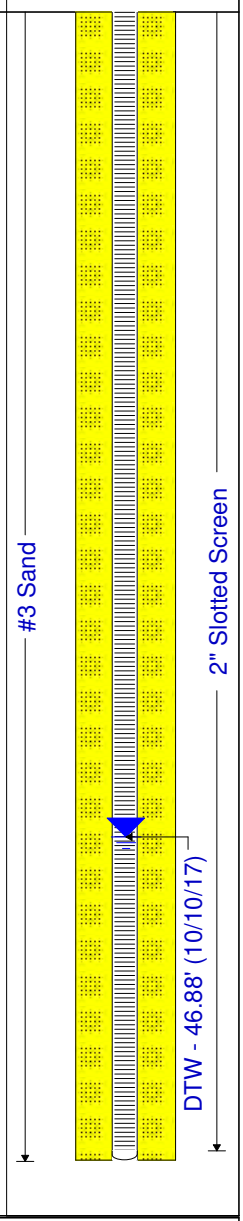
Number	Lab Results (TPH-GRO) / (TPH-DRO)
B24-7	127 / 10,500
B24-8	41.2 / 1,280
B24-9	23.9 / 2,360
B24-10	910 / 153
B24-11	NA / NA
B24-12	NA / NA

PID READINGS



MONITORING WELL DIAGRAM

Well Completion Details



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/20/2017

Hole Size: 6.875 INCHES

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B25

Diagram of Monitoring Well: MW10

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE

Depth	Symbol	Description	Depth
		Ground Surface	0.0
0		***Asphalt***	0.5
1–5		***B25-1 (0.5-5')*** Fine-grained; reddish brown; silty/sandy clay with silty/fine sand at approximately 4 feet bgs; slight petroleum odor; no moisture.	5.0
5–10		***B25-2 (5'-10')*** Fine-grained; mottled brown to light brown to orangish brown; silty/fine sand; slight petroleum odor; no moisture.	10.0
10–15		***B25-3 (10'-15')*** Fine-grained; mottled brown to dark brown; silty/fine sand; petroleum odor; no moisture.	15.0
15–20		***B25-4 (15'-20')*** Fine-grained; mottled dark brown to black to white; silty/fine sand; petroleum odor; no moisture.	20.0
20–25		***B25-5 (20'-25')*** Fine-grained; mottled dark brown to brown to white; silty/fine sand; petroleum odor; no moisture.	25.0
25–27		***B25-6 (25'-27')*** Fine-grained; dark brown to black to tan; silty/fine sand and weatherexd material; strong petroleum odor; no moisture.	27.0
27–30		Obtained rod refusal at approximately 27.0 feet bgs due to suspected weathered rock.	30.0

SAMPLE

Number	Type	Lab Results (TPH-GRO)
B25-1		1,280
B25-2		1,090
B25-3		1,360
B25-4		2,230
B25-5		ND
B25-6		NA
B25-7		ND

PID READINGS

VOC Concentration ppm (175, 350, 525)

135.7, 234.2, 270.2, 397.2, 447.9, 651.7, 101.4, 38.1

MONITORING WELL DIAGRAM

Well Completion Details

Grout

Bentonite

2" PVC Riser

Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/21/2017

Hole Size: 6.875 INCHES

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B25

Diagram of Monitoring Well: MW10

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE

Depth	Description	Depth
	B25-7 (30') Converted drill rig to HSA. Fine-grained; brown; silty/fine sand; petroleum odor; no moisture.	
	B25-8 (35') Fine-grained; brown; weathered material with silty/fine sand; petroleum odor; no moisture.	35.0
	B25-9 (40') Fine-grained; brown; weathered material with silty/fine sand; petroleum odor; no moisture.	40.0
	B25-10 (45') Fine-grained; brown; weathered material with silty/fine sand; petroleum odor; no moisture.	45.0
	B25-11 (50') Fine-grained; brown to light brown; weathered material; slight petroleum odor; moisture evident.	50.0
	B25-12 (55') Fine-grained; brown to light brown; weathered material; slight petroleum odor; moisture evident. Terminated soil boring B25 approximately 55 feet bgs due to evidence of groundwater. Converted soil boring B25 to monitoring well MW10.	55.0
	End of Borehole	

SAMPLE

Number	Lab Results (TPH-GRO)
B25-8	ND
B25-9	ND
B25-10	ND
B25-11	NA
B25-12	NA

PID READINGS

VOC Concentration ppm (175, 350, 525)

101.4, 108.3, 78.2, 109.1, 21.8, 38.1

MONITORING WELL DIAGRAM

Well Completion Details

#3 Sand

2" Slotted Screen

DTW - 45.59' (10/10/17)

Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/21/2017

Hole Size: 6.875 INCHES

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B26

Diagram of Monitoring Well: MW11

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE

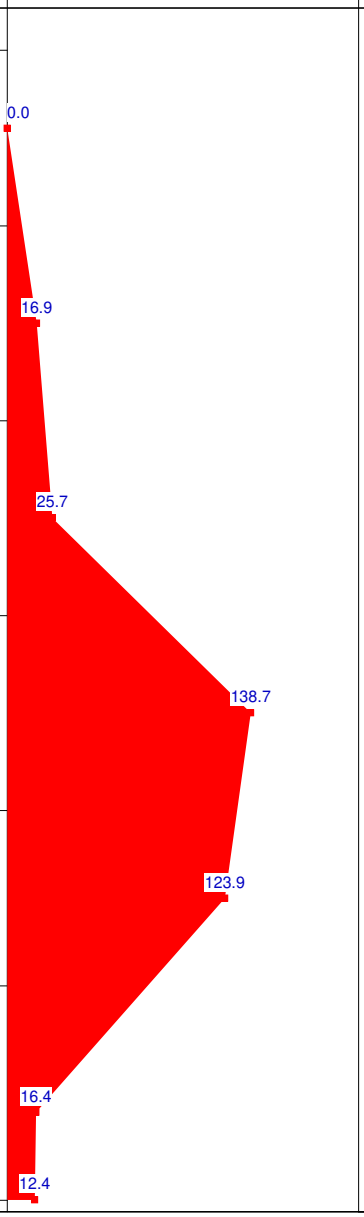
Depth	Symbol	Description	Depth
		Ground Surface	0.0
		Asphalt	0.5
		B26-1 (0.5-5') Fine-grained; reddish brown; silty/sandy clay; no petroleum odor; no moisture.	5.0
		B26-2 (5'-10') Fine-grained; mottled brown to light brown to tan; silty/fine sand; slight petroleum odor; no moisture.	10.0
		B26-3 (10'-15') Fine-grained; mottled brown to orangish brown with black; silty/fine sand; slight petroleum odor; no moisture.	15.0
		B26-4 (15'-20') Fine-grained; mottled brown to orangish brown with black; silty/fine sand; petroleum odor; no moisture.	20.0
		B26-5 (20'-24.5') Fine-grained; mottled orangish brown to brown to black; weathered material and silty fine sand; petroleum odor; no moisture. Obtained rod refusal at approximately 24.5 feet bgs due to suspected weathered rock.	24.5
		B26-6 (30') Converted drill rig to HSA. Fine-grained; brown; weathered material; silty/fine sand; slight petroleum odor; no moisture.	30.0

SAMPLE

Number	Type	Lab Results (TPH-GRO)
B26-1		NA
B26-2		ND
B26-3		ND
B26-4		ND
B26-5		ND
B26-6		ND

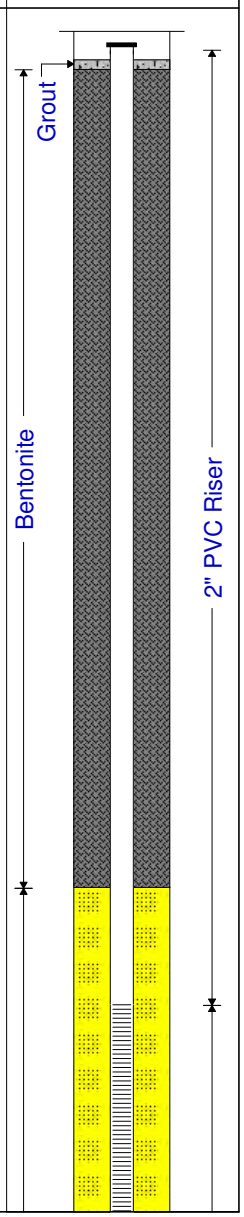
PID READINGS

VOC Concentration ppm (50, 100, 150)



MONITORING WELL DIAGRAM

Well Completion Details



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/21/2017

Hole Size: 6.875 INCHES

GREENE ENVIRONMENTAL SERVICES LLC
200 Buckwheat Lane
Rocky Mount, VA 24151

Project No: CSVI1002

Project: SITE CHARACTERIZATION REPORT

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B26

Diagram of Monitoring Well: MW11

Geologist: ADAM FLORA

Generation Date: 11/09/2017

SUBSURFACE PROFILE

Depth	Description	Depth
31–34	***B26-7 (35')*** Fine-grained; brown; weathered material; silty/fine sandl; slight petroleum odor; no moisture.	35.0
35–39	***B26-8 (40')*** Fine-grained; brown; weathered material with silty/fine sand; slight petroleum odor; no moisture.	40.0
40–44	***B26-9 (45')*** Fine-grained; brown; weathered material with silty/fine sand; slight petroleum odor; no moisture.	45.0
45–49	***B26-10 (50')*** Fine-grained; brown to dark brown; weathered material; slight petroleum odor; moisture evident.	50.0
50–54	***B26-11 (55')*** Fine-grained; brown to dark brown; weathered material; slight petroleum odor; moisture evident. Terminated soil boring B25 approximately 55 feet bgs due to evidence of groundwater. Converted soil boring B25 to monitoring well MW10.	55.0
55	End of Borehole	

SAMPLE

Number	Type	Lab Results (TPH-GRO)
B26-7		ND
B26-8		ND
B26-9		ND
B26-10		NA
B26-11		NA

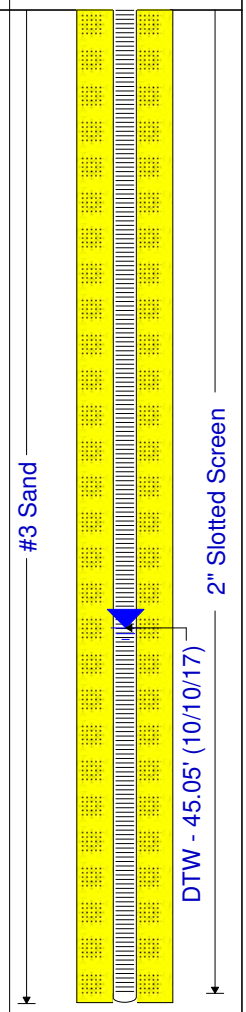
PID READINGS

VOC Concentration ppm (50, 100, 150)

16.4, 15.2, 12.1, 14.6, 9.0, 12.4

MONITORING WELL DIAGRAM

Well Completion Details



Drill Method: DIRECT PUSH/HSA

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/21/2017

Hole Size: 6.875 INCHES

GREENE ENVIRONMENTAL SERVICES LLC
200 Buckwheat Lane
Rocky Mount, VA 24151

Project No: CSVI1003

Project: SCRA

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B27

Diagram of Monitoring Well: MW12

Geologist: ADAM FLORA

Generation Date: 12/13/2018

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO) (TPH-DRO)	VOC Concentration ppm (2.5, 5, 7.5)	Well Completion Details
		Ground Surface	0.0					
		Grass						
		B27-1 (0'-20') Fine-grained; brown; silty/sandy clay; slightly micaceous; no petroleum odor; no moisture.	20.0	B27-1		NA	0.0	Bentonite
		B27-2 (20'-40') Fine-grained; brown; silty/sandy clay; slightly micaceous; no petroleum odor; no moisture.	40.0	B27-2		NA	0.0	6" Steel Casing
		B27-3 (50') Fine-grained; brown; slightly micaceous; slightly weathered; slight moisture.	50.0	B27-3		ND	0.0	
		B27-4 (60') Fine-grained; brown; slightly micaceous; weathered material; slight moisture.	60.0	B27-4		ND	0.0	

Drill Method: AIR ROTARY

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 08/14/18

Hole Size: 10-INCH

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1003

Project: SCRA

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

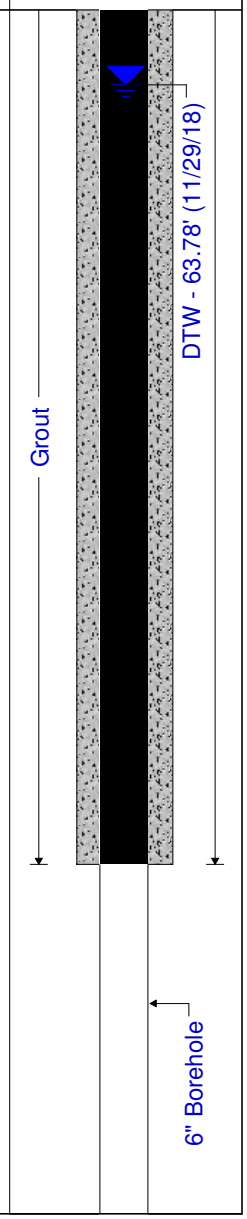
Log of Borehole: B27

Diagram of Monitoring Well: MW12

Geologist: ADAM FLORA

Generation Date: 12/13/2018

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO) (TPH-DRO)	VOC Concentration ppm 2.5 5 7.5	Well Completion Details
61–69		***B76-5 (70')*** Weathered rock observed approximately 63' bgs. No sample collected.	70.0					
70–79		***B27-6 (80')*** Competent bedrock observed approximately 75' bgs. No sample collected.	80.0					
80–89		***B27-7 (90')*** Competent bedrock. No sample collected.	90.0					
90–102		***B27-8 (103')*** Competent bedrock. No sample collected.	103.0					
103–119		***B27-9 (103'-120')*** Competent bedrock. No sample collected. Fracture observed approximately 113 ' bgs; estimated 3 gpm.	120.0					
120								



Drill Method: AIR ROTARY

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 08/14/18

Hole Size: 10-INCH

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1003

Project: SCRA

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B27

Diagram of Monitoring Well: MW12

Geologist: ADAM FLORA

Generation Date: 12/13/2018

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO) (TPH-DRO)	VOC Concentration ppm 2.5 5 7.5	Well Completion Details
121–139		***B27-10 (120'-140')*** Competent bedrock. No sample collected.	140.0					6" Borehole
140–159		***B27-11 (140'-160')*** Competent bedrock. No sample collected.	160.0					
160–179		***B27-12 (160'-180')*** Competent bedrock. No sample collected.	180.0					

Drill Method: AIR ROTARY

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 08/14/18

Hole Size: 10-INCH

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1003

Project: SCRA

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B27

Diagram of Monitoring Well: MW12

Geologist: ADAM FLORA

Generation Date: 12/13/2018

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO) (TPH-DRO)	VOC Concentration ppm 2.5 5 7.5	Well Completion Details
181–199		***B27-13 (180'-200')*** Competent bedrock. No sample collected. Fracture observed approximately 185 ' bgs; estimated 8-10 gpm.	200.0					
200–219		***B27-14 (200'-220')*** Competent bedrock. No sample collected.	220.0					6" Borehole
220–239		***B27-15 (220'-240')*** Competent bedrock. No sample collected.	240.0					

Drill Method: AIR ROTARY

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 08/14/18

Hole Size: 10-INCH

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1003

Project: SCRA

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B27

Diagram of Monitoring Well: MW12

Geologist: ADAM FLORA

Generation Date: 12/13/2018

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO) (TPH-DRO)	VOC Concentration ppm 2.5 5 7.5	Well Completion Details
241		***B27-16 (240'-260')*** Competent bedrock. No sample collected. Fracture observed approximately 250 ' bgs; estimated 50-75 gpm.						6" Borehole
242								
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261		End of Borehole						
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Drill Method: AIR ROTARY

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 08/14/18

Hole Size: 10-INCH

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1003

Project: SCRA

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

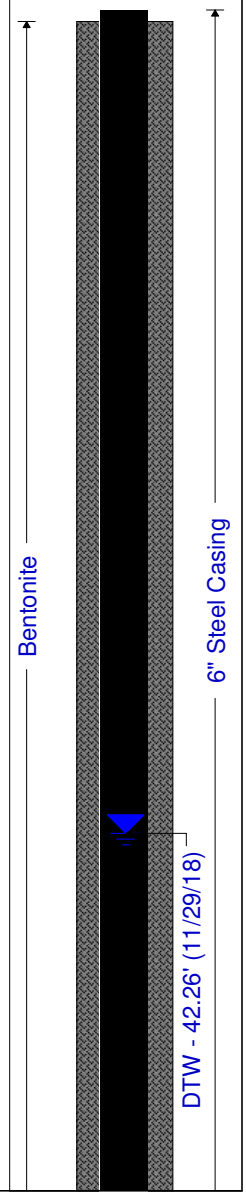
Log of Borehole: B28

Diagram of Monitoring Well: MW13

Geologist: ADAM FLORA

Generation Date: 12/13/2018

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO) (TPH-DRO)	VOC Concentration ppm (2.5, 5, 7.5)	Well Completion Details
		Ground Surface	0.0					
		Grass						
		B28-1 (0'-20') Fine-grained; brown; silty/sandy clay; no petroleum odor; no moisture.	20.0	B28-1		NA	0.0	
		B28-2 (20'-40') Fine-grained; brown; silty/sandy clay; no petroleum odor; no moisture.	40.0	B28-2		NA	0.0	
		B28-3 (50') Fine-grained; brown; slightly micaceous; weathered rock evident; no moisture.	50.0	B28-3		ND	0.0	
		B28-4 (60') Fine-grained; brown; slightly micaceous; weathered rock; slight moisture.	60.0	B28-4		ND	0.0	



Drill Method: AIR ROTARY

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 08/23/18

Hole Size: 10-INCH

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1003

Project: SCRA

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

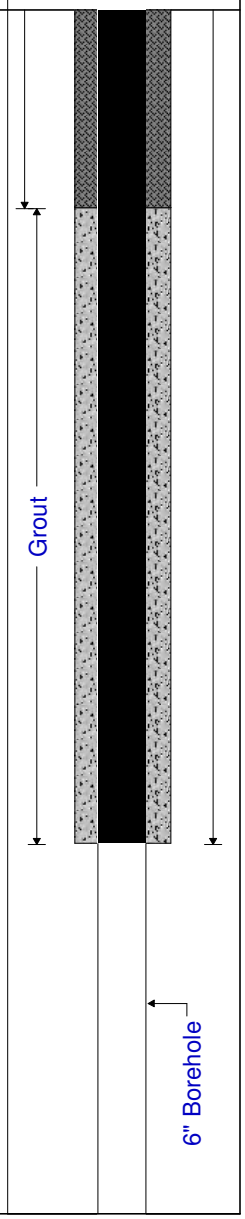
Log of Borehole: B28

Diagram of Monitoring Well: MW13

Geologist: ADAM FLORA

Generation Date: 12/13/2018

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO) (TPH-DRO)	VOC Concentration ppm 2.5 5 7.5	Well Completion Details
61–69		***B28-5 (70')*** Weathered rock. No sample collected.	70.0					
70–79		***B28-6 (80')*** Competent bedrock observed approximately 80' bgs. No sample collected.	80.0					
80–89		***B28-7 (90')*** Competent bedrock. No sample collected.	90.0					
90–101		***B28-8 (102')*** Competent bedrock. No sample collected.	102.0					
102–119		***B28-9 (102'-120')*** Competent bedrock. No sample collected.	120.0					



Drill Method: AIR ROTARY

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 08/23/18

Hole Size: 10-INCH

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1003

Project: SCRA

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B28

Diagram of Monitoring Well: MW13

Geologist: ADAM FLORA

Generation Date: 12/13/2018

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO) (TPH-DRO)	VOC Concentration ppm 2.5 5 7.5	Well Completion Details
121–139		***B28-10 (120'-140')*** Competent bedrock. No sample collected. Fracture observed approximately 135 ' bgs; estimated 3 gpm.	140.0					6" Borehole
140–159		***B28-11 (140'-160')*** Competent bedrock. No sample collected.	160.0					
160–179		***B28-12 (160'-180')*** Competent bedrock. No sample collected.	180.0					
180								

Drill Method: AIR ROTARY

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 08/23/18

Hole Size: 10-INCH

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1003

Project: SCRA

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B28

Diagram of Monitoring Well: MW13

Geologist: ADAM FLORA

Generation Date: 12/13/2018

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO) (TPH-DRO)	VOC Concentration ppm 2.5 5 7.5	Well Completion Details
181–199		**B28-13 (180'-200')** Competent bedrock. No sample collected.	200.0					
200–219		**B28-14 (200'-220')** Competent bedrock. No sample collected.	220.0					6" Borehole
220–239		**B28-15 (220'-240')** Competent bedrock. No sample collected.	240.0					

Drill Method: AIR ROTARY

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 08/23/18

Hole Size: 10-INCH

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1003

Project: SCRA

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B28

Diagram of Monitoring Well: MW13

Geologist: ADAM FLORA

Generation Date: 12/13/2018

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO) (TPH-DRO)	VOC Concentration ppm 2.5 5 7.5	Well Completion Details
241–259		***B28-16 (240'-260')*** Competent bedrock. No sample collected.	260.0					
260–279		***B28-17 (260'-280')*** Competent bedrock. No sample collected. Fracture observed approximately 270 ' bgs; estimated 50 gpm.	280.0					6" Borehole
280–299		***B28-18 (280'-300')*** Competent bedrock. No sample collected.	300.0					

Drill Method: AIR ROTARY

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 08/23/18

Hole Size: 10-INCH

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1003

Project: SCRA

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

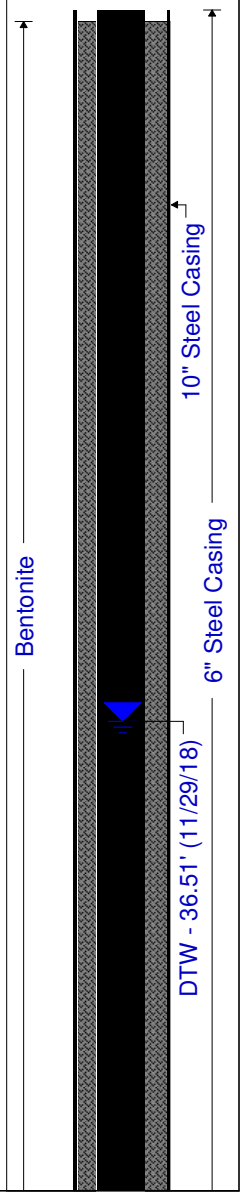
Log of Borehole: B29

Diagram of Monitoring Well: MW14

Geologist: ADAM FLORA

Generation Date: 12/13/2018

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO) (TPH-DRO)	VOC Concentration ppm (2.5, 5, 7.5)	Well Completion Details
		Ground Surface	0.0					
		Grass						
		B29-1 (0'-20') Fine-grained; brown; silty/sandy clay; slightly micaceous; no petroleum odor; no moisture.	20.0	B29-1		NA	0.0	
		B29-2 (30') Fine-grained; brown; silty/sandy clay; slightly micaceous; no petroleum odor; slight moisture.	30.0	B29-2		ND	0.0	
		B29-3 (40') Fine-grained; brown; silty/sandy clay; slightly micaceous; no petroleum odor; moisture/shallow groundwater evident.	40.0	B29-3		ND	0.0	
		B29-4 (50') Fine-grained; brown; slightly micaceous; silty/sandy clay with weathered material; shallow groundwater evident.	50.0	B29-4		NA	0.0	
		B29-5 (60') Weathered rock. No petroleum odor; shallow groundwater evident.	60.0	B29-5		NA	0.0	



Drill Method: AIR ROTARY

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/04/18

Hole Size: 10-INCH

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1003

Project: SCRA

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

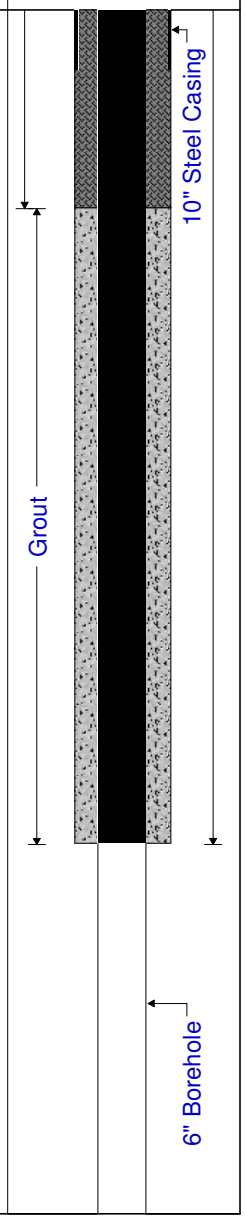
Log of Borehole: B29

Diagram of Monitoring Well: MW14

Geologist: ADAM FLORA

Generation Date: 12/13/2018

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO) (TPH-DRO)	VOC Concentration ppm 2.5 5 7.5	Well Completion Details
61–69		***B29-6 (70')*** Competent bedrock observed approximately 70' bgs. No sample collected.	70.0					
70–79		***B29-7 (80')*** Competent bedrock. No sample collected.	80.0					
80–89		***B29-8 (90')*** Competent bedrock. No sample collected.	90.0					
90–101		***B29-9 (102')*** Competent bedrock. No sample collected.	102.0					
102–120		***B29-10 (102'-120')*** Competent bedrock. No sample collected.	120.0					



Drill Method: AIR ROTARY
Drilled by: DAVIDSON DRILLING, INC.
Drill Date: 09/04/18
Hole Size: 10-INCH

GREENE ENVIRONMENTAL SERVICES LLC.

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Log of Borehole: B29

Diagram of Monitoring Well: MW14

Geologist: ADAM FLORA

Generation Date: 12/13/2018

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO) (TPH-DRO)	VOC Concentration ppm 2.5 5 7.5	Well Completion Details
121–139		***B29-11 (120'-140')*** Competent bedrock. No sample collected.	140.0					
140–159		***B29-12 (140'-160')*** Competent bedrock. No sample collected.	160.0					6" Borehole
160–179		***B29-13 (160'-180')*** Competent bedrock. No sample collected. Fracture observed approximately 170 ' bgs; estimated 75 gpm.	180.0					

Drill Method: AIR ROTARY

Drilled by: DAVIDSON DRILLING, INC.

Drill Date: 09/04/18

Hole Size: 10-INCH

GREENE ENVIRONMENTAL SERVICES LLC.

Project No: CSVI1003

Project: SCRA

Client: THE ESTATE OF LACY DUDLEY

Location: CHAMBLISSBURG SUPPLY

Log of Borehole: B29

Diagram of Monitoring Well: MW14

Geologist: ADAM FLORA

Generation Date: 12/13/2018

SUBSURFACE PROFILE				SAMPLE			PID READINGS	MONITORING WELL DIAGRAM
Depth	Symbol	Description	Depth	Number	Type	Lab Results (TPH-GRO) (TPH-DRO)	VOC Concentration ppm 2.5 5 7.5	Well Completion Details
181–199		***B29-14 (180'-200')*** Competent bedrock. No sample collected. Fracture observed approximately 185 ' bgs; estimated 75 gpm.	200.0					6" Borehole
200		End of Borehole						

Drill Method: AIR ROTARY
Drilled by: DAVIDSON DRILLING, INC.
Drill Date: 09/04/18
Hole Size: 10-INCH

GREENE ENVIRONMENTAL SERVICES LLC.

FRACTURE TRACE ANALYSIS & SITE RECONNAISSANCE FOR CHAMBLISSBURG SUPPLY

Vinton, Virginia

PREPARED FOR:

Mr. Adam Flora
Greene Environmental Services
129 Bunny Ridge Lane
Rocky Mount, VA 24151

November 3rd, 2017

Draper Aden Associates
Engineering • Surveying • Environmental Services

DAA Project Number: **17010623-010203**

Draper Aden Associates
Engineering • Surveying • Environmental Services

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November 3rd , 2017

Mr. Adam Flora
Greene Environmental Services
129 Bunny Ridge Lane
Rocky Mount, VA 24151

RE: Fracture Trace Analysis and Site Reconnaissance at Chamblissburg Supply, 10625 Stewartsville Road, Vinton, Virginia

Dear Mr. Flora,

Draper Aden Associates has completed the fracture trace analysis and site reconnaissance for the Chamblissburg Supply near Vinton, Virginia. The objective of this study was to conduct geologic research to identify fracture patterns that may be influencing groundwater movement to several water supply wells. The following report documents our methodologies and findings.

We value our professional relationship with Greene Environmental Services, and hope that you will contact us with any similar needs in the future. If you have any questions regarding this report, or if we can be of any further service to you please do not hesitate to contact us.

Sincerely,

Ethan Truman

Ethan Truman
Field Geologist

3RD PARTY REVIEW

This Report has been subjected to technical and quality reviews by:

Warren T. "Ted" Dean, PG		November 3rd, 2017
Geophysical Services Program Manager	Signature	Date

FIGURES

Figure 1. Study area of the fracture trace analysis.

Figure 2. A portion of the published geologic map of the study area. From Henika, 1997.

Figure 3. Results of fracture trace analysis, overlain with impacted water supply well locations.

TABLE OF CONTENTS

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2.0 INTRODUCTION 2
3.0 SITE GEOLOGY AND FRACTURE TRACE ANALYSIS 2
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1.0 EXECUTIVE SUMMARY

Draper Aden Associates (DAA) was retained by Greene Environmental Services to conduct a fracture trace analysis and site reconnaissance for the Chamblissburg Supply in Vinton, Virginia. The study area is located approximately 0.75 miles west of Chamblissburg, Virginia at 10625 Stewartsville Road, Vinton, Virginia. The objective of this study was to conduct geologic research to identify fracture patterns that may be influencing groundwater movement to several water supply wells.

The tasks involved in this study included:

1. Researching published geologic maps or other available literature;
2. Conducting a fracture trace analysis, and site reconnaissance;
3. Preparation of this document to detail theory, methods and findings.

The results of the background geologic research and fracture trace analysis revealed three prominent "sets" of fracture traces within the study area. The most prominent set (Set 1) is oriented generally northwest-southeast (spanning from 135 to 150 degrees), the secondary set (Set 2) is oriented approximately west-east (spanning from 75 to 120 degrees), and the third set (Set 3) is oriented northeast-southwest (spanning from 15 to 30 degrees).

The fracture trace analysis does not reveal any direct fracture pathway or pathways between the Chamblissburg Supply site and the impacted water supply wells. The contaminant migration path is likely to be a complex combination of the groundwater gradient and one or more fracture sets. Therefore, the fracture patterns may result in a lateral "stair-step" pathway of groundwater and contaminant flow.

2.0 INTRODUCTION

Draper Aden Associates (DAA) was retained by Greene Environmental Services to conduct a fracture trace analysis and site reconnaissance for the Chamblissburg Supply in Vinton, Virginia. The study area is located approximately 0.75 miles west of Chamblissburg, Virginia at 10625 Stewartsville Road, Vinton, Virginia (Figure 1). The objective of this study was to conduct geologic research to identify fracture patterns that may be influencing groundwater movement to several water supply wells.

The tasks involved in this study included:

4. Researching published geologic maps or other available literature;
5. Conducting a fracture trace analysis, and site reconnaissance;
6. Preparation of this document to detail theory, methods and findings.

3.0 SITE GEOLOGY AND FRACTURE TRACE ANALYSIS

3.1 Site Geology

The site is located within the Piedmont province, which is characterized by its rolling topography. The Piedmont province is underlain by a variety of igneous and metamorphic rocks, with most of the contacts between formations and other geologic structure trending northeast to southwest as is typical of Appalachian geology. According to the published bedrock geologic map the site is underlain by the biotite granofels and gneiss member of the Lovingston massif (Henika, W.S., 1997). The geologic map of the site contains no strike and dip symbols in the study area. The orientation of the strikes and dips of schistosity and compositional layering around the site are predominantly northeast-southwest with some of the compositional layering striking to the northwest-southeast, such as observed in the southeast corner of the study area (Figure 2).

In an attempt to obtain site-specific geologic information, a site reconnaissance was conducted. A thorough examination of local road cuts and stream beds was conducted, but no outcrops were found to confirm local geologic conditions.

3.2 Fracture Trace Analysis

A fracture trace analysis was conducted using a contour map produced from 2007 terrain models acquired from the Virginia Geographic Information Network (VGIN). Fracture traces are linear topographic features such as valleys or unusually straight river segments that are indicative of possible fracture zones within the underlying bedrock, which are the result of ancient directional tectonic stresses. Fractured bedrock is more susceptible to erosion and weathering than unfractured bedrock, and as such, over time the fractured bedrock zones weather downward at a faster rate than the relatively unfractured rock surrounding them, resulting in topographically lower linear features in the ground surface.

The results of the fracture trace analysis are presented in Figure 3, and are illustrated on a shaded relief terrain model. The interpreted fracture traces are illustrated as straight black lines, overlain with the impacted water supply wells (blue targets) for reference. The orientations of the interpreted fracture traces were used to create a rose diagram from which the most prominent fracture trace orientations can be derived.

The analysis revealed three prominent "sets" of fracture traces in the study area. The most prominent set (Set 1) is oriented generally northwest-southeast (spanning from 135 to 150 degrees), the secondary set (Set 2) is oriented approximately west-east (spanning from 75 to 120 degrees), and the third set (Set 3) is oriented northeast-southwest (spanning from 15 to 30 degrees).

4.0 CONCLUSIONS

The movement of groundwater and contaminants can be influenced by many factors, such as geologic structures and gradient. It is possible that any or all of the three sets of fracture traces could influence the migration of the groundwater. It should be noted that while the fracture trace analysis is conducted on fracture traces that are expressed in the topography, it is our experience in using geophysical imaging methods that fracture zones will exist in the bedrock that have no expression in the topography. Therefore, it is likely that fracture zones exist along the ridge on which Stewartsville Road resides where there are no observed fracture traces.

The fracture trace analysis does not reveal any direct fracture pathway or pathways between the Chamblissburg Supply site and the impacted water supply wells. The contaminant migration path is likely to be a complex combination of the groundwater gradient and one or more fracture sets. Therefore, the fracture patterns may result in a lateral "stair-step" pathway of groundwater and contaminant flow.

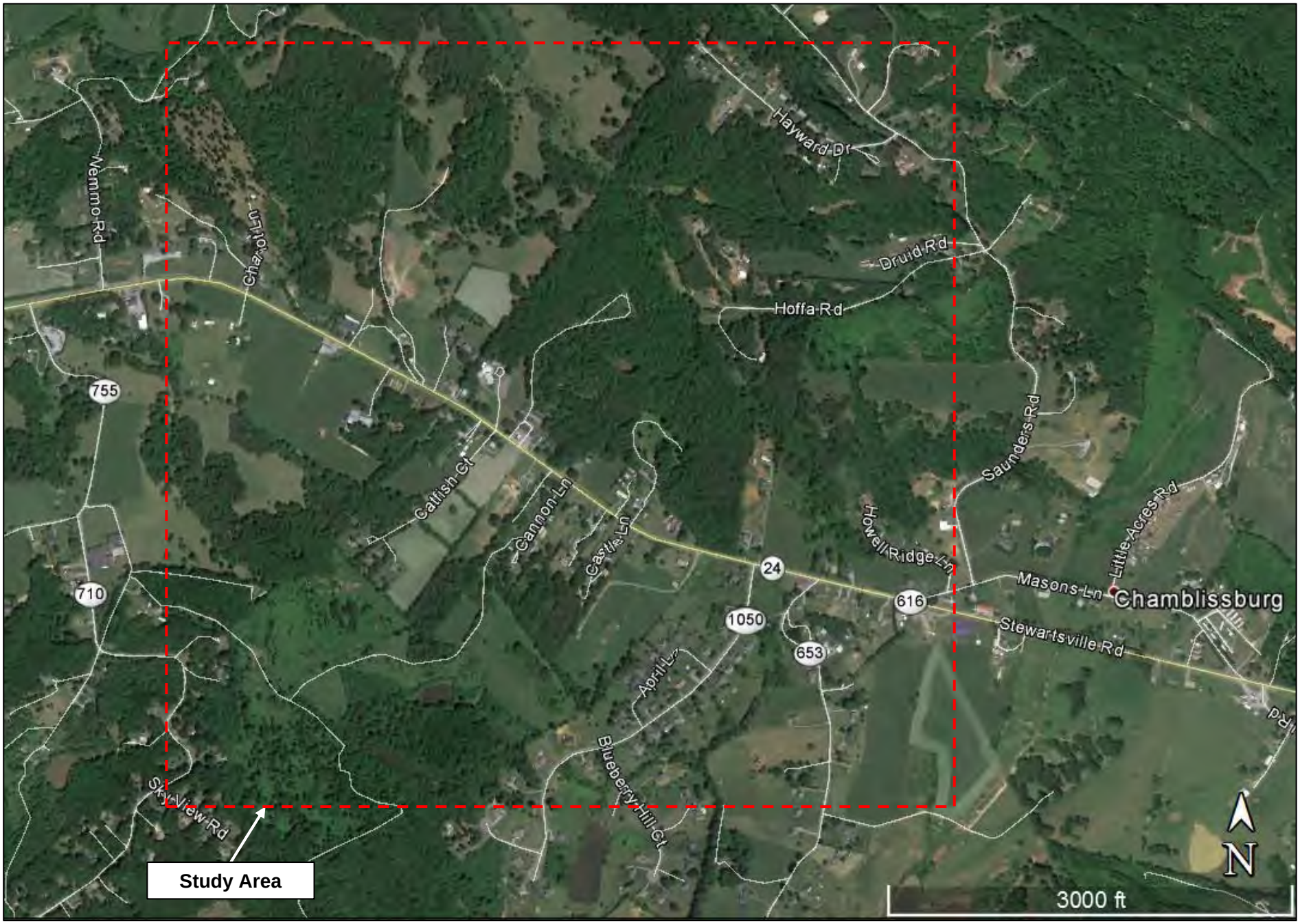
5.0 LIMITATIONS

In accordance with §54.1-402 of the Code of Virginia, any determination of topography or contours, or any depiction of physical improvements, property lines or boundaries using VGIN data is for general information only and shall not be used for the design, modification, or construction of improvements to real property or for flood plain determination.

6.0 REFERENCES

Henika, W.S., 1997. Geologic map of the Roanoke 30 x 60 minute quadrangle, Virginia Division of Mineral Resources, Publication 148, scale 1:100,000

7.0 FIGURES



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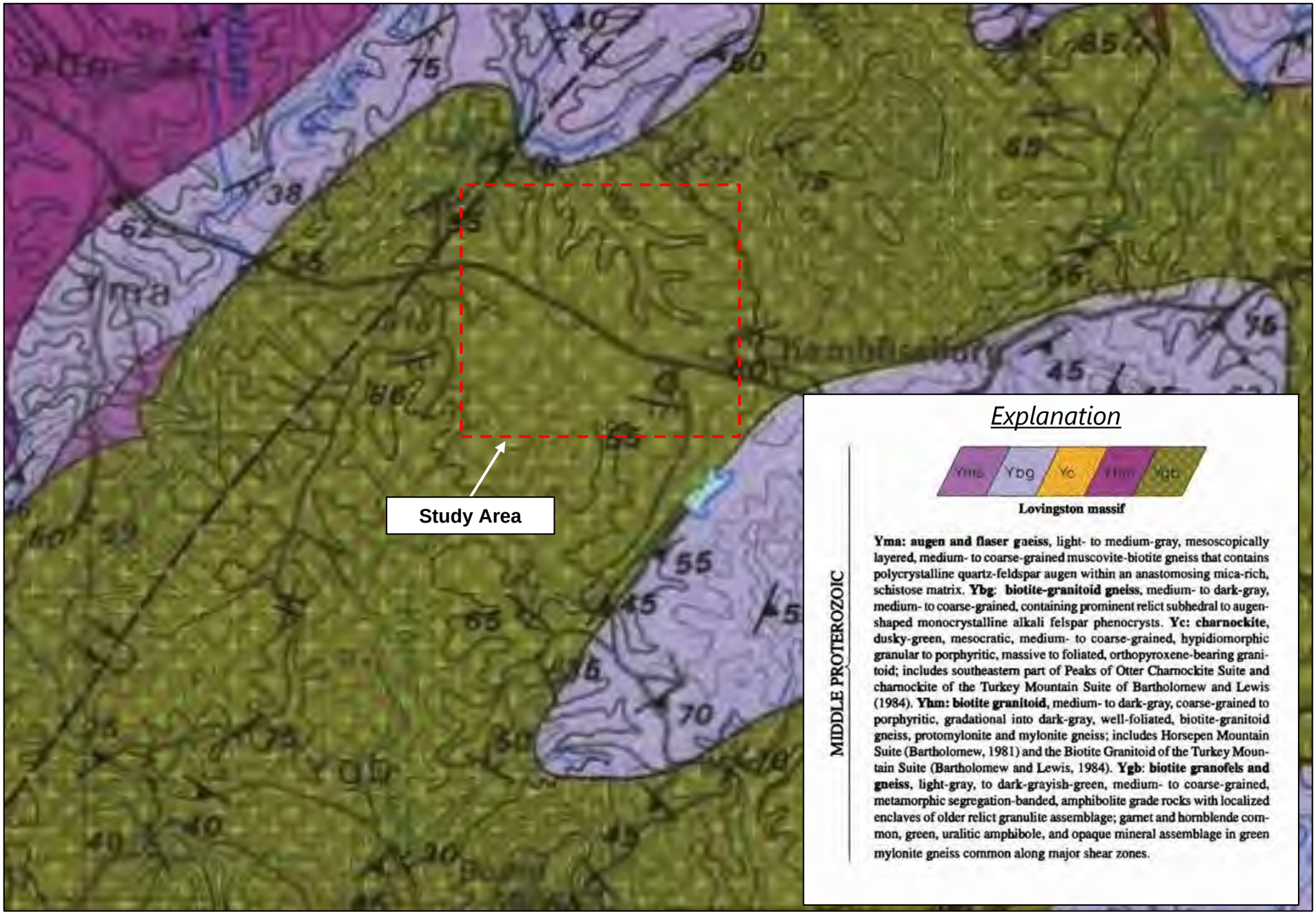
Charlottesville, VA
Hampton Roads, VA

Figure 1. Study area of the fracture trace analysis.

Fracture Trace Analysis for Chamblissburg Supply
Vinton, Virginia
DAA JN: 17010623-010203



Scale Unknown

Source: https://ngmdb.usgs.gov/ngm-bin/pdp/zui_viewer.pl?id=15039

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Figure 2. A portion of the published geologic map of the study area. After Henika, W.S., 1997.

Fracture Trace Analysis for Chamblissburg Supply
Vinton, Virginia
DAA JN: 17010623-010203

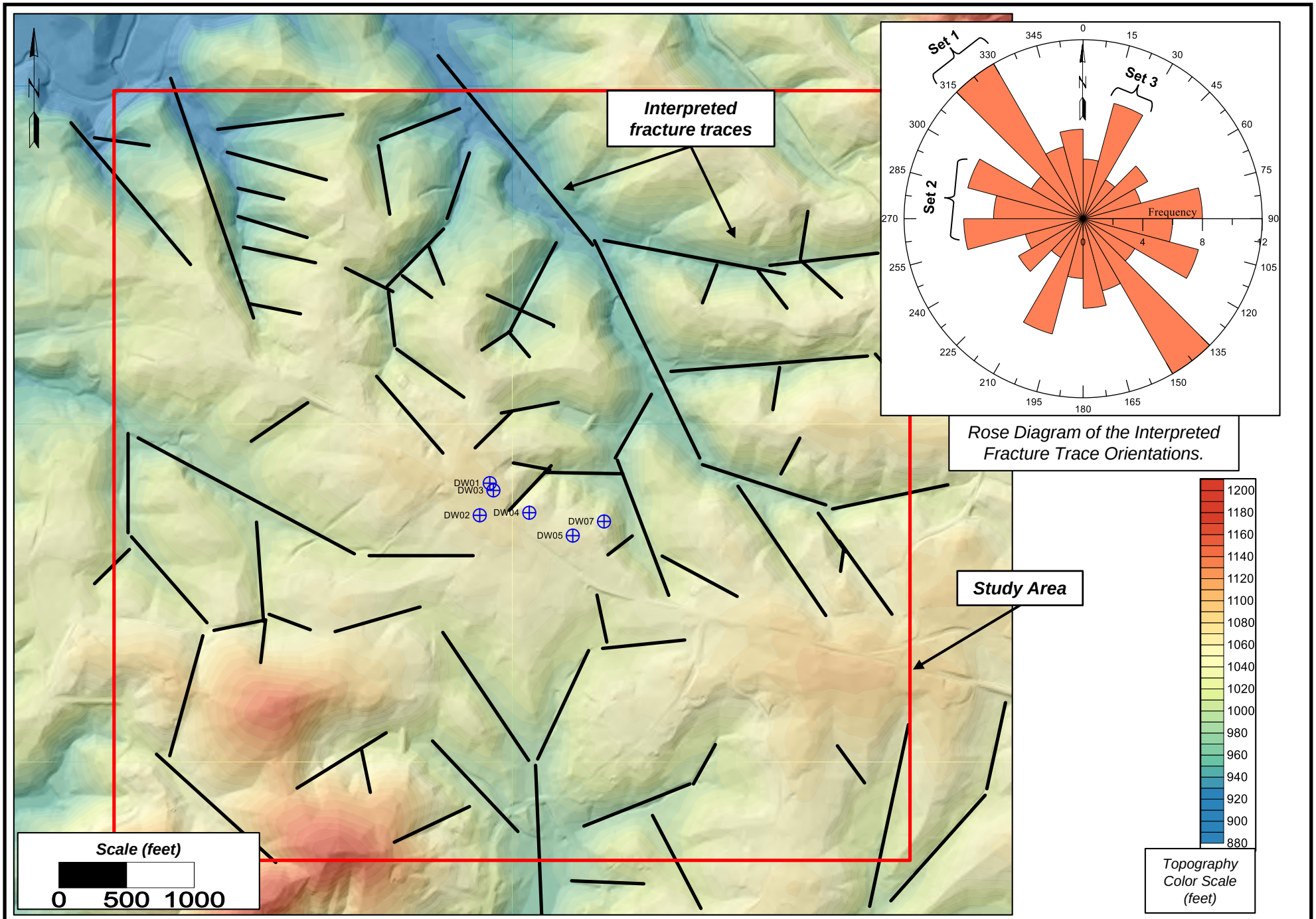

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Figure 3. Results of the fracture trace analysis, overlain with impacted water supply well locations (blue).

Fracture Trace Analysis for Chamblissburg Supply
Vinton, Virginia
DAA JN: 17010623-010203

FIGURES

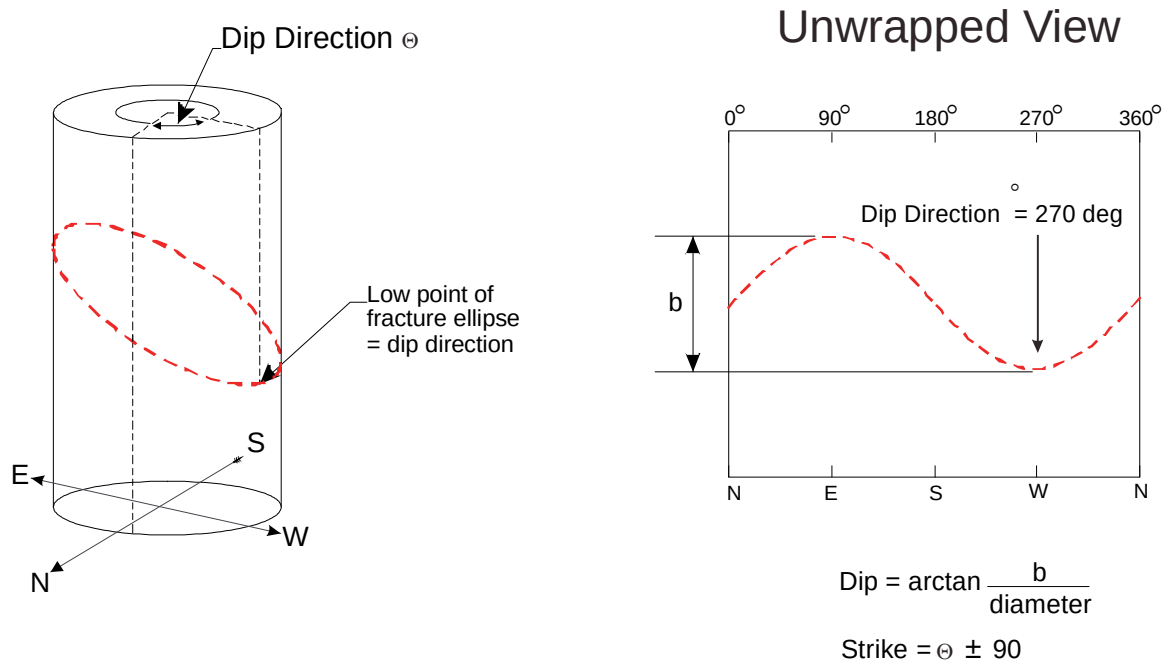


Figure 1: Diagram illustrating unwrapped view of fracture signature.

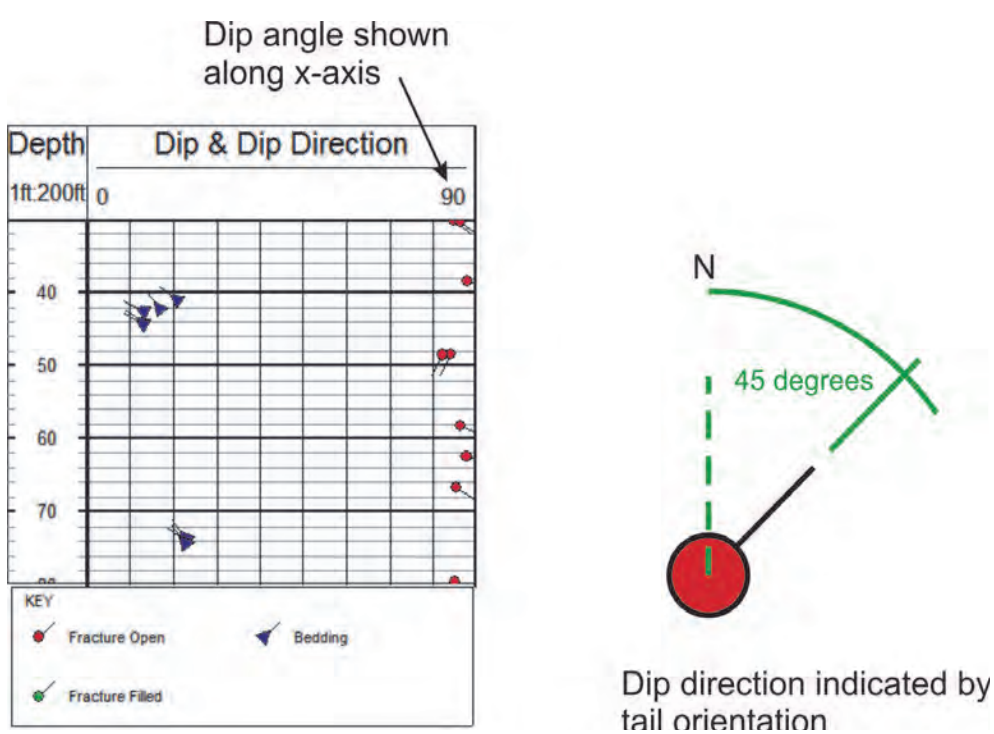


Figure 2: Dip & dip direction determination from the tadpole plot.

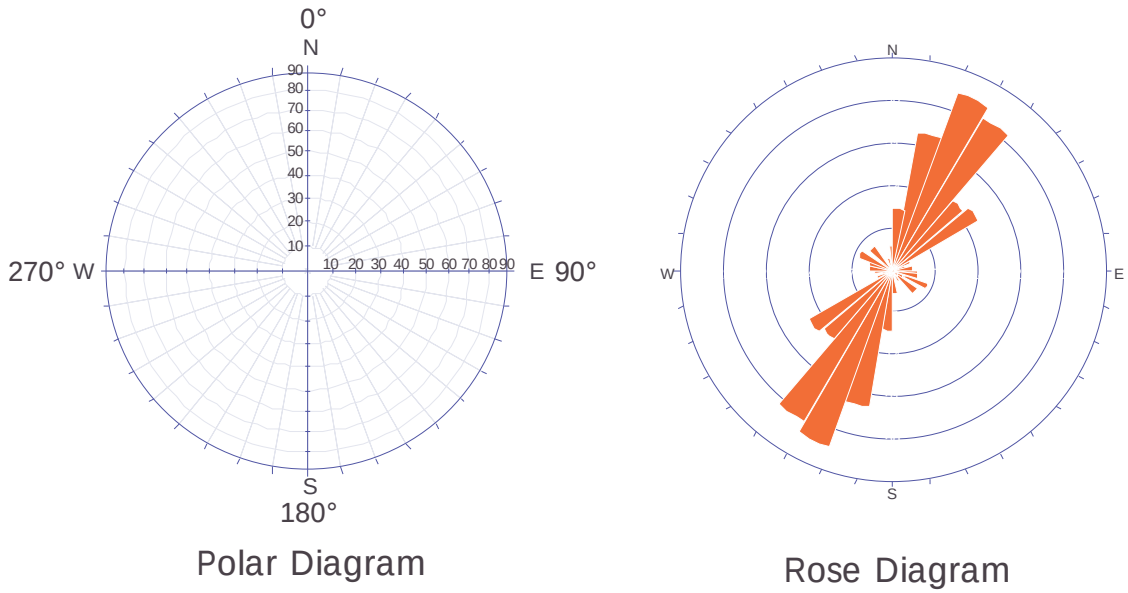


Figure 3: Example polar and rose diagrams. Polar diagram is used in this report for plotting dip and dip direction. Rose diagrams are used for plotting the frequency or number of strike measurements per sector.

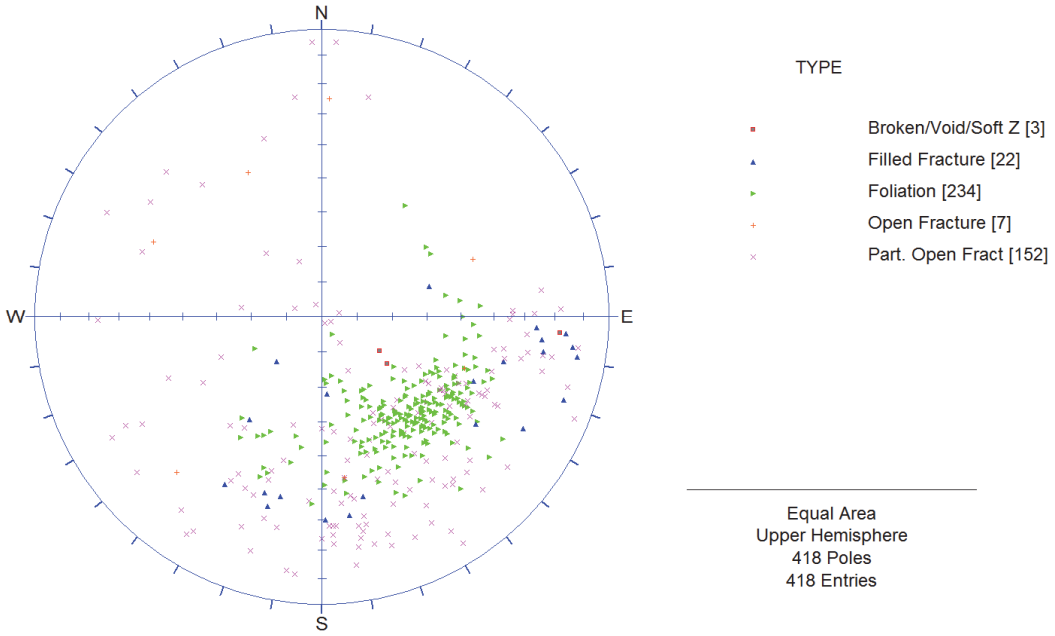


Figure 4A: A polar diagram plotting dip and dip direction of all planes categorized by plane type (Sitewide).

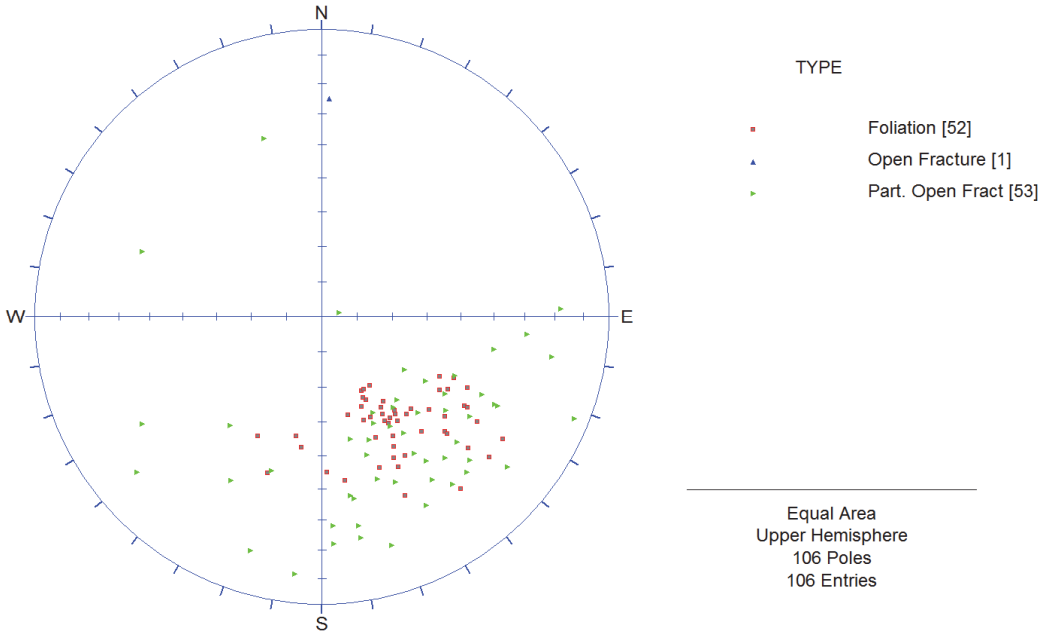


Figure 5B: A polar diagram plotting dip and dip direction of all planes categorized by plane type (DW-01A).

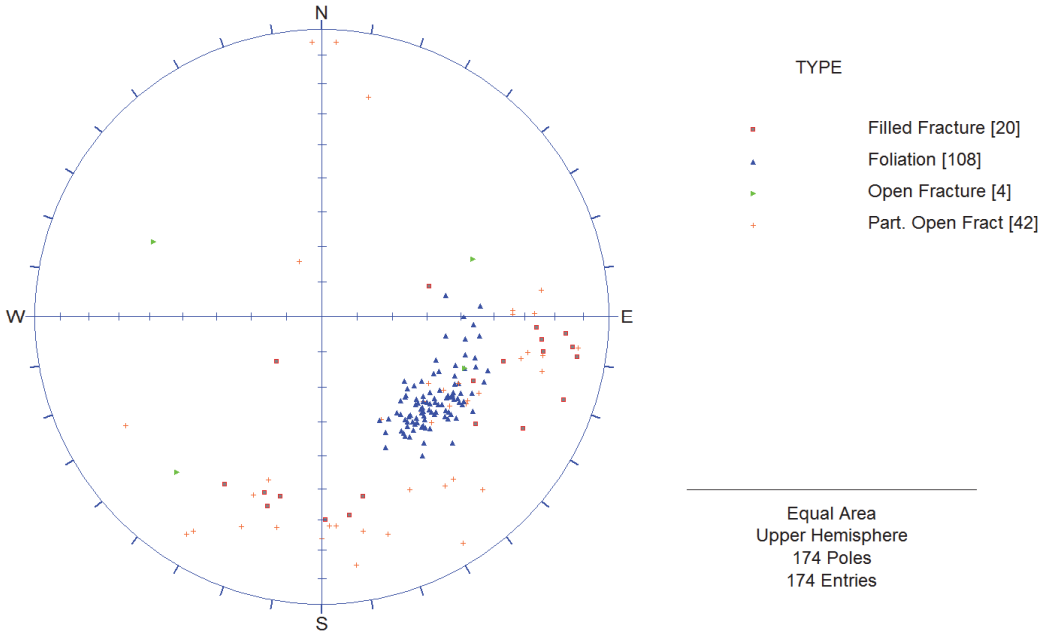


Figure 6C: A polar diagram plotting dip and dip direction of all planes categorized by plane type (DW-02A).

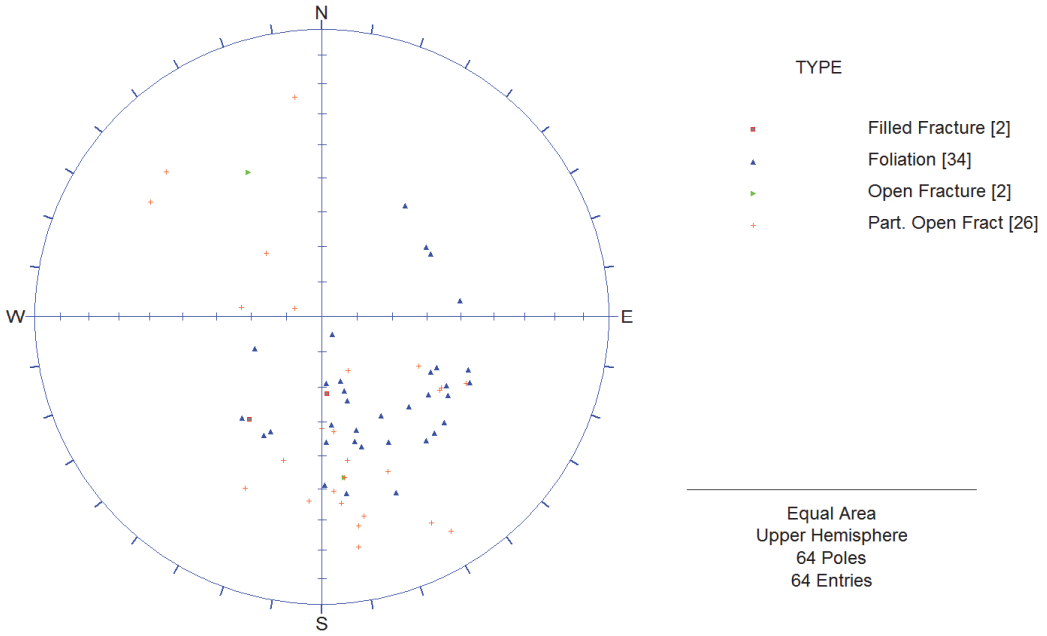


Figure 7D: A polar diagram plotting dip and dip direction of all planes categorized by plane type (DW-03A).

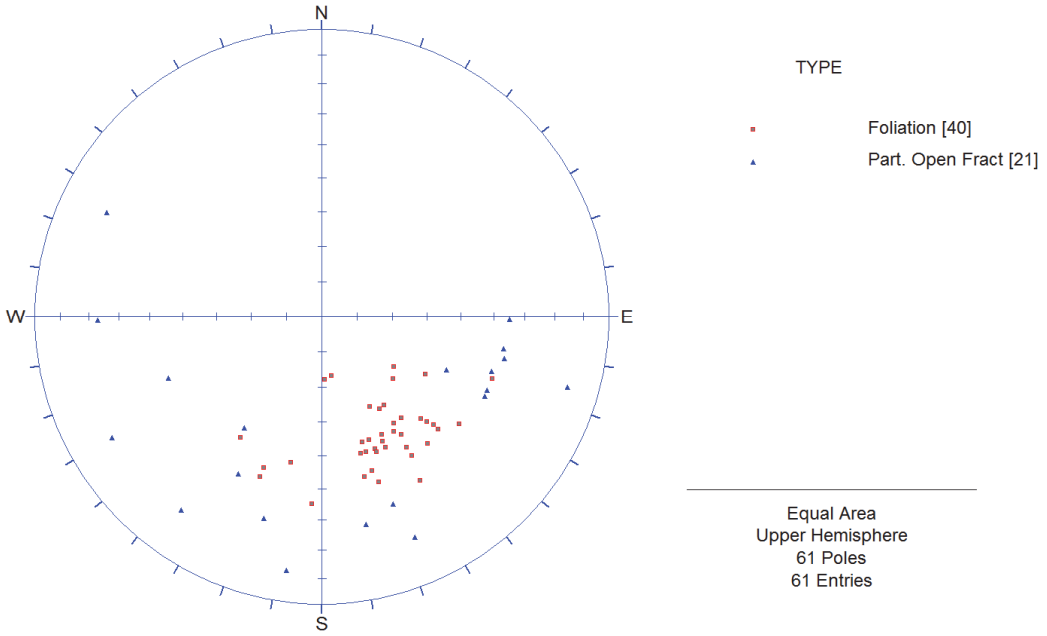


Figure 8E: A polar diagram plotting dip and dip direction of all planes categorized by plane type (DW-04A).

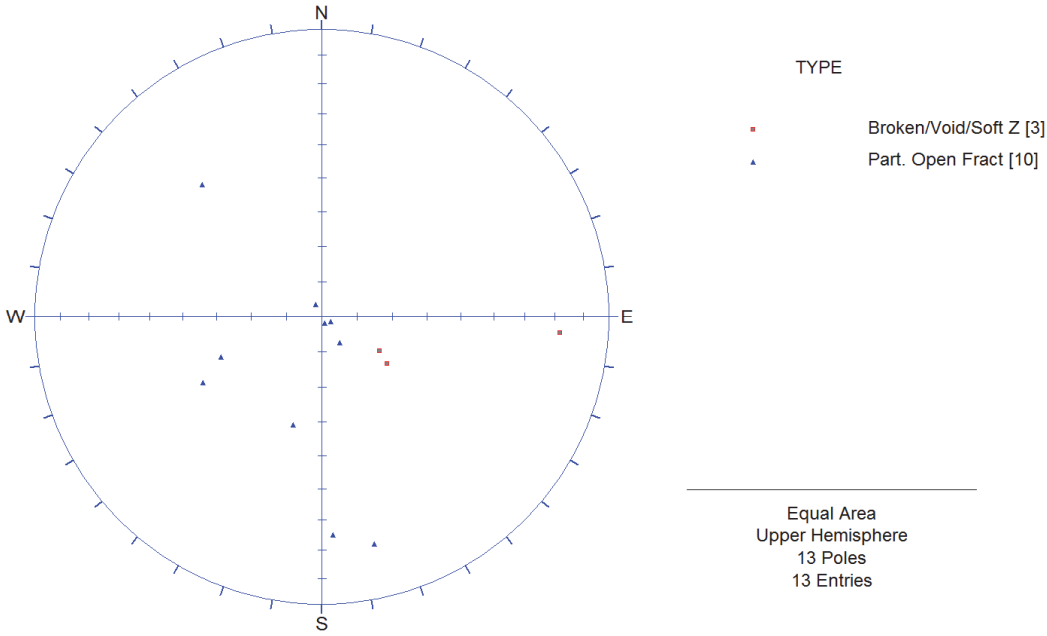


Figure 9F: A polar diagram plotting dip and dip direction of all planes categorized by plane type (DW-04B).

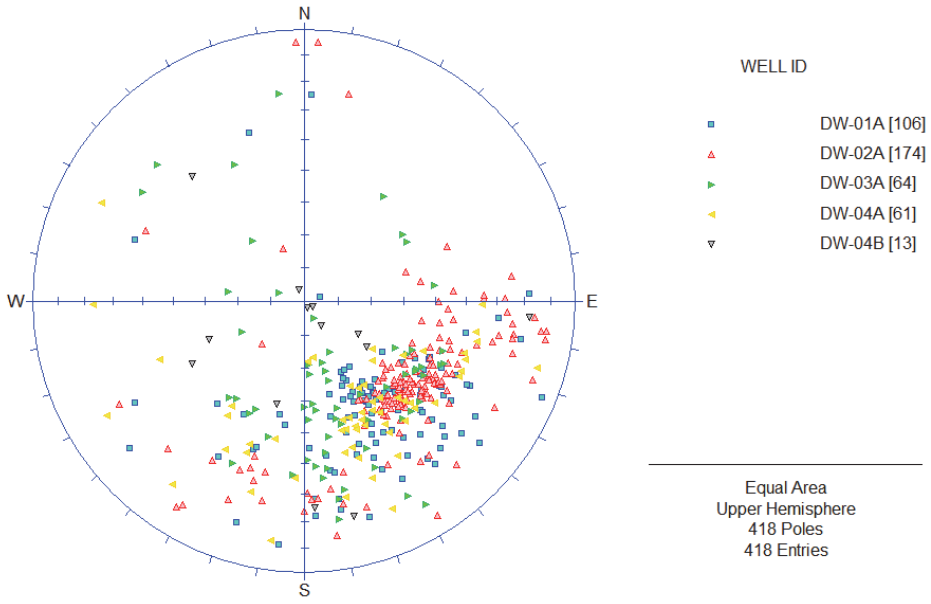


Figure 5: A polar diagram plotting dip and dip direction of all planes categorized by borehole.

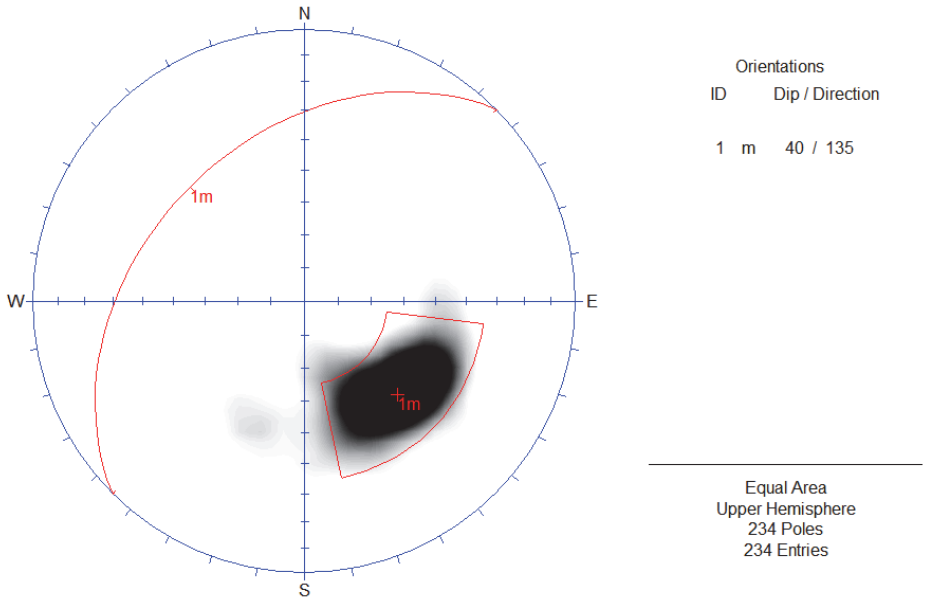


Figure 6A: A polar diagram with statistical contouring of all foliation planes (Sitewide). The calculated mean dip angle and direction is shown at the right of the diagram.

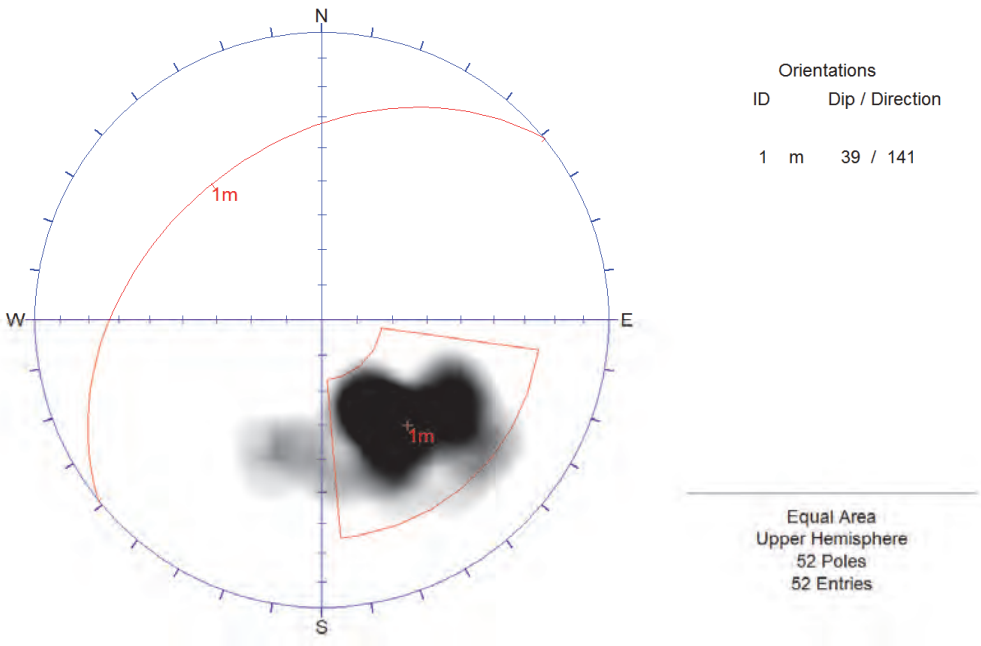


Figure 6B: A polar diagram with statistical contouring of all foliation planes (DW-01A). The calculated mean dip angle and direction is shown at the right of the diagram.

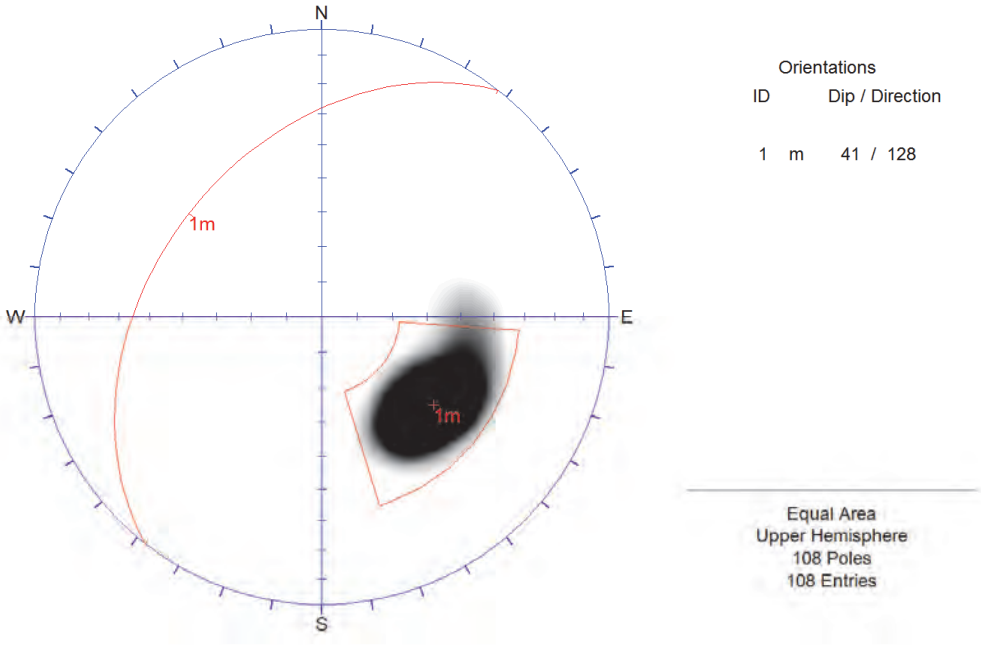


Figure 6C: A polar diagram with statistical contouring of all foliation planes (DW-02A). The calculated mean dip angle and direction is shown at the right of the diagram.

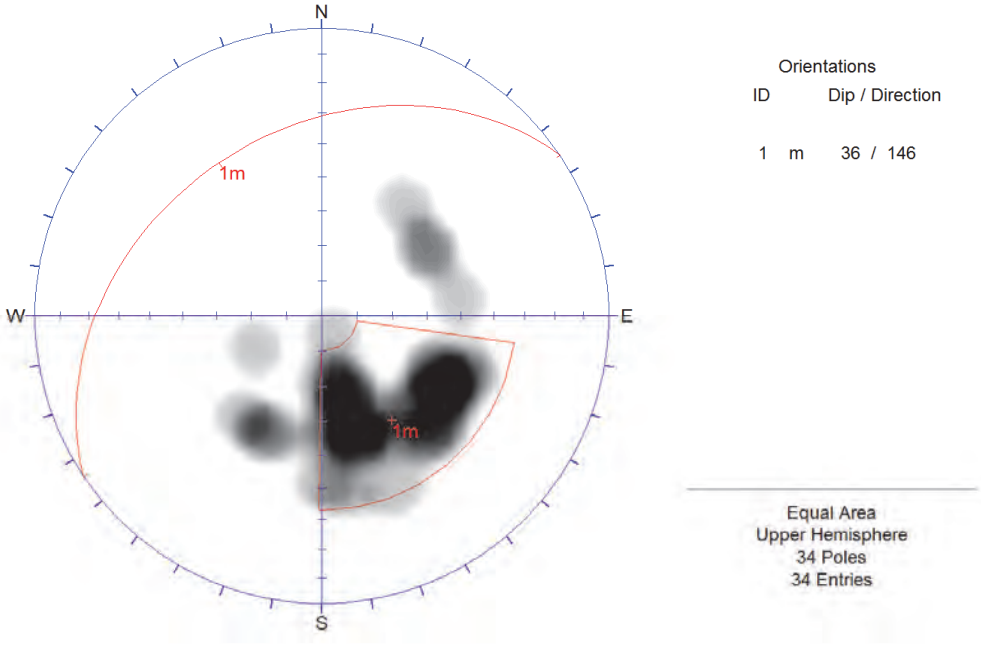


Figure 6D: A polar diagram with statistical contouring of all foliation planes (DW-03A). The calculated mean dip angle and direction is shown at the right of the diagram.

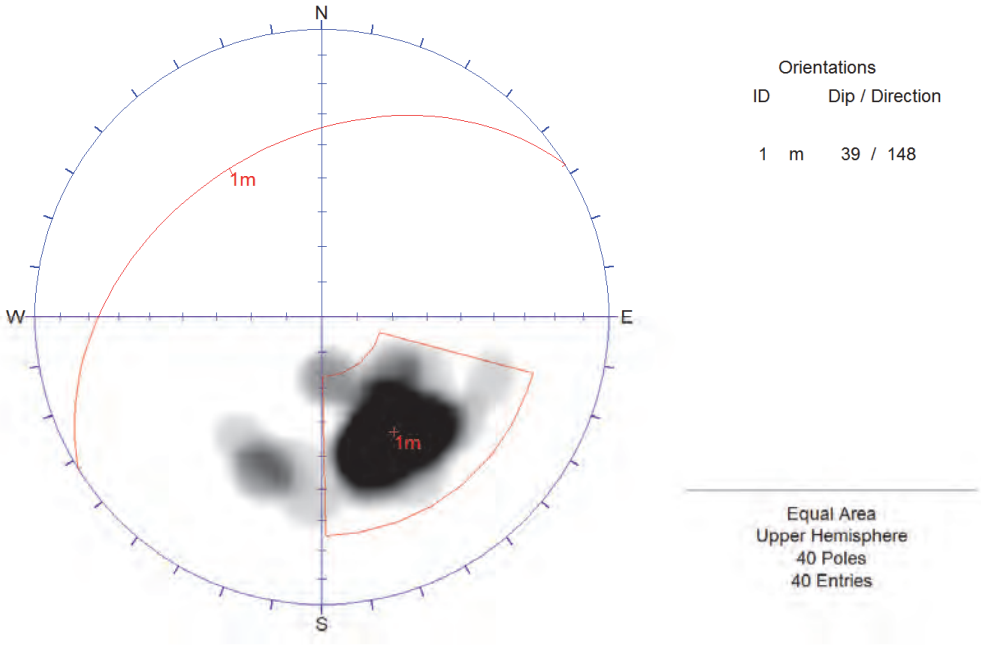


Figure 6E: A polar diagram with statistical contouring of all foliation planes (DW-04A). The calculated mean dip angle and direction is shown at the right of the diagram.

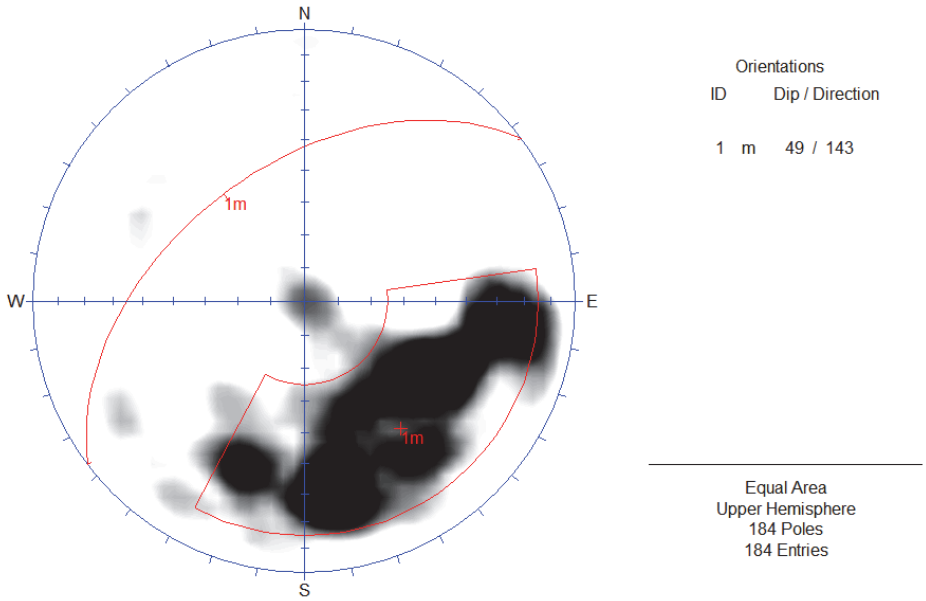


Figure 7A: A polar diagram with statistical contouring of all fracture planes (Sitewide). The calculated mean dip angle and direction is shown at the right of the diagram.

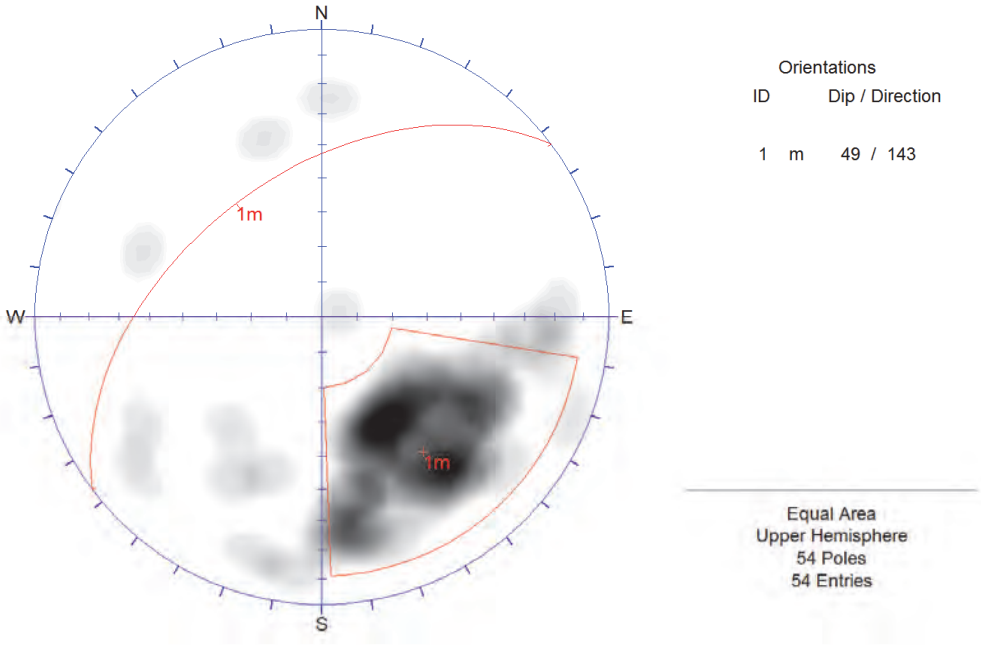


Figure 7B: A polar diagram with statistical contouring of all fracture planes (DW-01A). The calculated mean dip angle and direction is shown at the right of the diagram.

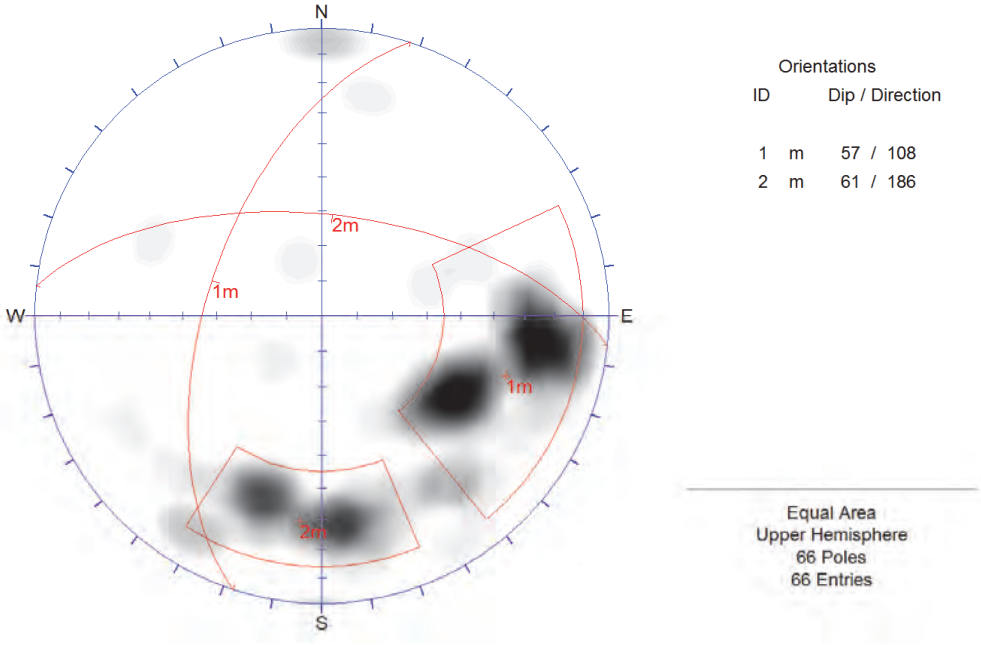


Figure 7C: A polar diagram with statistical contouring of all fracture planes (DW-02A). The calculated mean dip angle and direction is shown at the right of the diagram.

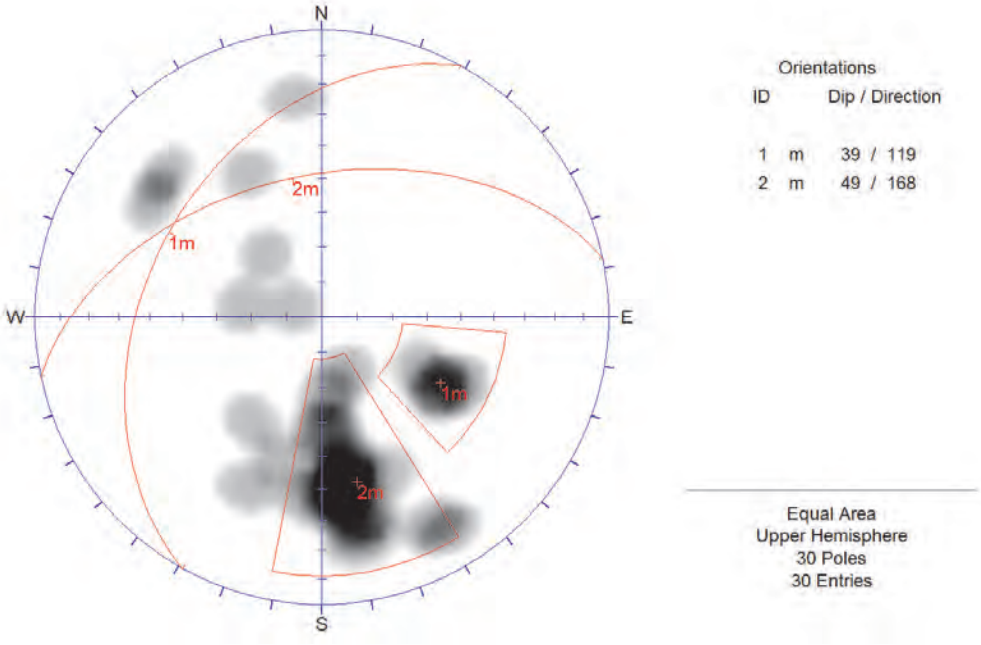


Figure 7D: A polar diagram with statistical contouring of all fracture planes (DW-03A). The calculated mean dip angle and direction is shown at the right of the diagram.

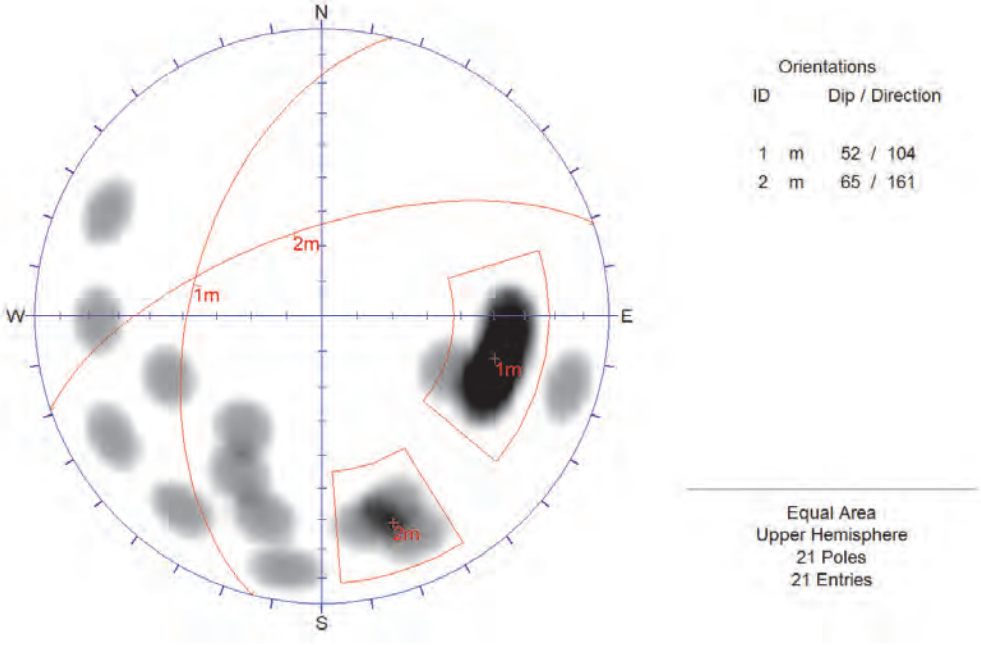


Figure 7E: A polar diagram with statistical contouring of all fracture planes (DW-04A). The calculated mean dip angle and direction is shown at the right of the diagram.

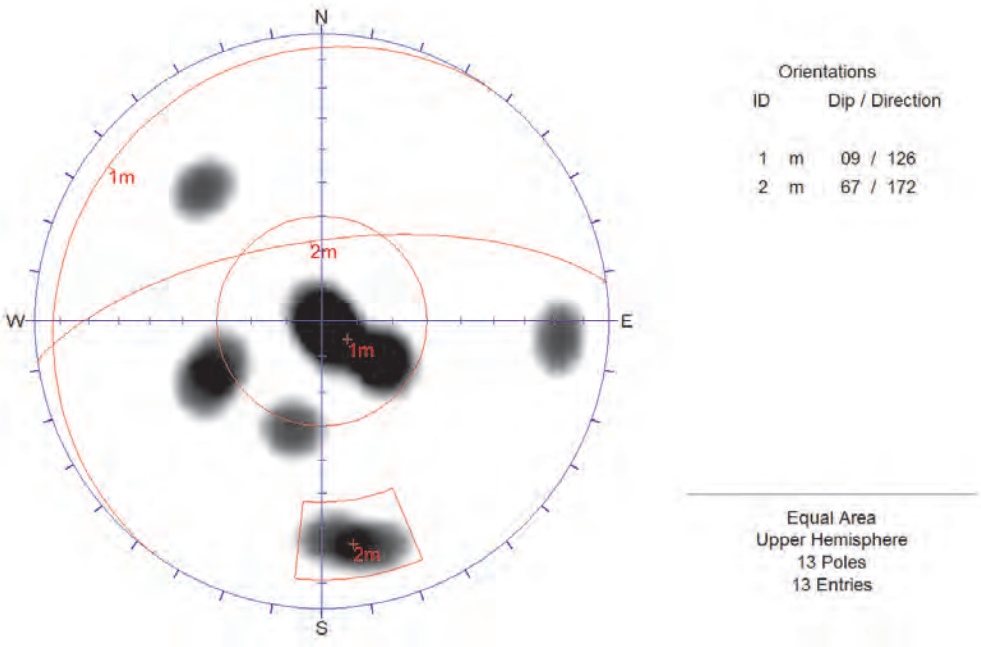


Figure 7F: A polar diagram with statistical contouring of all fracture planes (DW-04B). The calculated mean dip angle and direction is shown at the right of the diagram.

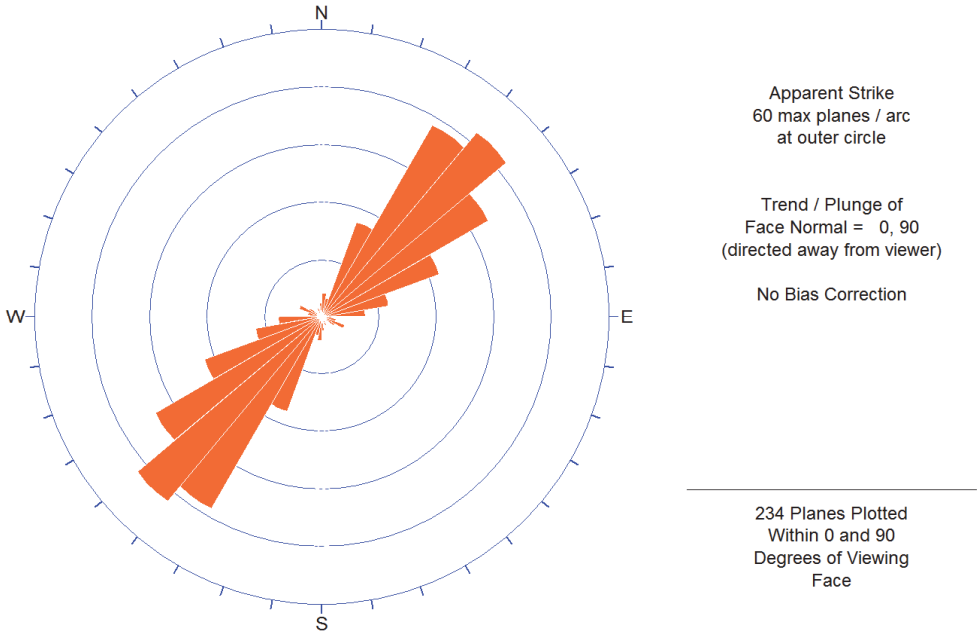


Figure 8A: A rose diagram illustrating strike distribution of all foliation planes (Sitewide).

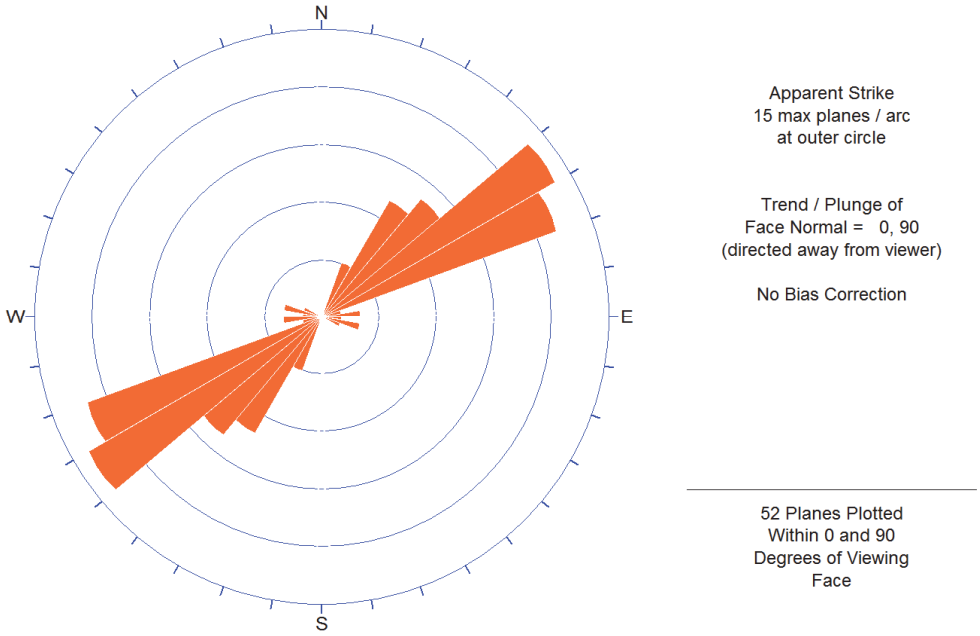


Figure 8B: A rose diagram illustrating strike distribution of all foliation planes (DW-01A).

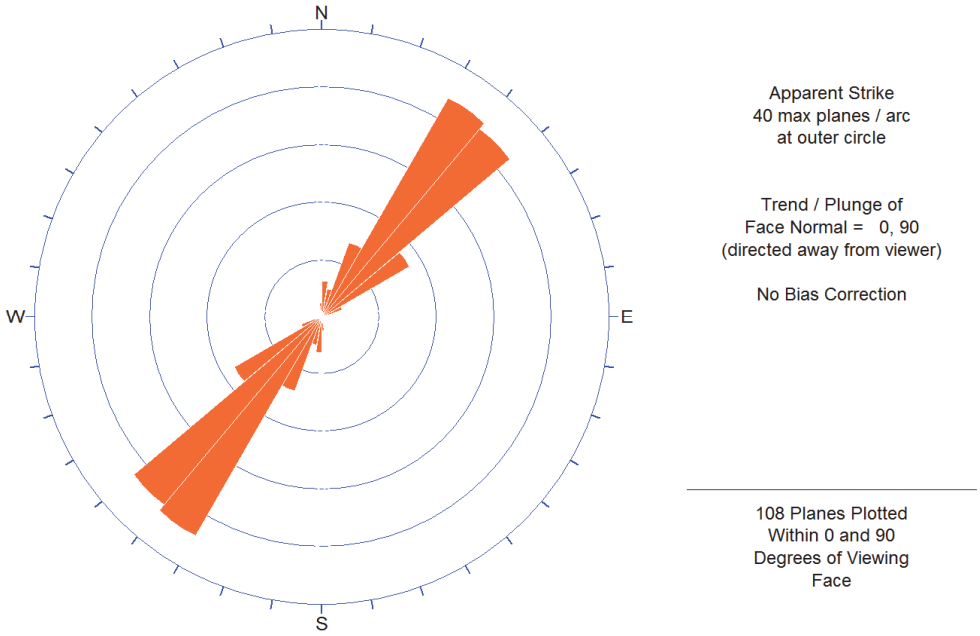


Figure 8C: A rose diagram illustrating strike distribution of all foliation planes (DW-02A).

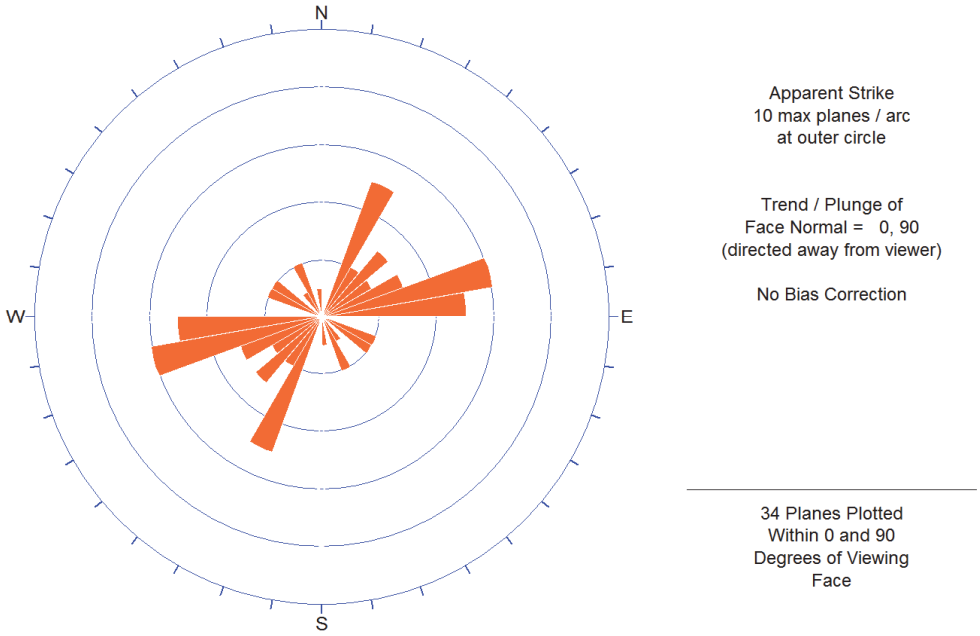


Figure 8D: A rose diagram illustrating strike distribution of all foliation planes (DW-03A).

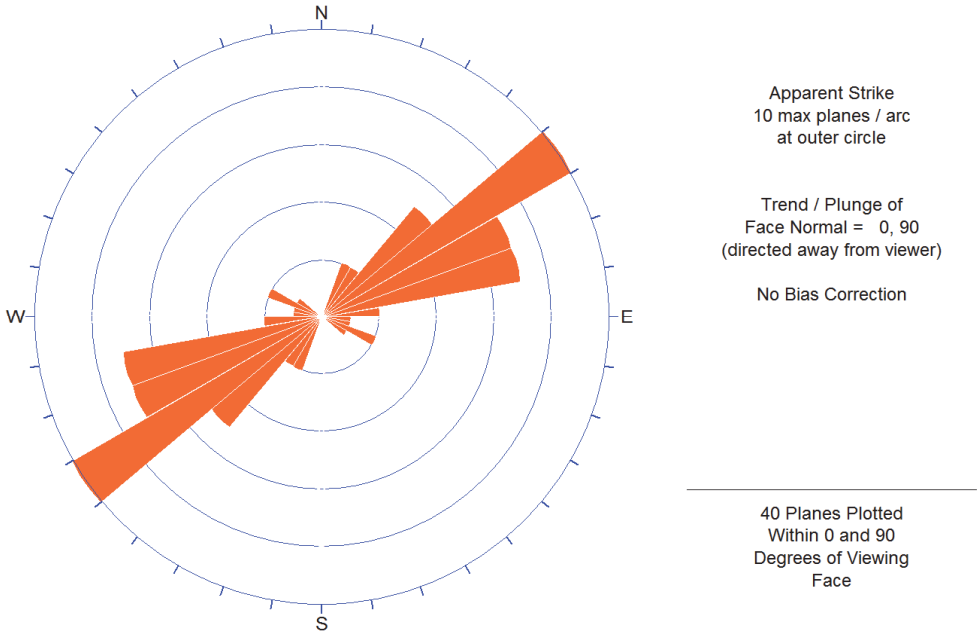


Figure 8E: A rose diagram illustrating strike distribution of all foliation planes (DW-04A).

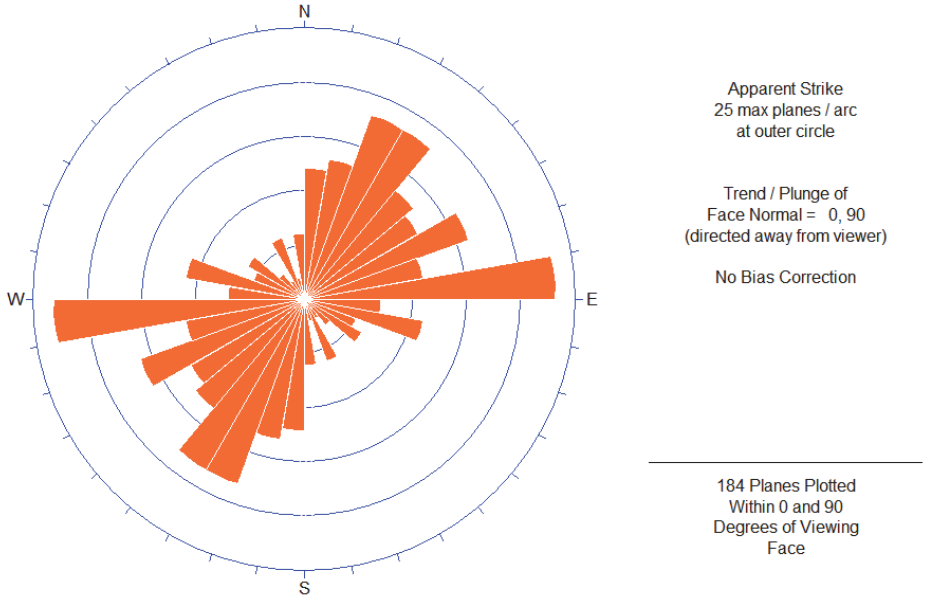


Figure 9A: A rose diagram illustrating strike distribution of all fractures (Sitewide).

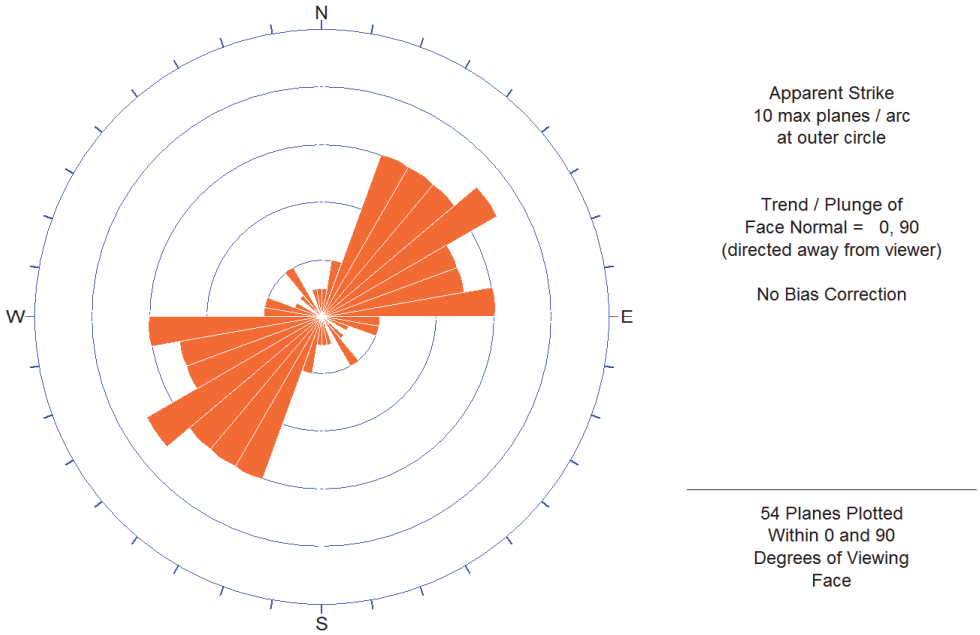


Figure 9B: A rose diagram illustrating strike distribution of all fractures (DW-01A).

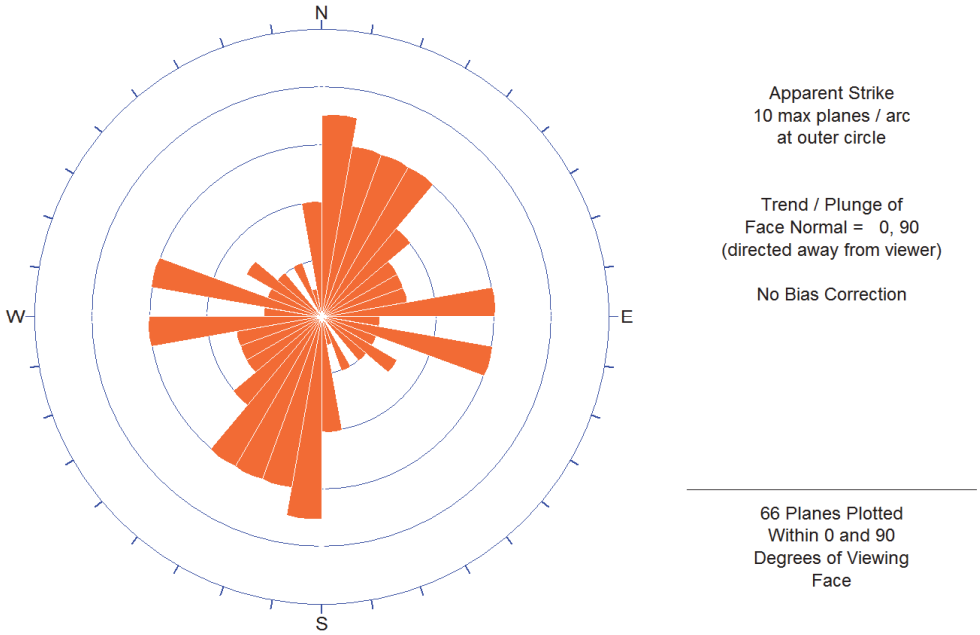


Figure 9C: A rose diagram illustrating strike distribution of all fractures (DW-02A).

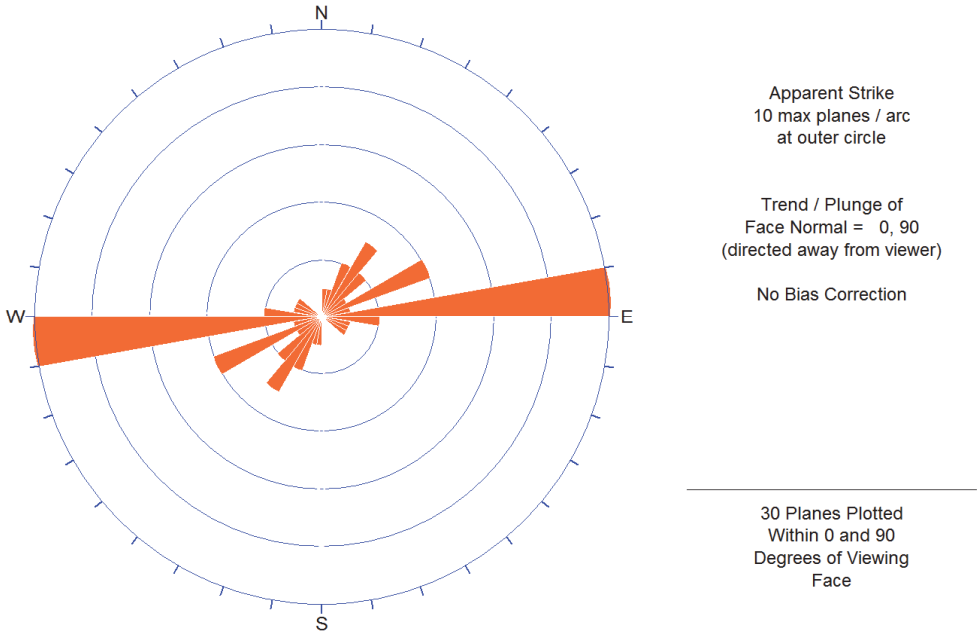


Figure 9D: A rose diagram illustrating strike distribution of all fractures (DW-03A).

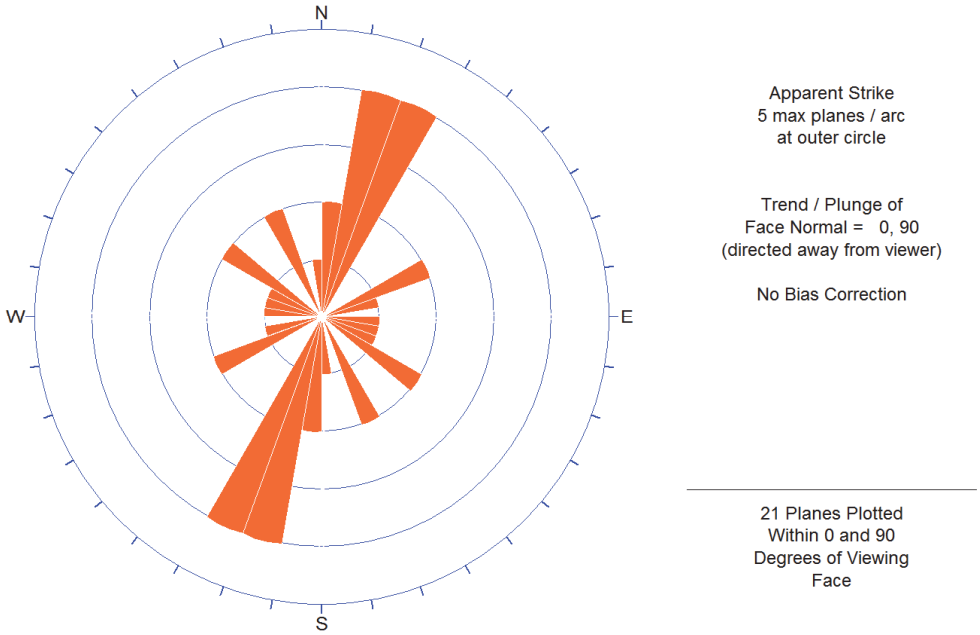


Figure 9E: A rose diagram illustrating strike distribution of all fractures (DW-04A).

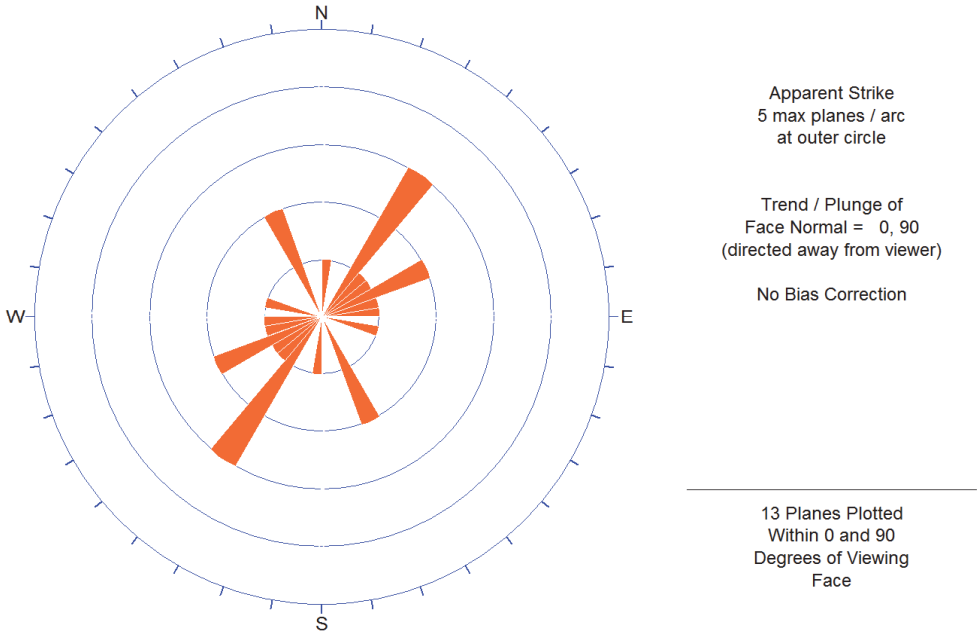


Figure 9F: A rose diagram illustrating strike distribution of all fractures (DW-04B).

ATTACHMENT A
LOGGING METHODS

1129 West Governor Road, PO Box 797
Hershey, PA 17033-0797
Voice: (717) 533 - 8600
Fax: (717) 533 - 8605

APPENDIX A: OVERVIEW OF LOGGING METHODS

CALIPER LOGS

The caliper log measures variations in borehole size as a function of depth in a well. Some example responses of in a caliper log is shown in Figure A- 1 (Rider, 2002[1.]) The log data enables (a) the detection of competent or fractured geologic units, (b) the location of washouts or tight zones, (c) the optimal placement of well screen, sand, and bentonite, and (d) the establishment of appropriate borehole correction factors to be applied to other well log curves. Further, when run in combination with other logs, the caliper log may be an indicator of lithologic makeup and degree of consolidation. The typical caliper response in a fractured, weathered, or karstic unit is a relatively abrupt increase in borehole size.

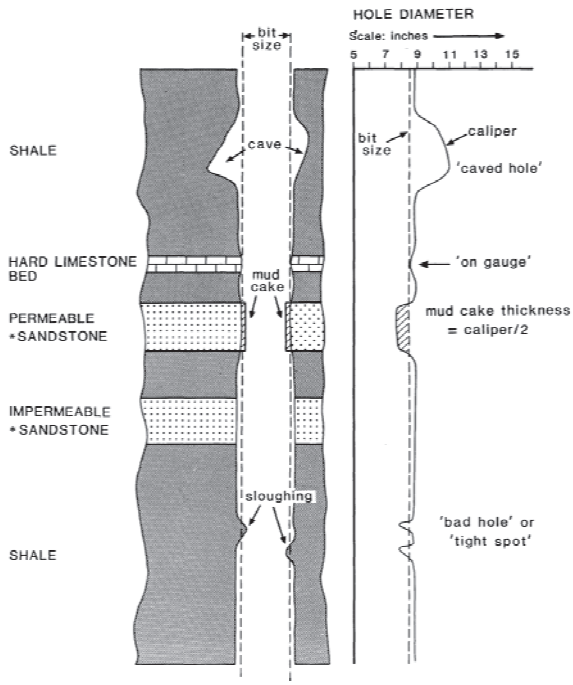


Figure A- 1: The caliper log showing some typical responses. (From Rider, 2002).

SPONTANEOUS POTENTIAL (SP) LOGS

The SP log measures the natural voltages that are created within the borehole due to the presence of borehole fluids, formation fluids, and formation matrix materials. It is recorded by measuring the difference in electrical potential in millivolts between an electrode in the borehole and a grounded electrode at the surface. The SP log is commonly used to 1) detect permeable beds, 2) detect boundaries of permeable beds, 3) determine formation water resistivity, and 4) determine the volume of shale in permeable beds. The constant SP readings observed in thicker shale units define the shale base line, a reference line from which further formation matrix and formation fluid property calculations may be completed. Although this log is consistently used in oil and gas applications, its effectiveness in water wells is limited since the method requires a contrast in salinity between borehole and formation fluids (Figure A- 2). This condition is often not met in ground water wells.

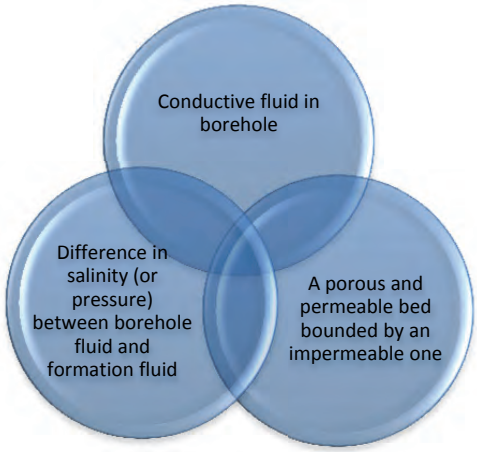


Figure A- 2: Conditions required to produce an SP response.

1 Rider, M. (2006) The Geological Interpretation of Well Logs, *Rider-French Consulting, Ltd*., 280pp.

The SP log can be qualitatively used for permeability recognition. SP deflections from the shale base line commonly indicate the presence of a permeable bed. The magnitude and direction of the deflection is dependent upon the relative resistivity (or salinity) values of the borehole fluid and the formation fluid. If the formation fluid resistivity is less than the borehole fluid resistivity, then the relative SP values will decrease in a porous, coarse-grained unit. Alternately, if the formation fluid resistivity is greater than the borehole fluid resistivity, the relative SP values will increase in the same body, and the curve shape is referred to as a "reversed SP". If both fluid resistivities are equal, no SP deflection will occur.

GAMMA RAY LOGS

The gamma ray log is a passive instrument that measures the amount of naturally occurring radioactivity from geologic units within the borehole. Commonly occurring radioelements include potassium, thorium, and uranium; the two former elements are predominant within a common fine-grained rock sequence. The gamma ray log is also an excellent lithologic indicator because fine-grained clays and shales contain a higher radioelement concentration than limestones or sands. Gamma ray values are often used to assess the percentage of clay materials (indurated or non-indurated) that are present within a formation by utilizing empirically derived equations and sand-shale base line information.

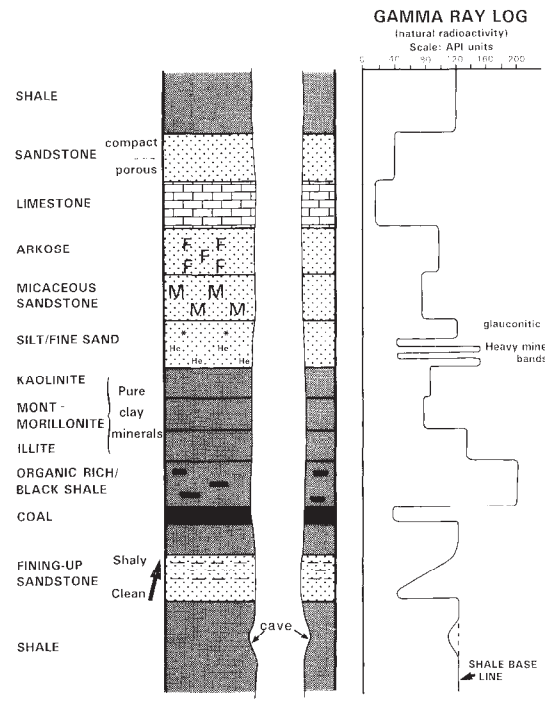


Figure A- 3: Characteristic gamma ray responses. (From Rider, 2002).

NORMAL RESISTIVITY LOGS

Resistivity is a measure of how well an electric current passes through a material. Formation resistivity is an intrinsic property of rocks and depends on the porosity and resistivity of the interstitial fluid and rock matrix. The spacing between the transmitter and receiver on the tool determines the depth of investigation into the surrounding formation; the greater the spacing, the deeper the penetration of electrical current into the formation.

In sedimentary rocks, the resistivity values of shales (5 - 30 ohm-m) is generally lower than the resistivity of sandstone (30 – 100 ohm-m), which is lower than the resistivity limestone (75 – 300 ohm-m). The resistivity log often shows a picture of the overall depositional sequence in sedimentary environment. Resistivity of igneous and metamorphic rocks is extremely high when compared to resistivity in sedimentary rocks, with values that are commonly thousands of ohm-meters. Example resistivity log responses are shown in Figure A- 4.

FLUID RESISTIVITY LOGS

Fluid resistivity, which is the reciprocal of fluid conductivity, provides data related to the concentration of dissolved solids in the fluid column. Although the quality of the fluid column may not reflect the quality of adjacent

interstitial fluids, information can be quite useful when combined with other logs. For example, change in fluid resistivity associated with a water-producing zone that is corroborated by other logs may indicate the inflow of ground water.

SINGLE-POINT RESISTANCE LOGS

Single point resistance measurements are made by passing a constant current between two electrodes and recording the voltage fluctuations as the probe is moved up the borehole. The resistance variations measured in the borehole is primarily due to variations in the immediate vicinity of the downhole electrode.

The resistance log is strongly affected by the resistance of the drilling fluid and variations in borehole diameter. It is extremely useful for detecting fractures in boreholes with relatively constant diameter. In sedimentary environments, the resistance log generally follows the variations in resistivity of the formation. Shales in clay generally exhibit low values, sandstones have intermediate values, while coal and limestone beds have high resistance values.

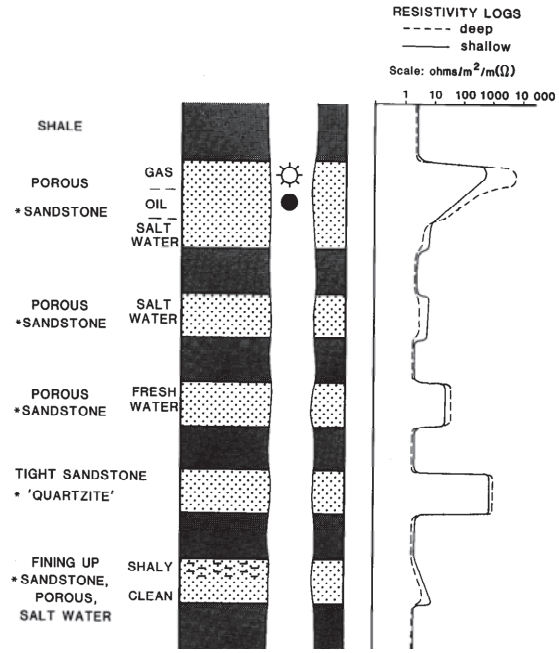


Figure A- 4: Characteristic resistivity responses. (From Rider, 2002)

TEMPERATURE LOGS

Temperature logs measure the change in fluid temperature within the borehole as a function of depth. This log can indicate the location of water- producing strata or fracture zones within the well. The inherent assumption of this technique is that the fluids entering the borehole from water producing zones are either cooler or warmer than the fluid in the borehole. In this case, it is possible to relate a temperature anomaly to a depth range in which waters of different temperature are emanating from a water-producing/receiving or fractured lithologic unit.

HEAT PULSE FLOWMETER (HPFM) LOGS

The heat pulse flowmeter measures the vertical flow rates within a borehole. The log may be used to identify contributing fracture zones under natural and pumping conditions. The system operates by heating a wire grid that is located between two thermistors. The heated body of water moves toward one of the thermistors under the effect of the vertical component of flow within the well. Positive and negative values on the log represent upward and downward flow, respectively. Measurements are recorded while the tool is stationary and the logs are presented as a bar graph (mud log) as shown in Figure A- 5.

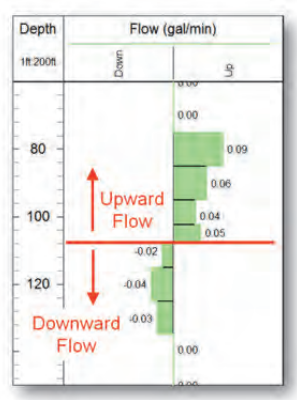


Figure A- 5: Example heat pulse flowmeter log.

A number of techniques have been attempted for measuring horizontal flow in wells without much success. The techniques may not represent the true hydrogeologic conditions due to variations in flow caused by the well.

OPTICAL TELEVIEWER (OTV) LOGS

The optical televiewer probe combines the axial view of a downward looking digital imaging system with a precision ground hyperbolic mirror to obtain an undistorted 360° view of the borehole wall. The probe records one 360° line of pixels at 0.003-ft depth intervals. The sample circle can be divided into 720 or 360 radial samples to give 0.5° or 1° radial resolution. For this investigation, the highest radial resolution (0.5°) was used. The line of pixels is aligned with respect to True North and digitally stacked to construct a complete, undistorted, and oriented image of the borehole walls. The data are 24 -bit true color and may be used for lithologic determination as part of the interpretation. Since the acquired image is digitized and properly oriented with respect to borehole deviation and tool rotation, it allows data processing to provide accurate strike and dip information of structural features. The borehole image is often shown as an "unwrapped" 360° image in which the cylindrical borehole image is sliced down the northern axis and flattened out as shown in Figure A- 6.

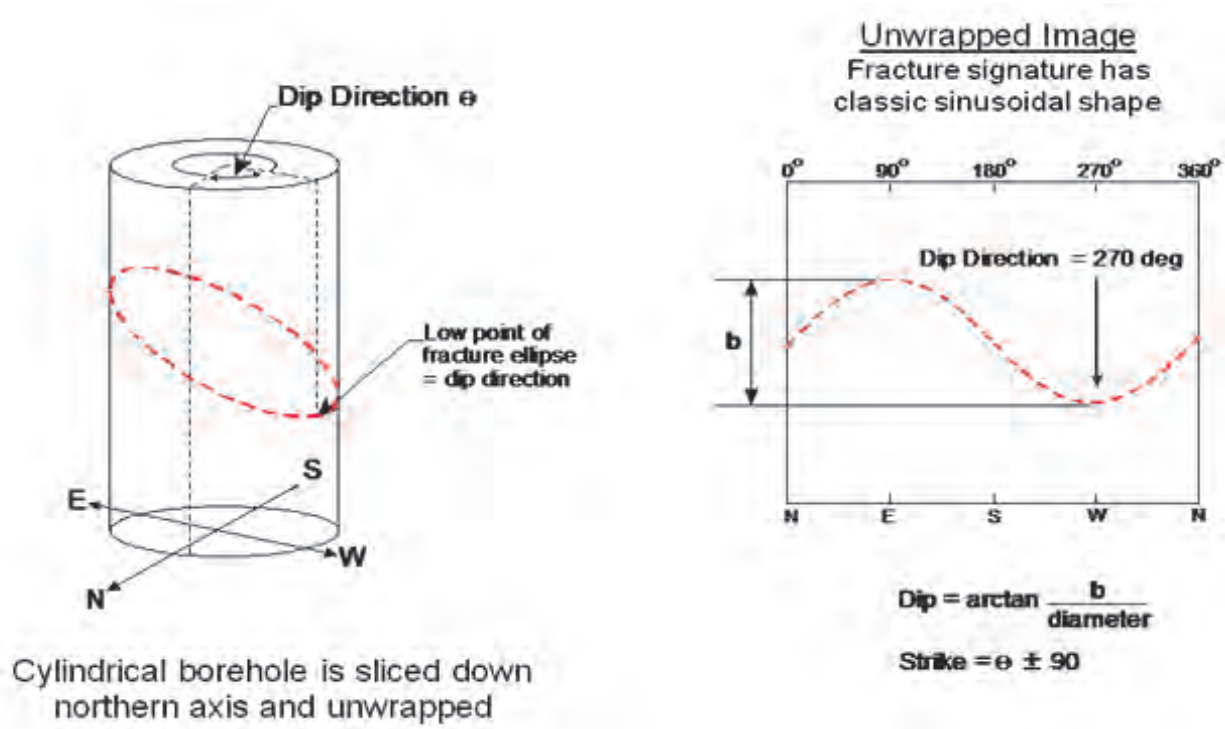


Figure A- 6: Schematic showing the sinusoidal fracture signature in the unwrapped borehole view.

ACOUSTIC TELEVIEWER (ATV) LOGS

Acoustic televiewer provides a 360° acoustic image of the borehole walls that can be used to identify and determine the orientation of planar features such as bedding and fractures. The data can also indicate the relative degree of hardness of formation materials. As shown in Figure A-7, Ultrasonic pulses are transmitted from a rotating transducer inside the tool. The transmitted pulses reflect off the borehole wall and return to the tool where the travel time and amplitude of the acoustic signal are measured. In order for the acoustic waves to travel to and from the borehole wall, the well must be fluid filled. Greater travel time can indicate openings in the rock. Strong amplitude suggests smooth, competent rock. Weaker amplitudes suggest rough or less competent rock.

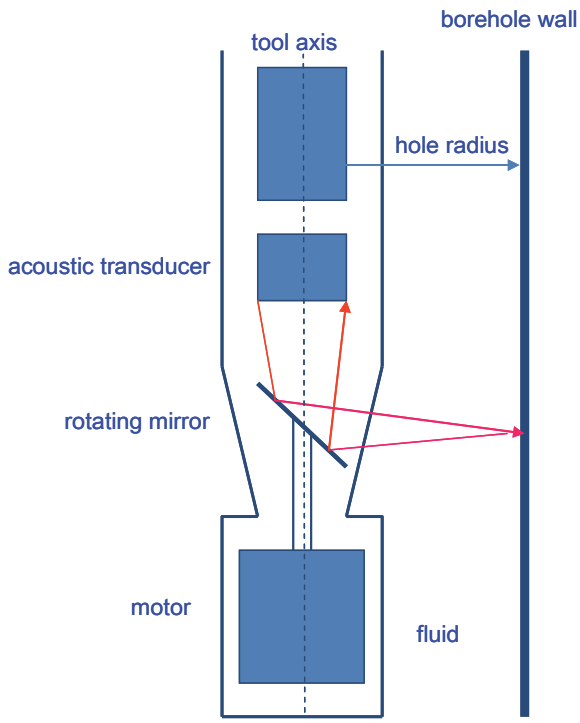


Figure A- 7: Schematic of the acoustic televiewer tool.

ATTACHMENT B
BOREHOLE LOGS

DW-01A

ARM GEOPHYSICS
Surface & Borehole Services

Hydro Log

COMP	Greene Environmental
WELL	DW-01A
FLD	Vinton
CNTY	Bedford
STAT	VA
ARM	170607
API	N/A

COMPANY: Greene Environmental
STATE: VA
WELL ID: DW-01A
ARM NO.: 170607
FIELD/SITE: Vinton
API NO.: N/A
COUNTY: Bedford

LOCATION:
NORTHING:
EASTING:
SEC: TWP: QUAD:

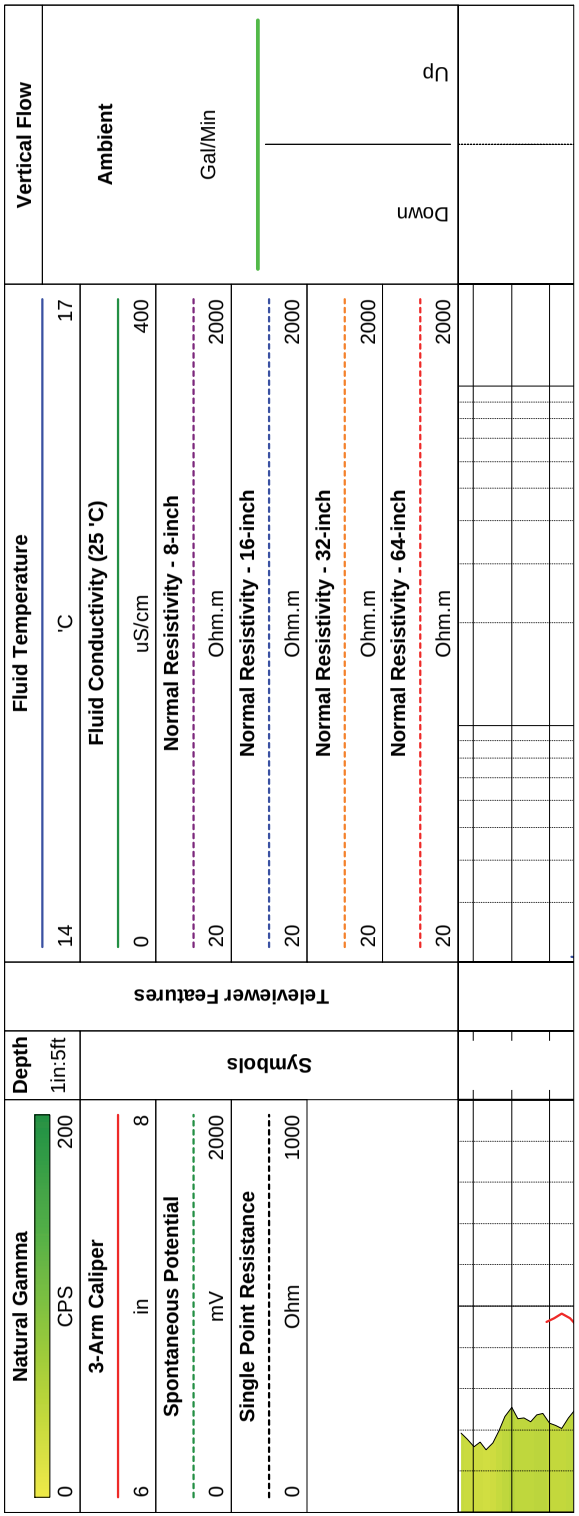
OTHER SERVICES

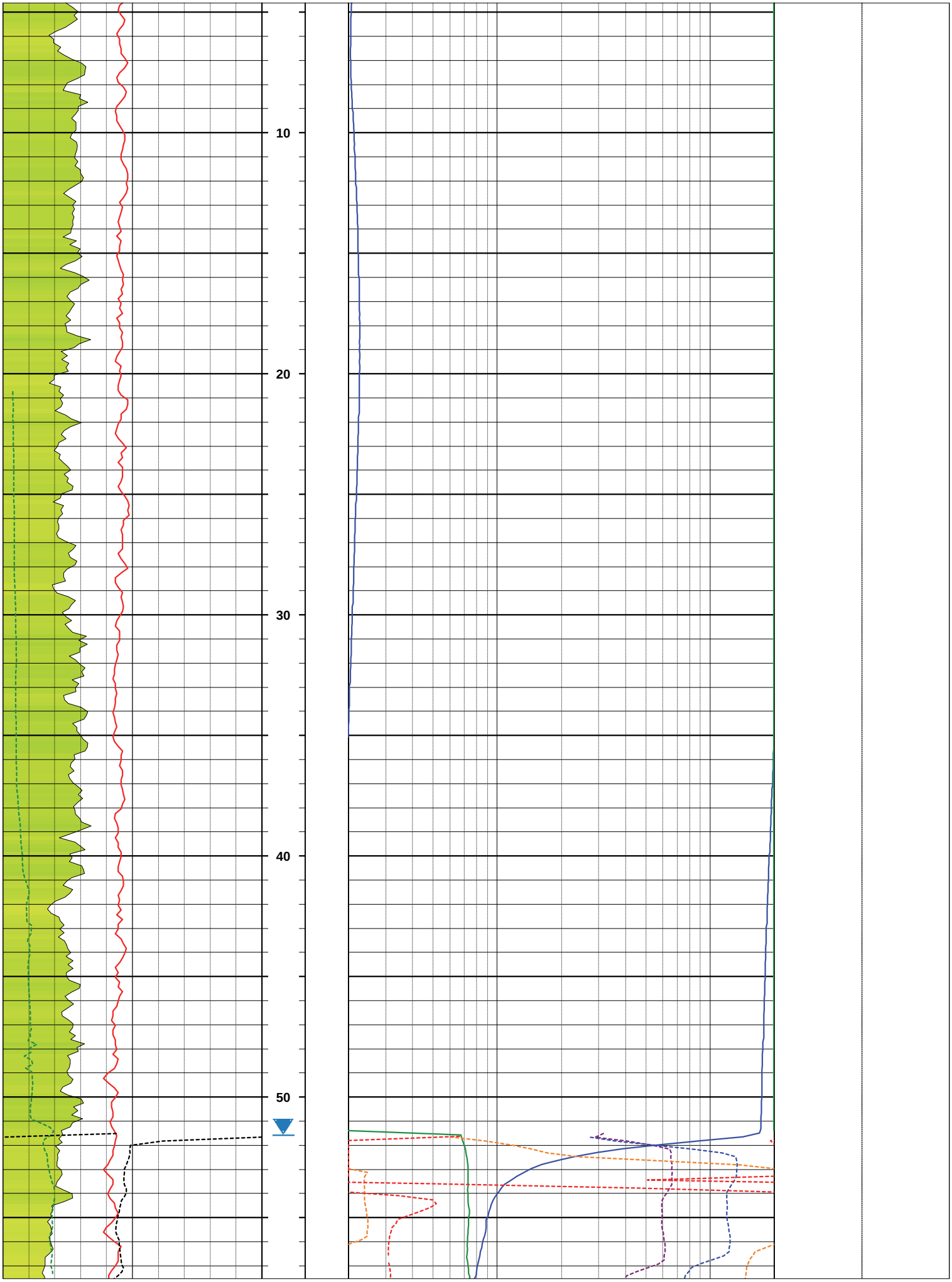
PERMANENT DATUM: Ground Surface ELEVATION: K.B.
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: D.F.
DRILLING MEAS. FROM: STICK UP: 1.6 G.L.

LOGGING DATE	11.28.2017	11.29.2017	11.29.2017	11.29.2017	
RUN NO	1	4	5	6	
TYPE LOG	FTC.GR	CAL	RES	HPFM A	
DRILLER DEPTH (FT)					
ARM DEPTH (FT)	291.75	292	292	N/A	
BTM LOGGED INTERVAL (FT)	297.58	292	292	285.02	
TOP LOGGED INTERVAL (FT)	4.53	5.08	26.88	86	
CASING SIZE (IN)/DEPTH (FT)	6/	6/	6/	6/	
CASING ARM (FT)	87.75	87.75	87.75	87.75	
BIT SIZE (IN)					
FLUID LEVEL IN HOLE (FT)	51.51				
MAG. DECLINATION (DEG)	8.77 W	8.77 W	8.77 W	8.77 W	
RECORDED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	
WITNESSED BY					

REMARKS:

Symbols
Bottom of Casing
Fluid Level

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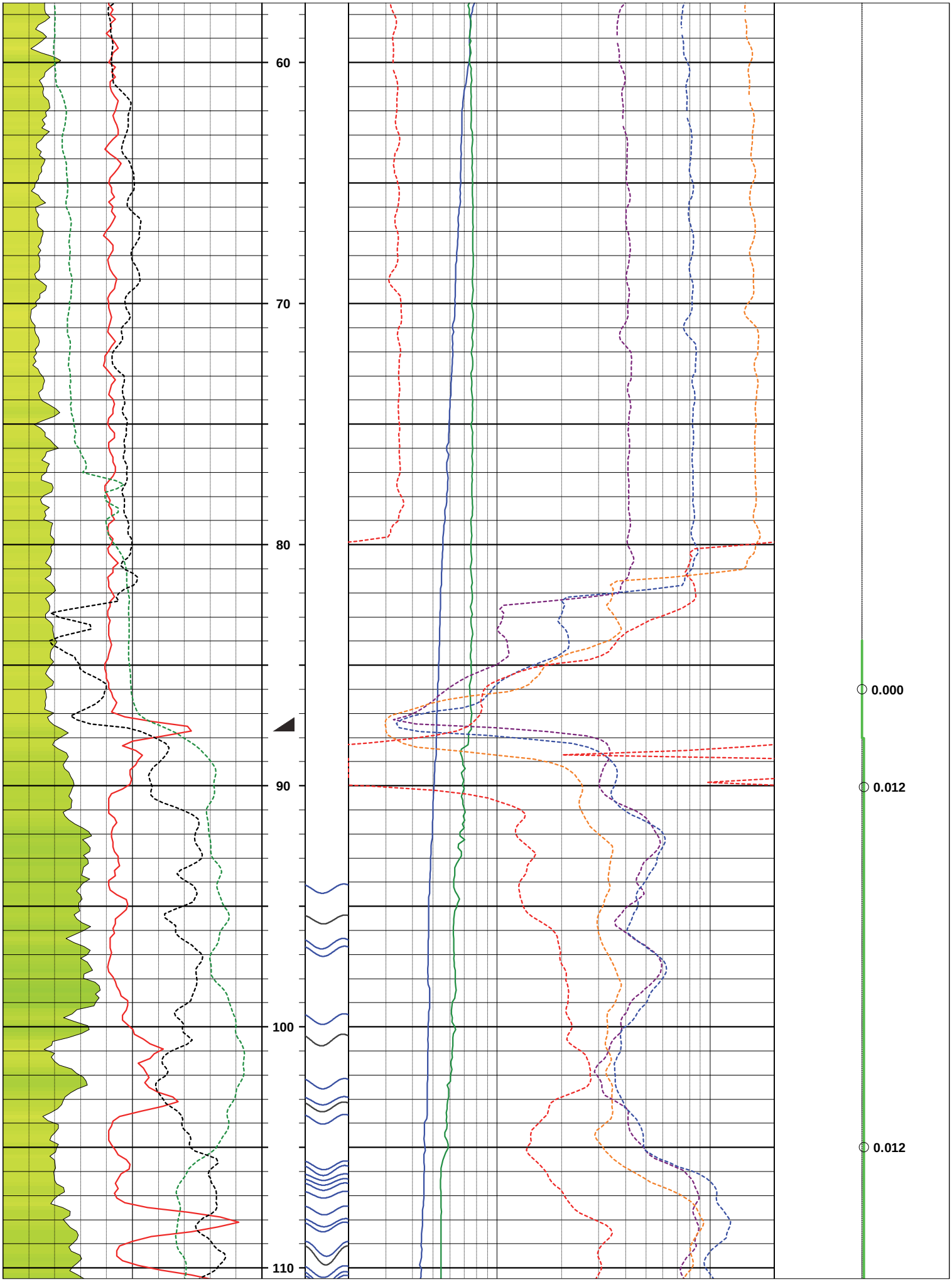
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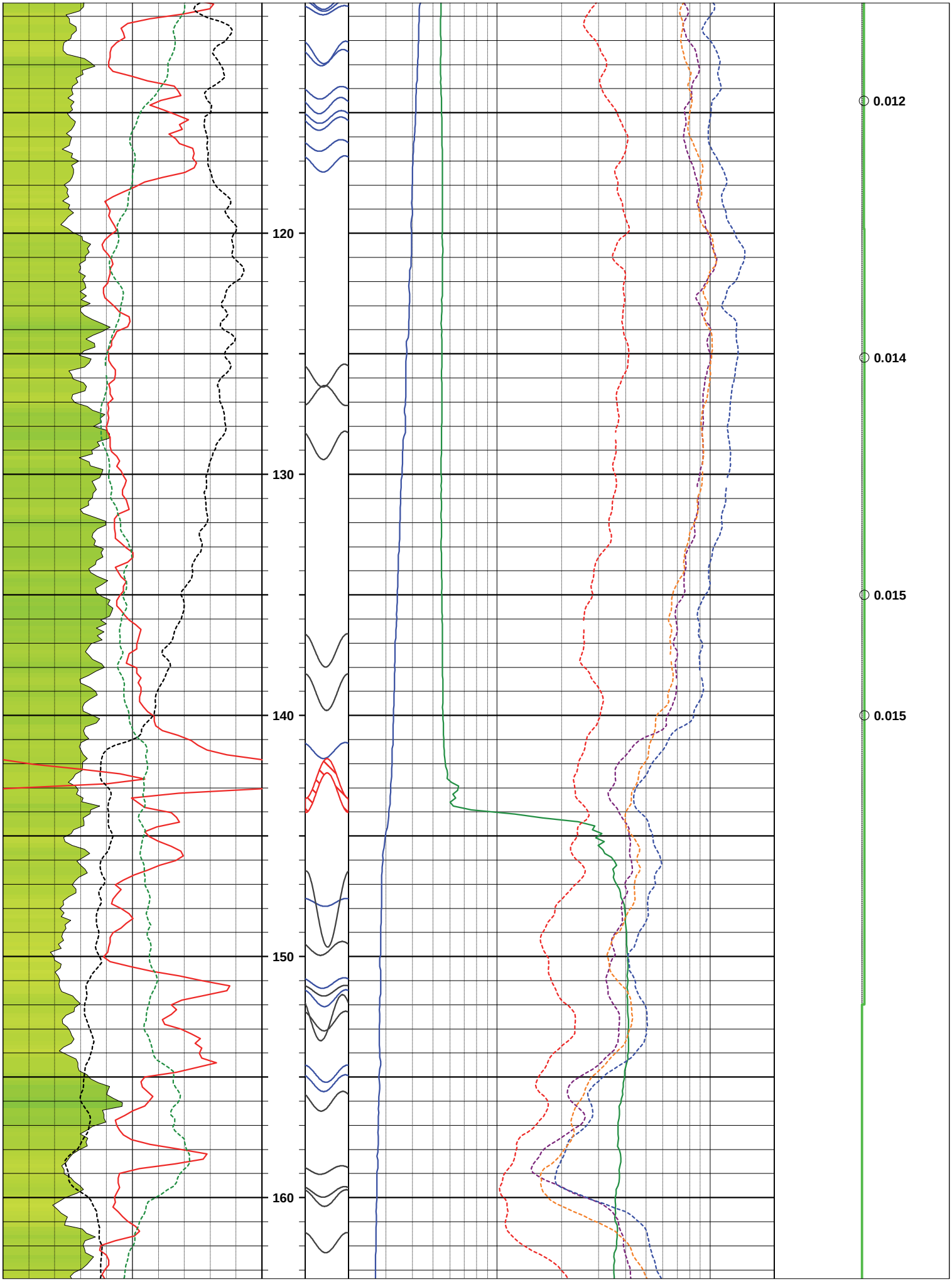
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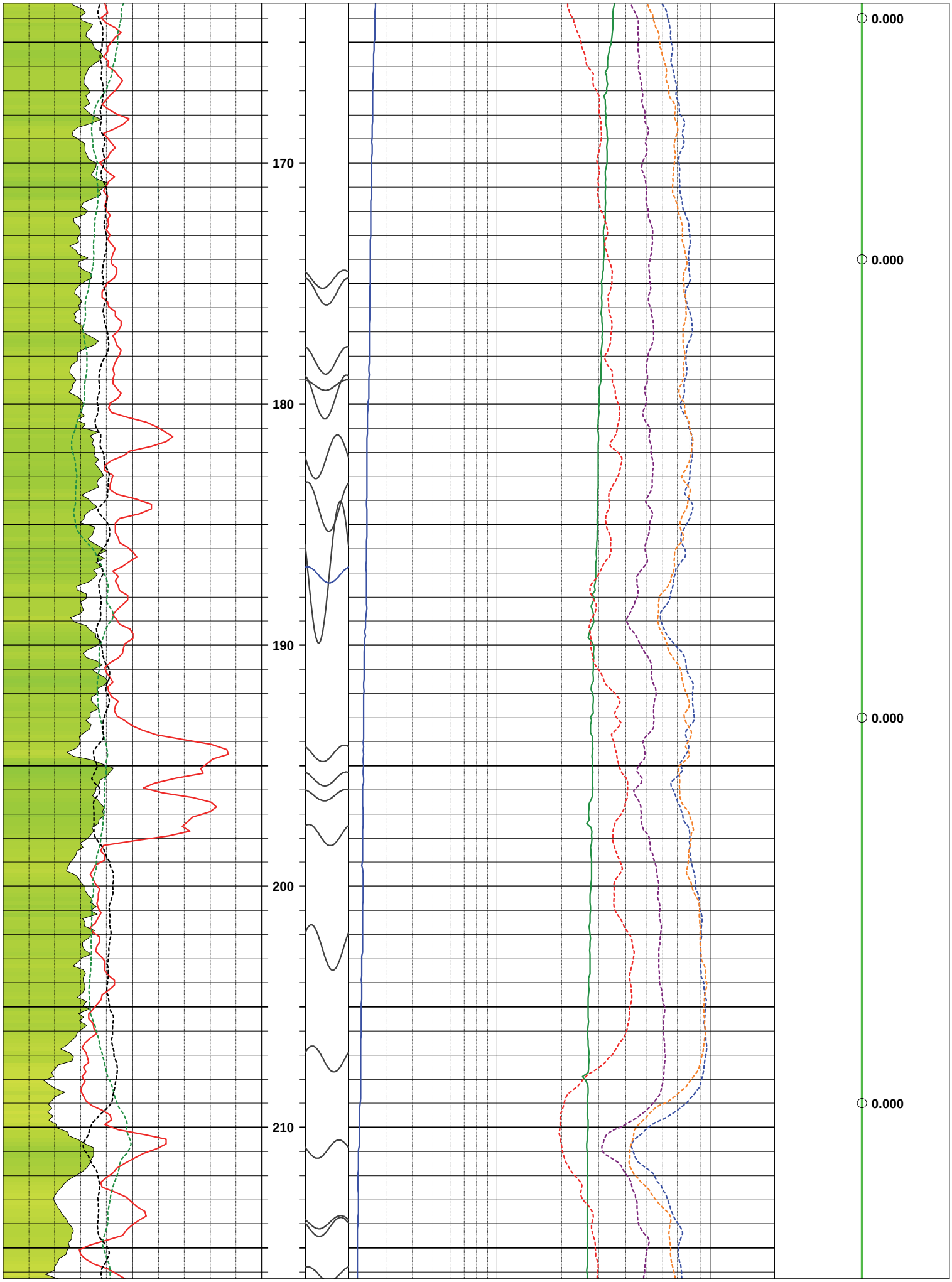
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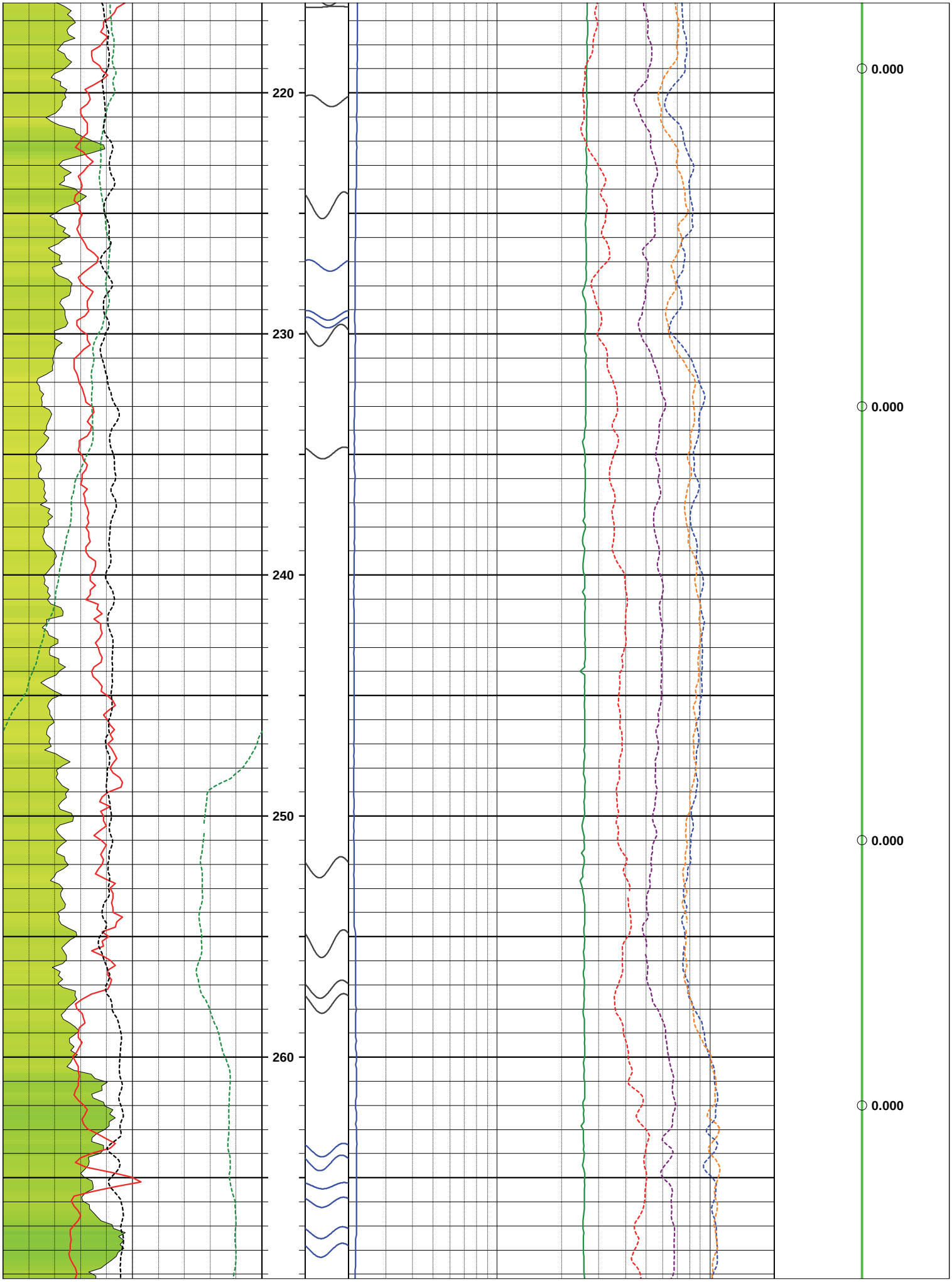
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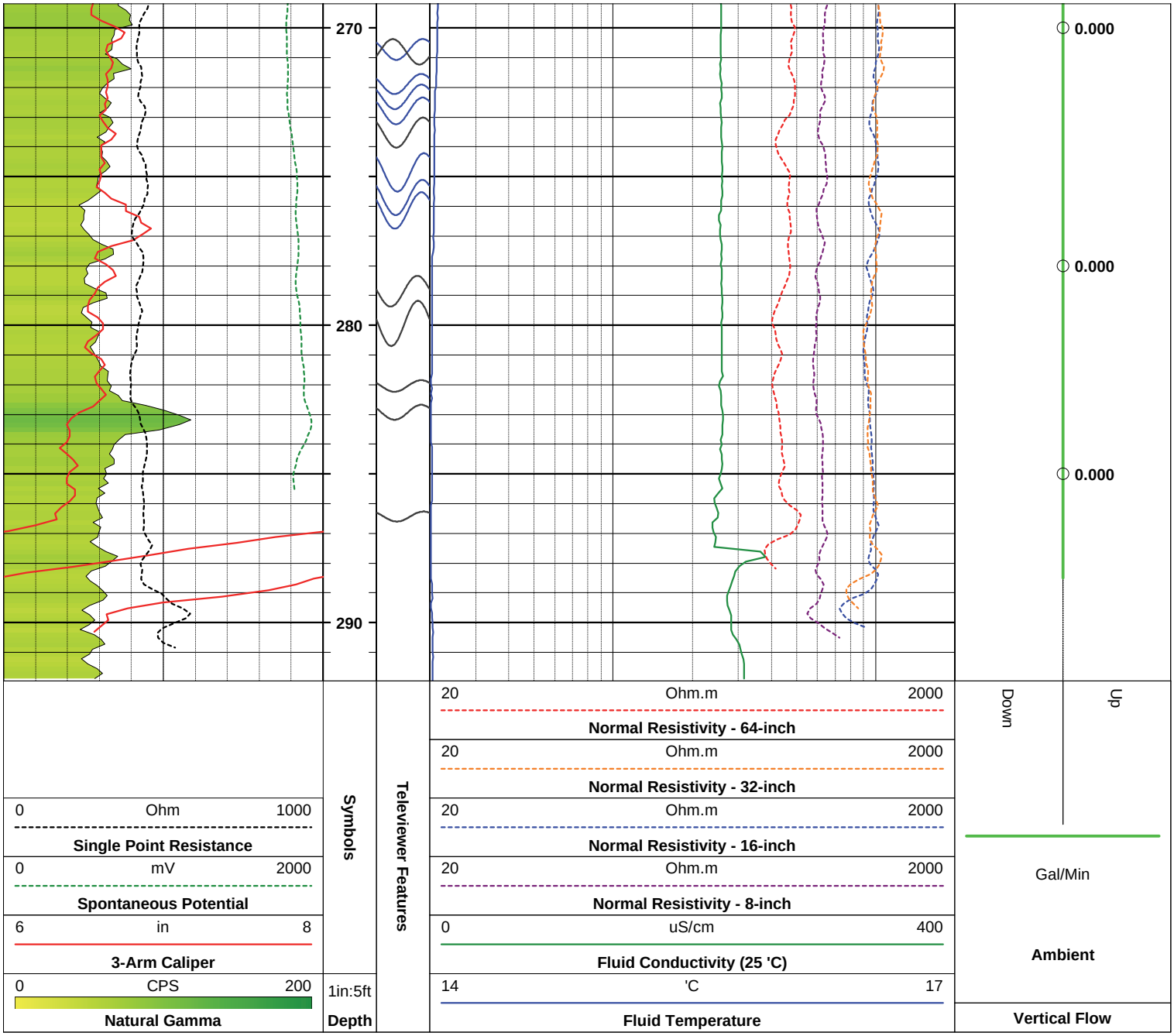
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0 Ohm 1000
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Spontaneous Potential
6 in 8
3-Arm Caliper
0 CPS 200
Natural Gamma
Symbols
1in:5ft
Depth
Televiewer Features
20 Ohm.m 2000
Normal Resistivity - 64-inch
20 Ohm.m 2000
Normal Resistivity - 32-inch
20 Ohm.m 2000
Normal Resistivity - 16-inch
20 Ohm.m 2000
Normal Resistivity - 8-inch
0 uS/cm 400
Fluid Conductivity (25 'C)
14 'C 17
Fluid Temperature
Down
Up
Gal/Min
Ambient
Vertical Flow

DW-02A

Hydro Log

ARM GEOPHYSICS
Surface & Borehole Services

COMP	Greene Environmental
WELL	DW-02A
FLD	Vinton
CNTY	Roanoke
STAT	VA
ARM	170607
API	N/A

COMPANY: Greene Environmental STATE: VA
WELL ID: DW-02A ARM NO.: 170607
FIELD/SITE: Vinton API NO.: N/A
COUNTY: Roanoke

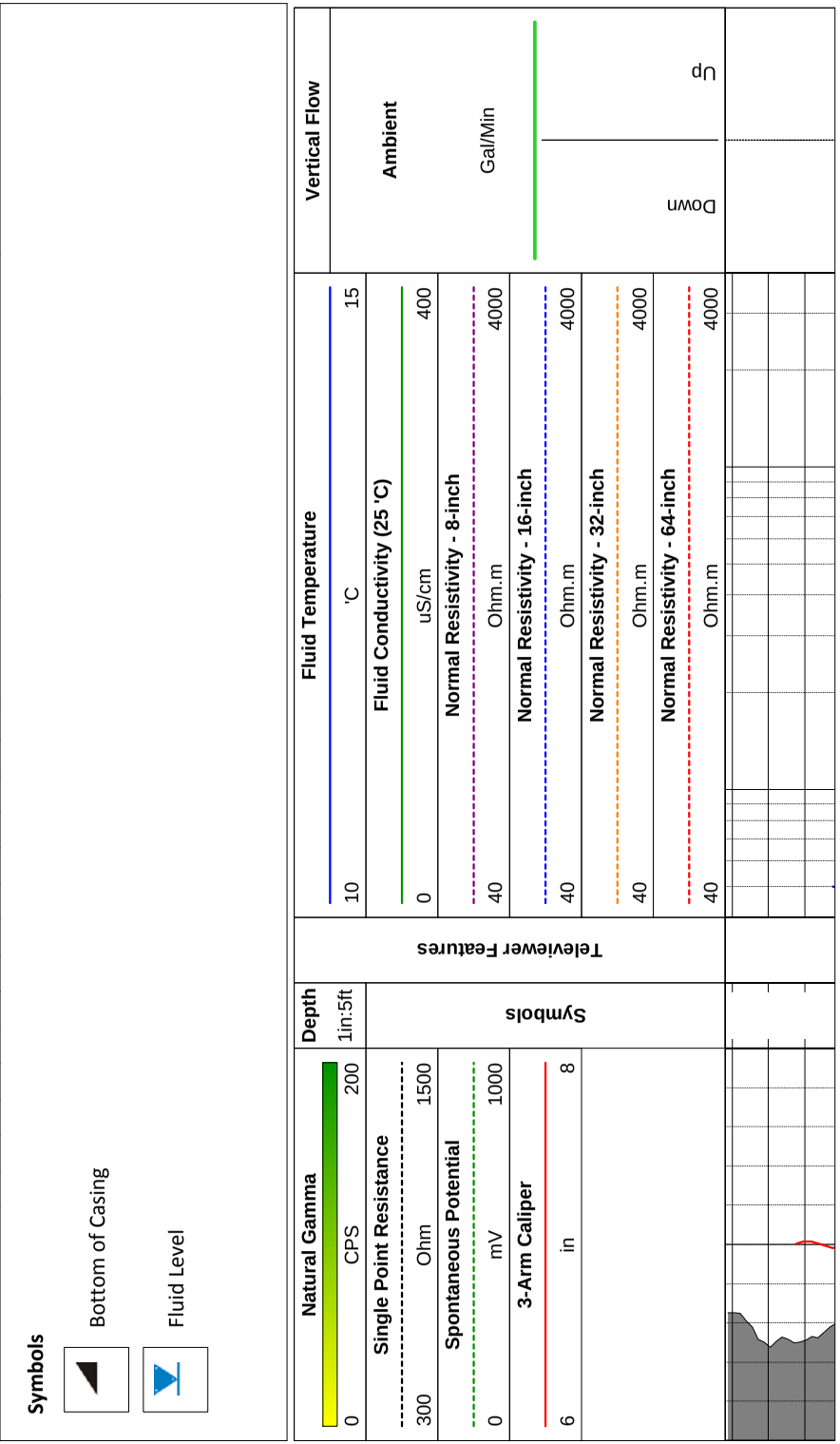
LOCATION:
NORTHING:
EASTING:
SEC: TWP: QUAD:

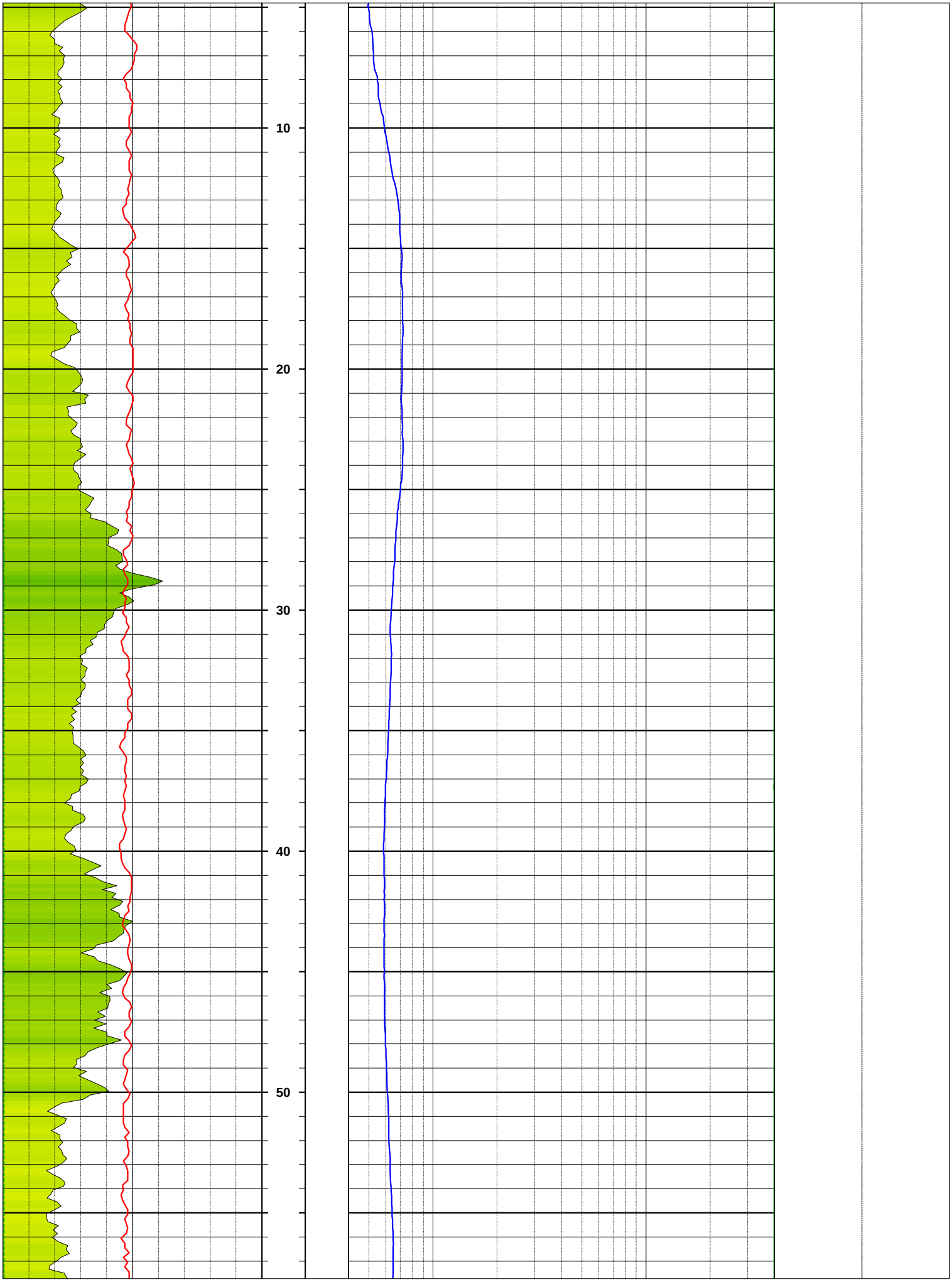
OTHER SERVICES

PERMANENT DATUM: Ground Surface ELEVATION: K.B.
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: D.F.
DRILLING MEAS. FROM: STICK UP: 1.4 G.L.

LOGGING DATE	10.31.2017	10.31.2017	10.31.2017	10.31.2017	
RUN NO	1	4	5	6	
TYPE LOG	FTC.GR	CAL	RES	HPFM A	
DRILLER DEPTH (FT)					
ARM DEPTH (FT)	261.46	260.11	260.54	N/A	
BTM LOGGED INTERVAL (FT)	261.46	260.11	260.54	258.99	
TOP LOGGED INTERVAL (FT)	4.73	5.04	31.32	91	
CASING SIZE (IN)/DEPTH (FT)	6/	6/	6/	6/	
CASING ARM (FT)	88.46	88.46	88.46	88.46	
BIT SIZE (IN)					
FLUID LEVEL IN HOLE (FT)	69.86				
MAG. DECLINATION (DEG)	8.77 W	8.77 W	8.77 W	8.77 W	
RECORDED BY	D. Apple	D. Apple	D. Apple	D. Apple	
WITNESSED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	

REMARKS:

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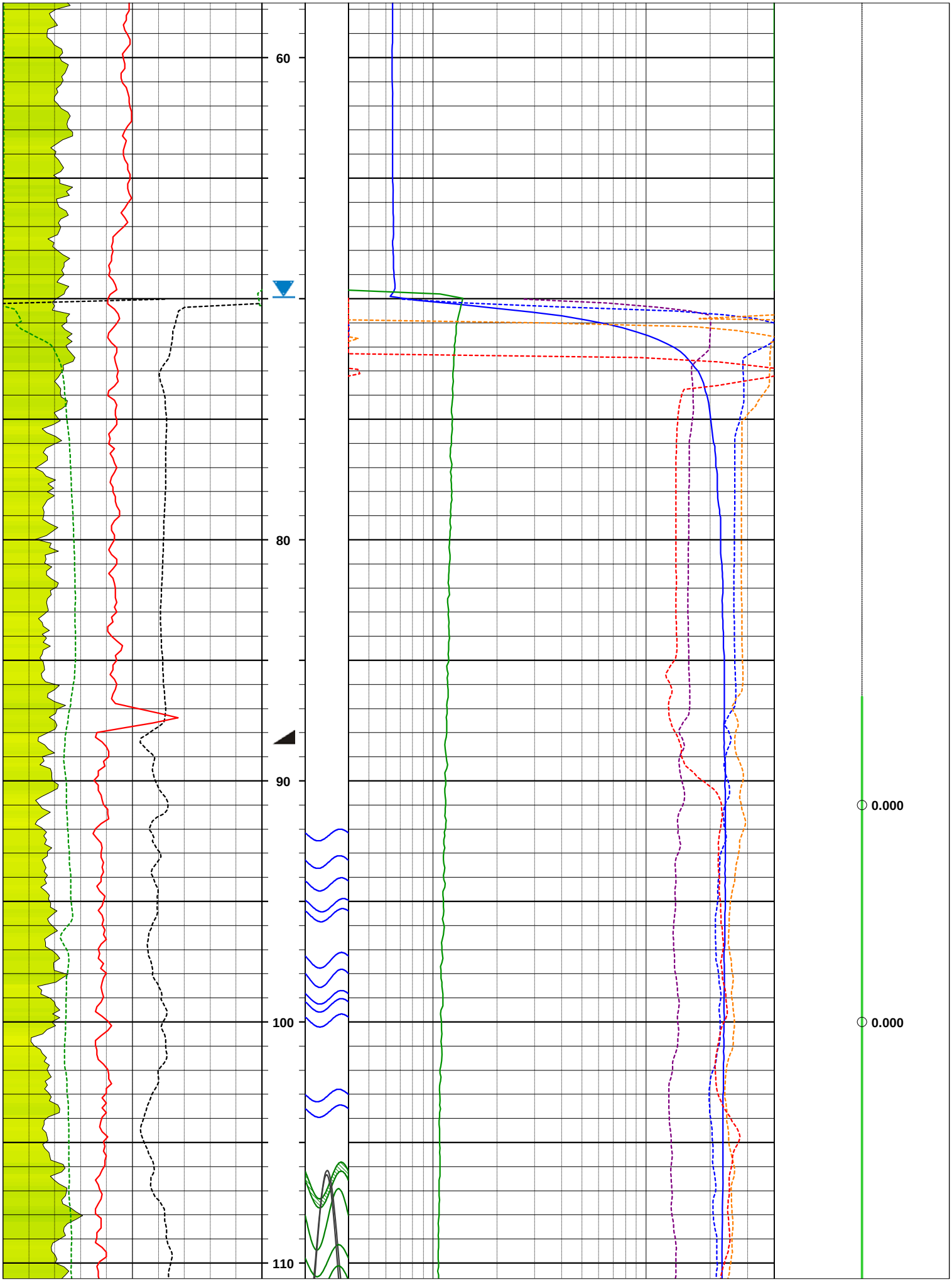
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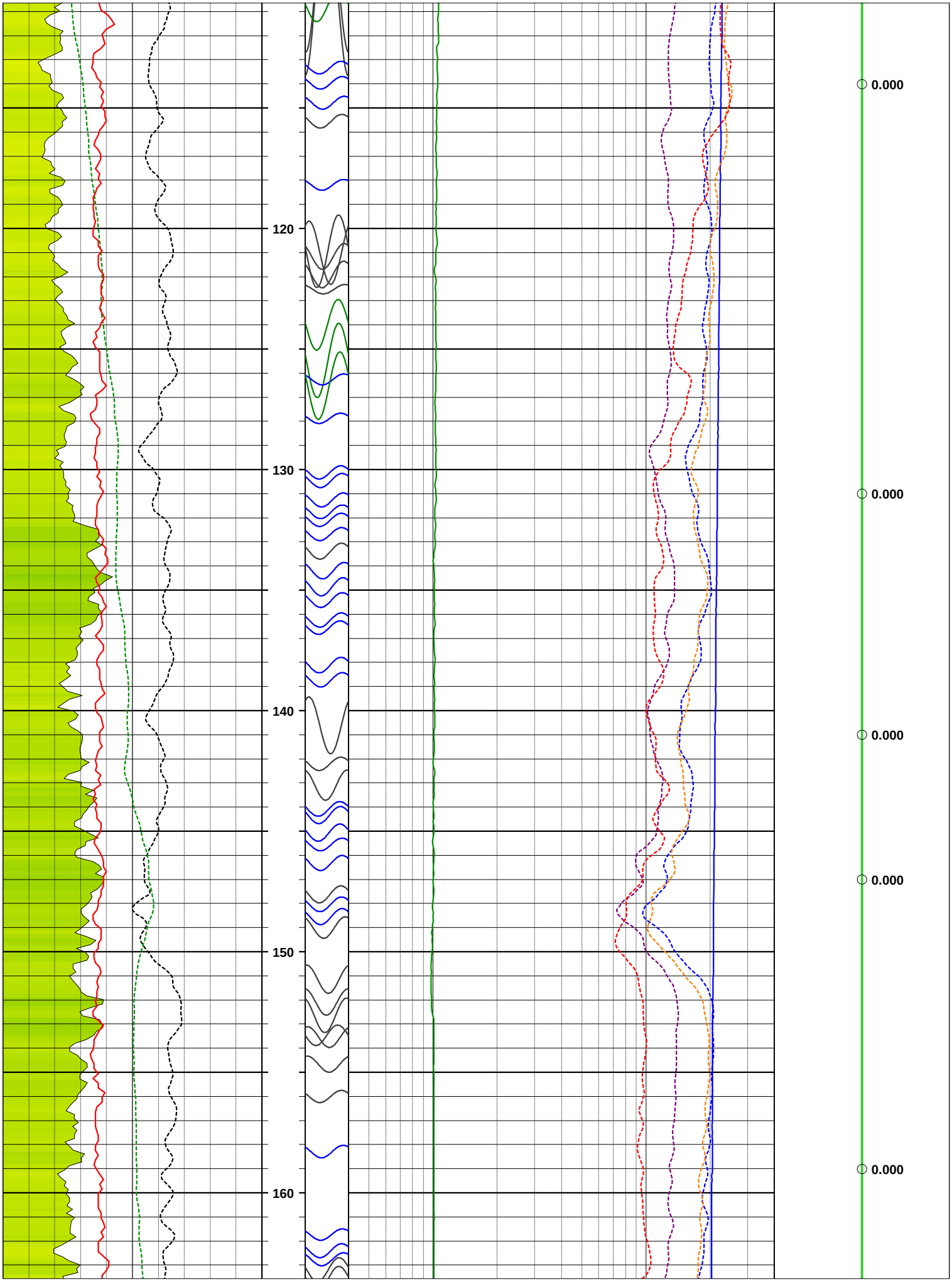
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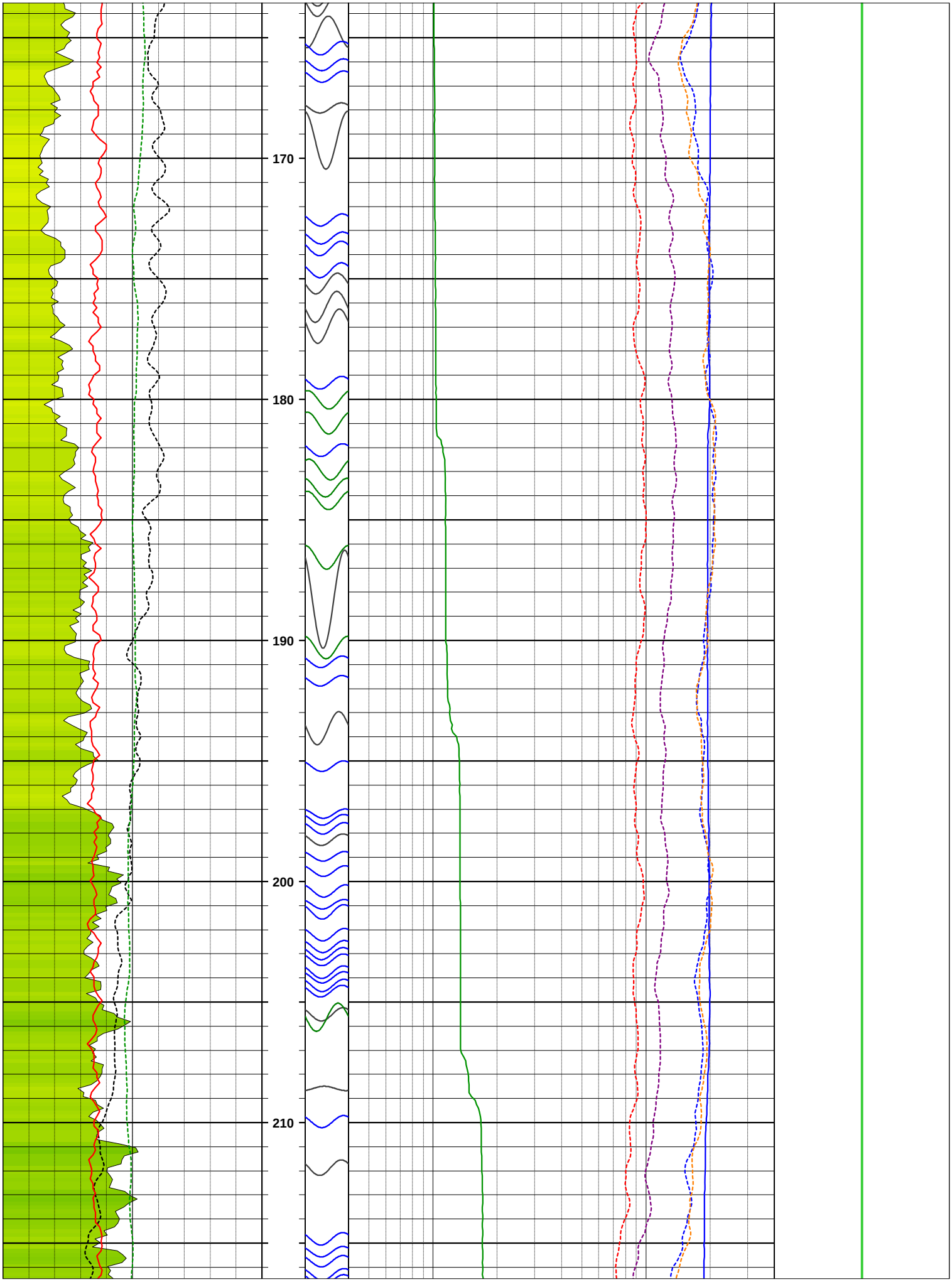
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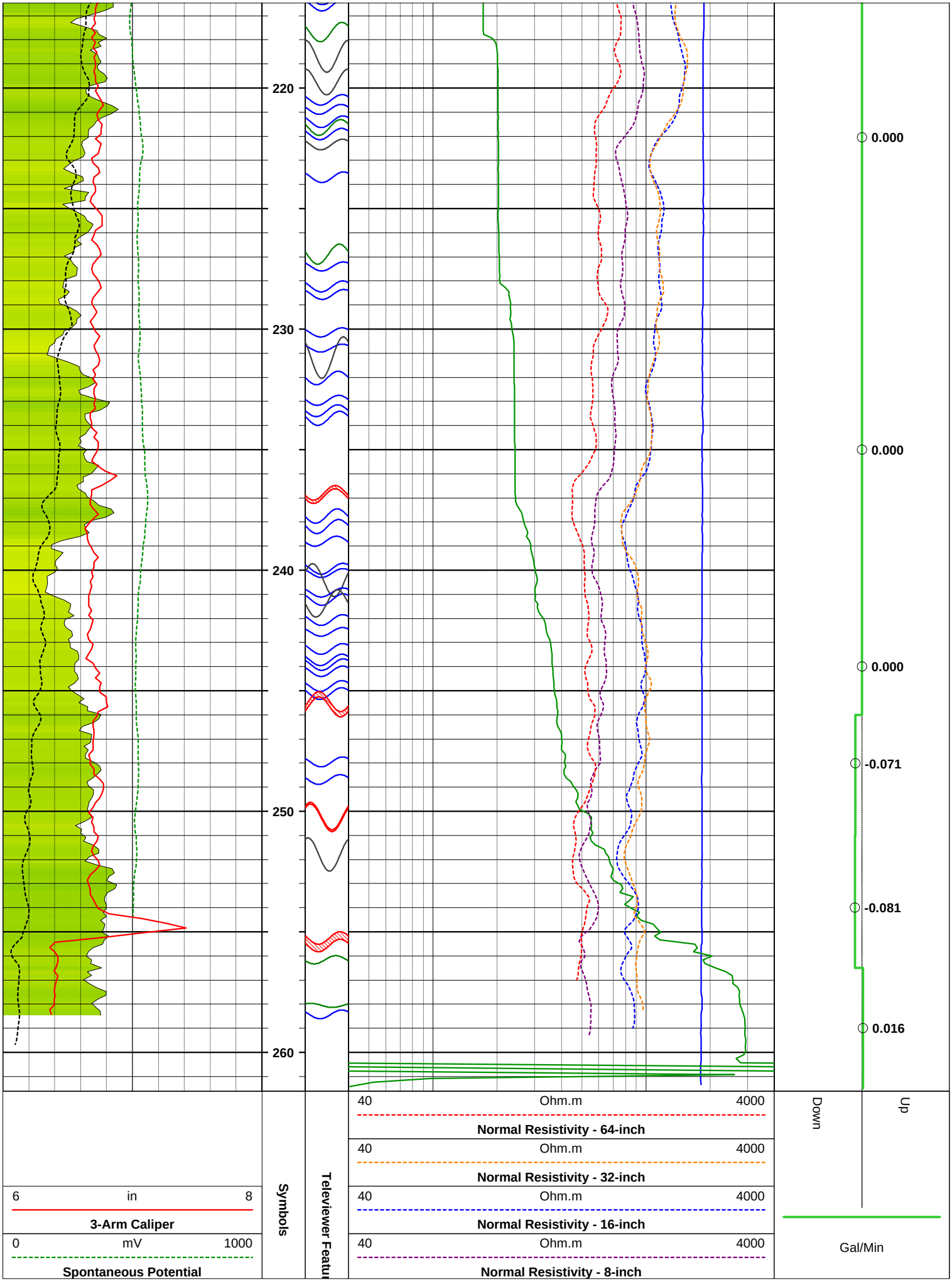
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0 mV 1000
Spontaneous Potential
Symbols
Televiewer Featur
40 Ohm.m 4000
Normal Resistivity - 64-inch
40 Ohm.m 4000
Normal Resistivity - 32-inch
40 Ohm.m 4000
Normal Resistivity - 16-inch
40 Ohm.m 4000
Normal Resistivity - 8-inch
Down
Up
Gal/Min

300 Ohm 1500 Single Point Resistance			0 uS/cm 400 Fluid Conductivity (25 'C)	Ambient	
0 CPS 200 Natural Gamma	1in:5ft Depth		10 'C 15 Fluid Temperature	Vertical Flow	

DW-03A

Hydro Log

COMP	Greene Environmental
WELL	DW-03A
FLD	Vinton
CNTY	Roanoke
STAT	VA
ARM	170607
API	N/A

COMPANY: Greene Environmental STATE: VA
WELL ID: DW-03A ARM NO.: 170607
FIELD/SITE: Vinton API NO.: N/A
COUNTY: Roanoke

LOCATION:
NORTHING:
EASTING:
SEC: TWP: QUAD:

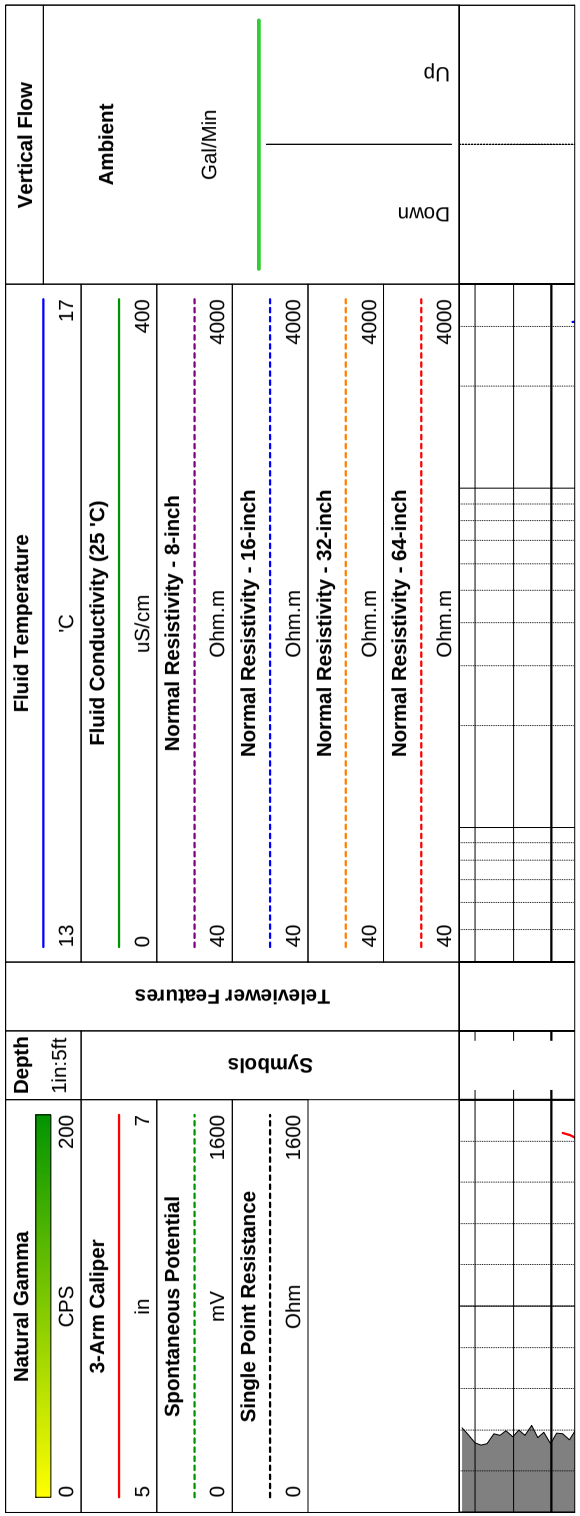
OTHER SERVICES

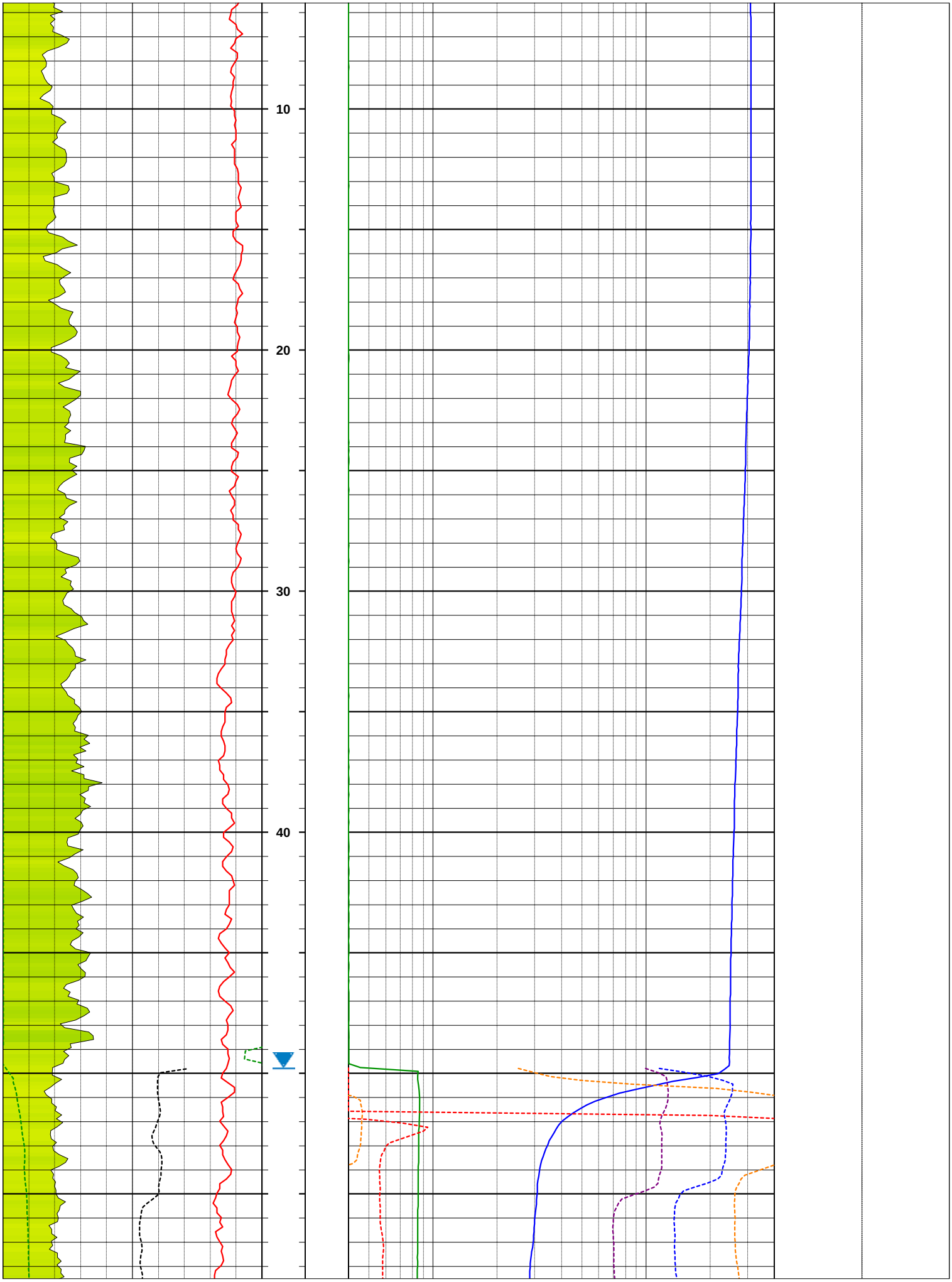
PERMANENT DATUM: Ground Surface ELEVATION: K.B.
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: D.F.
DRILLING MEAS. FROM: STICK UP: 0.62 G.L.

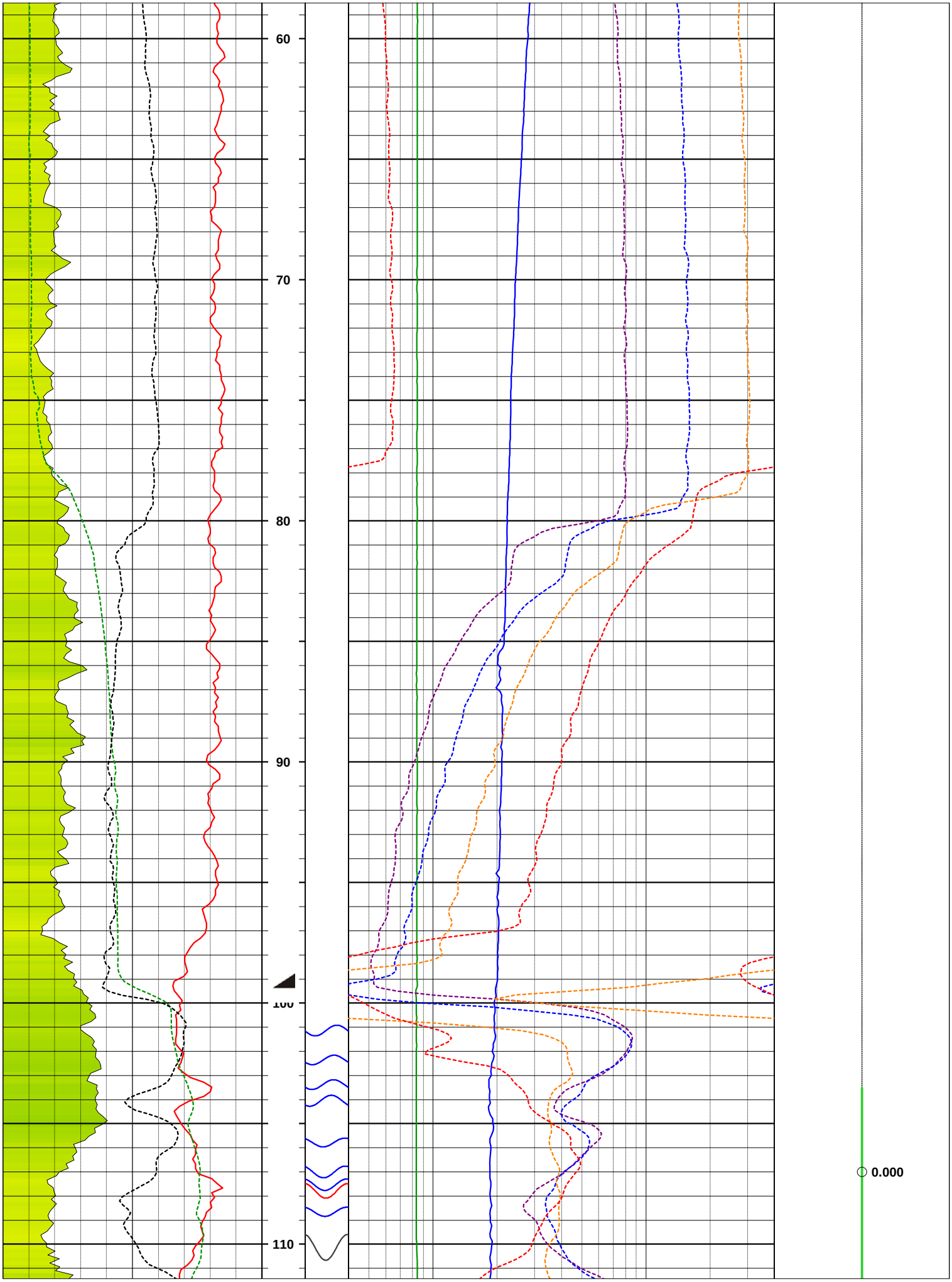
LOGGING DATE	10.31.2017	11.01.2017	11.01.2017	11.01.2017	
RUN NO	1	4	5	6	
TYPE LOG	FTC.GR	CAL	RES	HPFM A	
DRILLER DEPTH (FT)					
ARM DEPTH (FT)	197.5	192.58	192.58	N/A	
BTM LOGGED INTERVAL (FT)	197.5	192.58	192.58	184	
TOP LOGGED INTERVAL (FT)	5.51	5.97	5.97	107	
CASING SIZE (IN)/DEPTH (FT)	6/	6/	6/	6/	
CASING ARM (FT)	99.36	99.36	99.36	99.36	
BIT SIZE (IN)					
FLUID LEVEL IN HOLE (FT)	49.72				
MAG. DECLINATION (DEG)	8.77 W	8.77 W	8.77 W	8.77 W	
RECORDED BY	D. Apple	D. Apple	D. Apple	D. Apple	
WITNESSED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	

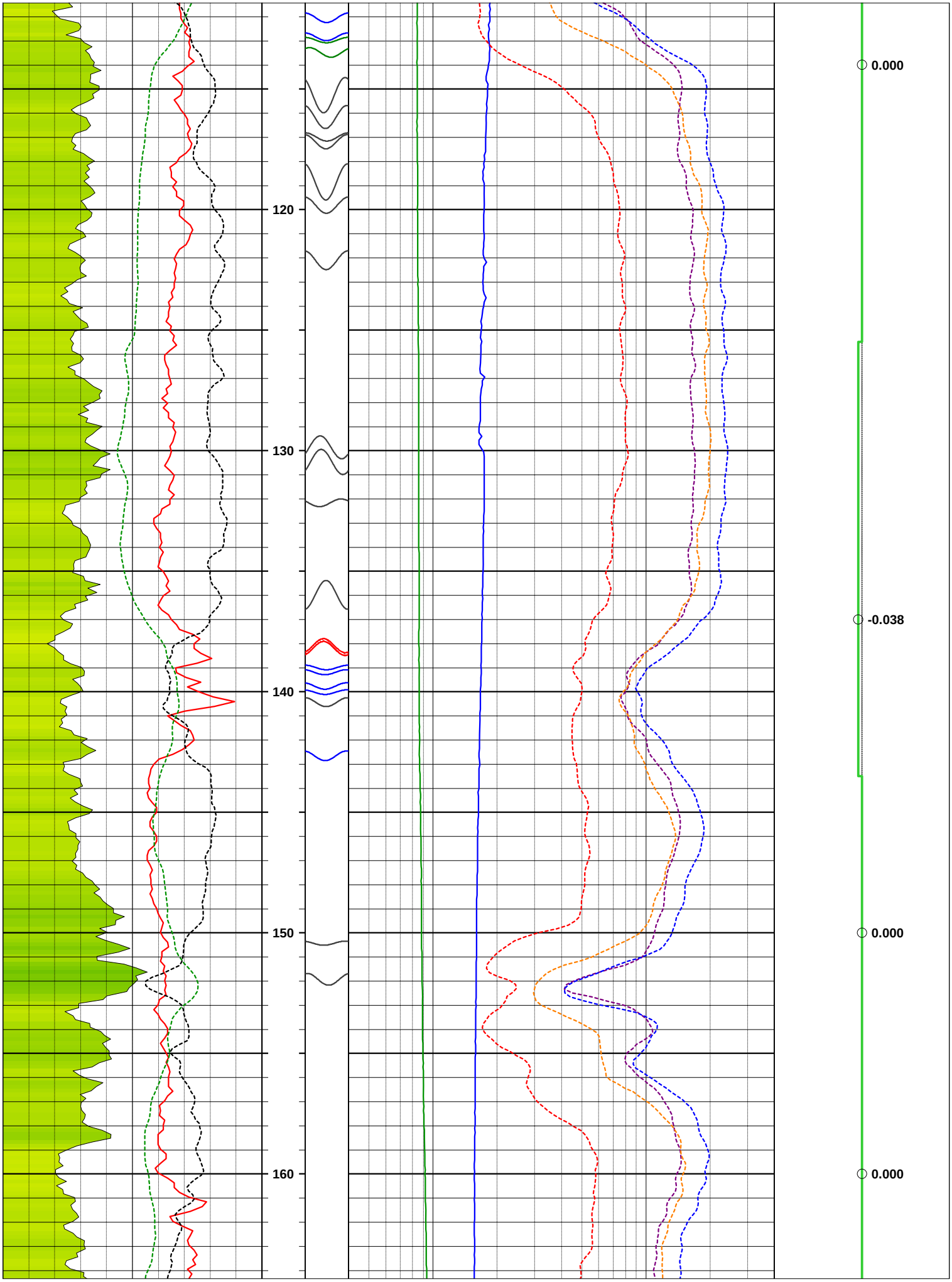
REMARKS:

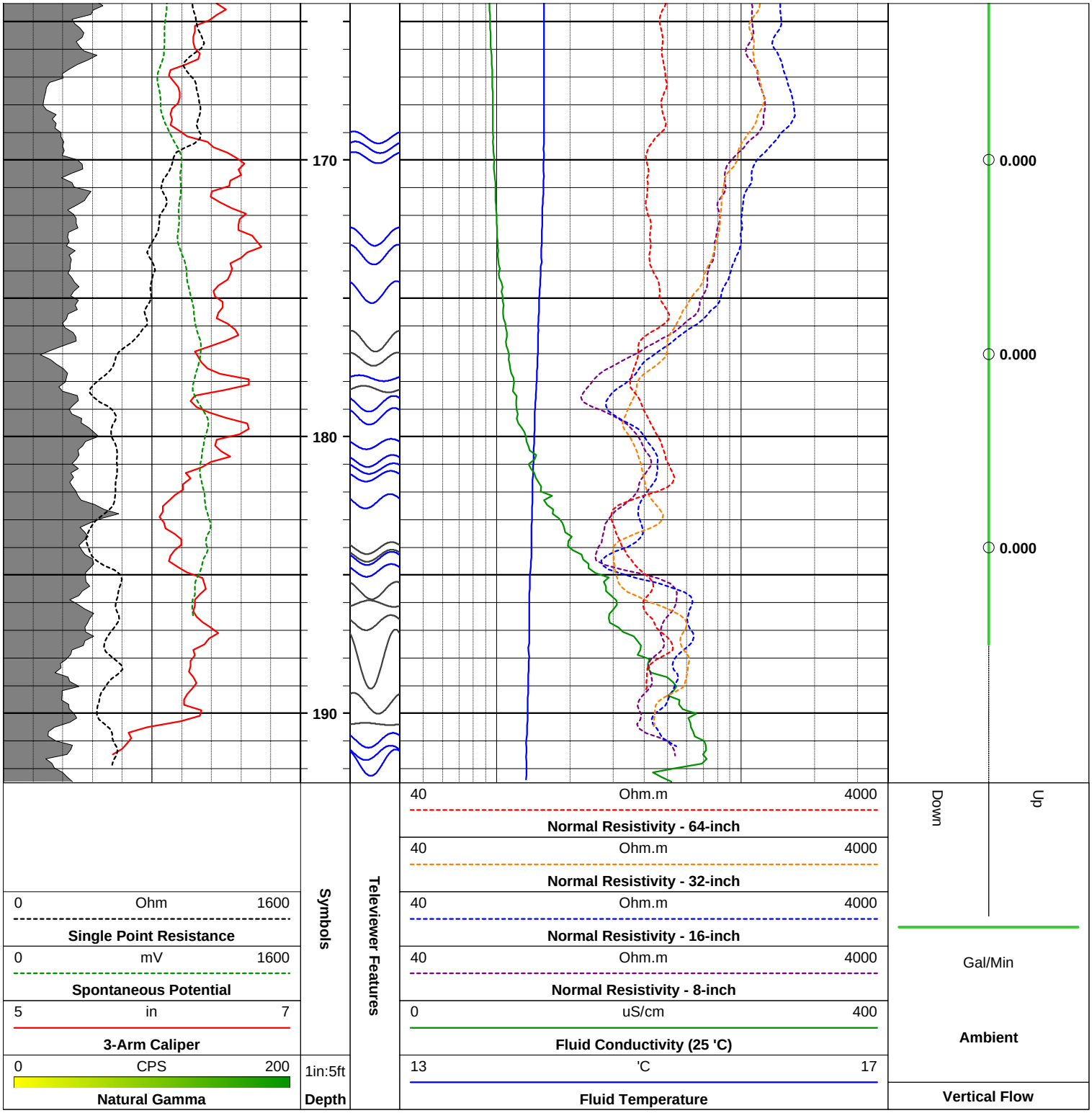
Symbols
Bottom of Casing
Fluid Level




10
20
30
40


60
70
80
90
100
110
0.000


120
130
140
150
160
0.000
-0.038
0.000
0.000


170
180
190
0.000
0.000
0.000
0 Ohm 1600
Single Point Resistance
0 mV 1600
Spontaneous Potential
5 in 7
3-Arm Caliper
0 CPS 200
Natural Gamma
Symbols
1in:5ft
Depth
Televiewer Features
40 Ohm.m 4000
Normal Resistivity - 64-inch
40 Ohm.m 4000
Normal Resistivity - 32-inch
40 Ohm.m 4000
Normal Resistivity - 16-inch
40 Ohm.m 4000
Normal Resistivity - 8-inch
0 uS/cm 400
Fluid Conductivity (25 'C)
13 'C 17
Fluid Temperature
Down
Up
Gal/Min
Ambient
Vertical Flow