TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH

Field Assistant:

Signature: JWA

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-146-160616-1147-JJW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM OVER RESIDUUM
Date:	6/16/16	% Slope:	30%	Slope Aspect:	217°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVE	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	22"	Slope Failure or slip:	BENT TREES
NRCS Soil Unit:	WEIKERT - BERKS	Bedrock Type :	SANDSTONE	Dip Slope & Direction:	40° NNW Strike: 216°
Mineralogy:	MIXED	Vegetation:	WHITE OAK, WHITE PINE, MAPLE, WITCH HAZEL, BLUEBERRY		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR2.5/1	—	—	—	—	—	— / —	—	—	aS	—	—	3-VF 2-F	— / 4.1	—	
A	1-1.5	10YR3/2	SiL	10	18	10 GR	<1	PO / SO	1FGR	VFR	aW	—	—	2-VF,F 1-M	0.25 / —	—	
Bw	1.5-9	10YR5/4	CH SiL	11	14	15 CH	0.5-2	PO / SO	1MSBK	VFR	cW	—	—	2-F,M,C	0.5 / 5.2	—	
2BC	9-18	10YR5/6	VCH SL	11	70	50 CH	1-3	PO / SO	1FSBK	FR	cW	—	—	2-F	— / 5.4	—	SANDSTONE COF
2Cr	18-22	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	
2R	22+	SANDSTONE				BEDROCK											

Other Notes: LINEAR - LINEAR BELOW SUMMIT, ABOVE BREAK TO STEEP SLOPE (>45%)

TEST PIT DESCRIPTION

Soil Scientist: JOHN WALL

Field Assistant:

Signature: JSWA

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-147-160616-1059-JSW	Topographic Position:	SUMMIT	Parent material:	RESIDUUM		
Date:	6/16/16	% Slope:	47%	Slope Aspect:	325°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVE	Depth to Water Table:	–		
RETTEW Job #:	089962000	Depth to Refusal:	29"	Slope Failure or slip:	–		
NRCS Soil Unit:	WEIKERT-BERKS	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	–	Strike:	–
Mineralogy:	MIXED	Vegetation:	MAPLE, HICKORY, WHITE OAK, BLUEBERRY				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-3	5YR2.5/1	–	–	–	–	–	– / –	–	–	a-S	–	–	3-VF 2-F	– / 4.4	–	
A	3-5	10YR3/1	GR SiL	11	15	GR 25	< 1	PO / SO	1FGR	VFR	AW	–	–	3-VF 2-F 1-M	0.5 / –	–	
Bw	5-10	10YR5/6	VCH SiL	13	12	CH 55	1-2	PO / SO	1MGR	FR	CW	–	–	2-M 1-C	0.5 / 4.6	–	
BC	10-17	10YR5/6	XCH SiL	13	12	CH 85	1-3	PO / SO	0MA	FR	CW	–	–	1-C	– / –	–	
Cr	17-29	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	
R	29+	SILTSTONE BEDROCK															

Other Notes: NARROW SUMMIT/RIDGE CREST

TEST PIT DESCRIPTION

Soil Scientist: JOHN WALL

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-148-160616-1044-SSW	Topographic Position:	BACKSLOPE	Parent material:	RESIDUUM
Date:	6/16/16	% Slope:	68%	Slope Aspect:	200°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVE	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	8"	Slope Failure or slip:	—
NRCS Soil Unit:	WEIKERT - BERKS	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	32° NNW Strike: 217°
Mineralogy:	MIXED	Vegetation:	CHESTNUT OAK, HICKORY, VA PINE, WHITE OAK		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR2.5/1	—	—	—	—	—	— / —	—	—	aS	—	—	3-VF,F	— / 4.4	—	
A	1-2	10YR3/1	CH SiL	10	15	30 CH	<1	PO / SO	1FGR	VFR	aW	—	—	3-F,M 1-C	0.25 / —	—	
C	2-4	10YR4/4	XCH SiL	10	12	75 CH	1-4	PO / SO	OMA	VFR	aW	—	—	2-F,M,C 1-VC	0.25 / 5.1	—	
Cr	4-8	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	
R	8+	SILTSTONE BEDROCK															

Other Notes: BACKSLOPE - LINEAR CONVEX; SANDSTONE FLAGS > 6" ON SURFACE SANDSTONE OUTCROPPING 4M ABOVE PIT, SILTSTONE OUTCROPPING TO SIDE; BEDROCK DIPPING INTO RIDGESIDE

TEST PIT DESCRIPTION

Soil Scientist: JOHN WANG

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-149-160616-1033-SSW	Topographic Position:	BACKSLOPE (RIDGE NOSE)	Parent material:	RESIDUUM
Date:	6/16/16	% Slope:	18%	Slope Aspect:	130°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVE	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	12"	Slope Failure or slip:	—
NRCS Soil Unit:	WEIKERT - BERKS	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	31° W (90°) Strike: 180°
Mineralogy:	MIXED	Vegetation:	VA PINE, CHESTNUT OAK, WHITE PINE, BLUEBERRY		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR2.5/1	—	—	—	—	—	- / —	—	-	as	-	—	3-VF 2-F	— / 4.4	—	
A	1-2	10YR3/1	CH SiL	11	18	CH 25	1-3	PO / SO	1FGR	VFR	aw	—	-	3-VF 2-M	0.25 / —	—	
Bw	2-5	10YR5/6	VCH SiL	13	15	VCH 50	2-5	PO / SO	1FSBK	FR	cw	—	-	2-M, C, VC	0.5 / 4-5	—	
BC	5-12	10YR5/6	XCH SiL	13	12	CH 75	2-5	PO / SO	1FSBK	FR	aw	—	-	1-F	/ 0.5	—	
R	12+	SILTSTONE BEDROCK						- / -	—	—	—	—	—	—			

Other Notes: BACKSLOPE ON LINEAR RIDGE

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH
Field Assistant:

Signature: JSWN

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-150-160616-1024-JSW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM OVER RESIDUUM
Date:	6/16/16	% Slope:	38%	Slope Aspect:	277°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVE	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	17"	Slope Failure or slip:	—
NRCS Soil Unit:	WEIKERT - BERKS	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	40° WNW(290°) Strike: 200°
Mineralogy:	MIXED	Vegetation:	WHITE PINE, VA PINE, CHESTNUT OAK, BLUEBERRY		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/1	—	—	—	—	—	— / —	—	—	AS	—	—	3-VF,F,M	— / 4.4	—	
A	2-3	10YR3/1	CH SiL	11	25	15 CH	< 1	PO / SO	1FGR	VFR	AW	—	—	3-VF,F,M	0.25 / —	—	SANDSTONE COF
Bw	3-11	10YR5/6	CH SiL	14	18	35 CH	< 1	PO / SO	1MSBK	FR	CW	—	—	2-F,M,C,VC	0.5 / 4.7	—	SANDSTONE & SILTSTONE CHANNERL
BC	11-17	10YR5/6	VCH SiL	13	15	55 CH	1-4	PO / SO	1FSBK	FR	AW	—	—	3-F 2-M	1.0 / —	—	
2R	17+	SILTSTONE BEDROCK															

Other Notes: BEDROCK DIPPING WITH SLOPE; LINEAR LINEAR BACKSLOPE

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio
Field Assistant: Mustafa Erten
Signature: Steve Dadio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P151-160606-1107-sdd	**Topographic Position:**	backslope	**Parent material:**	coll res
Date:	06/06/16	**% Slope:**	22	**Slope Aspect:**	150°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	**Drainage Class:**	Mod Well	**Depth to Water Table:**	40 water
RETTEW Job #:	089962000	**Depth to Refusal:**	45	**Slope Failure or slip:**	N/A
NRCS Soil Unit:	Lehew-Berks	**Bedrock Type :**	sandstone	**Dip Slope & Direction:**	10 150 **Strike:** 60
Mineralogy:	Mixed	**Vegetation:**	red maple, black oak very little groundcover		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (Inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	1	2.5YR 2.5/1	—	—	—	f1 30	4-8	— / —	—	—	aw	—	—	cf cm cc	<.25 / 4.5	S1	
A	2	10YR 3/2	sl	10	60	f1 40	4-8	PO / SO	1f gr	vfr	cw	—	—	ff cm	.25 / 4.5	S2	
E	6	10YR 5/2	sl	10	65	f1 40	4-8	PO / SO	1f sbk	vfr	cw	—	—	ff cm	.25 / 5.25	S3	
Bw1	24	10YR 5/6	sl	12	65	f1 30	4-6	PO / SO	1msbk	fr	cw	—	—	ff fm	.25 / 5.35	S4	
Bw2	32	10YR 6/6	sl	12	65	f1 25	4-6	PO / SO	1msbk	fr	cw	10YR 5/6	cmd	fm fc	.5 / 5.25	S5	
2Bw3	45	7.5YR 6/3	sl	12	55	f1 40	4-6	PO / SO	1msbk	fr	aw	7.5YR 5/6; 6/4	cmd cmd	fc	1.0 / 5.25	S6	
3R	45+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes: seepage @ 6-32" water @ 40'

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio
Field Assistant: Mustafa Erten
Signature: Steve Dadio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P152-160606-1257-Sdd	Topographic Position:	backslope	Parent material:	coll / res
Date:	06/06/16	% Slope:	38	Slope Aspect:	130
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	32	Slope Failure or slip:	N/A
NRCS Soil Unit:	Lehew - Berks	Bedrock Type :	Sandstone	Dip Slope & Direction:	20 S Strike: 13
Mineralogy:	Mixed	Vegetation:	black oak, mountain laurel, red maple		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	2	10YR 2/1	–	–	–	fl 20	6-12	– / –	–	–	aw	–	–	cf cm fc	<.25 / 4.5	–	
A	3	10YR 3/2	sl	10	60	fl 20	6-12	po / so	1 fgr	vfr	aw	–	–	cf cm	<.25 / 4.5	–	
Bw1	18	7.5YR 5/6	l	12	45	gr 25	2-4	ps / ss	1 msbk	fr	cw	–	–	ff cm fc	1.75 / 5.25	–	
Bw2	32	7.5YR 5/6	l	12	45	gr 40	1-2	ps / ss	1 m sbk	fr	aw	–	–	fm	1.5 / 5.25	–	
2R	32+	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio
Field Assistant: Mustafa Erken

Signature: Steve Dado

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	p153-160606-1407-sdd	Topographic Position:	footslope / bench	Parent material:	colluvium / res		
Date:	06/06/16	% Slope:	18	Slope Aspect:	140		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~WD~~ MW	Depth to Water Table:	seeps @ 28		
RETTEW Job #:	089962000	Depth to Refusal:	4	Slope Failure or slip:	N/A		
NRCS Soil Unit:	Oriskany	Bedrock Type :	sandstone	Dip Slope & Direction:	8	5	Strike: 45
Mineralogy:	Mixed	Vegetation:	red maple, chestnut oak, mountain laurel				

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	2	5YR 2.5/1	–	–	–	Fl 30	6-12	– / –	–	–	aw	–	–	C VF M F M M	<,25 4.5	–	
A	3	10YR 3/2	sil	15	30	Fl 30	6-12	PO / SS	1 f gr	vfr	aw	–	–	M F M M	,25 4.5	–	
BE	10	7.5YR 4/6	sil	16	30	cb 40	3-6	PS / SS	1 f sbk	fr	cw	–	–	C F C M	,25 5.25	–	
Bt1	24	7.5YR 5/6	sil	18	30	cb 40	3-6	PS / SS	2 m sbk	fr	cw	–		F F F M	,50 5.25	–	
Bt2	42	7.5YR 5/6	l	16	40	gr 30	2-4	PS / SS	1 m sbk	fr	aw	7.5YR 5/8 7.5YR 6/3	c m d c m d	F F	1.00 5.25	–	
2R	42+	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	

Other Notes: water seeping @ 28"

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio **Signature:** Steve Dadio
Field Assistant: Mustafa Erken

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P154-160606-1417-sdd	Topographic Position:	backslope	Parent material:	colluvium/residuum
Date:	06/06/16	% Slope:	24%	Slope Aspect:	
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Moderately Well ~~WD~~	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	32	Slope Failure or slip:	N/A
NRCS Soil Unit:	Oriskany	Bedrock Type :	sandstone	Dip Slope & Direction:	not determined - covered and broken rocks; Strike:
Mineralogy:	Mixed	Vegetation:	chestnut oak, mountain laurel		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	4	5YR 2.5/1	–	–	–	fl 60	6-12	– / –	–	–	aw	–	–	M F / M M	2.25 / 4.5	S1	
A	8	10YR 3/2	l	10	50	fl 60	6-12	po / so	1 f gr	vfr	aw	–	–	M F / M M	.25 / 4.5	S2	
Bt1	20	7.5YR 5/6	l	15	50	ch 40	2-4	ps / ss	1 m sbk	fr	cw	–	–	C M / F C	.25 / 4.75	S3	
Bt2	32	7.5YR 5/6	l	15	50	ch 40	2-4	ps / ss	1 m sbk	fr	aw	7.5YR 5/8 / 6/3	cmd / cmd	F M / F C	2.0 / 5.0	S4	
2R	32+	–	–	–	–	–	–	– / –	–	–	–	–	–	–	–		

Other Notes:

TEST PIT DESCRIPTION

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Soil Scientist: Duane A. Truax

Field Assistant: Max Dugon

Signature: [signature]

Test Pit ID:	P-155-160606-1110-DAT	Topographic Position:	Backslope	Parent material:	Colluvium
Date:	06-06-2016	% Slope:	32%	Slope Aspect:	191° South
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well Drained	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	>46" (Refusal on Boulders)	Slope Failure or slip:	N/A
NRCS Soil Unit:	Oriskany cobbly sandy loam	Bedrock Type :	N/A	Dip Slope & Direction:	N/A Strike: N/A
Mineralogy:	Siliceous	Vegetation:	Mixed Oak Varieties, Longleaf Pine, Mountain Laurel		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR 2.5/1	–	–	–	–	–	– / –	–	–	SA	–	–	3F 2Co	– / 4.5	S-1A / S-1B	
A	1-2	7.5YR 3/1	sil	5	35	CN 20%	0.25-1.5	PO / SO	Gr 1 F	VFR	SA	–	–	1m 2Co	0.25 / 4.4	S-2A / S-2B	
E	2-4	7.5YR 5/2	sl	6	65	XGR 65%	0.5-2.0	PO / SO	SBK 1m	VFR	IA	–	–	2m	0.25 / 4.3	S-3A / S-3B	
Bt1	4-12	7.5YR 5/4	l	15	50	VGR 40%	0.5-2.0	PO / SO	SBK 1CO	FR	SA	–	–	2m	1.25 / 4.6	S-4A / S-4B	
Bt2	12-24	7.5YR 5/4	l	22	46	XGR 60%	0.5-3.0	PS / SO	SBK 1Co	FR	SA	–	–	1m	1.75 / 4.5	S-5A / S-5B	
BC	24-30	7.5YR 5/4	sl	16	58	XGR 70%	0.5-3.0	PO / SO	SBK 1m	FR	SA	–	–	1m	1.5 / 4.5	S-6A / S-6B	
C	30-46	7.5YR 5/4	sl	11	61	XCB 85%	0.5-16"	PO / SO	SBK 1m	FR	IA	–	–	1m	1.25 / 4.7	X	NO SAMPLE; INSUFFICIENT FINES

Other Notes:

TEST PIT DESCRIPTION

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Soil Scientist: Duane A. Truax

Field Assistant: Max Dugan

Signature: [signature]

Test Pit ID:	P-156-160606-1355-DAT	**Topographic Position:**	TOESLOPE	**Parent material:**	Colluvium
Date:	06-06-2016	**% Slope:**	10%	**Slope Aspect:**	112° E
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	**Drainage Class:**	Somewhat Poorly Drained	**Depth to Water Table:**	22"
RETTEW Job #:	089962000	**Depth to Refusal:**	N/A	**Slope Failure or slip:**	N/A
NRCS Soil Unit:	Oriskony cobbly sandy loam	**Bedrock Type :**	N/A	**Dip Slope & Direction:**	N/A; **Strike:** N/A
Mineralogy:	siliceous	**Vegetation:**	Various Oaks, Sugar Maple, Long Leaf Pine, Mt. Laurel		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	7.5YR 2.5/1	—	—	—	—	—	— / —	—	—	IA	—	—	3F 2m	— / 4.0	S-1A S-1B	many cobbles and stones on surface
E	2-6	7.5YR 5/2	sl	5	65	XCB 80%	0.5-12.0"	PO / SO	SBK 2,1	VFRI	IA	—	—	2F 2m	0.25 / 4.3	S-2A S-2B	
Bt1	6-15	10YR 5/6	sl	12	55	GR 10%	0.25-2.0	PO / SO	SBK 1,3	VFRI	SA	—	—	2m	2.0 / 4.6	S-3A S-4B	Clay skins
Bt2	15-22+	10YR 6/6	l	16	48	GR 5%	0.25-2.0	PO / SO	SBK 1,2	FRI	-	D: 10YR 6/3 C: 10YR 4/6	CD CD	1m	1.5 / 4.6	S-4A S-4B	clay skins

Other Notes: Perched Water Table at 22" prevented description of profile to a greater depth

TEST PIT DESCRIPTION

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Soil Scientist: Duane A. Truax

Field Assistant: Max Dugan

Signature: [signature]

Loess does not contain coarse fragments; not present. Just a second colluvial event.

Test Pit ID:	P-157-160606-1512-DAT	Topographic Position:	BACKSLOPE	Parent material:	~~Loess~~/Colluvium/Residuum
Date:	06-06-2016	% Slope:	9%	Slope Aspect:	123°E
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well drained	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	N/A	Slope Failure or slip:	N/A
NRCS Soil Unit:	Oriskany cobbly sandy loam	Bedrock Type :	N/A	Dip Slope & Direction:	N/A Strike: N/A
Mineralogy:	Siliceous	Vegetation:	Various Oaks, Long Leaf Pine, Mt. Laurel		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	7.5YR 2.5/1	—	—	—	—	—	— / —	—	—	SA	—	—	3,F 2,m	— / 4.5	S-1A / S-1B	
A	2-4	7.5YR 4/2	SiL	10	20	GR 5%	0.25-0.5	PO / SO	SBK 1,VF	VFR	SA	—	—	2,F 2,m 1,Co	0.5 / 4.5	S-2A / S-2B	
Bw	4-11	7.5YR 5/4	SiL	16	26	GR 10%	0.25-1.0	SP / SS	SBK 1,M	FR	SA	—	—	1,m 1,Co	1.0 / 5.5	S-3A / S-3B	
2Bt1	11-18	7.5YR 5/6	SiCL	31	18	—	—	SP / SS	SBK 1,Co	FR	SA	—	—	1,m 1,Co	1.75 / 5.7	S-4A / S-4B	
2Bt2	18-26	5YR 5/6	SiC	48	6	—	—	MP / SS	PR 2,M	FR	SA	—	—	1,m	3.5 / 6.0	S-5A / S-5B	
2Bt3	26-38	5YR 5/6	C	55	5	—	—	VP / MS	SBK 2,Co	FI	SA	—	—	1,m	4.0 / 6.4	S-6A / S-6B	lithochromic Colors
2BCt	38-50+	7.5YR 5/6	SiCL	38	11	—	—	MP / SS	SBK 1,Co	FR	SA	—	—	1,m	3.4 / 6.7	S-7A / S-7B	lithochromic Colors

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH

Field Assistant:

Signature:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-158-160606-1717-SSW	Topographic Position:	TOESLOPE	Parent material:	COLLUVIUM
Date:	6/6/16	% Slope:	5	Slope Aspect:	300°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~POORLY~~ Somewhat Poorly	Depth to Water Table:	7"
RETTEW Job #:	089962000	Depth to Refusal:	- 10" - Water table	Slope Failure or slip:	–
NRCS Soil Unit:	ORISKANY	Bedrock Type :	- (SANDSTONE)	Dip Slope & Direction:	– Strike: –
Mineralogy:	SILICEOUS	Vegetation:	MAPLE, RHODEDENDRON, WHITE PINE, CHESTNUT OAK, SASSAFRAS		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-3	5YR2.5/1	–	–	–	–	–	– / –	–	–	AW	–	–	2-VF,F 1-CO	– / 4.0	–	
A	3-5	10YR4/3	GR SL	10	75	25 GR	2-5	PO / SO	1 M GR	VFR	CW	–	–	2-F,M	(WET) / –	–	
Bw	5-10	10YR5/6	VGR SL	13	72	50 GR	2-6	PO / SS	1 M SBK	FR	–	–	–	1-F,M	(WET) / 4.0	–	

Other Notes: 20' E OF STREAM; SANDSTONE ON SURFACE; 1ST/2ND ORDER STREAM - LOTS OF WATER MOVING; LITTLE TO NO CONCAVE FOOTSLOPE - STEEP BACKSLOPE TO RELATIVELY FLAT/TOESLOPE ALONG STREAM IN VALLEY BOTTOM;

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH
Signature: [signature]
Field Assistant:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-159-160606-1400-JSW	Topographic Position:	BACKSLOPE - LINEAR	Parent material:	COLLUVIUM OVER RESIDUUM
Date:	6/6/16	% Slope:	26%	Slope Aspect:	286°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVE	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	ORISKANY	Bedrock Type:	SANDSTONE	Dip Slope & Direction:	— Strike: —
Mineralogy:	SILICEOUS	Vegetation:	WHITE OAK, WHITE PINE, LAUREL, BLUEBERRY		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-3	5YR 2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	3-VF 2-F,M	— / 4.25	—	
A	3-4	10YR 3/1	GR L	13	45	25 GR	1-3	PO / SS	1FGR	VFR	AW	—	—	3-VF,F 2-M	0.25 / —	—	
BE	4-9	10YR 5/6	VGR L	16	45	40 GR	1-3	SP / SS	1MSBK	FR	CW	—	—	2-VF,F,M	0.5 / —	—	
Bt1	9-13	7.5YR 5/6	GR L	23	40	20 GR	1-2	MP / SS	2MSBK	FR	CW	—	—	2-F,M	1.5 / 4.5	—	CLAY SKINS
Bt2	13-24	7.5YR 5/6	GR L	26	40	30 GR	1	MP / SS	2MSBK	FR	CW	—	—	2-F,M 1-C	1.5 / —	—	CLAY SKINS
2BC	24-50	5YR 5/6	VGR SL	10	70	36 GR	1	PO / SO	1MPL	FR	—	—	—	—	2.5 / 4.5	—	LITHOCHROMIC CLAY SKINS

Other Notes: LINEAR - MID-LOWER BACKSLOPE; SIMILAR TO P-160; RED SANDSTONE ON SURFACE

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-160-160606-1210-SSW	Topographic Position:	BACKSLOPE - LINEAR	Parent material:	COLLUVIUM OVER RESIDUUM
Date:	6/6/16	% Slope:	32%	Slope Aspect:	285°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVE	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	DEKALB - ALTICREST	Bedrock Type:	SANDSTONE	Dip Slope & Direction:	— Strike: —
Mineralogy:	SILICEOUS	Vegetation:	CHESTNUT OAK, LAUREL, BLUEBERRY		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-3	5YR2.5/1	—	—	—	—	—	— / —	—	—	aW	—	—	3-VF,F,M	— / 4.0	—	
A	3-4	10YR3/1	GR SL	13	70	25 GR	1-2	PO / SO	1FGR	VFR	aW	—	—	3-F,M 2-VF,C	0.25 / —	—	
BE	4-9	10YR5/6	VGR SL	16	70	60 GR	2-4	PO / SS	1MSBK	FR	cW	—	—	3-F,M	0.5 / 4.5	—	
Bt1	9-27	10YR4/6	VGR SCL	21	62	40 GR	2-4	SP / SS	2MSBK	FR	cW	—	—	2-F,M 1-C	0.5 / —	—	CLAY SKINS
2Bt2	27-37	5YR5/6	C	41	28	5 GR	<1	MP / MS	2MSBK	FR	cW	—	—	2-F,M	2.0 / 4.5	—	CLAY SKINS FEW DECAYING SANDSTONE
2BC	37-50	5YR5/6	CL	35	30	10 GR	<1	SS / MP	1MSBK	FR	—	—	—	1-M	2.0 / —	—	LITHOCHROMIC CLAY SKINS POCKETS OF S (DECAYED SS)

Other Notes: LINEAR BACKSLOPE; RED SANDSTONE ON SURFACE

TEST PIT DESCRIPTION

Soil Scientist: JOHN WALL
Field Assistant:
Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-161-160606-1130-JSW	Topographic Position:	SHOULDER/UPPER BACKSLOPE	Parent material:	RESIDUUM
Date:	6/6/16	% Slope:	20	Slope Aspect:	332°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	36"	Slope Failure or slip:	—
NRCS Soil Unit:	DEKALB-ALTICREST	Bedrock Type :	SHALE	Dip Slope & Direction:	4% S(190°) Strike: 100°
Mineralogy:	MIXED	Vegetation:	CHESTNUT OAK, MAPLE, SASSAFRAS, WHITE PINE, LAUREL, BLUEBERRY/		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/1	—	—	—	—	—	— / —	—	—	AS	—	—	3-VF,F 2-M	— / 4.5	S1 A/B	
A	2-3	10YR3/2	CH SIL	13	15	25 CH	< 1	PO / SO	2FGR	FR	AW	—	—	3-F 2-VF,M	0.5 / 4.5	S2 A/B	
Bt	3-15	10YR5/6	CH SIL	18	25	30 CH	< 1	SP / SS	2MSBK	FR	AS	—	—	2-F,M	1.75 / 4.5	S3 A/B	CLAY SKINS
Cr	15-36	10YR5/6	XCH SIL	13	15	90 CH	1-3	SP / SS	0MA	FR	—	—	—	1-F	— / —	—	FINES BETWEEN CHF
R	36+																

Other Notes: BROAD SHOULDER, SLIGHTLY CONVEX/UPPER BACK SLOPE; SOME COLLUVIAL CONTRIBUTION TO SURFACE; SEEP AT 36";

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH

Field Assistant:

Signature: JSWH

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-162-160606-1040-SSW	**Topographic Position:**	SUMMIT - SLOPING	**Parent material:**	RESIDUUM
Date:	6/6/16	**% Slope:**	8%	**Slope Aspect:**	204°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	**Drainage Class:**	WELL	**Depth to Water Table:**	—
RETTEW Job #:	089962000	**Depth to Refusal:**	—	**Slope Failure or slip:**	—
NRCS Soil Unit:	DEKALB - ALTICREST COMPLEX	**Bedrock Type :**	SHALE	**Dip Slope & Direction:**	— **Strike:** —
Mineralogy:	MIXED	**Vegetation:**	CHESTNUT OAK, RED OAK, MAPLE, WHITE PINE, LAUREL, BLUEBERRY		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-3	5YR 2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	3-VF 2-F,M	— / 4.0	S1 A/B	
A	3-5	7.5YR 3/3	L	13	40	2 GR	< 1	SO / PO	2MGR	FR	AW	—	—	2-VF,F 1-C	0.25 / 4.5	S2 A/B	
Bt1	5-17	5YR 4/6	SiL	16	30	5 GR	< 1	SS / SP	2MSBK	FR	CW	—	—	2-F,M	0.5 / 4.5	S3 A/B	TN DISCONT. CLAY SKINS -
Bt2	17-32	7.5YR 4/6	SiL	17	29	7 GR	< 1	SS / SP	2COSBK	FR	CW	—	—	2-F	1.25 / 4.5	S4 A/B	CLAY SKINS
BC	32-50	7.5YR 5/6	SiL	15	30	10 GR	< 1	SS / SP	1TKPL	FR	—	(Mn) N2.5	M2P	—	3.75 / 4.5	S5 A/B	LITHOCHROMIC CLAY SKINS

Other Notes: SUMMIT SLOPING TO S, STEEP (≥25%) BACKSLOPE TO E, BROAD SHOULDER (8-25%) TO W

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH
Field Assistant: DAN FENSTERMAKER

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-163-160620-1126-JSW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM OVER RESIDUUM
Date:	6/20/16	% Slope:	46%	Slope Aspect:	115°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	39"	Slope Failure or slip:	FEW BENT TREES
NRCS Soil Unit:	MCCLUNG-LILY	Bedrock Type :	SANDSTONE	Dip Slope & Direction:	— Strike: —
Mineralogy:	SILICEOUS	Vegetation:	MAPLE, WHITE OAK, HICKORY, CHESTNUT OAK		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/1	-	-	-	-	-	- / -	-	-	AS	-	-	3-VF,F	— / 5.5	-	
A	2-4	10YR3/1	L	10	42	10 GR	<1	PO / SO	1FGR	VFR	AW	-	-	3-VF,F,M 2-C	0.25 / —	-	
Bw1	4-11	7.5YR4/6	SL	10	68	10 GR	<1	PO / SO	1MSBK	VFR	CW	-	-	2-VF,C 3-F,M	0.25 / —	-	
Bw2	11-23	7.5YR4/6	GR SL	11	72	15 GR	1	PO / SO	1MSBK	VFR	CW	-	-	2-F,M 1-C	0.5 / 5.2	-	
2Bw3	23-39	7.5YR4/6	GR SL	11	75	25 GR	1-4	PO / SO	1MSBK	FR	AW	-	-	1-F,M	0.5 / 4.6	-	DECAYED SANDSTONE COF
2R	39+	SANDSTONE BEDROCK															

Other Notes: DIP ANGLE UNCLEAR

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAU

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-164-160620-1117-JSW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM OVER RESIDUUM
Date:	6/20/16	% Slope:	45%	Slope Aspect:	129°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	–
RETTEW Job #:	089962000	Depth to Refusal:	40	Slope Failure or slip:	FEW BENT TREES
NRCS Soil Unit:	MCCLUNG-LILY	Bedrock Type :	SANDSTONE	Dip Slope & Direction:	30° NW (306°) Strike: 216°
Mineralogy:	SILICEOUS	Vegetation:	MAPLE, HICKORY, CHESTNUT OAK, CHESTNUT, BLUEBERRY		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (Inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR 2.5/1	–	–	–	–	–	– / –	–	–	AS	–	–	3-VF, F	– / 4.9	–	
A	2-4	10YR 3/2	SL	7	68	10 GR	<1	PO / SO	1 F GR	VFR	AW	–	–	3-VF, F 2-M	0.25	–	
BE	4-10	7.5YR 4/6	SL	9	72	10 GR	<1	PO / SO	1 F SBK	VFR	CW	–	–	2-F, M 1-C	0.25 / 5.1	–	
Bt1	10-19	7.5YR 5/6	SL	18	65	12 GR	<1	SP / SS	2 M SBK	FR	CW	–	–	1-F, M, C	0.5	–	CLAY SKINS
Bt2	19-29	7.5YR 5/6	GR SCL	24	55	30 GR	0.5-3	SP / SS	2 M SBK	FR	CW	–	–	2-M	1.0	–	FVFS DECAYING SANDSTONE COF
2BC	29-36	7.5YR 4/6	L	15	50	20 GR	<1	PO / SO	1 F SBK	FR	CW	–	–	–	0.75 / 4.8	–	LITHOCHROMIC FVFS
2Cr	36-40	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	
2R	40+	SANDSTONE BEDROCK															

Other Notes: SANDSTONE BEDROCK DIPPING INTO HILLSIDE;

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAU
Field Assistant:

Signature:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-165-160620-1112-JSW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM
Date:	6/20/16	% Slope:	25%	Slope Aspect:	127°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	FEW BENT TREES
NRCS Soil Unit:	ORISKANY	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	SILICEOUS	Vegetation:	MAPLE, CHESTNUT OAK, FEW BLUEBERRY		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR 2.5/1	—	—	—	—	—	— / —	—	—	AS	—	—	3-VF, F	~ / 4.5	—	
A	1-4	10YR 2/1	XGR SL	5	75	65 GR	1-2	PO / SO	1FGR	VFR	AW	—	—	3-VF, F 2-M 1-VC	<0.25 / —	—	SANDSTONE COF
BE	4-16	7.5YR 4/6	GR SL	12	72	20 GR	1-3	PO / SO	1FSBK	FR	CS	—	—	3-F 2-M	0.25 / —	—	
Bt1	16-26	7.5YR 4/6	SL	18	70	10 GR	<1	SP / SS	2MSBK	FR	CW	—	—	2-M 1-F	0.75 / 4.5	—	FN DISCONT. CLAY SKINS
Bt2	26-32	7.5YR 5/8	SL	15	75	55 GR	1-4	PO / SO	2MSBK	FR	CW	—	—	2-F, M	1.0 / —	—	
BC	32-50	7.5YR 5/6	SL	10	80	70 GR	<1 1-2	PO / SO	1FSBK	VFR	—	—	—	—	1.0 / 4.5	—	

Other Notes: SANDSTONE FLAGS > 8" ON SURFACE

TEST PIT DESCRIPTION

Soil Scientist: Jon Way

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Somewhat poorly drained

Test Pit ID:	T-166-160620-1107-JSW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM
Date:	6/20/16	% Slope:	8%	Slope Aspect:	137°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~MODERATELY WELL~~	Depth to Water Table:	37"
RETTEW Job #:	089962000	Depth to Refusal:	–	Slope Failure or slip:	–
NRCS Soil Unit:	ORISKANY - MURRILL	Bedrock Type :	–	Dip Slope & Direction:	– Strike: –
Mineralogy:	SILICEOUS	Vegetation:	WHITE OAK, CHESTNUT OAK, CHESTNUT, MAPLE, BLUEBERRY/		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR2.5/1	–	–	–	–	–	– / –	–	–	aS	–	–	3-VF,F	– / 4.5	–	
A	1-3	2.5Y4/4	CH SL	9	75	15 CH	<1	PO / SO	1FGR	VFR	aW	–	–	2-VF,F, M	<0.25 / –	–	
BE	3-11	10YR4/6	GR SL	13	72	20 GR	1-4	PO / SO	1MSBK	FR	cW	–	–	2-F,M 1-C,VC	0.25 / –	–	
Bt1	11-18	7.5YR5/6	GR SL	18	72	25 GR	1-4	SP / SS	2MSBK	FR	cW			1-F,M	1.0 / 4.5	–	IN DISCONTIN. CLAY SKINS
Bt2	18-33	7.5YR5/6	XCB SL	17	75	75 CB	4-8	PO / SS	1FSBK	FR	cW	5YR4/6	C2D	–	1.0 / –	–	QUARTZITE COF
Btx	33-47	7.5YR5/6	SL	18	77	10 GR	1<	SP / SS	2MSBK	FR	–	5YR4/6 10YR5/2 N2	M2D M2P C2P	–	2.5 / 4.5	–	DENSE IN PLACE FRAGIC PROPERTIES

Other Notes: WATER SEEPING IN AT 37";

TEST PIT DESCRIPTION

Soil Scientist: Jordan Wall

Field Assistant:

Signature: JSWL

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-167-160620-1037-JSW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM
Date:	6/20/16	% Slope:	4%	Slope Aspect:	321°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT POORLY	Depth to Water Table:	50'
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	LILY-McCLUNG-DEKALB	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	MIXED	Vegetation:	WHITE OAK, SASSAFRAS, MAPLE, BLUEBERRY		

USDA

Horizon	Depth In Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-3	5YR2.5/1	—	-	-	—	—	- -	—	-	aS	—	—	3-VF,F,M	— 4.3	S1 A/B	
A	3-5	10YR3/1	FSL	5	72	—	—	PO SO	1FGR	VFR	aW	—	—	3-VF	0.5 4.5	S2 A/B	
BE	5-11	10YR5/4	L	17	48	—	—	SP SS	2MSBK	FR	cS	10YR4/6	C2F	2-F,M 1-C	1.0 4.7	S3 A/B	↑VFS
Bt1	11-22	10YR5/4	SiCL	38	10	—	—	MP SS	2COSBK	FR	cS	7.5YR5/6 10YR5/2	C2D C2F	2-VF,F, C	1.5 4.7	S4 A/B	TN DISCONTIN. CLAY SKINS
Bt2	22-30	10YR5/3	CL	36	25	—	—	MP SS	2MSBK	FR	cS	7.5YR5/6 10YR6/1	C2D C2F	2-F,M	3.0 4.5	S5 A/B	↑VFS
2Btg	30-37	10YR6/2	SCL	22	55	—	-	SP SS	2MSBK	FR	cS	7.5YR5/8	C2P	1-F	1.5 4.5	S6 A/B	
2BC	37-50	2.5Y6/4	SL	8	79	—	—	PO SO	1COSBK	VFR	—	10YR5/6 2.5Y6/2	M3D F3F	—	2.0 4.5	S7 A/B	DENSE IN PLACE

Other Notes: BACKSLOPE. LINEAR. 4 M SE OF EPHEMERAL DRAINAGE; PROTO-SPODIC HORIZON, <1", 5YR4/6 ON RIGHT SIDE OF PIT FACE

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	R-170-160620-1122-DEF	Topographic Position:	Upper Backslope	Parent material:	Colluvium over residum		
Date:	6/20/16	% Slope:	12%	Slope Aspect:	161°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	27"	Slope Failure or slip:	—		
NRCS Soil Unit:	Dekalb-Alticrest complex (12D)	Bedrock Type :	Sandstone	Dip Slope & Direction:	11° SE	Strike:	46°
Mineralogy:	mixed	Vegetation:	Chestnut oak, Red maple, white oak, Blackgum, white pine, Blueberry				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1.75	5YR 2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	3f	— / 4.1	S1	
A	1.75-3	10YR2/1	LS	5	85	30% CB	1/4-7"	PO / SO	1fSBK	VFr	AW	—	—	3f 2M	0.05 / 4.2	S2	
E	3-4	10YR5/2	LS	5	85	30% CB	1/4-7"	PO / SO	1fSBK	VFr	AW	—	—	1f	0.05 / 4.3	S3	
Bhs	4-6	7.5YR 4/4	SL	7	78	30% CB	1/4-7"	PO / SO	1fSBK	VFr	CWB	—	—	3f 2m 1Co	0.05 / 4.4	S4	Broken horizon, 60% of Pit Present in
Bw	6-21	10YR 5/4	SL	7	76	30% GR	1/4-8"	PO / SO	1fSBK	VFR	CW	—	—	2f, M 1Co	0.25 / 5.3	S5	
2BC	21-27	10YR5/4	SL	7	76	40% CB	1/4-14"	PO / SO	1MSBK	VFR	AW	—	—	2f	0.5 / 5.3	S6	
2R	27+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: D. Fengstermacher

Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-171-160620-1045-DEF	Topographic Position:	lower backslope	Parent material:	Colluvium over Residuum
Date:	6/20/16	% Slope:	18	Slope Aspect:	136°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	30"	Slope Failure or slip:	—
NRCS Soil Unit:	Oriskany-Murrill complex (46C)	Bedrock Type :	Cherty Sandstone	Dip Slope & Direction:	20° SSE Strike: 55°
Mineralogy:	Mixed	Vegetation:	Hickory, Chestnut oak, Hophornbeam, blueberry		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-2.5	10YR2/2	SL	12	78	15% GR	<2"	PO / SO	1fSBK	VFr	AW	—	—	3f 2M 1Co	0.2 / 4.5	S1	+thin duff layer
Bw1	2.5-9	10YR 5/3	SL	12	73	38% GR	1/4-5"	PO / SO	1fSBK	VFr	CW	—	—	2f 1M, Co	0.25 / 5.5	S2	
Bw2	9.5-19	10YR 5/4	SL	15	67	45% GR	<3"	PO / SS	1MSBK	VFr	CW	—	—	2f, M	0.5 / 5.4	S3	
2Bw3	19-25	7.5YR 5/4	SCL	30	57	25% GR	<3"	PO / SS	1MSBK	Fr	CW	—	—	2f 1M	1.5 / 4.6	S4	
2C	25-30	7.5YR5/4 5YR 4/4(15)	SCL	33	57	40% GR	<8"	SP / SS	OM	Fr	AW	—	—	2f 1M	1.75 / 4.6	S5	Lithochromic colors
2R	30+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —		

Other Notes: PM 2 - chert CoF present
PM 1 - Sandstone CoF present

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher
Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-172-1606 20-1117-DEF	Topographic Position:	nose slope	Parent material:	Colluvium over Residuum
Date:	6/20/16	% Slope:	18%	Slope Aspect:	58°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	>50"	Slope Failure or slip:	—
NRCS Soil Unit:	Oriskany-Murrill Complex (46C)	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	mixed	Vegetation:	Sassafras, blackcherry, hophornbeam, red maple, [illegible]		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-1.5	10YR4/2	L	15	45	—	—	PO / SO	1FSBK	Fr	AW	—	—	3F 2M 2CO	0.1 / 5.4	—	
Bt	1.5-7	10YR 6/4	L	16	44	—	—	PO / SO	1MSBK	Fr	CW	—	—	2F, 1M 2CO	2.0 / 4.7	—	fine sand
2Bt	7-17	7.5YR 5/6	C	42	14	5% SL	18"	MP / SS	3MSBK	Fi	CW	—	—	2F, M 1CO	2.75 / —	—	
2Bt3	17-33	7.5YR 5/4	C	48	16	—	—	MP / MS	2COSBK	Fi	CW	—	-	1F, M 1	3.0 / 6.8	—	Strong clay films
2BC	33-50+	7.5YR4/6 10R4/3	SiC	45	12	15% CN	L1/2	MP / MS	1COSBK	Fi	—	—	—	1F	2.75 / 6.7	—	CoF are Red Shale

Other Notes: Few sandstone and Dolomitic Limestone Coarsefragments

10, 33-50+

TEST PIT DESCRIPTION

Soil Scientist: P. Fenstermacher
Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-173-160620-112-DEF	Topographic Position:	Backslope	Parent material:	Residuum
Date:	6/20/16	% Slope:	40	Slope Aspect:	80°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	16"	Slope Failure or slip:	—
NRCS Soil Unit:	Caneyville (9D)	Bedrock Type :	Dolomitic Limestone	Dip Slope & Direction:	— Strike: —
Mineralogy:	mixed	Vegetation:	Sugar maple, Hop hornbeam, black locust, Red oak, Black cherry		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	7.5YR 2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	3f	— / 7.2	S1	few limestone cobbles/stones on surface
A	1-5	7.5YR 4/6	gr.L	19	25	—	—	SP / SS	2FSBK	Fr	AW	—	—	2f,M 1c	1.5 / 6.8	S2	fine sands
Bt1	5-9	7.5YR 4/6	L	23	28	—	—	SP / SS	2MSBK	Fr	CW	—	—	2f,M 1c	1.5 / 4.8	S3	
Bt2	9-16	7.5YR 4/4	C	44	18	8% CN	< 1/4"	MP / MS	3MSBK	Fi	AW	—	—	2f 1M,c	3.25 / 6.4	S4	Strong clay films Shale C.F.
R	16+											—	—			—	

Other Notes: Brecciates as shallow as 13" and as deep as 24"±
Closed depression to SE.
Limestone cobbles/stones on surface - more impurities in surface stones

TEST PIT DESCRIPTION

Soil Scientist: Russell Loco / John Galbraith Signature: [signature]
Field Assistant: Steph Moraca

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P0174-160621-1645-RLL	Topographic Position:	Backslope	Parent material:	Residuum
Date:	6/21/2016	% Slope:	26%	Slope Aspect:	149°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	MWD	Depth to Water Table:	28"
RETTEW Job #:	089962000	Depth to Refusal:	39"	Slope Failure or slip:	—
NRCS Soil Unit:	McClung - Watahala - Dekalb	Bedrock Type :	Sandstone	Dip Slope & Direction:	N35W 38° Strike: S55°W
Mineralogy:	Mixed	Vegetation:	Blueberry & Maple		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	2	5YR2.5/1	—	—	—	—	—	— / —	F1GR	FR	CS	—	—	2F 1M	2.0 / 6.5	S1	
A	4	10YR3/1	FSL	10	60	—	—	PO	F1GR	FR	CS	—	—	2F	1.0 / 4.75	S2	
AE	8	10YR3/1	FSL	10	60	—	—	SO	F2GR	FR	GS	—	—	2F	1.5 / 5.25		
E	23	2.5Y7/2	FSL	10	60	—	—	PO / SO	M1SBK	FR	GS	—	—	2F, 1M	1.5 / 5.25	S3	
Bt1	28	10YR5/6	L	25	35	—	—	SP / SS	M2SBK	FR	DS	—	—	1F	3.5 / 5.25	S4	
Bt2	39	10YR5/6	SiL	27	15	—	—	SP / SS	M2SBK	FR		7.5YR6/8 2.5Y8/2	C2F		3.5 / 5.00	S5	
R	39+																

Other Notes: Red Maple, Chestnut oak, Scarlet Oak, Black Oak Sasafras, highbush blueberry

TEST PIT DESCRIPTION

Soil Scientist: Russell Losco / John Galbraith
Field Assistant: Steph Moraca
Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P175-160621-1150 RLL	Topographic Position:	Nose	Parent material:	Colluvium and Residuum
Date:	6/21/2016	% Slope:	16%	Slope Aspect:	170°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD - ~~MWD~~	Depth to Water Table:	14+
RETTEW Job #:	089962000	Depth to Refusal:	14"	Slope Failure or slip:	—
NRCS Soil Unit:	McClung-Watahala-DeKalb	Bedrock Type :	Limestone	Dip Slope & Direction:	16° Strike: S75°W
Mineralogy:	Mixed	Vegetation:	Red Maple		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	1	5YR2.5/1	—	—	—	—	—	— / —	F1GR	FR	C/S	—	—	2F	0 / 7.0		
A	3	10YR3/1	FSL	8	55	5% ST	1/4"	PO / SO	F1GR	FR	C/S	—	—	2F1M	0 / 6.5		
E	7	10YR6/4	L	16	40	5% ST	1/4"		F1SBK	FR	G/S	—	—	1F	4.25 / 4.75		
Bt	14	10YR5/6	SiCL	29	15	10% ST	1/4"	MP / SS	F2SBK	FI		—	—	1F	4.5 / 5.0		
R	14+																

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Russell Losco/John Galbraith
Field Assistant: Steph Moraca
Signature: RLL

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P176-160621-1155-RLL	Topographic Position:	Nose - Shoulder	Parent material:	Colluvium over Residuum
Date:	6/21/2016	% Slope:	31%	Slope Aspect:	158°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	50+
RETTEW Job #:	089962000	Depth to Refusal:	50	Slope Failure or slip:	—
NRCS Soil Unit:	McClung-Watahala-DeKalb	Bedrock Type :	Limestone	Dip Slope & Direction:	— Strike: —
Mineralogy:	Mixed	Vegetation:	Red Maple		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	1	5YR2.5/1	—	—	—	—	—	✓ / —	F1GR	FR	C/S	—	—	2F1M	0 / 5.5	S1	
AE	8	10YR5/6	fSL	10	65	—	—	PO / SO	F1SBK	FR	G/S	—	—	2F	1.5 / 5.25	S2	
Bw	37	Var. 7.5YR6/6	SL	12	70	50% CN	2 x 18"	PO / SO	M1SBK	VFR	C/S	—	—	2F1M	1.5 / 5.25	S3	
2Bt	50	7.5YR6/6 5YR5/8	C	50	10	—	—	VP / SS	M1SBK	FI					3.0 / 6.1	S4	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH
Field Assistant: TAYLOR WALTER
Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-177-160622-1027-JSW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM
Date:	6/22/16	% Slope:	17%	Slope Aspect:	310°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	MODERATELY WELL	Depth to Water Table:	22" (SHW)
RETTEW Job #:	089962000	Depth to Refusal:	–	Slope Failure or slip:	–
NRCS Soil Unit:	McClung-Watahala-Dekalb complex ~~ORISKANY - MURRILL~~	Bedrock Type:	–	Dip Slope & Direction:	– Strike: –
Mineralogy:	SILICEOUS	Vegetation:	MAPLE, HICKORY, STRIPPING MAPLE, FERN		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR 2.5/1	–	–	–	–	–	– / –	–	–	AS	–	–	3-VF, F	– / 4.5	–	
A	2-4	10YR 3/1	VCH SL	8	72	40 CH	1-3	PO / SO	1FGR	VFR	AW	–	–	3-VF, F 2-M	0.25 / –	–	SANDSTONE COF
BE	4-11	10YR 5/6	SL	7	75	10 CH	<1	PO / SO	1MSBK	VFR	CS	–	–	2-VF 3-F, M, C	0.5 / –	–	
Bt1	11-22	10YR 5/8	CH SL	15	60	15 CH	<1	PO / SO	2MSBK	FR	CS	–	–	2-VF 1-F	1.5 / 5.2	–	CLAY SKINS
Bt2	22-30	10YR 5/8	CH SL	18	58	15 CH	<1	SP / SS	2MSBK	FR	CS	10YR 6/4 7.5YR 4/6	C2D C2F	–	2.5 / –	–	CLAY SKINS SLIGHTLY BRITTLE
Bt3	30-50	10YR 6/8	SL	19	60	10 CH	<1	SP / SS	2MSBK	FR	–	10YR 6/4 7.5YR 4/6	C2D C2F	–	3.5 / 4.5	–	FIRM IN PLACE CLAY SKINS FRAGIC PROPERTIES

Other Notes: LOWER BACKSLOPE, 10 M ABOVE DRAINAGE WAY

TEST PIT DESCRIPTION

Soil Scientist: Duane Truax

Field Assistant: Taylor Walter

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-178-160621-1157-DAT	Topographic Position:	SHOULDER	Parent material:	Colluvium / Residuum
Date:	06-21-2016	% Slope:	35%	Slope Aspect:	190° S
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Somewhat Poorly Drained	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	48"	Slope Failure or slip:	N/A
NRCS Soil Unit:	McClung-Watahala-DeKalb complex	Bedrock Type :	Sandstone	Dip Slope & Direction:	N/A Strike: N/A
Mineralogy:	Siliceous	Vegetation:	Red Maple, Northern Red Oak, Hickory, Alder		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1.5	5YR 2.5/1	–	–	–	–	–	– / –	–	–	IA	–	–	3,F 2,m	0.25 / 4.5	—	NO SAMPLES
A	1.5-2.5	5YR 3/1	SiL	10	15	CX 15%	0.25-2.0	PO / SO	GR 1,3	VFR	SA	–	–	3,F 2,m	0.25 / 4.5	[illegible]	"
Bw1	2.5-11	10YR 6/4	SiL	12	30	CX 25%	0.25 2.0	PO / SO	SBK 1,1	FR	SA	–	–	2,m	1.5 / 4.5	—	"
Bw2	11-18	7.5YR 6/4	L	15	40	VCX 50	0.25-3.0	PO / SO	SBK 1,3	FRI	SA	–	–	1,F 1,m	2.5 / 4.5	—	"
BC	18-29	5YR 6/4	L	14	48	XCX 75%	0.25-5.6	PO / SO	SBK 1,2	FRI	SA	5YR 6/2 7.5YR 5/6	CD C	1,m	3.25 / 4.7	—	"
C	29-48	5YR 6/4	SL	18	55	XCX 85%	0.25-10.0	PO / SS	SBK 1,1	VFR	IA	5YR 6/2 5YR 5/6	C C	1,m	1.5 / 4.6	—	"
R	48+	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	FINE-GRAINED SANDSTONE BEDROCK

Other Notes: Dip could not be determined due to irregular weathering of bedrock surface

TEST PIT DESCRIPTION

Soil Scientist: JOHN WALL
Field Assistant: TAYLOR WALTER

Signature:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-179-160621-1215-JSW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM
Date:	6/22/16	% Slope:	35%	Slope Aspect:	201°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL-SOMEWHAT EXCESSIVE	Depth to Water Table:	–
RETTEW Job #:	089962000	Depth to Refusal:	–	Slope Failure or slip:	–
NRCS Soil Unit:	MCCLUNG-WATAHALA-DEKALB	Bedrock Type :	SANDSTONE	Dip Slope & Direction:	– Strike: –
Mineralogy:	SILICEOUS	Vegetation:	SASSAFRAS, MAPLE, WHITE OAK, BLUEBERRY		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	0-0.5	5YR 2.5/1	–	–	–	–	–	– / –	–	–	aS	–	–	3-VF,F	– / 4.3	–	
AE	0.5-2.5	10YR 3/3	VGR SL	6	78	GR 25 CB 15	<1 2-4	PO / SO	1FGR	VFR	CW	–	–	3-F 2-M	<0.25 / –	–	UNCOATED SAND GRAINS
BA	2.5-9	7.5YR 4/6	VGR SL	8	75	GR 30 CB 20	<1 2-4	PO / SO	1FSBK	VFR	CW	–	–	3-F 2-M 1-C	<0.25 / –	–	
BC1	9-24	10YR 5/6	XCB LS	4	85	35 CB 30 ST	3-6 10-15	PO / SO	1FSBK	VFR	CW	–	–	2-M,C	<0.25 / –	–	
BC2	24-50	7.5YR 5/6	XCB LS	4	87	35 CB 30 ST	3-6 10-15	PO / SO	1FSBK	VFR	–	–	–	2-M,C	<0.25 / 5.5	–	

Other Notes: UPPER BACKSLOPE NOSE/SHOULDER; PROTO-SPODIC HORIZON; SANDSTONE COBBLES AND STONES ON SURFACE

TEST PIT DESCRIPTION

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Soil Scientist: JOHN WALL

Field Assistant: TAYLOR WALTER

Signature: [signature]

Test Pit ID:	P-180-160621-1252-JSW	Topographic Position:	BACKSLOPE/FOOTSLOPE	Parent material:	COLLUVIUM
Date:	6/22/16	% Slope:	35%	Slope Aspect:	146°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	MODERATELY WELL	Depth to Water Table:	27" (SHW)
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	FEW BENT TREES
NRCS Soil Unit:	DEKALB - WATAUGA - MCCLUNG	Bedrock Type :	SANDSTONE	Dip Slope & Direction:	— Strike: —
Mineralogy:	SILICEOUS	Vegetation:	CHESTNUT OAK, MAPLE, SASSAFRAS		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-3	5YR2.5/1	—	—	—	—	—	— —	—	—	AS	-	-	3-VF,F 2-M	— 4.5	—	
A	3-5	7.5YR2.5/3	SL	9	71	10 CB	4-6	PO SO	1FSBK	VFR	CW	-	-	2-F,M 1-VF	<0.25 —	—	
Bw	5-9	10YR4/6	CB SL	9	75	25 CB	4-6	PO SO	1FSBK	VFR	CW	-	-	2-F,M, C	<0.25 —	—	FEW STONES
BC1	9-27	10YR5/6	XCB SL	6	75	65 CB	4-10	PO SO	1MSBK	VFR	CW	—	—	2-F,M, C	<0.25 —	—	FEW STONES
BC2	27-50	10YR5/6	XCB LS	5	85	65 CB	4-10	PO SO	1MSBK	VFR	—	7.5YR5/6 10YR6/2	C2F C2D	1-M	<0.25 5.0	—	POCKETS OF SL FEW STONES

Other Notes: LOWER BACKSLOPE/UPPER FOOTSLOPE. BEGINNING TO BE CONCAVE.

TEST PIT DESCRIPTION

Soil Scientist: JOHN WELL

Field Assistant: TAYLOR WALTER

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-181-160621-1300-JSW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM OVER RESIDUUM
Date:	6/22/16	% Slope:	35%	Slope Aspect:	320°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	MECKESVILLE - WATAUGA - DEKALB	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	— Strike: —
Mineralogy:	MIXED	Vegetation:	MAPLE, HICKORY, CHESTNUT OAK, WITCH HAZEL, SASSAFRAS		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-3	5YR2.5/1	—	—	—	—	—	— / —	—	—	AS	—	—	3-VF 2-F	— / 4.5		
A	3-4	10YR2/1	SiL	14	12	10 GR	<1	PO / SO	1FGR	VFR	AW	—	—	3-VF 2-F 1-C	0.25 / —		
BE	4-12	10YR5/6	SiL	13	18	12 GR	<1	PO / SO	1FSBK	FR	CS	—	—	3-F 2-M 1-C,VC	0.25 / —		
Bt1	12-18	10YR5/6	GR SiL	18	20	15 GR	<1	PO / SO	2MSBK	FR	CW	—	—	1-M,C, VC	0.75 / 4.5		CHERT CAP CLAY SKINS
Bt2	18-26	10YR5/8	GR SiL	22	19	10 GR 5 CB	<1 4-6	SP / SS	2FSBK	FR	CW	—	—	1-M,C	1.0 / —		CLAY SKINS
2BC1	26-33	5YR5/6	CH SiL	16	25	25 CH	2-4	PO / SO	1FSBK	FR	CW	—	—	1-M	0.5 / —		
2BC2	33-50	5YR5/6	XCH SiL	14	22	85 CH	2-4	PO / SO	1FSBK	FR	—	—	—	—	0.5 / 4.5		LITHOCHROMIC

Other Notes: UPPER BACKSLOPE - SHOULDER; PROTO-SPODIC HORIZON, <0.5", 7.5 YR 4/1; INTERBEDDED CHERT IN SILTSTONE

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAIJ
Field Assistant: TAYLOR WALTER

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-182-160621-1310-JSW	Topographic Position:	SUMMIT		Parent material:	COLLUVIUM OVER RESIDUUM	
Date:	6/22/16	% Slope:	3%		Slope Aspect:	125°	
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL		Depth to Water Table:	–	
RETTEW Job #:	089962000	Depth to Refusal:	–		Slope Failure or slip:	–	
NRCS Soil Unit:	MIXED	Bedrock Type :	SILTSTONE		Dip Slope & Direction:	–	Strike: –
Mineralogy:	MCCLUNG - WATAHALA - DEKALB	Vegetation:	CHESTNUT OAK, FEW BLUEBERRIES				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR 2.5/1	–	–	–	–	–	– / –	–	–	aS	–	–	3-VF,F	– / 4.5	–	
A	2-4	10YR 3/2	SL	9	75	2 GR	< 1	PO / SO	1FGR	VFR	aW	–	–	3-VF,F 2-M	0.25 / –		
BE	4-10	10YR 5/6	SL	14	70	2 GR	< 1	PO / SO	1MSBK	FR	CS	–	–	3-M 2-F,C, 1-VC	0.5 / –		1 3 8" SANDSTONE COF
Bt1	10-18	10YR 5/8	SL	17	72	2 GR	< 1	PO / SS	2MSBK	FR	CS	–	–	2-M 1-C,VC	0.75 / 4.5		TN DISCONT. CLAY SKINS
2Bt2	18-32	5YR 5/8	SiC	41	10	–	–	MP / SS	2COSBK	FI	CW	–	–	2-F	~~3.25~~ / –		CLAYSKINS
2Bt3	32-50	5YR 5/8	SiC	40	10	5 CH	< 1	MP / SS	2MSBK	FR	–	–	–	–	2.5 / 4.5		LITHOCHROMIC CLAY SKINS DECAYING SILTSTONE CCE

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH
Field Assistant: TAYLOR WALTER
Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-183-160621-1318-JSW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM
Date:	6/22/16	% Slope:	55%	Slope Aspect:	92°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL - SOMEWHAT EXCESSIVE	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	FEW BENT TREES
NRCS Soil Unit:	DEKALB - WATAUGA - MECLUNG	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	SILICEOUS	Vegetation:	TULIP POPLAR, CHESTNUT OAK, SASSAFRAS, FERN		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/1	–	–	–	–	–	– / –	–	–	AS	–	–	3-VF,F,M 2-C	– / 4.5	–	
A	2-4	10YR3/2	LS	4	87	2 GR	<1	PO / SO	1FGR	VFR	AW	–	–	3-VF,F, 2-M,C	<0.25 / –	–	
BW	4-10	10YR4/6	LS	5	85	2 GR	<1	PO / SO	1MSBK	VFR	CS	–	–	3-F,M 2-C,VC	<0.25 / –	–	SANDSTONE COF
C1	10-21	10YR5/6	S	3	90	5 GR	1-2	PO / SO	OSG	LO	CW	–	–	1-M,C	<0.25 / 5.5	–	SANDSTONE COF
C2	21-50	10YR5/6	XCB S	4	90	65 CB	4-10	PO / SO	OSG	LO	–	–	–		<0.25 / –	–	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: JOHN WALL
Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-184-160607-0950-JSW	Topographic Position:	BACKSLOPE	Parent material:	RESIDUUM
Date:	6/7/16	% Slope:	44%	Slope Aspect:	300°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVE	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	38"	Slope Failure or slip:	TREE 'BENDING'
NRCS Soil Unit:	WEIKERT - BERKS - ROUGH	Bedrock Type :	SHALE	Dip Slope & Direction:	87° SE (146°) Strike: 56°
Mineralogy:	MIXED	Vegetation:	PIN OAK, SCARLET OAK, WHITE PINE, HICKORY, BLUEBERRY		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/1	–	–	–	–	–	– / –	–	–	aw	–	–	2-VF 1-F	– / 4.5	–	
A	2-3.5	10YR3/3	XCH SiL	12	15	65 CH	<1	PO / SO	1MGR	VFR	aw	–	–	1-VF 2-F	0.25 / 4.5	–	
Bw	3.5-13	10YR5/6	XCH SiL	15	15	85 CH	1-3	PO / SS	1MSBK	FR	aw	–	–	1-F,M,C	0.5 / 4.5	–	
R	13+	SHALE - SILTSTONE ~~BE~~ BEDROCK								-	-	-	-	-	- / -	–	

Other Notes: BEDROCK DIPPING INTO SLOPE; TREES 'BENDING' UPSLOPE; SHALE BEDROCK DUGOUT TO 38"

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH

Field Assistant:

Signature:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-1XS-160607-1034-JSW	Topographic Position:	SUMMIT	Parent material:	RESIDUUM
Date:	6/7/16	% Slope:	7%	Slope Aspect:	323°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVE	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	23"	Slope Failure or slip:	—
NRCS Soil Unit:	WEIKERT-BERKS-ROUGH	Bedrock Type:	SHALE	Dip Slope & Direction:	16% SSE (160°) Strike: 50°
Mineralogy:	MIXED	Vegetation:	CHESTNUT OAK, WHITE PINE, HICKORY, BLUEBERRY		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR2.5/1	–	–	–	–	—	– / –	—	–	AS	–	—	3-VF 2-F 1-M,C	– / 5.5	—	
A	1-3	10YR3/3	VGR SiL	13	20	35 CH	<1	PO / SO	1FGR	VFR	AW	–	–	2-VF,F 2-M,C	0.25 / 4.5	–	
Bw	3-12	10YR5/6	XGR SiL	15	20	70 CH	0.5-2	PO / SS	1MSBK	FR	CW	–	–	2-F 1-M,C	0.5 / 4.5	–	
Cr	12-23	10YR5/6	XGR SiL	12	18	89 CH	2-4	PO / SO	0MA	FR	AW	–	–	1-F	– / –	–	FINES BETWEEN ROCKS
R	23+																

Other Notes: SLOPING RIDGE SUMMIT, NARROW - BREAK TO STEEP BACKSLOPE ~3M TO W AND 4M TO E

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-185A-160607-1234-JSW	Topographic Position:	BACKSLOPE	Parent material:	RESIDUUM
Date:	6/7/16	% Slope:	28%	Slope Aspect:	342°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVE	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	26"	Slope Failure or slip:	—
NRCS Soil Unit:	WEIKERT-BERKS-ROUGH	Bedrock Type :	SHALE	Dip Slope & Direction:	5% NNW (97°) Strike: 7°
Mineralogy:	MIXED	Vegetation:	HICKORY, VA PINE, WHITE PINE, PIN OAK, CHESTNUT OAK		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR 2.5/1	—	—	—	—	—	— / —	—	—	as	—	—	3-VF, F	— / 4.5	—	
A	2-3	10YR 3/3	VCH SIL	12	18	45 CH	< 1	PO / SO	1 F GR	VFR	aw	-	-	2-VF-F	Ø / 4.5	-	
Bw	3-17	10YR 5/6	XCH SIL	14	20	75 CH	1-3	PO / SS	1 M SBK	FR	aw	-	-	2-F 3-M	0.5 / 4.5	—	
R	17+	SHALE BEDROCK															

Other Notes: BACKSLOPE BETWEEN TWO FLAT SUMMITS ON RIDGELINE; SOFT SHALE BEDROCK ENCOUNTERED AT 17". EXCAVATED TO 26")

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-186-160607-1245-JSW	Topographic Position:	SUMMIT	Parent material:	RESIDUUM
Date:	6/7/16	% Slope:	9%	Slope Aspect:	294°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVE	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	17	Slope Failure or slip:	—
NRCS Soil Unit:	WEIKERT-BERKS-ROUGH	Bedrock Type:	SHALE	Dip Slope & Direction:	4% SE (132°) Strike: 42°
Mineralogy:	MIXED	Vegetation:	CHESTNUT OAK, VA PINE, HICKORY		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2.5	5YR2.5/1	—	—	—	—	—	— / —	—	—	AS	—	—	3-VF, F 2-M	— / 6.5	S1 A/B	
A	2.5-3	10YR3/1	VCH SIL	12	22	40 CH	<1	OP / OS	1MGR	VFR	AW	—	—	3-VF, F, M	0.25 / 5.7	S2 A/B	
BW	3-6	10YR5/6	XCH SIL	14	20	80 CH	1-3	OP / OS	1MSBK	FR	CW	—	—	3-F 2-M, C	0.5 / 4.7	S3 A/B	
Cr	6-10	10YR5/6	XCH SIL	13	20	90	2-5	OP / OS	0MA	FR	AS	—	—	1-F	— / —	—	FINES BETWEEN RICKS
R	10+	SHALE BEDROCK															

Other Notes: SUMMIT, NARROW SLOPING RIDGE; STEEP BACKSLOPE (>25%) ~4 M TO THE E AND ~3 M TO THE W.

TEST PIT DESCRIPTION

Soil Scientist: John Wah

Field Assistant:

Signature: JSW

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-187-160607-1427-JSW	Topographic Position:	SUMMIT	Parent material:	RESIDUUM
Date:	6/7/16	% Slope:	8%	Slope Aspect:	306°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVE	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	48"	Slope Failure or slip:	—
NRCS Soil Unit:	GILPIN	Bedrock Type :	SHALE	Dip Slope & Direction:	22% SE(140°) Strike: 50°
Mineralogy:	MIXED	Vegetation:	PIN OAK, HICKORY, CHESTNUT OAK		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1.5	5YR2.5/1	—	—	—	—	—	— / —	—	—	as	—	—	3-VF,F 1-M	— / 4.5	S1 A/B	
A	1.5-2	10YR3/2	VCH SiL	11	25	70 CH	<1	PO / SO	1FGR	VFR	aw	—	—	3-VF,F 2-M	0.25 / 4.5	S2 A/B	
Bw	2-7	10YR5/6	XCH SiL	14	22	85 CH	1-3	PO / SS	1MSBK	FR	ci	—	—	3-VF,F 2-M	0.5 / 4.7	S3 A/B	
Cr	7-17	10YR5/6	XCH SiL	13	20	90 CH	2-5	PO / SO	OMA	FR	aw	—	—	1-F	— / —	—	FINES BETWEEN ROCKS
R	17+	SHALE BEDROCK															

Other Notes: SMALL ROUND SUMMIT KNOB

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio

Field Assistant: Dave Skippon

Signature: S Dadio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	p188-160607-0937-sdd	Topographic Position:	Upper BS	Parent material:	coll/res
Date:	06/07/16	% Slope:	27	Slope Aspect:	350
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	36	Slope Failure or slip:	N/A
NRCS Soil Unit:	Gilpin	Bedrock Type :	siltstone	Dip Slope & Direction:	15 170° Strike: 80
Mineralogy:	Mixed	Vegetation:	white pine, chestnut oak, mountain laurel		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	1	10YR 3/2	Sil	14	25	30 gr	1-2	PS / SS	1fgr	vfr	aw	—	—	cf cm	<.25 / 4.5	—	thin 1/4" Oe present
Bw1	12	10YR 6/4	Sil	16	20	30 gr	1-2	PS / SS	1msbk	fr	cw	—	—	cm fc	.25 / 5.5	—	
Bw2	20	10YR 6/4	Sil	16	20	50 gr	2-4	PS / SS	1fsbk	fi	aw	—	—	cm cc	.50 / 5.5	—	
2C	36	10YR 6/4	Sil	14	10	80 fl	4-8	PS / SS	0 m	fr	aw	—	—	fm fc	1.5 / 5.5	—	
2R	36																

Other Notes: plasticity was difficult due to ↑ rock content

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio
Field Assistant: Dave Skippon
Signature: S Dadio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P189-160607-1143-sdd	Topographic Position:	lower backslope	Parent material:	colluvium/res		
Date:	06/07/16	% Slope:	38%	Slope Aspect:	180		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	N/A		
RETTEW Job #:	089962000	Depth to Refusal:	47	Slope Failure or slip:	N/A		
NRCS Soil Unit:	Weikert-Berks Rough Complex	Bedrock Type:	Siltston	Dip Slope & Direction:	90 N	Strike:	20°
Mineralogy:	Mixed	Vegetation:	chestnut oak, hickory, white oaks				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	2	10YR 3/2	–	–	–	30 gr	<.5	– / –	–	–	aW	–	–	CM CM FC	<.25 / 4.5	S1	
Bt1	16	10YR 6/6	Sicl	30	10	30 gr	<.5	PS / MS	2 m sbk	fr	CW	–	–	CF CM	2.25 / 5.25	S2	
Bt 2	25	10YR 6/6	sicl	32	8	40 gr	<.5	PS / MS	2 msbk	fr	CW	10YR 6/3 10YR 5/8	cmd cmf	CM	1.5 / 5.25	S3	
2Bc	35	7.5YR 5/6	sicl	28	12	30 gr	2-4	PS / SS	1 m sbk	fi	cw	10YR 6/3	cmd	FM	2.75 / 5.25	S4	
2C	47	7.5YR 5/6			15	70 fl	3-6	PS / SS	0 m	fr	aw	5YR 5/6	fmf	FM	5.25 / 3.0	S5	
2R	47+															–	

Other Notes: plasticity is difficult due to rock content

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio
Field Assistant: Dave Skippon
Signature: S Dadio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	p190-160607-1315-sdd	Topographic Position:	backslope	Parent material:	colluvium/residuum
Date:	06/07/16	% Slope:	32	Slope Aspect:	330
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	42	Slope Failure or slip:	N/A
NRCS Soil Unit:	Gilpon	Bedrock Type :	siltstone	Dip Slope & Direction:	20 80 Strike: 180
Mineralogy:	Mixed	Vegetation:	white pine, black oak, mountain laurel		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	2	5YR 2.5/1	–	–	–	20 gr	<.5	– / –	–	–	CS	–	–	CVF CM FM	<.25 / 4.5	–	
Oa	4	10YR 2/1	–	–	–	20 gr	<.5	– / –	–	–	aw	–	–	CM CM	.25 / 4.5	–	
E	9	10YR 6/4	sil	20	20	gr	1-2	PS / SS	1 msbk	fr	cw	–	–	CF	1.0 / 5.25	–	
Bt1	20	7.5YR 5/6	sil	25	18	gr	1-2	PS / SS	2 msbk	fr	cw	–	–	CM CC	1.5 / 5.25	–	
2Bt2	26	7.5YR 5/6	sicl	30	16	ch	2-4	PS / SS	1 msbk	fr fi	cw	–	–	FF	1.75 / 5.25	–	
2C	42	7.5YR 5/6	sil	22	15	ch 80	2-4		0 m	fr		–	–	VF F	2.25 / 5.25	–	
R	42+																

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio

Signature: S Dadio

Field Assistant: Dave Skippon

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	p191-160607-1459-sdd	Topographic Position:	Summit	Parent material:	residuum
Date:	06/07/16	% Slope:	5	Slope Aspect:	260
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SED	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	24	Slope Failure or slip:	N/A
NRCS Soil Unit:	Gilpin	Bedrock Type :	siltstone	Dip Slope & Direction:	5° 120 Strike: 25
Mineralogy:	Mixed	Vegetation:	Virginia pine, chestnut oak, Scarlet oak		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	3	10YR3/3	sil	14	10	ch 40	1-2	ps / ss	1 f gr	fr	aw	–	–	c f / c m	1.0 / 4.5	–	
Bt1	8	10YR4/6	sil	20	8	ch 25	2-4	ps / ss	1 m sbk	fr	cw	–	–	f f / c m	1.0 / 5.25	–	
Bt2	13	10YR4/6	sil	20	8	ch 60	2-4	ps / ss	1 m sbk	fr	aw	–	–	f f / c c	1.75 / 5.25	–	
Cr	23							– / –			aw					–	
R								– / –								–	

Other Notes: very thin Oa (less than 1/4")

TEST PIT DESCRIPTION

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Soil Scientist: Steve Dodio
Field Assistant: Dave Skippon
Signature: S Dodio

Test Pit ID:	P192-160607-1631-sdd	**Topographic Position:**	upper backslope	**Parent material:**	colluvium over residuum
Date:	06/07/16	**% Slope:**	18	**Slope Aspect:**	100
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	**Drainage Class:**	WD	**Depth to Water Table:**	N/A
RETTEW Job #:	089962000	**Depth to Refusal:**	36	**Slope Failure or slip:**	N/A
NRCS Soil Unit:	Gilpin	**Bedrock Type :**	Siltstone	**Dip Slope & Direction:**	25 90 **Strike:** 355
Mineralogy:	Mixed	**Vegetation:**	chestnut oak, blackgum, scarlet oak		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	2	5YR 2.5/1	–	–	–	gr 20	1-2	– / –	–	–	aw	–	–	CF FM	.25 / 4.5	–	
Bt1	12	10YR 6/6	sil	25	15	gr 20	1-2	PS / SH	1 f sbk	fr		–	–	FF CM	1.25 / 5.5	–	
Bt2	28	10YR 6/4	sil	23		ch 40	2-4	PS / SM	2 m sbk	fr		10YR 6/3 10YR 5/8	cmf cmd	FF CM CC	1.75 / 5.5	–	
2Bt3	36	7.5YR 5/6	sil			ch 70	2-4	PS / SM	1 m sbk	fr		–	–	FM CC	2.25 / 5.5	–	5YR 5/8 lithochromic colors
2R	36+																

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH
Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-193-160607-1620-JSW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM OVER RESIDUUM
Date:	6/7/16	% Slope:	35%	Slope Aspect:	70°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVE	Depth to Water Table:	–
RETTEW Job #:	089962000	Depth to Refusal:	40"	Slope Failure or slip:	–
NRCS Soil Unit:	BERKS-WEIKERT	Bedrock Type :	SILTSTONE/SHALE	Dip Slope & Direction:	– Strike: –
Mineralogy:	MIXED	Vegetation:	CHESTNUT OAK, RED OAK, HICKORY, WHITE PINE		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/2	–	–	–	–	–	– / –	–	–	as	–	–	3-VF,F	– / 4.4	–	
Bw	2-10	10YR5/6	XCH SIL	14	22	65 CH	1-3	PO / SS	1MSBK	FR	ci	–	–	2-VF,M 3-F	0.5 / 4.7	–	
2Cr	10-36	10YR5/6	XCH SIL	12	20	90 CH	2-5	PO / SO	OMA	FR	cw	–	–	1-M	– / –	–	BETWEEN ROCKS + WEATHERED SHALE
2R	36+	SHALE/SILTSTONE BEDROCK															

Other Notes: Fe-RICH SHALE/SILTSTONE IN BOTTOM OF PIT AT 40", 2.5YR4/6; WEATHERED, SOFT BEDROCK AT 10" DUG OUT TO 36"

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio

Field Assistant: Dave Skippon

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	p195-160608-1325-sdd	Topographic Position:	upper backslope	Parent material:	colluvium
Date:	06/08/16	% Slope:	19	Slope Aspect:	160
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	N/A	Slope Failure or slip:	N/A
NRCS Soil Unit:	McClung - Watahala - Dekalb	Bedrock Type :	siltstone	Dip Slope & Direction:	— Strike: —
Mineralogy:	Mixed	Vegetation:	hickory, red maple, tulip poplar		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	4	5YR 2.5/1	—	—	—	10 gr	1-2	— / —	—	—	aw	—	—	MF MM	<.25 / 5.5	—	
A	6	10YR 3/2	sil	14	12	20 gr	1-2	PS / SS	1f gr	vfr	aw	—	—	CF MF FC	.50 / 4.5	—	
E	14	10YR 5/4	sil	13	20	20 gr	1-2	PS / SS	1msbk	fr	cw	—	—	FF FM	2.25 / 4.75	—	
Bt1	25	10YR 5/6	sil	19	18	25 gr	1-2	PS / SS	2msbk	fr	cw	—	—	F ~~F~~	3.0 / 4.75	—	
2Bt2	35	7.5YR 5/6	sil	20	10	40 ch	1-2	PS / SS	2 msbk	fr	gw	—	—	VF F	3.25 / 5.0	—	7.5YR 8/2 variegated
2Bt3	60	7.5YR 5/6	sil	20	10	60 ch	1-2	PS / SS	2msbk	fr-fi	—	—	—	VF F	3.5 / 5.0	—	↓

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio
Field Assistant: Dave Skippon
Signature: S. Dadio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	p196-160608-1157-sdd	Topographic Position:	upper backslope	Parent material:	Colluvium/Res
Date:	06/08/16	% Slope:	32	Slope Aspect:	158
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	N/A	Slope Failure or slip:	N/A
NRCS Soil Unit:	McClung - Watahala - Dekalb	Bedrock Type :	siltstone	Dip Slope & Direction:	— Strike: —
Mineralogy:	Mixed	Vegetation:	red maple, tulip poplar		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	1	10YR 2/1	—	—	—	gr 20	1-2	— / —	—	—	aw	—	—	MF MM	<.25 / 4.5	—	
A	6	10YR 4/2	s.l	16	30	gr 20	1-2	PS / SS	1 f gr	vfr	aw	—	—	MF MM FC	1.0 / 4.5	—	
E	13	10YR 7/3	s.l	15	35	gr 20	1-2	PS / SS	1 m sbk	fr	cw	—	—	FM FC	1.0 / 5.0	—	
Bw	25	10YR 6/4	s.l	16	30	gr 40	1-2	PS / SS	1 m sbk	fr	cw	—	—	FC	1.75 / 5.0	—	
2 BC1	35	7.5YR 6/6	s.l	20	20	ch 40	2-4	PS / SS	1 m sbk	fr	gw	—	—	VFC	2.5 / 5.25	—	
2BC2	50	7.5YR 5/6	s.l	20	20	ch 70	2-4	PS / SS	1 m sbk	fr-fi		—	—	VFC	2.5 / 5.25		

Other Notes:

TEST PIT DESCRIPTION

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Soil Scientist: Steve Dadio

Field Assistant: Dave Skippon

Signature: S Dadio

Test Pit ID:	P197 - 160608 - 1047 - sdd	**Topographic Position:**	backslope	**Parent material:**	colluvium / res
Date:	06/08/16	**% Slope:**	40	**Slope Aspect:**	140
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	**Drainage Class:**	WD	**Depth to Water Table:**	N/A
RETTEW Job #:	089962000	**Depth to Refusal:**	N/A	**Slope Failure or slip:**	N/A
NRCS Soil Unit:	McClung - Watahala - Dekalb	**Bedrock Type :**	siltstone	**Dip Slope & Direction:**	— **Strike:** —
Mineralogy:	Mixed	**Vegetation:**	red maple, tulip poplar, hickory		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	2	5YR 2.5/1	—	—	—	30 gr	1-2	— / —	—	—	aw	—	—	MF MM FC	<.25 / 5.0	S1	
A	5	10YR 3/2	sl	10	60	20 gr	1-2	PO / SO	1 f gr	vfr	aw	—	—	MF CM	.25 / 4.5	S2	
E	14	10YR 6/3	sl	9	60	20 gr	1-2	PO / SO	1 f sbk	fr	cw	—	—	FF CM CC	1.0 / 4.5	S3	
Bw	31	10YR 6/4	sl	10	65	40 gr	1-2	PO / SO	1 m sbk	fr	cw	—	—	FF CC	1.5 / 4.75	S4	
2BC	52	7.5YR 4/6	sil	16	35	60 ch	1-2	PS / SS	1 m pl	fr	—	—	—	FF FM	2.25 / 5.0	S5	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio
Field Assistant: Dave Skippon
Signature: S. Dadio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-199-160608-0856-sdd	Topographic Position:	linear		
Date:	06/08/16	% Slope:	5	Parent material:	coll/res
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Slope Aspect:	80°
RETTEW Job #:	089962000	Depth to Refusal:	N/A	Depth to Water Table:	N/A
NRCS Soil Unit:	McClung - Watahala - Dekalb	Bedrock Type :	siltstone	Slope Failure or slip:	N/A
Mineralogy:	Mixed	Vegetation:	red maple, white pine, tulip poplar	Dip Slope & Direction:	— Strike: —

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	3	5YR 2.5/1	–	–	–	20 gr	.5-1	– / –	–	–	aw	–	–	MF CM	<.25 / 4.5	S1	
A	5	10YR 2/1	sil	15	20	20 gr	.5-1	PS / SS	1 f gr	vfr	aw	–	–	CF CM	0.75 / 4.5	S2	
E	11	10YR 6/4	sil	13	22	25 gr	.5-1	PS / SS	1 msbk	fr	cw	–	–	FF CM	1.25 / 4.5	S3	
2Bt	20	7.5YR 6/6	sil	20	15	25 gr	<.5	PS / SS	2 msbk	fr	cw	–	–	FF FM	1.75 / 5.0	S4	
2Bt2	30	7.5YR 6/6	sil	23	15	30 gr	<.5	PS / SS	2 msbk	fr	gw	–	–	FF FM	1.0 / 5.0	S5	2.5YR 5/8 also present
2BC	50	7.5YR 6/6 2.5YR 5/8	sil	20	15	30 ch	1-2	PS / SS	1 m pl	fr	–	10YR 2/1	cmp	VF M	2.75 / 5.0	S6	Manganese

Other Notes: 2 BC grading to paralithic contact

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio
Signature:
Field Assistant: Dale Skippon

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	200-160603-1446-Soil	Topographic Position:	backslope	Parent material:	colluvium/residuum
Date:	06/03/16	% Slope:	31%	Slope Aspect:	280
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	40	Slope Failure or slip:	N/A
NRCS Soil Unit:	Dekalb-Lily-Marlow	Bedrock Type :	sandstone	Dip Slope & Direction:	45 280 Strike: 20
Mineralogy:		Vegetation:	chestnut oak, red pine, white pine, red maple, mountain laurel		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	2	5YR 2.5/1	—	—	—	gr 10	1-2	— / —	—	—	cw	—	—	M VF C M	<.25 / 4.25	—	
E	4	7.5YR 5/1	sl	8	50	gr 10	1-2	PO / SO	1 f gr	vfr	aw	—	—	C F C M	<.25 / 4.5	—	
Bw1	16	10YR 5/6	l	10	40	25 cb	4-8	PO / SS	1 f sbk	fr	cw	—	—	C F C M F C	.25 / 5.25	—	
Bw2	28	7.5YR 5/6	sl	10	60	10 ch	1-2	PO / SO	1 m sbk	fr	cw	—	—	F F F M	.25 / 5.25	—	
2Cr	34	7.5YR 5/6	sl	10	65	10 ch	1-2	PO / SS	1 m sbk	fr	aw	—	—	F M	.5 / 5.25	—	
2R	40+																

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: John Watt
Field Assistant: Miguel Paromes
Signature: [illegible]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-201-160603-1326-JSW	Topographic Position:	RIDGE SUMMIT	Parent material:	COLLUVIUM OVER RESIDUUM
Date:	6/3/16	% Slope:	5%	Slope Aspect:	220°
Job.Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	DEKALB - LILY - MCCLUNG	Bedrock Type:	SILTSTONE	Dip Slope & Direction:	— Strike: —
Mineralogy:	SILICEOUS	Vegetation:	CHESTNUT OAK, BLACK GUM, WHITE PINE, LAUREL, BLUEBERRY		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	3-VF 1-C	— / —	—	—
A	2-3	10YR3/3	SL	10	72	5% GR	<1	OP / OS	1F SBK	VF	AW	—	—	3-VF 2-F	— / 6.5	—	
BE	3-12	10YR6/6	SL	13	72	2% GR	<1	OP / SS	1M SBK	FR	CW	—	—	2-F	4.7 / 0.25	—	
Bt1	12-18	10YR5/6	GR SL	18	64	16% GR	<1	SP / SS	1M SBK	FR	CW	—	—	3-F	— / 1.25	—	CLAY SKINS
2Bt2	18-28	7.5YR5/6	CL	34	25	5% CH	1-2	MP / SS	2M SBK	FR	CS	—	—	1-F	5.5 / 1.5	—	CLAY SKINS
2BC1	28-39	7.5YR5/6	SICL	32	12	12% CH	2-3	MP / SS	1TNPL	FR	GS	10YR 2.5	C2P	—	— / 1.5	—	CLAY SKINS LITHOCHROMIC
2BC2	39-50	7.5YR5/6	SICL	32	12	12% CH	2-3	MP / SS	1TNPL	FR	—	—	—	—	— / 1.5	—	DECAYING SS STRINGER LITHOCHROMIC

Other Notes: NARROW RIDGE SLOPING TO SW; 275? BACKSLOPE 30 M TO NW, 20 M TO SE. SOME UNIT [illegible]

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio
Field Assistant: Dave Skipper
Signature: S Dadio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-202-160603-1339-sdd	Topographic Position:	Summit / Shoulder	Parent material:	residuum
Date:	06/03/16	% Slope:	8%	Slope Aspect:	280
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	NA
RETTEW Job #:	089962000	Depth to Refusal:	24	Slope Failure or slip:	N/A
NRCS Soil Unit:	Dekalb - Lily - McClure	Bedrock Type :	sandstone	Dip Slope & Direction:	5 280 Strike: 350
Mineralogy:	Mixed	Vegetation:	chestnut oak, mountain laurel, dogwood		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	2	5YR 2.5/1	–	–	–	10 gr	1-2	– / –	–	–	aw	–	–	MF CM	<.25 / 4.25		
E	3.5	7.5YR 5/4	SL	8	60	10 gr	1-2		1 f gr	vfr	aw	–	–	CF CM	<.25 / 4.25	–	
BE	14	10YR 4/6	SL	10	45	10 gr	1-2		1 m sbk	fr	cw	–	–	CM CC	.5 / 4.75	–	
Bw	22	10YR 6/6	SL	14	40	cb 25	3-6		1 m sbk	fr	aw	–	–	FM	.75 / 5.00	–	
R	24+											–	–				

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio

Field Assistant: Dave Skippon

Signature: S Dadio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P203-160603-1129-sdd	Topographic Position:	concave backslope	Parent material:	colluvium/residuum
Date:	06/03/16	% Slope:	16	Slope Aspect:	300
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	N/A	Slope Failure or slip:	N/A
NRCS Soil Unit:	Dekalb-Lily-McClung	Bedrock Type :	siltstone	Dip Slope & Direction:	N/A Strike: N/A
Mineralogy:	mixed	Vegetation:	chestnut oak, black oak, white pine, mountain laurel		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	2	10YR 2/1	–	–	–	10 cb	2-4	– / –	–	–	aw	–	–	MVF MF CM	<.25 / 4.25	–	
E	3	10YR 5/1	l	10	55	10 cb	2-4		1 f gr	vfr	aw	–	–	MF	<.25 / 4.25	–	
Bt1	14	10YR 5/6	l	14	50	10 cb	2-4		1 m sbk	fr	cw	–	–	CF MM	.5 / 4.5	–	
Bt2	20	7.5YR 5/6	l	16	40	ch 10	1-2		2 m sbk	fr	gw	–	–	CF CM	.75 / 4.5	–	
BC	32	7.5YR 5/6	l	18	40	ch 25	1-2		2 m sbk	fi	cw	–	–	FM	2.25 / 5	–	
2Ct	50	7.5YR 5/6	sil	25	15	ch 70	1-2		0 rcf	fi	–	–	–		>4.5 / 5	–	close to a Cr horizon rocks are para-channers

Other Notes: closely correlates with P204

TEST PIT DESCRIPTION

Soil Scientist: Steve Dorlio

Field Assistant: Dale Skippon

Signature: S Dorlio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P204-160603-0939-sdd	Topographic Position:	[illegible] /bs	Parent material:	residuum
Date:	06/03/16	% Slope:	7%	Slope Aspect:	[illegible]
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	N/A	Slope Failure or slip:	N/A
NRCS Soil Unit:	Dekalb - Lily - McClung	Bedrock Type :	siltstone	Dip Slope & Direction:	N/A Strike: N/A
Mineralogy:	Mixed	Vegetation:	white pine, red oak, chestnut oak, mountain laurel		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	1	5YR 2.5/1	–	–	–	fl 20	4-8	– / –	–	–	aw	–	–	M F, M M	<.25 / 4.25	S1	
E	9	10YR 7/3	l	11	55	fl 20	4-8	PO / SO	1 f gr	vfr	cw	–	–	M F, M M, F C	.5 / 4.75	S2	
BE1	16	10YR 4/6	sil	16	35	gr 10	1-2	PO / SS	2 m sbk	fr	aw	–	–	C F, C M	1.25 / 5.25	S3	
2Bt2	30	5YR 5/6	sicl	39	8	–	–	MP / MS	2 m sbk	fr	cw	–	–	C F, C M	1.75 / 5.25	S4	
2BCt	50	7.5YR 5/6	sil	20	10	–		SP / SS	1 m sbk	fr	–	–	–	F W	2.0 / 5.25	S5	getting close to weathered Pm

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: [illegible]
Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-205-160603-11CT-JSW	Topographic Position:	SUMMIT/SHOULDER	Parent material:	COLLUVIUM OVER RESIDUUM
Date:	6/3/16	% Slope:	8%	Slope Aspect:	330°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	DEKALB-LILY-MCCLUNG	Bedrock Type:	SANDSTONE	Dip Slope & Direction:	— Strike: —
Mineralogy:	SILICEOUS	Vegetation:	CHESTNUT OAK, BLACK GUM, WHITE PINE, LAUREL, BLUEBERRY		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/1	—	—	—	—	—	— / —	—	—	AS	—	—	3-VF,F M	— / —	—	
E	2-4	10YR5/2	L	18	42	5 GR	1-2	PO / SO	1FSBK	VFR	AW	—	—	2-F,M 1-C	— / Ø	—	
Bt1	4-12	10YR5/6	L	18	37	5 GR	1-2	SP / SS	1MSBK	FR	CS	—	—	1-F 3-C	5.5 / 0.25	—	IN DISC. CLAY SKINS
2Btx2	12-21	7.5YR5/6	SiCL	34	10	2 GR	<1	MP / SS	2MSBK	FR	CS	—	—	2-F 2-M	— / 2.25	—	CLAY SKINS
2Btx3	21-29	7.5YR5/6	SiCL	35	10	5 GR	<1	MP / SS	2MSBK → 1TNPL	FR	CS	—	—	1-F	4.7 / 3.25	—	CLAY SKINS LITHOCHROMIC DECAYING SS PLATES
2BCt	29-41	5YR5/6	SiCL	34	10	10 GR	<1	MP / SS	1MSBK → 1MPL	FR	CS	—	—	—	— / 3.0	—	LITHOCHROMIC CLAY SKINS DECAYING SS PLATES
2Cr	41-50	5YR5/6	XCH SiCL	31	10	85 CH	<1	SS / SP	1TNPL (ROCK)	FR	—	N2.5	C2P	—	— / >4.5	—	LITHOCHROMIC DECAYING SS PLATES

Other Notes: BROAD SLOPING SUMMIT/UPPER SHOULDER; SHOULDER TO STEEP BACKSLOPE 50 m TO THE WNW, NARROW DEKALB RIDGE 40 m TO ESE; SAME UNIT AS P-206

TEST PIT DESCRIPTION

Soil Scientist: John Wah

Signature:

Field Assistant:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-206-160603-0930-JSW	Topographic Position:	SUMMIT	Parent material:	COLLUVIUM OVER RESIDUUM
Date:	6/3/16	% Slope:	11%	Slope Aspect:	260°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	DEKALB	Bedrock Type:	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	SILICEOUS	Vegetation:	MIXED DECIDUOUS - CHESTNUT OAK, BLACK OAK (SEE NOTES)		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-3	5YR2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	3-VF,F 2-M	— / —	—	
BE	3-6	10YR5/6	L	14	40	5 GR	<1	PO / SS	1MSBK	FR	CS	—	—	3-VF,F 1-M 1-VC	0.25 / —	—	
Bt1	6-16	7.5YR5/6	L	18	38	7 GR	<1	SP / SS	2MSBK	FR	CS	—	—	2-F 1-C	0.5 / 5.3	—	TN DISCONT. CLAY SKINS
Bt2	16-26	7.5YR5/6	L	19	40	10 GR	<1	SP / SS	2MSBK	FR	GS	—	—	2-C	1.0 / —	—	CLAY SKINS
2Bt3	26-37	5YR5/6	SiCL	35	10	1 GR	<1	MP / MS	1COPR → 2COPL	FI	CS	—	—	—	>4.5 / —	—	CLAY SKINS
2BCt	37-50	5YR4/6	SiC	42	10	Ø	—	MP / MS	1COSBK → 1COPL	FI	—	—	—	—	1.75 / 4.7	—	CLAY SKINS LITHOCHROMIC

Other Notes: BROAD SLOPING SUMMIT; BLACK GUM, WHITE PINE; SAME UNIT AS P-214
FEW BLUEBERRY, LAUREL

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH

Field Assistant: DUANE TRUAX

Signature: [illegible]

Test Pit ID:	P-207-160602-1508-JSW	Topographic Position:	SUMMIT / SHOULDER	Parent material:	RESIDUUM
Date:	6/2/16	% Slope:	5%	Slope Aspect:	230°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~MODERATELY WELL~~ Well Drained	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	21	Slope Failure or slip:	—
NRCS Soil Unit:	DEKALB	Bedrock Type :	SANDSTONE	Dip Slope & Direction:	7% SW (240°) Strike: 150°
Mineralogy:	SILICEOUS	Vegetation:	MIXED DECIDUOUS - CANOPY MORE OPEN - SEE NOTES		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-3	5YR 2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	2-VF 3-F 2-M	— / —	—	
A	3-6	7.5YR 3/3	VGR L	10	48	30 GR 25 ST	1-3 >6	PO / SS	1FGR	VFR	AW	—	—	2-VF 1-F	0.25 / 4.5	—	
BW	6-21	10YR 5/6	VST. L	12	40	15 GR 49 ST	<1 >6	PO / SO	1FSBK	FR	AW	—	—	3-VF 2-FM 1-C	0.25 / 5.5	—	
R	21+	SANDSTONE BEDROCK							—	—	—	—	—	—	— / —	—	

Other Notes: ON NF, NEXT TO PROPERTY BOUNDARY; SUMMIT SLOPING DOWN TO WSW; CHESTNUT OAK, WHITE OAK, WHITE PINE, BLUEBERRY; MANY SURFACE STONES >12" SANDSTONE; PROMINENT, NARROW, STEEP SIDED RIDGE SUPPORTED BY SANDSTONE BEDROCK. DEPTH TO BEDROCK VARIES FROM 9" TO 26"; WEATHERED SEAMS IN BEDROCK OK (CONTINUED 6/3)

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio

Field Assistant: Dave Skinner

Signature: S Dadio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P208 - 160603 - 0837 - SOD	Topographic Position:	Backslope	Parent material:	residuum
Date:	06/03/16	% Slope:	75	Slope Aspect:	315
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	36	Slope Failure or slip:	N/D
NRCS Soil Unit:	Dekalb - rock outcrop	Bedrock Type :	sandstone	Dip Slope & Direction:	20° SE Strike: 47°
Mineralogy:	mixed	Vegetation:	chestnut oak white o[illegible] mountain laurel		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	4	5YR 2.5/1	-	-	-	10 gr	1-2	- / -	-	-	aw	-	-	M VF M F	< .25 4.25	-	
E	6	7.5YR 5/1	sl	9	50	10 gr	1-2	PO / SO	1 f gr	vfr	aw	-	-	C F C M	< .25 4.25	-	
Bw1	16	10YR 5/6	l	10	45	10 gr	2-4	PO / SS	1 m sbk	fr	aw	-	-	C F C M	.25 4.5	-	
Bw2	32	7.5YR 5/4	l	13	40	40 fl	4-6	PO / SS	1 m sbk	fr	aw	-	-	F F F M	1.0 4.5	-	
R	36															-	
	36+															-	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio **Signature:** Steve Dadio
Field Assistant: Dave Skippon

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P209_160602-1356 - SDD	Topographic Position:	Shoulder	Parent material:	residuum		
Date:	06/02/16	% Slope:	8%	Slope Aspect:	320		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	N/A		
RETTEW Job #:	089962000	Depth to Refusal:	30	Slope Failure or slip:	N/A		
NRCS Soil Unit:	Dekalb Rock Outcrop	Bedrock Type :	sandstone	Dip Slope & Direction:	35° NW	Strike:	30° - 210°
Mineralogy:	mixed	Vegetation:	chestnut oak, mountain laurel, red pine				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	2	5YR 2.5/1	–	–	–	20 gr	.1-2	– / –	–	–	cs	–	–	M VF M F C M	<.25 / 4.25	–	
Oa	6	7.5YR 2.5/1	–	–	–	10 gr	1-2	– / –	–	–	aw	–	–	C VF C F F M	.25 / 4.25	–	
AE	7	7.5YR 4/2	l	10	50	10 gr	1-2		1 f gr	vfr	aw	–	–	C F C M	.5 / 4.25	–	
Bw	21	10YR 5/6	l	12	45	30 gr	.5-2		1 m sbk	fr	aw	–	–	C M F C	.75 / 5.0	–	
R	30	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	
Bedrock	30+																

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Steve Dodio

Field Assistant: Dillon Skiborn

Signature: Steve Dodio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P210-160607-1332-sdd	**Topographic Position:**	backslope	**Parent material:**	residuum
Date:	06/07/2016	**% Slope:**	35	**Slope Aspect:**	326
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	**Drainage Class:**	SED	**Depth to Water Table:**	N/A
RETTEW Job #:	089962000	**Depth to Refusal:**	20	**Slope Failure or slip:**	N/A
NRCS Soil Unit:	Dekalb - Rock Outcrop	**Bedrock Type :**	sandstone	**Dip Slope & Direction:**	16 326 **Strike:** 56
Mineralogy:		**Vegetation:**	chestnut oak, mountain laurel, white pine		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	2	5YR 2.5/1	—	—	—	gr 20	.5-2	— / —	—	—	CS	—	—	M VF, M F, C M	<.25 / 4.25	—	
Oa	4	10YR 2/1	—	—	—	gr 20	.5-2	— / —	—	—	aw	—	—	M VF, M F, C M	<.25 / 4.25	—	
E	6	7.5YR 5/1	1	11	40	gr 20	.1-2	PO / SO	1 fgr	vfr	aw	—	—	M F, C M	<.25 / 4.25	—	
Bw	20	10YR 6/6	1	14	40	vgr 40	2-4	PO / SS	1 m sbk	fr	aw	—	—	C F, C M	.25 / 4.5	—	
R	20+																

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio
Field Assistant: Dave Skippon
Signature: Steve Dadio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-711-160602-1140-sdd	Topographic Position:	Backslope	Parent material:	residuum
Date:	06/02/16	% Slope:	16%	Slope Aspect:	155
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	N/A	Slope Failure or slip:	N/A
NRCS Soil Unit:	Dekalb Rock Outcrop	Bedrock Type :	sandstone/red sandstone	Dip Slope & Direction:	Strike:
Mineralogy:	Mixed	Vegetation:	Chestnut oak, mountain laurel, sassafras		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	1	5YR 2.5/1	–	–	–	10	1-2	– / –	–	–	aw	–	–	M F M M	<.25 4.25	S1	
EA	2	10YR 5/2	l	10	45	12	1-2	PO SO	1 m gr	vfr	cw	–	–	M F M M	.25 4.5	S2	
Bw1	20	10YR 4/6	l	12	45	8	1-2	PO SS	2 m sbk	fr	cw	–	–	C M	.5 5.25	S3	
2Bw2	50	7.5YR 5/6	sl	10	60	60 v cb	4-8	PO SS	1 m sbk	fr	cw	–	–	F M	.5 4.5	S4	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio

Field Assistant: Dave Skippon

Signature: Steve Dadio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-212-160602-1002-Sdd	Topographic Position:	shoulder	Parent material:	residuum
Date:	06/02/16	% Slope:	11	Slope Aspect:	238
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	NONE
RETTEW Job #:	089962000	Depth to Refusal:	22	Slope Failure or slip:	N/A
NRCS Soil Unit:	Dekalb - Rock outcrop	Bedrock Type :	sandstone	Dip Slope & Direction:	5 - (100) Strike: 10
Mineralogy:		Vegetation:	chestnut oak, mountain laurel		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	3	5YR 2.5/1	–	–	–	CH 10	1-6	– / –	–	–	aw	–	–	MVF MF MM	<0.25 / 4.25	S1	
E	5	7.5YR 6/1	sl	6	60	fl 10	1-6	PO / SO	1 f gr	vfr	a b w	–	–	CF CM	0.25 / 4.5	S2	
Bw	22	10YR 4/6	l	9	50	fl 40	1-6	PO / SS	1 m sbk	fr	aw	–	–	CF CM	0.75 / 4.5	S3	
R	22+	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio

Field Assistant: Dave Skippon

Signature: Steve Dadio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	712A-160607-1109-sdd	Topographic Position:	Backslope	Parent material:	residuum		
Date:	06/02/16	% Slope:	15	Slope Aspect:	315		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SED	Depth to Water Table:	NONE		
RETTEW Job #:	089962000	Depth to Refusal:	24	Slope Failure or slip:	N/A		
NRCS Soil Unit:	Dekalb - Rock Outcrop Mixed	Bedrock Type :	sandstone	Dip Slope & Direction:	6 225	Strike:	315
Mineralogy:		Vegetation:	Mt Laurel, chestnut oak, red maple				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	.5	5YR 2.5/1	-	-	-	18 gr	1-2	Po so	-	-	aw	-	-	M VF M F C M	<.25 4.25	-	
E	1	10YR 6/4	Sl	12	65	25 gr	1-2	PO so	1 f gr	vfr	aw	-		M VF M F C M	.25 4.5	-	
Bw	14	10YR 4/6	l	18	40	40 vcb	2-5	sp ss	1 m sbk	fr	aw	-		C F C M	.5 4.5	-	
C	24	10YR 4/6	l	18	40	88 xcb	5-10	sp ss	0 m	fr	aw	-		F F	.5 4.5	-	
R	24+																

Other Notes:

1236

TEST PIT DESCRIPTION

Soil Scientist: [illegible]
Field Assistant: DUANE TRUAX

Signature: [illegible]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-213-160602-1236-1SW	Topographic Position:	SUMMIT/BROAD SHOULDER	Parent material:	COLLUVIUM OVER RESIDUUM		
Date:	6/2/16	% Slope:	11%	Slope Aspect:	320°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—		
NRCS Soil Unit:	DEKALB	Bedrock Type:	—	Dip Slope & Direction:	—	Strike:	—
Mineralogy:	SILICEOUS	Vegetation:	MIXED DECIDUOUS				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (Inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1.5	5YR2.5/1	—	—	—	—	—	— / —	—	—	AS	—	—	3-VF,F	— / 4.4	S-1 A/B	
BE	1.5-8	7.5YR5/6	GR SIL	13	32	15 GR	<1	SS / SP	1MSBK	FR	CS	—	—	2-F 1-C	0.75 / 6.5	S-2 A/B	
Bw	8-15	7.5YR5/6	L	20	41	10 GR	<1.5	SS / SP	1MSBK	FR	CS	—	—	1-M,C	1.25 / 6.5	S-3 A/B	
2Bt1	15-26	5YR5/6	CL	33	25	—	—	SS / MP	2COSBK	FR	AS	—	—	1-F,M	2.75 / 6.5	S-4 A/B	CLAY SKINS
2Bt2	26-34	5YR5/8	SIC	42	10	—	—	SS / MP	2MSBK	FR	AS	—	—	1-M	4.25 / 6.7	S-5 A/B	CLAY SKINS LITHOCHROMIC
2Bt3	34-50	5YR5/8	SICL	37	10	—	—	SS / MP	1MSBK	FR	—	—	—	—	3.75 / 6.3	S-6 A/B	CLAY SKINS LITHOCHROMIC

Other Notes: ~25' ABOVE SHOULDER AND STEEP BACKSLOPE; CHESTNUT OAK, WHITE OAK, SASSAFRAS, BLUEBERRY, LAUREL; ON NF PROPERTY, SUMMIT IS PRIVATE; LIMESTONE RESIDUUM

1118

TEST PIT DESCRIPTION

Soil Scientist: Jarrod Mayo
Field Assistant: Duane Truax

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-214-160602-1118-JSW	Topographic Position:	BACKSLOPE - LINEAR	Parent material:	COLLUVIUM OVER RESIDUUM
Date:	6/2/16	% Slope:	26%	Slope Aspect:	330°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	28"	Slope Failure or slip:	—
NRCS Soil Unit:	DEKALB	Bedrock Type :	SANDSTONE	Dip Slope & Direction:	10% WNW (290°) Strike: 200°
Mineralogy:	SILICEOUS	Vegetation:	MIXED DECIDUOUS		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/1	—	—	—	—	—	— / —	—	—	aw	—	—	3-VF,F 2-M	— / —	—	
A	2-2.5	10YR3/1	SL	6	70	5 GR	1-3	SO / PO	1FGR	VFR	aw	—	—	3-VF,F,M	Ø / 4.3	—	
E	2.5-4	10YR5/2	SL	6	75	5 GR	1-3	SO / PO	1FGR	VFR	aw	—	—	3-FM 1-C	Ø / —	—	
Bw1	4-12	10YR4/6	SL	13	60	10 GR	2-4	SS / PO	1MSBK	FR	cw	—	—	2-F,M 1-C,VC	0.25 / —	—	
Bw2	12-28	10YR4/6	GR SL	12	65	25 GR	2-4	SS / SP	1MSBK	FR	aw	—	—	2-F,M 1-C	0.25 / 4.5	—	FEW COF >8"
2R	28+	SANDSTONE BEDROCK								—	—	—	—	—	— / —	—	GRAY SANDSTONE

Other Notes: BACKSLOPE, LINEAR; ~50' FROM SUMMIT/SHOULDER; CHESTNUT OAK, WHITE PINE, LAUREL, BLUE BERRY

SAME DELINEATION AS P-215

0

TEST PIT DESCRIPTION

Soil Scientist: JOHN WALL
Field Assistant: DUANE TRUAX

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-215-160602-1037-JSW	Topographic Position:	BACKSLOPE - LINEAR	Parent material:	COLLUVIUM OVER RESIDUUM		
Date:	6/2/15	% Slope:	29%	Slope Aspect:	330°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	38"	Slope Failure or slip:	—		
NRCS Soil Unit:	DEKALB	Bedrock Type:	SANDSTONE	Dip Slope & Direction:	9% WNW (288°)	Strike:	198°
Mineralogy:	SILICEOUS	Vegetation:	MIXED DECIDUOUS				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/1	—	—	—	—	—	— / —	—	—	aw	—	—	3-F,VF	— / —	S1 A/B	
A	2-2.5	10YR3/2	SL	8	70	5 GR	1-2	SO / PO	F GR	VFR	aw	—	-	3-VF,F	Ø / 4.3	S2 A/B	
E	2.5-4	10YR5/2	SL	8	70	5 GR	2-3	SO / PO	1 F GR	VFR	aw	—	-	3-VF, F	Ø / 4.4	S3 A/B	
Bw1	4-13	10YR4/6	SL	12	65	7 GR	2-3	SS / PO	1 M SBK	VFR	cw	—	-	3-F 2-M	0.25 / 4.7	S4 A/B	
Bw2	13-24	10YR5/6	GR SL	16	65	17 GR	3-5	SS / SP	1 M SBK	FR	cw	—	-	3-F 2-M	0.25 / 4.7	S5 A/B	
2BC	24-38	10YR6/6	SL	6	75	5 GR	1-2	SO / PO	1 M SBK	VFR	cw	—	-	1-F,M	3.5 / 5.8	S6 A/B	DECAYING SANDSTONE COF LITHOCHROMIC MOTTE
2R	38+	10YR6/6	SANDSTONE ~~BED~~ ROCK							—	—	—	-	-	6.3	—	PH ON PULVERIZED SANDSTONE

Other Notes: ON NF PROPERTY, SUMMIT PRIVATE. RED OAK, CHESTNUT OAK, WHITE PINE, BLUEBERRY LAUREL. STEEP LINEAR BACKSLOPE. MICROTOPOGRAPHIC BENCH... COMMON STONES ON SURFACE

TEST PIT DESCRIPTION

Soil Scientist: DUANE TRUAX

Field Assistant: Taylor Walter

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P216-160608-1140-DAT	Topographic Position:	BACKSLOPE	Parent material:	Residuum		
Date:	06-08-2016	% Slope:	30%	Slope Aspect:	196° S-SW		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~MODERATELY~~ WELL DRAINED	Depth to Water Table:	N/A		
RETTEW Job #:	089962000	Depth to Refusal:	36"	Slope Failure or slip:	N/A		
NRCS Soil Unit:	Berks channery loam	Bedrock Type :	SHALE	Dip Slope & Direction:	66° N	Strike:	261°
Mineralogy:	Siliceous	Vegetation:	White Oak, Chestnut Oak, Scarlott Oak, Dogwood, Virginia Pine, White Pine				

USDA

Horizon	Depth In inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	7.5YR 2.5/1	–	–	–	–	–	– / –	–	–	SA	–	–	–	– / 4.3	–	
Bw1	1-8	10YR 6/4	l	18	35	VCH 35%	0.25-2.0	PO / SO	SBK 1,1	fri	SA	–	–	2,m 1,c	1.25 / 4.5	–	
Bw2	8-21	10YR 5/4	l	21	43	XCH 70%	0.25 6.0	PS / SS	SBK 1,2	fri	WA	–	–	1,m 1,c	2.25 / 4.5	–	
C	21-36	10YR 5/4	SiL	24	28	XCH 95%	0.25-12.0	PS / SS	SBK 1,2	fri	IA	D: 10YR 6/2 C: 7.5YR 4/6	D: CD C: CP	1,c	1.5 / 4.7	–	
R	36+	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	SHALE

Other Notes:

TEST PIT DESCRIPTION

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Soil Scientist: Duane Truax

Field Assistant: Taylor Walter

Signature: [signature]

Test Pit ID:	P216A-160608-1320-DAT	Topographic Position:	SHOULDER	Parent material:	Residuum
Date:	06-08-2016	% Slope:	28%	Slope Aspect:	306° NW
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVELY DRAINED	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	24"	Slope Failure or slip:	N/A
NRCS Soil Unit:	Berks channery silt loam	Bedrock Type :	Shale	Dip Slope & Direction:	74° W Strike: 215°
Mineralogy:	Siliceous	Vegetation:	Virginia Pine		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	7.5YR 2.5/1	–	–	–	–	–	– / –	–	–	SA	–	–	–	– / 4.2	–	
Bw1	1-5	10YR 4/4	l	12	42	VCH 35%	0.25-1.5	PO / SO	SBK 1,1	FRI	SA	–	–	1,F 2,m 1,c	1.5 / 4.3	–	
Bw2	5-10	7.5YR 5/4	l	15	46	XCH 75%	0.25-3.0	PO / SO	SBK 1,2	FRI	SA	–	–	2,m 1,c	2.5 / 4.5	–	
C	10-18	7.5YR 5/4	sil	10	30	XCH 98%	4.0-8.0	PO / SO	m,Ø	FRI	IA	–	–	1,m	N/A / 4.5	–	
R	18+	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	SHALE BEDROCK

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Duane Truax
Field Assistant: Taylor Walter
Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P216B-160608-1414-DAT	Topographic Position:	BACKSLOPE	Parent material:	RESIDUUM
Date:	06-08-2016	% Slope:	25%	Slope Aspect:	263°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVELY DRAINED	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	26"	Slope Failure or slip:	N/A
NRCS Soil Unit:	Berks channery silt loam	Bedrock Type :	Shale	Dip Slope & Direction:	86° N Strike: 245
Mineralogy:	Siliceous	Vegetation:	Virginia Pine, White Pine, Chestnut Oak, White Oak, Scarlett Oak		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	7.5YR 2.5/1	–	–	–	–	–	– / –	–	–	SA	–	–	–	– / 4.2	–	
Bw1	1-7	10YR 4/4	SiL	12	25	CHR 25%	0.25-1.0	PO / SO	SBK 1,1	FRI	SA	–	–	1,F 2,M 1,C	1.0 / 4.5	–	
Bw2	7-14	10YR 6/4	SiL	14	35	XCH 70%	0.25-4.0	PO / SO	SBK 1,3	FRI	SA	–	–	2,M 1,C	1.0 / 4.5	–	
C	14-26	10YR 6/6	SiL	18	24	XCH 92%	0.25-6.0	PO / SO	M,Ø	FRI	SA	–	–	1,M	N/A / 4.3	–	
R	26+	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	–

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: DUANE A TRUAX

Field Assistant: Taylor Walter

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-217-160608-0823-DAT	Topographic Position:	BACKSLOPE	Parent material:	Residuum
Date:	06-08-2016	% Slope:	65%	Slope Aspect:	26°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL DRAINED	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	19"	Slope Failure or slip:	N/A
NRCS Soil Unit:	Berks channery loam	Bedrock Type :	SHALE	Dip Slope & Direction:	70° NE Strike: 195°
Mineralogy:	Siliceous	Vegetation:	Red Maple, Sugar Maple, Scarlett Oak, Dogwood, Hickory		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-0.5	5YR 2.5/1	-	-	-	-	-	- / -	-	-	SA	-	-	-	- / 4.3	-	
A	0.5-1.5	7.5YR 3/2	SiL	9	15	BR 15%	0.25-0.5	PO / SO	GR 1,2	VFRI	SA	-	-	2,F 2,M	0.25 / 4.5	-	
Bw1	1.5-9.0	7.5YR 5/4	SiL	14	35	GR 30%	0.25-1.5	PO / SO	SBK 1,2	FRI	SA	-	-	1,F 2,M	1.0 / 4.6	-	
Bw2	9.0-19.0	5YR 5/6	L	21	45	XCH 70%	0.25-3.0	PS / SS	SBK 1,3	FRI	SA	-	-	2,M 1,C	1.5 / 4.8	-	
R	19.0+	-	-	-	-	-	-	- / -	-	-	-	-	-	-	- / -	-	SHALE BEDROCK

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: DUANE TRUAX
Field Assistant: Taylor Walter

Signature: Duane Truax

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P218-160608-1010-DAT	Topographic Position:	SHOULDER	Parent material:	RESIDUUM
Date:	06-08-2016	% Slope:	24%	Slope Aspect:	221° N
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL DRAINED	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	18"	Slope Failure or slip:	N/A
NRCS Soil Unit:	Berks channery loam	Bedrock Type :	SHALE	Dip Slope & Direction:	79° W Strike: 196°
Mineralogy:	Siliceous	Vegetation:	Chestnut Oak, Red Maple, Scarlett Oak, White Pine, Virginia Pine		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR 2.5/1	–	–	–	–	–	– / –	–	–	SA	–	–	–	– / 4.5		
A	1-3	7.5YR 4/2	l	13	41	GR 20%	0.25 0.5	PO / SO	GR 1,3	VFRI	SA	–	–	3,F 2,M	0.25 / 4.7	–	
Bt1	3-9	7.5YR 5/4	l	22	47	VCH 60%	0.25-2.0	PS / SS	SBK 1,2	FRI	SA	–	–	2,F 2,M	1.75 / 4.4	–	
Bt2	9-18	7.5YR 5/6	cl	31	50	XCH 75%	0.25-4.0	PS / SS	SBK 1,3	FRI	IA	–	–	1,F 1,M	3.5 / 4.6	–	
R	18"	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	SHALE

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Duane Truax

Field Assistant: Dr. John Galbraith

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P219-160607-1430-DAT	Topographic Position:	Backslope	Parent material:	Residuum
Date:	06-07-2016	% Slope:	51%	Slope Aspect:	330° North Facing
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Somewhat Excessively	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	15.5"	Slope Failure or slip:	N/A
NRCS Soil Unit:	Berks channery silt loam	Bedrock Type :	Shale	Dip Slope & Direction:	55° S; Strike: 281°
Mineralogy:	siliceous	Vegetation:	White Pine, Hickory Oak, White Oak, Red Maple		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	0.0-0.5	7.5YR 2.5/1	–	–	–	–	–	– / –	–	–	SA	–	–	–	– / 4.5	–	
A	0.5-2.0	10YR 4/3	SiL	8	10	CH 15%	0.25-2.0	PO / SO	SBK 1,1	VFR	SA	–	–	2,m 1,c	0.25 / 4.3	S-1A / S-1B	
Bw1	2.0-8.0	10YR 5/4	SiL	10	15	CH 25%	0.25-2.0	PO / SO	SBK 1,2	FR	SA	–	–	2,m	1.0 / 4.5	S-2A / S-2B	
Bw2	8.0-15.5	10YR 5/4	SiL	15	15	VCH 55%	0.25-3.0	PS / SS	SBK 1,3	FR	WA	–	–	2,m	2.25 / 4.5	S-3A / S-3B	
R	15.5+	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	Shale Bedrock

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Duane Truax

Field Assistant: Dr. John Galbraith

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-220-160607-1336-DAT	Topographic Position:	SHOULDER ON NOSE	Parent material:	Residuum
Date:	06-07-2016	% Slope:	18%	Slope Aspect:	240° NORTH FACING
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well Drained	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	24"	Slope Failure or slip:	N/A
NRCS Soil Unit:	Berks channery silt loam	Bedrock Type :	Shale	Dip Slope & Direction:	12° SOUTH Strike: 110°
Mineralogy:	Siliceous	Vegetation:	Chestnut Oak, Hickory, Virginia, White Pine, White Oak		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-0.5	7.5YR 2.5/1	–	–	–	–	–	– / –	–	–	SA	–	–	2,F	– / 4.5	–	
A	0.5-3.0	10YR 4/4	SiL	15	15	XCH 40%	0.25-1.0	PO / SO	SBK 1,1	VFR	WA	–	–	2,F 1,C	0.25 / 4.5	–	
Bw1	3.0-9.0	10YR 5/6	SiL	20	20	XCH 50%	0.25-4.0	PS / SS	SBK 1,2	FR	SA	–	–	2,M 1,C	0.75 / 4.5	–	
Bw2	9.0-20.0	7.5YR 5/4	SiL	24	20	XCH 70%	0.25-8.0	PS / SS	SBK 1,3	FR	SA	–	–	1,M 1,C	1.5 / 4.5	–	
R	24+	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	SHALE BEDROCK

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Duane Truax

Field Assistant: Dr. John Galbraith

Signature:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P221-160607-1223-DAT	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM [illegible]
Date:	06-07-2016	% Slope:	28%	Slope Aspect:	200° SOUTH FACING
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL DRAINED	Depth to Water Table:	>50"
RETTEW Job #:	089962000	Depth to Refusal:	>50"	Slope Failure or slip:	N/A
NRCS Soil Unit:	Berks channery loam	Bedrock Type :	N/A	Dip Slope & Direction:	N/A Strike: N/A
Mineralogy:	Siliceous	Vegetation:	Black Oak, Chestnut Oak, White Oak, White Pine, Ash		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	7.5YR 2.5/1	–	–	–	–	–	– / –	–	–	SA	–	–	1,F	– / 6.8	S-1A / S-1B	
A	1-3	7.5YR 4/2	SiL	8	10	XGR 60%	0.25-0.75	PO / SO	GR 1,3	VFRI	SA	–	–	1,F 2,m	0.25 / 6.6	S-2A / S-2B	
E	3-9	10YR 6/3	SiL	10	10	XGR 70%	0.25-1.0	PO / SO	SBK 1,1	VFRI	SA	–	–	2,m	0.25 / 5.7	S-3A / S-3B	
Bw1	9-15	10YR 6/4	L	12	50	VCN 50%	0.25-2.0	PO / SO	SBK 1,2	FRI	SC	–	–	2,m	1.0 / 5.6	S-4A / S-4B	
Bw2	15-23	10YR 5/4	L	15	50	XCN 60%	0.25-2.0	PO / SO	SBK 1,2,	FRI	SA	–	–	1,m	1.0 / 6.3	S-5A / S-5B	
C	23-50+	10YR 5/4	SL	8	70	XCN 70%	0.25-0.5	PO / SO	0,SG	VFRI	[illegible]	–	–	–	1.25 / 6.5	S-6A / S-6B	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Duane Trax

Field Assistant: Dr. John Galbraith

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-222-160607-1055-DAT	Topographic Position:	BACKSLOPE	Parent material:	Colluvium
Date:	06-07-2016	% Slope:	23%	Slope Aspect:	310°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	MOD. WELL DRAINED	Depth to Water Table:	>50"
RETTEW Job #:	089962000	Depth to Refusal:	>50"	Slope Failure or slip:	N/A
NRCS Soil Unit:	Berks channery loam	Bedrock Type :	N/A	Dip Slope & Direction:	N/A Strike: N/A
Mineralogy:	Siliceous	Vegetation:	Scarlet Oak, Chestnut Oak, White Pine, Red Maple, Black Oak		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-0.5	10YR 3/1	SiL	10	12	GR 25%	—	PO SO	GR 1,1	VFRI	SA	—	—	1,F	0.25 4.3	S-1A S-1B	
E	0.5-9	10YR 6/4	SiL	12	15	VGR 40%	0.25-0.5	PO SO	SBK 1,1	FRI	SA	—	—	2,m	0.75 5.3	S-2A S-2B	
Bw1	9-18	10YR 5/4	SiL	15	20	VCH 50%	0.25-3.0	PS SØ	SBK 1,3	FRI	SA	—	—	2,m	1.5 4.8	S-3A S-3B	
Bw2	18-33	7.5YR 5/4	SiL	18	25	XCH 65%	0.25-4.0	PS SØ	SBK 1,3	FRI	SA	—	—	1,m	1.75 4.5	S-4A S-4B	
BC	33-50+	7.5YR 5/4	L	12	38	XCH 80%	0.25-4.0	PØ SØ	SBK 1,3	FRI	—	D: 10YR 6/3 C: 7.5YR 5/6	CD CD	—	3.0 4.5	S-5A S-5B	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: DUANE TRUAX

Field Assistant: Dr. John Galbraith

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-223-160607-0910-DAT	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM / RESIDUUM
Date:	06-07-2016	% Slope:	49°	Slope Aspect:	180°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL DRAINED	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	Bottom @ 46" soft siltstone	Slope Failure or slip:	N/A
NRCS Soil Unit:	Berks channery silt loam	Bedrock Type :	Siltstone	Dip Slope & Direction:	15° South; Strike: 110°
Mineralogy:	~~Siliceous~~ Mixed	Vegetation:	Scarlet Oak, Chestnut Oak, White Oak, Hickory, Dogwood		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	0-0.25	5YR 2.5/1	—	—	—	[illegible]	—	— / —	—	VFRI	SA	—	—	2,m 2,f	— / 6.0	S-1A / S-1B	
A	0.25-3.5	10YR 2/2	Loam	10	40	GR 8%	0.25	PO / SO	GR 1,3	VFRI	SA	—	—	2,m	<0.25 / 7.0	S-2A / S-2B	
Bt1	3.5-7.5	7.5YR 5/4	SiL	18	31	VGR 35%	0.25-0.5	PS / SO	SBK 1,1	VFRI	SA	—	—	1,m	0.25 / 6.5	S-3A / S-3B	
Bt2	7.5-17.0	7.5YR 5/4	Loam	25	35	CH 25%	0.25-1.0	PS / SS	SBK 1,2	FRI	SA	—	—	1,m	1.0 / 6.5	S-4A / S-4B	
Bt3	17-29	7.5YR 5/4	CL	30	30	CH 30%	0.25-3.0	PS / SS	SBK 1,2	FRI	SA	-	—	1m	2.25 / 4.5	S-5A / S-5B	
2BC	29-36	7.5YR 5/4	SiL	18	15	XCH 70%	0.25-4.0	PS / SO	SBK 1,1	FRI	SA	-	—	—	2.0 / 4.5	S-6A / S-6B	lithochromic colors
2Cr	36-46+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	Saprolitic siltstone

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio

Field Assistant: Dave Skippon

Signature: S Dadio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-224-160608-1315-sdd	Topographic Position:	Backslope	Parent material:	Colluvium over residuum
Date:	06/08/16	% Slope:	34	Slope Aspect:	100
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SED	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	26	Slope Failure or slip:	N/A
NRCS Soil Unit:	Berks channery sil	Bedrock Type:	siltstone	Dip Slope & Direction:	35° E 40 Strike: 300
Mineralogy:	Mixed	Vegetation:	hickory, white pine, white oaks		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	1	5YR 2.5/1	–	–	–	ch 10	1-2	– / –	–	–	aw	–	–	C F, F M	<.25 / 5.0	–	
A	3	10YR 3/2	sil	16	20	ch 20	1-2	PO / SO	1 f gr	vfr	aw	–	–	C F, F M	.5 / 5.0	–	
Bw	11	10YR 5/6	sil	15	20	ch 60	2-4	PO / SO	1 f sbk	fr	aw	–	–	C F, F M, C C	1.25 / 4.75	–	
C	26	10YR 5/6	sil	15	20	fl 90	4-8	PO / SO	0 m	fr	aw	–	–	F F, F M, F C	1.75 / 4.75	–	roots between rocks
R	26+	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	

Other Notes:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane
Field Assistant: Dr. Galbraith

Signature: [signature]

Test Pit ID:	D-225-160601-1130-MEL	Topographic Position:	footslope/terrace	Parent material:	Colluvium
Date:	6/01/2016	% Slope:	2.5%	Slope Aspect:	250°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	MWD	Depth to Water Table:	>45
RETTEW Job #:	089962000	Depth to Refusal:	cobbly fragic horizon 45"	Slope Failure or slip:	—
NRCS Soil Unit:	Monongahela fine loamy	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	mixed mineralogy	Vegetation:	sugar maple, white pine, ironwood, shagbark hickory, privet, fl dogwood,		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Ap	0-7	10YR4/3	sil	12	10			PO / SO	2fgran	fr	SC	—	—	3vf,f,m,c	0.5 / 4.8	S1	
Bt	7-16	7.5YR5/6	sil	20	10			MP / MS	2msbk	FR	SC	—	—	3m,3c	2.25 / 4.7	S2	
2Bt1	16-24	7.5YR5/4	VGR/ sil	15	15	grav 40%	<1	SP / SS	2fsbk	FR	SG	—	—	2f,m	too rocky / 4.6	S3	
2Bt2	24-30	7.5YR5/4	VGR/ sil	15	15	grav 40%	<1	SP / SS	1fsbk	FR	SC	7.5YR6/2 7.5YR5/6	cmf	2f,m	too rocky / 4.5	S4	
3Bt	30-39	10YR5/6	sil	23	8			MP / SS	2msbk	FR	SG	10YR5/2 7.5YR5/6	mmd	2f	2.0 / 4.5	S5	
3Bx	39-45	7.5YR4/4	CB./ sil	20	5	30%	up to 6"	SP / SS	2mabk	FI		10YR5/2 7.5YR5/8	mcp	—	2.0 / 4.5	S6	

Other Notes: Sampled/Dup.

TEST PIT DESCRIPTION

Soil Scientist: JOHN ROBERTS
Field Assistant: M. WOOD, John Wah

Signature: John C Roberts

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-225A-160601-1130-JCR	Topographic Position:	FLOODPLAIN	Parent material:	ALLUVIUM		
Date:	6/1/16	% Slope:	2	Slope Aspect:	215°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~MODERATELY WELL~~ Somewhat Poorly Drained	Depth to Water Table:	36"		
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—		
NRCS Soil Unit:	CRAIGSVILLE	Bedrock Type:	—	Dip Slope & Direction:	—	Strike:	—
Mineralogy:	MIXED	Vegetation:	MIXED DECIDUOUS				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/pH	Lab Sample ID	Notes
A	0-7	10YR 3/2	SiL	15	15	10% CH	<1	PO / SS	2MGR	FR	CS	—	—	3F 2M	0.75 / 6.5	S1	
Bw1	7-18	10YR 4/4	GR SiL	17	24	30 GR	<0.5	PO / SS	1MSBK	VFR	GS	—	—	2FMCO	1.5 / 6.5	S2	
Bw2	18-36	10YR 4/4	VGR SiL	18	25	40 GR	<1	PO / SS	1MSBK	FR	—	F2D	10YR 5/6	2F 1CO	1.75 / 6.5	S3	

Other Notes: 18-36 FEW CF > 5"; MAPLE, WOODNETTLE, MAYAPPLE

TEST PIT DESCRIPTION

Soil Scientist: STEVE DADIO
Field Assistant: Johns Wall
Signature: Steve Dadio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-225 B-166601-1312-SDD	Topographic Position:	Footslope	Parent material:	Colluvium
Date:	6-1-16	% Slope:	17%	Slope Aspect:	190°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SWP	Depth to Water Table:	12"
RETTEW Job #:	089962000	Depth to Refusal:	>50"	Slope Failure or slip:	—
NRCS Soil Unit:	Berks	Bedrock Type :	hematite cemented sandstone	Dip Slope & Direction:	— Strike: —
Mineralogy:	mixed	Vegetation:	Black Gum, white pine, white oak, witch hazel, red maple, sassafrass		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-2	10YR 3/2	SiL	12	12	3 GR	<1	SO / PO	2MGR	FR	AW	—	—	3-VF, F 1-M	0.25 / 6.0	S1	
Bt1	2-12	10YR 6/6	SiL	18	12	10 GR	<1	SS / SP	2MSBK	FR	CW	—	—	1-F 1-M	2.0 / 6.0	S2	
Bx2	12-26	10YR 6/8	SiL	22	14	14 GR	<1	SS / SP	2MSBK	FR	CW	C2D C2D C2D	10YR 6/3 10YR 6/1 7.5YR 5/8	1-M	2.5 / 6.0	S3	FN DISCONTINUOUS CLAY SKINS
Btx	26-50	7.5YR 5/6	SiL	18	10	10 GR	<1	SS / SP	1COPR → 1MPL	FI	—	C3P C3P	7.5YR 7/1 5YR 5/8	1-M	>4.5 / 6.0	S4	FRAGIC PROPERTIES WEAK PAN FN CLAY SKINS

Other Notes: f-si, mixed, mesic Fragic Hapludult

TEST PIT DESCRIPTION

Soil Scientist: Duane Truax

Field Assistant: Michael Lane

Signature:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-226-160601-1400-DAT	Topographic Position:	Shoulder, slightly concave	Parent material:	Colluvial creep over residuum
Date:	6/1/16	% Slope:	43%	Slope Aspect:	195°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	38"	Slope Failure or slip:	—
NRCS Soil Unit:	Berks	Bedrock Type :	siltstone	Dip Slope & Direction:	28° E Strike: 31°
Mineralogy:	mixed	Vegetation:	White pine, White oak, Black gum Red maple		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	7.5YR 2.5/1	—	—	—	—	—		—		S/A	—	—	—		S1	
A	1-2	10YR 4/3	si	8	5	10	channers <1"	PO / SO	1 co gr	VFR	S/A	—	—	3 m	0.25 / 5.0	S2	
BE	2-7	10YR 5/6	CN si	10	7	15	channers <1"	PO / SS	1 m sbk	FR	S/A	—	—	3 m, c	1.0 / 5.0	S3	
Bt1	7-16	10YR 5/8	VCN sil	20	18	45	channers 1/4"-1 1/2"	SP / SS	1 m sbk	FR	S/A	—	—	2 m	1.5 / 4.5	S4	
Bt2	16-24	7.5YR 5/6 ~~10~~	XCN l	20	35	65	channers <1"	PO / SO	1 f sbk	FR	S/A	—	—	1 m	1.75 / 4.5	S5	lithochromic colors 7.5YR 5/3
2Cr	24-31	10YR 6/6	XCN	—	—	85	channers 1"	— / —	0 M	FR	I/A	—	—	—	too rocky	—	siltstone w/fines
2R	31-38	—	—	—	—	—	—	— / —	—	—	—	—	—	—	—	—	siltstone bedrock

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Tom Wall
Field Assistant: Joel Galbraith

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-227-160601-1500-1SW	Topographic Position:	Summit	Parent material:	Residuum		
Date:	6/1/16	% Slope:	5%	Slope Aspect:	240°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~somewhat~~ excessive	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	18"	Slope Failure or slip:	—		
NRCS Soil Unit:	Berks	Bedrock Type :	Siltstone	Dip Slope & Direction:	20% E (85°)	Strike:	355°
Mineralogy:	Mixed	Vegetation:	Mixed deciduous				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	0-1	5YR2.5/1	—	—	—	—	—	— / —	—	—	as	—	—	3-VF,F,M 1-C	— / 4.25	S1	
A	1-3	10YR3/2	SiL	10	20	10% CH	0.5-3	PO / SS	2MGR	VFR	aw	—	—	3-VF,F,M 1-C	0.25 / 4.5	S2	
Bw1	3-11	10YR5/4	VCH SiL	15	25	40 CH	0.5-3	SP / SS	1FSBK	FR	cs	—	—	2-VF,F,M 3-C,VC	0.75 / 5.0	S3	
Bw2	11-18	10YR5/6	VCH SiL	18	25	55 CH	0.5-3	SP / SO	1FSBK	FR	aw	—	—	1-VF,F,M 2-C,VC	0.5 / 5.0	S4	
R	18+	Siltstone				Bedrock											

Other Notes: White oak, chestnut oak, hickory, white pine, red maple

TEST PIT DESCRIPTION

Soil Scientist: DFenstermacher

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-223-160610-0907-DEF	Topographic Position:	Headslope	Parent material:	Colluvium
Date:	6/10/16	% Slope:	35	Slope Aspect:	316°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	56" - Auger	Slope Failure or slip:	—
NRCS Soil Unit:	Berks (8F)	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	Mixed	Vegetation:	Redmaple, Blackgum, white oak, white pine, blueberry		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1.5	5YR 2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	3f	— / 4.5	S1	
AB	1.5-4	10YR4/3	SiL	18	22	15% CN	<2"	PS / SS	1fSBK	VFr	CW	—	—	3f 2M	0.1 / 4.8	S2	
Bw	4-14	7.5YR 5/4	SiL	20	22	38% CN	<2"	SP / SS	1MSBK	VFr	CW	—	—	2f,M 1Co	1.0 / 5.5	S3	
2Bw	14-26	7.5YR 5/4	SiL	14	35	85% CN	1/2-3"	PS / SO	1COSBK	VFr	CW	—	—	2f 1M	Too many Rocks / 5.3	S4	
3Bw	26-37	7.5YR 5/4	SiL	22	18	38% CN	<4"	SP / SS	1COSBK	FC	CW	—	—	1f	1.0 / 4.8	S5	
3C	37-56+	7.5YR 5/4	SiL	18	25	38% CN	<4"	SP / SS	1COSBK	Fr	—	—	—	1f	1.25 / 4.8	S6	7.5YR 5/6 - Lithochrome from weathering shales Mn-concentrations

Other Notes: Augered to 56" - Refusal on Coarse fragments - CN

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant: May Dugan

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-229-160610-0900-DEF	Topographic Position:	Mid Backslope	Parent material:	Colluvium
Date:	6/10/16	% Slope:	5.5	Slope Aspect:	187
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well Drained	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	52" - Auger Refusal	Slope Failure or slip:	—
NRCS Soil Unit:	Berks (8F)	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	Mixed	Vegetation:	Hickory, white oak, white Pine, white snakeroot, grass, ferns		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-4.5	10YR 3/2	SiL	16	28	25% Gr	< 1/2"	PO / SO	1 f SBK	VFr	CW	—	—	3M 2 co,F	0 / 5.2	—	Thin layer of duff no organic layer
Bw	4.5-17	7.5YR 5/6	SiL	18	28	40% gr	< 2" mostly 1/4-1/2	PG / SS	1 MSBK	Fr	CW	—	—	2f,m 1co	1.0 / 5.0	—	
BC	17-27	7.5YR 5/4	SiL	18	28	85% CN	1/4 - 10"	PO / SS	1 CoSBK	Fr	GW	—	—	3f 2M	— / —	—	
C	27-52+	—	—	—	—	85% CN	2-10"	— / —	OM	—	—	—	—	2f 1M	— / —	—	15% voided space few fines on Rock faces

Other Notes: Could not auger any deeper
C - Contains randomoriented Coarse fragments with voided space in between.
Shale coarse fragments

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher
Field Assistant: Max Dugan

Signature: David Fenstermacher

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-230A-160610-0855-DEF	Topographic Position:	Backslope	Parent material:	Residuum (Colluvium in A)
Date:	6/10/16	% Slope:	35%	Slope Aspect:	257
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	27"	Slope Failure or slip:	—
NRCS Soil Unit:	Berks (8E)	Bedrock Type :	Shale 1/4-1" thick	Dip Slope & Direction:	15° E; Strike: 348°
Mineralogy:	Mixed	Vegetation:	White oak, witch hazel, virginia Pine, blueberry, MT laurel, Sav.		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-4.5	10YR 4/2	SiL	15	28	40% CN	< 1/2"	PO / SO	2MGR	VFr	CW	—	—	3f 2M 1Co	0.1 / 4.4	—	Very thin and sparse Oe horizon. Red Shale CoF
Bw1	4.5-18	7.5YR 5/4	SiL	16	18	30% CN	1/4-3"	SP / SS	1fSBK	Fr	CW	—	—	3f 2M, Co	0.5 / 5.2	—	Brown Shale CoF
Bw2	18-24	7.5YR 5/4	SiL	17	20	55% CN	1/2-8"	SP / SS	1MSBK	Fr	CW	—	—	2f 1M	1.25 / —	—	
Cr	24-27	7.5YR 5/4	CN Channers	—	—	98%	2-8"	— / —	Rock defined	—	CW	—	—	1f	— / —	—	Bedded Rock w/ fines in between fractures
R	27+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes: Area Clearcut several years ago very thick shrubby growth w/ few Random mature trees
Brown shale CoF throughout profile, except in A which has Red and Brown Shales

TEST PIT DESCRIPTION

Soil Scientist: P. Fenstermacher

Field Assistant: Max Dugan

Signature:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-231-160610-1130-DEF	Topographic Position:	Backslope	Parent material:	Residuum
Date:	6/10/16	% Slope:	43	Slope Aspect:	87
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	26"	Slope Failure or slip:	—
NRCS Soil Unit:	Berks (8E)	Bedrock Type :	Shale - Brown	Dip Slope & Direction:	12° ESE; Strike: 20°
Mineralogy:	Mixed	Vegetation:	Witchhazel, chestnut oak, Red maple, Allegheny Blackberry, black locust, christmas fern		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-2.5	10YR 3/3	SiL	15	28	38% gr	<1/2"	PO / SO	1 GR	VFr	AW	—	—	3f 2M 1Co	0 / 5.5	—	Red Shale CoF
AB	2.5-7	10YR 5/3	SiL	15	29	38% gr	<1/2"	PO / SO	1FSBK	VFr	CW	—	—	3f,m 1Co	0.25 / —	—	Redshale CoF
Bw	7-18	10YR 5/4	SiL	17	22	45% CN	1/4-7"	SP / SS	1MSBK	Fr	CW	—	—	2f,M	0.25 / 4.8	—	
Cr	18-26	10YR 5/4	—	—	—	95% CN	2-10"	— / —	Rock defined	—	CW	—	—	1f	— / —	—	Bedded Rock w/ fines in between fractures
R	26+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes: Minor Colluvial influence in A & AB horizons

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-233-160607-1000-MEL	Topographic Position:	Ridge shoulder	Parent material:	residuum		
Date:	6/7/16	% Slope:	14%	Slope Aspect:	230°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	18"	Slope Failure or slip:	—		
NRCS Soil Unit:	Berks 8D	Bedrock Type :	shale	Dip Slope & Direction:	23° N	Strike:	270°
Mineralogy:	mixed	Vegetation:	white pine, chestnut oak, white oak,				

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR 2.5/1									SC			3FM	0.0 / 5.4	S1	
A	1-2	10YR 3/2	GR SiL	10	25	15	<1	PO / SO	1MGR	FR	SC			3FM	0.25 / 5.1	S2	
Bw	2-6	10YR 5/4	GR SiL	12	25	30	1	PO / SS	1MSBK	FR	WC			2FM	0.5 / 5.5	S3	
C	6-14	10YR 5/6	XGR SiL	15	30	75	1-3	PO / SS	massive	FR	WC			2FM	too rocky / 5.2		did not sample too few fines
Cr	14-18	10YR 5/6	XGR SiL	15	30	90+	very few fines							[illegible]			
R	fractured shale bedrock																

Other Notes:

233

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-234-160607-1045-MEL	Topographic Position:	Sideslope	Parent material:	Colluvium over residuum		
Date:	06/07/16	% Slope:	45	Slope Aspect:	155		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD-ED	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	24"	Slope Failure or slip:	—		
NRCS Soil Unit:	Berks 8F	Bedrock Type:	Shale	Dip Slope & Direction:	15% NE	Strike:	290
Mineralogy:	mixed	Vegetation:	chestnut oak, hickory				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1.5	5YR2.5/1									SC	—		2F	0.0 / 6.5	S1	
A	1.5-3	7.5YR 3/2	VGR SiL	10	25	35	1	PO / SO	1FGR	FR	SC	—		3F	0.25 / 6.0	S2	
Bw	3-8	7.5YR 5/6	VGR SiL	12	30	50	1-2	PO / SO	1FSBK	FR	IC	—		2FM	0.5 / 5.0	S3	
Cr	8-24	7.5YR 5/6	XCB SiL	12	20	90+	up to 10	PO / SS	massive	—		—		occasional in fractures	+? / 5.1		fracturing shale
R	24+	fractured bedrock															

Other Notes:

234

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane
Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-235-160607-1135-MEL	Topographic Position:	Ridge Summit	Parent material:	residuum w/ thin colluvial cap
Date:	6/7/16	% Slope:	5%	Slope Aspect:	160°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	23"	Slope Failure or slip:	—
NRCS Soil Unit:	Berks 8D	Bedrock Type :	Shale	Dip Slope & Direction:	— Strike: —
Mineralogy:	mixed	Vegetation:	White Oak, hickory, dogwood, pine		

Horizon	Depth in inches	Matrix Color	Texture Class (USDA)	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/1									SA	—		3FM	0 / 5.5		
AE	2-4	10YR 5/3	GR SiL	15	25	20	1	PO / SO	1FGR	FR	WG	—		3FMC	0.75 / 5.0		
Bw	4-10	10YR 5/6	VGR SiL	15	20	40	1	PO / SO	1MSBK	FR	IC	—		2FMC	0.75 / 4.5		
Cr	10-11	10YR 5/6	XGR SiL	15	20	85	1-3	PO / SO	0massive	FR		—		occasional	[illegible] / 4.5		
R	11-23	fractured shale bedrock															

Other Notes: Did not sample
See P-233-160607-1000-MEL

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TEST PIT DESCRIPTION

Soil Scientist: Michael Lane
Field Assistant: Rachel Hill

Signature: Michael E. L

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-236-160607-1535-MEL	Topographic Position:	Sideslope	Parent material:	Colluvium over residuum
Date:	06/07/16	% Slope:	30	Slope Aspect:	310°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	34	Slope Failure or slip:	—
NRCS Soil Unit:	Berks 8 F	Bedrock Type :	Shale	Dip Slope & Direction:	20° E Strike: 350
Mineralogy:	mixed	Vegetation:	White Pine, Chestnut Oak, Witchhazel, Blueberry, Mountain Laurel		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (Inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/1									SC	—		3FM	0.0 / 4.5	S1	
A	2-4	10YR3/2	GR L	12	40	25	<1	PO / SO	1FGR	FR-VFR	SC	—		2FM	0.25 / 5.0	S2	Some sandstone gravels
Bw	4-14	10YR5/4	GR SiL	15	30	25	1	PO / SO	1MSBK	FR	WG	—		2FMC	0.75 / 5.5	S3	
C	14-35	10YR5/6	VGR SiL	12	30	40	1-3"	PO / SO	0 MASS	FR	WC	—		1M	0.75	S4	
R	25+	fractured shale															

Other Notes:

236

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane
Field Assistant: Rachel Hill
Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-237-160607-1240-MEL	**Topographic Position:**	Sideslope, head of hollow	**Parent material:**	Colluvium		
Date:	6/7/16	**% Slope:**	33%	**Slope Aspect:**	205°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	**Drainage Class:**	WD	**Depth to Water Table:**	—		
RETTEW Job #:	089962000	**Depth to Refusal:**		**Slope Failure or slip:**	—		
NRCS Soil Unit:	Berks 8E	**Bedrock Type :**	—	**Dip Slope & Direction:**	—	**Strike:**	—
Mineralogy:	mixed	**Vegetation:**	White oak, white pine, chestnut oak, hickory				

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
AE	0-2	10YR 4/3	GR SiL	12	25	15	1	PO / SO	1FGR	FR	SC	—		3FM	0.75 / 5.2	S1	then O Horizon <0.5-1
BE	2-8	10YR 5/4	GR SiL	12	25 VC	15	<1	PO / SS	1MSBK	FR	WC	—		3FM	1.25 / 5.5	S2	
Bw	8-15	10YR 5/8	VGR SiL	18	25 VC	40	<0.25	PO / SS	1FSBK	FR	WC	—		2MC	1.25 / 5.0	S3	no clay films
BC	15-35	7.5YR 5/6	VGR SiL	15	25 VC	60	<0.25	PO / SO	1FSBK	FR	WD	—		1M	1.25 / 4.5	S4	
C	35-52	7.5YR 5/6	VGR SiL	15	25 VC	60	up to 1	PO / SO	0 massive	FR		—		1M	— / 4.5	S5	most gravels <0.25

Other Notes: Very coarse sand, very fine & fine gravel affect texture, penetrometer accuracy
Head of hollow - deep colluvium, very gravelly silt loam, wk structural development in transitional horizons, pit dissimilar to adjoining pits

237

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-238-160607-1355-ME	Topographic Position:	sideslope	Parent material:	Colluvium over residuum
Date:	6/7/16	% Slope:	30	Slope Aspect:	320
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	Berks (8F)	Bedrock Type :	Shale	Dip Slope & Direction:	— Strike: —
Mineralogy:	mixed	Vegetation:	witch hazel, pine		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2.5	5YR2.5/1									SC	—		2FM	0 / 6.0		
A	2.5-3.5	10YR3/2	SiL	10	25	<10		PO / SO	1FGR	FR	WC	—		3FM	0.25 / 5.0		
BE	3.5-12	10YR5/4	GR SiL	12	20	15	1	PO / SO	1FSBK	FR	WC	—		2FMC	0.3 / 5.3		
Bw	12-19	10YR5/6	VGR SiL	15	20	40	1+	PO / SS	1MSBK	FR	WC	—		1FM	0.5 / 4.5		
C	19-28	10YR5/8	XGR SiL	12	20	75	up to 6	PO / SO	0 massive	FR		—		[illegible]	too rocky / 4.5		
R	28-50	weathered siltstone										—		occasional	too rocky		

Other Notes:

238

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher
Field Assistant: Max

Signature: Daniel Fenster

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-239-160607-1427-DEF	Topographic Position:	Terrace/~~[illegible]~~ Bench	Parent material:	Alluvium over Colluvium
Date:	6/7/16	% Slope:	10%	Slope Aspect:	163°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:		Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	42" - flagstone	Slope Failure or slip:	—
NRCS Soil Unit:	Berks (8E)	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	Mixed	Vegetation:	Red maple (mostly), witch hazel, white pine, Greenbriar		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-3	10YR 2/1	SiL	18	22	15% CN	<1/2"	PO SO	1fSBK	Fr	AW	—	—	3f 1M	0.25 5.4	S1	Rounded CoF Alluvium Very thin Oe
Bw1	3-14	7.5YR 4/6	SiL	22	22	25% CN	<1/2"	PO SS	1fSBK	Fr	CW	—	—	3fM 1Co	1.25 5.2	S2	Rounded edge CoF Alluvial
2Bw2	14-26	10YR 4/6	CN (SiL)	26	[illegible]	98% CN	<1/4"	PO SS	1fSBK	VFr	AW	—	—	2f 1M	0.75 5.4	S3	Sharp edged CoF Colluvium
3Bw3	26-42+	2.5Y 6/1	VCH SiL	26	14	50% CN	95% <1/2" few flagstone	SP SS	1CoSBK	Fi	—	10YR 5/6	MP	1f	3.5 5.2	S4	Colluvium

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: D Fenstermacher
Field Assistant: Max

Signature: Daniel Fenster

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-239 A-160607-1430-DEF	Topographic Position:	flood plain	Parent material:	Alluvium over colluvium
Date:	6/7/16	% Slope:	2	Slope Aspect:	182°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Moderately Well Drained	Depth to Water Table:	29"
RETTEW Job #:	089962000	Depth to Refusal:	30" - water table	Slope Failure or slip:	—
NRCS Soil Unit:	Berks (3E)	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	Mixed	Vegetation:	Chestnut oak, Red maple, witchhazel, Hickory, White pine, Hop hornbeam		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-1	10YR 2/1	SiL	16	21	15% CH	<2"	— / —	2MGR	VFr	AW	—	—	3FM 1Co	0.25 / 4.6	S1	
Bw1	1-12	10YR 5/4	CN SiL	16	21	30% CN	<4"	PO / SO	1MSBK	Fr	CW	—	—	2C 3M 3Co	0.75 / 5.1	S2	
2Bw2	12-18	10YR 5/4	XCN SiL	22	25	80% GR	<1/4"	PO / SS	1MSBK	VFr	CW	—	—	~~2FM~~ 2FM	1.25 / 5.2	S3	
3Bw3	18-27	10YR 6/4	CN SiL	22	25	30% CN	<2"	SP / SS	1MSBK	Fr	CW	10YR 4/6	CD	2FM	0.5 / 5.4	S4	
4Bw3	27-30+	10YR 6/4	XCN SiL	22	18	70% GN	<4"	SP / SS	1COSBK	Fr	—	2.5Y 5/2 10YR 5/6	CFP CFD	2FM	toomuch / 5.5	S5	Colluvium Cof have Sharp edges

Other Notes: Series of Alluvial materials of Colluvium

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant: Max

Signature: Daniel Fenstermacher

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-240-160607-0932-DEF	Topographic Position:	Backslope/nose	Parent material:	Residuum
Date:	6/7/16	% Slope:	24 24	Slope Aspect:	226°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	29"	Slope Failure or slip:	~~N~~
NRCS Soil Unit:	Berks (8E)	Bedrock Type :	finegrain Sandstone & siltstone	Dip Slope & Direction:	70° SW Strike: 126°
Mineralogy:	Mixed	Vegetation:	Scarlet oak, Blackgum, Am Chestnut, Huckleberry, Mountain Laurel, Witchhazel		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-3	5YR 2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	3f	— / —	—	
A	3-4.5	10YR 3/2	GR SiL	16	15	15% gr	<2"	PO / SO	1FSBK	VFr	AW	—	—	2M 3f 1Co	0 / 4.5	—	
Bw	4.5-20	10YR5/4	VGR SiL	18	16	40% gr	<2"	SP / SS	1MSBK	Fr	CW	—	—	1f 2M 1Co	1.0 / 4.9	—	
Cr	20-29	10YR 5/4	(note) —	—	—	99% CB	2-8"	— / —	OM	—	CW	—	—	1f	— / —	—	
R	29+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes: Cr - Rocks w/ fines in between - bedded

TEST PIT DESCRIPTION

Soil Scientist: D Fenstermacher
Field Assistant: Max

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-241-160607-0926-DEF	Topographic Position:	Ridge Top	Parent material:	Residuum		
Date:	6/7/16	% Slope:	3%	Slope Aspect:	295°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	well	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	19"	Slope Failure or slip:	—		
NRCS Soil Unit:	Berks, 8F	Bedrock Type :	fine grained Sandstone & Shale	Dip Slope & Direction:	31° NE	Strike:	294°
Mineralogy:	mixed	Vegetation:	Chestnut oak, white Pine, white oak, blueberry				

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-15	5YR 2.5/2	—	—	—	—	—	— / —	—	-	AW	—	—	3fM 1Co	— / 4.4	S1	
A	1.5-3.5	10YR4/2	CN SiL	14	18	20% CN	<2"	PO / SO	1fSBK	VFr	AW	—	—	3fM 1Co	0.5 / 4.5	S2	
Bw1	3.5-11	10YR 6/4	V.CN SiL	15	10	38% CN	<2"	SP / SS	1fSBK	Fr	CW	—	—	2f,M 1Co	1.0 / 5.2	S3	
Bw2	11-19	10YR 6/4	XCN SiL	15	10	62% CN	<4"	SP / SS	1MSBK	Fr	AW	—	—	3f 2m	1.25 / 5.2	S4	
R	19+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant: Max

Signature: Daniel Fenstermacher

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-241A 160607-0940-PEF	Topographic Position:	Backslope	Parent material:	Residuum		
Date:	6/7/16	% Slope:	~~52~~ 52	Slope Aspect:	131°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	well	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	30"	Slope Failure or slip:	—		
NRCS Soil Unit:	Berks (8F)	Bedrock Type :	fine grained Sandstone	Dip Slope & Direction:	28° NE	Strike:	322°
Mineralogy:	mixed	Vegetation:	Hickory, Red Oak, Blueberries, Chestnut Oak				

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (Inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-0.5	7.5YR 2.5/1	—	-	-	-	—	— / —	—	-	AW	—	-	3F	— / 4.5	—	
A	0.5-3	10YR3/2	VGR SiL	15	20	38% GR	<1"	PO / SO	2MGR	VFR	AW	—	-	3MF	0 / 4.7	—	
Bw	3-12	7.5YR5/4	VGR SiL	17	18	38% GR	1-2"	SP / SS	1MSBK	FR	CW	—	—	3FM 1Co	0.75 / 5.1	—	
BC	12-30	7.5YR 5/4	VCB SiL	17	16	55% CB	1-6"	SP / SS	1COSBK	FR	AW	—	—	3FM 2Co	1.25 / 5.2	—	
R	30+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-242-160607-0920-DEF	Topographic Position:	Backslope	Parent material:	Colluvium
Date:	6/7/16	% Slope:	18	Slope Aspect:	270°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well Drained	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	Berks (8F)	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	Mixed	Vegetation:	Mountain laurel, white pine, chestnut oak, blackgum, American Chestnut		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR 2.5/1	—	—	—	—	—	— / —	—	—	—	—	—	3f	— / 4.2	S1	
A	2-4	10YR 2/1	GR SiL	16	22	15% GR	< 1/2"	PO / SO	1fSBK	VFr	AW	—	—	3f, M 1Co	0.5 / 4.4	S2	
Bw1	4-17	10YR 6/4	GR SiL	16	18	15% GR	< 1/2"	SP / SS	1fSBK	Fr	CW	—	—	2fM 1Co	1.5 / 4.7	S3	
2Bw2	17-32	7.5YR 5/4	GR SiL	18	18	20% GR	< 1/2"	SP / SS	1MSBK	Fr	CW	—	—	1f 1M	1.75 / 4.8	S4	
2Bw3	32-50+	7.5YR 5/6	GR SiL	18	15	30% Gr	< 1/2"	SP / SS	1MSBK	Fr	—	—	—	1f	1.75 / 4.5	S5	on the firm side of Friable

Other Notes: No Clayfilms or Redox observed. Red siltstone and brown Sandstone and Shale fragments throughout profile

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant:

Signature: Daniel Fenster

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-243-160607-0900	Topographic Position:	Backslope - slight nose	Parent material:	Residuum
Date:	6/7/16	% Slope:	33%	Slope Aspect:	221°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	27"	Slope Failure or slip:	—
NRCS Soil Unit:	Berks 8E	Bedrock Type :	Sandstone-finegrain	Dip Slope & Direction:	23° NE; Strike: 312°
Mineralogy:	mixed	Vegetation:	Chestnut oak, white pine, Blackgum, Blueberry		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR 3/2	—	—	—	—	—	— / —	—	—	AW	—	—	3f	— / —	—	
A	2-2.5	10YR 3/2	SiL	21	18	—	—	PO / SO	2MGR	VFr	AW	—	—	3f 2m	0.25 / —	—	
Bw1	2.5-7	10YR 5/4	CN SiL	23	18	20% CN	<1"	SP / SS	1MSBK	Fr	CW	—	—	2fm 2co 1vco	0.5 / 5.2	—	
Bw2	7-20	7.5YR 5/4	CN SiL	23	18	35% CN	<2"	SP / SS	1MSBK	Fr	CW	—	—	2fm 2co 1vco	0.75 / —	—	Shale CoF
BC	20-27	7.5YR 5/4	XCB SiL	22	20	70% CB	3-8	SP / SS	1GSBK	Fr	AW	—	—	2fm	1.25 / 4.8	—	fine grained Sandstone CoF
R	27+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes: Bedrock is in sheets ~2" thick Dipping into hillside

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher
Field Assistant: Moustafa

Signature: Daniel Fenstermacher

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-249-160607-0910-DEF	Topographic Position:	Backslope	Parent material:	Colluvium over Residuum		
Date:	6/7/16	% Slope:	42	Slope Aspect:	262°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	39	Slope Failure or slip:	—		
NRCS Soil Unit:	Berks (8E)	Bedrock Type :	Shale Bedrock 1/4-1/2" Sheets	Dip Slope & Direction:	15° ENE	Strike:	322°
Mineralogy:	mixed	Vegetation:	Chestnut oak, blackgum, Scarlet oak, Mountain laurel				

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (Inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-3	10YR 2/1	XGR SiL	15	33	70% Gr	<2"	PO / SO	1MGR	VFr	AW	—	—	3f 1M	0.25 / 4.6	S1	
AB	3-8	10YR5/3	XGR SiL	15	28	62% Gr	1/2-2"	PO / SS	1FSBK	VFr	CW	—	—	3f,M 2Co	0.25 / 4.8	S2	Sandstone CoF
2Bw1	8-25	10YR 6/4	CN SiL	15	22	48% CN	<1/2	SP / SS	1MSBK	Fr	CW	—	—	3f 2M 1Co 1VCo	0.75 / 5.2	S3	Shale CoF
2Bw2	25-37	10YR 5/4	CN SiL	17	22	30% CN	<1"	SP / SS	1CoSBK	Fr	CW	—	—	2f 1M	1.25 / 5.0	S4	
2Cr	37-39	10YR 5/4	CN (SiL)	16	14	CN 92%	2-6"	SP / SS	OM	Fr	AS	—	—	1f	— / —	—	
2R	39+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes: Thin Mantle of Colluvium that has been mixed with Residuum in AB horizon
Bedrock Dips Down into hillside

Just some Duff on surface - fairly rocky and No organic layer under Duff/Moss

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-245-160608-0855-DEF	Topographic Position:	Back / slight nose	Parent material:	Residuum		
Date:	6/8/16	% Slope:	33	Slope Aspect:	242°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Somewhat excessively Drained	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	18"	Slope Failure or slip:	—		
NRCS Soil Unit:	Berks (8E)	Bedrock Type :	fine grained sandstone	Dip Slope & Direction:	18° ENE	Strike:	330°
Mineralogy:	mixed	Vegetation:	White Pine, Black oak, Chestnut oak, Blueberries, Pine w/ 3 twisted needles				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1.5	5YR 2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	3f,M	— / 4.5	—	
A	1.5-3.25	10YR 3/1	SiL	15	33	25% GR	< 1"	PO / SO	1fSBK	Fr	AW	—	—	3fM 2co	0.1 / 4.8	—	
Bw	3.25-14	7.5YR 6/4	SiL	16	20	40% GR	< 3"	SP / SS	1fSBK	Fr	CW	—	—	3f 2m	0.75 / 5.4	—	
Cr	14-18	7.5YR 6/4	Cobbles (S.L)	16	20	98% CB	2-10"		OM	Fr	AW	—	—	2f 1M	— / —	—	Bed Rock w/ fines in between.
R	18+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-246-160608-0900-DEF	Topographic Position:	Ridge - shoulder	Parent material:	Residuum		
Date:	6/8/16	% Slope:	~~26~~% Remeasured as Aug 24	Slope Aspect:	168°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	22"	Slope Failure or slip:	—		
NRCS Soil Unit:	Hazleton (51D)	Bedrock Type :	Siltstone	Dip Slope & Direction:	18° NE	Strike:	292°
Mineralogy:	Mixed	Vegetation:	Chestnut oak, hickory White pine, blueberry, grass				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-3.5	10YR3/2	SiL	14	28	45% CN	<1"	PO / SO	2MGR	VFr	AW	—	—	3f 2M	0.25 / 4.4	—	Very thin (≤1/8") and ~~Sparse or~~ Not consistent on surface
Bw	3.5-17	7.5YR5/4	SiL	16	20	85% CN	<1"	PO / SO	1CoSBK	VFr	CW	—	—	3f 2M 1Co,VCo	1.0 / 4.4	—	Shale CoF
Cr	17-22	7.5YR5/4	—	—	—	—	—	— / —	—	—	AW	—	—	1f	— / —	—	Soft Bedded Rock minimal fines btwn
R	22+	—												—	— / —	—	Competent Rock No fines in between

Other Notes: Cr - rips as channers 1/2 - 4"

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher
Field Assistant: Max Dugan

Signature: Daniel Fenstermacher

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-247-160608-0912-DEF	Topographic Position:	Upper Backslope	Parent material:	Colluvium over Residuum
Date:	6/8/16	% Slope:	30	Slope Aspect:	58°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	34"	Slope Failure or slip:	—
NRCS Soil Unit:	Hazleton (50E)	Bedrock Type :	Shale 1/4-1/2 thick Sheets Brown	Dip Slope & Direction:	22° NE Strike: 309°
Mineralogy:	Mixed	Vegetation:	Young Saplings - 80% Redmaple, Redoak, white snake root		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-6	7.5YR 3/3	SiL	16	24	15% GR	< 1/2	PO / SO	1fSBK	VFr	CW	—	—	2f,M 1co	0 / 5.3	S1	No Organic layer Only Thin Duff
Bw1	6-19	5YR 5/4	GR SiL	18	24	15% GR	< 1/2"	SP / SS	1fSBK	VFr	CW	—	—	2f,m 1co	0.5 / 5.2	S2	Red shale and Brown Sandstone CoF
2Bw2	19-28	7.5YR 5/6	XCN SiL	22	18	70% CN	1/2-3"	SP / SS	1VcoSBK	Fr	CW	—	—	2f,m 1m	2.0 / 4.9	S3	CoF oriented w/BR
2Cr	28-34	7.5YR 5/6	CN (SiL)	22	18	90% CN	1/2-5"	— / —	OM	Fr	AW	—	—	1f	~~2~~	—	Mn Concentrations on Rock faces Bedded Shale with fines in between
2R	34+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes: Slightly concave horizontally

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher
Field Assistant: Max Dugan

Signature: David Fenstermacher

20%

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-248-160608-0920a DEF	Topographic Position:	Nose Slope	Parent material:	Residuum
Date:	6/8/16	% Slope:	20%	Slope Aspect:	168°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Somewhat excessively drained	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	17"	Slope Failure or slip:	—
NRCS Soil Unit:	Berks (8D)	Bedrock Type :	Shale 1/4 - 1/2" thick	Dip Slope & Direction:	20° NE; Strike: 301°
Mineralogy:	Mixed	Vegetation:	Chestnut oak, Red Maple, Striped maple, witch hazel, blueberry		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR 2.5/1	—	—	.	—	—	— / —	—	—	AW	—	—	3f 2M	— / 4.7	S1	
A	1-3	10YR 4/2	SiL	16	22	38% GR	<2"	PO / SO	1FSBK	VFr	CW	—	—	3FM 1Co	0.75 / 4.5	S2	some colluvial material Sandstone CoF
BE	3-8	10YR 5/3	SiC	18	14	40% CN	<2"	SP / SS	1MSBK	Fr	CW	—	—	3f 2MCo	1.0 / 4.4	S3	
Bt	8-17	7.5YR 6/6	V.CN SiL	24	10	40% CN	<3"	MP / MS	2MSBK	Fr	AW	—	—	2M,f	1.75 / 4.3	S4	clay films
R	17+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher
Field Assistant: Max Dugan
Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-249-160608-0923	Topographic Position:	Upper Backslope	Parent material:	Colluvium over Residuum
Date:	6/8/16	% Slope:	35%	Slope Aspect:	211°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	50"	Slope Failure or slip:	—
NRCS Soil Unit:	Weikert (89F3)	Bedrock Type :	Shale - Gray	Dip Slope & Direction:	40° NE Strike: 112°
Mineralogy:	Mixed	Vegetation:	Chestnut oak, Black Gum, Mountain laurel, white Pine, Blueberry		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1.5	5YR 2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	3f	— / 4.4	S1	
A	1.5-3	10YR 3/2	SiL	15	23	38% Gr	< 1/2	PG / SO	1MGR	VFR	AW	—	—	3f, M 1Co	0 / 4.5	S2	
AB	3-11	10YR 4/2	SiL	15	20	38% GR	< 4"	PG / SO	1FSBK	VFR	CW	—	—	3M,f 2Co	0.5 / 5.2	S3	
Bw	11-29	10YR 5/4	L	16	38	55% COB	2-10"	PO / SO	1COSBK	Fr	CW	—	—	3M,f	1.25 / 4.6	S4	
2C	29-50	2.5Y 5/2 2.5YR 4/6 (5/3)	SiCL	33	8	35% CH	< 6"	SP / SS	OM	Fi	AW	—	—	3M 2f	1.75 / 4.2	S5	Lithochromic colors
R	50+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane
Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-250-160608-1320-MEL	Topographic Position:	Ridge Summit	Parent material:	Shale Colluvium/Residuum
Date:	6/8/16	% Slope:	8%	Slope Aspect:	180°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	32"	Slope Failure or slip:	—
NRCS Soil Unit:	Berks 8D	Bedrock Type :	Shale	Dip Slope & Direction:	45° N Strike: 285
Mineralogy:	mixed	Vegetation:	Maple, Hickory, Black Locust		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR 2.5/1									SC		—	3FM	0.0 / 4.5		
AE	2-4	10YR 4/3	GR SiL	12	25	25	1	PO / SO	1FGR	FR	WC		—	2FM	0.75 / 5.0		Sandstone c.f.
BE	4-9	10YR 5/4	GR SiL	12	20	25	1	PO / SO	1FSBK	FR	WG		—	3FMC	1.25 / 4.8		
Bw	9-18	10YR 5/6	GR SiL	15	20	30	up to 3	PO / SO	1FSBK	FR	WC		—	3FMC	1.25 / 4.5		
Cr	18-32	10YR 5/6	SiL			75		PO / SO	0 massive	FR			—	Occasional	too rocky / 4.5		Some lithochromic ≤2 chroma SiCL veins along faces
R	32+ bedrock		shale														

Other Notes: Some surface stoniness, sandstone

250

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane
Field Assistant: Rachel Hill
Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-251-160608-1230-MEL	Topographic Position:	Shoulder/Sideslope	Parent material:	colluvium over residuum
Date:	6/8/16	% Slope:	35%	Slope Aspect:	170°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~WD~~ Somewhat Excessively	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	26	Slope Failure or slip:	—
NRCS Soil Unit:	Weikert (89F3)	Bedrock Type :	Fine grained sandstone	Dip Slope & Direction:	— Strike: —
Mineralogy:	mixed	Vegetation:	Red maple chestnut oak, blueberry, white pine		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
O	0-1.5	5YR 2.5/1									WC	—		3FMC	0.0 / 4.5		very thin A Horizon <0.5
BE	1.5-4.5	10YR 5/4	SiL	14	30	<10	1	PO / SO	1MSBK	FR	WC	—		2FMC	1.0 / 5.0		
Bw	4.5-13	10YR 5/6	GR SiL	15	20	20	1+	PO / SO	1MSBK	FR	WC	—		2FMC	1.25 / 5.3		
Cr	13-26	10YR 5/6	XCB SiL	15	20	75	6+	PO / SO	massive			—		1FMC	too rocky / 5.1		
R	26+	fractured sandstone bedrock															

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-252-160608-1452-MEL	Topographic Position:	Ridge Summit	Parent material:	Colluvium over Residuum
Date:	6/8/16	% Slope:	8%	Slope Aspect:	350°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	Berks 8D	Bedrock Type :	Shale	Dip Slope & Direction:	— Strike: —
Mineralogy:	mixed	Vegetation:	Chestnut Oak, Hickory, Mountain Laurel		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
O	0-2	5YR 2.5/1									WC	—		3FM	0.0 / 4.5		
BE	[illegible]-9	10YR 5/4	VGR SiL	12	25	40	<1	PO / SO	1FSBK	FR	WC	—		2FM	1.0 / 4.7		
Bw	[illegible]	10YR 5/6	VGR SiL	15	25	50	up to 3	PO / SO	1MSBK	FR	WC	—		2FMC	1.75 / 4.7		
Cr	[illegible]-50	10YR 5/6	XGR SiL	15	25	70		PO / SO	Massive	FR		—		occassional	too rocky / 4.7		lithochromic <2 chroma
												—					

Other Notes: few surface stones, some sandstone gravels in BE horizon
unable to advance beyond 50" w/ posthole alone
Clean shale faces extending up to 29", few roots, silt loam veins extending to depth

252

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-253-160608-0950-MEL	Topographic Position:	sideslope	Parent material:	Collvium over residuum
Date:	6/8/16	% Slope:	50% F	Slope Aspect:	85° E
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	28"	Slope Failure or slip:	—
NRCS Soil Unit:	Berks 8F	Bedrock Type :	Sandstone	Dip Slope & Direction:	— Strike: —
Mineralogy:	mixed	Vegetation:	Red maple sapling stand		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR 2.5/1									SA			3FM	0 / 5.5	S1	
A	2-4	10YR 3/3	GR L	12	40	20	1	PO SO	FGR	FR	WC			3FM	0.25 / 5.3	S2	
Bw1	4-10	10YR 5/6	VGR SL	15	60	40	1-2	PO SO	1FSBK	FR	WC			2FM	0.25 / 5.5	S3	
Bw2	10-21	10YR 6/6	VCB SL	10	65	75	6-10	PO SO	1FSBK	FR	WC			2FMC	1 / 5.0	S4	
2Cr	21-28	10YR 5/6	XCB SL			90+	6+		Gro-?					[illegible]	too rock		

Other Notes: Some surface stoniness - Few shale ghost fragments in B horizons, Bw2 w/ some pockets of silt loam

253

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: Rachel Hill

Signature:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-254-160608-1050-MEL	Topographic Position:	nose slope	Parent material:	Colluvium over residuum
Date:	6/8/16	% Slope:	30%	Slope Aspect:	130°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	26"	Slope Failure or slip:	—
NRCS Soil Unit:	Berks, 8D	Bedrock Type :	Sandstone	Dip Slope & Direction:	20° SE Strike: 40
Mineralogy:	mixed	Vegetation:	Hickory, red maple saplings		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
O	0-2	5YR 2.5/1								FR	WC	—		2F	0 / 6.7	S1	
A	2-3	10YR 4/3	GR SiL	12	35	20	1	PO / SO	1FGR	FR	WC	—		3FMC	0.5 / 6.1	S2	
Bw1	3-10	10YR 5/6	GR SiL	15	30	30	1	PO / SO	1FSBK	FR	WG	—		3FM	0.5 / 5.2	S3	
Bw2	10-16	10YR 5/6	VGR SiL	12	30	50	3-6	PO / SS	1MSBK	FR	WC	—		2MC	1 / 5.4	S4	
Cr	16-26	10YR 5/6				90			0 massive					occasional	[illegible]		Cobbles 3"-10"+
R	Bedrock fine grained sandstone																

Other Notes:

254

TEST PIT DESCRIPTION

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Soil Scientist: JOHN WAH
Field Assistant: JOHN GALBRAITH
Signature: JSW

Test Pit ID:	P-255-160608-0850-JSW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM OVER RESIDUUM
Date:	6/8/16	% Slope:	43%	Slope Aspect:	50°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	–
RETTEW Job #:	089962000	Depth to Refusal:	40"	Slope Failure or slip:	–
NRCS Soil Unit:	BERKS	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	– Strike: –
Mineralogy:	MIXED	Vegetation:	RED MAPLE, CHESTNUT OAK, HICKORY, WITCHHAZEL, BLACK LOCUST		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-3	5YR2.5/1	–	–	–	–	–	– / –	–	–	AS	–	–	3-VF,F 1-M,C	– / 5.5	–	
A	3-5	10YR4/3	GR SIL	15	30	25 GR	<1	SP / SS	1FGR	VFR	AW	–	–	3-VF,F 2-M	0.25 / 4.5	–	
Bt1	5-14	7.5YR5/6	GR SIL	21	25	30 GR	<1	SP / SS	1MSBK	FR	CW	–	–	3-F 1-M	0.5 / 4.5	–	
Bt2	14-24	7.5YR5/6	VGR L	18	50	50 GR	<1	SP / SS	2MSBK	FR	CW	–	–	1-F 2-M 2-VC	0.5 / 4.5	–	↑ NCOS, COS
Cr	24-40	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	
R	40+	SILTSTONE BEDROCK															

Other Notes: LINEAR-CONCAVE BACKSLOPE

TEST PIT DESCRIPTION

Soil Scientist: JOHN WATT

Field Assistant: JOHN GALBRAITH

Signature: JSW

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-256-160608-0925-JSW	Topographic Position:	SUMMIT	Parent material:	RESIDUUM
Date:	6/8/16	% Slope:	8%	Slope Aspect:	120°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~WELL~~ SOMEWHAT EXCESSIVE	Depth to Water Table:	-
RETTEW Job #:	089962000	Depth to Refusal:	21"	Slope Failure or slip:	-
NRCS Soil Unit:	BERKS	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	- Strike: -
Mineralogy:	MIXED	Vegetation:	HICKORY, CHESTNUT OAK, BLUEBERRY, VA PINE		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR2.5/1	-	-	-	-	-	- / -	-	-	AS	-	-	3-VF 2-F 1-C	- / 4.8	-	
A	1-3	10YR3/3	GR SiL	10	20	15 GR	<1	PO / SO	1FGR	VFR	CW	-	-	3-F 2-M 1-C	0.25 / 4.5	-	
Bw	3-10	10YR5/6	VCH SiL	14	20	55 CH	0.5-2	PO / SO	1MSBK	FR	AW	-	-	2-F,M 1-C	0.50 / 4.5	-	
Cr	10-21	-	-	-	-	-	-	- / -	-	-	-	-	-	-	- / -	-	
R	21+	SILTSTONE BEDROCK															

Other Notes: NARROW SUMMIT, ~2 M TO STEEP BACKSLOPE TO N & S; SILTSTONE ON SUMMIT, SANDSTONE ON BACKSLOPES

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH

Field Assistant: Jonal GALBRAITH

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-257-160608-1040-JSW	Topographic Position:	~~BACKSLOPE~~ Nose slope	Parent material:	RESIDUUM
Date:	6/8/16	% Slope:	27%	Slope Aspect:	270°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVE	Depth to Water Table:	–
RETTEW Job #:	089962000	Depth to Refusal:	27"	Slope Failure or slip:	–
NRCS Soil Unit:	BERKS	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	12 ESE (120°) Strike: 30°
Mineralogy:	MIXED	Vegetation:	HICKORY, CHESTNUT OAK, PITCH PINE, BLACK OAK, BLUEBERRY		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR2.5/1	–	–	–	–	–	– / –	–	–	as	–	–	3-VF,F	– / 4.5	–	
A	1-4	10YR3/2	CH SiL	11	20	25 CH	<1	PO / SO	1MGR	VFR	aw	–	–	3-VF,F 1-M	0.25 / 4.5	–	
Bw	4-7	10YR5/6	VCH SiL	14	18	55 CH	<1	PO / SS	1MSBK	FR	cw	–	–	3-F,M 1-C	0.5 / 4.5	–	
BC	7-27	10YR5/6	XCH SiL	13	20	75 CH	2-4	PO / SS	1MSBK	FR	cw	–	–	2-F,M 2-C,VC	0.5 / 4.5	–	
R	27+	SILT	STONE			BEDROCK											

Other Notes: BACKSLOPE ON SUMMIT, NARROW - FALLING OFF TO STEEP BACKSLOPES TO N & S.

TEST PIT DESCRIPTION

Soil Scientist: John Wah

Field Assistant: John Galbraith

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P258-160608-1051-JSW	Topographic Position:	Linear - Convex Backslope	Parent material:	Siltstone Residuum		
Date:	6-8-16	% Slope:	36%	Slope Aspect:	280°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Excessive	Depth to Water Table:	> 24"		
RETTEW Job #:	089962000	Depth to Refusal:	20"	Slope Failure or slip:	–		
NRCS Soil Unit:	Berks	Bedrock Type :	Siltstone	Dip Slope & Direction:	80% 290°	Strike:	200°
Mineralogy:	Mixed	Vegetation:	Pitch Pine, Scarlet Oak, Black Oak, Hickory, Blueberry				

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR 3/2	hemic	–	–	–	–	– / –	–	–	sa	–	–	–	0 / 4.5		
Oa	1-2	5YR 2.5/1	sapric	–	–	–	–	– / –	–	–	sa	–	–	m, vf-m, f, c	0.25 / 4.5		
A	2-5	10YR 3/2	GR SiL	10	15	15% GR	1/2 - 2	po / so	wk, f, gr	vfr	wc	–	–	m, vf-vc	0.25 / 4.5		
Bw	5-10	10YR 4/6	XCH SiL	14	25	70% XCH	1/2 - 3	po / so	wk, f, sbk	fr	wa	–	–	c, vf-vc	0.25 / 4.5		
Cr	10-19	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	
R	>19	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	

Other Notes: Roots follow vertical bedding planes to 19". No soil material between rock layers in Cr

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH

Field Assistant:

Signature:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-259-160608-1305-JSW	Topographic Position:	SUMMIT	Parent material:	RESIDUUM
Date:	6/8/16	% Slope:	5%	Slope Aspect:	80°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVE	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	17"	Slope Failure or slip:	—
NRCS Soil Unit:	BERKS	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	57%, NNE; Strike: N66W
Mineralogy:	MIXED	Vegetation:	HICKORY, CHESTNUT OAK, WHITE PINE, MAPLE, BLUEBERRY		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/1	—	—	—	—	—	— / —	—	—	AS	—	—	3-VF 2-F	— / 4.5	—	
A	2-3	10YR3/2	GR SIL	12	18	25 GR	<1	PO / SO	1MGR	VFR	AW	—	—	2-VF 1-F	0.25 / 4.5	—	
BW	3-8	10YR5/6	VGR SIL	14	20	55 CH	1	PO / SS	1MSBK	FR	CW	—	—	1-F,M, C	0.5 / 4.5	—	
BC	8-17	10YR5/6	XGR SIL	14	20	85 CH	1-3	PO / SS	1FSBK	FR	CW	—	—	1-F	— / 4.5	—	
R	17+	SILTSTONE BEDROCK															

Other Notes: BEDROCK NEARLY VERTICALLY BEDDED; SANDSTONE FLOATERS ON SURFACE

TEST PIT DESCRIPTION

Soil Scientist: JOHN WATT
Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-260-160609-0845-JSW	Topographic Position:	BACKSLOPE	Parent material:	RESIDUUM
Date:	6/9/16	% Slope:	17%	Slope Aspect:	110°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	EXCESSIVE	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	16"	Slope Failure or slip:	—
NRCS Soil Unit:	BERKS	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	27% SE(130) Strike: 40°
Mineralogy:	MIXED	Vegetation:	HICKORY, CHESTNUT OAK, PIN OAK, VA PINE, BLUEBERRY		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/1	-	-	-	-	-	- / -	-	-	AS	-	-	3-VF 1-M	— / 4.5	-	
A	2-3	10YR3/2	CH SIL	13	19	25 CH	<1	PO / SO	1MGR	VFR	AW	-	-	3-VF 2-F	0.25 / 4.5	-	
Bw	3-8	10YR5/6	VCH SIL	14	22	60 CH	1-2	SO / PO	1MSBK	FR	CW	-	-	2-VF,F 1-M	0.5 / 4.5	-	
Cr	8-16	-	-	-	-	-	-	- / -	-	-	-	-	-	-	- / -	-	
R	16+	SILTSTONE BEDROCK															

Other Notes: 8-25% BACKSLOPE ON NESE OF RIDGE FROM P-259 SUMMIT TO 0-8 SUMMIT BELOW; STEEP BACKSLOPES >25% ~4 M TO N & 5 M TO SOUTH

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-261-160609-0920-JSW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM
Date:	6/9/16	% Slope:	49%	Slope Aspect:	355°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	BERKS	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	MIXED	Vegetation:	HICKORY, MAPLE, WHITE PINE, CHESTNUT, LAUREL, BLUEBERRY		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/1	—	—	—	—	—	— / —	—	—	as	—	—	3-VF, F	— / 4.5	—	
A	2-3	10YR3/1	GR SiL	13	20	20 GR	< 1	PO / SO	1MGR	VFR	aw	—	—	3-VF, F, M	0.25 / —	—	
BE	3-8	10YR5/6	GR SiL	13	22	20 GR	< 1	PO / SS	1MSBK	FR	cw	—	—	3-VF, F 2-M 1-C	0.5 / —	—	
Bt1	8-22	10YR4/6	GR SiL	16	20	17 GR	<1 1-3	PO / SS	2MSBK	FR	cw	—	—	2-F, M 1-C	0.5 / 4.5	—	TN DISCONT. CLAY SKINS
Bt2	22-40	7.5YR4/6	VCH SiL	24	19	50 CH	<1 2-5	SP / SS	2MSBK	FR	cw	—	—	1-F, M, C	0.5 / —	—	CLAY SKINS
Bt3	40-52	7.5YR4/6	XCH SiL	22	20	68 CH	<1 3-6	SP / SS	2FSBK	FR	—	—	—	1-M, C	0.5 / 4.5	—	CLAY SKINS

Other Notes: BACKSLOPE - LINEAR - CONCAVE; SILTSTONE COLLUVIUM TO 22' OVER FINE SANDSTONE COLLUVIUM; LENS OF SANDSTONE FLAGS BEGINNING AT 17"

TEST PIT DESCRIPTION

Soil Scientist: JOHN WASH

Field Assistant:

Signature:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-262-160609-1134-JSW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM OVER RESIDUUM
Date:	6/9/16	% Slope:	48%	Slope Aspect:	178°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	43	Slope Failure or slip:	BENT TREES
NRCS Soil Unit:	BERKS	Bedrock Type :	SANDSTONE	Dip Slope & Direction:	— Strike: —
Mineralogy:	MIXED	Vegetation:	HICKORY, CHESTNUT OAK, MAPLE, RED OAK		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/1	—	—	—	—	—	— / —	—	—	aW	—	—	3-VF 2-F	— / 5.5	S1 A/B	
A	2-4	10YR3/3	GR SiL	13	25	GR 20	< 1	OP / OS	1FSBK		aW	—	—	3-VF,F 1-M	0.25 / 4.5	S2 A/B	
BW	4-13	10YR4/6	VGR SiL	14	28	GR 36	< 1	OP / OS	1MSBK		cW	—	—	2-VF, F, M, C 1-VC	0.5 / 4.5	S3 A/B	
2C	13-26	7.5YR4/6	XF VFSL	8	65	F 78	3-8	OS / OP	OMA		cW	—	—	2-F 1-C	0.25 / 4.5	S4 A/B	LITHOCHROMIC FINES
2Cr	26-43	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —		
2R	43+	SANDSTONE BEDROCK															

Other Notes: LINEAR-CONVEX BACKSLOPE. FINE GRAINED RED SANDSTONE WITH MICA; TWO DARK SANDSTONE - THIN - STRINGERS AT 26"

TEST PIT DESCRIPTION

Soil Scientist: John Wah

Field Assistant:

Signature:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-263-160609-1334-JSW	Topographic Position:	SUMMIT	Parent material:	RESIDUUM
Date:	6/9/16	% Slope:	37%	Slope Aspect:	58°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVE	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	22"	Slope Failure or slip:	—
NRCS Soil Unit:	BERKS	Bedrock Type:	SILTSTONE	Dip Slope & Direction:	90° Strike: 240°
Mineralogy:	MIXED	Vegetation:	CHESTNUT OAK, HICKORY, WHITE PINE, BLUEBERRY, LAUREL		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR2.5/1	—	—	—	—	—	— / —	—	—	AS	—	—	3-VF 2-F	— / 4.5	—	
Bw	1-6	10YR5/6	VGR SiL	11	20	40 GR	< 1	PO / SO	1MSBK	FR	CW	—	—	3-F 1-M	0.5 / 4.5	—	
BC	6-22	10YR5/6	XCH SiL	11	18	70 CH	1-3	PO / SO	OMA	FR	CW	—	—	1-F 1-M	0.5 / —	—	FINES LITHOCHROMIC
R	22+	SILTSTONE BEDROCK															

Other Notes: NARROW SUMMIT/RIDGE CREST; SANDSTONE INCLUSION; VERTICAL BEDDED

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-264-160609-1425-JJW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM OVER RESIDUUM
Date:	6/9/16	% Slope:	26%	Slope Aspect:	336°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	BERKS	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	MIXED	Vegetation:	HICKORY, CHESTNUT OAK, MAPLE, BLUEBERRY, LAUREL		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-3	5YR2.5/1	—	—	—	—	—	— / —	—	—	AS	—	—	3-VF 1-F,M	— / 4.5	—	
BE	3-6	10YR5/6	GR SIL	13	22	15 GR	<1		1MSBK	FR	CW	—	—	2-VF,C 1-C	0.5 / —	—	
Bt1	6-14	10YR4/6	GR SIL	16	20	15 GR	<1	SP / SS	2MSBK	FR	CW	—	—	2-VF 2-C	1.0 / 4.5	—	IN DISCONT. CLAY SKINS
2Bt2	14-23	7.5YR4/6	CH SIL	24	20	25 CH	<1	SP / SS	2MSBK	FR	CW	—	—	2-F,M 1-C	1.0 / —	—	CLAY SKINS
2Bt3	23-31	7.5YR4/6	SICL	29	15	10 CH	<1	SP / SS	2COSBK	FR	CS	—	—	1-F,C VC	1.5 / 4.5	—	CLAY SKINS
2BCt	31-52	7.5YR5/6	SICL	33	10	2 CH	<0.5	MP / SS	1TKPL → 1MSBK		—	—	—	1-VF	2.0 / —	—	LITHOCHROMIC DECAYING SILTSTONE CHIPS CLAY SKINS

Other Notes: BACKSLOPE - LINEAR LINEAR;

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane
Field Assistant: Rachel Hill
Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-265-160609-1040-MEL	Topographic Position:	sideslope	Parent material:	residuum
Date:	6/9/16	% Slope:	55%	Slope Aspect:	130°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	39	Slope Failure or slip:	—
NRCS Soil Unit:	Berks (8F)	Bedrock Type :	Sandstone	Dip Slope & Direction:	— Strike: —
Mineralogy:	mixed	Vegetation:	Chestnut oak, hickory, white oak		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	7.5YR 2.5/1									SA	—		3FM	0 / 4.6	S1	
A	2-3.5	10YR 3/3	CH L	12	50	15	1	PO	1FGR	FR	WC	—		3FM	0.25 / 6.0	S2	
Bw	3.5-13	10YR 5/6	GR FSL	12	55	25	up to 3		1FSBK	FR	WG	—		3FMC	0.25 / 5.4	S3	
Bw2	13-29	10YR 5/6	VCB FSL	10	60	50	6+		1FSBK	FR	WC	—		2FMC	0.75 / 5.5	S4	
Cr	29-39	10YR 5/6	XST FSL			90			1FSBK	FR		—		Occasional C	2+ rock / 5.2		
R	39+	fractured sandstone															

Other Notes:

265

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-266-160609-0950-MEL	Topographic Position:	Ridge Summit	Parent material:	Residuum
Date:	6/9/16	% Slope:	4%	Slope Aspect:	100°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~WD - ED~~ Somewhat excessively	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	20"	Slope Failure or slip:	—
NRCS Soil Unit:	Berks 8D	Bedrock Type :	siltstone/shale	Dip Slope & Direction:	75% + SE Strike: 50°
Mineralogy:	mixed	Vegetation:	red maple, white oak, witchhazel, blueberry, mountain laurel, spruce		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR 2.5/1	—	—	—	—	—	— / —	—	—	—	—		3FM	0 / 4.5		
A	1-2	10YR 3/2	VCH SiL	12	25	35	up to 3	PO / SO	1FGR	FR	SC	—		3F/1C	0.75 / 4.6		A horizon not complete
Bw	2-5	10YR 6/4	VCH SiL	15	20	35	up to 3	PO / SO	1MSBK	FR	BC	—		2F	0.23 / 4.7		
Cr	5-20	10YR 6/4	XCH SiL			70+	6	PO / SO	0 massive	FR	WG	—		Occasional C	too rocky / 4.4		
R		bedrock shale															

Other Notes: Narrow ridgeline sloping to N and S
<12" bedrock Cr

260

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-267-160609-1205-MEL	Topographic Position:	Sideslope convex	Parent material:	residuum
Date:	6/9/16	% Slope:	41%	Slope Aspect:	130
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	31	Slope Failure or slip:	—
NRCS Soil Unit:	Berks 8E	Bedrock Type :	siltstone/shale	Dip Slope & Direction:	30 SW Strike: 65°
Mineralogy:	mixed	Vegetation:	mixed oak, hickory, red maple		

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (Inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	USDA Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR 2.5/1									SC	—		3FM	0.0 / 5.4	|	
A	1-2	10YR 3/3	GR SiL	12	25	20	1	PO / SO	1FGR	FR	WC	—		2FM	0.5 / 5.2	|	silt stone
Bw1	2-8	10YR 5/6	GR SiL	12	20	25	<1	PO / SO	1FSBK	FR	WG	—		3FMC	0.75 / 5.0	|	
Bw2	8-14	10YR 5/8	VCN SiL	12	20	40	1+	PO / SO	1FSBK	FR	WC	—		2FMC	1.0 / 5.0	|	
C	14-21	10YR 5/8	XCN SiL	12	30	70	1-6	PO / SO	massive	FR	WC	—		2M	— / 5.1	|	
Cr	21-31	10YR 5/3	XFL SiL			90+			massive	FR		—		1C	—	|	
R	31+	fractured bedrock															

Other Notes: sideslope w/ tree throws
siltstone in Cr breaking to 6" + ~~flags~~ flags, overlying Bw w/ oriented siltstone c.f.

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane
Field Assistant: Rachel Hill
Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-268-160609-1430-MEL	Topographic Position:	Sideslope	Parent material:	colluvium over residuum
Date:	6/9/16	% Slope:	38%	Slope Aspect:	15°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	27	Slope Failure or slip:	—
NRCS Soil Unit:	Berks (8E)	Bedrock Type :	silt stone	Dip Slope & Direction:	— Strike: —
Mineralogy:	mixed	Vegetation:	witch hazel, red maple		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR 2.5/1									SC	—		3FM	0 / 4.7		
A	2-3	10YR 3/2	GR SiL	15	25	15	1	PO SO	1FGR	FR	WC	—		3FMC	0.5 / 5.2		some sandstone gravel
Bw1	3-9	10YR 5/6	GR SiL	12	20	15	1	PO SO	1FSBK	FR	WC	—		2FMC	0.75 / 5.1		
Bw2	9-21	10YR 5/8	GR SiL	15	20	30	1+	PO SO	1MSBK	FR	WC	—		1FM	1.25 / 5.0		few stones
2Cr	21-27	10YR 5/6	XCB SiL			90+		—	0 massive			—		[illegible]	too rocky		
2R	27+	fractured bedrock															

Other Notes:

268

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-269-160609-1320-MEL	Topographic Position:	Ridge Summit	Parent material:	residuum
Date:	6/9/16	% Slope:	<3% nearly level	Slope Aspect:	ridge runs E/W slopes N and S
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~WD to~~ ED	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	23"	Slope Failure or slip:	—
NRCS Soil Unit:	Berks 8D	Bedrock Type :	shale/siltstone	Dip Slope & Direction:	35° NE; Strike: 290
Mineralogy:	mixed	Vegetation:	white pine, chestnut oak, witchhazel		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR 2.5/1	—	—	—	—	—	— / —	—	—	SC	—		3FMIC	0.0 / 4.5		
Bw	1-3	10YR 5/6	XGR S.L	15	20	70	<1	PO / SO	VFSBK	FR	WC	—		2FMC	~~0~~1.75 / 4.7		
Cr	3-15	10YR 5/4	—	—	—	90+	—	— / —	0 massive		WG	—		1M	— / —		
R	15+	bedrock															

Other Notes: very thin A/AE horizon, 0.25in, broken, 7.5 YR 4/1

269

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: Rachel Hill, De Galbraith

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-270-160610-0915-MEL	Topographic Position:	sideslope	Parent material:	~~[illegible]~~ hard siltstone residuum
Date:	6/10/16	% Slope:	52%	Slope Aspect:	180°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~WD to~~ ED	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	12	Slope Failure or slip:	—
NRCS Soil Unit:	Berks 8F	Bedrock Type :	Hard siltstone	Dip Slope & Direction:	35% NE; Strike: 323°
Mineralogy:	mixed	Vegetation:	Chestnut Oak, Red Maple, Serviceberry		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR 2.5/1	hemic	—	—	—	—	— / —	—	—	SC	—		m3F c2MC	0.0 / 4.5	|	
A	1-2	10YR 3/2	SiL	12	25	40		PO / SO	1FGR	FR	SC	—		3FM 2C	0.25 / 5	|	
Bw	2-4.5	10YR 5/4	VGR SiL	15	10	40	1	PO / SO	1FSBK	FR	WC	—		2FMC	0.75 / 5.5	|	
C	4.5-15	10YR 5/6	XCB L	17	40	75	up to 10	SP / SS	0 massive	FR	WC	—		1MC	rocky / 5.3	|	
Cr	15-21	—	—	—	—	—	—	— / —	—			—		Occasional	— / —	|	
R	21+	siltstone bedrock															

Other Notes: sandstone outcrop above
head of concave slope, near ridge summit

270

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: Rachel Hill, Dr. Galbraith

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-271-160610-1105-MEL	Topographic Position:	Sideslope	Parent material:	siltstone colluvium over residuum
Date:	6/10/16	% Slope:	20%	Slope Aspect:	120°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	24	Slope Failure or slip:	—
NRCS Soil Unit:	Berks 8D	Bedrock Type :	Siltstone	Dip Slope & Direction:	35 N; Strike: 283
Mineralogy:	mixed	Vegetation:	red maple, striped maple, grape		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR 2.5/1	—	—	—	—	—	— / —	—	—	CS	—		3FM 1C	0.0 / 4.7	S1	
A	1-3	10YR 3/2	GR SiL	10	10	15	<1	PO / SO	1FGR	FR	GW	—		3FM	0.25 / 5.1	S2	
Bw1	3-9	10YR 5/4	SiL	15	10	<10	1	SP / SS	2FSBK	FR	GW	—		1FM	1.25 / 5.3	S3	
Bw2	9-24	10YR 5/6	VGR SiL	20	15	60	0.5-3	SP / SS	2FSBK	FR		—		1FM	too rocky / 5.2	S4	
R	24+	bedrock			siltstone												

Other Notes: bench, possible log landing area

271

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: Rachel Hill
Dr. Galbraith

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-272-160610-1210-MEL	Topographic Position:	sideslope	Parent material:	colluvium over Residuum
Date:	6/10/16	% Slope:	55%	Slope Aspect:	10°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	>40"
RETTEW Job #:	089962000	Depth to Refusal:	33	Slope Failure or slip:	—
NRCS Soil Unit:	Berks 8E	Bedrock Type :	Siltstone	Dip Slope & Direction:	82%, 30° Strike: 300°
Mineralogy:	mixed	Vegetation:	Mtn. laurel, chestnut oak, service berry, white pine, witch hazel, red [illegible]		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1.5	5YR 2.5/1	humic	—	—	—	—	— / —	—	—	AS	—		3VF-C	0.0 / 4.3	—	
A	1.5-2	10YR 3/2	GR [illegible]	8	10	15	<1	PO / SO	2FGR	VFR	AS	—		3VF-C	0.0 / 4.4	—	
Bw1	2-12	10YR 5/4	GR SiL	12	10	25	up to 1.5	SP / SO	2FSBK	VFR	WC	—		2VF-F 3M-VC	1.0 / 5.2	—	
Bw2	12-20	10YR 5/6	VCN SiL	17	15	55	up to 3	SP / SS	1MSBK	FR	WC	—		3VF-VC	1.2 / 5.0	—	
2BC	20-43	10YR 5/4	XCN SiL	20	20	85	up to 6	SP / SS	1MSBK	FR		—		1VF-F 2M-C	1.0	—	
2 Cr	43-52	—	—	—	—	—	—		—		—	—	—	—			
2 R	52	—	—	—	—	—	—		—	—	—						

Other Notes: evidence of pan - i.e. Highly fractured siltstone almost vertical, so a deeper pit. No soil between fragments in Cr or R.

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane
Field Assistant: Rachel Hill
Dr. Galbraith

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-273-160610-1300-MEL	Topographic Position:	sideslope, convex noseslope	Parent material:	Colluvium over residuum		
Date:	6/10/16	% Slope:	28%	Slope Aspect:	170°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~WD to ED~~ Somewhat excessively	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	21	Slope Failure or slip:	—		
NRCS Soil Unit:	Berks	Bedrock Type :	siltstone	Dip Slope & Direction:	22° NE	Strike:	330
Mineralogy:	mixed	Vegetation:	hickory, chestnut oak				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1.5	5YR 2.5/1	—	—	—	—	—	— / —	—		SC			3FM	0.0 / 4.4		
AB	1.5-3	10YR 4/3	GR SiL	12	35	25	<0.5	PO / SO	1FSBK	FR	WC			3FM	0.5 / 4.6		
Bw	3-8	10YR 5/6	VGR SiL	16	25	35	1	PO / SO	1FSBK	FR	WC			3FML	1-25 / 4.8		
2C	8-15	10YR 5/6	XGR SiL	15	30	70	up to 1	PO / SO	0 massive	FR	WC			2FML	rocky / 4.8		
2Cr	15-21	—	—	—	—	—	—	— / —	—	—				Occasional			
2R	21+	bedrock			siltstone												

Other Notes:

273

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-274-160610-1210-JSW	Topographic Position:	SUMMIT	Parent material:	RESIDUUM		
Date:	6/10/16	% Slope:	47.	Slope Aspect:	74°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~SOMEWHAT~~ EXCESSIVE	Depth to Water Table:	–		
RETTEW Job #:	089962000	Depth to Refusal:	32	Slope Failure or slip:	–		
NRCS Soil Unit:	BERKS	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	–	Strike:	–
Mineralogy:	MIXED	Vegetation:	CHESTNUT OAK, HICKORY, WHITE PINE, BLUEBERRY, MAPLE				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	–	.	–	–	–	–	– / –	–	–	aS	–	–	2-VF,F	– / 4.5	–	
A	2-3	10YR3/1	CH SiL	11	15	18 CH	<1		1MGR	VFR	CW	–	–	1-VF,F,M	0 / 4.5	–	
Bw	3-11	10YR5/6	VCH SiL	14	18	60 CH	1-3		1FSBK	FR	CW	–	–	2-M	3.0 / 4.5	–	
Cr	11-32	–	–	–	–	–	–	. / –	–	–	–	–	–	.	. / –	–	
R	32+	SILTSTONE BEDROCK															

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAN
Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-275-160610-1046-JSW	Topographic Position:	BACKSLOPE	Parent material:	RESIDUUM
Date:	6/10/16	% Slope:	67%	Slope Aspect:	74°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	30"	Slope Failure or slip:	BENT TREES
NRCS Soil Unit:	BERKS	Bedrock Type:	SANDSTONE	Dip Slope & Direction:	22% S (100°) Strike: 10°
Mineralogy:	MIXED	Vegetation:	HICKORY, FEW WHITE OAK & BLUEBERRY		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-3	5YR2.5/1	—	—	—	—	—	— / —	—	—	AS	—	—	2-VF 1-F	— / 7.0	—	
A	3-6	5YR3/3	VGR L	13	40	35 GR	<1	SO / PO	1MGR	FR	GW	—	—	3-F 1-VF,M,C	0 / 5.0	—	
Bt	6-16	5YR5/6	VGR SL	17	65	60 GR	<1	SS / PO	1FSBK	FR	CW	—	—	2-F,C	0.75 / 4.5	—	TN CLAY SKINS
BC	16-30	5YR5/6	XCH SL	15	68	90 CH	1-3	SO / PO	OMA	FR	CW	—	—	1-VF	1.0 / 4.5	—	
R	30+	SANDSTONE BEDROCK															

Other Notes: STEEP LINEAR BACKSLOPE (APPROACING LINEAR CONVEX

TEST PIT DESCRIPTION

Soil Scientist: JOSHUA WALL
Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-276-160610-0838-JSW	Topographic Position:	FLOODPLAIN	Parent material:	ALLUVIUM/COLLUVIUM
Date:	6/10/16	% Slope:	42	Slope Aspect:	183°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	41"
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	CRAIGSVILLE	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	MIXED	Vegetation:	MAPLE, BEECH, CHESTNUT OAK, LEATHERWOOD FERN, MAYAPPLE		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-3	5YR2.5/1	—	—	—	—	—	— / —	—	—	CW	—	—	3-VF,F,M	— / 4.5	S1 A/B	
A	3-6	10YR3/1	VGR SIL	7	26	35 GR 20 CB	<1 4-6	PO / SO	1FGR	VFR	CW	—	—	3-VF,F,M 2-C 1-VC	0.25 / 4.5	S2 A/B	
Bw1	6-15	7.5YR3/4	XGR SL	6	72	40 GR 25 CB	<1 4-6	PO / SO	1FSBK	VFR	CW	—	—	3-F,M 2-C 1-VF,VC	0.25 / 5.5	S3 A/B	
Bw2	15-26	7.5YR3/3	XGR SL	14	70	40 GR 40 CBFL	<1 4-8	PO / SO	1FSBK	FR	CS	—	—	3-F,M 1-C	0.25 / 5.5	S4 A/B	
C	26-41	7.5YR3/3	XGR LS	5	88	60 GR 30 CB	<1 4-6	PO / SO	OSG	—	—	—	—	2-F,M 1-C	Ø / 5.5	S5 A/B	

Other Notes: 5 M SW OF STREAM, 12 M NE OF STEEP BACKSLOPE; MULTIPLE CHANNELS; 0.75 M ABOVE STREAM; SUBROUNDED SANDSTONE & CONGLOMERATE COBBLES AND STONES ON SURFACE; VERY COARSE ALLUVIUM/COLLUVIUM IN NARROW, STEEP SIDED STREAM VALLEY

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio
Field Assistant: Dave Skippon
Signature: S Dad

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P277-160610-0841-sdd	Topographic Position:	footslope	Parent material:	colluvium /all
Date:	06/10/16	% Slope:	6%	Slope Aspect:	260
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SWP	Depth to Water Table:	8 - redox chroma 2
RETTEW Job #:	089962000	Depth to Refusal:	43 - large stones	Slope Failure or slip:	N/A
NRCS Soil Unit:	Monongahela	Bedrock Type :	sandstone	Dip Slope & Direction:	– Strike: –
Mineralogy:	Mixed	Vegetation:	tulip poplar, scarlet oak, locust, red maple		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	3	7.5YR 4/3	Sil	16	25	gr 20	1-6	PS / SS	1 m gr	fr	aw	–	–	cf cM	1.0 / 5.25	S1	
Bt1	8	7.5YR 5/6	Sil	24	8	gr 20	2-4	PM / SS	1 mpl	fi	cw	–	–	f f	.75 / 5.25	S2	
Btx	20	7.5YR 5/6	Sil	24	8	gr 20	2-4	PM / SS	2 m pl	vfr	aw	7.5YR 4/2 7.5YR 5/8	cmd cmf	–	>4.25 / 5.25	S3	
2Bt1	36	5YR 5/6	Sicl	30	12	ch 65	2-10	PM / SM	1 msbk	fi	aw	10YR 7/1	mmp	f c	1.25 / 5.25	S4	coll
3BC2	43	10YR 4/6	Sicl	32		75 gr	<.5	PM / SM	1 f sbk	fr	–	–	–	–	1.0 / 3.5	S5	all

Other Notes: fragiaquic subgroup

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio

Field Assistant: Dave Skippon

Signature: S Dadio

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P278-160610-1143-sdd	Topographic Position:	shoulder	Parent material:	residuum
Date:	06/10/16	% Slope:	8	Slope Aspect:	180
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~SED~~ Excessively	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	–	Slope Failure or slip:	N/A
NRCS Soil Unit:	Berks	Bedrock Type :	siltstone	Dip Slope & Direction:	25° W; Strike: 225
Mineralogy:	Mixed	Vegetation:	scarlet oak, red maple, chestnut oak, mountain laurel		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	2	5YR 2.5/1	–	–	–	30 ch	1-4	– / –	–	–	aw	–	–	CF CM CC	<.25 / 4.25	S1	
A	3	10YR 2/1	sil	16	25	ch 30	1-4	PS / SS	1fgr	vfr	aw	–	–	CM CC	1.0 / 4.25	S2	
Bw	9	10YR 6/6	sil	24	10	ch 40	1-4	PS / SM	1msbk	fr	aw	–	–	CC	2.75 / 4.5	S3	
Cr	50																

Other Notes: 5YR 5/4 color of siltstone paralithic rocks

TEST PIT DESCRIPTION

Soil Scientist: Duane Truax

Field Assistant: Taylor Walter

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P279-160610-1359-DAT	Topographic Position:	Floodplain	Parent material:	Alluvium
Date:	06-10-20	% Slope:	5%	Slope Aspect:	220° SW
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well Drained	Depth to Water Table:	>50"
RETTEW Job #:	089962000	Depth to Refusal:	N/A	Slope Failure or slip:	N/A
NRCS Soil Unit:	Craigsville sandy loam	Bedrock Type :	N/A	Dip Slope & Direction:	N/A Strike: N/A
Mineralogy:	siliceous	Vegetation:	Hemlock, White Pine, White Oak, Red Maple, Sycamore		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-0.5	5YR 2.5/1	–	–	–	–	–	– / –	–	–	SA	–	–	–	– / 4.5	S-1A / S-1B	
A	0.5-4	5YR 3/1	l	8	43	GR 10%	0.25-2.0	PO / SO	GR 1,3	VFR	SA	–	–	3F 3M 1C	0.25 / 4.25	S-2A / S-2B	
AB	4-7	5YR 4/3	sl	11	55	VGR 50%	0.25-3.0	PO / SO	SBK 1,1	VFRI	SA	–	–	2M 2C	0.5 / 4.5	S-3A / S-3B	
C1	7-18	7.5YR 4/2	S	2	90	GR 15%	0.25-1.0	PO / SO	SG, 0	VL	WA	–	–	2M	0.25 / 4.7	S-4A / S-4B	
C2	18-36	7.5YR 4/2	S	4	91	XGR 65%	0.5-8.0	PO / SO	SG, 0	L	WA	–	–	–	0.25 / 4.5	S-5A / S-5B	
C3	36-50+	7.5YR 4/2	S	5	92	XCOB 85%	0.5-24.0	PO / SO	SG 0	L	–	–	–	–	– / –	–	Observed along stream cut-bank

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Dan Fenstermacher

Field Assistant:

Signature: Daniel Fenk

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-279A-160610-1450-DEF	Topographic Position:	Terrace	Parent material:	Alluvium over Colluvium
Date:	6/10/16	% Slope:	7	Slope Aspect:	213°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Mod. Well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	Monongahela (63B)	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	Mixed	Vegetation:	witch hazel, Red oak, hemlock, Red maple, white pine, Mt laurel		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-2.5	7.5YR 3/2	SiL	18	33	35% CN	<8"	PO SG	2MGR	VFr	AW	—	—	3f,M 2Co	0.25 4.8	S1	
Bw1	2.5-11.5	7.5YR 5/3	SiL	21	29	38% CN	<8"	SP SS	1MSBK	Fr	CW	—	—	2f,M 1Co	0.75 4.7	S2	Rounded Edges on CoF finegrained Sandstone CoF
2Bw2	11.5-36	7.5YR 5/4	SiL	22	27	65% gr	4"-18"	SP SS	1CoSBK	Fr	AW	—	—	2f 1M	1.25 4.6	S3	
3BX	36-50+	7.5YR 5/4	SiL	26	27	20% CN	<3"	MP SS	1VCoPri	Fi	—	7.5YR 6/6 10YR 6/2	CP CP	1f	2.25 4.6	S4	Angular CoF

Other Notes: 3Bx is Colluvium -

TEST PIT DESCRIPTION

Soil Scientist: Steve Dadio
Field Assistant: Dave Skippon
Signature: S Dado

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P279~~0~~-160610-1249-sdd	Topographic Position:	backslope	Parent material:	coll
Date:	06/10/16	% Slope:	21	Slope Aspect:	120
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SWP ~~/ MW~~	Depth to Water Table:	26
RETTEW Job #:	089962000	Depth to Refusal:	–	Slope Failure or slip:	N/A
NRCS Soil Unit:	Berks	Bedrock Type :	siltstone	Dip Slope & Direction:	– Strike: –
Mineralogy:	Mixed	Vegetation:	black oak, red maple, scarlet oak		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	2	7.5YR 2.5/1	–	–	–	20 gr	.5-1	– / –	–	–	aw	–	–	m f, m m, f c	<.25 / 4.25	–	
A	4	10YR 3/2	sil	16	15	20 gr	.5-1	PO / SO	1 f gr	fr	aw	–	–	c f, c m, c c	.5 / 4.25	–	
Bt1	18	10YR 6/4	sil	20	15	15 gr	.5-1	PS / SS	2 m sbk	fr	cw	–	–	c f, c m	1.25 / 4.75	–	
2Bt2	26	7.5YR 6/6	sil	23	10	~~20~~ gr	1-2	PS / SS	2 msbk	fr	cw	5YR 5/8	c m d	c f, c m	2.5 / 4.75	–	red rocks in coll
3Bt3	50+	5YR 5/6	sicl	30	10	25 gr	2-4	PS / SM	2 m sbk	fr, fi	–	7.5YR 6/1, 7.5YR 5/8, 7.5YR 4/4	c m p, c m d, c m d	f f, f c	3.5 / 4.75	–	red rocks in coll

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Duane Truax

Field Assistant: Taylor Walter

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P280-160610-1308-DAT	Topographic Position:	BACKSLOPE	Parent material:	Colluvium / Residuum
Date:	06-10-2016	% Slope:	55%	Slope Aspect:	300° NW
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT EXCESSIVELY	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	24"	Slope Failure or slip:	N/A
NRCS Soil Unit:	Berks channery silt loam	Bedrock Type :	Siltstone	Dip Slope & Direction:	25° Strike: 21
Mineralogy:	Siliceous	Vegetation:	White Pine, Chestnut Oak		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-0.5	7.5YR 2.5/2	–	–	–	–	–	– / –	–	–	SA	–	–	–	– / 4.2	–	
A	0.5-2.5	7.5YR 4/2	l	10	45	CH 25%	0.25-1.0	PO / SO	GR 1,2	VFRI	SA	–	–		0.25 / 4.4	–	
Bw1	2.5-8.0	10YR 5/6	sil	16	35	VCH 40%	0.25-4.0	PO / SO	SBK 1,1	VFRI	SA	–	–		0.75 / 4.5		
Bw2	8.0-19	10YR 5/6	sil	20	31	XCH	0.25 8.0	PO / SO	SBK 1,2	FRI	SA	–	–		1.75 / 4.5		
2C	19-24	10YR 5/6	sil	16	20	XCH 95%	0.5-10.0	PO / SO	M,0	FRI	IA	–	–		– / 4.6		
2R	24+	–	–	–	–	–	–	– / –	–	–	–	–	–	–	– / –	–	Siltstone Bedrock

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Duane Truax

Field Assistant: Taylor Walter

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P281-160610-1144-DHT	Topographic Position:	SUMMIT	Parent material:	Residuum
Date:	06-10-2016	% Slope:	12%	Slope Aspect:	275° W
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SOMEWHAT POORLY DRAINED	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	32"	Slope Failure or slip:	N/A
NRCS Soil Unit:	Berks channery silt loam	Bedrock Type :	Siltstone	Dip Slope & Direction:	18° Strike: [illegible] 23° N
Mineralogy:	siliceous	Vegetation:	White Oak, Chestnut Oak, White Pine, Dogwood, Virginia Pine		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	7.5YR 2.5/2	—	-	-	-	—	- / -	—	—	SA	—	—	—	— / 4.2	S-1A / S-1B	
BE	1-7	10YR 6/4	l	14	38	vcht 40%	0.25-15	PO / SS	SBK 1,1	fr	SA	—	—	2,F 2,m	2.25 / 4.5	S-2A / S-2B	
Bt1	7-13	10YR 6/6	sil	26	22	xcht 60%	0.25-3.0	PS / SS	SBK 1,2	fr	SA	—	—	1F 2,m	2.75 / 4.7	S-3A / S-3B	
Bt2	13-18	10YR 6/6	sil	21	27	xcht 80%	0.25-4.0	PO / SO	SBK 1,2	fr	SA	D: 10YR 6/3 C: 7.5YR 4/6	D: c 1 C: c 1	1,F	3.75 / 4.7	S-4A / S-4B	
Cr	18-32	—	-	-	-	-	—	- / -	—	—	SA	—	—	—	— / —	—	saprolitic siltstone
R	32+	—	-	-	-	-	-	- / -	—	-	-	—	—	—	— / —	-	siltstone

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Duane Truax

Field Assistant: Taylor Walter

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P282-160610-0839-DAT	Topographic Position:	TOESLOPE	Parent material:	Colluvium / Residuum
Date:	06-10-2016	% Slope:	32°	Slope Aspect:	113° E
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well drained	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	64"	Slope Failure or slip:	N/A
NRCS Soil Unit:	Berks Channery silt loam	Bedrock Type :	Sandstone	Dip Slope & Direction:	26° — Strike: 321° NW
Mineralogy:	Siliceous	Vegetation:	Red Maple, Scarlett Oak, Chestnut Oak, White Oak, Black Gum		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR 2.5/2	–	–	-	–	–	– / –	–	–	SA	–	–	–	/ 5.4	S-1A / S-1B	
A	1-3	7.5YR 4/2	l	12	45	GR 20%	0.25- 0.5	PO / SO	GR 1,3	VFRI	SA	–	–	2F 2F	0.5 / 4.9	S-2A / S-2B	
BE	3-9	7.5YR 5/6	l	21	51	CH 15%	0.25- 1.5	PO / SO	SBK 1,1	VFRI	SA	–	–	2F 1C 1M	2.0 / 4.5	S-3A / S-3B	
Bt1	9-16	5YR 5/6	sl	25	60	VCH 35%	0.25- 2.0	PS / SO	SBK 1,2	FRI	SA	–	–	1F 1,M 1,C	2.5 / 4.6	S-4A / S-4B	clay skins
Bt2	16-27	5YR 5/6	scl	29	56	VCH 40%	0.25- 3.0	PS / SS	SBK 1,3	FRI	SA	–	–	1F 1M	3.25 / 4.7	S-5A / S-5B	clay skins
Bt3	27-44	7.5YR 5/6	cl	35	44	VCH 35%	0.25- 3.0	PM / SS	SBK 1,3	FRI	SA	–	–	1F	3.5 / 4.5	S-6A / S-6B	clay skins
BC	44-51	7.5YR 5/6	scl	30	50	CH 20%	0.25- 2.0	PS / SS	SBK 1,3	FRI	SA	–	–	1F	1.5 / 5.2	S-7A / S-7B	no clay skins
2C	51-64	7.5YR 5/6	sl	23	55	XCH 85%	0.25- 6.0	PO / SO	SBK 1,2	VFRI	SA	–	–	–	2.0 / 5.2	S-8A / S-8B	bedding planes

Other Notes: R 64+ Sandstone Bedrock

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant: Taylor Walter

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Headslope

Test Pit ID:	P-283-160606-0743-DFF	Topographic Position:	Footslope/Backslope	Parent material:	colluvium
Date:	6/6/16	% Slope:	32%	Slope Aspect:	351°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Moderately well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	Weikert (89F3)	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	Mixed	Vegetation:	Chestnut oak, witch hazel, Red oak, red maple, Rhododendron		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-0.5	7.5YR 2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	3fM	— / 5.2	S1	
A	0.5-4.5	10YR 4/3	CN S.L	16	16	25% CN	<1/2	SS / SP	1MSBK	VFr	AW	—	—	3f 3M 1Co	1.0 / 4.7	S2	
Bw	4.5-16	7.5YR 6/4	VCN S.L	16	16	40% CN	<1/2"	SS / SP	1MSBK	VFr	CW	—	—	3f 2M 1Co	1.0 / 4.7	S3	Red & Brown Shale CoF
2C1	16-33	7.5YR 5/4	ExCN S.L	18	21	90% CN	<1/2"	SS / PO	1MSBK	Fr	CS	—	—	3f 2M	1.25 / 4.5	S4	
3C2	33-44	7.5YR 5/4	V.CN S.L	16	22	60% CN	<1/2"	SS / SP	2MSBK	Fr	CW	10YR 7/2 7.5YR 5/8	CMP CMD	1f	1.75 / 4.5	S5	Red Shale & [illegible] Shale CoF
4C3	44-50+	7.5YR 5/4	Channery (Si.L)	16	22	95% CN	<1/2"	SS / PO	1MSBK	VFr	—	—	—	1f	1.75 / 4.8	S6	

Other Notes: Horizontally flat area on a slope in a gulley bottom

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant: Tayler Walter

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-284-160606-0748-DEF	Topographic Position:	Backslope	Parent material:	thin Colluvium over residuum
Date:	6/6/16	% Slope:	55%	Slope Aspect:	355°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	36	Slope Failure or slip:	—
NRCS Soil Unit:	Bucks (8F	Bedrock Type:	Shale & siltstone	Dip Slope & Direction:	40° S; Strike: 73°
Mineralogy:	Mixed	Vegetation:	Chestnut oak, Red oak, Rhododendron, Blueberry, St. pedgrape		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2.5	7.5YR 2.5/1	—	—	—	—	—	— / —	—	-	AW	—	—	3f	— / 4.2	S1	
A	2.5-4	10YR 4/3	CN SiL	15	25	20% gr	<1/4	PO / SO	1fSBK	VFr	AW	—	—	3f 2m	0.25 / 4.3	S2	Colluvium Red CCF.
2Bw1	4-16	7.5YR 6/4	CN SiL	17	25	30% gr	<1/2"	SP / SS	1MSBK	Fr	CW	-	-	2fm 1Co	0.5 / 5.4	S3	Residuum
2Bw2	16-25	7.5YR 5/6	VCH SiL	17	25	50% gr	<3"	SP / SS	1MSBK	Fr	CW	-	-	2fM 1Co	1.0 / 5.4	S4	
2Cr	25-34	7.5YR 5/6	Cobbly	-	-	98% cob	2-6"	— / —	OM	-	CS	-	-	1f	- / -	—	
3R	34-36	tan Shale						— / —	—	—	AS	-	-	—	- / -	—	
4R	36+	light Brown Siltstone						- / -	—	-	—	-	—		- / —	—	

Other Notes: Thin colluvial mantle over residuum

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher
Field Assistant: Tayler Walter

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-285-160606-0757-DEF	Topographic Position:	Ridge top	Parent material:	Residuum over Residuum		
Date:	6/6/16	% Slope:	7	Slope Aspect:	4°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	well	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	37	Slope Failure or slip:	—		
NRCS Soil Unit:	Berks 8D	Bedrock Type :	Siltstone - lightcolor	Dip Slope & Direction:	27° S	Strike:	73°
Mineralogy:	Mixed	Vegetation:	Chestnut oak, white oak, white pine, blueberry				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	7.5YR 2.5/1	—	—	—	—	—	— / —	—	—	—	—	—	3f 2m	— / 4.5	S1	
A	1-2.5	10YR 4/2	SiL	14	28	10% gr	<1"	PO / SO	1fSBk	Fr	AW	—	-	3f 2m	0.25 / 4.5	S2	
Bt1	2.5-12	10YR 6/4	CN SiL	16	20	15% gr	<1"	SS / SP	1MSBk	Fr	CW	—	—	3f 2m 1co	1.0 / 5.5	S3	
2Bt2	12-23	7.5YR 6/6	CN SiCL	33	12	30% gr	<1/2"	SP / SS	2MSBk	Fr	CW	—	-	2f 1m 1co	1.75 / 6.5	S4	Clay films Red shale CoF
3Bt3	23-34	10YR 6/4, 2.5Y 7/1, 7.5YR 5/6	SiCL	36	5	—	—	MP / MS	3MSBk	Fi	CW	—	—	1f 1m	3.5 / 6.5	S5	Clay films
3Cr	34-37	10YR 6/4, 10YR 5/6, 2.5Y 7/1	SiL	25	4	—	—	PO / SS	0M	Fr	CW	—	—	—	— / —	—	weathered siltstone Rock structure but Soft enough to break by hand
3R	37+	—	—	—	—	—	-	- / -	—	—	-	-	-	—	— / —	—	

Other Notes: Cr - very soft rocks - completely breakdown into fines w/o coarse fragments with 3 lithochromic matrix colors.

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant: Taylor Walter

Signature: Daniel Fenstermacher

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-286-160606-0808-DEF	Topographic Position:	upper back/headslope	Parent material:	Colluvium
Date:	6/6/16	% Slope:	24%	Slope Aspect:	239°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	Berks (BE)	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	Mixed	Vegetation:	Blackgum, whitepine, Redoak, Rhododendron, Blueberry		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	0-1.5	5YR 2.5/1	—	—	—	—	—	— / —	—	—	CW	—	—	3f 2M	— / 4.2	S1	Broken 10YR 4/1 very thin AE underlying too thin 2/4"
Bw1	1.5-19	10YR 3/4	CN SiL	15	10	15% CN	<1"	PO / SO	1FSBK	VFr	CW	—	—	3f 2m 1Co	0.25 / 5.2	S2	Red fine sandstone and brown shale CoF oriented different direction
Bw2	19-28	10YR 5/4	CN SiL	17	12	29% CN	<1"	PO / SS	1MSBK	Fr	CW	—	—	2f 1M	1.5 / 4.8	S3	No Clay films
2BC	28-50+	7.5YR 5/6 10YR 6/3	V.CN SiL	18	12	40% CN	<3"	SP / SS	1CoSBK	Fr	—	—	—	1f	1.5 / 4.8	S4	Lithochromic colors CoF - randomly oriented

Other Notes: Colluvi

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant: Taylor Walter

Signature: Paul Fenst[illegible]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-287-160606-0825-DEF	Topographic Position:	Ridge Shoulder	Parent material:	Residuum over Residuum
Date:	6/6/16	% Slope:	24%	Slope Aspect:	10°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	39	Slope Failure or slip:	—
NRCS Soil Unit:	Berks (8D)	Bedrock Type :	Siltstone	Dip Slope & Direction:	98° SSW Strike: 80°
Mineralogy:	Mixed	Vegetation:	Chestnut oak, Black gum, white Pine, Blueberry, Rhododendron		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2.5	5YR 2.5/1	—	—	—	—	—	— / —	—	—	—	—	—	3f	— / —	—	Thin Oa underneath 10YR 5/1 Broken E under <1/4"
Bw	2.5-15	10YR 6/4	CN SiL	16	15	15% CN	<1"	PO / SO	1FSBK	Fr	CS	—	—	2f,M 1Co	0.5 / 4.5	—	
Bw2	15-29	7.5YR 6/4	V.CN SiL	18	14	38% CN	<2"	SS / SP	1MSBK	Fr	CW	—	—	2f,M	0.75 / 4.5	—	CoF oriented w/ Bedrock Reder fine Sandstone
2BC	29-39	10YR 6/4	XCN SiCL	32	10	75% CN	2-6"	SS / SP	1COSBK	Fr	CW	—	—	2f 1M	— / —	—	
2R	39+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes: water at 38" in hole resultant from recent rainfall, No redox present

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant: taylor walter

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-288-160606-1433-DEF	Topographic Position:	Shoulder	Parent material:	Residuum
Date:	6/6/16	% Slope:	25-40	Slope Aspect:	172°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	32"	Slope Failure or slip:	—
NRCS Soil Unit:	Berks 8D	Bedrock Type :	fine grained Sandstone	Dip Slope & Direction:	22° S Strike: 61°
Mineralogy:	Mixed	Vegetation:	Red oak, chestnut oak, red maple, white pine, mountain laurel, blueberry (from photos)		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR 2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	3f	/ 4.3	S1	
A	2-5.5	10YR 4/3	CN SiL	15	15	20% CN	<2"	PO / SO	1FSBK	VFr	AW	—	—	3f 3M 1Co	0.25 / 4.5	S2	
Bw1	5.5-22	10YR 6/4	V.CB SiL	16	14	40% CB	2-8"	PO / SO	1MSBK	Fr	CW	—	—	3f 2M	0.75 / 4.4	S3	
2BC	22-32	7.5YR 6/6	V.CB SiL	25	12	45% CB	2-8"	SP / SS	1CoSBK	Fr	CW	—	—	2f 1M	1.75 / 4.4	S4	White siltstone CoF - soft mostly Sandstone CoF
2R	32+																

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-289-160606-1540-MEL	Topographic Position:	Sideslope	Parent material:	Colluvium over Residuum
Date:	6/6/16	% Slope:	40 % +	Slope Aspect:	270
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	27"	Slope Failure or slip:	—
NRCS Soil Unit:	Berks 8E	Bedrock Type:	siltstone	Dip Slope & Direction:	25° S; Strike: 100°
Mineralogy:	mixed	Vegetation:	chestnut oak, white oak, mtn laurel, white pine, hickory		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-1	10YR 3/3	GR SiL	10	25	15	0.5	PO / SO	1FGR	FR	WC	—	—	3FM	0.25 / 5.0		thin O horizon < 0.5 in
Bw1	1-9	10YR 5/6	GR SiL	12	25	15	0.5	PO / SO	1FSBK	FR	WG	—	—	3FM	0.5 / 5.2		
Bw2	9-16	10YR 5/8	GR SiL	12	30	20	1	PO / SS	1MSBK	FR	WG	—	—	3FMC	0.75 / 5.0		
2C	16-21	10YR 5/8	VGR SiL	15	30	50	1	SP / SS	0 massive	FR	WC	—	—	2M	too rocky / 5.0		
R	21-27	Bedrock															

Other Notes: Steep sideslope increasing to F slopes

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TEST PIT DESCRIPTION

Soil Scientist: Michael Lane
Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-290-160606-1445-MEL	Topographic Position:	Ridge/sideslope	Parent material:	Colluvium over Residuum
Date:	6/6/16	% Slope:	11	Slope Aspect:	270
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	>50"	Slope Failure or slip:	—
NRCS Soil Unit:	Berks 8D	Bedrock Type:	Sandstone	Dip Slope & Direction:	— Strike: —
Mineralogy:	mixed	Vegetation:	mtn laurel, white oak, chestnut oak, white pine		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR 2.5/1	—	—	—	—	—	— / —	—	—	SC	—	—	3FM	0.25 / 4.0	S1	
A	2-3.5	10YR 3/3	GR SL	15	60	15	<1	PO / SO	1FGR	VFR	WC	—	—	3FMC	0.5 / 4.5	S2	
BE	3.5-10	10YR 5/4	GR FSL	12	65	15	1	PO / SO	1FSBK	VFR	WG	—	—	3FMC	0.5 / 5.5	S3	
Bw	10-21	10YR 5/6	VGR FSL	15	65	40	1	SP / SO	1MSBK	VFR	WG	—	—	2MC	0.75 / 5	S4	
C	21-39	10YR 5/6	XGR FSL	10	60	70	1	PO / SO	0.[illegible]	FR	WC	—	—	2M			dusky red [illegible]
CR	39-50	fractured fine grain sandstone															

Other Notes:

290

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: Rachel Hill

Signature:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-291-160606-1330-MEL	Topographic Position:	Summit	Parent material:	Colluvium over Residuum		
Date:	6/6/16	% Slope:	7%	Slope Aspect:	215°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	40 (pinacle 35")	Slope Failure or slip:	no		
NRCS Soil Unit:	Berks 8D	Bedrock Type :	Silt Stone	Dip Slope & Direction:	45° SE	Strike:	250°
Mineralogy:	mixed	Vegetation:	Chestnut oak, scarlet oak, white pine, red maple, privet				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-1.5	10YR 3/2	GR SiL	15	15	15	1	PO / SO	1MGR	FR	SC			2FM	0.5 / 5.0	S1	thin O Horizon <0.5"
BE	1.5-7	10YR 5/4	GR SiL	18	15	25	>1	SP / SS	1FSBK	FR	WG			3FMC	1.5 / 4.7	S2	
Bt	7-18	10YR 5/6	GR SiCL	30	15	20	1	MP / SS	1MSBK	FR	WG			3FMC	1.5 / 4.5	S3	
2C	18-20	10YR 5/3 7.5YR 5/8	VGR SiCL	30	20	40	1	SP / SS	0massive	FR-FI	IC			2M	1.75 / 4.5	S4	lithichromic
Cr	20-35	10YR 5/3 7.5YR 5/8	XGR SiCL	30	20	80	1	SP / SS	0massive	FI				Occasional			
Bed Rock																	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane
Field Assistant: Rachel Hill
Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-292-160606-1230-MEL	Topographic Position:	sideslope	Parent material:	colluvium over residuum
Date:	6/6/16	% Slope:	35%	Slope Aspect:	180°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	see note
RETTEW Job #:	089962000	Depth to Refusal:	43	Slope Failure or slip:	no
NRCS Soil Unit:	Berks 8D	Bedrock Type :	shale/siltstone	Dip Slope & Direction:	60 S; Strike: 250
Mineralogy:	mixed	Vegetation:	red maple, hickory, chestnut oak,		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-2	10YR 4/3	GR sil	15%	30%	15%	1/2	PO / SO	1MGR	FR	WA			2FM	0.5 / 5.0	—	
Bt	2-9	10YR 5/6	GR sil	20%	20%	15%	1/2	PO / SO	1MSBK	FR	SG			2FM	0.75 / 4.6	—	
2Bt	9-23	10YR 5/6	SiCL	30%	15%	<10%		MP / SS	1MSBK	FR	WG			3FMC	1 / 4.4	—	Some yellowish red lithochromic
2BC	23-33	10YR 6/4	SiCL	28%	15%	<10%		MP / SS	2MSBK	FR	WC			2FM	1 / 5.0	—	Some yellowish red lithochromic
2CR	33-43	2.5Y 6/3	XCn SiCL			90+			0 massive	FR				occasional		—	fractured shale
RBed	43+ rock																lithichromic

Other Notes:
- similar to P296 additional samples not required
- heavy rain w/in last 24 hr

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TEST PIT DESCRIPTION

Soil Scientist: Michael Lane
Field Assistant: Rachel Hill
Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-293-160606-1056-MEL	Topographic Position:	Summit/Ridge	Parent material:	Sandstone residuum
Date:	6/6/16	% Slope:	8%	Slope Aspect:	220°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	46"	Slope Failure or slip:	—
NRCS Soil Unit:	Hazleton (50D)	Bedrock Type :	Sandstone	Dip Slope & Direction:	could not mea Strike: el
Mineralogy:	Mixed	Vegetation:	Chestnut Oak, Scarlett Oak, w Pine, Hickory, Red Maple		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR 2.5/1	—	—	—	-	-	- / -	-	-	SC			3F	0.25 / 4.5	S1	
A	1-2	10YR 4/2	GR SL	12%	60%	15%	1	PO / SO	1FGR	VFR	SC			3FM	0.25 / 5.0	S2	
BE	2-5	10YR 5/3	GR SL	10%	60%	15%	1	PO / SO	1MSBK	VFR	WG			3FM	0.25 / 5.2	S3	
Bw	5-12	10YR 5/6	VGR SL	15%	60%	40%	1-3	PO / SS	1MSBK	VFR	WG			2FMC	0.25 / 5.5	S4	clay +5% coarse loamy
BC	12-24	10YR 5/4 10YR 5/8	XGR SL	15%	65%	80%	3	PO / SO	1MSBK + 0Massive	VFR	WC			1M	4.5	S5	
CR	24-46	dusky red fractured sandstone	—	—	—	-	-	- / -	-	-				Very few			
Bedrock sandstone																	

Other Notes:

293

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane
Field Assistant: Rachel Hill
Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-294-160606-0905-MEL	Topographic Position:	sideslope, head of hollow	Parent material:	Colluvium over residuum
Date:	06/06/16	% Slope:	24%	Slope Aspect:	110°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	none
RETTEW Job #:	089962000	Depth to Refusal:	35"	Slope Failure or slip:	no
NRCS Soil Unit:	Berks 8D	Bedrock Type:	fractured Shale	Dip Slope & Direction:	65° S — Strike: 80°
Mineralogy:	Mixed	Vegetation:	Red maple, oak (mixed), privet		

USDA

Horizon	Depth In Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
O	0-1.5	5YR2.5/1	—			—	—	— / —	—	—	SA			3FM	0.0 / 5.5		
A	1.5-2.5	10YR 3/3	GR SIL	15%	25%	25%	<0.5	PO / SS	2FGR	FR	SA			3FM	0.75 / 5.0		
BE	2.5-7	10.5YR 5/4	GR SIL	17%	30%	15%	<1	PO / SS	2MSPK	FR	WG			2FM	0.75 / 5.0		
BC	7-14	10YR 5/6	GR-VGR SIL	15%	25%	35%	<1	SP / SS	1FSPK	FR	BG			3MC	1.75 / 5.2		
CR	14-35	10YR 5/6 10YR 5/8	XFL SIL			90%					(see notes)			Occasional			~6in wide SICL similar to P296 horizon 2C
Bedrock fractured Shale																	

Other Notes:
- Some surface quartzite stoneyness (colluvial)
Moving from Berks to Hazleton series

TEST PIT DESCRIPTION Michael Lane

Soil Scientist: ~~P-295-16C603-1335-MEL~~

Field Assistant: Rachel Hill, Dan F.

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-295-16C603-1335-MEL	Topographic Position:	Summit/Ridge shoulder	Parent material:	Residuum
Date:	6/3/16	% Slope:	10%	Slope Aspect:	354
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well drained	Depth to Water Table:	none
RETTEW Job #:	089962000	Depth to Refusal:	24	Slope Failure or slip:	no
NRCS Soil Unit:	Berks (8D)	Bedrock Type :	Shale	Dip Slope & Direction:	40° 35° NW Strike: 40°
Mineralogy:	Mixed	Vegetation:	mtn laurel, red maple, white pine		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
~~O~~A	0-2	10YR 3/3	SIL	10%	15%	<10	~~<1~~	PO / SO	1FGR	Fr	SC			3FM	0.25 / 4.7		
Bw	2-7	10YR 5/4	GR SIL	12%	15%	30	~~6+~~ 6<1	PO / SO	1FSPK	Fr	IC			2FMC	0.75 / 5		
C	7-24	10YR 5/4	XCO SIL	12%	15%	85	6+	PO / SO	OMassive	Fr				Occasional			
R	24	Fractured bedrock															

Other Notes: Narrow ridge top, borderline loamy skeletal reddish shale cobbles

295

TEST PIT DESCRIPTION

Soil Scientist: Dan Fenstermacher

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-296-160603-1245-DEF	Topographic Position:	upper backslope	Parent material:	Colluvium over residuum
Date:	6/3/16	% Slope:	23	Slope Aspect:	~~178~~ 160 (adjust for wrong (correction)
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	Minor seepage above rock
RETTEW Job #:	089962000	Depth to Refusal:	39"	Slope Failure or slip:	—
NRCS Soil Unit:	Berks (8D)	Bedrock Type :	Sandstone	Dip Slope & Direction:	33° S; Strike: ~~10~~ 92
Mineralogy:	Mixed	Vegetation:	Chestnut oak, blackgum, Red oak, Red maple, Blueberry		

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-2.5	10YR3/2	L	14	38	15% gr	<1"	PO / SO	1MGr	VFr	AW	—	—	3fM 2Co	0	S1	Very thin, <0.25" Sandstone CoF
Bt1	2.5-10	2.5Y6/4	SiL	16	20	15% gr	<1"	PO / SS	1FSBK	FR	GS	—	—	2mf 1Co	0	S2	Red Sandstone CoF
2Bt2	10-25	10YR6/4	SiCL	~~38~~ 32	14	—	—	MP / MS	2MSBK	Fr	CS	—	—	2f 1M	0.75	S3	No clay films CoF
2C	25-39	2.5Y5/3 5YR4/6 (15%)	SiCL	38	5	—	—	VP / VS	OM	Fr	AS	—	—	1fM	0.75	S4	ghost coarse fragments Lithochromic colors
3R	39+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	competent not breakable

Other Notes: Bedrock slopes with slope

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-297-160603-1153-MEL	Topographic Position:	Summit along ridge	Parent material:	residuum shale
Date:	6/3/16	% Slope:	5%	Slope Aspect:	270°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	well drained	Depth to Water Table:	see notes
RETTEW Job #:	089962000	Depth to Refusal:	27	Slope Failure or slip:	no
NRCS Soil Unit:	Berks	Bedrock Type :	shale silt stone	Dip Slope & Direction:	45° NW Strike: 70°
Mineralogy:	mixed	Vegetation:	red oak, pine, mtn laurel		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe/Oa	0-1.5	10YR 2/2	~~SIL~~						~~1FGR~~	~~Fr~~					— / 4.6	S1	
A	1.5-2	10YR 3/4	SIL					PO / SO	1FGR	Fr	SC			3FM	0.5 / 4.7	S2	
BE	2-7	10YR 6/4	CNSIL	15%	10%	25%	1	SP / SS	1FSBK	Fr	WC			3FMC	0.5 / 5.4	S3	
Bw	7-13	10YR 5/6	CN SIL	15%	15%	30%	<1	SP / SS	2FSBK	Fr	WC			2MC	1.25 / 5.2	S4	
C	13-17	10YR 5/8	VCN SIL	15%	15%	30%	<1	SP / SS	0MASSIVE	Fr	WC			1F	1.25 / 5.0	S5	
Cr	17-27	10YR 7/2 7.5YR 7/6	XCN SIL	—	—	85%	3	— / —	—	—	WC			few btw fragments			
R	shale bedrock																

Other Notes: 1in water in bottom of pit, heavy rain w/in last 24 hrs

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TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher
Field Assistant:

Signature: Daniel Fenstermacher

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-298-100003-1000-OEF	Topographic Position:	Backslope	Parent material:	Residuum
Date:	6/3/16	% Slope:	55	Slope Aspect:	30°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	9" - Seep - ~~Not~~ due to Rain.
RETTEW Job #:	089962000	Depth to Refusal:	30	Slope Failure or slip:	—
NRCS Soil Unit:	Berks (8E)	Bedrock Type :	Siltstone	Dip Slope & Direction:	38°, S Strike: 100°
Mineralogy:	Mixed	Vegetation:	Chestnut Oak, Red oak, Hickory, Red maple with hazel, Rhododendron, Striped Maple		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1.5	5YR 2.5/2	—	—	—	—	—	— / —	—	—	—	—	—	3f	— / —	—	Thin Oa underlying
A	1.5-3.5	10YR 3/2	SiL	16	18	20% gr	<2"	SS / SP	1fSBK	VFr	AW	—	—	3fM 1Co	0 / 4.5		
Bw1	3.5-16	7.5YR 6/4	SiL	16	14	CH 30	<2"	SS / SP	1MSBK	Fr	GW	—	—	3fM 2Co	0.25 / —		
Bw2	16-30	10YR 6/4	SiL	18	15	gr 40	<3"	SS / SP	1CoSBK	Fr	CW	—	—	2fM 1Co	0.25 / 4.8		
R	30+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	Siltstone, almost white, Somewhat fractured

Other Notes: Several inches of Rainfall Evening Prior.

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant:

Signature: Daniel Fenstermacher

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-299-160603-0820-DBF	Topographic Position:	Ridge Top	Parent material:	Residuum over Residuum
Date:		% Slope:	4	Slope Aspect:	349
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	well	Depth to Water Table:	36 - Recent Rainfall
RETTEW Job #:	089962000	Depth to Refusal:	50	Slope Failure or slip:	—
NRCS Soil Unit:	Berks (8D)	Bedrock Type:	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	Mixed	Vegetation:	Chestnut oak, Red maple, Rhododendron.		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/pH	Lab Sample ID	Notes
Oe	0-1	5YR 2.5/2	—	—	—	—	—	— / —	—	—	—	—	—	3f	— / 4.25	S-1	
A	1-2.5	10YR 2/1	L	15	39	—	—		1fSBK	VFr	AW	—	—	2f 1co 2m	0.25 / 4.75	S-2	
BE	2.5-4.5	10YR 5/3	L	16	35	5% gr	<1"	PO / ~~PO~~	1fSBK	Fr	AW	—	—	3m 1f	0.25 / 5.0	S3	
Bw1	4.5-7	10YR 6/5	L	16	35	10% gr	<1"	SS / SP	1MSBK	Fr	CW	—	—	3f 2m 1co	0.25 / 4.5	S4	
Bw2	7-17	10YR 6/4	[illegible]	17	35	20% gr	<2"	SS / SP	1MSBK	Fr	CW	—	—	3m 2f 1co	0.5 / 4.5	S5	fine Sands
Bw3	17-27	10YR 6/4	[illegible]	18	33	30% gr	<2"	SS / SP	2MSBK	Fr	GW	—	—	2m	0.75 / 4.5	S6	fine sands
2Bw4	27-50	10YR 6/4	SiL	22	12	40% cob	~~1-3~~ 1-4	MS / SP	1CoSBK	Fr	—	—	—	2f 1m	0.5 / 4.5	S7	Bith-chromic 7.5YR5/4 fine sands from slightly clayier geology bed

Other Notes: No clay films

water table not representative of Seasonaly high WT - just reflective of Rain fall - will drain

TEST PIT DESCRIPTION

Soil Scientist: John C Roberts
Field Assistant: Taylor Walter
Signature: John C Roberts

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-300-160603-1123-JCR	Topographic Position:	Lower Shoulder above backslope	Parent material:	Residuum under Colluvium
Date:	0603-2016	% Slope:	55	Slope Aspect:	24
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	34	Slope Failure or slip:	—
NRCS Soil Unit:	Berks	Bedrock Type :	Silt stone	Dip Slope & Direction:	80° 163 Strike: 73
Mineralogy:	—. Mixed	Vegetation:	Blueberry, Dog wood, Red Maple, White Pine, Chestnut Oak		

USDA

Horizon	Depth In Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	1	10YR 2/1	—	—	—	GR 15	<0.5"	— / —	—	VFR	CS	—	—	2f	0.25 / 4.25	1	
A	2	10YR 2/2	GR SIL	12	10	GR 15	0.5-1.0"	PO / SO	1MGR	FR	CS	—	—	3f	0.25 / 4.5	2	
BA	5	10YR 5/4	SIL	14	12	GR 10	0.5-1.0"	PO / SO	1MSBK	FR	CS	—	—	2f 2m	0.25 / 5.0	3	
Bw	9	10YR 6/6	SIL	14	12	GR 10	0.5-1.0"	PO / SS	1MSBK	FR	CS	—	—	2m 1co	0.5 / 5.0	4	
2Bt1	15	7.5YR 5/6	GR SIL	20	18	GR 20	0.5"-20"	SP / SS	2MSBK	FR	CS	—	—	2f 2m 1co	11.0 / 4.5	5	clay films
2Bt2	23	7.5YR 5/8	GR SIL	22	16	GR 20	0.5-3"	SP / SS	1MSBK	FR	CS	—	—	2m 1m	1.25 / 4.5	6	Clay films
2Cr	34	10YR 5/8	—	—	—	CN 95	1"-6"	— / —	0 m	-	GW	—	—	1f	— / —	—	Lithochromic Chroma 2's
R	34+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes: Water seeping in pit @ 15 from previous nights rain, no redox observed.

TEST PIT DESCRIPTION

Soil Scientist: John C Roberts
Field Assistant: Taylor Walter
Signature: John C Roberts

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-301-160603-1326-JCR	Topographic Position:	Ridge Top Curved	Parent material:	Residuum
Date:	06-02-2016	% Slope:	15	Slope Aspect:	21°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	25	Slope Failure or slip:	—
NRCS Soil Unit:	Berks	Bedrock Type :	SH Stone	Dip Slope & Direction:	80° 193 Strike: 103
Mineralogy:	— Mixed	Vegetation:	Red Maple, Hickory, Chestnut Oak, Red Oak		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
O	1	10YR 2/1	—	—	—	CN 10	0.5-2"	PO / S	—	—	CW	—	—	2f 1vh	0.25 / 4.5	—	
A	2	10YR 4/3	CN SiL	L	1?	CN 15	1-2"	PO / SO	1mGR	VFR	CW	—		3f 2m	0.25 / 4.25	—	
Bw1	6	10YR 5/6	SiL	15	2	CN 20	1-3"		1MSBK	FR	CW	—		2f 3m	0.5 / 5.0	—	
Bw2	9	10YR 5/8	SiL	16	10	CN 30	1-4"		1MSBK	FR	CW	—		2f 2m	0.5 / 5.0	—	
Cr	24	10YR 5/8	—	—	—	85 CN	2-6"	— / —	—		GW	—		1f	— / —	—	
R	24+																

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: M. WOOD

Signature: [signature]

Field Assistant:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P302-160603-1115-MGW	Topographic Position:	RIDGE	Parent material:	RESIDUUM
Date:	6/3/16	% Slope:	5%	Slope Aspect:	290
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~MW~~ Well Drained	Depth to Water Table:	>32
RETTEW Job #:	089962000	Depth to Refusal:	32	Slope Failure or slip:	
NRCS Soil Unit:	BERKS	Bedrock Type:	SILTSTONE	Dip Slope & Direction:	Strike:
Mineralogy:	Mixed	Vegetation:	SEE BELOW		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1													3 f/VF 2 m	4.2	–	
BW1	1-4	10YR 5/4	GR SiL	11	14	GR 30	<1.5	PO SO	1 F GR	VFR	CW	–	–	3 f/VF 1 Co/M	0.25 4.7	–	
BW2	4-12	10YR 5/4	SiL	14	16	VGR 55	<2.0	PO SO	1 M SBK 1 M GR	VFR	CW	–	–	1 F/VF 1 Co/M	0.35 4.7	–	
Cr	12-19	10YR 5/4	SiL	14	16	GR 10	<6.0	PO SO	1 M SBK	FR	GW	–	–	1 F/VF	– –	–	
R	19-32	–	–	–	–	–	–	– –	–	–	–	–	–	–	– –		
R																	

Other Notes: ~~[illegible]~~ STANDING WATER 27" (DUE TO RECENT RAIN)

CHESTNUT OAK, RED OAK, RED MAPLE, CHERRY, HUCKLEBERRY

TEST PIT DESCRIPTION

Soil Scientist: M. WOOD

Field Assistant: MAX DUGAN

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P303-160603-0830-MGW	Topographic Position:	backslope	Parent material:	COLLUVIUM / RESIDUUM
Date:	6/3/16	% Slope:	39%	Slope Aspect:	122°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	W	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	37	Slope Failure or slip:	~~NA~~
NRCS Soil Unit:	BERKS	Bedrock Type:	SILTSTONE	Dip Slope & Direction:	NA; Strike: NA
Mineralogy:	Mixed	Vegetation:	BELOW		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1													3F/VF 2M	4.2	S1	
A	1-2	10Yr 4/1	gr Si	9	15	20% Gr	<1.5"	PO SO	1FGr	VFr	AS	—	—	3F/VF 2M	.25 4.6	S2	
Bw1	2-7	10Yr 5/6	vgr SiL	15	15	40% Gr	<2"	PO SO	1FSBK	Fr	CW	—	—	2F/VF 1CO/M	.25 4.6	S3	
Bw2	7-15	10Yr 5/6	vgr SiL	18	15	45% Gr	<2.5"	PO SO	2MSBK	Fr	CW	—	—	2F/VF 2CO/M	.75 4.6	S4	
Bw3	15-23	7.5Yr 5/6	Exgr SiL	15	18	65% Gr	<3"	PO SO	1MSBK	Fr	CW	—	—	1F/VF 1CO	1.0 4.6	S5	
2CB	23-30	7.5Yr 5/6	Exgr SiL	15	18	70% Gr	<2.5"	PO SO	0M	—	CW	—	—	1F/VF 1CO	1.25 4.6		
2Cr	30-37+	7.5Yr 5/6	Exgr SiL	15	18	90%	<5"	PO SO	0M	—	—	—	—	1F/VF	— —		

Other Notes: VEG: RED MAPLE, HICKORY, WHITE OAK, HUCKLEBERRY

TEST PIT DESCRIPTION

Soil Scientist: MICHAEL WOOD

Field Assistant: MAX DUGAN

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P.303A-160603-0920-MGW	Topographic Position:	SHOULDER/BACK SLOPE	Parent material:	RESIDUUM
Date:	6/3/16	% Slope:	16%	Slope Aspect:	312
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~MWD~~ Somewhat excessively	Depth to Water Table:	N/A
RETTEW Job #:	089962000	Depth to Refusal:	32"	Slope Failure or slip:	N/A
NRCS Soil Unit:	BERKS	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	73% S — Strike: 80°
Mineralogy:	MIXED	Vegetation:	Red maple, see below		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (Inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	~~10yr~~ 2/1	—	—	—	—	—	— / —	—	—	—	—	—	3 F/VF 2 CO/M	— / 4.3	—	
BA	1-3	10yr 5/4	gr SiL	12	12	Gr 20%	<1"	PO / SO	1 F Gr	VFr	AS	—	—	3 F/VF 2 CO/M	0.25 / 4.7	—	
BW1	3-8	10Yr 5/6	vgr SiL	14	12	50% gr	<1.5"	PO / SO	1 F SBK 1 F gr	Fr	CW	—	—	2 F/VF 1 CO/M	0.25 / 4.7	—	
BW2	8-13	7.5 Yr 5/6	Exgr SiL	14	15	75% gr	<2"	PO / SO	1 M SBK	VFr	GW	—	—	1 F/VF 1 CO/M	1.25 / 4.7	—	
CR	13-19	7.5Yr 5/6	SiL	—	—	gr 95%	<6"	— / —	OM	—	—	—	—	1 VF/F	3 / —	—	
R	19-32	"	—	—	—	—	—										

Other Notes: Red maple, chestnut oak, mountain laurel, huckleberry

TEST PIT DESCRIPTION

Soil Scientist: MG WOOD

Field Assistant: MAX DUGAN

Signature: MGW

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P304-160603-0815-MGW	Topographic Position:	RIDGE UPPER SHOULDER	Parent material:	RESIDUUM
Date:	6/3/16	% Slope:	7%	Slope Aspect:	300°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~MW~~ WELL	Depth to Water Table:	21" (DUE TO RAIN)
RETTEW Job #:	089962000	Depth to Refusal:	24"	Slope Failure or slip:	—
NRCS Soil Unit:	BERK	Bedrock Type:	SILTSTONE REDISH BROWN	Dip Slope & Direction:	N/A Strike: N/A
Mineralogy:	Mixed	Vegetation:	BELOW		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1													3-F/VF 2-m	~~0.25~~ 4.4		
A	~~1-1.5~~ 1-1.5	7.5 YR 4/1	SiL	12	12	GR 5%	<1.5"	PO SO	~~GR 2F~~ 2FGr	VFR	AS	NA	NA	3-F/VF 2-m	.25 4.8		SMALL POCKETS OF E HORIZON
Bw1	1.5"-10"	10YR 6/6	SiL gr	15	14	35% Gr	<1.5"	PO SO	2MSBK	Fr	CW	—	—	2-F/VF 2-m 1-CO	.25 4.7		
Bw2	10-16	7.5YR 5/6	Vgr SiL	18	18	45% Gr	<2.5"	PS SS	1MSBK	Fr	CW	—	—	1-F/VF 1-m	.75 4.7		
BCr	16-24	7.5 YR 5/6	Exgr SiL	14	20	50% Gr	<4"	SO PO	OM	—	CW	—	—	1 F/VF			

Other Notes: Standing water @ 21" — rain night before
this pit from 6/2 was redug, previous pit filled w/ water

CHESTNUT OAK, BLACKGUM, DOGWOOD, MTN LAUREL, HUCKLEBERRY

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher
Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-305-160602-1145-DEF	Topographic Position:	Shouldr	Parent material:	Residuum
Date:	6/2/16	% Slope:	25%	Slope Aspect:	73°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	~~29~~ 31	Slope Failure or slip:	—
NRCS Soil Unit:	Berks	Bedrock Type :	Siltstone Redish Brown	Dip Slope & Direction:	78° SE; Strike: 230°
Mineralogy:	mixed	Vegetation:	Chestnut oak, Scarlet oak, blackgum blueberry		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR 2.5/2	—	—	—	—	—	— / —	~~2mg~~	—	—	—	—		— / —	—	
A	1-1.5	10YR 3/2	SiL	16	13	10% gr	<1"		2mgr			—	—	3f 1co	0 / 4.4	—	
Bw	1.5-12	10YR 6/4	SiL	16	12	38 gr	<1"	SP / SS	1fsbk	fr	CW	—	—	3f 2m 1co	.25 / 4.8	—	
Bw2	12-20	7.5YR 6/4	SiL	18	16	55% gr	<2"	SP / SS	1fsbk	Fr	CW	—	—	2f 1m	2.25 / —	—	
Cr	20-28	7.5YR 6/6	SiL	18	18	90% gr	1-4"	PO / SS	OM	—	CW	—	—	1f	— / —	—	Closely beded w/ Silts in crevices Soft Rocks
R	28-31+							— / —	—	—	—	—	—				

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Michael Wood
Field Assistant: DEF,
Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-306-160602-1100-MGW	Topographic Position:	RIDGE	Parent material:	Residuum	
Date:	6/2/16	% Slope:	4%	Slope Aspect:	65°	
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	—	
RETTEW Job #:	089962000	Depth to Refusal:	40"	Slope Failure or slip:	—	
NRCS Soil Unit:	Ber US	Bedrock Type :	Siltstone - Reddish Brown	Dip Slope & Direction:	not clear in Pit	Strike:
Mineralogy:		Vegetation:	Chestnut oak, Blackgum, Red maple, blueberry			

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR 3/2	—	—	—	—	—	— / —	—	—	AS	—	—	3fVF 2M	— / 4.3	S1	
A	1-2	10YR 4/2	SiL	14	12	10% gr	<15"	PO / SO	2FGR	Fr	CW	—	—	3f 1M	0.25 / 4.8	S2	
Bw1	2-9	10YR 5/6	SiL	15	12	10% gr	<15"	PO / SO	2MSBK	Fr	CW	—	—	2F 3M	1.25 / 4.8	S3	
Bw2	9-19	10YR 6/6	gr SiL	18	15	30% gr	<4"	SP / SS	2MSBK	Fr	CW	—	—	2F, 1Co	1.25 / 4.8	S4	
Cr	19-31	7.5YR 6/6	Ex gr SiL	18	15	80% gr	<4"	— / —	OM	—	CW	—	—	1f	— / —	—	
R	31-40	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	Rips as coarse gravel

Other Notes: in nearby Roadcut - verticle bed shale 90° Dip w/ Strike to 53°

TEST PIT DESCRIPTION

Soil Scientist: Don Fenstermacher

Field Assistant: Max

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-307-160602-1045-~~MGW~~ DEF	Topographic Position:	Upper Backslope	Parent material:	Residuum
Date:	6/2/16	% Slope:	21	Slope Aspect:	45°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	–
RETTEW Job #:	089962000	Depth to Refusal:	40	Slope Failure or slip:	–
NRCS Soil Unit:	Berks	Bedrock Type :	Siltstone - reddish Brown	Dip Slope & Direction:	55° SE; Strike: 60°
Mineralogy:	Mixed	Vegetation:	Chestnut oak, Scarlet oak, Red oak, black oak, Dogwood, Blueberry, Mt laurel		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-25	5YR2.5/2	–	–	–	–	–	– / –	–	–	AW	–	–	3f 2m	– / –	–	
A	25-4	10YR4/2	SiL	14	18	30% gr	<1"	PO / SO	2fgr	VFr	AW	–	–	3f 2m	0.25 / 4.3	–	very thin E in some spots 2.5Y 4/1
Bw	4-13	10YR6/4	SiL	15	16	30% gr	<1"	SP / SS	1MSBK	Fr	CS	–	–	2f 2m	0.25 / –	–	
Bw2	13-21	7.5YR6/4	SiL	15	15	40% gr	<2"	SP / SS	1MSBK	Fr	CW	–	–	2f 1m	1.75 / 4.8	–	
BC	21-28	7.5YR 5/4	SiL	16	16	85% CH	<3"	SP / ~~SS~~	1COSBK	~~Fr~~	CW	–	–	1f	2.0 / –	–	
Cr	28-33	7.5YR 6/6	Gravel (SiL)	18	12	95% gr	<4"	– / –	QM	–	CW	–	–	1f	– / –	–	
R	33-40+	–	–	–	–	–	–	– / –	–	–		–	–	–	– / –		

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: John C. Roberts
Field Assistant: Taylor Walter

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-308-160602-1231-JCR	Topographic Position:	Back slope	Parent material:	Residuum
Date:	06-02-2016	% Slope:	38	Slope Aspect:	111°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SED	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	Berks / Weikert	Bedrock Type:	Silt Stone	Dip Slope & Direction:	80% 142° Strike: 52°
Mineralogy:	—	Vegetation:	Red Maple, Black Gum, White Pine, Chestnut Oak, Mockernut Hickory		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	—	—	—	—	—	—	PO / SO	—	VFR	CS	—	—	2f	0.25 / 4.0	S1	
AE	1-8	10YR 6/4	SIL	18	12	GR 10	<1"	SP / SS	1MSBK	VFR	CS	—	—	3f 2m	0.75 / 4.5	S2	
Bw	8-16	10YR 5/6	VGR SIL	20	15	GR 40	1-3"	SP / SS	1MSBK	FR	CS	—	—	3f 2m 1co	0.75 / 4.5	S3	
Cr	16-50+	10YR 5/6	—	—	—	CN	2-6"	— / —	—	—	—	—	—	—	— / —	—	Few fines b/w rocks - no roots

Other Notes: No true surface or A horizon present

TEST PIT DESCRIPTION

Soil Scientist: John C Roberts
Field Assistant: Taylor Walter

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-308A-160602-B43-JCR	Topographic Position:	Summit	Parent material:	Residuum		
Date:	06-02-2016	% Slope:	6	Slope Aspect:	171°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SED	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	30	Slope Failure or slip:	—		
NRCS Soil Unit:	Weikert - Berks	Bedrock Type :	Silt Stone	Dip Slope & Direction:	78° 158°	Strike:	68°
Mineralogy:	—	Vegetation:	Dogwood, Red Maple, White Pine, Chestnut Oak				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	—	—	—	—	CN 10	0.5"-1"	— / —	—	VFR	AS	—	—	2f	0.25 / 4.25	—	
AE	1-10	10YR 6/6	VCN SIL	14	15	CN 45	0.5"-3"	PO / SS	1 M SBK	FR	CS	—	—	1 Co 3 m 3 f	0.75 / 4.5	—	Slight seepage @ AE/Bw transition
Bw	10-17	10YR 5/8	ECN SIL	16	15	CN 75	1"-6"	PO / SS	1 m SBK	FR	GW	—	—	3f	0.75 / 4.5	—	
Cr	17-30	10YR 5/8	—	—	—	CN 95	1-6	— / —	—	—	—	—	—	—	— / —	—	
R	30+																

Other Notes: Skinny Ridge/Summit ≈ 75'-90' wide; No true surface or A horizon

TEST PIT DESCRIPTION

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Soil Scientist: John C Roberts

Field Assistant: Taylor Walter

Signature: [signature]

Test Pit ID:	P-309-060602-1449-JCR	Topographic Position:	Rock slope	Parent material:	Re Colluvium with Colluvial capping
Date:	06-02-2016	% Slope:	48	Slope Aspect:	171°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	ED	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	28	Slope Failure or slip:	—
NRCS Soil Unit:	Berks	Bedrock Type:	Silt stone	Dip Slope & Direction:	80% 321° Strike: 231°
Mineralogy:	—	Vegetation:	White Pine, Hickory		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	—	—		—	CN 10	0.5"-1.0"	— / —	—	VFR	CS	—	—	3f	0.25 / 5.0	—	
AE	1-4	10YR5/4	CN SIL	14	10	CN 30	0.5"-2"	PO / SS	1M SBK	FR	CS	—	—	3f 2m	0.5 / 4.75	—	Coarse rock dispersed with AE
2Bw	4-10	10YR 4/6	CN SIL	15	10	CN 30	1"-4"	PO / SS	1M SBK	FR	GW	—	—	2m 2co	1.0 / 5.5	—	
2Cr	10-28	10YR6/6	—	—	—	95% CN/CO	1"-8"	— / —	—	—	—	—	—	—	— / —	—	Could not remove loose stones with dig bar
R	28+																

Other Notes: No true A horizon; Some fines between rock faces within Cr; no roots observed in Cr horizon; colluvium over residuum

TEST PIT DESCRIPTION

Soil Scientist: John C Roberts

Field Assistant: Jeff Nosaflook

Signature: John C Roberts

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-310-160603-835-JCR	Topographic Position:	Back slope	Parent material:	Colluvium / Residuum
Date:	06-03-2016	% Slope:	25%	Slope Aspect:	13°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	≥50"	Slope Failure or slip:	—
NRCS Soil Unit:	Weikert	Bedrock Type:	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	— Mixed	Vegetation:	Black Gum, Chestnut Oak, White Pine		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0.5	—	—	—	—	GR 5	<0.5"	— / —	—	VFR	AS	—		2m	0.25 / 4.5	—	
A	1	10YR 4/2	SIL	15	10	GR 5	<0.5"	PO / SO	1m GR	VFR	CS	—		2f	0.25 / 4.25	—	
Bw	10	10YR 4/4	GR SIL	15	10	GR 30	0.5"-1.0"	PO / SO	1m SBK	FR	CS	—		2f 2m	0.5 / 4.5	—	
2Bw1	19	10YR 6/4	GR SIL	20	15	GR 15	0.5"-	SP / SS	1m SBK	FR	CS	—		2f 2m 1c0	0.5 / 5.25	—	
2Bw2	29	10YR 5/6	SIL	22	15	GS 5	<0.5"	SP / SS	1 mSBK	FR	CS	—		2f 1m	0.75 / 5.25	—	
2Bw3	39	7.5YR 5/6	SIL	24	10	GS 10	0.5"-1.0"	SS / SP	1mSBK	FR	CS	—		1m	0.75 / 5.25	—	Lithochromic Colors
2C	50+	7.5YR 5/6	SIL	20	15	VGR 40	0.5-2"	SS / SP	0M	FI	CS	—		1m	1.5 / 4.0	—	

Other Notes: Pit filled with water from previous night's rainfall, No bedrock observed

TEST PIT DESCRIPTION

Michael Lane

Soil Scientist: Delp / Carpenter / Lane

Field Assistant: Rachel Hill, Geospatec

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Summit

Test Pit ID:	P-311-160602-1600-MEL	Topographic Position:	Upland ridgetop	Parent material:	Siltstone / Shale
Date:	6/2/2016	% Slope:	8%	Slope Aspect:	90°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	not observed
RETTEW Job #:	089962000	Depth to Refusal:	26"	Slope Failure or slip:	
NRCS Soil Unit:	Weikert	Bedrock Type:	Siltstone	Dip Slope & Direction:	75° E; Strike: 20°
Mineralogy:	Mixed: prob Kaolinite / Illite	Vegetation:	Mixed Hardwoods ; dominately Chestnut Oak		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oi	0-2																
Oe/Oa/A	2-2½	10YR 3/2	SiL	8	25	Shale 10%	3-6	NP NS	2-f gr	VFR	AS			Medium f m c	0.75	S1	
BA	2½-6	10YR 5/4	SiL	10	25	Shale & Siltstone 15	3-6	NP NS	1-f+m ~~SBK~~	FR	CW				no BA in T-311-A	S2	
BW	6-18	10YR 5/6-5/8	Heavier SiL	12	30	Shale & Siltst 20	3-6	SP SS	1-2-m SBK	FR	CW				1.5	S3	
C	18-22	10YR 5/6-5/8	SiL	12	30	Shale & Siltstone 25	3-6	~~SP~~ SS	m 0	FR	CW	Relict 10YR 7/2-7/3		Few ~~fine~~	too rocky	S4	
Cr	22-26	10YR 5/8 w/ relict 10YR 7/2-7/3	SiL	12		Siltstone 60	3-6		m 0	FR							
R	26	Siltstone of mixed 10YR 5/8 and 10YR 7/2 : Difficult to excavate w/ ~~Sand~~ bar															

Other Notes: Soil reaction will be determined from samples
Description made to assist Rettew; Bad weather - heavy rain.
Staff did not have Penetrometer. - Penetrometer readings, strike dip, aspect from 6/3/16 + T-311-A

311

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: ~~P-312-160602-1509-MEL~~ Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-312-160602-1509-MEL	Topographic Position:	Head of hollow	Parent material:	Residuum w/colluvial cap
Date:	6/2/16	% Slope:	35%	Slope Aspect:	220°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SWPD	Depth to Water Table:	14"
RETTEW Job #:	089962000	Depth to Refusal:	40"	Slope Failure or slip:	—
NRCS Soil Unit:		Bedrock Type :	Siltstone	Dip Slope & Direction:	no face Strike:
Mineralogy:	mixed	Vegetation:	white oak, hickory		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistance	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa/Oe	0-0.5								~~1 f gran~~		SA	—	—	3fmc	~~1.0~~ 4.5	S1	
A	0.5-1	10YR4/4	sil	12	20	<10%		PO SO	1 f gran ~~1 f sbk~~	FR	SC	—	—	3fmc	1.0 4.5	S2	
BE	~~1~~-14	10YR5/4	sil	12	20	<10%		PO SO	1 f sbk	FR	WC	Roots 2fmc	—		1.75 5.0	S3	
BW	14-22	10YR5/6	sil	14	25	<10%		PO SO	2 m sbk	FR	WC	Roots 3fmc	cmd	7.5YR4/6 10YR6/2	1.75 5.0	S4	
C	22-31	10YR5/4	CN sil	15	20	25%	<1"	PS SS	Ø mass	FR	WC	Roots 1fm	mcp	7.5YR5/8 10YR7/2	2.25 4.8	S5	
Cr	31-40	variegated weathered siltstone															
R	40+																

Other Notes: Redox Feature Colors recorded in the "Roots" column for Bw and C horizons, Roots recorded in "Redox Feature Color" column for BE, BW, and C horizons.

TEST PIT DESCRIPTION

Soil Scientist: Michael Lane

Field Assistant: Rachel Hill, Geosyntec

Signature:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-314-160602-1115-MEL	Topographic Position:	sideslope, near summit of ridge	Parent material:	Colluvium over residuum
Date:	6/2/16	% Slope:	49%	Slope Aspect:	270° W
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	>50"
RETTEW Job #:	089962000	Depth to Refusal:	>50"	Slope Failure or slip:	—
NRCS Soil Unit:	Hazleton	Bedrock Type :	shale/siltstone	Dip Slope & Direction:	— Strike: —
Mineralogy:	mixed	Vegetation:	Pine, white oak, red maple, mountain laurel, sassafras (See notes for outcrop measure)		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oi	0-2	10YR3/2									SA	—		3fmc	4.2	S1	Combined O horizons for sampling
Oe	2-3	10YR3/1									SA	—		3fmc	4.2	S1	
A	3-4	10YR4/4	GR-l	12	40	30%	<3"	PO / SO	2 fgr	VFR	WA	—		3fmc	0.5 / 4.2	S2	
BE	4-11	10YR4/6	GR-l	14	40	30%	<3"	SP / SS	1msbk	FR-VFR	WC	—		2fmc	0.5 / 5.0	S3	
Bw1	11-20	7.5YR4/6	VGR-l	16	35	45%	<3"	SP / SS	1msbk	FR	WC	—		2fmc	0.75 / 5.2	S4	
Bw2	20-32	10YR5/6	VGR-l	16	35	45%	gravels w/ cobbles and stones	SP / SS	1msbk	FR	WC	—		2fmc	1.0 / 4.8	S5	
2C	32-40	variegated 7.5YR5/6 5YR4/6	VGR-cl-scl	20	55	60%		SP / SS	0 massive	FR-FI	WC	—		1f	rocky / 4.3	S6	
2Cr	40-50			siltstone/shale										occassional roots between fractures			

Other Notes: Bedrock outcrop at summit - quartzite dipping 60° E / Strike 20°

Extremely stony surface, quartzite stones

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH
Field Assistant: TAYLOR WALTER

Signature:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-333-160621-1327-JSW	Topographic Position:	BACKSLOPE	Parent material:	COLLUVIUM OVER RESIDUUM
Date:	6/22/16	% Slope:	36%	Slope Aspect:	355°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	FEW BENT TREES
NRCS Soil Unit:	DEKALB-WATAHALA-MECLUNG	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	MIXED	Vegetation:	MAPLE, CHESTNUT OAK, FERN		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-3	5YR2.5/1	—	—	—	—	—	— / —	—	—	as	—	—	3-VF 2-F	— / 4.5	—	
A	3-6	10YR3/1	XGR SiL	10	15	GR 85	1-2	PO / SO	1FGR	VFR	aw	—	—	2-VF, F, M 1-C	0.25 / —	—	
BE	6-12	10YR4/6	SiL	12	20	45 GR	1-2	PO / SO	1FSBK	FR	cw	—	—	2-F, M	0.5 / —	—	
Bt1	12-27	10YR6/4	SiL	15	25	25 GR	1-2	PO / SO	1MSBK	FR	cw	—	—	2-F, M 1-C, VC	1.0 / 6.5	—	
Bt2	27-37	10YR6/4	SiL	18	22	50 CB	4-7	SP / SS	1FSBK	FR	cw	—	—	3-F 1-C	1.0 / —	—	CLAY SKINS
2Bt3	37-50	7.5YR5/6	SiL	22	20	15 GR	<1	SP / SS	2MSBK	FR	—	—	—	2-F	1.25 / 4.5	—	CLAY SKINS

Other Notes: NICE CHERT COF

TEST PIT DESCRIPTION

Soil Scientist: Russell Losco

Field Assistant: Steph Moraca

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P334-160622-1115-RLL	Topographic Position:	Backslope	Parent material:	Colluvium over Residuum
Date:	6/22/2016	% Slope:	45%	Slope Aspect:	195°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	24+"
RETTEW Job #:	089962000	Depth to Refusal:	24"	Slope Failure or slip:	—
NRCS Soil Unit:	Weikert Berks Rough	Bedrock Type :	Siltstone	Dip Slope & Direction:	N350W 35° — Strike: N55°E
Mineralogy:	Mixed	Vegetation:	Mixed hardwoods & Pine		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	1.5	5YR 2.5/1	—	—	—	—	—	— / —	1GR	FR	C/S	—		1F 1M	0 / 4.5		
E	5	2.5Y 7/3	L	10	40	ST 10%	1/2"	PO / SO	1SBK	FR	G/S	—		1F	2.5 / 5.25		
Bw	15	10YR 8/3	SIL	22	5	ST 30%	1/2"	SP / MS	1SBK	FR	G/S	—		2F 2M	4.5+ / 5.1		
Cr	24	10YR 8/3	SIL	20	9	ST 70%	1/2-3/4	SP / MS	ØM	FI				1M	4.5+ / 5.1		
R																	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Russell Losco
Field Assistant: Steph Moraca

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P335-160622-1110-RLL	Topographic Position:	Stream Terrace	Parent material:	Alluvium over Residuum
Date:	6/22/2016	% Slope:	1%	Slope Aspect:	356°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	18"+
RETTEW Job #:	089962000	Depth to Refusal:	18"	Slope Failure or slip:	—
NRCS Soil Unit:	Macove	Bedrock Type :	Siltstone	Dip Slope & Direction:	S10°E 40 — Strike: N80°E
Mineralogy:	Mixed	Vegetation:	Mixed Hardwoods & Evergreens		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	1	5YR 2.5/1	—	—	—	—	—	— / —	F1GR	FR	C/S	—	—	2F 2M	0 / 5.1	S1	
A	4	10YR 3/3	SIL	18	20	20% GR	1/4"	PO / SS	F1GR	FR	C/S	—	—	2F 2M	0 / 5.0	S2	
Bw1	9	10YR 5/6	SL	10	60	80% GR	1/4"	PO / SS	ØSG	L	C/S	—	—	1M	2.5 / 5.25	S3	
Bw2	18	10YR 6/6	SL	8	70	80% GR	1/4-3/4"	PO / SO	ØSG	L					2.75 / 5.25	S4	
R	18+																

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Russell Losco

Field Assistant: Steph Moraca

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P336-160627-1100-RLL	Topographic Position:	Backslope	Parent material:	Colluvium over Residuum
Date:	6/22/2016	% Slope:	35%	Slope Aspect:	329°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	20+
RETTEW Job #:	089962000	Depth to Refusal:	20"	Slope Failure or slip:	—
NRCS Soil Unit:	Weikert - Rough	Bedrock Type :	Siltstone	Dip Slope & Direction:	S70°W 4° Strike: N20°W
Mineralogy:	Mixed	Vegetation:	Oak + Pine		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	1	5YR 2.5/1	—	—	—	5% ST	1/2"	— / —	F1GR	FR	C/S	—	—	1F 1M	0 / 4.5		
AE	7	2.5Y 8/3	SIL	20	3	40 ST	1/2"	PO / SS	F1GR	FR	G/S	—	—	1F	2.5 / 5.4		
Cr	15	10YR 8/3	SICL	32	5	80 CN	1/2x3"	SP / MS	VF1SBK	FR	C/W	—	—	2F 1M	4.5+ / 5.25		
R	20																

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Russell Losco

Field Assistant: Steph Moraca

Signature:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P337-160622-1055-RLL	Topographic Position:	Backslope - Nose	Parent material:	Colluvium over Residuum
Date:	6/22/2016	% Slope:	32%	Slope Aspect:	329°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	35+"
RETTEW Job #:	089962000	Depth to Refusal:	35"	Slope Failure or slip:	—
NRCS Soil Unit:	Weikert Rough	Bedrock Type :	Siltstone	Dip Slope & Direction:	S80°E 24° Strike: N10°E
Mineralogy:	Mixed	Vegetation:	Mixed oak + Pine		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	2	5YR 2.5/1	—	—	—	—	—	— / —	F1GR	FR	C/S	—	—	2F 2M 1CO	0 / 4.75	S1	
E	8	2.5Y 8/3	SiL	20	5	40 ST	1/4-1/2"	PO / SS	F2SBK	FR	C/S	—	—	2F 1M 1CO	1.25 / 5.25	S2	
Cr	22	10YR 6/6	SiCL	35	8	40 ST	1/2-1"	MP / MS	F2SBK	FR	C/I	—	—	1F	4.5+ / 5.25	S3	
R	35+																

Other Notes:

TEST PIT DESCRIPTION

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Soil Scientist: Russell Losco

Field Assistant: Steph Moracs

Signature: Russell L

Test Pit ID:	P338-160622-1045-RLL	Topographic Position:	Backslope	Parent material:	Colluvium over Residum
Date:	6/22/2016	% Slope:	37%	Slope Aspect:	~~27%~~ 198°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	18+"
RETTEW Job #:	089962000	Depth to Refusal:	18"	Slope Failure or slip:	—
NRCS Soil Unit:	Weikert-Berks-Rough	Bedrock Type :	Siltstone	Dip Slope & Direction:	N65°W 340 / Strike: S35°W
Mineralogy:	Mixed	Vegetation:	Maple & Oak		

USDA

Horizon	Depth in Inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	0.5	5YR2.5/1	—			ST 20%	1/2x1"	— / —	F1GR	FR	C/S	—		1F	0 / 5.25		
Bw	3	10YR5/6	SiL	~~16~~	9	ST 40%	1/2x1"	PO / SS	F1SBK	FR	C/W	—		1F2M	1.5 / 5		
R	3-18+																

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: Russell Losco
Field Assistant: Steph Moraca

Signature:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P339-160622-1035-RLL	Topographic Position:	Backslope-Shoulder	Parent material:	Colluvium over Residuum	
Date:	06/22/2016	% Slope:	28%	Slope Aspect:	89°	
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	SPD	Depth to Water Table:	4" - Perched on R	
RETTEW Job #:	089962000	Depth to Refusal:	18"	Slope Failure or slip:	—	
NRCS Soil Unit:	Weikert-Rough	Bedrock Type :	Siltstone	Dip Slope & Direction:	12°	Strike: S55°E
Mineralogy:	Mixed	Vegetation:	Oaks & Walnut			

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oa	2	5YR2.5/1	—	—	—	10% ST	1/2"	— / —	F1GR	FR	C/S	—	—	1F 1M	0 / 4.5		
Bw	4	10YR5/6	SiL	12	10	50% ST	1/2-1"	PO / SO	F1SBK	FR	C/S	—		2F	4.5 / 4.5		
Cr	12	10YR6/6	SiL	18	5	80% CN	1x3"	SP / SS	F2SBK	FR		10YR8/1 7.5YR6/8	F2D	2F	4.5+ / 4.75		
R	18+																

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: M. WOOD
Field Assistant: R. HILL

Signature: M. Wo[illegible]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P340-160622-1600-MGW	Topographic Position:	SADDLE SIDE SLOPE	Parent material:	~~[illegible]~~ / RESIDUUM
Date:	6/22/16	% Slope:	15	Slope Aspect:	39
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	> 20
RETTEW Job #:	089962000	Depth to Refusal:	20	Slope Failure or slip:	
NRCS Soil Unit:	WEIKERT-BERKS-ROUGH	Bedrock Type :	SILT STONE	Dip Slope & Direction:	3° 74° Strike: 344
Mineralogy:	Mixed	Vegetation:	CHESTNUT + RED OAK, HICKORY, DOGWOOD, WHITE PINE, BLUE BERRY		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	7.5YR 3/2	—							—	AS	—	-	2 F-VF 1 CO-M	— 4.2	—	
A	1-1.5	10YR 4/1	GR SIL	8	30	GR 20%	< 1.0"	PO SO	1 VF GR	vfr	CS	—	.	2 F-VF 1 CO-M	0.25 4.8	—	
Bw	1.5-4	10YR 6/4	VGR SIL	9	30	GR 40%	< 2.0"	PO SO	1 VF SBK-GR	VFR	CW	—	-	2 F-VF 1 CO-M	0.25 5.4	—	
CR	4-20	10YR 6/4	XGR SIL	9	35	GR 90%	< 6.0"	PO SO	0 M	VFR	CW	—	—	1 F-VF 1 CO-M	— —	—	
R	20+																

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher
Field Assistant: Rachel Hill

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-341-160622-1525-DEF	Topographic Position:	Upper Back slope	Parent material:	Colluvium over Residuum		
Date:	6/22/16	% Slope:	42%	Slope Aspect:	84°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Somewhat excessively	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	19.5	Slope Failure or slip:	—		
NRCS Soil Unit:	Weikert-Rough Complex (60F)	Bedrock Type :	Siltstone	Dip Slope & Direction:	26° W	Strike:	10°
Mineralogy:	Mixed	Vegetation:	Hickory (80%) Chestnut oak, sparse blueberry, no herbs				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1.75	5YR 2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	3f	— / 5.4	—	
A	1.75-2.25	10YR3/2	SiL	20	12	15% GR	<2"	PO / SO	2MGR	VFr	AW	—	—	3f 2M 1Co	0.1 / 4.8	—	
Bw1	2.25-7	10YR5/4	SiL	20	12	38% GR	1/2-4"	PO / SS	1fSBK	Fr	CW	—	—	2f,M 1Co	0.75 / 4.6	—	
2Bw2	7-19.5	10YR6/4	SiL	22	12	48% GR	1/2-8"	PO / SS	1CoSBK	Fr	AW	—	—	2f 1M	~~too Dry~~ / 5.3	—	
2R	19.5+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: M. WOOD

Field Assistant: R HILL

Signature: M Wood

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P342-160622-1040-MGW	Topographic Position:	SUMMIT	Parent material:	RESIDUUM		
Date:	6/22/16	% Slope:	2	Slope Aspect:	20		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	> 14"		
RETTEW Job #:	089962000	Depth to Refusal:	14"	Slope Failure or slip:			
NRCS Soil Unit:	WEIKERT-BERKS-ROUGH	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	1.5° SSE	Strike:	251°
Mineralogy:	MIXED	Vegetation:	CHESTNUT OAK, HICKORY, WHITE PINE				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1.5	7.5YR 3/2	–	–	–	–	–	– / –	–	–	AS	–	–	3 F-VF 2 CO-M	4.3	S1	
A	1.5-2	10YR 3/1	VGR SIL	8	30	GR 30%	< 10"	PO / SO	1 VF GR	VFR	CW	–	–	3 F-VF 2 CO-M	0.25 / 4.4	S2	
Bw	2-4	10YR 6/4	VGR SIL	9	30	GR 30%	< 1.5"	PO / SO	1 VF SBK-GR	VFR	CW	–	–	3 F-VF 1 CO-M	0.25 / 4.4	–	
Cr	4-14	10YR 6/6	XGR SIL	8	35	GR 85	< 7.0"	PO / SO	0 M	–	–	–	–	2 F-VF 1 CO-M	– / 4.6	–	
R	–	–	–	–	–	–	–										

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: M. WOOD
Field Assistant: R HILL

Signature: M. Wood

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P343-160622-1130-MGW	Topographic Position:	LINEAR SIDE SLOPE	Parent material:	COLLUVIUM / RESIDUUM		
Date:	6/22/16	% Slope:	30	Slope Aspect:	304		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	>36"		
RETTEW Job #:	089962000	Depth to Refusal:	36"	Slope Failure or slip:	—		
NRCS Soil Unit:	WEIKERT-BERKS-ROUGH	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	1%, 124°	Strike:	33°
Mineralogy:	MIXED	Vegetation:	WHITE PINE, RED MAPLE, RED OAK, BLACK GUM, BLUEBERRY				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1.5	7.5YR 3/2	—	—	—	—	—	— / -	—	-	AS	—	—	3F-VF 3CO-M 1VC	4.4	—	
A	1.5-2	10YR 3/2	S.I	9	30	GR 15	<0.5"	PO / SO	1 VF GR	VFR	CS	—	—	3 F-VF 3 CO-M 1 VC	0.1 / 4.5	—	
BA	2-5	10YR 5/4	S.I	9	30	GR 15	<0.5"	PO / SO	1 VF GR	VFR	CS	—	-	3 F-VF 2 CO-M 1 VC	0.25 / 5.1	—	
Bt1	5-10	10YR 6/4	GR S.I	14	30	GR 20	<1.0"	PO / SO	1 F SBK	FR	CW	—	-	3 F-VF 2 CO-M 1 VC	0.5 / 5.4	—	
Bt2	10-19	10YR 5/6	VGR S.I	17	35	GR 45	<3.0"	PO / SS	1 M SBK	FR	GW	—	—	2 F-VF 1 CO-M	1.75 / 5.1	—	
CR	19-36	10YR 5/6	XGR S.I	11	35	GR 75	<6.0"	PO / SO	—	-	CW	—	—	2 F-VF 1 CO-M	— / 4.6	—	
R	36+	—															

Other Notes: E HORIZON (0.25" THICK) VERY SPOTTY

TEST PIT DESCRIPTION

Soil Scientist: M. WOOD

Field Assistant: R. HILL

Signature: M. Wood

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P344-160622-1030-MGW	Topographic Position:	NOSE SLOPE	Parent material:	COLLUVIUM / RESIDUUM		
Date:	6/22/16	% Slope:	19	Slope Aspect:	149°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	>28		
RETTEW Job #:	089962000	Depth to Refusal:	28	Slope Failure or slip:	—		
NRCS Soil Unit:	WEIKERT - BERKS - ROUGH	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	17% 149°	Strike:	59°
Mineralogy:	Mixed	Vegetation:	CHESTNUT OAK, HICKORY, BLUE BERRY				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	7.5YR 3/2	—	—	—	—	—	— / —	—	—	AS	—	—	3 F-VF 2 C-M	4.3	—	
A	1-2	10YR 4/2	VGR SIL	10	35	GR 40	<1.0	PO SO	1 VF GR	VFR	CS	-	—	3 F-VF 2 C-M	5.1	—	
BA	2-5	10YR 5/4	VGR SIL	11	35	GR 45	<1.0	PO SO	1 VF GR	VFR	CW	—	—	2 F-VF 1 CO-M	5.4	—	
Bw	5-10	10YR 6/4	XGR SIL	11	38	GR 70	<4.0	PO SO	1 F SBK	FR	GW	—	—	2 F-VF 1 CO-M	5.2	—	
CR	10-28	10YR 6/4	XGR SIL	9	40	GR 75	<8.0	PO SO	1 M SBK	FR	CW	—	—	2 F-VF 1 CO-M	5.2	-	
R	28+	—	—	—	-	-	—										

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: M. WOOD

Field Assistant: R. HILL

Signature: M Wood

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P345-160622-1025-MGW	Topographic Position:	NOSE SLOPE	Parent material:	COLLUVIUM / RESIDUUM
Date:	6/22/16	% Slope:	23	Slope Aspect:	323
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	>17"
RETTEW Job #:	089962000	Depth to Refusal:	17"	Slope Failure or slip:	—
NRCS Soil Unit:	NEIKERT-BERKS-ROUGH	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	9% 196 Strike: 106
Mineralogy:	MIXED	Vegetation:	CHESTNUT + RED OAK, WHITE PINE, DOGWOOD, BLUEBERRY		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1.5	7.5YR 3/2	—	—	—	—	—		—	—	AS	—	—	2f-VF 1 M-CO	4.6	—	
A	1.5-2	10YR 4/1	GR SiL	10	27	GR 20%	<1.0	PO SO	1 vf GR	VFR	CS	—	—	2 F-VF 1 M-CO	0.25 4.5	—	
EB	2-4	10YR 4/4	GR SiL	10	27	GR 20%	<1.0	PO SO	1 vf GR	FR	CW	—	—	2 F-VF 1 M-CO	0.25 5.3	—	
Bt	4-9	10YR 5/6	GR SiL	17	30	GR 25%	<2.0	PO SO	1 F SBK	FI-FR	CW	—	—	2 F-VF 1 M-CO	1.0 5.2	—	
BC	9-17	10YR 5/6	XGR SiL	12	35	GR 75%	<8.0"	PO SO	1 F SBK	VFR	CW	—	—	1 F-VF 1 M-CO	— 5.2	—	
~~C~~R	17	10YR 5/6	—	—	—	—	—										

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: M. WOOD
Field Assistant: R. HILL

Signature: M. Wood

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P346-160622-1020-MGW	Topographic Position:	SUMMIT	Parent material:	RESIDUUM
Date:	6/22/16	% Slope:	4%	Slope Aspect:	303
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	>13
RETTEW Job #:	089962000	Depth to Refusal:	13	Slope Failure or slip:	—
NRCS Soil Unit:	WEIKERT BERKS ROUGH	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	4% 213 Strike: 123
Mineralogy:	Mixed	Vegetation:	HICKORY, CHESTNUT OAK - WHITE PINE, BLUEBERRY		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	7.5YR 3/2	—	—	—	—	—	— / —	—	—	AS	—		3 F-VF 1 CO-M	4.8	—	
A	1-1.5	10YR 4/1	VGR SiL	11	35	GR 50	<2.0"	PO / SO	1 VF GR	VFR	AS	—		3 F-VF 1 CO-M	0.25 / 4.5	—	
Bw	1.5-13	10YR 6/6	XGR SiL	11	35	GR 70	<6.0"	PO / SO	1 M SBK	VFR	CW	—		2 F-VF 1 CO-M	0.25 / 5.2	—	
R	13+	10YR 6/6	—	—	—	—	—										

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant:

Signature: Daniel Fen

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	D-347-160621-1409-DEF	Topographic Position:	Headslope	Parent material:	Residuum
Date:	6/21/16	% Slope:	50	Slope Aspect:	250
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Excessive	Depth to Water Table:	-
RETTEW Job #:	089962000	Depth to Refusal:	4'	Slope Failure or slip:	Surface Sloughing
NRCS Soil Unit:	Shelocta-Berks Complex (50E)	Bedrock Type :	Shale	Dip Slope & Direction:	16° NW Strike: 150°
Mineralogy:	Mixed	Vegetation:	White Pine, Chestnut oak, blueberry, blackgum		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
A	0-1.5	10YR3/2	SiL	15	20	25% CN	<1"	PO / SO	2fGR	VFr	AW	—	—	3f	0.2	S1	Surface Channers
Bw	1.5-4	10YR4/4	SiL	16	20	70% CN	<1"	PO / SO	1fSBK	Fr	AW	—	—	2f 1M	0.5	S2	
R	4+	—															

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: M. WOOD

Field Assistant: R. HILL

Signature: M. Wood

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P348-160621-1115-MGW	Topographic Position:	SUMMIT	Parent material:	RESIDUUM
Date:	6/21/16	% Slope:	9%	Slope Aspect:	273
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	~~WD~~ Somewhat Excessively	Depth to Water Table:	>15"
RETTEW Job #:	089962000	Depth to Refusal:	15"	Slope Failure or slip:	—
NRCS Soil Unit:	WEIKERT-BERKS-ROUGH	Bedrock Type:	SANDSTONE	Dip Slope & Direction:	16% 312° Strike: 222
Mineralogy:	Mixed	Vegetation:	WHITE PINE, VIRGINIA PINE, CHESTNUT OAK, HICKORY, BLUE BERRY		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1	5YR 3/2	—	—	—	—	—	—	—	—	AS	—	—	3 F-VF 3 M-CO	— 4.3	—	
A	1-1.5	10YR 4/2	VCN SL	8	55	CN 30%	<6"	PO SO	1 VF GR	VFR	CS	—	—	3 F-VF 3 M-CO	— 4.5	—	
BC	1.5-15	10YR 5/4	XCN SL	8	55	CN 75%	<6"	PO SO	1 VF SBK	VFR	CW	—	—	2 F-VF 1 M-CO	0.01 5.1	—	
R	15+																

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: M. WOOD

Field Assistant: R. HILL

Signature: M. Wood

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P349-160621-1215-MGW	Topographic Position:	SIDE SLOPE	Parent material:	COLLUVIUM over residuum
Date:	6/21/16	% Slope:	24	Slope Aspect:	280
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	MWD	Depth to Water Table:	24"
RETTEW Job #:	089962000	Depth to Refusal:	32	Slope Failure or slip:	—
NRCS Soil Unit:	WEIKERT-BERKS-ROUGH	Bedrock Type :	SANDSTONE	Dip Slope & Direction:	35% Strike: 190
Mineralogy:	Mixed	Vegetation:	WHITE PINE, CHESTNUT OAK, HICKORY, DOGWOOD, BLUE BERRY, SASSAFRASS		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oi	0-1	7.5YR 3/2	—	—	—	—	—	— /	—	—	AS	—	—	2 F-VF, 1 M-CO, 1 VC	— / 4.4	—	
A	1-2	10YR 2/2	SiL	14	25	GR 10%	<1.0"	PO / SO	1 VF GR	VFR	AS	—	—	2 F-VF, 1 M-CO, 1 VC	0.25 / 4.5	—	
E	2-5	10YR 5/4	SiL	15	25	GR 10%	<1.0"	PO / SO	1 VF GR	VFR	CW	—	—	2 F-VF, 1 M-CO, 1 VC	0.25 / 5.1	—	
BE	5-10	10YR 5/4	L	17	35	GR 10%	<1.0"	MP / SS	2 M SBK	FR	CW	—	—	1 F-VF, 1 M-CO	0.25 / 5.2	—	
Bt1	10-19	10YR 5/6	SCL	32	55	GR 15%	<1.0	MP / SS	2 M SBK	FR	CW	—		1 F-VF, 1 M-CO	0.5 / 5.0	—	
BC	19-32	7.5YR 6/8	SL	18	60	GR 50	<2.0	PO / SS	1 M SBK	FI	CW	10YR 5/4	c/d	1 F-VF	2.75 / 5.[illegible]	—	REDOX 24"
R	32+	—	—	—	—	—	—	— / —	.								

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: D Fenstermacher

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-350-160621-1205-DEF	Topographic Position:	Nose slope	Parent material:	Residuum		
Date:	6/21/16	% Slope:	12	Slope Aspect:	290		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	well	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	19"	Slope Failure or slip:	—		
NRCS Soil Unit:	Weikert-Berks-Rough complex (57D)	Bedrock Type :	Shale	Dip Slope & Direction:	10° NW	Strike:	158°
Mineralogy:	Mixed	Vegetation:	White pine, Chestnut oak, Blueberry				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-0.25	5YR 2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	3f	— / 4.8	—	
A	0.25-2	10YR 3/2	SiL	14	15	25% CN	<4"	PO / SO	2FGR	VFR	AW	—	—	3f 2M	0.25 / 4.6	—	
Bw1	2-9	10YR 5/4	SiL	16	15	25% CN	<4"	PO / SS	1FSBK	VFR	CW	—	—	2f,M 1Co	0.5 / 4.2	—	
Bw2	9-19	10YR 5/6	SiL	16	~~20~~ 15	50% CN	<6"	PO / SS	1MSBK	FR	AW	—	—	2f,M 1Co	0.75 / 4.8	—	
R	19+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P351-160621-1140-DEF	Topographic Position:	Backslope	Parent material:	Colluvium over Residuum
Date:	6/21/16	% Slope:	82	Slope Aspect:	161°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	35	Slope Failure or slip:	—
NRCS Soil Unit:	Weikert Berks Rough Complex (57D)	Bedrock Type:	Shale - Ta	Dip Slope & Direction:	5° NW; Strike: 235°
Mineralogy:	Mixed	Vegetation:	Chestnut oak, Hickory, White Ash, Sparse blueberry in understory		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/pH	Lab Sample ID	Notes
A	0-1.5	10YR3/2	SiL	20	18	60% CN	<2"	PO / SO	1fSBK	VFr	AW	—	—	3f 2m 1Co	0.25 / 4.4	—	less than 1/4" of O material
Bw1	1.5-9	10YR5/4	SiL	21	16	60% CN	<2"	PO / SO	1fSBK	Fr	CW	—	—	3M, f 2Co, 1VCo	0.75 / 4.8	—	
Bw2	9-29	10YR5/4	SiL	22	16	85% CN	<8"	SP / SS	1MSBK	Fr	CW	—	—	3M 2f, Co	1.25 / —	—	
2BC	29-35	10YR6/6	SiL	22	12	85% CN	2-12"	SP / SS	1CoSBK	Fr	AW	—	—	1f, M	too many CoF / 4.6	—	Bedded CoF
2R	35+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant: Max Dugan

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-352-160621-1145-DEF	Topographic Position:	floodplain	Parent material:	Alluvium over colluvium
Date:	6/22/16	% Slope:	3%	Slope Aspect:	123°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:		Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	—	Slope Failure or slip:	—
NRCS Soil Unit:	Shelocta-Berks complex (50D)	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	Mixed	Vegetation:	White oak, Shagbark hickory, microstegium vimineum, Deer tongue		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe/a	0-0.5	5YR 2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	3f 1	— / 6.3	S1	Portions are highly decomposed
A	0.5-3	10YR 3/2	SiL	17	16	15% GR	<1/2"	SP / SS	1MGR	VFr	AW	—	—	3f 2m, 1co	0.1 / 4.8	S2	
Bw	3-7	10YR 4/4	SiL	17	18	20% GR	<1 1/2"	SP / SS	1MSBK	Fr	CW	—	—	2f 1M,Co	1.5 / 5.2	S3	
BC	7-29	10YR 4/3	SiL	16	20	40% CN	<1"	SP / SS	1CoSBK	VFr	CS	—	—	2f 1 m,co	0.75 / 5.2	S4	CoF have Rounded Edges
2C1	29-39	10YR 5/4	SiL	18	28	60% CN	<1"	SP / SS	1 CoSBK	Fr	CS	—	—	1f	1.5 / 5.3	S5	Some Lithochromic 10YR5/8 from weathering Shale CoF
2C2	39-50+	2.5Y 6/2	SiL	18	28	40% CN	<3"	SP / SS	1CoSBK	Fr	—	10YR 5/6	CP	1f	2.0 / 5.4	S6	Some Lithochromic oranges 10YR5/8 from weathering Shales CoF have Sharp Corners

Other Notes: Small Ephemeral Stream meandering through valley bottom, headcut 5' deep located downstream of A or creek bed is Dry.
No water observed in hole, moist throughout.

TEST PIT DESCRIPTION

Soil Scientist: M. WOOD
Field Assistant: R. HILL

Signature: M. Wood

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P352A-160621-1147-MGW	Topographic Position:	TOE SLOPE	Parent material:	COLLUVIUM
Date:	6/21/16	% Slope:	43%	Slope Aspect:	46°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WD	Depth to Water Table:	50+
RETTEW Job #:	089962000	Depth to Refusal:	50+	Slope Failure or slip:	—
NRCS Soil Unit:	WEIKERT-BERKS-ROUGH	Bedrock Type :	—	Dip Slope & Direction:	— Strike: —
Mineralogy:	Mixed	Vegetation:	WHITE OAK, CHESTNUT OAK, HICKORY		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	7.5YR 3/2	–	–	–	–	–	— / —	–	–	AS	–	–	3 F-VF 2 M-CO 1 VC	5.8	–	–
A	2-4	7.5YR 3/3	sl	10	50	GR 30	< 1.0	PS / SO	1 VF GR	VFR	CS	–	–	3 F-VF 2 M-CO 1 VC	0.25 / 5.5	–	–
Bw1	4-12	5YR 5/4	sl	12	55	GR 55	< 2.0	PO / SO	1 M SBK	FR	CW	–	–	2 F-VF 2 M-CO 1 VC	0.5 / 5.2	–	–
Bw2	12-50+	5YR 5/4	sl	12	65	GR 65	< 2.0	PO / SS	1 M SBK	FR	CW	–	–	1 F-VF 1 M-CO	1.25 / 5.0	–	–
~~C~~	~~F~~	5YR 5/4	sl	–	–			/ SS	–	–	–	–	–			–	–

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher
Field Assistant: Max Dugan

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-353-160622-1050-DEF	Topographic Position:	Ridge top	Parent material:	Residuum
Date:	6/22/16	% Slope:	14%	Slope Aspect:	255°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	well	Depth to Water Table:	—
RETTEW Job #:	089962000	Depth to Refusal:	26"	Slope Failure or slip:	—
NRCS Soil Unit:	Weikert, berks, Rough Complex (57D)	Bedrock Type :	Shale - tan	Dip Slope & Direction:	12° E Strike: 164°
Mineralogy:	Mixed	Vegetation:	White Pine, Hickory, Chestnut oak, Sparse blueberry & herb layer		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-1.5	5YR 2.5/1	—	—	—	—	—	— / —	—	—	AW	—	—	3f	— / —	—	
A	1.5-3.5	10YR 3/2	SiL	15	22	40% CN	∠1"	PO / SO	1fGR	VFr	AW	—	—	3f 2m	0 / 4.6	—	
Bw	3.5-8	7.5YR 5/4	SiL	16	18	75% CN	1/4-4"	SP / SS	1fSBK	Fr	CW	—	—	2f,M 1co	0.5 / 4.6	—	
C	8-26	7.5YR 4/4	Channery (SiL)	—	—	98% CN	1-6"	— / —	OM	—	CW	—	—	2f,M	CoF / —	—	
R	26+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes:

TEST PIT DESCRIPTION

Soil Scientist: D. Fenstermacher

Field Assistant:

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	P-353A-160622-1035-DEF	Topographic Position:	Upper back slope	Parent material:	Colluvium over residuum		
Date:	6/22/16	% Slope:	42	Slope Aspect:	140°		
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	Well	Depth to Water Table:	—		
RETTEW Job #:	089962000	Depth to Refusal:	27"	Slope Failure or slip:	—		
NRCS Soil Unit:	Weikert - Berks Rough Complex (57E)	Bedrock Type :	Shale - Tan	Dip Slope & Direction:	28° E	Strike:	28°
Mineralogy:	Mixed	Vegetation:	White oak, Chestnut oak, hickory, white pine, very sparse herb layer				

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-0.5	5YR 2.5/2	—	—	—	—	—	— / —	—	—	AW	—	—	2f	— / 6.5	—	
A	0.5-3	10YR 2/1	SiL	16	25	50% CN	< 1/2"	PO / SO	1MGR	VFr	AW	—	—	2f 1M,Co	0.2 / 6.5	—	
Bw1	3-10	7.5YR 5/4	SiL	18	18	75% CN	< 1/4"	SP / SS	1VfSBK	VFr	CW	—	—	2f 1M,Co	0.2 / 5.4	—	
Bw2	10-19	7.5YR 5/4	SiL	18	22	85% CN	< 4"	SP / SS	1MSBK	Fr	AW	—	—	2M,f	CoF / 5.6	—	Orange Shale CoF Random CoF oriental...
2C	19-27	10YR 6/4	Chanmers —	—	—	98% CN	1-6"	— / —	OM	—	CW	—	—	1f	— / —	—	fractured Rock with fines inbetween oriented with BedRock
2R	27+	—	—	—	—	—	—	— / —	—	—	—	—	—	—	— / —	—	

Other Notes:

Attachment 5
Soil Transect Log

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: Duane Truax

Rettew Job # : 089962000

Date: 06/20/2016

Section:

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T007A 160620-1420-DAT

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oa	0-0.5	5YR 2.5/1	—	—	—	—	
A	0.5-4.0	5YR 3/2	SiL	XST 60%	—	—	
AB	4.0-7.0	5YR 4/4	SiL	VCK 40%	—	—	
Bt1	7.0-14.0	2.5YR 5/4	SiCL	GR 10%	—	—	
Bt2	14.0-18+	2.5YR 5/4	SiCL	GR 5%	—	—	

Notes: * many stones and flagstones on surface

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID: T007B 160620-1418-DAT

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
A	0-2	2.5YR 3/1	SiL±	VCK 50%	—	—	
AB	2-6	2.5YR 3/3	SiL	VCK 40%	—	—	
Bt1	6-12	2.5YR 5/4	SiL	GR 15%	—	—	
Bt2	12-18+	2.5YR 5/4	SiL	GR 10%	—	—	

Notes: * many stones and flagstones on surface

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

TEST PIT DESCRIPTION

Soil Scientist: JOHN WAH
Field Assistant: MIGUEL PARAMES

Signature: [signature]

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Test Pit ID:	T-025A-160614-1455-JSW	Topographic Position:	BENCH, NOSE	Parent material:	RESIDUUM
Date:	6/14/16	% Slope:	17	Slope Aspect:	152°
Job Name:	Dominion - Atlantic Coast Pipeline Soil Survey	Drainage Class:	WELL	Depth to Water Table:	–
RETTEW Job #:	089962000	Depth to Refusal:	–	Slope Failure or slip:	–
NRCS Soil Unit:	CALVIN-DEKALB-BERKS	Bedrock Type :	SILTSTONE	Dip Slope & Direction:	– Strike: -
Mineralogy:	MIXED	Vegetation:	MAPLE, HICKORY, WHITE PINE, BLUEBERRY		

USDA

Horizon	Depth in inches	Matrix Color	Texture Class	% clay	% sand	Rock Fragment Type & %	Rock Fragment Size (inches)	Plasticity/ Stickiness	Structure Type, Grade, and Size	Moist Consistence	Horizon Boundary Topography & Distinctness	Redox Feature Color	Redox Feature Description	Roots	Pocket Penetrometer/ pH	Lab Sample ID	Notes
Oe	0-2	5YR2.5/1	–	–	–	–	–	– / –	–	–	CS	–	–	3-VF 2-F	– / –	–	
A	2-3	10YR3/1	SiL	12	10	5 GR	1	PO / SO	1FGR	VFR	AW	–	–	2-F	– / –	–	
BE	3-7	10YR5/6	SiL	14	15	5 GR	<1	PO / SO	1MSBK	FR	CS	–	–	2-F 1-C	– / –	–	
Bt1	7-14	10YR5/8	SiL	24	20	2 CH	1	SP / SS	2MSBK	FR	CS	–	–	2-M 1-C	– / –	–	CLAY SKINS
Bt2	14-21	10YR5/4	SiCL	29	18	1 CH	<1	MP / SS	2MSBK	FR	–	–	–	2-F,M	– / –	–	CLAY SKINS

Other Notes: SOME COLLUVIAL INFLUENCE IN SURFACE, JUST LIKE T-024

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: John C Roberts
Rettew Job # : 089962000

Date: 6-17-2016
Section: P-027-029

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-027A-160617-1116-JCR
Slope & Aspect: 34%, 240 | Position: Backslope | PM: colluvium

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	1	5YR 2.5/1	[illegible]	—	—		
A	2	10YR 4/1	SL	-		—	
Bw	18	7.5YR 5/6	SL	-		—	

Notes: ollovium

Transect Point ID: T-029A-160617-1219-JCR
Slope & Aspect: 7%/136° | Position: Bench | PM: Colluvium

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	3	5YR 2.5/1	—				
A	6	10YR 4/1	L	—	~	—	
Bw	18	10YR 5/6	L	—	—	—	

Notes: Colluvium

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: John C. Roberts
Rettew Job # : 089962000

Date: 06-14-2016
Section: P-041 - P-045

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-045A-160614-1201-JCR
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	1	5YR 2.5/1	—	—	—	—	
A	3	10YR 3/2	SIL	20 CH		—	
Bw	20	10YR 5/4	SIL	30 CH			
Bt	34	10YR 5/6	SIL				25%/clay films

Notes: Colluvium
Road cut

Transect Point ID: T-042A-160614-1441-JCR
Slope & Aspect: 15% 29° Position: Summit PM: Silt Stone

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	1	5YR 3/1	—	10 GR	—		
A	3	10YR 3/2	SIL	15 GR	—		
Bw	10	10YR 5/6	SIL	15 GR	—		

Notes: Residuum material

Transect Point ID:
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: P. Feuerstenwald

Rettew Job # : 089962000

Date: 6/14/16

Section: P-047-049

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-049A-160614-1410-DEF

Slope & Aspect: 4% 331 | Position: floodplain | PM: Alluvium

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
A	0-2	10YR3/2	L	40% GR	10YR4/6	CD	
Bg	2-6	10YR4/1	L	30% GR	10YR4/6	MP	
Ab	6-9+	10YR3/1	L	65% GR	10YR4/4	FD	Saturated

Notes: located in Pocket on east side of Creek about 1' above creek bottom. Poorly Drained wt@ 7"

Transect Point ID: T-049B-160614-1430-DEF

Slope & Aspect: 3% 330 | Position: floodplain | PM: Alluvium

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-1	5YR2.5/1	—	Surface Cobbles	—	—	
A	1-5	10YR3/2	L	55% CB	-	—	
Bw1	5-18+	10YR5/4	SiL	55% CB	—	—	

Notes: 24" above creek bottom refusal on CoF Mod Well Drained

Transect Point ID: T-047A-160614-1555-DEF

Slope & Aspect: 35% 63° | Position: Upper Bench | PM: Residuum

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-2	5YR2.5/1	—	—	—	—	
A	2-6	10YR2/1	SiL	15%	—	—	
Bw	6-17+	10YR5/4	SiL	30% GR	—	-	Angular CoF

Notes: Resid.

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: Russell Losco
Rettew Job # : 089962000

Date: 6.13.16
Section: P-055

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T055A 160613-1115-RLL
Slope & Aspect: 21.5 | Position: Shoulder | PM: ~~Siltstone~~ Residuum

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oa	2	2.5YR 2.5/2	SiL	5	—	—	21% slope
B	12	10YR 4/6	SiL	20	—	—	
B	16	10YR 5/6	SiL	45	—	—	
	Refusal						

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Soil Scientist: Steve Dadio
Rettew Job # : 089962000
Date: 06/14/16
Section: E P067-071

Transect Point ID: T-067A-160614-1552-sdd
Slope & Aspect: 10 240 | Position: shoulder | PM: res

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	2	5YR 2.5/1	–	ch 40	–	–	
A	4	5YR 3/2	sil	ch 30	–	–	
Bw	20	5YR 4/6	sil	fl 60	–	–	

Notes:

Transect Point ID: T-071A-160614-1618-sdd
Slope & Aspect: 32 320 | Position: upper bs | PM: coll

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	2	7.5YR 2.5/1	–	ch 30	–	–	
A	4	7.5YR 3/2	l		–	–	
Bw	16	7.5YR 5/6	l	ch 70	–	–	

Notes: N

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Soil Scientist: Steve Dadio
Rettew Job # : 089962000
Date: 6/16/16
Section: E P-073-076

Transect Point ID: T-075A 160616 - 1614 - sdd
Slope & Aspect:
Position: backslope
PM: coll

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oa	2	7.5YR 3/2	—	40ch			
A	4	10YR 2/2	sil	40ch			
Bw	20	10YR 5/6	sil	65ch			

Notes:

Transect Point ID: T-076A 160616 - 1628
Slope & Aspect: 6
Position: - parking area
PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
A	6	10YR 3/2	sil	—	—	—	platy

Notes: landing/parking area, needs remediation from compaction

Transect Point ID: T-073A 160616 - 1645 - sdd
Slope & Aspect:
Position: saddle
PM: coll

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	2	7.5YR 2.5/1	-	25	-	-	
A	4	10YR 3/2	sil	30	-	-	
Bt	18+	10YR 5/6		25	-	-	

Notes: argillic, likely deep soil in saddle

Transect Point ID:
Slope & Aspect:
Position:
PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: Steve Dadio

Rettew Job # : 089962000

Date: 6/17/16

Section: E P-079

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T079A 160617 - $341-sdd
Slope & Aspect: 48 | Position: bs | PM: res

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	2	7.5YR 2.5/1	sil	ch 50	–	–	
A	6	7.5YR 3/2	sil	ch 50	–	–	
Cr	16				–	–	
R	16+						

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
-Soil Transect Log

Soil Scientist: Steve Dadio, John Galbraith

Rettew Job # : 089962000

Date: 6-9-16

Section: A P-093

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-093A-160609-1556-SDD

Slope & Aspect: 190° 40% | Position: Shoulder | PM: Residuum

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oa	1	7.5YR 2.5/2	Sapric		–	–	
A	3	7.5YR 3/2	SiL	15% GR	–	–	
Bw	12	10YR 5/6	SiL	40% GRV	–	–	
R	>12	–					Siltstone

Notes: Chestnut oak

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: JOHN WAH
Rettew Job # : 089962000

Date: 6/13/16
Section: A P-103

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-103A-160613-1328-JSW
Slope & Aspect: S 12, 145° | Position: BACKSLOPE | PM: RESIDUUM ?

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-1	5YR2.5/1	-	-	-	-	
A	1-2	10YR3/1	GR SIL	20	-	-	
Bw	2-9	10YR5/6	VCH SIL	40	-	-	

Notes: ON BACKSLOPE NEAR SUMMIT, ABOVE SANDSTONE OUTCROP;

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID: T-103B-160613-1329-JSW
Slope & Aspect: S 12, 145° | Position: BACKSLOPE | PM: COLLUVIUM OVER RESIDUUM

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-1	5YR2.5/1	-	-	-	-	
A	1-2	10YR3/1	GR SIL	15	-	-	
Bt	2-12	7.5YR4/6	GR SIL	25	-	-	
2BC	12-16	7.5YR4/6	VCH SIL	65	-	-	

Notes: ABOVE P-103
BELOW SS OUTCROP, SS COLLUVIUM OVER SILTSTONE RESIDUUM

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Soil Scientist: John C Roberts

Rettew Job # : 089962000

Date: 6-13-2016

Section: P-114 to P-112

Transect Point ID: T-114A 160613-1427-JCR

Slope & Aspect: | Position: | PM: Colluvium

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	1	5YR 2.5/1	—	—	—	—	
A	3	10YR 3/2	SiL				
Bw1	11	10YR 5/6	SiL				30% CH
Bw2	23+	10YR 5/6	SiL				40% CH + 20% flagstones

Notes: Colluvium

Transect Point ID: T-112A-160613-1645-JCR

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	1	5YR 2.5/1	—	—	—		
A	5	10YR 3/2	SiL		—	—	
Bw	17	10YR 5/6	SiL	—		—	

Notes: Hemlock, Red Maple
No wetness w/in 17"

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: M. Wood

Rettew Job # : 089962000

Date: 6/16/16

Section: P121

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-121A 060616-1200-MGW

Slope & Aspect: 98% 244 | Position: LAT SLOPE | PM: COLLUVIUM

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
0.5	Oe	7.5YR 3/2	—	–	—	-	—
0.5-2	A	10YR 5/3	SL	<15	–	–	
2-10	Bw1	10YR 5/6	GR SL	20%	–	—	
10-17	Bw2	10YR 5/6	VGR SL	50%	-	-	
17+	Cr						

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: Steve Dadio
Rettew Job # : 089962000

Date: 6/15/16
Section: A P-135

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: + 135A 160615 - 1341 - sdd
Slope & Aspect: 25 60° | Position: upper bS | PM: coll/res

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
O	.5	7.5YR 2.5/1	–	ch 30	–	–	
A	2	10YR 5/6	sil	ch 30	–	–	
Bw	10	10YR 5/6	sil	ch 60	–	–	
2C	16	10YR 5/6	sil	ch 85	–	–	
2R	16+						

Notes: 22° S dip 100° strike

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: Steve Dadio
Rettew Job # : 089962000

Date: 6/6/16
Section: B P-151

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-154-160606-1157-sd
Slope & Aspect: 38/150 Position: BS PM: colluvium

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	2	5YR 2/1		50fl	-	-	
A	6	10YR 4/1	sl	50fl	-	-	
Bw	16	6/6	sl	25gr	-	-	

Notes: wet in hole bottom. >35% slope seepage

Transect Point ID:
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: D. TRUAX
Rettew Job # : 089962000

Date: 6-6-2016
Section: (P-155 to P-158)

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T154A-1606061711-DAT 121°E

Slope & Aspect: 35%/E		Position: BACKSLOPE		PM: COLLUVIUM			
Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-1	7.5YR 2.5/1	–	–	–	–	
A	1-4	7.5YR 3/2	LOAM	CH	–	–	
Bw1	4-12	5YR 5/4	LOAM	VCH	–	–	
Bw2	12-20+	5YR 5/4	LOAM	VCH	–	–	

Notes: VERY SIMILAR TO P-155

Transect Point ID:

Slope & Aspect:		Position:		PM:			
Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect:		Position:		PM:			
Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect:		Position:		PM:			
Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: John Wah
Rettew Job # : 089962000

Date: 160607
Section: GNFW-D P-187

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-187a-160607-1436-JSW
Slope & Aspect: 54%, 270 | Position: LC | PM: colluvium over residium?

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-3	5YR2.5/1	–	–	–	–	
Bw1	3-11	10YR56	VGRSIL	55	–	–	
Bw2	11-21	10YR46	VGRSIL	60	–	–	
2Bt	21-25	5YR56	VGRSCL	45	–	–	clay skins

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: Steve Dadio

Rettew Job # : 089962000

Date: 06/07/16

Section: D P-189-191

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-189A 160607-1112-sdd

Slope & Aspect: 5% 300 | Position: saddle/bench | PM: res (or slope creep)

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oa	1	10YR 2/1	—	10 gr	—	—	
Bt1	12	7.5YR 5/6	Sil	10 gr	—	—	15 c 10 s 75 si
Bt2	20	7.5YR 5/6	Sil	25 gr	—	—	↓
	refusal on large rocks						

Notes: white pine dominant
rocks 2.5YR 5/6 siltstone

Transect Point ID: T-191B 160607-1533-sd

Slope & Aspect: 22 200 | Position: sh / upper bs | PM: coll/res

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	2	5YR 2.5/1	—	20 gr	—	—	
Bt1	13	10YR 4/6	s.l	30 gr	—	—	
Bt2	24	10YR 4/6	sil	50 ch	—	—	
2R							

Notes: 10YR 7/1; 7/3; 5YR 5/8 clay washed on rocks

Transect Point ID: T-191A-160607-1611-sdd

Slope & Aspect: 25 80 | Position: backslope | PM: coll/res

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oa	2	10YR 3/1	—	20	—	—	
BE1	3	6/6	vfsl		—	—	
Bt1	15	6/6	vfsl	10 gr	—	—	
2BC	26	5YR 6/8	vfsl	40 ch	—	—	

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: Steve Dadio

Rettew Job # : 089962000

Date: 06/03/16

Section: E P-203

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T203A-160603-1137-sdd

Slope & Aspect: 9% 358° | Position: upper BS | PM: residuum

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oa	2	7.5YR 2/1	-	-	-	-	
Bw1	14	10YR 5/6	sil		-	-	high silt
Bw2	22	10YR 5/6	sl	40% cb	-	-	higher sand

Notes: convex slope, near 203-centerline zone of loss, sandstone residuum

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: STEVE DADIO
Rettew Job # : 089962000

Date: 6/1/16
Section: P-226

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-226A-160601-1419-SDD
Slope & Aspect: 17% 209 | Position: BACKSLOPE | PM: COLLUVIUM

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-1	5YR2.5/1	–	–	–	–	
A	1-3	10YR3/2	SiL	10	–	–	
Bw	3-12	10YR5/4	GR SiL	15	–	–	

Notes: BACKSLOPE BENCH; SASSAFRAS, WHITE PINE, WHITE OAK, RED MAPLE

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID: T-226B-160601-1445-SDD
Slope & Aspect: 24% 180° | Position: BACKSLOPE | PM: RESIDUUM

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-0.5	5YR2.5/1	–	–	–	–	
A	0.5-2	10YR3/2	CH SiL	20	–	–	
Bw	2-14	10YR4/6	CH SiL	30	–	–	

Notes: LINEAR BACKSLOPE, STEEPER ABOVE BENCH, SILTSTONE

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: Michael Lane
Rettew Job # : 089962000

Date: 6/7/16
Section: P-234 – P-239

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-238A-160607-1505-MEL
Slope & Aspect: 30%/110° Position: sideslope head slope PM: colluvium

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-0.5	5YR 2.5/1					
A	0.5-2.5	10YR 3/2	GR S.L	15	—		
BE	2.5-5	10YR 5/5	GR S.L	30	—		
BC	5-13	10YR 5/6	VGR S.L	60	—		

Notes: Corellate to 238

Transect Point ID:
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Soil Scientist: D.Fenstermacher

Date: 6/7/16

Rettew Job # : 089962000

Section: P-239

Transect Point ID: T-239A-160607-1450-DEF

Slope & Aspect: 17% 295 | Position: footslope gulley bottom | PM: Alluvial

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
OE	0-2	5YR 2.5/2	–	–	–	–	
A	2-3.5	10YR 4/2	SiL	38% gr	–	–	Rounded CoF
B	3.5-14	10YR 5/4	SiL	45% CN	–	–	Rounded ≥ 80% CoF

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: P.Fenstermacher

Rettew Job # : 089962000

Date: 6/8/16

Section: P-247

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-247A-160608-1347-DEP
Slope & Aspect: 34% 64° | Position: Backslope | PM: Residuum

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
A	0-1	10YR3/2	SiL	30% CN	—	—	
Bw1	1-6	10YR5/4	SiL	38% CN	—	—	Angled Edges on CoF
Bw2	6-8+	10YR5/4	SiL	50% CN	—	–	Shale CoF

Notes:

Transect Point ID: T-247B-160608-1358-DEF
Slope & Aspect: 35% 64° | Position: Backslope | PM: Residuum

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
A	0-2	10YR3/2	SiL	25% CN	—	—	
Bw	2-7+	10YR5/4	SiL	38% CN	—	—	Angled CoF Matches material - Shale

Notes:

Transect Point ID: T-247C-160608-1404-DEP
Slope & Aspect: 35 64° | Position: Backslope | PM: Colluvium

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-1	2.5YR 2.5/1	—	—	—	—	
A	1-4	7.5YR 3/3	SiL	20% GR	—	—	mixed & Rounded CoF
Bw	4-7+	5YR5/4	SiL	20% CNR	—	—	

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: Michael Lane
Rettew Job # : 089962000

Date: 6/8/16
Section: P-250 - P255

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-253A-160608-1150-MEL
Slope & Aspect: 34%/350° | Position: headslope | PM: Colluvium

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-2	5YR2.5/1	—	—	—	—	
A	2-3	10YR4/3	VGR L	35%	—	—	
Bw1	3-8	10YR5/6	GR-CB SIL	25%	—	—	
Bw2	8-18	10YR5/6	SIL	<10%	—		

Notes: In concave, narrow headslope, Bw2 w/ very few coarse fragments compared to surrounding sideslopes

Transect Point ID: T-250A-160608-1426-MEL
Slope & Aspect: 17%/330° | Position: sideslope | PM: Colluvium

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-2	5YR2.5/1			—	—	
BE	2-6	10YR 5/4	SiL	<10	—	—	
Bw	6-23	10YR 5/6	SiL	<10	—	—	
							2fm Roots to depth

Notes: Few c.f. - surface sandstone <1" chestnut, witchhazel - increasing c.f. w/depth

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: JOHN WAH
Rettew Job # : 089962000

Date: 6/8/16
Section: H P-256

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-256A-160608-0945-JSW
Slope & Aspect: 43%, 190° | Position: BACKSLOPE | PM: RESIDUUM

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-1	5YR2.5/1	–	–	–	–	
A	1-2	10YR3/1	GR SiL	30	–	–	
BW	2-6	10YR4/6	VCH SiL	55	–	–	
R	6+	SANDSTONE BEDROCK					

Notes: SS BEDROCK DIPPING INTO SLOPE, LITHIC UDORTHENT
OUTCROPPINGS ON BACKSLOPE, VARIABILITY IN DEPTH TO ROCK
DIP 25% NNE(20°) STRIKE: 290°, REFUSED AT 23"

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: JOHN WAIT
Rettew Job # : 089962000

Date: 6/8/16
Section: H P-258

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T258A-160608-1257-JSW
Slope & Aspect: 44%, 354° | Position: BACKSLOPE | PM: COLLUVIUM

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-2	5YR2.5/1	–	–	–	–	
A	2-4	10YR3/2	GR SiL	15	–	–	
BE	4-12	10YR5/6	VGR SiL	30	–	–	
Bt	12-25	10YR5/6	VGR SiL	50	–	–	

Notes: SAME UNIT AS P-255

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: Michael Lane

Rettew Job # : 089962000

Date: 6/9/16

Section: P 265 - P 269

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-269A-160609-1405-MEL

Slope & Aspect: <5%/90° | Position: ridge summit | PM: residuum

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
A	0-3	10YR3/2	GR SiL	15%			
Bw	3-8	10YR5/6	VGR SiL	50%			
Cr	8-20			85%			

Notes: Thin Oe horizon <1/2 in, chestnut oak, white pine c.f. in Bw vary to channery, siltstone/shale

Transect Point ID: T-266A-160609-1525-MEL

Slope & Aspect: 45%/185° | Position: Sideslope | PM: Thin Colluvium over residuum

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
0-0.5	Oe	5YR2.5/1			—		
0.5-2	A	10YR3/3	GR SiL	20	—		
2-7	Bw1	10YR5/6	GR SiL	25	—		<1 in CF
7-13	Bw2	10YR5/6	GR SiL	25	—		1in+ CF
13-20	C	10YR5/6	XCN SiL	75	—		

Notes: Compare to P-267, T-266A higher on landscape, some surface sandstone gravels

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: Steve Dadio

Rettew Job # : 089962000

Date: 06/10/16

Section: H P-277

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-277A-160610-1106-sdd

Slope & Aspect: 45/280 | Position: backslope | PM: coll/res

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	2	7.5YR 2.5/1	–	20 ch	–	–	
BA	3	10YR 4/2	sil	25 ch	–	–	
Bw1	12	10YR 5/6	sil	40 ch	–	–	
Bw2	18	7.5YR 5/6	sil	40 ch	–	–	
2R	18+						

Notes: bedrock dipping @ 90 degrees

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey

Soil Transect Log

Soil Scientist: P. Fenstermacher

Rettew Job # : 089962000

Date: 6/6/16

Section: 283-288

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-285A-160606-1233-DEF

Slope & Aspect: 16% 334° | Position: Shoulder | PM: Residuum

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-2	5YR2.5/1	–	–	–	–	
A	2-3	10YR4/1	SiL	–	–	–	
Bt	3-14+	10YR6/4	SiL	10% CH	–	–	Clay films moderate strong

Notes: Same as P-285

Transect Point ID: T-283A-160606-1359-DEF

Slope & Aspect: 20% 0° | Position: Nose | PM: Residuum

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-2	5YR2.5/1	–	–	–	–	
A	2-2.5	10YR2/1	SiC		–	–	
BW	2.5-16+	10YR6/4	SiL	25% CH	–	–	

Notes: Similar to 284 in a more stable Position

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: Michael Lane

Rettew Job # : 089962000

Date: 06/06/16

Section: P-289- P-291

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: P-291D-R06E06-1637-MEL							
Slope & Aspect: 4%, 210°		Position: summit			PM: Colluvium		
Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
O	0-1						
A	1-2	10YR4/3	Gr SiL	15			
BE	2-7	10YR5/6	Gr SiL	20			
Bw	7-16	10YR5/8	VGr SiL	35			

Notes: correlate to P-291, no argillic horizon

Transect Point ID:							
Slope & Aspect:		Position:			PM:		
Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:							
Slope & Aspect:		Position:			PM:		
Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:							
Slope & Aspect:		Position:			PM:		
Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: Michael Lane
Rettew Job # : 089962000

Date: 6/6/16
Section: P-299 - P-293

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-296A-160606-0849-MEL
Slope & Aspect: 22%/160° Position: Sideslope PM: Colluvium

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
~~Oa~~/Oe	0-2						
A	2-3	10YR3/4	sil	10%	—	—	
BE	3-8	10YR5/4	sil	10%	—	—	
Bw	8-16	10YR5/6	GR sil	15%	—	—	

Notes: No argillic subsurface horizon

Transect Point ID: T-293A-160606-1037-MEL
Slope & Aspect: 4%/345° Position: Summit Ridge PM: Shale Colluvium

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-1.5						
A	1.5-2	10YR3/2	sil	—	—	—	
BE	2-6	10YR5/4	GR sil	30%	—	—	
Bw	6-16	10YR5/6	VGR sil	40%	—	—	3' gravels coarse grained shale

Notes: Near sandstone/shale geologic boundary similar to P-294, P-297

Transect Point ID: T-293B-160606-1122-MEL
Slope & Aspect: 18%/220° Position: Side Slope PM: Shale Colluvium

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-1.5						
A	1.5-2.5	10YR 3/2	L	<10%			
BE	2.5-6	10YR5/4	sil	<10%			
BW	6-16	10YR5/6	GR sil	20%			

Notes: Similar to T-293A

Transect Point ID: T-291A-160606-1525-MEL
Slope & Aspect: 23%/80° Position: Shoulder PM: Colluvium

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-1	~~10Y~~					
A	1-2	10YR3/2	gr sil	15%	—	—	
BE	2-8	10YR5/4	gr sil	20%	—	—	
Bt	8-16	10YR5/6	vgr sil	50%	—	—	
					—	—	

Notes: Correlate to P-291 argillic subsurface horizon

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: Michael Lane
Rettew Job # : 089962000

Date: 6/3/16
Section: P-299 -

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-299A-160603-1040-MEL
Slope & Aspect: 17%, 40° | Position: sideslope ridge | PM: shale/siltstone

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oi/Oe/Oa	0-3	10YR 2/2	—	—	—	—	
A	3-4	10YR4/3	GR sil	20%	—	—	
BE	4-10	10YR5/4	GR sil	20%	—	—	
Bw	10-18	10YR5/6	CBGR sil	30%+	—	—	

Notes: Correlate to P-299, C slope to D slope between P-299, P-298, Bw GR to VGR

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: M. WOOD
Rettew Job # : 089962000

Date: 6/3/16
Section: 301

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T 301A-160603-1350-MGW
Slope & Aspect: 32/278 Position: SHOULDER/BACK PM: COLLUVIUM/RES

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-1	10YR3/1	–		–	–	–
BA	1-2	10YR5/4	SiL	GR	–	–	–
Bw1	2-7	10YR5/6	SiL	VGR	–	–	
Bw2	7-19	10YR5/6	SiL	VGR		–	–
Cr	19+	10YR5/6	SiL	EXGR	–		

Notes:

Transect Point ID:
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: MICHAEL WOOD
Rettew Job # : 089962000

Date: 1/2/16
Section: 307

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-307A-160602-~~MGW~~ 1430-MGW
Slope & Aspect: 48 / 74 Position: BACKSLOPE PM: RESIDUAL

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	1-0	—	~~STL~~				
A	0-1	7.5YR 3/2	SiL		–	–	
Bw1	0-12	10YR 6/6	SiL		–	–	
Bw2	12-22+	7.5YR 5/6	SiL		–	–	

Notes: SIMILAR TO P307
RED SILTSTONE P.M.

Transect Point ID:
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: John C Roberts

Rettew Job # : 089962000

Date: 6-2-2016

Section: P-309 - P-310

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-309B 160602-1125-JCR

Slope & Aspect: 35° 120° | Position: Nose slope | PM: Silt stone Res.

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	1	—	—	—	—		
A	2	10YR3/2	SiL		—	—	
Bw	7	10YR5/6	SiL	CN	—	—	1"-3" frag
Cr	7+	—	—	VCN			

Notes: Dip 10% 221° Strike 111°, Nose slope
Residuum

Transect Point ID: T-309A-160602-1436-JCR

Slope & Aspect: 25° 171° | Position: Head Slope | PM: Silt stone Res.

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	2		—	—	—	—	
AE	9	10YR5/4	SiL	—	—	—	
Bw	16+	10YR5/6	SiL	GR	—	—	

Notes: Residuum

Transect Point ID: T-310A-160602-1532-JCR

Slope & Aspect: | Position: Back slope | PM: Col. / Residuum

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	1	—	—	—	—	—	
AE	6	10YR5/4	SiL	CN 10%	—	—	coarse rock intermixed
2Bw	14	10YR5/6	SiL	CN 35%	—	—	

Notes: Colluvium / Residuum

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: John C Roberts

Rettew Job # : 089962000

Date: 06-03-2016

Section: P-310

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

T-310C-160603-0938-JCR

Transect Point ID: ~~T-310A-160603-0938-JCR~~

Slope & Aspect: 6% 342° | Position: Summit | PM: Residuum

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0.5	10YR 3/1	–	GR 2%	—		
A	1	10YR 4/2	SIL	GR 10%		—	Gravel size 0.5 - 1.0"
Bw	14	10YR 6/6	GR SIL	GR 15%		—	Gravel size 0.5 - 1.5"

Notes: Silt stone

Transect Point ID: T-310B-160603-0937-JCR

Slope & Aspect: 6% 308 | Position: | PM: Residuum

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0.75	10YR 2/1	–	GR 2%	—		
A	1.25	10YR 4/2	SIL	GR 10%	—		
Bw	12	10YR 6/6	GR SIL	GR 20%	—		

Notes: Silt stone

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: Michael Lane
Rettew Job # : 089962000

Date: 6/3/16
Section: P 314 - P 311

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-311A-160603-0837-MEL
Slope & Aspect: 12%/150° Position: Summit Ridge PM: shale residuum

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe/A	0-2	10YR3/2	sil	10%	/		
~~BA~~ Bw	2-16	10YR5/6	channery sil	20%	/		
Cr	16-20	variegated 10YR 5/6	XCN sil	85%	/		
R	20-38				/		

Notes: Road cut Rock @ 16" Strike ~~20%~~ 20° Dip ~~75%~~ 75° E

Transect Point ID: T-311B-160603-0857-MEL
Slope & Aspect: 50%/150° Position: sideslope PM: shale colluvium

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oi/Oa/A	0-4	10YR3/2	sil	<10%	—		
BE	4-8	10YR5/4	VGR sil	40%	—		
Bw	8-14	10YR5/6	VGR sil	40%	—		
C	14-18	10YR5/6	XCN sil	70%	—		

Notes: Steep slope down to stream bottom

Transect Point ID:
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: Position: PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: Michael Lane

Rettew Job # : 089962000

Date: 6/2/16

Section: P311 - P314

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-312A-160602-1412-MEL

Slope & Aspect: 8% 270° | Position: Slide | PM: Colluvium

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Ap	0-3	10YR3/3	sil	<10%			mixed A horizon
Bw	3-10	10YR5/4	CN sil	15%	10YR6/2	mmp	
Bt	10-19	10YR5/6	CN sil	20%	10YR6/2	mcp	

Notes: Correlate to R-013-160510-1505-MPC
Lowlying w/in slide area, poorly drained depression
(See Rachel Hill photo)

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: M WOOD
Rettew Job # : 089962000

Date: 6/22/16
Section: P-345

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T345A-160622-1420-MGW
Slope & Aspect: 55/39 | Position: LINEAR SLOPE | PM: COLLUVIUM over residuum

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-1	7.5YR 3/2	—	—	—	—	—
A	1-1.5	10YR 2/2	SiL	10% GR	—	—	—
Bw1	1.5-4	10YR 5/6	SiL	15% GR	—	—	
Bw2	4-11	10YR 5/6	SiL	45% GR	—	—	
Cr	11+						

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:
Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Dominion ACP - Soil Survey
Soil Transect Log

Soil Scientist: D. Fenstermacher

Rettew Job # : 089962000

Date: 6/22/16

Section: P-353

RETTEW Associates, Inc.
3020 Columbia Avenue
Lancaster, PA 17603
Phone: 717-394-3721
Fax: 717-394-1063

Transect Point ID: T-353A-160622-1057-DEF

Slope & Aspect: 58% 370° | Position: lower Back | PM: Colluvium over Residuum

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes
Oe	0-2	5YR25/1	–	–	–	–	
A	2-4	10YR3/2	SiL	30% CN	–	–	
Bw1	4-11	7.5YR6/4	SiL	60% CN	–	–	
Bw2	11-19	7.5YR6/4	SiL	85% CN	–	–	Random orientation
2C	19-25	7.5YR6/4	–	99.9% CN	–	–	fractured rock w/Roots following bedded with Bedrock

Notes: Dip 10° NE Strike 310°
Shale Bedrock at 25"

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Transect Point ID:

Slope & Aspect: | Position: | PM:

Horizon	Depth (in)	Color	Texture	CoF	Redox Color	Redox Descr.	Notes

Notes:

Attachment 6
ACP Soil Mapping Key

Attachment 6

ACP Order 1 Soil Mapping Key

Parent Material	Slope Class	Drainage Class	Diagnostic Subsurface	Restrictive Layer Type	Depth to Restrictive Layer	Family Particle Size Class
1 – Residuum	A – 0-3%	1 – Very Poorly	A – Argillic	0 – None	1 – ≤12"	A – Coarse Silty
2 – Alluvium	B – >3-8%	2 – Poorly	B – Fragipan	1 – Bedrock	2 – >12-24"	B – Fine Silty
3 – Colluvium	C – >8-15%	3 – Somewhat Poorly	C – Cambic	2 – Fragipan	3 – >24-36"	C – Coarse Loamy
4 – Colluvium over Residuum	D – >15-25%	4 – Moderately Well	D – Spodic		4 – >36-48"	D – Fine Loamy
5 – Colluvium over Alluvium	E – >25-45%	5 – Well	E – None		5 – >48"	E – Sandy
6 – Human Transported Materials (HTM)	F – >45-70%	6 – Somewhat Excessively				F – Fine
7 – Organic Soil Materials	G – >70%	7 – Excessively				G – Very Fine
8 – Alluvium over Colluvium						H – Sandy-Skeletal
9 – HTM over Colluvium						I – Loamy-Skeletal
10 – Alluvium over Residuum						J – Clayey-Skeletal
						K – Clayey

Attachment 7
Laboratory Results Summary

Sample ID	Soil pH	P (ppm)	K (ppm)	Mg (ppm)	Reccomendations		Ca (ppm)	Acidity (meq/100g)	CEC (meq/100g)	% Saturation of CEC			Zn (ppm)	Cu (ppm)	S (ppm)	Total Volatile Solids (%)	TOC (mg/kg)	TOC (%)	Particle Size Analysis			
					Limestone (lb/Ac)	Mg (lb/Ac)				K	Mg	Ca							% Sand	% Silt	% Clay	Texture Class
P-003-160620-1025-rll-S1A	4.0	9	107	113	20,000	0	1400	20.7	23.2	1.2	4.1	30.1	3.3	1.2	8.9	53.6	374,000	37.4	N/A	N/A	N/A	N/A
P-003-160620-1025-rll-S2A	3.7	12	74	54	20,000	20	549	21.3	18.4	1.0	2.4	14.9	1.8	0.9	12.0	15.8	100,000	10	33.0	38.8	28.2	Clay Loam
P-003-160620-1025-rll-S3A	4.6	3	34	26	14,000	80	157	15.9	16.1	0.5	1.3	4.9	1.8	1.0	15.6	5.0	8,780	0.878	16.9	42.6	40.5	Silty Clay
P-003-160620-1025-rll-S4A	4.5	3	37	35	12,000	50	120	13.5	14.5	0.7	2.0	4.2	1.1	1.0	9.1	3.4	2,270	0.227	22.8	47.2	29.9	Clay Loam
P-010-160620-1315-mgw-S1A	4.8	8	152	128	9,000	0	832	10.5	16.1	2.4	6.6	25.8	4.2	1.3	7.0	86.3	476,000	47.6	N/A	N/A	N/A	N/A
P-010-160620-1315-mgw-S2A	3.6	17	64	33	18,000	50	225	20.1	16.6	1.0	1.7	6.8	2.8	1.4	10.0	41.4	185,000	18.5	64.3	17.2	18.5	Sandy Loam
P-010-160620-1315-mgw-S3A	4.1	7	46	17	18,000	100	72	19.5	15.6	0.8	0.9	2.3	2.4	1.4	21.4	14.8	67,200	6.72	45.4	25.1	29.5	Sandy Clay Loam
P-010-160620-1315-mgw-S4A	4.7	7	25	11	9,000	110	45	11.1	11.5	0.6	0.8	2.0	2.2	1.0	25.5	8.1	30,500	3.05	42.6	25.0	32.4	Clay Loam
P-010-160620-1315-mgw-S5A	4.7	2	17	8	8,000	110	36	9.9	10.2	0.4	0.7	1.8	1.9	1.1	37.4	5.1	7,200	0.72	43.3	22.9	33.8	Clay Loam
P-010-160620-1315-mgw-S6A	4.7	1	25	9	9,000	110	44	10.5	10.9	0.6	0.7	2.0	1.6	1.1	24.3	4.3	3,280	0.328	43.3	21.0	35.7	Clay Loam
P-010-160620-1315-mgw-S7A	4.6	1	23	9	9,000	110	48	10.5	10.9	0.5	0.7	2.2	1.1	1.1	25.5	5.9	2,360	0.236	41.4	20.7	37.9	Clay Loam
P-010-160620-1315-mgw-S8A	4.6	1	30	14	15,000	100	55	17.1	15.5	0.5	0.8	1.8	1.0	0.9	33.3	5.0	2,810	0.281	23.5	19.8	56.7	Clay
P-012-160620-1115-mgw-S1A	5.1	8	158	113	9,000	0	627	11.1	15.6	2.6	6.0	20.1	3.2	1.2	6.7	96.9	484,000	48.4	N/A	N/A	N/A	N/A
P-012-160620-1115-mgw-S2A	3.9	11	119	56	20,000	20	360	21.3	17.6	1.7	2.7	10.2	3.2	1.1	21.1	18.1	147,000	14.7	54.9	27.3	17.8	Sandy Loam
P-012-160620-1115-mgw-S3A	4.3	16	49	22	15,000	80	107	17.1	15.8	0.8	1.2	3.4	3.4	1.0	28.7	16.4	92,400	9.24	55.9	25.5	18.6	Sandy Loam
P-012-160620-1115-mgw-S4A	4.9	7	18	13	8,000	100	54	9.9	10.3	0.4	1.0	2.6	2.4	1.0	37.6	8.7	49,800	4.98	53.7	31.0	15.3	Sandy Loam
P-012-160620-1115-mgw-S5A	4.9	7	20	10	8,000	110	52	9.3	9.7	0.5	0.9	2.7	2.9	1.1	42.6	6.4	21,600	2.16	49.2	24.6	26.2	Sandy Clay Loam
P-022-160614-1050-jsw-S1A	3.3	7	139	37	24,000	50	51	26.1	15.9	2.2	1.9	1.6	2.7	0.9	12.4	64.6	473,000	47.3	N/A	N/A	N/A	N/A
P-022-160614-1050-jsw-S2A	3.5	18	66	18	23,000	80	51	24.3	15.6	1.1	1.0	1.6	2.2	0.9	6.1	33.3	238,000	23.8	57.5	19.4	23.1	Sandy Clay Loam
P-022-160614-1050-jsw-S3A	4.2	5	18	10	4,000	110	41	5.7	6	0.8	1.4	3.4	1.1	0.7	3.6	1.3	5,540	0.554	79.6	12.2	8.2	Loamy Sand
P-022-160614-1050-jsw-S4A	4.3	21	27	9	9,000	110	28	10.5	10.8	0.6	0.7	1.3	1.3	1.2	18.9	4.1	13,000	1.3	66.8	11.4	21.8	Sandy Clay Loam
P-022-160614-1050-jsw-S5A	4.4	7	37	10	6,000	110	48	8.1	8.5	1.1	1.0	2.8	1.2	1.0	18.7	3.2	2,230	0.223	13.6	59.6	26.8	Silt Loam
P-022-160614-1050-jsw-S6A	4.5	1	59	14	11,000	100	31	12.9	13.3	1.1	0.9	1.2	1.0	1.2	24.3	4.3	710	0.071	22.9	31.1	45.9	Clay
P-022-160614-1050-jsw-S7A	4.4	1	53	16	11,000	100	31	12.3	12.7	1.1	1.0	1.2	0.9	1.3	17.3	6.0	1,110	0.111	8.8	37.2	54.0	Clay
P-040-160615-1119-jcr-S1A	4.5	11	147	63	12,000	0	424	13.5	16.5	2.3	3.2	12.8	3.3	1.0	19.8	38.8	411,000	41.1	N/A	N/A	N/A	N/A
P-040-160615-1119-jcr-S2A	4.0	5	92	31	17,000	60	57	18.9	15.8	1.5	1.6	1.8	2.2	1.0	15.5	10.1	75,700	7.57	35.9	46.0	18.1	Loam
P-040-160615-1119-jcr-S3A	4.8	3	49	13	6,000	100	43	8.1	8.5	1.5	1.3	2.5	2.2	1.2	25.7	3.7	7,880	0.788	18.4	51.4	30.2	Silty Clay Loam
P-040-160615-1119-jcr-S4A	4.6	1	53	18	8,000	80	51	9.9	10.4	1.3	1.4	2.4	1.4	0.9	23.2	3.7	1,790	0.179	29.2	39.0	31.8	Clay Loam
P-040-160615-1119-jcr-S5A	4.7	1	44	23	6,000	80	35	8.1	8.6	1.3	2.2	2.0	1.3	1.1	19.6	2.5	1,400	0.14	19.6	44.0	36.4	Silty Clay Loam
P-045-160614-1019-jcr-S1A	4.4	8	127	54	12,000	20	313	13.5	15.8	2.1	2.8	9.9	2.8	1.1	12.0	49.4	273,000	27.3	N/A	N/A	N/A	N/A
P-045-160614-1019-jcr-S2A	4.5	3	63	33	11,000	50	131	12.3	13.4	1.2	2.1	4.9	1.9	1.1	9.1	9.6	53,700	5.37	32.1	42.7	25.2	Loam
P-045-160614-1019-jcr-S3A	4.9	3	65	34	8,000	50	80	9.9	10.7	1.6	2.6	3.7	1.9	1.2	7.1	3.2	4,230	0.423	24.3	51.2	24.5	Silt Loam
P-045-160614-1019-jcr-S4A	5.3	2	83	122	7,000	0	443	8.7	12.1	1.8	8.4	18.2	1.3	1.2	5.2	3.8	3,480	0.348	27.0	45.4	27.6	Clay Loam
P-063-160614-0950-rll-S1A	6.5	57	151	97	0	0	2,839	3.9	19.3	2.0	4.2	73.6	2.8	1.9	10.6	11.1	49,800	4.98	34.8	41.0	24.2	Loam
P-063-160614-0950-rll-S2A	5.8	2	43	66	3,000	0	1,092	4.5	10.6	1.0	5.2	51.4	1.1	0.9	7.3	3.5	2,470	0.247	21.7	37.6	40.7	Clay
P-063-160614-0950-rll-S3A	4.8	1	75	207	9,000	0	76	10.5	12.8	1.5	13.5	3.0	2.2	1.9	5.6	2.7	1,100	0.11	8.8	48.7	42.4	Silty Clay
P-068-160614-1338-sdd-S1A	6.1	119	139	232	4,000	0	3,230	5.1	22.4	1.6	8.6	67.0	15.8	1.3	17.0	60.3	270,000	27	N/A	N/A	N/A	N/A
P-068-160614-1338-sdd-S2A	5.3	263	67	60	8,000	0	952	9.9	15.3	1.1	3.3	31.0	6.8	1.2	23.1	8.8	62,900	6.29	74.1	16.6	9.3	Sandy Loam
P-068-160614-1338-sdd-S3A	4.8	85	39	23	8,000	80	87	93	10	1.0	1.9	4.3	1.3	0.7	9.6	1.9	2,280	0.228	53.5	25.1	21.4	Sandy Clay Loam
P-068-160614-1338-sdd-S4A	5.2	10	46	44	7,000	30	414	8.7	11.3	1.0	3.3	18.4	1.4	0.9	8.6	2.7	4,200	0.42	37.3	32.7	30.0	Clay Loam
P-069-160614-1158-sdd-S1A	4.9	67	154	127	10,000	0	1,289	11.7	19.6	2.0	5.4	32.9	6.8	1.9	23.6	47.3	123,000	12.3	N/A	N/A	N/A	N/A
P-069-160614-1158-sdd-S2A	4.2	35	75	27	14,000	80	79	15.9	15.8	1.2	1.4	2.5	2.7	1.9	22.6	11.4	72,000	7.2	48.7	36.0	15.3	Loam
P-069-160614-1158-sdd-S3A	4.6	27	51	21	9,000	80	77	10.5	11.2	1.2	1.6	3.4	3.2	0.8	24.1	5.5	37,600	3.76	40.9	39.0	20.1	Loam

Sample ID	Soil pH	P (ppm)	K (ppm)	Mg (ppm)	Reccomendations		Ca (ppm)	Acidity (meq/100g)	CEC (meq/100g)	% Saturation of CEC			Zn (ppm)	Cu (ppm)	S (ppm)	Total Volatile Solids (%)	TOC (mg/kg)	TOC (%)	Particle Size Analysis			
					Limestone (lb/Ac)	Mg (lb/Ac)				K	Mg	Ca							% Sand	% Silt	% Clay	Texture Class
P-069-160614-1158-sdd-S4A	4.6	10	27	16	7,000	100	52	8.7	9.2	0.8	1.5	2.8	1.5	0.8	17.6	2.2	1,630	0.163	50.3	31.1	18.6	Loam
P-069-160614-1158-sdd-S5A	4.7	3	39	35	7,000	50	62	8.7	9.4	1.1	3.1	3.3	1.4	0.8	20.3	2.5	1,530	0.153	64.3	22.4	13.2	Sandy Loam
P-077-160617-1035-sdd-S1A	5.1	34	144	188	11,000	0	1,497	12.3	21.7	1.7	7.2	34.5	10.3	1.5	17.1	87.2	194,000	19.4	N/A	N/A	N/A	N/A
P-077-160617-1035-sdd-S2A	4.9	25	60	28	10,000	60	103	11.7	12.6	1.2	1.9	4.1	4.1	1.5	14.1	8.7	68,700	6.87	50.3	32.5	17.1	Loam
P-077-160617-1035-sdd-S3A	5.1	3	38	57	10,000	20	281	11.7	13.7	0.7	3.5	10.3	1.3	1.3	7.4	3.6	6,160	0.616	32.9	37.0	30.2	Clay Loam
P-077-160617-1035-sdd-S4A	5.1	2	48	86	10,000	0	299	11.7	14.0	0.9	5.1	10.6	1.3	1.4	8.6	3.7	5,130	0.513	44.7	33.5	21.9	Loam
P-077-160617-1035-sdd-S5A	4.9	1	63	80	14,000	0	170	15.3	16.7	1.0	4.0	5.1	1.3	1.4	12.6	3.7	1,300	0.13	32.8	34.5	32.7	Clay Loam
P-100-160609-1105-def-S1A	3.8	8	149	101	21,000	0	445	23.1	18.4	2.1	4.6	12.1	3.7	0.9	16.3	93.0	522,000	52.2	N/A	N/A	N/A	N/A
P-100-160609-1105-def-S2A	4.0	7	177	35	18,000	80	59	19.5	16	2.8	1.8	1.8	2.0	0.7	11.6	56.5	292,000	29.2	48.8	38.7	12.5	Loam
P-100-160609-1105-def-S3A	4.8	8	61	16	11,000	100	42	12.9	13.4	1.2	1.0	1.6	3.7	1.0	23.9	12.2	17,000	1.7	25.2	37.8	37.0	Clay Loam
P-121-160616-0950-mgw-S1A	6.0	41	227	207	5,000	0	1,829	6.3	17.8	3.3	9.7	51.5	5.4	1.2	29.2	77.2	362,000	36.2	N/A	N/A	N/A	N/A
P-121-160616-0950-mgw-S2A	4.7	6	142	132	11,000	0	515	12.9	16.9	2.1	6.5	15.2	2.0	0.9	11.1	4.2	33,800	3.38	48.8	33.5	17.7	Loam
P-121-160616-0950-mgw-S3A	5.1	4	90	227	1,000	0	568	12.9	17.9	1.3	10.6	15.9	1.5	1.6	9.3	6.0	18,900	1.89	25.5	43.4	31.0	Clay Loam
P-121-160616-0950-mgw-S4A	4.8	2	74	244	9,000	0	578	10.5	15.6	1.2	13.0	18.5	1.3	1.5	8.1	4.4	13,300	1.33	39.4	34.0	26.6	Loam
P-126-160615-1410-mgw-S1A	5.1	39	161	101	9,000	0	381	11.1	14.3	2.9	5.9	13.4	4.3	0.9	24.3	59.5	322,000	32.2	N/A	N/A	N/A	N/A
P-126-160615-1410-mgw-S2A	4.1	6	92	46	18,000	30	107	20.1	16.2	1.5	2.4	3.3	2.4	0.8	17.3	10.9	106,000	10.6	39.2	38.0	22.7	Loam
P-126-160615-1410-mgw-S3A	4.5	4	49	23	11,000	80	66	12.3	12.9	1.0	1.5	2.5	2.0	0.9	18.0	4.6	14,600	1.46	21.6	51.2	27.2	Clay Loam
P-126-160615-1410-mgw-S4A	4.8	22	35	26	10,000	80	47	11.7	12.2	0.7	1.8	1.9	1.4	0.9	15.1	4.1	7,330	0.733	31.4	41.4	27.1	Clay Loam
P-126-160615-1410-mgw-S5A	4.8	4	49	45	11,000	50	106	12.3	13.3	0.9	2.8	4.0	1.2	0.8	10.9	3.7	3,310	0.331	43.2	32.8	24.1	Loam
P-134-160615-1506-sdd-S1A	3.9	8	107	95	24,000	0	392	26.1	18.0	1.5	4.4	10.9	5.9	1.2	10.8	78.2	388,000	38.8	N/A	N/A	N/A	N/A
P-134-160615-1506-sdd-S2A	4.6	6	112	53	14,000	20	380	15.9	17.6	1.6	2.5	10.8	3.5	1.1	18.6	18.4	113,000	11.3	40.0	34.4	25.6	Loam
P-134-160615-1506-sdd-S3A	4.8	2	76	30	9,000	60	54	11.1	11.8	1.6	2.1	2.3	1.7	0.8	28.4	3.8	5,700	0.57	26.0	40.4	33.6	Clay Loam
P-134-160615-1506-sdd-S4A	4.7	1	67	81	11,000	0	52	12.3	13.4	1.3	5.0	1.9	1.2	0.6	24.8	3.3	1,720	0.172	49.9	23.1	27.0	Sandy Clay Loam
P-134-160615-1506-sdd-S5A	5.0	1	89	100	9,000	0	53	10.5	11.8	1.9	7.0	2.2	1.2	0.8	20.1	3.1	1,650	0.165	55.9	22.5	21.7	Sandy Clay Loam
P-156-160606-1355-dat-S1A	3.7	5	151	62	18,000	0	169	19.5	16.7	2.3	3.1	5.0	2.4	0.7	12.5	80.2	373,000	37.3	N/A	N/A	N/A	N/A
P-156-160606-1355-dat-S2A	4.0	5	54	19	8,000	80	59	9.9	10.5	1.3	1.5	2.8	1.3	0.7	7.5	6.1	42,000	4.2	65.6	23.5	10.9	Sandy Loam
P-156-160606-1355-dat-S3A	5.0	3	29	10	4,000	110	38	5.7	6.0	1.2	1.4	3.1	2.9	0.8	36.0	1.7	2,830	0.283	56.7	22.5	20.8	Sandy Clay Loam
P-156-160606-1355-dat-S4A	4.9	2	30	11	4,000	110	36	5.7	6.0	1.3	1.5	3.0	2.4	0.8	40.4	1.5	1,610	0.161	56.9	21.9	21.2	Sandy Clay Loam
P-157-160606-1512-dat-S1A	4.1	9	151	54	14,000	20	137	15.3	16.5	2.3	2.7	4.1	2.9	0.8	12.7	78.0	355,000	35.5	N/A	N/A	N/A	N/A
P-157-160606-1512-dat-S2A	4.3	5	61	27	12,000	80	93	13.5	14.3	1.1	1.6	3.2	2.0	1.1	15.7	7.9	42,800	4.28	55.5	29.6	14.9	Sandy Loam
P-157-160606-1512-dat-S3A	4.8	4	46	13	6,000	100	35	7.5	7.9	1.5	1.4	2.2	2.4	1.0	26.2	2.9	8,340	0.834	45.6	24.7	29.7	Sandy Clay Loam
P-157-160606-1512-dat-S4A	4.6	2	62	16	7,000	100	40	8.7	9.2	1.7	1.5	2.2	1.4	1.2	33.5	2.6	4,370	0.437	37.6	26.2	36.2	Clay Loam
P-157-160606-1512-dat-S5A	4.7	1	88	28	9,000	60	34	10.5	11.1	2.0	2.1	1.5	1.1	1.8	40.9	3.4	1,540	0.154	12.1	23.3	64.6	Clay
P-157-160606-1512-dat-S6A	4.5	1	84	29	9,000	60	37	11.1	11.7	1.8	2.1	1.6	1.0	1.7	27.0	3.2	2,300	0.23	12.6	25.0	62.4	Clay
P-157-160606-1512-dat-S7A	4.7	1	50	15	8,000	100	45	9.9	10.4	1.2	1.2	2.1	0.9	1.6	18.8	3.9	2,320	0.232	28.4	18.0	53.6	Clay
P-162-160606-1040-jsw-S1A	4.4	9	161	35	15,000	80	214	17.1	16.8	2.5	1.7	6.4	2.8	1.4	15.3	84.2	501,000	50.1	N/A	N/A	N/A	N/A
P-162-160606-1040-jsw-S2A	4.4	4	82	16	14,000	100	32	15.3	15.5	1.4	0.9	1.0	2.1	1.6	20.4	9.5	42,500	4.25	48.8	26.1	25.2	Sandy Clay Loam
P-162-160606-1040-jsw-SA3	4.6	6	72	27	10,000	80	51	11.7	12.4	1.5	1.8	2.1	1.6	1.5	58.8	5.7	12,600	1.26	34.0	25.8	40.2	Clay
P-162-160606-1040-jsw-SA4	4.8	1	59	35	9,000	80	53	10.5	11.2	1.3	2.6	2.4	1.1	1.4	62.2	3.5	1,100	0.11	45.7	19.8	34.5	Sandy Clay Loam
P-162-160606-1040-jsw-SA5	4.6	5	69	30	8,000	60	61	9.9	10.6	1.7	2.4	2.9	1.2	1.4	23.9	3.0	670	0.067	43.5	22.6	33.9	Clay Loam
P-170-160620-1122-def-S1A	3.7	5	98	31	17,000	60	209	18.9	16.6	1.5	1.6	6.3	2.7	1.1	7.4	95.8	507,000	50.7	N/A	N/A	N/A	N/A
P-170-160620-1122-def-S2A	3.6	11	100	22	17,000	80	50	18.3	15.7	1.6	1.2	1.6	2.1	1.1	8.4	56.5	264,000	26.4	84.9	9.0	6.2	Loamy Sand
P-170-160620-1122-def-S3A	3.9	7	22	14	9,000	100	40	10.5	10.9	0.5	1.1	1.8	1.3	1.4	6.8	3.2	14,700	1.47	76.6	15.0	8.4	Sandy Loam

Laboratory Results Summary

Sample ID	Soil pH	P (ppm)	K (ppm)	Mg (ppm)	Reccomendations		Ca (ppm)	Acidity (meq/100g)	CEC (meq/100g)	% Saturation of CEC			Zn (ppm)	Cu (ppm)	S (ppm)	Total Volatile Solids (%)	TOC (mg/kg)	TOC (%)	Particle Size Analysis			
					Limestone (lb/Ac)	Mg (lb/Ac)				K	Mg	Ca							% Sand	% Silt	% Clay	Texture Class
P-170-160620-1122-def-S4A	4.4	4	25	11	10,000	110	34	11.7	12.0	0.5	0.8	1.4	1.5	1.3	26.9	4.7	21,300	2.13	67.1	14.3	18.6	Sandy Loam
P-170-160620-1122-def-S5A	4.7	8	26	10	5,000	110	33	6.3	6.6	1.0	1.3	2.5	1.4	1.2	23.1	3.2	3,050	0.305	65.2	13.9	20.9	Sandy Clay Loam
P-170-160620-1122-def-S6A	4.8	6	20	9	4,000	110	32	5.7	6.0	0.9	1.3	2.7	1.2	1.1	22.0	1.7	2,340	0.234	75.5	8.9	15.6	Sandy Loam
P-173-160620-1112-def-S1A	6.7	5	104	128	0	0	2,224	2.2	14.7	1.8	7.3	75.9	3.1	1.5	6.8	76.3	370,000	37	N/A	N/A	N/A	N/A
P-173-160620-1112-def-S2A	5.2	4	88	87	10,000	0	1,332	11.7	19.3	1.2	3.8	34.5	3.6	1.5	12.7	9.0	48,400	4.84	28.6	37.4	34.0	Clay Loam
P-173-160620-1112-def-S3A	5.2	1	75	46	7,000	30	600	8.7	12.3	1.6	3.1	24.5	1.5	1.4	9.8	4.3	8,220	0.822	20.0	40.8	39.2	Silty Clay Loam
P-173-160620-1112-def-S4A	6.5	1	125	147	0	0	3,246	3.9	20.4	1.6	6.0	73.4	1.0	1.5	7.4	5.7	6,020	0.602	5.9	22.3	71.9	Clay
P-176-160621-1155-rll-S1A	5.8	15	161	181	4,000	0	1,844	5.7	16.8	2.5	9.0	54.7	6.9	1.6	10.3	74.7	389,000	38.9	N/A	N/A	N/A	N/A
P-176-160621-1155-rll-S2A	4.9	7	154	74	5,000	0	260	6.9	9.2	4.3	6.7	14.1	3.7	1.0	10.9	12.2	57,700	5.77	62.7	27.2	10.1	Sandy Loam
P-176-160621-1155-rll-S3A	5.6	1	60	63	2,000	0	131	3.4	4.7	3.3	11.1	13.8	1.3	1.3	4.7	1.0	1,080	0.108	65.8	18.2	16.0	Sandy Loam
P-176-160621-1155-rll-S4A	5.2	1	147	150	9,000	0	1,122	11.1	18.3	2.1	6.8	30.6	1.0	1.0	63.4	7.0	2,220	0.222	28.2	11.8	60.0	Clay
P-187-160607-1427-jsw-S1A	4.7	24	175	46	12,000	30	138	14.1	15.6	2.9	2.5	4.4	9.5	1.2	40.1	52.5	311,000	31.1	N/A	N/A	N/A	N/A
P-187-160607-1427-jsw-S2A	4.8	5	103	32	12,000	60	140	13.5	14.7	1.8	1.8	4.7	2.9	1.5	21.2	9.4	60,300	6.03	25.6	38.4	35.9	Clay Loam
P-187-160607-1427-jsw-S3A	4.8	5	64	22	8,000	80	48	9.9	10.5	1.6	1.7	2.3	1.9	1.5	15.8	5.1	14,600	1.46	37.3	39.6	23.1	Loam
P-215-160602-1037-jsw-S1A	3.8	16	148	32	17,000	60	150	18.3	16.4	2.3	1.6	4.6	2.3	1.2	9.6	82.7	505,000	50.5	N/A	N/A	N/A	N/A
P-215-160602-1037-jsw-S2A	3.8	4	49	16	12,000	100	52	13.5	14.0	0.9	1.0	1.9	1.5	1.2	12.3	4.3	35,800	3.58	58.3	22.5	19.3	Sandy Loam
P-215-160602-1037-jsw-S3A	3.8	13	45	13	12,000	100	51	13.5	14.0	0.8	0.8	1.8	1.3	1.1	8.9	6.9	39,900	3.99	64.6	23.5	11.9	Sandy Loam
P-215-160602-1037-jsw-S4A	4.6	5	33	9	6,000	110	30	8.1	8.4	1.0	0.9	1.8	1.5	0.9	28.0	4.2	13,500	1.35	49.0	23.8	27.3	Sandy Clay Loam
P-215-160602-1037-jsw-S5A	4.6	3	34	9	6,000	110	33	8.1	8.4	1.0	0.9	1.9	1.4	1.0	31.7	2.6	3,700	0.37	46.6	24.8	28.6	Sandy Clay Loam
P-215-160602-1037-jsw-S6A	4.3	1	15	8	4,000	110	36	5.7	6.0	0.6	1.1	3.0	0.9	0.8	37.5	1.1	< 500	< 0.05	75.5	9.9	14.6	Sandy Loam
P-222-160607-1055-dat-S1A	3.8	9	79	34	20,000	50	175	20.7	16.4	1.2	1.7	5.3	2.5	1.1	18.5	16.0	183,000	18.3	39.1	43.1	17.7	Loam
P-222-160607-1055-dat-S2A	4.7	4	56	16	7,000	100	66	8.7	9.3	1.5	1.4	3.6	3.2	1.5	18.8	5.4	20,300	2.03	30.0	40.2	29.8	Clay Loam
P-222-160607-1055-dat-S3A	4.7	2	44	14	6,000	100	41	8.1	8.5	1.3	1.4	2.4	1.3	1.1	23.3	4.5	5,660	0.566	33.8	36.8	29.4	Clay Loam
P-222-160607-1055-dat-S4A	4.7	1	55	32	6,000	60	56	8.1	8.8	1.6	3.0	3.2	1.1	1.0	19.6	4.2	2,790	0.279	49.1	28.6	22.3	Loam
P-222-160607-1055-dat-S5A	4.9	1	56	52	6,000	20	70	7.5	8.4	1.7	5.1	4.2	1.3	1.1	14.8	4.2	1,830	0.183	46.2	30.9	22.9	Loam
P-225-160601-1130-mel-S1A	5.0	3	75	60	8,000	0	197	9.9	11.6	1.7	4.3	8.5	1.4	1.4	15.7	8.6	34,100	3.41	23.2	43.1	33.7	Clay Loam
P-225-160601-1130-mel-S2A	5.0	3	52	111	11,000	0	164	12.3	14.2	0.9	6.5	5.8	1.2	1.1	28.1	4.3	3,960	0.396	18.6	33.7	47.6	Clay
P-225-160601-1130-mel-S3A	5.0	2	73	113	8,000	0	164	9.9	11.8	1.6	7.9	6.9	1.1	1.0	11.9	3.7	1,740	0.174	45.7	19.0	35.3	Sandy Clay
P-225-160601-1130-mel-S4A	5.0	1	66	107	11,000	0	145	12.3	14.1	1.2	6.3	5.1	1.1	1.2	24.6	4.4	3,260	0.326	32.9	28.0	39.1	Clay Loam
P-225-160601-1130-mel-S5A	4.8	1	41	105	12,000	0	83	13.5	14.9	0.7	5.9	2.8	1.1	1.1	57.9	4.1	1,910	0.191	12.0	44.2	43.9	Silty Clay
P-225-160601-1130-mel-S6A	4.9	1	37	101	11,000	0	81	12.3	13.6	0.7	6.2	3.0	1.0	1.2	66.7	3.9	2,070	0.207	20.3	43.9	35.8	Clay Loam
P-225A-160601-1130-jcr-S1A	5.1	6	141	197	7,000	0	882	8.7	15.1	2.4	10.9	29.2	40.1	2.1	7.7	10.7	55,300	5.53	41.7	33.4	24.9	Loam
P-225A-160601-1130-jcr-S2A	5.1	3	97	165	7,000	0	277	8.7	11.7	2.1	11.7	11.8	2.4	1.5	7.1	11.2	4,780	0.478	61.8	18.5	19.7	Sandy Loam
P-225A-160601-1130-jcr-S3A	5.4	2	58	167	6,000	0	382	7.5	11.0	1.4	12.7	17.4	1.3	1.3	9.5	4.2	4,040	0.404	48.6	25.1	26.3	Sandy Clay Loam
P-225B-160601-1312-sdd-S1A	4.8	17	99	148	9,000	0	608	10.5	15.0	1.7	8.2	20.2	7.4	1.4	10.5	21.8	140,000	14	40.3	36.5	23.2	Loam
P-225B-160601-1312-sdd-S2A	4.8	3	61	49	8,000	20	65	9.3	10.2	1.5	4.0	3.2	1.9	1.2	13.0	3.4	3,990	0.399	23.8	43.0	33.1	Clay Loam
P-225B-160601-1312-sdd-S3A	4.7	1	50	49	8,000	20	39	9.9	10.6	1.2	3.8	1.8	1.3	1.2	24.1	3.2	2,070	0.207	23.5	41.3	35.2	Clay Loam
P-225B-160601-1312-sdd-S4A	4.9	1	31	68	8,000	0	33	9.3	10.1	0.8	5.6	1.6	1.1	1.1	24.6	2.9	790	0.079	20.7	39.3	40.0	Clay Loam
P-227-160601-1500-jsw-S1A	4.2	7	101	85	21,000	0	664	22.5	19.3	1.3	3.7	17.2	3.5	1.4	7.8	59.1	233,000	23.3	N/A	N/A	N/A	N/A
P-227-160601-1500-jsw-S2A	4.1	8	89	39	20,000	50	103	21.3	16.1	1.4	2.0	3.2	4.2	1.5	14.6	32.5	119,000	11.9	34.3	38.4	27.3	Clay Loam
P-227-160601-1500-jsw-S3A	4.6	11	63	27	8,000	80	65	9.9	10.6	1.5	2.1	3.1	2.3	1.2	13.1	5.9	20,000	2	42.4	33.1	24.5	Loam
P-227-160601-1500-jsw-S4A	4.6	21	39	25	9,000	100	64	11.1	11.7	0.9	1.8	2.7	1.5	1.4	11.5	3.7	2,860	0.286	40.1	33.9	26.0	Loam
P-239-160607-1427-def-S1A	4.9	5	112	85	10,000	0	481	11.7	15.1	1.9	4.7	15.9	3.0	1.4	11.1	13.8	70,900	7.09	53.1	30.3	16.6	Sandy Loam

Sample ID	Soil pH	P (ppm)	K (ppm)	Mg (ppm)	Reccomendations Limestone (lb/Ac)	Reccomendations Mg (lb/Ac)	Ca (ppm)	Acidity (meq/100g)	CEC (meq/100g)	% Saturation of CEC K	% Saturation of CEC Mg	% Saturation of CEC Ca	Zn (ppm)	Cu (ppm)	S (ppm)	Total Volatile Solids (%)	TOC (mg/kg)	TOC (%)	Particle Size Analysis % Sand	Particle Size Analysis % Silt	Particle Size Analysis % Clay	Particle Size Analysis Texture Class
P-239-160607-1427-def-S2A	5.0	4	46	101	9,000	0	147	11.1	12.8	0.9	6.6	5.8	1.4	1.4	21.9	4.6	5,050	0.505	45.0	30.8	24.2	Loam
P-239-160607-1427-def-S3A	4.9	6	68	198	5,000	0	174	6.3	9.0	1.9	18.3	9.7	1.5	1.2	11.5	3.9	980	0.098	66.8	15.0	18.2	Sandy Loam
P-239-160607-1427-def-S4A	4.9	7	83	176	11,000	0	134	12.9	15.2	1.4	9.6	4.4	2.0	1.4	12.2	3.8	24,800	2.48	46.3	23.4	30.3	Sandy Clay Loam
P-239A-160607-1430-def-S1A	4.6	14	151	156	13,000	0	602	14.7	19.4	2.0	6.7	15.5	7.5	1.5	30.6	10.6	69,900	6.99	49.9	32.8	17.3	Loam
P-239A-160607-1430-def-S2A	4.8	3	119	61	9,000	0	63	10.5	11.6	2.6	4.4	2.7	2.2	1.5	12.6	4.0	6,120	0.612	38.0	32.4	29.6	Clay Loam
P-239A-160607-1430-def-S3A	4.9	2	104	111	8,000	0	75	9.9	11.5	2.3	8.1	3.3	1.3	1.2	12.4	2.6	2,990	0.299	57.9	18.6	23.6	Sandy Clay Loam
P-239A-160607-1430-def-S4A	5.4	2	93	211	5,000	0	251	6.3	9.6	2.5	18.4	13.2	1.2	1.4	6.7	4.1	4,190	0.419	35.6	32.1	32.3	Clay Loam
P-239A-160607-1430-def-S5A	5.1	2	76	145	5,000	0	130	6.9	9.0	2.2	13.5	7.2	1.2	1.6	7.8	4.3	4,350	0.435	36.5	34.1	29.4	Clay Loam
P-253-160608-0950-mel-S1A	5.6	23	144	134	7,000	0	1,539	8.7	17.9	2.1	6.2	43.0	6.2	1.5	17.4	27.6	273,000	27.3	N/A	N/A	N/A	N/A
P-253-160608-0950-mel-S2A	5.0	11	110	43	9,000	30	277	11.1	13.1	2.1	2.7	10.6	2.2	1.7	15.6	6.7	35,400	3.54	57.1	27.5	15.4	Sandy Loam
P-253-160608-0950-mel-S3A	4.6	3	40	17	8,000	100	49	9.3	9.8	1.0	1.4	2.5	1.2	1.4	17.7	4.1	9,800	0.98	62.4	17.7	19.9	Sandy Loam
P-253-160608-0950-mel-S4A	4.8	15	39	26	7,000	80	50	8.7	9.3	1.1	2.3	2.7	1.3	1.4	11.6	2.8	4,740	0.474	57.6	20.7	21.7	Sandy Clay Loam
P-254-160608-1050-mel-S1A	6.6	23	145	267	0	0	3,605	2.0	19.6	1.9	11.4	76.5	16.3	1.8	20.6	67.8	300,000	30	N/A	N/A	N/A	N/A
P-254-160608-1050-mel-S2A	5.8	17	138	162	5,000	0	1,908	6.9	18.1	2.0	7.4	52.6	9.7	1.5	16.5	8.7	29,400	2.94	45.8	33.2	21.0	Loam
P-254-160608-1050-mel-S3A	4.9	7	85	32	9,000	60	130	11.1	12.2	1.8	2.2	5.3	1.2	1.4	8.9	4.4	10,800	1.08	36.6	38.0	25.5	Loam
P-254-160608-1050-mel-S4A	5.1	19	81	83	8,000	0	359	9.9	12.6	1.6	5.5	14.3	1.2	1.4	7.7	4.4	6,940	0.694	45.0	29.4	25.6	Loam
P-276-160610-0838-jsw-S1A	5.1	4	95	187	8,000	0	943	9.9	16.4	1.5	9.5	28.7	5.1	1.9	10.3	20.8	86,500	8.65	N/A	N/A	N/A	N/A
P-276-160610-0838-jsw-S2A	5.1	4	81	235	7,000	0	648	8.7	14.1	1.5	13.9	23.0	3.0	1.7	9.0	4.5	25,700	2.57	56.3	20.8	22.8	Sandy Clay Loam
P-276-160610-0838-jsw-S3A	5.4	2	48	233	3,000	0	430	4.5	8.7	1.4	22.3	24.7	1.7	1.7	3.9	3.2	7,530	0.753	74.7	11.9	13.4	Sandy Loam
P-276-160610-0838-jsw-S4A	5.6	2	66	290	4,000	0	502	5.1	10.2	1.7	23.7	24.6	1.6	2.0	4.9	4.9	11,000	1.1	61.0	20.9	18.1	Sandy Loam
P-276-160610-0838-jsw-S5A	5.9	2	54	214	2,000	0	414	2.8	6.8	2.0	26.3	30.5	1.0	1.1	2.3	3.1	2,800	0.28	75.6	6.8	17.6	Sandy Loam
P-279-160610-1359-dat-S1A	4.7	7	140	126	13,000	0	557	14.7	18.9	1.9	5.6	14.7	5.1	1.1	15.2	36.3	212,000	21.2	N/A	N/A	N/A	N/A
P-279-160610-1359-dat-S2A	4.4	6	101	85	16,000	0	296	17.7	17.4	1.5	4.1	8.5	2.6	1.4	12.5	17.3	92,400	9.24	50.5	29.1	20.3	Loam
P-279-160610-1359-dat-S3A	4.8	5	104	64	9,000	0	80	11.1	12.3	2.2	4.3	3.3	1.4	1.6	8.5	4.5	19,400	1.94	63.7	19.9	16.4	Sandy Loam
P-279-160610-1359-dat-S4A	4.8	2	72	46	8,000	30	48	9.3	10.1	1.8	3.8	2.4	1.1	1.4	8.2	2.8	3,870	0.387	77.5	10.2	12.2	Sandy Loam
P-279-160610-1359-dat-S5A	5.0	10	80	133	5,000	0	134	6.9	8.9	2.3	12.5	7.5	2.7	4.1	6.9	2.7	2,050	0.205	77.7	10.6	11.7	Sandy Loam
P-279A-160610-1450-def-S1A	4.2	5	74	39	13,000	50	257	14.7	16.5	1.2	2.0	7.8	2.2	1.3	13.6	11.4	83,900	8.39	50.2	33.6	16.2	Loam
P-279A-160610-1450-def-S2A	4.8	2	48	22	6,000	80	61	7.5	8.1	1.5	2.3	3.8	1.4	1.1	7.6	3.2	5,870	0.587	44.1	32.1	23.8	Loam
P-279A-160610-1450-def-S3A	5.1	1	63	71	6,000	0	117	8.1	9.4	1.7	6.3	6.2	1.3	1.1	7.0	3.0	2,880	0.288	61.6	15.3	23.1	Sandy Clay Loam
P-279A-160610-1450-def-S4A	5.0	1	62	152	9,000	0	107	10.5	12.5	1.3	10.2	4.3	1.3	1.3	35.8	3.6	1,040	0.104	45.7	22.2	32.1	Sandy Clay Loam
P-283-160606-0743-def-S1A	4.7	10	149	95	12,000	0	1,071	14.1	20.6	1.9	3.8	26.0	6.5	1.5	9.6	89.8	453,000	45.3	N/A	N/A	N/A	N/A
P-283-160606-0743-def-S2A	4.5	3	40	26	13,000	80	58	14.7	15.3	0.7	1.4	1.9	1.9	1.4	18.8	7.6	35,600	3.56	31.5	44.2	24.2	Loam
P-283-160606-0743-def-S3A	4.7	2	44	30	8,000	60	55	9.3	9.9	1.1	2.5	2.8	1.5	1.3	13.8	3.8	6,890	0.689	44.9	31.0	24.1	Loam
P-283-160606-0743-def-S4A	4.9	1	62	59	8,000	0	75	9.3	10.3	1.5	4.8	3.6	1.1	1.2	13.6	4.2	1,360	0.136	52.7	23.5	23.7	Sandy Clay Loam
P-283-160606-0743-def-S5A	4.7	1	69	109	9,000	0	56	10.5	11.9	1.5	7.7	2.4	1.1	1.0	30.2	4.3	1,030	0.103	50.5	25.7	23.8	Sandy Clay Loam
P-283-160606-0743-def-S6A	5.0	2	67	105	9,000	0	48	10.5	11.8	1.5	7.4	2.0	1.2	1.2	17.1	3.7	1,610	0.161	62.2	16.3	21.5	Sandy Clay Loam
P-286-160606-0808-def-S1A	3.9	7	142	81	22,000	0	372	23.7	17.9	2.0	3.8	10.4	2.6	1.0	10.1	91.1	470,000	47	N/A	N/A	N/A	N/A
P-286-160606-0808-def-S2A	4.8	2	46	12	6,000	110	49	7.5	8.0	1.5	1.3	3.1	1.5	1.0	40.7	3.8	6,910	0.691	32.4	39.7	27.9	Clay Loam
P-286-160606-0808-def-S3A	4.7	1	71	21	9,000	80	55	10.5	11.1	1.6	1.6	2.5	1.0	1.0	49.0	1.8	1,450	0.145	31.8	37.2	31.0	Clay Loam
P-286-160606-0808-def-S4A	4.8	1	69	31	8,000	60	37	9.9	10.5	1.7	2.5	1.8	1.2	1.1	22.4	3.6	1,950	0.195	32.4	37.2	30.5	Clay Loam
P-290-160606-1445-mel-S1A	3.1	5	136	36	30,000	50	236	30.9	16.8	2.1	1.8	7.0	4.0	1.1	11.8	97.1	526,000	52.6	N/A	N/A	N/A	N/A
P-290-160606-1445-mel-S2A	3.5	9	58	20	15,000	80	111	17.1	15.9	0.9	1.1	3.5	2.0	1.1	11.1	8.2	36,800	3.68	40.9	43.5	15.7	Loam
P-290-160606-1445-mel-S3A	4.7	2	40	10	6,000	110	39	7.5	7.9	1.3	1.1	2.4	1.3	1.0	18.2	2.7	7,620	0.762	33.6	41.7	24.6	Loam

Laboratory Results Summary

Sample ID	Soil pH	P (ppm)	K (ppm)	Mg (ppm)	Reccomendations Limestone (lb/Ac)	Mg (lb/Ac)	Ca (ppm)	Acidity (meq/100g)	CEC (meq/100g)	% Saturation of CEC K	Mg	Ca	Zn (ppm)	Cu (ppm)	S (ppm)	Total Volatile Solids (%)	TOC (mg/kg)	TOC (%)	Particle Size Analysis % Sand	% Silt	% Clay	Texture Class
P-290-160606-1445-mel-S4A	4.5	1	42	11	7,000	110	44	8.7	9.1	1.2	1.0	2.4	1.0	0.9	23.7	3.4	2,730	0.273	40.0	35.9	24.1	Loam
P-291-160606-1330-mel-S1A	4.3	4	65	33	16,000	50	143	17.7	16.2	1.0	1.7	4.4	1.7	1.1	10.2	11.8	82,800	8.28	35.1	43.5	21.4	Loam
P-291-160606-1330-mel-S2A	4.5	1	37	11	9,000	110	37	11.1	11.5	0.8	0.8	1.6	1.1	1.4	12.3	4.1	10,300	1.03	24.3	40.5	35.2	Clay Loam
P-291-160606-1330-mel-S3A	4.6	3	52	36	14,000	50	95	15.9	15.9	0.8	1.9	3.0	1.8	1.6	20.2	5.5	4,500	0.45	14.8	30.9	54.3	Clay
P-291-160606-1330-mel-S4A	4.7	1	58	41	12,000	50	33	14.1	14.8	1.0	2.3	1.1	1.7	1.7	12.6	3.3	1,260	0.126	27.9	35.3	36.8	Clay Loam
P-293-160606-1056-mel-S1A	4.6	10	175	98	14,000	0	405	15.3	18.3	2.5	4.5	11.1	4.0	0.9	18.2	66.7	333,000	33.3	N/A	N/A	N/A	N/A
P-293-160606-1056-mel-S2A	3.9	6	100	33	12,000	50	54	14.1	14.9	1.7	1.8	1.8	2.1	0.9	12.4	11.5	57,100	5.71	5.5	42.0	52.4	Silty Clay
P-293-160606-1056-mel-S3A	4.7	2	27	12	6,000	110	42	8.1	8.5	0.8	1.2	2.5	1.4	0.9	12.0	4.0	9,790	0.979	61.8	28.1	10.1	Sandy Loam
P-293-160606-1056-mel-S4A	4.7	2	27	11	6,000	110	35	8.1	8.4	0.8	1.1	2.1	1.5	1.0	15.0	3.7	5,700	0.57	48.7	26.0	25.3	Sandy Clay Loam
P-293-160606-1056-mel-S5A	4.7	1	26	29	9,000	60	40	10.5	11.0	0.6	2.2	1.8	1.3	1.0	24.9	2.5	3,740	0.374	60.1	16.9	23.0	Sandy Clay Loam
P-347-160621-1409-def-S1A	4.2	8	133	131	18,000	0	378	19.5	18.3	1.9	6.0	10.3	4.6	1.5	13.2	17.9	198,000	19.8	59.2	18.4	22.4	Sandy Clay Loam
P-347-160621-1409-def-S2A	4.7	5	63	37	11,000	50	48	12.3	13.0	1.2	2.4	1.9	2.3	1.9	15.9	6.1	14,100	1.41	50.9	19.8	29.3	Sandy Clay Loam
P-352-160621-1145-def-S1A	5.0	13	155	189	12,000	0	1,217	13.5	21.6	1.8	7.3	28.2	8.9	1.7	17.7	66.8	324,000	32.4	N/A	N/A	N/A	N/A
P-352-160621-1145-def-S2A	5.0	6	94	152	9,000	0	631	11.1	15.8	1.5	8.0	20.0	2.0	1.5	11.6	10.7	54,800	5.48	37.3	31.8	30.9	Clay Loam
P-352-160621-1145-def-S3A	5.2	4	66	131	9,000	0	262	11.1	13.7	1.2	8.0	9.6	1.5	2.2	9.6	5.5	17,600	1.76	20.6	32.7	46.8	Clay
P-352-160621-1145-def-S4A	5.4	3	98	216	8,000	0	280	9.9	13.3	1.9	13.5	10.5	1.4	2.3	8.3	4.9	15,700	1.57	26.4	29.5	44.1	Clay
P-352-160621-1145-def-S5A	5.3	2	117	276	5,000	0	278	6.3	10.3	2.9	22.3	13.5	1.1	1.8	6.3	10.8	5,570	0.557	48.4	11.5	40.1	Sandy Clay
P-352-160621-1145-def-S6A	5.3	1	112	260	6,000	0	262	8.1	11.9	2.4	18.3	11.0	1.0	2.0	7.5	5.8	6,060	0.606	36.7	21.6	41.7	Clay

Attachment 8
AASLAB Nutrient Analysis Results

PENNSTATE
1855

(814) 863-0841 Fax: (814) 863-4540
Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32384		Lancaster			P-003-160620-1025-rll-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.0				
[2]Phosphorus (P)	9	ppm			
[2]Potassium (K)	107	ppm			
[2]Magnesium (Mg)	113	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 20000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: **Optional Tests:** **[2]Trace Elements** *See back for comments*

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
1400	20.7	23.2	1.2	4.1	30.1				3.3	1.2	8.9

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

3004

Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

ST-4 Interpreting Soil Tests for Agronomic Crops-Explains the soil test report and provides additional information on the recommendations.

Soil Nutrient Levels Soil nutrient levels are given as parts per million (ppm) elemental P, K , and Mg. As a rule of thumb to convert ppm to lb/A multiply ppm x 2. The elemental results in lb/A can be converted to oxide forms using the following conversions: P x 2.3=P_2O_5, K x 1.2=K_2O, Mg x 1.6=MgO

Below Optimum	Optimum	Above Optimum
Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

Recommendations N,P, and K recommendations are made for three crop years on this field. New samples should be taken after 3 years. The recommendations for the 2nd and 3rd year assume that the earlier recommendations were followed. These recommendations are based on the results of the soil test and the information provided with the sample. If you think that there is an error on the report, contact the lab at the address on the front of the report. Tables that can be used to adjust or change recommendations for all crops based on the soil test can be found on the web at: www.aasl.psu.edu.

Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32385		Lancaster			P-003-160620-1025-rll-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	3.7		■		
[2]Phosphorus (P)	12	ppm	■		
[2]Potassium (K)	74	ppm	■		
[2]Magnesium (Mg)	54	ppm	■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 20000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 20 lb/A

Limestone containing .1% Mg (.2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
549	21.3	18.4	1.0	2.4	14.9				1.8	0.9	12.0

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

Agronomy

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Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

ST-4 Interpreting Soil Tests for Agronomic Crops-Explains the soil test report and provides additional information on the recommendations.

Soil Nutrient Levels Soil nutrient levels are given as parts per million (ppm) elemental P, K , and Mg. As a rule of thumb to convert ppm to lb/A multiply ppm x 2. The elemental results in lb/A can be converted to oxide forms using the following conversions: P x 2.3=P_2O_5, K x 1.2=K_2O, Mg x 1.6=MgO

Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

Recommendations N,P, and K recommendations are made for three crop years on this field. New samples should be taken after 3 years. The recommendations for the 2nd and 3rd year assume that the earlier recommendations were followed. These recommendations are based on the results of the soil test and the information provided with the sample. If you think that there is an error on the report, contact the lab at the address on the front of the report. Tables that can be used to adjust or change recommendations for all crops based on the soil test can be found on the web at: www.aasl.psu.edu.

Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32386		Lancaster			P-003-160620-1025-rll-S3A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.6		■■■■■		
[2]Phosphorus (P)	3	ppm	■		
[2]Potassium (K)	34	ppm	■■■		
[2]Magnesium (Mg)	26	ppm	■■■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 14000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing .6% Mg (.9 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
157	15.9	16.1	0.5	1.3	4.9				1.8	1.0	15.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

3006

Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Below Optimum	Optimum	Above Optimum
Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

Recommendations N,P, and K recommendations are made for three crop years on this field. New samples should be taken after 3 years. The recommendations for the 2nd and 3rd year assume that the earlier recommendations were followed. These recommendations are based on the results of the soil test and the information provided with the sample. If you think that there is an error on the report, contact the lab at the address on the front of the report. Tables that can be used to adjust or change recommendations for all crops based on the soil test can be found on the web at: www.aasl.psu.edu.

Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32387		Lancaster			P-003-160620-1025-rll-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.5		▬		
[2]Phosphorus (P)	3	ppm	▬		
[2]Potassium (K)	37	ppm	▬		
[2]Magnesium (Mg)	35	ppm	▬		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 12000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 50 lb/A

Limestone containing .4% Mg (.7 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
120	13.5	14.5	0.7	2.0	4.2				1.1	1.0	9.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32388		Lancaster			P-012-160620-1115-mgw-S1A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.1				
[2]Phosphorus (P)	8	ppm			
[2]Potassium (K)	158	ppm			
[2]Magnesium (Mg)	113	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
627	11.1	15.6	2.6	6.0	20.1				3.2	1.2	6.7

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32389		Lancaster			P-012-160620-1115-mgw-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	3.9		▇		
[2]Phosphorus (P)	11	ppm	▇		
[2]Potassium (K)	119	ppm	▇		
[2]Magnesium (Mg)	56	ppm	▇		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 20000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 20 lb/A

Limestone containing .1% Mg (.2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
360	21.3	17.6	1.7	2.7	10.2				3.2	1.1	21.2

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32390		Lancaster			P-012-160620-1115-mgw-S3A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.3				
[2]Phosphorus (P)	16	ppm			
[2]Potassium (K)	49	ppm			
[2]Magnesium (Mg)	22	ppm			

RECOMMENDATIONS:

(See back messages for important information)

Limestone*: 15000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing .5% Mg (.9 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
107	17.1	15.8	0.8	1.2	3.4				3.4	1.0	28.7

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

Recommendation Messages

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Zn (ppm)	Cu (ppm)	S (ppm)
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32391		Lancaster			P-012-160620-1115-mgw-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.9		■		
[2]Phosphorus (P)	7	ppm	■		
[2]Potassium (K)	18	ppm	■		
[2]Magnesium (Mg)	13	ppm	■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 100 lb/A

Limestone containing 1.3% Mg (2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
54	9.9	10.3	0.4	1.0	2.6				2.4	1.0	37.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32392		Lancaster			P-012-160620-1115-mgw-S5A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.9				
[2]Phosphorus (P)	7	ppm			
[2]Potassium (K)	20	ppm			
[2]Magnesium (Mg)	10	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 1.4% Mg (2.2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
52	9.3	9.7	0.5	0.9	2.7				2.9	1.1	42.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

ST-4 Interpreting Soil Tests for Agronomic Crops-Explains the soil test report and provides additional information on the recommendations.

Soil Nutrient Levels Soil nutrient levels are given as parts per million (ppm) elemental P, K , and Mg. As a rule of thumb to convert ppm to lb/A multiply ppm x 2. The elemental results in lb/A can be converted to oxide forms using the following conversions: P x 2.3=P_2O_5, K x 1.2=K_2O, Mg x 1.6=MgO

Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

Recommendations N,P, and K recommendations are made for three crop years on this field. New samples should be taken after 3 years. The recommendations for the 2nd and 3rd year assume that the earlier recommendations were followed. These recommendations are based on the results of the soil test and the information provided with the sample. If you think that there is an error on the report, contact the lab at the address on the front of the report. Tables that can be used to adjust or change recommendations for all crops based on the soil test can be found on the web at: www.aasl.psu.edu.

Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32393		Lancaster			P-022-160614-1050-jsw-S1A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	3.3				
[2]Phosphorus (P)	7	ppm			
[2]Potassium (K)	139	ppm			
[2]Magnesium (Mg)	37	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 24000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 50 lb/A

Limestone containing .2% Mg (.3 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (*See back for comments*)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
51	26.1	15.9	2.2	1.9	1.6				2.7	0.9	12.4

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

3013

Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Soil Nutrient Levels Soil nutrient levels are given as parts per million (ppm) elemental P, K , and Mg. As a rule of thumb to convert ppm to lb/A multiply ppm x 2. The elemental results in lb/A can be converted to oxide forms using the following conversions: P x 2.3=P_2O_5, K x 1.2=K_2O, Mg x 1.6=MgO

Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

Recommendations N,P, and K recommendations are made for three crop years on this field. New samples should be taken after 3 years. The recommendations for the 2nd and 3rd year assume that the earlier recommendations were followed. These recommendations are based on the results of the soil test and the information provided with the sample. If you think that there is an error on the report, contact the lab at the address on the front of the report. Tables that can be used to adjust or change recommendations for all crops based on the soil test can be found on the web at: www.aasl.psu.edu.

Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

Distribution of Soil Test Results Summaries of soil test results may be used in educational programs. However, individual results will not be released outside of Penn State without permission of the client. Electronic copies of your results are available to you, contact the lab for more information.

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32394		Lancaster			P-022-160614-1050-jsw-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	3.5				
[2]Phosphorus (P)	18	ppm			
[2]Potassium (K)	66	ppm			
[2]Magnesium (Mg)	18	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 23000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing .3% Mg (.6 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
51	24.3	15.6	1.1	1.0	1.6				2.2	0.9	6.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

3014

Agronomy

Recommendation Messages

Enclosures

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Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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Zn (ppm)	Cu (ppm)	S (ppm)
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32395		Lancaster			P-022-160614-1050-jsw-S3A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.2				
[2]Phosphorus (P)	5	ppm			
[2]Potassium (K)	18	ppm			
[2]Magnesium (Mg)	10	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 4000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 2.8% Mg (4.4 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: / **Optional Tests:** / **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
41	5.7	6.0	0.8	1.4	3.4				1.1	0.7	3.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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The Pennsylvania State University
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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32396		Lancaster			P-022-160614-1050-jsw-S4A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.3		■		
[2]Phosphorus (P)	21	ppm	■		
[2]Potassium (K)	27	ppm	■		
[2]Magnesium (Mg)	9	ppm	■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 1.2% Mg (2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
28	10.5	10.8	0.6	0.7	1.3				1.3	1.2	18.9

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32397		Lancaster			P-022-160614-1050-jsw-S5A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1] Soil pH	4.4				
[2] Phosphorus (P)	7	ppm			
[2] Potassium (K)	37	ppm			
[2] Magnesium (Mg)	10	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 110 lb/A

Limestone containing 1.8% Mg (2.9 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2] Trace Elements *See back for comments*		
[2] Calcium (ppm)	[3] Acidity (meq/100 g)	[4] CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
48	8.1	8.5	1.1	1.0	2.8				1.2	1.0	18.7

Test Methods: [1] 1:1 soil:water pH, [2] Mehlich 3 (ICP), [3] Mehlich Buffer pH, [4] Summation of Cations

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Recommendation Messages

Enclosures

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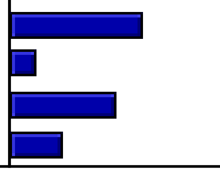
DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32398		Lancaster			P-022-160614-1050-jsw-S6A	

SOIL NUTRIENT LEVELS — Below Optimum / Optimum / Above Optimum

[1] Soil pH	4.5	
[2] Phosphorus (P)	1	ppm
[2] Potassium (K)	59	ppm
[2] Magnesium (Mg)	14	ppm



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 11000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 100 lb/A

Limestone containing .9% Mg (1.5 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS: / **Optional Tests:** / **[2] Trace Elements** *(See back for comments)*

[2] Calcium (ppm)	[3] Acidity (meq/100 g)	[4] CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
31	12.9	13.3	1.1	0.9	1.2				1.0	1.2	24.3

Test Methods: [1] 1:1 soil:water pH, [2] Mehlich 3 (ICP), [3] Mehlich Buffer pH, [4] Summation of Cations

Agronomy

Recommendation Messages

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32399		Lancaster			P-022-160614-1050-jsw-S7A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.4				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	53	ppm			
[2]Magnesium (Mg)	16	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 11000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 100 lb/A

Limestone containing .9% Mg (1.5 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
31	12.3	12.7	1.1	1.0	1.2				0.9	1.3	17.3

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32400		Lancaster			P-040-160615-1119-jcr-S1A	

SOIL NUTRIENT LEVELS — Below Optimum | Optimum | Above Optimum

[1]Soil pH	4.5	
[2]Phosphorus (P)	11	ppm
[2]Potassium (K)	147	ppm
[2]Magnesium (Mg)	63	ppm

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 12000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

****Calcium Carbonate equivalent***

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
424	13.5	16.5	2.3	3.2	12.8				3.3	1.0	19.8

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

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Zn (ppm)	Cu (ppm)	S (ppm)
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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32401		Lancaster			P-040-160615-1119-jcr-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.0				
[2]Phosphorus (P)	5	ppm			
[2]Potassium (K)	92	ppm			
[2]Magnesium (Mg)	31	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 17000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 60 lb/A

Limestone containing .4% Mg (.6 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
57	18.9	15.8	1.5	1.6	1.8				2.2	1.0	15.5

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

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7/7/2016	S16-32402		Lancaster			P-040-160615-1119-jcr-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8				
[2]Phosphorus (P)	3	ppm			
[2]Potassium (K)	49	ppm			
[2]Magnesium (Mg)	13	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 100 lb/A

Limestone containing 1.7% Mg (2.7 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
43	8.1	8.5	1.5	1.3	2.5				2.2	1.2	25.7

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32403		Lancaster			P-040-160615-1119-jcr-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.6				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	53	ppm			
[2]Magnesium (Mg)	18	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing 1% Mg (1.6 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
51	9.9	10.4	1.3	1.4	2.4				1.4	0.9	23.2

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32404		Lancaster			P-040-160615-1119-jcr-S5A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	44	ppm			
[2]Magnesium (Mg)	23	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 80 lb/A

Limestone containing 1.3% Mg (2.1 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
35	8.1	8.6	1.3	2.2	2.0				1.3	1.1	19.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Zn (ppm)	Cu (ppm)	S (ppm)
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32405		Lancaster			P-063-160614-0950-rll-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	6.5				
[2]Phosphorus (P)	57	ppm			
[2]Potassium (K)	151	ppm			
[2]Magnesium (Mg)	97	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: NONE **Magnesium (Mg):** NONE

****Calcium Carbonate equivalent***

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: **Optional Tests:** **[2]Trace Elements** *See back for comments*

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	% Saturation of the CEC Mg	% Saturation of the CEC Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
2839	3.9	19.3	2.0	4.2	73.6				2.8	1.9	10.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32406		Lancaster			P-063-160614-0950-rll-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
1 Soil pH	5.8		■		
2 Phosphorus (P)	2	ppm	■		
2 Potassium (K)	43	ppm	■		
2 Magnesium (Mg)	66	ppm	■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 3000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **2 Trace Elements** (*See back for comments*)

2 Calcium (ppm)	3 Acidity (meq/100 g)	4 CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
1092	4.5	10.6	1.0	5.2	51.4				1.1	0.9	7.3

Test Methods: 1 1:1 soil:water pH, 2 Mehlich 3 (ICP), 3 Mehlich Buffer pH, 4 Summation of Cations

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Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32407		Lancaster			P-063-160614-0950-rll-S3A	

SOIL NUTRIENT LEVELS — Below Optimum / Optimum / Above Optimum

[1]Soil pH	4.8		
[2]Phosphorus (P)	1	ppm	
[2]Potassium (K)	75	ppm	
[2]Magnesium (Mg)	207	ppm	

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

****Calcium Carbonate equivalent***

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: — **Optional Tests:** — **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
76	10.5	12.8	1.5	13.5	3.0				2.2	1.9	5.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32408		Lancaster			P-068-160614-1338-sdd-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	6.1				
[2]Phosphorus (P)	119	ppm			
[2]Potassium (K)	139	ppm			
[2]Magnesium (Mg)	232	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 4000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
3230	5.1	22.4	1.6	8.6	67.0				15.8	1.3	17.0

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high calcium level in this sample indicates the probable presence of soluble calcium. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable calcium level of 15 meq/100 g.

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32409		Lancaster			P-068-160614-1338-sdd-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.3				
[2]Phosphorus (P)	263	ppm			
[2]Potassium (K)	67	ppm			
[2]Magnesium (Mg)	60	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
952	9.9	15.3	1.1	3.3	31.0				6.8	1.2	23.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32411		Lancaster			P-068-160614-1338-sdd-S3A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8				
[2]Phosphorus (P)	85	ppm			
[2]Potassium (K)	39	ppm			
[2]Magnesium (Mg)	23	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing 1% Mg (1.6 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
87	9.3	10.0	1.0	1.9	4.3				1.3	0.7	9.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32412		Lancaster			P-068-160614-1338-sdd-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.2				
[2]Phosphorus (P)	10	ppm			
[2]Potassium (K)	46	ppm			
[2]Magnesium (Mg)	44	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 7000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 30 lb/A

Limestone containing .4% Mg (.7 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
414	8.7	11.3	1.0	3.3	18.4				1.4	0.9	8.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32413		Lancaster			P-069-160614-1158-sdd-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.6				
[2]Phosphorus (P)	27	ppm			
[2]Potassium (K)	51	ppm			
[2]Magnesium (Mg)	21	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing .9% Mg (1.4 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
77	10.5	11.2	1.2	1.6	3.4				3.2	0.8	24.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32414		Lancaster			P-069-160614-1158-sdd-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.6		▬		
[2]Phosphorus (P)	10	ppm	▬		
[2]Potassium (K)	27	ppm	▬		
[2]Magnesium (Mg)	16	ppm	▬		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 7000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 100 lb/A

Limestone containing 1.4% Mg (2.3 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
52	8.7	9.2	0.8	1.5	2.8				1.5	0.8	17.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32415		Lancaster			P-069-160614-1158-sdd-S5A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7		■		
[2]Phosphorus (P)	3	ppm	■		
[2]Potassium (K)	39	ppm	■		
[2]Magnesium (Mg)	35	ppm	■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 7000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 50 lb/A

Limestone containing .7% Mg (1.1 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
62	8.7	9.4	1.1	3.1	3.3				1.4	0.8	20.3

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32416		Lancaster			P-100-160609-1105-def-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	3.8				
[2]Phosphorus (P)	8	ppm			
[2]Potassium (K)	149	ppm			
[2]Magnesium (Mg)	101	ppm			

RECOMMENDATIONS:

(See back messages for important information)

Limestone*: 21000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients:

(If manure will be applied, adjust these recommendations accordingly. See back of report.)

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	% Saturation of the CEC Mg	% Saturation of the CEC Ca	Optional Tests: Organic Matter %	Optional Tests: Nitrate-N ppm	Optional Tests: Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
445	23.1	18.4	2.1	4.6	12.1				3.7	0.9	16.3

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32417		Lancaster			P-100-160609-1105-def-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.0				
[2]Phosphorus (P)	7	ppm			
[2]Potassium (K)	177	ppm			
[2]Magnesium (Mg)	35	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 18000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing .4% Mg (.7 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (*See back for comments*)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
59	19.5	16.0	2.8	1.8	1.8				2.0	0.7	11.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32418		Lancaster			P-100-160609-1105-def-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1] Soil pH	4.8		■■■■■		
[2] Phosphorus (P)	8	ppm	■■		
[2] Potassium (K)	61	ppm	■■■■■		
[2] Magnesium (Mg)	16	ppm	■■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 11000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 100 lb/A

Limestone containing .9% Mg (1.5 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2] Trace Elements (See back for comments)		
[2] Calcium (ppm)	[3] Acidity (meq/100 g)	[4] CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
42	12.9	13.4	1.2	1.0	1.6				3.7	1.0	23.9

Test Methods: [1] 1:1 soil:water pH, [2] Mehlich 3 (ICP), [3] Mehlich Buffer pH, [4] Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
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Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32419		Lancaster			P-121-160616-0950-mgw-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	6.0				
[2]Phosphorus (P)	41	ppm			
[2]Potassium (K)	227	ppm			
[2]Magnesium (Mg)	207	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 5000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

****Calcium Carbonate equivalent***

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

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ADDITIONAL RESULTS:			% Saturation of the CEC			Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
1829	6.3	17.8	3.3	9.7	51.5				5.4	1.2	29.2

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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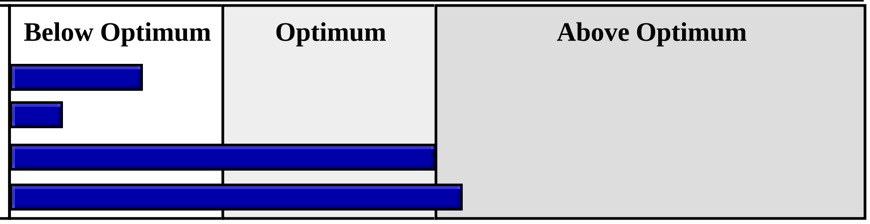
SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32420		Lancaster			P-121-160616-0950-mgw-S2A	

SOIL NUTRIENT LEVELS

[1]**Soil pH**	4.7	
[2]**Phosphorus (P)**	6	**ppm**
[2]**Potassium (K)**	142	**ppm**
[2]**Magnesium (Mg)**	132	**ppm**



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 11000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
515	12.9	16.9	2.1	6.5	15.2				2.0	0.9	11.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32421		Lancaster			P-121-160616-0950-mgw-S3A	

SOIL NUTRIENT LEVELS — Below Optimum | Optimum | Above Optimum

[1]Soil pH	5.1		
[2]Phosphorus (P)	4	ppm	
[2]Potassium (K)	90	ppm	
[2]Magnesium (Mg)	227	ppm	

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 11000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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568	12.9	17.9	1.3	10.6	15.9				1.5	1.6	9.3

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1.1 - 9.4	1.2 - 5.5	10 - 25

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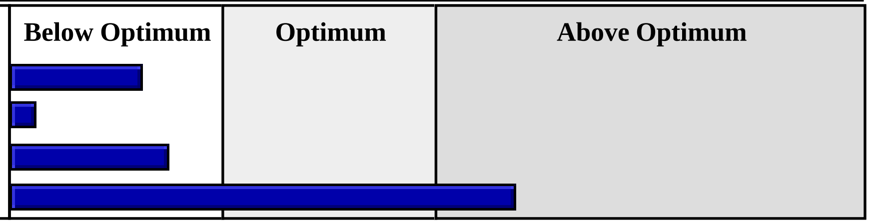
Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32422		Lancaster			P-121-160616-0950-mgw-S4A	

SOIL NUTRIENT LEVELS

[1]Soil pH	4.8	
[2]Phosphorus (P)	2	ppm
[2]Potassium (K)	74	ppm
[2]Magnesium (Mg)	244	ppm



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
578	10.5	15.6	1.2	13.0	18.5				1.3	1.5	8.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32423		Lancaster			P-126-160615-1410-mgw-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.1				
[2]Phosphorus (P)	39	ppm			
[2]Potassium (K)	161	ppm			
[2]Magnesium (Mg)	101	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
381	11.1	14.3	2.9	5.9	13.4				4.3	0.9	24.3

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

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Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32424		Lancaster			P-126-160615-1410-mgw-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.1				
[2]Phosphorus (P)	6	ppm			
[2]Potassium (K)	92	ppm			
[2]Magnesium (Mg)	46	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 18000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 30 lb/A

Limestone containing .2% Mg (.3 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
107	20.1	16.2	1.5	2.4	3.3				2.4	0.8	17.3

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32425		Lancaster			P-126-160615-1410-mgw-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.5				
[2]Phosphorus (P)	4	ppm			
[2]Potassium (K)	49	ppm			
[2]Magnesium (Mg)	23	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 11000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 80 lb/A

Limestone containing .7% Mg (1.2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
66	12.3	12.9	1.0	1.5	2.5				2.0	0.9	18.0

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32426		Lancaster			P-126-160615-1410-mgw-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8		■		
[2]Phosphorus (P)	22	ppm	■		
[2]Potassium (K)	35	ppm	■		
[2]Magnesium (Mg)	26	ppm	■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 10000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing .8% Mg (1.3 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
47	11.7	12.2	0.7	1.8	1.9				1.4	0.9	15.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32427		Lancaster			P-126-160615-1410-mgw-S5A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8				
[2]Phosphorus (P)	4	ppm			
[2]Potassium (K)	49	ppm			
[2]Magnesium (Mg)	45	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 11000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 50 lb/A

Limestone containing .5% Mg (.7 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
106	12.3	13.3	0.9	2.8	4.0				1.2	0.8	10.9

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32428		Lancaster			P-134-160615-1506-sdd-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	3.9				
[2]Phosphorus (P)	8	ppm			
[2]Potassium (K)	107	ppm			
[2]Magnesium (Mg)	95	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 24000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
392	26.1	18.0	1.5	4.4	10.9				5.9	1.2	10.8

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32429		Lancaster			P-134-160615-1506-sdd-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.6				
[2]Phosphorus (P)	6	ppm			
[2]Potassium (K)	112	ppm			
[2]Magnesium (Mg)	53	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 14000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 20 lb/A

Limestone containing .1% Mg (.2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
380	15.9	17.6	1.6	2.5	10.8				3.5	1.1	18.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum**-Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum**-The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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(814) 863-0841 Fax: (814) 863-4540
Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32430		Lancaster			P-134-160615-1506-sdd-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8				
[2]Phosphorus (P)	2	ppm			
[2]Potassium (K)	76	ppm			
[2]Magnesium (Mg)	30	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 60 lb/A

Limestone containing .7% Mg (1.1 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
54	11.1	11.8	1.6	2.1	2.3				1.7	0.8	28.4

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32431		Lancaster			P-134-160615-1506-sdd-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	67	ppm			
[2]Magnesium (Mg)	81	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 11000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
52	12.3	13.4	1.3	5.0	1.9				1.2	0.6	24.8

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32432		Lancaster			P-134-160615-1506-sdd-S5A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.0				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	89	ppm			
[2]Magnesium (Mg)	100	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** *See back for comments*

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
53	10.5	11.8	1.9	7.0	2.2				1.2	0.8	20.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
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www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32433		Lancaster			P-156-160606-1355-dat-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	3.7				
[2]Phosphorus (P)	5	ppm			
[2]Potassium (K)	151	ppm			
[2]Magnesium (Mg)	62	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 18000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

****Calcium Carbonate equivalent***

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements *See back for comments*		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
169	19.5	16.7	2.3	3.1	5.0				2.4	0.7	12.5

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table - Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32434		Lancaster			P-156-160606-1355-dat-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.0				
[2]Phosphorus (P)	5	ppm			
[2]Potassium (K)	54	ppm			
[2]Magnesium (Mg)	19	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing 1% Mg (1.6 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
59	9.9	10.5	1.3	1.5	2.8				1.3	0.7	7.5

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32435		Lancaster			P-156-160606-1355-dat-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.0				
[2]Phosphorus (P)	3	ppm			
[2]Potassium (K)	29	ppm			
[2]Magnesium (Mg)	10	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 4000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 2.8% Mg (4.4 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
38	5.7	6.0	1.2	1.4	3.1				2.9	0.8	36.0

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32436		Lancaster			P-156-160606-1355-dat-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.9		■■■■■■		
[2]Phosphorus (P)	2	ppm	■		
[2]Potassium (K)	30	ppm	■■		
[2]Magnesium (Mg)	11	ppm	■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 4000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 2.8% Mg (4.4 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	% Saturation of the CEC Mg	% Saturation of the CEC Ca	Optional Tests: Organic Matter %	Optional Tests: Nitrate-N ppm	Optional Tests: Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
36	5.7	6.0	1.3	1.5	3.0				2.4	0.8	40.4

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32438		Lancaster			P-157-160606-1512-dat-S1A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.1				
[2]Phosphorus (P)	9	ppm			
[2]Potassium (K)	151	ppm			
[2]Magnesium (Mg)	54	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 14000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 20 lb/A

Limestone containing .1% Mg (.2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
137	15.3	16.5	2.3	2.7	4.1				2.9	0.8	12.7

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Recommendation Messages

Enclosures

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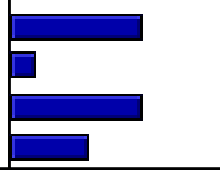
Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32439		Lancaster			P-157-160606-1512-dat-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.3				
[2]Phosphorus (P)	5	ppm			
[2]Potassium (K)	61	ppm			
[2]Magnesium (Mg)	27	ppm			



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 12000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing .7% Mg (1.1 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:			% Saturation of the CEC			Optional Tests:			[2]Trace Elements *See back for comments*		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
93	13.5	14.3	1.1	1.6	3.2				2.0	1.1	15.7

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32440		Lancaster			P-157-160606-1512-dat-S3A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8				
[2]Phosphorus (P)	4	ppm			
[2]Potassium (K)	46	ppm			
[2]Magnesium (Mg)	13	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 100 lb/A

Limestone containing 1.7% Mg (2.7 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
35	7.5	7.9	1.5	1.4	2.2				2.4	1.0	26.2

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Agronomy

Recommendation Messages

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Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32441		Lancaster			P-157-160606-1512-dat-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
1 Soil pH	4.6				
2 Phosphorus (P)	2	ppm			
2 Potassium (K)	62	ppm			
2 Magnesium (Mg)	16	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 7000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 100 lb/A

Limestone containing 1.4% Mg (2.3 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			2 Trace Elements (See back for comments)		
2 Calcium (ppm)	3 Acidity (meq/100 g)	4 CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
40	8.7	9.2	1.7	1.5	2.2				1.4	1.2	33.5

Test Methods: 1 1:1 soil:water pH, 2 Mehlich 3 (ICP), 3 Mehlich Buffer pH, 4 Summation of Cations

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Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table - Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32442		Lancaster			P-157-160606-1512-dat-S5A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	88	ppm			
[2]Magnesium (Mg)	28	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 60 lb/A

Limestone containing .7% Mg (1.1 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
34	10.5	11.1	2.0	2.1	1.5				1.1	1.8	40.9

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32443		Lancaster			P-157-160606-1512-dat-S6A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.5				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	84	ppm			
[2]Magnesium (Mg)	29	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 60 lb/A

Limestone containing .7% Mg (1.1 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
37	11.1	11.7	1.8	2.1	1.6				1.0	1.7	27.0

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32444		Lancaster			P-157-160606-1512-dat-S7A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7		▇▇▇▇		
[2]Phosphorus (P)	1	ppm	▇		
[2]Potassium (K)	50	ppm	▇▇▇		
[2]Magnesium (Mg)	15	ppm	▇▇		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 100 lb/A

Limestone containing 1.3% Mg (2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
45	9.9	10.4	1.2	1.2	2.1				0.9	1.6	18.8

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32445		Lancaster			P-162-160606-1040-jsw-S1A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.4				
[2]Phosphorus (P)	9	ppm			
[2]Potassium (K)	161	ppm			
[2]Magnesium (Mg)	35	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 15000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing .5% Mg (.9 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:			% Saturation of the CEC			Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
214	17.1	16.8	2.5	1.7	6.4				2.8	1.4	15.3

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32446		Lancaster			P-162-160606-1040-jsw-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.4				
[2]Phosphorus (P)	4	ppm			
[2]Potassium (K)	82	ppm			
[2]Magnesium (Mg)	16	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 14000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 100 lb/A

Limestone containing .7% Mg (1.1 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: / **Optional Tests:** / **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
32	15.3	15.5	1.4	0.9	1.0				2.1	1.6	20.4

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Zn (ppm)	Cu (ppm)	S (ppm)
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32447		Lancaster			P-162-160606-1040-jsw-SA3	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.6		■		
[2]Phosphorus (P)	6	ppm	■		
[2]Potassium (K)	72	ppm	■		
[2]Magnesium (Mg)	27	ppm	■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 10000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing .8% Mg (1.3 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
51	11.7	12.4	1.5	1.8	2.1				1.6	1.5	58.8

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32448		Lancaster			P-162-160606-1040-jsw-SA4	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8		■■■■■		
[2]Phosphorus (P)	1	ppm	■		
[2]Potassium (K)	59	ppm	■■■■		
[2]Magnesium (Mg)	35	ppm	■■■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing .9% Mg (1.4 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
53	10.5	11.2	1.3	2.6	2.4				1.1	1.4	62.2

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

ST-4 Interpreting Soil Tests for Agronomic Crops -Explains the soil test report and provides additional information on the recommendations.

Soil Nutrient Levels Soil nutrient levels are given as parts per million (ppm) elemental P, K , and Mg. As a rule of thumb to convert ppm to lb/A multiply ppm x 2. The elemental results in lb/A can be converted to oxide forms using the following conversions: P x 2.3=P_2O_5, K x 1.2=K_2O, Mg x 1.6=MgO

Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

Recommendations N,P, and K recommendations are made for three crop years on this field. New samples should be taken after 3 years. The recommendations for the 2nd and 3rd year assume that the earlier recommendations were followed. These recommendations are based on the results of the soil test and the information provided with the sample. If you think that there is an error on the report, contact the lab at the address on the front of the report. Tables that can be used to adjust or change recommendations for all crops based on the soil test can be found on the web at: www.aasl.psu.edu.

Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32449		Lancaster			P-162-160606-1040-jsw-SA5	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.6				
[2]Phosphorus (P)	5	ppm			
[2]Potassium (K)	69	ppm			
[2]Magnesium (Mg)	30	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 60 lb/A

Limestone containing .8% Mg (1.2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
61	9.9	10.6	1.7	2.4	2.9				1.2	1.4	23.9

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32450		Lancaster			P-170-160620-1122-def-S1A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
1 Soil pH	3.7				
2 Phosphorus (P)	5	ppm			
2 Potassium (K)	98	ppm			
2 Magnesium (Mg)	31	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 17000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 60 lb/A

Limestone containing .4% Mg (.6 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			2 Trace Elements (See back for comments)		
2 Calcium (ppm)	3 Acidity (meq/100 g)	4 CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
209	18.9	16.6	1.5	1.6	6.3				2.7	1.1	7.4

Test Methods: 1 1:1 soil:water pH, 2 Mehlich 3 (ICP), 3 Mehlich Buffer pH, 4 Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Zn (ppm)	Cu (ppm)	S (ppm)
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32451		Lancaster			P-170-160620-1122-def-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	3.6				
[2]Phosphorus (P)	11	ppm			
[2]Potassium (K)	100	ppm			
[2]Magnesium (Mg)	22	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 17000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing .5% Mg (.8 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
50	18.3	15.7	1.6	1.2	1.6				2.1	1.1	8.4

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32452		Lancaster			P-170-160620-1122-def-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	3.9		■		
[2]Phosphorus (P)	7	ppm	■		
[2]Potassium (K)	22	ppm	■		
[2]Magnesium (Mg)	14	ppm	■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 100 lb/A

Limestone containing 1.1% Mg (1.8 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
40	10.5	10.9	0.5	1.1	1.8				1.3	1.4	6.8

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32453		Lancaster			P-170-160620-1122-def-S4A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.4				
[2]Phosphorus (P)	4	ppm			
[2]Potassium (K)	25	ppm			
[2]Magnesium (Mg)	11	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 10000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 1.1% Mg (1.8 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
34	11.7	12.0	0.5	0.8	1.4				1.5	1.3	26.9

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32454		Lancaster			P-170-160620-1122-def-S5A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7				
[2]Phosphorus (P)	8	ppm			
[2]Potassium (K)	26	ppm			
[2]Magnesium (Mg)	10	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 5000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 2.2% Mg (3.5 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
33	6.3	6.6	1.0	1.3	2.5				1.4	1.2	23.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32455		Lancaster			P-170-160620-1122-def-S6A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8		■■■■■		
[2]Phosphorus (P)	6	ppm	■■		
[2]Potassium (K)	20	ppm	■■		
[2]Magnesium (Mg)	9	ppm	■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 4000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 2.8% Mg (4.4 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
32	5.7	6.0	0.9	1.3	2.7				1.2	1.1	22.0

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Below Optimum	Optimum	Above Optimum
Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32456		Lancaster			P-173-160620-1112-def-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	6.7				
[2]Phosphorus (P)	5	ppm			
[2]Potassium (K)	104	ppm			
[2]Magnesium (Mg)	128	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: NONE

Magnesium (Mg): NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
2224	2.2	14.7	1.8	7.3	75.9				3.1	1.5	6.8

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Zn (ppm)	Cu (ppm)	S (ppm)
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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
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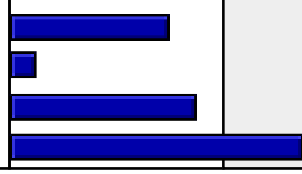
DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32457		Lancaster			P-173-160620-1112-def-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.2				
[2]Phosphorus (P)	4	ppm			
[2]Potassium (K)	88	ppm			
[2]Magnesium (Mg)	87	ppm			



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 10000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
1332	11.7	19.3	1.2	3.8	34.5				3.6	1.5	12.7

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

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7/7/2016	S16-32458		Lancaster			P-173-160620-1112-def-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.2				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	75	ppm			
[2]Magnesium (Mg)	46	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 7000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 30 lb/A

Limestone containing .4% Mg (.7 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
600	8.7	12.3	1.6	3.1	24.5				1.5	1.4	9.8

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32459		Lancaster			P-173-160620-1112-def-S4A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	6.5				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	125	ppm			
[2]Magnesium (Mg)	147	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: NONE **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
3246	3.9	20.4	1.6	6.0	73.4				1.0	1.5	7.4

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high calcium level in this sample indicates the probable presence of soluble calcium. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable calcium level of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

Recommendations N,P, and K recommendations are made for three crop years on this field. New samples should be taken after 3 years. The recommendations for the 2nd and 3rd year assume that the earlier recommendations were followed. These recommendations are based on the results of the soil test and the information provided with the sample. If you think that there is an error on the report, contact the lab at the address on the front of the report. Tables that can be used to adjust or change recommendations for all crops based on the soil test can be found on the web at: www.aasl.psu.edu.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32460		Lancaster			P-176-160621-1155-rll-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.8				
[2]Phosphorus (P)	15	ppm			
[2]Potassium (K)	161	ppm			
[2]Magnesium (Mg)	181	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 4000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
1844	5.7	16.8	2.5	9.0	54.7				6.9	1.6	10.3

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

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Zn (ppm)	Cu (ppm)	S (ppm)
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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
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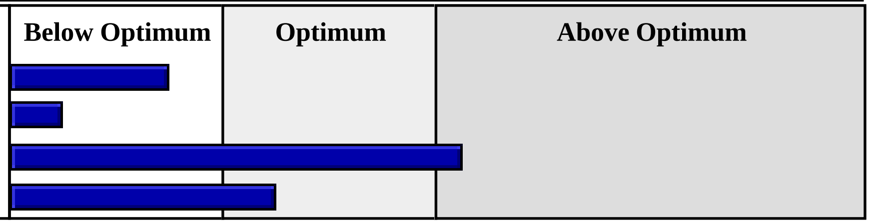
DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32461		Lancaster			P-176-160621-1155-rll-S2A	

SOIL NUTRIENT LEVELS — Below Optimum / Optimum / Above Optimum



[1]Soil pH	4.9	
[2]Phosphorus (P)	7	ppm
[2]Potassium (K)	154	ppm
[2]Magnesium (Mg)	74	ppm

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 5000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
260	6.9	9.2	4.3	6.7	14.1				3.7	1.0	10.9

Optional Tests: Organic Matter, Nitrate-N, Salts

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32462		Lancaster			P-176-160621-1155-rll-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1] Soil pH	5.6				
[2] Phosphorus (P)	1	ppm			
[2] Potassium (K)	60	ppm			
[2] Magnesium (Mg)	63	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 2000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2] Trace Elements (See back for comments)		
[2] Calcium (ppm)	[3] Acidity (meq/100 g)	[4] CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
131	3.4	4.7	3.3	11.1	13.8				1.3	1.3	4.7

Test Methods: [1] 1:1 soil:water pH, [2] Mehlich 3 (ICP), [3] Mehlich Buffer pH, [4] Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32463		Lancaster			P-176-160621-1155-rll-S4A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.2				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	147	ppm			
[2]Magnesium (Mg)	150	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

****Calcium Carbonate equivalent***

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
1122	11.1	18.3	2.1	6.8	30.6				1.0	1.0	63.4

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

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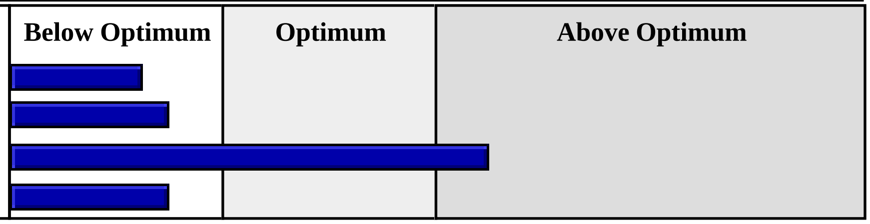
DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32464		Lancaster			P-187-160607-1427-jsw-S1A	

SOIL NUTRIENT LEVELS

[1]**Soil pH**	4.7	
[2]**Phosphorus (P)**	24	**ppm**
[2]**Potassium (K)**	175	**ppm**
[2]**Magnesium (Mg)**	46	**ppm**



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 12000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 30 lb/A

Limestone containing .3% Mg (.4 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
138	14.1	15.6	2.9	2.5	4.4				9.5	1.2	40.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32465		Lancaster			P-187-160607-1427-jsw-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8				
[2]Phosphorus (P)	5	ppm			
[2]Potassium (K)	103	ppm			
[2]Magnesium (Mg)	32	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 12000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 60 lb/A

Limestone containing .5% Mg (.8 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
140	13.5	14.7	1.8	1.8	4.7				2.9	1.5	21.2

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32466		Lancaster			P-187-160607-1427-jsw-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8				
[2]Phosphorus (P)	5	ppm			
[2]Potassium (K)	64	ppm			
[2]Magnesium (Mg)	22	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 80 lb/A

Limestone containing 1% Mg (1.6 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
48	9.9	10.5	1.6	1.7	2.3				1.9	1.5	15.8

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

ST-4 Interpreting Soil Tests for Agronomic Crops -Explains the soil test report and provides additional information on the recommendations.

Soil Nutrient Levels Soil nutrient levels are given as parts per million (ppm) elemental P, K , and Mg. As a rule of thumb to convert ppm to lb/A multiply ppm x 2. The elemental results in lb/A can be converted to oxide forms using the following conversions: P x 2.3=P_2O_5, K x 1.2=K_2O, Mg x 1.6=MgO

Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

Recommendations N,P, and K recommendations are made for three crop years on this field. New samples should be taken after 3 years. The recommendations for the 2nd and 3rd year assume that the earlier recommendations were followed. These recommendations are based on the results of the soil test and the information provided with the sample. If you think that there is an error on the report, contact the lab at the address on the front of the report. Tables that can be used to adjust or change recommendations for all crops based on the soil test can be found on the web at: www.aasl.psu.edu.

Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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(814) 863-0841 Fax: (814) 863-4540
Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32467		Lancaster			P-215-160602-1037-jsw-S1A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	3.8				
[2]Phosphorus (P)	16	ppm			
[2]Potassium (K)	148	ppm			
[2]Magnesium (Mg)	32	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 17000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 60 lb/A

Limestone containing .4% Mg (.6 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (*See back for comments*)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
150	18.3	16.4	2.3	1.6	4.6				2.3	1.2	9.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Soil Nutrient Levels Soil nutrient levels are given as parts per million (ppm) elemental P, K , and Mg. As a rule of thumb to convert ppm to lb/A multiply ppm x 2. The elemental results in lb/A can be converted to oxide forms using the following conversions: P x 2.3=P_2O_5, K x 1.2=K_2O, Mg x 1.6=MgO

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Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

Distribution of Soil Test Results Summaries of soil test results may be used in educational programs. However, individual results will not be released outside of Penn State without permission of the client. Electronic copies of your results are available to you, contact the lab for more information.

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32468		Lancaster			P-215-160602-1037-jsw-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	3.8				
[2]Phosphorus (P)	4	ppm			
[2]Potassium (K)	49	ppm			
[2]Magnesium (Mg)	16	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 12000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 100 lb/A

Limestone containing .8% Mg (1.3 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
52	13.5	14.0	0.9	1.0	1.9				1.5	1.2	12.3

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32469		Lancaster			P-215-160602-1037-jsw-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	3.8				
[2]Phosphorus (P)	13	ppm			
[2]Potassium (K)	45	ppm			
[2]Magnesium (Mg)	13	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 12000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 100 lb/A

Limestone containing .8% Mg (1.3 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
51	13.5	14.0	0.8	0.8	1.8				1.3	1.1	8.9

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32471		Lancaster			P-215-160602-1037-jsw-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.6				
[2]Phosphorus (P)	5	ppm			
[2]Potassium (K)	33	ppm			
[2]Magnesium (Mg)	9	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 1.8% Mg (2.9 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: / **Optional Tests:** / **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
30	8.1	8.4	1.0	0.9	1.8				1.5	0.9	28.0

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32472		Lancaster			P-215-160602-1037-jsw-S5A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
1 Soil pH	4.6				
2 Phosphorus (P)	3	ppm			
2 Potassium (K)	34	ppm			
2 Magnesium (Mg)	9	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 1.8% Mg (2.9 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			2 Trace Elements (See back for comments)		
2 Calcium (ppm)	3 Acidity (meq/100 g)	4 CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
33	8.1	8.4	1.0	0.9	1.9				1.4	1.0	31.7

Test Methods: 1 1:1 soil:water pH, 2 Mehlich 3 (ICP), 3 Mehlich Buffer pH, 4 Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32473		Lancaster			P-215-160602-1037-jsw-S6A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.3				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	15	ppm			
[2]Magnesium (Mg)	8	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 4000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 2.8% Mg (4.4 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
36	5.7	6.0	0.6	1.1	3.0				0.9	0.8	37.5

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32474		Lancaster			P-222-160607-1055-dat-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]**Soil pH**	3.8				
[2]**Phosphorus (P)**	9	**ppm**			
[2]**Potassium (K)**	79	**ppm**			
[2]**Magnesium (Mg)**	34	**ppm**			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 20000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 50 lb/A

Limestone containing .3% Mg (.4 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
175	20.7	16.4	1.2	1.7	5.3				2.5	1.1	18.5

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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(814) 863-0841 Fax: (814) 863-4540

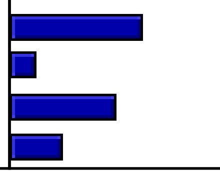
Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32475		Lancaster			P-222-160607-1055-dat-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
1 Soil pH	4.7				
2 Phosphorus (P)	4	ppm			
2 Potassium (K)	56	ppm			
2 Magnesium (Mg)	16	ppm			



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 7000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 100 lb/A

Limestone containing 1.4% Mg (2.3 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **2 Trace Elements** (*See back for comments*)

2 Calcium (ppm)	3 Acidity (meq/100 g)	4 CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
66	8.7	9.3	1.5	1.4	3.6				3.2	1.5	18.8

Test Methods: 1 1:1 soil:water pH, 2 Mehlich 3 (ICP), 3 Mehlich Buffer pH, 4 Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
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University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32476		Lancaster			P-222-160607-1055-dat-S3A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1] Soil pH	4.7				
[2] Phosphorus (P)	2	ppm			
[2] Potassium (K)	44	ppm			
[2] Magnesium (Mg)	14	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 100 lb/A

Limestone containing 1.7% Mg (2.7 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: / **Optional Tests:** / **[2] Trace Elements** (*See back for comments*)

[2] Calcium (ppm)	[3] Acidity (meq/100 g)	[4] CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
41	8.1	8.5	1.3	1.4	2.4				1.3	1.1	23.3

Test Methods: [1] 1:1 soil:water pH, [2] Mehlich 3 (ICP), [3] Mehlich Buffer pH, [4] Summation of Cations

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Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Zn (ppm)	Cu (ppm)	S (ppm)
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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32477		Lancaster			P-222-160607-1055-dat-S4A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	55	ppm			
[2]Magnesium (Mg)	32	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 60 lb/A

Limestone containing 1% Mg (1.6 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
56	8.1	8.8	1.6	3.0	3.2				1.1	1.0	19.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32478		Lancaster			P-222-160607-1055-dat-S5A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.9				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	56	ppm			
[2]Magnesium (Mg)	52	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 20 lb/A

Limestone containing .3% Mg (.5 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
70	7.5	8.4	1.7	5.1	4.2				1.3	1.1	14.8

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

Recommendations N,P, and K recommendations are made for three crop years on this field. New samples should be taken after 3 years. The recommendations for the 2nd and 3rd year assume that the earlier recommendations were followed. These recommendations are based on the results of the soil test and the information provided with the sample. If you think that there is an error on the report, contact the lab at the address on the front of the report. Tables that can be used to adjust or change recommendations for all crops based on the soil test can be found on the web at: www.aasl.psu.edu.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32479		Lancaster			P-225-160601-1130-mel-S1A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.0				
[2]Phosphorus (P)	3	ppm			
[2]Potassium (K)	75	ppm			
[2]Magnesium (Mg)	60	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** *(See back for comments)*

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
197	9.9	11.6	1.7	4.3	8.5				1.4	1.4	15.7

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32480		Lancaster			P-225-160601-1130-mel-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.0				
[2]Phosphorus (P)	3	ppm			
[2]Potassium (K)	52	ppm			
[2]Magnesium (Mg)	111	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 11000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
164	12.3	14.2	0.9	6.5	5.8				1.2	1.1	28.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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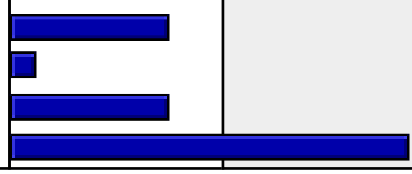
DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32481		Lancaster			P-225-160601-1130-mel-S3A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.0				
[2]Phosphorus (P)	2	ppm			
[2]Potassium (K)	73	ppm			
[2]Magnesium (Mg)	113	ppm			



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
164	9.9	11.8	1.6	7.9	6.9				1.1	1.0	11.9

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32482		Lancaster			P-225-160601-1130-mel-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
1 Soil pH	5.0				
2 Phosphorus (P)	1	ppm			
2 Potassium (K)	66	ppm			
2 Magnesium (Mg)	107	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 11000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

****Calcium Carbonate equivalent***

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			2 Trace Elements (See back for comments)		
2 Calcium (ppm)	3 Acidity (meq/100 g)	4 CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
145	12.3	14.1	1.2	6.3	5.1				1.1	1.2	24.6

Test Methods: 1 1:1 soil:water pH, 2 Mehlich 3 (ICP), 3 Mehlich Buffer pH, 4 Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
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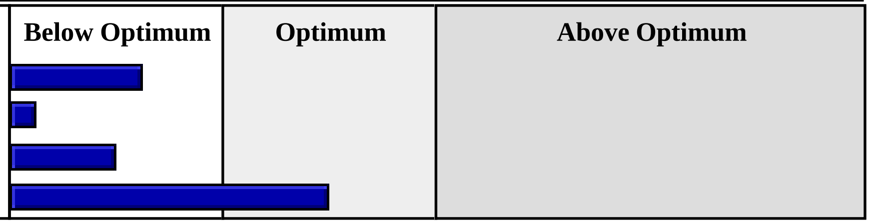
DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32483		Lancaster			P-225-160601-1130-mel-S5A	

SOIL NUTRIENT LEVELS — Below Optimum / Optimum / Above Optimum

[1]**Soil pH**	4.8	
[2]**Phosphorus (P)**	1	ppm
[2]**Potassium (K)**	41	ppm
[2]**Magnesium (Mg)**	105	ppm



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 12000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

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3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | [2]**Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
83	13.5	14.9	0.7	5.9	2.8				1.1	1.1	57.9

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32484		Lancaster			P-225-160601-1130-mel-S6A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.9				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	37	ppm			
[2]Magnesium (Mg)	101	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 11000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
81	12.3	13.6	0.7	6.2	3.0				1.0	1.2	66.7

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32485		Lancaster			P-225B-160601-1312-sdd-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8				
[2]Phosphorus (P)	17	ppm			
[2]Potassium (K)	99	ppm			
[2]Magnesium (Mg)	148	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	% Saturation of the CEC Mg	% Saturation of the CEC Ca	Optional Tests: Organic Matter %	Optional Tests: Nitrate-N ppm	Optional Tests: Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
608	10.5	15.0	1.7	8.2	20.2				7.4	1.4	10.5

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32486		Lancaster			P-225B-160601-1312-sdd-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1] Soil pH	4.8		▇▇▇▇▇		
[2] Phosphorus (P)	3	ppm	▇		
[2] Potassium (K)	61	ppm	▇▇▇▇▇		
[2] Magnesium (Mg)	49	ppm	▇▇▇▇▇▇		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 20 lb/A

Limestone containing .3% Mg (.4 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2] Trace Elements (See back for comments)		
[2] Calcium (ppm)	[3] Acidity (meq/100 g)	[4] CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
65	9.3	10.2	1.5	4.0	3.2				1.9	1.2	13.0

Test Methods: [1] 1:1 soil:water pH, [2] Mehlich 3 (ICP), [3] Mehlich Buffer pH, [4] Summation of Cations

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Recommendation Messages

Enclosures

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Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32487		Lancaster			P-225B-160601-1312-sdd-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	50	ppm			
[2]Magnesium (Mg)	49	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 20 lb/A

Limestone containing .3% Mg (.4 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
39	9.9	10.6	1.2	3.8	1.8				1.3	1.2	24.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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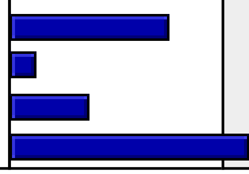
DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32488		Lancaster			P-225B-160601-1312-sdd-S4A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.9				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	31	ppm			
[2]Magnesium (Mg)	68	ppm			



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.   **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
33	9.3	10.1	0.8	5.6	1.6				1.1	1.1	24.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32489		Lancaster			P-227-160601-1500-jsw-S1A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1] Soil pH	4.2				
[2] Phosphorus (P)	7	ppm			
[2] Potassium (K)	101	ppm			
[2] Magnesium (Mg)	85	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 21000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2] Calcium (ppm)	[3] Acidity (meq/100 g)	[4] CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2] Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
664	22.5	19.3	1.3	3.7	17.2				3.5	1.4	7.8

Test Methods: [1] 1:1 soil:water pH, [2] Mehlich 3 (ICP), [3] Mehlich Buffer pH, [4] Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Below Optimum	Optimum	Above Optimum
Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32490		Lancaster			P-227-160601-1500-jsw-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.1				
[2]Phosphorus (P)	8	ppm			
[2]Potassium (K)	89	ppm			
[2]Magnesium (Mg)	39	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 20000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 50 lb/A

Limestone containing .3% Mg (.4 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
103	21.3	16.1	1.4	2.0	3.2				4.2	1.5	14.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Zn (ppm)	Cu (ppm)	S (ppm)
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32491		Lancaster			P-227-160601-1500-jsw-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.6				
[2]Phosphorus (P)	11	ppm			
[2]Potassium (K)	63	ppm			
[2]Magnesium (Mg)	27	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing 1% Mg (1.6 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
65	9.9	10.6	1.5	2.1	3.1				2.3	1.2	13.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32492		Lancaster			P-227-160601-1500-jsw-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.6				
[2]Phosphorus (P)	21	ppm			
[2]Potassium (K)	39	ppm			
[2]Magnesium (Mg)	25	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 100 lb/A

Limestone containing 1.1% Mg (1.8 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
64	11.1	11.7	0.9	1.8	2.7				1.5	1.4	11.5

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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(814) 863-0841 Fax: (814) 863-4540
Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32493		Lancaster			P-239-160607-1427-def-S1A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.9		■■■■■		
[2]Phosphorus (P)	5	ppm	■		
[2]Potassium (K)	112	ppm	■■■■■■■■■		
[2]Magnesium (Mg)	85	ppm	■■■■■■■■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 10000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (*See back for comments*)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
481	11.7	15.1	1.9	4.7	15.9				3.0	1.4	11.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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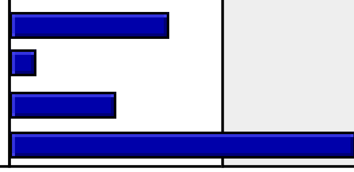
SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32494		Lancaster			P-239-160607-1427-def-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.0				
[2]Phosphorus (P)	4	ppm			
[2]Potassium (K)	46	ppm			
[2]Magnesium (Mg)	101	ppm			



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
147	11.1	12.8	0.9	6.6	5.8				1.4	1.4	21.9

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32495		Lancaster			P-239-160607-1427-def-S3A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.9				
[2]Phosphorus (P)	6	ppm			
[2]Potassium (K)	68	ppm			
[2]Magnesium (Mg)	198	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 5000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
174	6.3	9.0	1.9	18.3	9.7				1.5	1.2	11.5

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Agronomy

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Zn (ppm)	Cu (ppm)	S (ppm)
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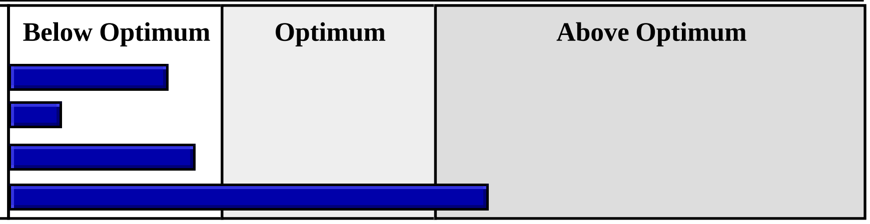
Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32496		Lancaster			P-239-160607-1427-def-S4A	

SOIL NUTRIENT LEVELS

[1]**Soil pH**	4.9	
[2]**Phosphorus (P)**	7	**ppm**
[2]**Potassium (K)**	83	**ppm**
[2]**Magnesium (Mg)**	176	**ppm**



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 11000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | [2]**Trace Elements** *See back for comments*

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
134	12.9	15.2	1.4	9.6	4.4				2.0	1.4	12.2

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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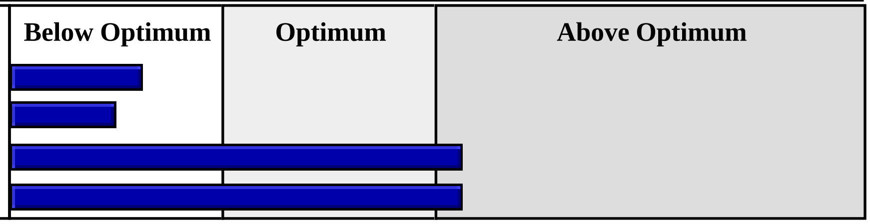
SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32498		Lancaster			P-239A-160607-1430-def-S1A	

SOIL NUTRIENT LEVELS

[1]Soil pH	4.6	
[2]Phosphorus (P)	14	ppm
[2]Potassium (K)	151	ppm
[2]Magnesium (Mg)	156	ppm



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 13000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

****Calcium Carbonate equivalent***

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: / **Optional Tests:** / **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
602	14.7	19.4	2.0	6.7	15.5				7.5	1.5	30.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32499		Lancaster			P-239A-160607-1430-def-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8		■		
[2]Phosphorus (P)	3	ppm	■		
[2]Potassium (K)	119	ppm	■		
[2]Magnesium (Mg)	61	ppm	■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
63	10.5	11.6	2.6	4.4	2.7				2.2	1.5	12.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32500		Lancaster			P-239A-160607-1430-def-S3A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.9				
[2]Phosphorus (P)	2	ppm			
[2]Potassium (K)	104	ppm			
[2]Magnesium (Mg)	111	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
75	9.9	11.5	2.3	8.1	3.3				1.3	1.2	12.4

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32501		Lancaster			P-239A-160607-1430-def-S4A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.4				
[2]Phosphorus (P)	2	ppm			
[2]Potassium (K)	93	ppm			
[2]Magnesium (Mg)	211	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 5000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** *(See back for comments)*

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
251	6.3	9.6	2.5	18.4	13.2				1.2	1.4	6.7

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32502		Lancaster			P-239A-160607-1430-def-S5A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.1				
[2]Phosphorus (P)	2	ppm			
[2]Potassium (K)	76	ppm			
[2]Magnesium (Mg)	145	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 5000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
130	6.9	9.0	2.2	13.5	7.2				1.2	1.6	7.8

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32503		Lancaster			P-253-160608-0950-mel-S1A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.6				
[2]Phosphorus (P)	23	ppm			
[2]Potassium (K)	144	ppm			
[2]Magnesium (Mg)	134	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 7000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements *See back for comments*		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
1539	8.7	17.9	2.1	6.2	43.0				6.2	1.5	17.4

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Agronomy

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32504		Lancaster			P-253-160608-0950-mel-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.0				
[2]Phosphorus (P)	11	ppm			
[2]Potassium (K)	110	ppm			
[2]Magnesium (Mg)	43	ppm			

RECOMMENDATIONS:

(See back messages for important information)

Limestone*: 9000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 30 lb/A

Limestone containing .3% Mg (.5 % MgO) will satisfy the magnesium requirement

Plant Nutrients:

(If manure will be applied, adjust these recommendations accordingly. See back of report.)

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
277	11.1	13.1	2.1	2.7	10.6				2.2	1.7	15.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32505		Lancaster			P-253-160608-0950-mel-S3A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.6				
[2]Phosphorus (P)	3	ppm			
[2]Potassium (K)	40	ppm			
[2]Magnesium (Mg)	17	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 100 lb/A

Limestone containing 1.3% Mg (2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
49	9.3	9.8	1.0	1.4	2.5				1.2	1.4	17.7

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32506		Lancaster			P-253-160608-0950-mel-S4A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8		■		
[2]Phosphorus (P)	15	ppm	■		
[2]Potassium (K)	39	ppm	■		
[2]Magnesium (Mg)	26	ppm	■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 7000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing 1.1% Mg (1.8 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: / **Optional Tests:** / **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
50	8.7	9.3	1.1	2.3	2.7				1.3	1.4	11.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32507		Lancaster			P-254-160608-1050-mel-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1] Soil pH	6.6				
[2] Phosphorus (P)	23	ppm			
[2] Potassium (K)	145	ppm			
[2] Magnesium (Mg)	267	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: NONE **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2] Trace Elements** (*See back for comments*)

[2] Calcium (ppm)	[3] Acidity (meq/100 g)	[4] CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
3605	2.0	19.6	1.9	11.4	76.5				16.3	1.8	20.6

Test Methods: [1] 1:1 soil:water pH, [2] Mehlich 3 (ICP), [3] Mehlich Buffer pH, [4] Summation of Cations

The high calcium level in this sample indicates the probable presence of soluble calcium. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable calcium level of 15 meq/100 g.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32508		Lancaster			P-254-160608-1050-mel-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.8				
[2]Phosphorus (P)	17	ppm			
[2]Potassium (K)	138	ppm			
[2]Magnesium (Mg)	162	ppm			

RECOMMENDATIONS:

(See back messages for important information)

Limestone*: 5000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients:

(If manure will be applied, adjust these recommendations accordingly. See back of report.)

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
1908	6.9	18.1	2.0	7.4	52.6				9.7	1.5	16.5

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32509		Lancaster			P-254-160608-1050-mel-S3A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]**Soil pH**	4.9		■■■■■■■		
[2]**Phosphorus (P)**	7	**ppm**	■■		
[2]**Potassium (K)**	85	**ppm**	■■■■■■■■		
[2]**Magnesium (Mg)**	32	**ppm**	■■■■■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 60 lb/A

Limestone containing .7% Mg (1.1 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | [2]**Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
130	11.1	12.2	1.8	2.2	5.3				1.2	1.4	8.9

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32510		Lancaster			P-254-160608-1050-mel-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.1				
[2]Phosphorus (P)	19	ppm			
[2]Potassium (K)	81	ppm			
[2]Magnesium (Mg)	83	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	% Saturation of the CEC Mg	% Saturation of the CEC Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
359	9.9	12.6	1.6	5.5	14.3				1.2	1.4	7.7

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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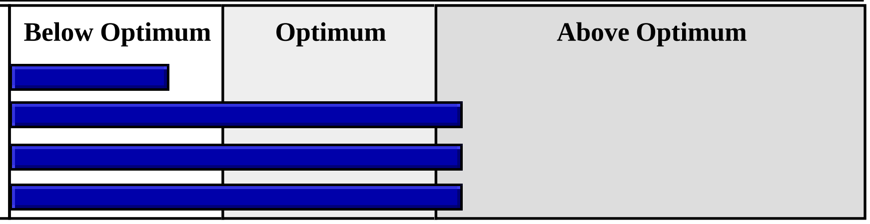
DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32511		Lancaster			P-069-160614-1158-sdd-S1A	

SOIL NUTRIENT LEVELS

[1]Soil pH	4.9	
[2]Phosphorus (P)	67	ppm
[2]Potassium (K)	154	ppm
[2]Magnesium (Mg)	127	ppm



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 10000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
1289	11.7	19.6	2.0	5.4	32.9				6.8	1.9	23.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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1.1 - 9.4	1.2 - 5.5	10 - 25

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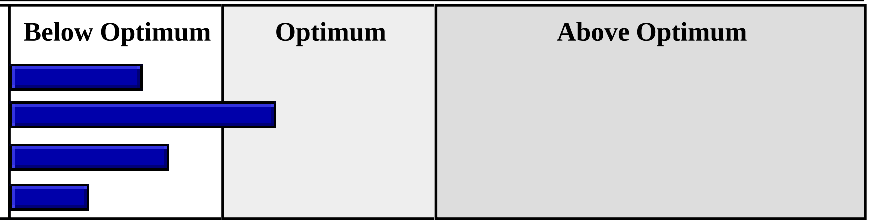
SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32512		Lancaster			P-069-160614-1158-sdd-S2A	

SOIL NUTRIENT LEVELS

[1]Soil pH	4.2	
[2]Phosphorus (P)	35	ppm
[2]Potassium (K)	75	ppm
[2]Magnesium (Mg)	27	ppm



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 14000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing .6% Mg (.9 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
79	15.9	15.8	1.2	1.4	2.5				2.7	1.9	22.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Recommendation Messages

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32709		Lancaster			P-276-160610-0838-jsw-S1A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.1				
[2]Phosphorus (P)	4	ppm			
[2]Potassium (K)	95	ppm			
[2]Magnesium (Mg)	187	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
943	9.9	16.4	1.5	9.5	28.7				5.1	1.9	10.3

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Zn (ppm)	Cu (ppm)	S (ppm)
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7/7/2016	S16-32710		Lancaster			P-276-160610-0838-jsw-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.1				
[2]Phosphorus (P)	4	ppm			
[2]Potassium (K)	81	ppm			
[2]Magnesium (Mg)	235	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 7000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

****Calcium Carbonate equivalent***

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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ADDITIONAL RESULTS: / **Optional Tests:** / **[2]Trace Elements** (*See back for comments*)

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648	8.7	14.1	1.5	13.9	23.0				3.0	1.7	9.0

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Agronomy

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32711		Lancaster			P-276-160610-0838-jsw-S3A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.4				
[2]Phosphorus (P)	2	ppm			
[2]Potassium (K)	48	ppm			
[2]Magnesium (Mg)	233	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 3000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

**Calcium Carbonate equivalent*

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	% Saturation of the CEC Mg	% Saturation of the CEC Ca	Optional Tests: Organic Matter %	Optional Tests: Nitrate-N ppm	Optional Tests: Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
430	4.5	8.7	1.4	22.3	24.7				1.7	1.7	3.9

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

ST-4 Interpreting Soil Tests for Agronomic Crops -Explains the soil test report and provides additional information on the recommendations.

Soil Nutrient Levels Soil nutrient levels are given as parts per million (ppm) elemental P, K , and Mg. As a rule of thumb to convert ppm to lb/A multiply ppm x 2. The elemental results in lb/A can be converted to oxide forms using the following conversions: P x 2.3=P_2O_5, K x 1.2=K_2O, Mg x 1.6=MgO

Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

Recommendations N,P, and K recommendations are made for three crop years on this field. New samples should be taken after 3 years. The recommendations for the 2nd and 3rd year assume that the earlier recommendations were followed. These recommendations are based on the results of the soil test and the information provided with the sample. If you think that there is an error on the report, contact the lab at the address on the front of the report. Tables that can be used to adjust or change recommendations for all crops based on the soil test can be found on the web at: www.aasl.psu.edu.

Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32712		Lancaster			P-276-160610-0838-jsw-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.6				
[2]Phosphorus (P)	2	ppm			
[2]Potassium (K)	66	ppm			
[2]Magnesium (Mg)	290	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 4000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
502	5.1	10.2	1.7	23.7	24.6				1.6	2.0	4.9

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Soil Nutrient Levels Soil nutrient levels are given as parts per million (ppm) elemental P, K , and Mg. As a rule of thumb to convert ppm to lb/A multiply ppm x 2. The elemental results in lb/A can be converted to oxide forms using the following conversions: P x 2.3=P_2O_5, K x 1.2=K_2O, Mg x 1.6=MgO

Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32713		Lancaster			P-276-160610-0838-jsw-S5A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.9				
[2]Phosphorus (P)	2	ppm			
[2]Potassium (K)	54	ppm			
[2]Magnesium (Mg)	214	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 2000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	% Saturation of the CEC: Mg	% Saturation of the CEC: Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
414	2.8	6.8	2.0	26.3	30.5				1.0	1.1	2.3

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Below Optimum	Optimum	Above Optimum
Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32714		Lancaster			P-279-160610-1359-dat-S1A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7				
[2]Phosphorus (P)	7	ppm			
[2]Potassium (K)	140	ppm			
[2]Magnesium (Mg)	126	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 13000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

****Calcium Carbonate equivalent***

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
557	14.7	18.9	1.9	5.6	14.7				5.1	1.1	15.2

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32715		Lancaster			P-279-160610-1359-dat-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.4				
[2]Phosphorus (P)	6	ppm			
[2]Potassium (K)	101	ppm			
[2]Magnesium (Mg)	85	ppm			

RECOMMENDATIONS:

(See back messages for important information)

Limestone*: 16000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients:

(If manure will be applied, adjust these recommendations accordingly. See back of report.)

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
296	17.7	17.4	1.5	4.1	8.5				2.6	1.4	12.5

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32716		Lancaster			P-279-160610-1359-dat-S3A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8				
[2]Phosphorus (P)	5	ppm			
[2]Potassium (K)	104	ppm			
[2]Magnesium (Mg)	64	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
80	11.1	12.3	2.2	4.3	3.3				1.4	1.6	8.5

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32717		Lancaster			P-279-160610-1359-dat-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8				
[2]Phosphorus (P)	2	ppm			
[2]Potassium (K)	72	ppm			
[2]Magnesium (Mg)	46	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 30 lb/A

Limestone containing .4% Mg (.6 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
48	9.3	10.1	1.8	3.8	2.4				1.1	1.4	8.2

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Agronomy

Recommendation Messages

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32718		Lancaster			P-279-160610-1359-dat-S5A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.0				
[2]Phosphorus (P)	10	ppm			
[2]Potassium (K)	80	ppm			
[2]Magnesium (Mg)	133	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 5000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
134	6.9	8.9	2.3	12.5	7.5				2.7	4.1	6.9

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32719		Lancaster			P-279A-160610-1450-def-S1A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.2				
[2]Phosphorus (P)	5	ppm			
[2]Potassium (K)	74	ppm			
[2]Magnesium (Mg)	39	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 13000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 50 lb/A

Limestone containing .4% Mg (.6 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:			% Saturation of the CEC			Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
257	14.7	16.5	1.2	2.0	7.8				2.2	1.3	13.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

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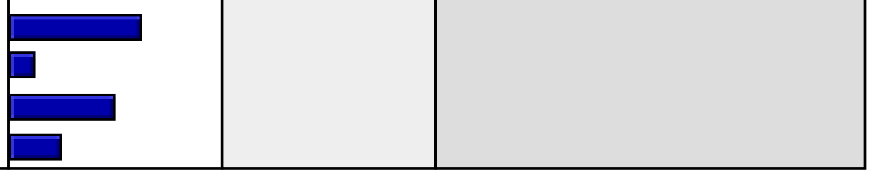
SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32720		Lancaster			P-279A-160610-1450-def-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8				
[2]Phosphorus (P)	2	ppm			
[2]Potassium (K)	48	ppm			
[2]Magnesium (Mg)	22	ppm			



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing 1.3% Mg (2.1 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
61	7.5	8.1	1.5	2.3	3.8				1.4	1.1	7.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

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Zn (ppm)	Cu (ppm)	S (ppm)
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32721		Lancaster			P-279A-160610-1450-def-S3A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.1				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	63	ppm			
[2]Magnesium (Mg)	71	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

****Calcium Carbonate equivalent***

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS: / **Optional Tests:** / **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
117	8.1	9.4	1.7	6.3	6.2				1.3	1.1	7.0

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

Distribution of Soil Test Results Summaries of soil test results may be used in educational programs. However, individual results will not be released outside of Penn State without permission of the client. Electronic copies of your results are available to you, contact the lab for more information.

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The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32722		Lancaster			P-279A-160610-1450-def-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.0				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	62	ppm			
[2]Magnesium (Mg)	152	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
107	10.5	12.5	1.3	10.2	4.3				1.3	1.3	35.8

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Below Optimum	Optimum	Above Optimum
Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

Recommendations N,P, and K recommendations are made for three crop years on this field. New samples should be taken after 3 years. The recommendations for the 2nd and 3rd year assume that the earlier recommendations were followed. These recommendations are based on the results of the soil test and the information provided with the sample. If you think that there is an error on the report, contact the lab at the address on the front of the report. Tables that can be used to adjust or change recommendations for all crops based on the soil test can be found on the web at: www.aasl.psu.edu.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32724		Lancaster			P-283-160606-0743-def-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7		■		
[2]Phosphorus (P)	10	ppm	■		
[2]Potassium (K)	149	ppm	■	■	
[2]Magnesium (Mg)	95	ppm	■	■	

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 12000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
1071	14.1	20.6	1.9	3.8	26.0				6.5	1.5	9.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32725		Lancaster			P-283-160606-0743-def-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.5				
[2]Phosphorus (P)	3	ppm			
[2]Potassium (K)	40	ppm			
[2]Magnesium (Mg)	26	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 13000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing .6% Mg (1 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
58	14.7	15.3	0.7	1.4	1.9				1.9	1.4	18.8

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32726		Lancaster			P-283-160606-0743-def-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7		▮		
[2]Phosphorus (P)	2	ppm	▮		
[2]Potassium (K)	44	ppm	▮		
[2]Magnesium (Mg)	30	ppm	▮		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 60 lb/A

Limestone containing .8% Mg (1.2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
55	9.3	9.9	1.1	2.5	2.8				1.5	1.3	13.8

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32727		Lancaster			P-283-160606-0743-def-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.9				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	62	ppm			
[2]Magnesium (Mg)	59	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
75	9.3	10.3	1.5	4.8	3.6				1.1	1.2	13.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
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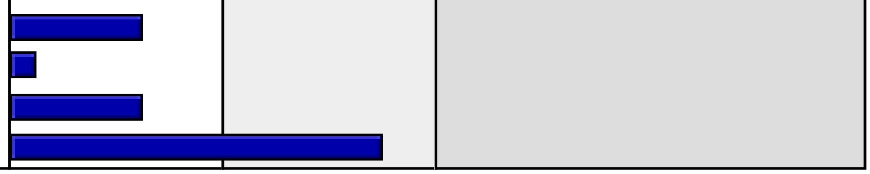
DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32728		Lancaster			P-283-160606-0743-def-S5A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	69	ppm			
[2]Magnesium (Mg)	109	ppm			



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (*See back for comments*) Zinc ppm	Copper ppm	Sulfur ppm
56	10.5	11.9	1.5	7.7	2.4				1.1	1.0	30.2

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32729		Lancaster			P-283-160606-0743-def-S6A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.0		■		
[2]Phosphorus (P)	2	ppm	■		
[2]Potassium (K)	67	ppm	■		
[2]Magnesium (Mg)	105	ppm	■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
48	10.5	11.8	1.5	7.4	2.0				1.2	1.2	17.1

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Recommendation Messages

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32730		Lancaster			P-286-160606-0808-def-S1A	

SOIL NUTRIENT LEVELS

[1]Soil pH	3.9		Below Optimum
[2]Phosphorus (P)	7	ppm	Below Optimum
[2]Potassium (K)	142	ppm	Optimum
[2]Magnesium (Mg)	81	ppm	Optimum

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 22000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

****Calcium Carbonate equivalent***

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
372	23.7	17.9	2.0	3.8	10.4				2.6	1.0	10.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32731		Lancaster			P-286-160606-0808-def-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8				
[2]Phosphorus (P)	2	ppm			
[2]Potassium (K)	46	ppm			
[2]Magnesium (Mg)	12	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 1.8% Mg (2.9 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
49	7.5	8.0	1.5	1.3	3.1				1.5	1.0	40.7

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32732		Lancaster			P-286-160606-0808-def-S3A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	71	ppm			
[2]Magnesium (Mg)	21	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing .9% Mg (1.4 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
55	10.5	11.1	1.6	1.6	2.5				1.0	1.0	49.0

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32733		Lancaster			P-286-160606-0808-def-S4A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	69	ppm			
[2]Magnesium (Mg)	31	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 60 lb/A

Limestone containing .8% Mg (1.2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
37	9.9	10.5	1.7	2.5	1.8				1.2	1.1	22.4

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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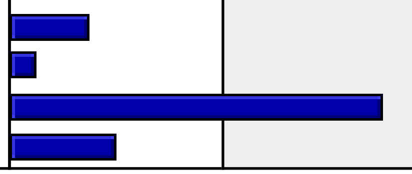
Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32734		Lancaster			P-290-160606-1445-mel-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	3.1				
[2]Phosphorus (P)	5	ppm			
[2]Potassium (K)	136	ppm			
[2]Magnesium (Mg)	36	ppm			



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 30000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 50 lb/A

Limestone containing .2% Mg (.3 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
236	30.9	16.8	2.1	1.8	7.0				4.0	1.1	11.8

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32735		Lancaster			P-290-160606-1445-mel-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	3.5		■		
[2]Phosphorus (P)	9	ppm	■		
[2]Potassium (K)	58	ppm	■		
[2]Magnesium (Mg)	20	ppm	■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 15000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 80 lb/A

Limestone containing .5% Mg (.9 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
111	17.1	15.9	0.9	1.1	3.5				2.0	1.1	11.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32736		Lancaster			P-290-160606-1445-mel-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7				
[2]Phosphorus (P)	2	ppm			
[2]Potassium (K)	40	ppm			
[2]Magnesium (Mg)	10	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 1.8% Mg (2.9 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
39	7.5	7.9	1.3	1.1	2.4				1.3	1.0	18.2

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32737		Lancaster			P-290-160606-1445-mel-S4A	

SOIL NUTRIENT LEVELS

	Value	Unit	Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.5				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	42	ppm			
[2]Magnesium (Mg)	11	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 7000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 1.6% Mg (2.5 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
44	8.7	9.1	1.2	1.0	2.4				1.0	0.9	23.7

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32738		Lancaster			P-291-160606-1330-mel-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.3				
[2]Phosphorus (P)	4	ppm			
[2]Potassium (K)	65	ppm			
[2]Magnesium (Mg)	33	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 16000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 50 lb/A

Limestone containing .3% Mg (.5 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
143	17.7	16.2	1.0	1.7	4.4				1.7	1.1	10.2

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32739		Lancaster			P-291-160606-1330-mel-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.5				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	37	ppm			
[2]Magnesium (Mg)	11	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 1.2% Mg (2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
37	11.1	11.5	0.8	0.8	1.6				1.1	1.4	12.3

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32740		Lancaster			P-291-160606-1330-mel-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.6				
[2]Phosphorus (P)	3	ppm			
[2]Potassium (K)	52	ppm			
[2]Magnesium (Mg)	36	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 14000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 50 lb/A

Limestone containing .4% Mg (.6 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	% Saturation of the CEC Mg	% Saturation of the CEC Ca	Optional Tests: Organic Matter %	Optional Tests: Nitrate-N ppm	Optional Tests: Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
95	15.9	15.9	0.8	1.9	3.0				1.8	1.6	20.2

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

Distribution of Soil Test Results Summaries of soil test results may be used in educational programs. However, individual results will not be released outside of Penn State without permission of the client. Electronic copies of your results are available to you, contact the lab for more information.

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32741		Lancaster			P-291-160606-1330-mel-S4A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7		■■■■■		
[2]Phosphorus (P)	1	ppm	■		
[2]Potassium (K)	58	ppm	■■■■		
[2]Magnesium (Mg)	41	ppm	■■■■■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 12000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 50 lb/A

Limestone containing .4% Mg (.7 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
33	14.1	14.8	1.0	2.3	1.1				1.7	1.7	12.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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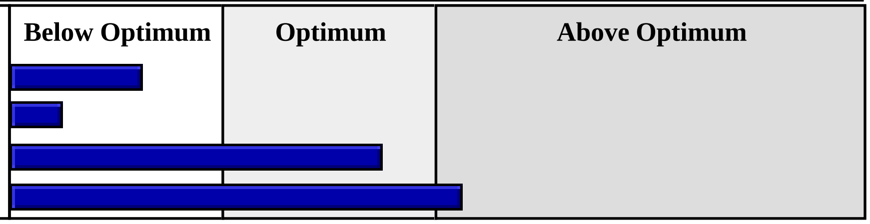
SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32742		Lancaster			P-347-160621-1409-def-S1A	

SOIL NUTRIENT LEVELS

[1]**Soil pH**	4.2	
[2]**Phosphorus (P)**	8	**ppm**
[2]**Potassium (K)**	133	**ppm**
[2]**Magnesium (Mg)**	131	**ppm**



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 18000 lb/A for a target pH of 6.5.

Magnesium (Mg): NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen	Phosphate	Potash	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen	Phosphate	Potash	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	% Saturation of the CEC Mg	% Saturation of the CEC Ca	Optional Tests: Organic Matter %	Optional Tests: Nitrate-N ppm	Optional Tests: Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
378	19.5	18.3	1.9	6.0	10.3				4.6	1.5	13.2

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32743		Lancaster			P-347-160621-1409-def-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7				
[2]Phosphorus (P)	5	ppm			
[2]Potassium (K)	63	ppm			
[2]Magnesium (Mg)	37	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 11000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 50 lb/A

Limestone containing .5% Mg (.7 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
48	12.3	13.0	1.2	2.4	1.9				2.3	1.9	15.9

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32744		Lancaster			P-352-160621-1145-def-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.0				
[2]Phosphorus (P)	13	ppm			
[2]Potassium (K)	155	ppm			
[2]Magnesium (Mg)	189	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 12000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	% Saturation of the CEC Mg	% Saturation of the CEC Ca	Optional Tests: Organic Matter %	Optional Tests: Nitrate-N ppm	Optional Tests: Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
1217	13.5	21.6	1.8	7.3	28.2				8.9	1.7	17.7

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32745		Lancaster			P-352-160621-1145-def-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.0				
[2]Phosphorus (P)	6	ppm			
[2]Potassium (K)	94	ppm			
[2]Magnesium (Mg)	152	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
631	11.1	15.8	1.5	8.0	20.0				2.0	1.5	11.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
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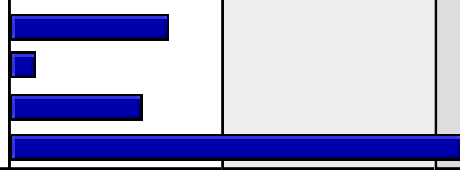
DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32746		Lancaster			P-352-160621-1145-def-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.2				
[2]Phosphorus (P)	4	ppm			
[2]Potassium (K)	66	ppm			
[2]Magnesium (Mg)	131	ppm			



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
262	11.1	13.7	1.2	8.0	9.6				1.5	2.2	9.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32747		Lancaster			P-352-160621-1145-def-S4A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.4				
[2]Phosphorus (P)	3	ppm			
[2]Potassium (K)	98	ppm			
[2]Magnesium (Mg)	216	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.
Magnesium (Mg): NONE

****Calcium Carbonate equivalent***

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
280	9.9	13.3	1.9	13.5	10.5				1.4	2.3	8.3

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32748		Lancaster			P-352-160621-1145-def-S5A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.3				
[2]Phosphorus (P)	2	ppm			
[2]Potassium (K)	117	ppm			
[2]Magnesium (Mg)	276	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 5000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
278	6.3	10.3	2.9	22.3	13.5				1.1	1.8	6.3

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32749		Lancaster			P-352-160621-1145-def-S6A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.3				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	112	ppm			
[2]Magnesium (Mg)	260	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
262	8.1	11.9	2.4	18.3	11.0				1.0	2.0	7.5

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32750		Lancaster			P-010-160620-1315-mgw-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.8		■		
[2]Phosphorus (P)	8	ppm	■		
[2]Potassium (K)	152	ppm	■	■	
[2]Magnesium (Mg)	128	ppm	■	■	

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5.   **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: / **Optional Tests:** / **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
832	10.5	16.1	2.4	6.6	25.8				4.2	1.3	7.0

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32751		Lancaster			P-010-160620-1315-mgw-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	3.6		■		
[2]Phosphorus (P)	17	ppm	■		
[2]Potassium (K)	64	ppm	■		
[2]Magnesium (Mg)	33	ppm	■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 18000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 50 lb/A

Limestone containing .3% Mg (.4 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
225	20.1	16.6	1.0	1.7	6.8				2.8	1.4	10.0

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32752		Lancaster			P-010-160620-1315-mgw-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.1				
[2]Phosphorus (P)	7	ppm			
[2]Potassium (K)	46	ppm			
[2]Magnesium (Mg)	17	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 18000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 100 lb/A

Limestone containing .6% Mg (.9 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
72	19.5	15.6	0.8	0.9	2.3				2.4	1.4	21.4

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32753		Lancaster			P-010-160620-1315-mgw-S4A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7				
[2]Phosphorus (P)	7	ppm			
[2]Potassium (K)	25	ppm			
[2]Magnesium (Mg)	11	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5.

****Calcium Carbonate equivalent***

Magnesium (Mg): 110 lb/A

Limestone containing 1.2% Mg (2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
45	11.1	11.5	0.6	0.8	2.0				2.2	1.0	25.5

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32754		Lancaster			P-010-160620-1315-mgw-S5A	

SOIL NUTRIENT LEVELS

	Value	Unit	Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7				
[2]Phosphorus (P)	2	ppm			
[2]Potassium (K)	17	ppm			
[2]Magnesium (Mg)	8	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 1.4% Mg (2.2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
36	9.9	10.2	0.4	0.7	1.8				1.9	1.1	37.4

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32755		Lancaster			P-010-160620-1315-mgw-S6A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	25	ppm			
[2]Magnesium (Mg)	9	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 110 lb/A

Limestone containing 1.2% Mg (2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
44	10.5	10.9	0.6	0.7	2.0				1.6	1.1	24.3

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32756		Lancaster			P-010-160620-1315-mgw-S7A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.6		■		
[2]Phosphorus (P)	1	ppm	■		
[2]Potassium (K)	23	ppm	■		
[2]Magnesium (Mg)	9	ppm	■		

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 1.2% Mg (2 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

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3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: / **Optional Tests:** / **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
48	10.5	10.9	0.5	0.7	2.2				1.1	1.1	25.5

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Below Optimum	Optimum	Above Optimum
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32758		Lancaster			P-010-160620-1315-mgw-S8A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.6				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	30	ppm			
[2]Magnesium (Mg)	14	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 15000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 100 lb/A

Limestone containing .7% Mg (1.1 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
55	17.1	15.5	0.5	0.8	1.8				1.0	0.9	33.3

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32759		Lancaster			P-045-160614-1019-jcr-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.4				
[2]Phosphorus (P)	8	ppm			
[2]Potassium (K)	127	ppm			
[2]Magnesium (Mg)	54	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 12000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 20 lb/A

Limestone containing .2% Mg (.3 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
313	13.5	15.8	2.1	2.8	9.9				2.8	1.1	12.0

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32760		Lancaster			P-045-160614-1019-jcr-S2A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.5				
[2]Phosphorus (P)	3	ppm			
[2]Potassium (K)	63	ppm			
[2]Magnesium (Mg)	33	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 11000 lb/A for a target pH of 6.5.

***Calcium Carbonate equivalent**

Magnesium (Mg): 50 lb/A

Limestone containing .5% Mg (.7 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
131	12.3	13.4	1.2	2.1	4.9				1.9	1.1	9.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

ST-4 Interpreting Soil Tests for Agronomic Crops -Explains the soil test report and provides additional information on the recommendations.

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Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

Recommendations N,P, and K recommendations are made for three crop years on this field. New samples should be taken after 3 years. The recommendations for the 2nd and 3rd year assume that the earlier recommendations were followed. These recommendations are based on the results of the soil test and the information provided with the sample. If you think that there is an error on the report, contact the lab at the address on the front of the report. Tables that can be used to adjust or change recommendations for all crops based on the soil test can be found on the web at: www.aasl.psu.edu.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

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Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32761		Lancaster			P-045-160614-1019-jcr-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.9				
[2]Phosphorus (P)	3	ppm			
[2]Potassium (K)	65	ppm			
[2]Magnesium (Mg)	34	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 8000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 50 lb/A

Limestone containing .6% Mg (1 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
80	9.9	10.7	1.6	2.6	3.7				1.9	1.2	7.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

ST-4 Interpreting Soil Tests for Agronomic Crops -Explains the soil test report and provides additional information on the recommendations.

Soil Nutrient Levels Soil nutrient levels are given as parts per million (ppm) elemental P, K , and Mg. As a rule of thumb to convert ppm to lb/A multiply ppm x 2. The elemental results in lb/A can be converted to oxide forms using the following conversions: P x 2.3=P_2O_5, K x 1.2=K_2O, Mg x 1.6=MgO

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Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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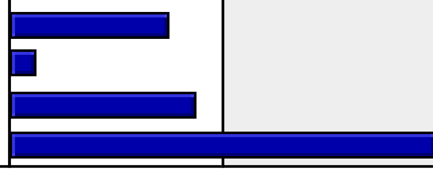
SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32762		Lancaster			P-045-160614-1019-jcr-S4A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.3				
[2]Phosphorus (P)	2	ppm			
[2]Potassium (K)	83	ppm			
[2]Magnesium (Mg)	122	ppm			



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 7000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
443	8.7	12.1	1.8	8.4	18.2				1.3	1.2	5.2

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32763		Lancaster			P-077-160617-1035-sdd-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.1		■		
[2]Phosphorus (P)	34	ppm	■		
[2]Potassium (K)	144	ppm	■	■	
[2]Magnesium (Mg)	188	ppm	■	■	■

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 11000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

***Calcium Carbonate equivalent**

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** *(See back for comments)*

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
1497	12.3	21.7	1.7	7.2	34.5				10.3	1.5	17.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Zn (ppm)	Cu (ppm)	S (ppm)
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SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32764		Lancaster			P-077-160617-1035-sdd-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.9				
[2]Phosphorus (P)	25	ppm			
[2]Potassium (K)	60	ppm			
[2]Magnesium (Mg)	28	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 10000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 60 lb/A

Limestone containing .6% Mg (1 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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3	Other	0	0	0	0	*See ST2 for other crop recommendations*

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ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
103	11.7	12.6	1.2	1.9	4.1				4.1	1.5	14.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

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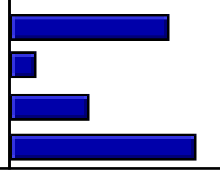
DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32765		Lancaster			P-077-160617-1035-sdd-S3A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	5.1				
[2]Phosphorus (P)	3	ppm			
[2]Potassium (K)	38	ppm			
[2]Magnesium (Mg)	57	ppm			



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 10000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 20 lb/A

Limestone containing .2% Mg (.3 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS: | **Optional Tests:** | **[2]Trace Elements** (*See back for comments*)

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
281	11.7	13.7	0.7	3.5	10.3				1.3	1.3	7.4

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

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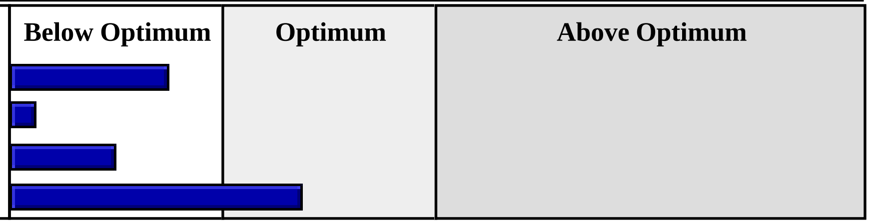
DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32766		Lancaster			P-077-160617-1035-sdd-S4A	

SOIL NUTRIENT LEVELS — Below Optimum | Optimum | Above Optimum

[1]Soil pH	5.1	
[2]Phosphorus (P)	2	ppm
[2]Potassium (K)	48	ppm
[2]Magnesium (Mg)	86	ppm



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 10000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
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299	11.7	14.0	0.9	5.1	10.6				1.3	1.4	8.6

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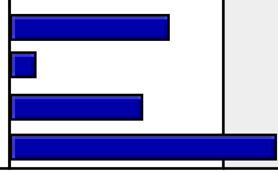
SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32767		Lancaster			P-077-160617-1035-sdd-S5A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.9				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	63	ppm			
[2]Magnesium (Mg)	80	ppm			



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 14000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (*See back for comments*)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
170	15.3	16.7	1.0	4.0	5.1				1.3	1.4	12.6

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

ST-4 Interpreting Soil Tests for Agronomic Crops -Explains the soil test report and provides additional information on the recommendations.

Soil Nutrient Levels Soil nutrient levels are given as parts per million (ppm) elemental P, K , and Mg. As a rule of thumb to convert ppm to lb/A multiply ppm x 2. The elemental results in lb/A can be converted to oxide forms using the following conversions: P x 2.3=P_2O_5, K x 1.2=K_2O, Mg x 1.6=MgO

Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

Recommendations N,P, and K recommendations are made for three crop years on this field. New samples should be taken after 3 years. The recommendations for the 2nd and 3rd year assume that the earlier recommendations were followed. These recommendations are based on the results of the soil test and the information provided with the sample. If you think that there is an error on the report, contact the lab at the address on the front of the report. Tables that can be used to adjust or change recommendations for all crops based on the soil test can be found on the web at: www.aasl.psu.edu.

Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park, PA 16802
www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32768		Lancaster			P-293-160606-1056-mel-S1A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
1 Soil pH	4.6				
2 Phosphorus (P)	10	ppm			
2 Potassium (K)	175	ppm			
2 Magnesium (Mg)	98	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 14000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

2 Calcium (ppm)	3 Acidity (meq/100 g)	4 CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	2 Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
405	15.3	18.3	2.5	4.5	11.1				4.0	0.9	18.2

Test Methods: 1 1:1 soil:water pH, 2 Mehlich 3 (ICP), 3 Mehlich Buffer pH, 4 Summation of Cations

The high acidity of this sample indicates that a portion of the acidity is not in the exchangeable form. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable acidity of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

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Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32769		Lancaster			P-293-160606-1056-mel-S2A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	3.9				
[2]Phosphorus (P)	6	ppm			
[2]Potassium (K)	100	ppm			
[2]Magnesium (Mg)	33	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 12000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 50 lb/A

Limestone containing .4% Mg (.7 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
54	14.1	14.9	1.7	1.8	1.8				2.1	0.9	12.4

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

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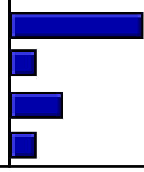
DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32770		Lancaster			P-293-160606-1056-mel-S3A	

SOIL NUTRIENT LEVELS

			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7				
[2]Phosphorus (P)	2	ppm			
[2]Potassium (K)	27	ppm			
[2]Magnesium (Mg)	12	ppm			



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 1.8% Mg (2.9 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
42	8.1	8.5	0.8	1.2	2.5				1.4	0.9	12.0

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

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Recommendation Messages

Enclosures

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1.1 - 9.4	1.2 - 5.5	10 - 25

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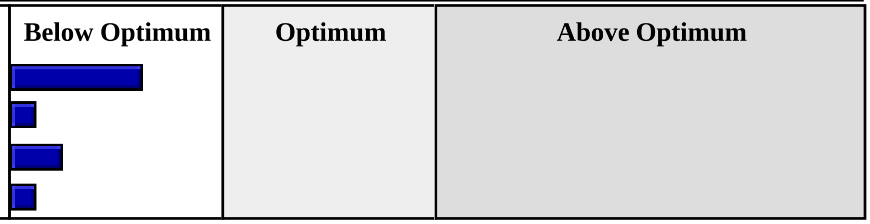
SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32771		Lancaster			P-293-160606-1056-mel-S4A	

SOIL NUTRIENT LEVELS

[1]**Soil pH**	4.7	
[2]**Phosphorus (P)**	2	ppm
[2]**Potassium (K)**	27	ppm
[2]**Magnesium (Mg)**	11	ppm



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 110 lb/A

Limestone containing 1.8% Mg (2.9 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments) Zinc ppm	Copper ppm	Sulfur ppm
35	8.1	8.4	0.8	1.1	2.1				1.5	1.0	15.0

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32772		Lancaster			P-293-160606-1056-mel-S5A	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	4.7				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	26	ppm			
[2]Magnesium (Mg)	29	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 9000 lb/A for a target pH of 6.5.

Calcium Carbonate equivalent

Magnesium (Mg): 60 lb/A

Limestone containing .7% Mg (1.1 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements (See back for comments)		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	Zinc ppm	Copper ppm	Sulfur ppm
40	10.5	11.0	0.6	2.2	1.8				1.3	1.0	24.9

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

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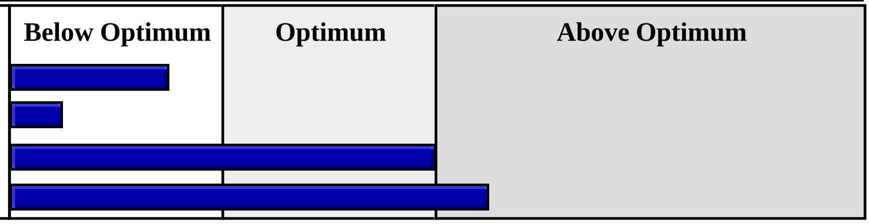
DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32773		Lancaster			P-225A-160601-1130-jcr-S1A	

SOIL NUTRIENT LEVELS

[1]Soil pH	5.1	
[2]Phosphorus (P)	6	ppm
[2]Potassium (K)	141	ppm
[2]Magnesium (Mg)	197	ppm



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 7000 lb/A for a target pH of 6.5.
Magnesium (Mg): NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (*See back for comments*): Zinc ppm	Copper ppm	Sulfur ppm
882	8.7	15.1	2.4	10.9	29.2				40.1	2.1	7.7

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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Recommendation Messages

Enclosures

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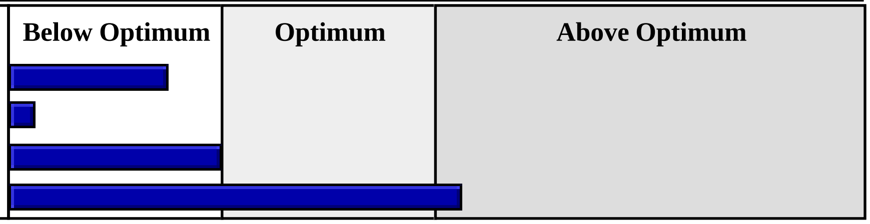
DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32774		Lancaster			P-225A-160601-1130-jcr-S2A	

SOIL NUTRIENT LEVELS

[1]**Soil pH**	5.1	
[2]**Phosphorus (P)**	3	**ppm**
[2]**Potassium (K)**	97	**ppm**
[2]**Magnesium (Mg)**	165	**ppm**



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 7000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	Other	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:

[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC: K	Mg	Ca	Optional Tests: Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	[2]Trace Elements (See back for comments): Zinc ppm	Copper ppm	Sulfur ppm
277	8.7	11.7	2.1	11.7	11.8				2.4	1.5	7.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table- Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

ST-4 Interpreting Soil Tests for Agronomic Crops -Explains the soil test report and provides additional information on the recommendations.

Soil Nutrient Levels Soil nutrient levels are given as parts per million (ppm) elemental P, K , and Mg. As a rule of thumb to convert ppm to lb/A multiply ppm x 2. The elemental results in lb/A can be converted to oxide forms using the following conversions: P x 2.3=P_2O_5, K x 1.2=K_2O, Mg x 1.6=MgO

Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

Recommendations N,P, and K recommendations are made for three crop years on this field. New samples should be taken after 3 years. The recommendations for the 2nd and 3rd year assume that the earlier recommendations were followed. These recommendations are based on the results of the soil test and the information provided with the sample. If you think that there is an error on the report, contact the lab at the address on the front of the report. Tables that can be used to adjust or change recommendations for all crops based on the soil test can be found on the web at: www.aasl.psu.edu.

Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county agent.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results The normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. Cu, Zn and S deficiencies are uncommon in PA, but may occur on soils testing below the normal range. Cu, Zn and S toxicities may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	10 - 25

Distribution of Soil Test Results Summaries of soil test results may be used in educational programs. However, individual results will not be released outside of Penn State without permission of the client. Electronic copies of your results are available to you, contact the lab for more information.

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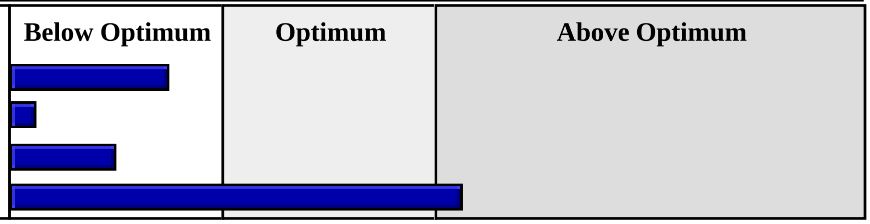
SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
DAN FENSTERMACHER RETTEW ASSOCIATES INC 3020 COLUMBIA AVE LANCASTER PA 17603	DUANE TRUAX RETTEW ASSOCIATES 3020 COLUMBIA AVE LANCASTER PA 17603

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
7/7/2016	S16-32775		Lancaster			P-225A-160601-1130-jcr-S3A	

SOIL NUTRIENT LEVELS

[1]**Soil pH**	5.4	
[2]**Phosphorus (P)**	2	**ppm**
[2]**Potassium (K)**	58	**ppm**
[2]**Magnesium (Mg)**	167	**ppm**



RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 6000 lb/A for a target pH of 6.5. **Magnesium (Mg):** NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
2	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
3	**Other**	0	0	0	0	*See ST2 for other crop recommendations*

No crop was specified. Therefore no recommendation is given.

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements *See back for comments*		
[2]**Calcium** (ppm)	[3]**Acidity** (meq/100 g)	[4]**CEC** (meq/100 g)	**% Saturation of the CEC** **K**	**Mg**	**Ca**	**Organic Matter %**	**Nitrate-N ppm**	**Salts** mmhos/cm	**Zinc ppm**	**Copper ppm**	**Sulfur ppm**
382	7.5	11.0	1.4	12.7	17.4				1.3	1.3	9.5

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

Agronomy

Recommendation Messages

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Zn (ppm)	Cu (ppm)	S (ppm)
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Attachment 9

AASLAB Particle Size Analysis Results

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DATE RECEIVED	**DATE COMPLETE**	**COUNTY**
07/05/2016	**7/7/2016**	**Lancaster**

Particle Size Analysis

Customer ID	Serial Number	Lab ID	Sand %	Silt %	Clay %	Soil Textural Class
P-003-160620-1025-rll-S2A		S16-32385	33.0	38.8	28.2	Clay Loam
P-003-160620-1025-rll-S3A		S16-32386	16.9	42.6	40.5	Silty Clay
P-003-160620-1025-rll-S4A		S16-32387	22.8	47.2	29.9	Clay Loam
P-012-160620-1115-mgw-S2A		S16-32389	54.9	27.3	17.8	Sandy Loam
P-012-160620-1115-mgw-S3A		S16-32390	55.9	25.5	18.6	Sandy Loam
P-012-160620-1115-mgw-S4A		S16-32391	53.7	31.0	15.3	Sandy Loam
P-012-160620-1115-mgw-S5A		S16-32392	49.2	24.6	26.2	Sandy Clay Loam
P-022-160614-1050-jsw-S2A		S16-32394	57.5	19.4	23.1	Sandy Clay Loam
P-022-160614-1050-jsw-S3A		S16-32395	79.6	12.2	8.2	Loamy Sand
P-022-160614-1050-jsw-S4A		S16-32396	66.8	11.4	21.8	Sandy Clay Loam
P-022-160614-1050-jsw-S5A		S16-32397	13.6	59.6	26.8	Silt Loam

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DATE RECEIVED	**DATE COMPLETE**	**COUNTY**
07/05/2016	**07/11/2016**	**Lancaster**

Particle Size Analysis

Customer ID	Serial Number	Lab ID	Sand %	Silt %	Clay %	Soil Textural Class
P-022-160614-1050-jsw-S6A		S16-32398	22.9	31.1	45.9	Clay
P-022-160614-1050-jsw-S7A		S16-32399	8.8	37.2	54.0	Clay
P-040-160615-1119-jcr-S2A		S16-32401	35.9	46.0	18.1	Loam
P-040-160615-1119-jcr-S3A		S16-32402	18.4	51.4	30.2	Silty Clay Loam
P-040-160615-1119-jcr-S4A		S16-32403	29.2	39.0	31.8	Clay Loam
P-040-160615-1119-jcr-S5A		S16-32404	19.6	44.0	36.4	Silty Clay Loam
P-063-160614-0950-rll-S1A		S16-32405	34.8	41.0	24.2	Loam
P-063-160614-0950-rll-S2A		S16-32406	21.7	37.6	40.7	Clay
P-063-160614-0950-rll-S3A		S16-32407	8.8	48.7	42.4	Silty Clay
P-068-160614-1338-sdd-S2A		S16-32409	74.1	16.6	9.3	Sandy Loam
P-068-160614-1338-sdd-S3A		S16-32411	53.5	25.1	21.4	Sandy Clay Loam

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DATE RECEIVED	**DATE COMPLETE**	**COUNTY**
07/05/2016	**07/12/2016**	**Lancaster**

Particle Size Analysis

Customer ID	Serial Number	Lab ID	Sand %	Silt %	Clay %	Soil Textural Class
P-068-160614-1338-sdd-S4A		S16-32412	37.3	32.7	30.0	Clay Loam
P-069-160614-1158-sdd-S3A		S16-32413	40.9	39.0	20.1	Loam
P-069-160614-1158-sdd-S4A		S16-32414	50.3	31.1	18.6	Loam
P-069-160614-1158-sdd-S5A		S16-32415	64.3	22.4	13.2	Sandy Loam
P-100-160609-1105-def-S2A		S16-32417	48.8	38.7	12.5	Loam
P-100-160609-1105-def-S3A		S16-32418	25.2	37.8	37.0	Clay Loam
P-121-160616-0950-mgw-S2A		S16-32420	48.8	33.5	17.7	Loam
P-121-160616-0950-mgw-S3A		S16-32421	25.5	43.4	31.0	Clay Loam
P-121-160616-0950-mgw-S4A		S16-32422	39.4	34.0	26.6	Loam
P-126-160615-1410-mgw-S2A		S16-32424	39.2	38.0	22.7	Loam
P-126-160615-1410-mgw-S3A		S16-32425	21.6	51.2	27.2	Clay Loam

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DATE RECEIVED	**DATE COMPLETE**	**COUNTY**
07/05/2016	**07/12/2016**	**Lancaster**

Particle Size Analysis

Customer ID	Serial Number	Lab ID	Sand %	Silt %	Clay %	Soil Textural Class
P-126-160615-1410-mgw-S4A		S16-32426	31.4	41.4	27.1	Clay Loam
P-126-160615-1410-mgw-S5A		S16-32427	43.2	32.8	24.1	Loam
P-134-160615-1506-sdd-S2A		S16-32429	40.0	34.4	25.6	Loam
P-134-160615-1506-sdd-S3A		S16-32430	26.0	40.4	33.6	Clay Loam
P-134-160615-1506-sdd-S4A		S16-32431	49.9	23.1	27.0	Sandy Clay Loam
P-134-160615-1506-sdd-S5A		S16-32432	55.9	22.5	21.7	Sandy Clay Loam
P-156-160606-1355-dat-S2A		S16-32434	65.6	23.5	10.9	Sandy Loam
P-156-160606-1355-dat-S3A		S16-32435	56.7	22.5	20.8	Sandy Clay Loam
P-156-160606-1355-dat-S4A		S16-32436	56.9	21.9	21.2	Sandy Clay Loam
P-157-160606-1512-dat-S2A		S16-32439	55.5	29.6	14.9	Sandy Loam
P-157-160606-1512-dat-S3A		S16-32440	45.6	24.7	29.7	Sandy Clay Loam

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DATE RECEIVED	**DATE COMPLETE**	**COUNTY**
07/05/2016	**7/14/2016**	**Lancaster**

Particle Size Analysis

Customer ID	Serial Number	Lab ID	Sand %	Silt %	Clay %	Soil Textural Class
P-157-160606-1512-dat-S4A		S16-32441	37.6	26.2	36.2	Clay Loam
P-157-160606-1512-dat-S5A		S16-32442	12.1	23.3	64.6	Clay
P-157-160606-1512-dat-S6A		S16-32443	12.6	25.0	62.4	Clay
P-157-160606-1512-dat-S7A		S16-32444	28.4	18.0	53.6	Clay
P-162-160606-1040-jsw-S2A		S16-32446	48.8	26.1	25.2	Sandy Clay Loam
P-162-160606-1040-jsw-SA3		S16-32447	34.0	25.8	40.2	Clay
P-162-160606-1040-jsw-SA4		S16-32448	45.7	19.8	34.5	Sandy Clay Loam
P-162-160606-1040-jsw-SA5		S16-32449	43.5	22.6	33.9	Clay Loam
P-170-160620-1122-def-S2A		S16-32451	84.9	9.0	6.2	Loamy Sand
P-170-160620-1122-def-S3A		S16-32452	76.6	15.0	8.4	Sandy Loam
P-170-160620-1122-def-S4A		S16-32453	67.1	14.3	18.6	Sandy Loam

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DATE RECEIVED	DATE COMPLETE	COUNTY
07/05/2016	**07/15/2016**	**Lancaster**

Particle Size Analysis

Customer ID	Serial Number	Lab ID	Sand %	Silt %	Clay %	Soil Textural Class
P-170-160620-1122-def-S5A		S16-32454	65.2	13.9	20.9	Sandy Clay Loam

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DATE RECEIVED	**DATE COMPLETE**	**COUNTY**
07/05/2016	**7/18/2016**	**Lancaster**

Particle Size Analysis

Customer ID	Serial Number	Lab ID	Sand %	Silt %	Clay %	Soil Textural Class
P-170-160620-1122-def-S6A		S16-32455	75.5	8.9	15.6	Sandy Loam
P-173-160620-1112-def-S2A		S16-32457	28.6	37.4	34.0	Clay Loam
P-173-160620-1112-def-S3A		S16-32458	20.0	40.8	39.2	Silty Clay Loam
P-173-160620-1112-def-S4A		S16-32459	5.9	22.3	71.9	Clay
P-176-160621-1155-rll-S2A		S16-32461	62.7	27.2	10.1	Sandy Loam
P-176-160621-1155-rll-S3A		S16-32462	65.8	18.2	16.0	Sandy Loam
P-176-160621-1155-rll-S4A		S16-32463	28.2	11.8	60.0	Clay
P-187-160607-1427-jsw-S2A		S16-32465	25.6	38.4	35.9	Clay Loam
P-187-160607-1427-jsw-S3A		S16-32466	37.3	39.6	23.1	Loam
P-215-160602-1037-jsw-S2A		S16-32468	58.3	22.5	19.3	Sandy Loam
P-215-160602-1037-jsw-S3A		S16-32469	64.6	23.5	11.9	Sandy Loam

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DATE RECEIVED	**DATE COMPLETE**	**COUNTY**
07/05/2016	**07/19/2016**	**Lancaster**

Particle Size Analysis

Customer ID	Serial Number	Lab ID	Sand %	Silt %	Clay %	Soil Textural Class
P-215-160602-1037-jsw-S4A		S16-32471	49.0	23.8	27.3	Sandy Clay Loam
P-215-160602-1037-jsw-S5A		S16-32472	46.6	24.8	28.6	Sandy Clay Loam
P-215-160602-1037-jsw-S6A		S16-32473	75.5	9.9	14.6	Sandy Loam
P-222-160607-1055-dat-S1A		S16-32474	39.1	43.1	17.7	Loam
P-222-160607-1055-dat-S2A		S16-32475	30.0	40.2	29.8	Clay Loam
P-222-160607-1055-dat-S3A		S16-32476	33.8	36.8	29.4	Clay Loam
P-222-160607-1055-dat-S4A		S16-32477	49.1	28.6	22.3	Loam
P-222-160607-1055-dat-S5A		S16-32478	46.2	30.9	22.9	Loam
P-225-160601-1130-mel-S1A		S16-32479	23.2	43.1	33.7	Clay Loam
P-225-160601-1130-mel-S2A		S16-32480	18.6	33.7	47.6	Clay
P-225-160601-1130-mel-S3A		S16-32481	45.7	19.0	35.3	Sandy Clay

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DATE RECEIVED	**DATE COMPLETE**	**COUNTY**
07/05/2016	**07/20/2016**	**Lancaster**

Particle Size Analysis

Customer ID	Serial Number	Lab ID	Sand %	Silt %	Clay %	Soil Textural Class
P-225-160601-1130-mel-S4A		S16-32482	32.9	28.0	39.1	Clay Loam
P-225-160601-1130-mel-S5A		S16-32483	12.0	44.2	43.9	Silty Clay
P-225-160601-1130-mel-S6A		S16-32484	20.3	43.9	35.8	Clay Loam
P-225B-160601-1312-sdd-S1A		S16-32485	40.3	36.5	23.2	Loam
P-225B-160601-1312-sdd-S2A		S16-32486	23.8	43.0	33.1	Clay Loam
P-225B-160601-1312-sdd-S3A		S16-32487	23.5	41.3	35.2	Clay Loam
P-225B-160601-1312-sdd-S4A		S16-32488	20.7	39.3	40.0	Clay Loam
P-227-160601-1500-jsw-S2A		S16-32490	34.3	38.4	27.3	Clay Loam
P-227-160601-1500-jsw-S3A		S16-32491	42.4	33.1	24.5	Loam
P-227-160601-1500-jsw-S4A		S16-32492	40.1	33.9	26.0	Loam
P-239-160607-1427-def-S1A		S16-32493	53.1	30.3	16.6	Sandy Loam

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DATE RECEIVED	**DATE COMPLETE**	**COUNTY**
07/05/2016	**07/21/2016**	**Lancaster**

Particle Size Analysis

Customer ID	Serial Number	Lab ID	Sand %	Silt %	Clay %	Soil Textural Class
P-239-160607-1427-def-S2A		S16-32494	45.0	30.8	24.2	Loam
P-239-160607-1427-def-S3A		S16-32495	66.8	15.0	18.2	Sandy Loam
P-239-160607-1427-def-S4A		S16-32496	46.3	23.4	30.3	Sandy Clay Loam
P-239A-160607-1430-def-S1A		S16-32498	49.9	32.8	17.3	Loam
P-239A-160607-1430-def-S2A		S16-32499	38.0	32.4	29.6	Clay Loam
P-239A-160607-1430-def-S3A		S16-32500	57.9	18.6	23.6	Sandy Clay Loam
P-239A-160607-1430-def-S4A		S16-32501	35.6	32.1	32.3	Clay Loam
P-239A-160607-1430-def-S5A		S16-32502	36.5	34.1	29.4	Clay Loam
P-253-160608-0950-mel-S2A		S16-32504	57.1	27.5	15.4	Sandy Loam
P-253-160608-0950-mel-S3A		S16-32505	62.4	17.7	19.9	Sandy Loam
P-253-160608-0950-mel-S4A		S16-32506	57.6	20.7	21.7	Sandy Clay Loam

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DATE RECEIVED	**DATE COMPLETE**	**COUNTY**
07/05/2016	**07/22/2016**	**Lancaster**

Particle Size Analysis

Customer ID	Serial Number	Lab ID	Sand %	Silt %	Clay %	Soil Textural Class
P-254-160608-1050-mel-S2A		S16-32508	45.8	33.2	21.0	Loam
P-254-160608-1050-mel-S3A		S16-32509	36.6	38.0	25.5	Loam
P-254-160608-1050-mel-S4A		S16-32510	45.0	29.4	25.6	Loam
P-069-160614-1158-sdd-S2A		S16-32512	48.7	36.0	15.3	Loam
P-276-160610-0838-jsw-S2A		S16-32710	56.3	20.8	22.8	Sandy Clay Loam
P-276-160610-0838-jsw-S3A		S16-32711	74.7	11.9	13.4	Sandy Loam
P-276-160610-0838-jsw-S4A		S16-32712	61.0	20.9	18.1	Sandy Loam
P-276-160610-0838-jsw-S5A		S16-32713	75.6	6.8	17.6	Sandy Loam
P-279-160610-1359-dat-S2A		S16-32715	50.5	29.1	20.3	Loam
P-279-160610-1359-dat-S3A		S16-32716	63.7	19.9	16.4	Sandy Loam
P-279-160610-1359-dat-S4A		S16-32717	77.5	10.2	12.2	Sandy Loam

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DATE RECEIVED	DATE COMPLETE	COUNTY
07/06/2016	07/22/2016	Lancaster

Particle Size Analysis

Customer ID	Serial Number	Lab ID	Sand %	Silt %	Clay %	Soil Textural Class
P-279-160610-1359-dat-S5A		S16-32718	77.7	10.6	11.7	Sandy Loam
P-279A-160610-1450-def-S1A		S16-32719	50.2	33.6	16.2	Loam
P-279A-160610-1450-def-S2A		S16-32720	44.1	32.1	23.8	Loam
P-279A-160610-1450-def-S3A		S16-32721	61.6	15.3	23.1	Sandy Clay Loam
P-279A-160610-1450-def-S4A		S16-32722	45.7	22.2	32.1	Sandy Clay Loam
P-283-160606-0743-def-S2A		S16-32725	31.5	44.2	24.2	Loam
P-283-160606-0743-def-S3A		S16-32726	44.9	31.0	24.1	Loam
P-283-160606-0743-def-S4A		S16-32727	52.7	23.5	23.7	Sandy Clay Loam
P-283-160606-0743-def-S5A		S16-32728	50.5	25.7	23.8	Sandy Clay Loam
P-283-160606-0743-def-S6A		S16-32729	62.2	16.3	21.5	Sandy Clay Loam
P-286-160606-0808-def-S2A		S16-32731	32.4	39.7	27.9	Clay Loam

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DATE RECEIVED	**DATE COMPLETE**	**COUNTY**
07/06/2016	**07/25/2016**	**Lancaster**

Particle Size Analysis

Customer ID	Serial Number	Lab ID	Sand %	Silt %	Clay %	Soil Textural Class
P-286-160606-0808-def-S3A		S16-32732	31.8	37.2	31.0	Clay Loam
P-286-160606-0808-def-S4A		S16-32733	32.4	37.2	30.5	Clay Loam
P-290-160606-1445-mel-S2A		S16-32735	40.9	43.5	15.7	Loam
P-290-160606-1445-mel-S3A		S16-32736	33.6	41.7	24.6	Loam
P-290-160606-1445-mel-S4A		S16-32737	40.0	35.9	24.1	Loam
P-291-160606-1330-mel-S1A		S16-32738	35.1	43.5	21.4	Loam
P-291-160606-1330-mel-S2A		S16-32739	24.3	40.5	35.2	Clay Loam
P-291-160606-1330-mel-S3A		S16-32740	14.8	30.9	54.3	Clay
P-291-160606-1330-mel-S4A		S16-32741	27.9	35.3	36.8	Clay Loam
P-347-160621-1409-def-S1A		S16-32742	59.2	18.4	22.4	Sandy Clay Loam
P-347-160621-1409-def-S2A		S16-32743	50.9	19.8	29.3	Sandy Clay Loam

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DATE RECEIVED	**DATE COMPLETE**	**COUNTY**
07/06/2016	**07/26/2016**	**Lancaster**

Particle Size Analysis

Customer ID	Serial Number	Lab ID	Sand %	Silt %	Clay %	Soil Textural Class
P-352-160621-1145-def-S2A		S16-32745	37.3	31.8	30.9	Clay Loam
P-352-160621-1145-def-S3A		S16-32746	20.6	32.7	46.8	Clay
P-352-160621-1145-def-S4A		S16-32747	26.4	29.5	44.1	Clay
P-352-160621-1145-def-S5A		S16-32748	48.4	11.5	40.1	Sandy Clay
P-352-160621-1145-def-S6A		S16-32749	36.7	21.6	41.7	Clay
P-010-160620-1315-mgw-S2A		S16-32751	64.3	17.2	18.5	Sandy Loam
P-010-160620-1315-mgw-S3A		S16-32752	45.4	25.1	29.5	Sandy Clay Loam
P-010-160620-1315-mgw-S4A		S16-32753	42.6	25.0	32.4	Clay Loam
P-010-160620-1315-mgw-S5A		S16-32754	43.3	22.9	33.8	Clay Loam
P-010-160620-1315-mgw-S6A		S16-32755	43.3	21.0	35.7	Clay Loam
P-010-160620-1315-mgw-S7A		S16-32756	41.4	20.7	37.9	Clay Loam

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DATE RECEIVED	**DATE COMPLETE**	**COUNTY**
07/06/2016	**07/26/2016**	**Lancaster**

Particle Size Analysis

Customer ID	Serial Number	Lab ID	Sand %	Silt %	Clay %	Soil Textural Class
P-010-160620-1315-mgw-S8A		S16-32758	23.5	19.8	56.7	Clay
P-045-160614-1019-jcr-S2A		S16-32760	32.1	42.7	25.2	Loam
P-045-160614-1019-jcr-S3A		S16-32761	24.3	51.2	24.5	Silt Loam
P-045-160614-1019-jcr-S4A		S16-32762	27.0	45.4	27.6	Clay Loam
P-077-160617-1035-sdd-S2A		S16-32764	50.3	32.5	17.1	Loam
P-077-160617-1035-sdd-S3A		S16-32765	32.9	37.0	30.2	Clay Loam
P-077-160617-1035-sdd-S4A		S16-32766	44.7	33.5	21.9	Loam
P-077-160617-1035-sdd-S5A		S16-32767	32.8	34.5	32.7	Clay Loam
P-293-160606-1056-mel-S2A		S16-32769	5.5	42.0	52.4	Silty Clay
P-293-160606-1056-mel-S3A		S16-32770	61.8	28.1	10.1	Sandy Loam
P-293-160606-1056-mel-S4A		S16-32771	48.7	26.0	25.3	Sandy Clay Loam

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DATE RECEIVED	DATE COMPLETE	COUNTY
07/06/2016	**07/27/2016**	**Lancaster**

Particle Size Analysis

Customer ID	Serial Number	Lab ID	Sand %	Silt %	Clay %	Soil Textural Class
P-293-160606-1056-mel-S5A		S16-32772	60.1	16.9	23.0	Sandy Clay Loam
P-225A-160601-1130-jcr-S1A		S16-32773	41.7	33.4	24.9	Loam
P-225A-160601-1130-jcr-S2A		S16-32774	61.8	18.5	19.7	Sandy Loam
P-225A-160601-1130-jcr-S3A		S16-32775	48.6	25.1	26.3	Sandy Clay Loam

Attachment 10
ALS Environmental TOC and LOI Results

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

July 18, 2016

Mr. Duane Truax
Rettew Associates Inc.
3020 Columbia Avenue
Lancaster, PA 17603

Certificate of Analysis

Project Name:	**2016-TOC AND LOI ON SOILS**	Workorder:	**2156362**
Purchase Order:		Workorder ID:	**89962000**

Dear Mr. Truax:

Enclosed are the analytical results for samples received by the laboratory on Tuesday, July 5, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

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ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

CC: Mr. Dan Fenstermacher , Rettew

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

SAMPLE SUMMARY

Workorder: 2156362 89962000

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2156362001	P-003-160620-1025-rll-S1B	Solid	6/20/2016 10:25	7/5/2016 13:19	Collected by Client
2156362002	P-003-160620-1025-rll-S2B	Solid	6/20/2016 10:25	7/5/2016 13:19	Collected by Client
2156362003	P-003-160620-1025-rll-S3B	Solid	6/20/2016 10:25	7/5/2016 13:19	Collected by Client
2156362004	P-003-160620-1025-rll-S4B	Solid	6/20/2016 10:25	7/5/2016 13:19	Collected by Client
2156362005	P-012-160620-1115-mgw-S1B	Solid	6/20/2016 11:15	7/5/2016 13:19	Collected by Client
2156362006	P-012-160620-1115-mgw-S2B	Solid	6/20/2016 11:15	7/5/2016 13:19	Collected by Client
2156362007	P-012-160620-1115-mgw-S3B	Solid	6/20/2016 11:15	7/5/2016 13:19	Collected by Client
2156362008	P-012-160620-1115-mgw-S4B	Solid	6/20/2016 11:15	7/5/2016 13:19	Collected by Client
2156362009	P-012-160620-1115-mgw-S5B	Solid	6/20/2016 11:15	7/5/2016 13:19	Collected by Client
2156362010	P-022-160614-1050-jsw-S1B	Solid	6/14/2016 10:50	7/5/2016 13:19	Collected by Client
2156362011	P-022-160614-1050-jsw-S2B	Solid	6/14/2016 10:50	7/5/2016 13:19	Collected by Client
2156362012	P-022-160614-1050-jsw-S3B	Solid	6/14/2016 10:50	7/5/2016 13:19	Collected by Client
2156362013	P-022-160614-1050-jsw-S4B	Solid	6/14/2016 10:50	7/5/2016 13:19	Collected by Client
2156362014	P-022-160614-1050-jsw-S5B	Solid	6/14/2016 10:50	7/5/2016 13:19	Collected by Client
2156362015	P-022-160614-1050-jsw-S6B	Solid	6/14/2016 10:50	7/5/2016 13:19	Collected by Client
2156362016	P-022-160614-1050-jsw-S7B	Solid	6/14/2016 10:50	7/5/2016 13:19	Collected by Client
2156362017	P-040-160615-1119-jcr-S1B	Solid	6/15/2016 11:19	7/5/2016 13:19	Collected by Client
2156362018	P-040-160615-1119-jcr-S2B	Solid	6/15/2016 11:19	7/5/2016 13:19	Collected by Client
2156362019	P-040-160615-1119-jcr-S3B	Solid	6/15/2016 11:19	7/5/2016 13:19	Collected by Client
2156362020	P-040-160615-1119-jcr-S4B	Solid	6/15/2016 11:19	7/5/2016 13:19	Collected by Client

ALS Environmental

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NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

SAMPLE SUMMARY

Workorder: 2156362 89962000

Notes

- -- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- -- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- -- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- -- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- -- The Chain of Custody document is included as part of this report.
- -- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- -- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are preformed in the laboratory and are therefore analyzed out of hold time.
- -- Method references listed on this report beginning with the prefix “S” followed by a method number (such as S2310B-97) refer to methods from “Standard Methods for the Examination of Water and Wastewater”.
- -- For microbiological analyses, the "Prepared" value is the date/time into the incurbator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

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34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID: **2156362001** Date Collected: 6/20/2016 10:25 Matrix: Solid

Sample ID: **P-003-160620-1025-rll-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	55.8		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	53.6	3	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	374000		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	44.2	1,2	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID: **2156362002** Date Collected: 6/20/2016 10:25 Matrix: Solid

Sample ID: **P-003-160620-1025-rll-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	33.7		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	15.8	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	100000		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	66.3	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID: **2156362003** Date Collected: 6/20/2016 10:25 Matrix: Solid

Sample ID: **P-003-160620-1025-rll-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	19.1		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	5.0	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	8780		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	80.9	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID: **2156362004** Date Collected: 6/20/2016 10:25 Matrix: Solid
Sample ID: **P-003-160620-1025-rll-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	12.1		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	3.4	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	2270		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	87.9	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental

34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID: **2156362005** Date Collected: 6/20/2016 11:15 Matrix: Solid

Sample ID: **P-012-160620-1115-mgw-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	57.6		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	96.9	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	484000		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	42.4	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID:	**2156362006**	Date Collected:	6/20/2016 11:15	Matrix:	Solid
Sample ID:	**P-012-160620-1115-mgw-S2B**	Date Received:	7/5/2016 13:19		

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	34.6		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	18.1	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	147000		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	65.4	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID: **2156362007** Date Collected: 6/20/2016 11:15 Matrix: Solid
Sample ID: **P-012-160620-1115-mgw-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	34.0		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	16.4	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	92400		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	66.0	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID:	**2156362008**	Date Collected:	6/20/2016 11:15	Matrix:	Solid
Sample ID:	**P-012-160620-1115-mgw-S4B**	Date Received:	7/5/2016 13:19		

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	25.8		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	8.7	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	49800		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	74.2	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID: **2156362009** Date Collected: 6/20/2016 11:15 Matrix: Solid
Sample ID: **P-012-160620-1115-mgw-S5B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	22.9		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	6.4	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	21600		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	77.1	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental

34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID: **2156362010** Date Collected: 6/14/2016 10:50 Matrix: Solid

Sample ID: **P-022-160614-1050-jsw-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	57.8		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	64.6	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	473000		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	42.2	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID: **2156362011** Date Collected: 6/14/2016 10:50 Matrix: Solid

Sample ID: **P-022-160614-1050-jsw-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	40.0		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	33.3	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	238000		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	60.0	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID: **2156362012** Date Collected: 6/14/2016 10:50 Matrix: Solid
Sample ID: **P-022-160614-1050-jsw-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	10.6		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	1.3	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	5540		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	89.4	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID:	**2156362013**	Date Collected:	6/14/2016 10:50	Matrix:	Solid
Sample ID:	**P-022-160614-1050-jsw-S4B**	Date Received:	7/5/2016 13:19		

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	12.9		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	4.1	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	13000		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	87.1	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID:	**2156362014**	Date Collected:	6/14/2016 10:50	Matrix:	Solid
Sample ID:	**P-022-160614-1050-jsw-S5B**	Date Received:	7/5/2016 13:19		

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	15.0		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	3.2	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	2230		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	85.0	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID: **2156362015** Date Collected: 6/14/2016 10:50 Matrix: Solid

Sample ID: **P-022-160614-1050-jsw-S6B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	18.3		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	4.3	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	710		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	81.7	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID: **2156362016** Date Collected: 6/14/2016 10:50 Matrix: Solid

Sample ID: **P-022-160614-1050-jsw-S7B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	19.1		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	6.0	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	1110		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	80.9	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID: **2156362017** Date Collected: 6/15/2016 11:19 Matrix: Solid
Sample ID: **P-040-160615-1119-jcr-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	44.8		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	38.8	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	411000		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	55.2	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID: **2156362018** Date Collected: 6/15/2016 11:19 Matrix: Solid
Sample ID: **P-040-160615-1119-jcr-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	21.3		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	10.1	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	75700		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	78.7	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID: **2156362019** Date Collected: 6/15/2016 11:19 Matrix: Solid

Sample ID: **P-040-160615-1119-jcr-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	18.5		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	3.7	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	7880		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	81.5	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156362 89962000

Lab ID: **2156362020** Date Collected: 6/15/2016 11:19 Matrix: Solid

Sample ID: **P-040-160615-1119-jcr-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	15.3		%	0.1	S2540G-11			7/8/16 13:58	SLC	A
Solids, Total Volatile	3.7	2	%	1.0	S2540G-11			7/8/16 13:58	SLC	A
Total Organic Carbon (TOC)	1790		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	84.7	1	%	0.1	S2540G-11			7/8/16 13:58	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

PARAMETER QUALIFIERS

Lab ID	#	Sample ID	Analytical Method	Analyte
2156362001	1	P-003-160620-1025-rll-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362001	2	P-003-160620-1025-rll-S1B	S2540G-11	Total Solids
The RPD associated with this sample was recovered at 8.3%. The RPD is outside method acceptance limits of 5.0%. The results used to calculate the RPD were 47.9 and 44.1%.				
2156362001	3	P-003-160620-1025-rll-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362002	1	P-003-160620-1025-rll-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362002	2	P-003-160620-1025-rll-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362003	1	P-003-160620-1025-rll-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362003	2	P-003-160620-1025-rll-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362004	1	P-003-160620-1025-rll-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362004	2	P-003-160620-1025-rll-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362005	1	P-012-160620-1115-mgw-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362005	2	P-012-160620-1115-mgw-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362006	1	P-012-160620-1115-mgw-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362006	2	P-012-160620-1115-mgw-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362007	1	P-012-160620-1115-mgw-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362007	2	P-012-160620-1115-mgw-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362008	1	P-012-160620-1115-mgw-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362008	2	P-012-160620-1115-mgw-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362009	1	P-012-160620-1115-mgw-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362009	2	P-012-160620-1115-mgw-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362010	1	P-022-160614-1050-jsw-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362010	2	P-022-160614-1050-jsw-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

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ANALYTICAL RESULTS

Workorder: 2156362 89962000

2156362011	1	P-022-160614-1050-jsw-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362011	2	P-022-160614-1050-jsw-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362012	1	P-022-160614-1050-jsw-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362012	2	P-022-160614-1050-jsw-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362013	1	P-022-160614-1050-jsw-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362013	2	P-022-160614-1050-jsw-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362014	1	P-022-160614-1050-jsw-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362014	2	P-022-160614-1050-jsw-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362015	1	P-022-160614-1050-jsw-S6B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362015	2	P-022-160614-1050-jsw-S6B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362016	1	P-022-160614-1050-jsw-S7B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362016	2	P-022-160614-1050-jsw-S7B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362017	1	P-040-160615-1119-jcr-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362017	2	P-040-160615-1119-jcr-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362018	1	P-040-160615-1119-jcr-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362018	2	P-040-160615-1119-jcr-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362019	1	P-040-160615-1119-jcr-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362019	2	P-040-160615-1119-jcr-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156362020	1	P-040-160615-1119-jcr-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156362020	2	P-040-160615-1119-jcr-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

Samples in 2 Bins.

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CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

8

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

CO
AL

* 2 1 5 6 3 6 2 *

1 of 19

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave
Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT [X] Normal-Standard TAT is 10-12 business days.
[ ] Rush-Subject to ALS approval and surcharges.
Date Required: 13-Jul-16 Approved By:
Email? [X]-Y Dfenstermacher@rettew.com
Fax? [ ]-Y No.:

Container Type / Container Size / Preservative

ANALYSES/METHOD REQUESTED

Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)								
P-003-160620-1025-rll-S1B	6/20/2016	1025	G	SO	X	X								
P-003-160620-1025-rll-S2B	6/20/2016	1025	G	SO	X	X								
P-003-160620-1025-rll-S3B	6/20/2016	1025	G	SO	X	X								
P-003-160620-1025-rll-S4B	6/20/2016	1025	G	SO	X	X								
P-012-160620-1115-mgw-S1B	6/20/2016	1115	G	SO	X	X								
P-012-160620-1115-mgw-S2B	6/20/2016	1115	G	SO	X	X								
P-012-160620-1115-mgw-S3B	6/20/2016	1115	G	SO	X	X								
P-012-160620-1115-mgw-S4B	6/20/2016	1115	G	SO	X	X								
P-012-160620-1115-mgw-S5B	6/20/2016	1115	G	SO	X	X								
P-022-160614-1050-jsw-S1B	6/14/2016	1050	G	SO	X	X								

Receipt Information (completed by Receiving Lab)
Cooler Temp: 2.6 Therm ID: TH-352
No. of Coolers: ____

	Y	N	Initial
Custody Seals Present?		✓	JS
(if present) Seals Intact?			
Received on Ice?			
COC/Labels Complete/Accurate?			
Cont. in Good Cond.?			
Correct Containers?			
Correct Sample Volumes?			
Correct Preservation?			
Headspace/Volatiles?			

Courier/Tracking #: 7824 9325 8660

Sample/COC Comments

ALS Field Services: _Pickup _Labor
_Composite Sampling _Rental Equipment
_Other:

Project Comments:

LOGGED BY(signature): DATE 7/6 TIME
REVIEWED BY(signature): DATE TIME

	Relinquished By / Company Name	Date	Time		Received By / Company Name	Date	Time
1	DFenstermacher Rettew	7/1/16	11:00	2	ALS	7/5/16	1319
3				4			
5				6			
7				8			
9				10			

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]
Reportable to PADEP? Yes [ ]
PWSID #
EDDS: Format Type-

Special Processing: USACE [ ] Navy [ ] [ ]
Sample Disposal: Lab [ ] Special [ ]

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] WV

*G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

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CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

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COC #: 2156362 | 2 of 19

ALS Quote #:

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave
Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT [X] Normal-Standard TAT is 10-12 business days.
[ ] Rush-Subject to ALS approval and surcharges.
Date Required: 13-Jul-16 Approved By:
Email? [X]-Y Dfenstermacher@rettew.com
Fax? [ ]-Y No.:

Container Type / Container Size / Preservative

ANALYSES/METHOD REQUESTED

Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)	Sample/COC Comments
P-022-160614-1050-jsw-S2B	6/14/2016	1050	G	SO	X	X	
P-022-160614-1050-jsw-S3B	6/14/2016	1050	G	SO	X	X	
P-022-160614-1050-jsw-S4B	6/14/2016	1050	G	SO	X	X	
P-022-160614-1050-jsw-S5B	6/14/2016	1050	G	SO	X	X	
P-022-160614-1050-jsw-S6B	6/14/2016	1050	G	SO	X	X	
P-022-160614-1050-jsw-S7B	6/14/2016	1050	G	SO	X	X	
P-040-160615-1119-jcr-S1B	6/15/2016	1119	G	SO	X	X	
P-040-160615-1119-jcr-S2B	6/15/2016	1119	G	SO	X	X	
P-040-160615-1119-jcr-S3B	6/15/2016	1119	G	SO	X	X	
P-040-160615-1119-jcr-S4B	6/15/2016	1119	G	SO	X	X	

Receipt Information (completed by Receiving Lab)
Cooler Temp: 26.2 Therm ID: TH-352
No. of Coolers: ____ Y N Initial

	Y	N	Initial
Custody Seals Present?		✓	VS
(if present) Seals Intact?		✓	
Received on Ice?		✓	
COC/Labels Complete/Accurate?	✓		
Cont. In Good Cond.?	✓		
Correct Containers?	✓		
Correct Sample Volumes?	✓		
Correct Preservation?	✓		
Headspace/Volatiles?			

Courier/Tracking #:

ALS Field Services: __Pickup __Labor __Composite Sampling __Rental Equipment __Other:

Project Comments:

LOGGED BY(signature): DATE 7/1/16 TIME
REVIEWED BY(signature): DATE TIME

	Relinquished By / Company Name	Date	Time		Received By / Company Name	Date	Time
1	D Fenstermacher Rettew	7/1/16	1100	2	ALS	7/5/16	1319
3				4			
5				6			
7				8			
9				10			

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]
Reportable to PADEP? Yes [ ]
PWSID #
EDDS: Format Type-

Special Processing: USACE [ ] Navy [ ] [ ]
Sample Disposal: Lab [ ] Special [ ]

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] WV

*G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

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July 18, 2016

Mr. Duane Truax
Rettew Associates Inc.
3020 Columbia Avenue
Lancaster, PA 17603

Certificate of Analysis

Project Name:	**2016-TOC AND LOI ON SOILS**	Workorder:	**2156363**
Purchase Order:		Workorder ID:	**89962000**

Dear Mr. Truax:

Enclosed are the analytical results for samples received by the laboratory on Tuesday, July 5, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

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ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

CC: Mr. Dan Fenstermacher , Rettew

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Mr. Brad W Kintzer
Project Coordinator

SAMPLE SUMMARY

Workorder: 2156363 89962000

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2156363001	P-040-160615-1119-jcr-S5B	Solid	6/15/2016 11:19	7/5/2016 13:19	Collected by Client
2156363002	P-063-160614-0950-rll-S1B	Solid	6/14/2016 09:50	7/5/2016 13:19	Collected by Client
2156363003	P-063-160614-0950-rll-S2B	Solid	6/14/2016 09:50	7/5/2016 13:19	Collected by Client
2156363004	P-063-160614-0950-rll-S3B	Solid	6/14/2016 09:50	7/5/2016 13:19	Collected by Client
2156363005	P-068-160614-1338-sdd-S1B	Solid	6/14/2016 13:38	7/5/2016 13:19	Collected by Client
2156363006	P-068-160614-1338-sdd-S2B	Solid	6/14/2016 13:38	7/5/2016 13:19	Collected by Client
2156363007	P-068-160614-1338-sdd-S3B	Solid	6/14/2016 13:38	7/5/2016 13:19	Collected by Client
2156363008	P-068-160614-1338-sdd-S4B	Solid	6/14/2016 13:38	7/5/2016 13:19	Collected by Client
2156363009	P-069-160614-1158-sdd-S1B	Solid	6/14/2016 11:58	7/5/2016 13:19	Collected by Client
2156363010	P-069-160614-1158-sdd-S2B	Solid	6/14/2016 11:58	7/5/2016 13:19	Collected by Client
2156363011	P-069-160614-1158-sdd-S3B	Solid	6/14/2016 11:58	7/5/2016 13:19	Collected by Client
2156363012	P-069-160614-1158-sdd-S4B	Solid	6/14/2016 11:58	7/5/2016 13:19	Collected by Client
2156363013	P-069-160614-1158-sdd-S5B	Solid	6/14/2016 11:58	7/5/2016 13:19	Collected by Client
2156363014	P-100-160609-1105-def-S1B	Solid	6/9/2016 11:05	7/5/2016 13:19	Collected by Client
2156363015	P-100-160609-1105-def-S2B	Solid	6/9/2016 11:05	7/5/2016 13:19	Collected by Client
2156363016	P-100-160609-1105-def-S3B	Solid	6/9/2016 11:05	7/5/2016 13:19	Collected by Client
2156363017	P-121-160616-0950-mgw-S1B	Solid	6/16/2016 09:50	7/5/2016 13:19	Collected by Client
2156363018	P-121-160616-0950-mgw-S2B	Solid	6/16/2016 09:50	7/5/2016 13:19	Collected by Client
2156363019	P-121-160616-0950-mgw-S3B	Solid	6/16/2016 09:50	7/5/2016 13:19	Collected by Client
2156363020	P-121-160616-0950-mgw-S4B	Solid	6/16/2016 09:50	7/5/2016 13:19	Collected by Client

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SAMPLE SUMMARY

Workorder: 2156363 89962000

Notes

-- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
-- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
-- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
-- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
-- The Chain of Custody document is included as part of this report.
-- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
-- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are preformed in the laboratory and are therefore analyzed out of hold time.
-- Method references listed on this report beginning with the prefix “S” followed by a method number (such as S2310B-97) refer to methods from “Standard Methods for the Examination of Water and Wastewater”.
-- For microbiological analyses, the "Prepared" value is the date/time into the incurbator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

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ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363001** Date Collected: 6/15/2016 11:19 Matrix: Solid
Sample ID: **P-040-160615-1119-jcr-S5B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	15.0		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	2.5	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	1400		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	85.0	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

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State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363002** Date Collected: 6/14/2016 09:50 Matrix: Solid

Sample ID: **P-063-160614-0950-rll-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	26.8		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	11.1	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	49800		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	73.2	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363003** Date Collected: 6/14/2016 09:50 Matrix: Solid

Sample ID: **P-063-160614-0950-rll-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	17.0		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	3.5	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	2470		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	83.0	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363004** Date Collected: 6/14/2016 09:50 Matrix: Solid
Sample ID: **P-063-160614-0950-rll-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	13.7		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	2.7	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	1100		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	86.3	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363005** Date Collected: 6/14/2016 13:38 Matrix: Solid
Sample ID: **P-068-160614-1338-sdd-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	43.7		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	60.3	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	270000		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	56.3	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363006** Date Collected: 6/14/2016 13:38 Matrix: Solid

Sample ID: **P-068-160614-1338-sdd-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	16.7		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	8.8	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	62900		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	83.3	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363007** Date Collected: 6/14/2016 13:38 Matrix: Solid

Sample ID: **P-068-160614-1338-sdd-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	7.3		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	1.9	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	2280		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	92.7	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363008** Date Collected: 6/14/2016 13:38 Matrix: Solid

Sample ID: **P-068-160614-1338-sdd-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	14.1		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	2.7	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	4200		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	85.9	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363009** Date Collected: 6/14/2016 11:58 Matrix: Solid

Sample ID: **P-069-160614-1158-sdd-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	48.4		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	47.3	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	123000		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	51.6	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363010** Date Collected: 6/14/2016 11:58 Matrix: Solid

Sample ID: **P-069-160614-1158-sdd-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	28.1		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	11.4	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	72000		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	71.9	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363011** Date Collected: 6/14/2016 11:58 Matrix: Solid
Sample ID: **P-069-160614-1158-sdd-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	17.2		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	5.5	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	37600		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	82.8	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363012** Date Collected: 6/14/2016 11:58 Matrix: Solid
Sample ID: **P-069-160614-1158-sdd-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	11.0		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	2.2	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	1630		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	89.0	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363013** Date Collected: 6/14/2016 11:58 Matrix: Solid
Sample ID: **P-069-160614-1158-sdd-S5B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	9.7		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	2.5	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	1530		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	90.3	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental

34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363014**
Sample ID: **P-100-160609-1105-def-S1B**

Date Collected: 6/9/2016 11:05
Date Received: 7/5/2016 13:19
Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	67.0		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	93.0	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	522000		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	33.0	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363015** Date Collected: 6/9/2016 11:05 Matrix: Solid
Sample ID: **P-100-160609-1105-def-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	62.2		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	56.5	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	292000		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	37.8	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
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ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363016** Date Collected: 6/9/2016 11:05 Matrix: Solid

Sample ID: **P-100-160609-1105-def-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	16.3		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	12.2	3	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	17000	1	mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	83.7	2	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID:	**2156363017**	Date Collected:	6/16/2016 09:50	Matrix:	Solid
Sample ID:	**P-121-160616-0950-mgw-S1B**	Date Received:	7/5/2016 13:19		

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	66.3		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	77.2	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	362000		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	33.7	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363018** Date Collected: 6/16/2016 09:50 Matrix: Solid
Sample ID: **P-121-160616-0950-mgw-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	12.6		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	4.2	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	33800		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	87.4	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363019** Date Collected: 6/16/2016 09:50 Matrix: Solid
Sample ID: **P-121-160616-0950-mgw-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	21.8		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	6.0	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	18900		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	78.2	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
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ANALYTICAL RESULTS

Workorder: 2156363 89962000

Lab ID: **2156363020** Date Collected: 6/16/2016 09:50 Matrix: Solid

Sample ID: **P-121-160616-0950-mgw-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	14.5		%	0.1	S2540G-11			7/8/16 14:56	SLC	A
Solids, Total Volatile	4.4	2	%	1.0	S2540G-11			7/8/16 14:56	SLC	A
Total Organic Carbon (TOC)	13300		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	85.5	1	%	0.1	S2540G-11			7/8/16 14:56	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

PARAMETER QUALIFIERS

Lab ID	#	Sample ID	Analytical Method	Analyte
2156363001	1	P-040-160615-1119-jcr-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363001	2	P-040-160615-1119-jcr-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363002	1	P-063-160614-0950-rll-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363002	2	P-063-160614-0950-rll-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363003	1	P-063-160614-0950-rll-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363003	2	P-063-160614-0950-rll-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363004	1	P-063-160614-0950-rll-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363004	2	P-063-160614-0950-rll-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363005	1	P-068-160614-1338-sdd-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363005	2	P-068-160614-1338-sdd-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363006	1	P-068-160614-1338-sdd-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363006	2	P-068-160614-1338-sdd-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363007	1	P-068-160614-1338-sdd-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363007	2	P-068-160614-1338-sdd-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363008	1	P-068-160614-1338-sdd-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363008	2	P-068-160614-1338-sdd-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363009	1	P-069-160614-1158-sdd-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363009	2	P-069-160614-1158-sdd-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363010	1	P-069-160614-1158-sdd-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363010	2	P-069-160614-1158-sdd-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363011	1	P-069-160614-1158-sdd-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363011	2	P-069-160614-1158-sdd-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

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State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156363 89962000

2156363012	1	P-069-160614-1158-sdd-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363012	2	P-069-160614-1158-sdd-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363013	1	P-069-160614-1158-sdd-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363013	2	P-069-160614-1158-sdd-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363014	1	P-100-160609-1105-def-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363014	2	P-100-160609-1105-def-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363015	1	P-100-160609-1105-def-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363015	2	P-100-160609-1105-def-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363016	1	P-100-160609-1105-def-S3B	SW846 9060A	Total Organic Carbon (TOC)
The recovery of the Matrix Spike (MS) associated to this analyte was outside of the established control limits.				
2156363016	2	P-100-160609-1105-def-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363016	3	P-100-160609-1105-def-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363017	1	P-121-160616-0950-mgw-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363017	2	P-121-160616-0950-mgw-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363018	1	P-121-160616-0950-mgw-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363018	2	P-121-160616-0950-mgw-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363019	1	P-121-160616-0950-mgw-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363019	2	P-121-160616-0950-mgw-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156363020	1	P-121-160616-0950-mgw-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156363020	2	P-121-160616-0950-mgw-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

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CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC
ALS (
2156363

3 of 19

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave
Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT: [X] Normal-Standard TAT is 10-12 business days. [ ] Rush-Subject to ALS approval and surcharges.
Date Required: 13-Jul-16 Approved By:
Email? [X]-Y Dfenstermacher@rettew.com
Fax? [ ]-Y No.:

Container Type / Container Size / Preservative

ANALYSES/METHOD REQUESTED

Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)								Sample/COC Comments
P-040-160615-1119-jcr-S5B	6/15/2016	1119	G	SO	X	X								
P-063-160614-0950-rll-S1B	6/14/2016	950	G	SO	X	X								
P-063-160614-0950-rll-S2B	6/14/2016	950	G	SO	X	X								
P-063-160614-0950-rll-S3B	6/14/2016	950	G	SO	X	X								
P-068-160614-1338-sdd-S1B	6/14/2016	1338	G	SO	X	X								
P-068-160614-1338-sdd-S2B	6/14/2016	1338	G	SO	X	X								
P-068-160614-1338-sdd-S3B	6/14/2016	1338	G	SO	X	X								
P-068-160614-1338-sdd-S4B	6/14/2016	1338	G	SO	X	X								
P-069-160614-1158-sdd-S1B	6/14/2016	1158	G	SO	X	X								
P-069-160614-1158-sdd-S2B	6/14/2016	1158	G	SO	X	X								

Receipt Information (completed by Receiving Lab)
Cooler Temp: 26°c Therm ID: IR-352
No. of Coolers:

	Y	N	Initial
Custody Seals Present?		✓	
(If present) Seals Intact?			
Received on Ice?		X	
COC/Labels Complete/Accurate?	✓		
Cont. in Good Cond.?	✓		
Correct Containers?	✓		
Correct Sample Volumes?	✓		
Correct Preservation?	✓		
Headspace/Volatiles?			

Courier/Tracking #:

ALS Field Services: __Pickup __Labor __Composite Sampling __Rental Equipment __Other:

Project Comments:

LOGGED BY(signature): DATE 7/6 TIME
REVIEWED BY(signature): DATE TIME

	Relinquished By / Company Name	Date	Time		Received By / Company Name	Date	Time
1	DFenstermacher : Rettew	7/1/16	1100	2	DS	7/5/16	1315
3				4			
5				6			
7				8			
9				10			

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]
Reportable to PADEP? Yes [ ]
PWSID #
EDDS: Format Type-

Special Processing: USACE [ ] Navy [ ] [ ]
Sample Disposal: Lab [ ] Special [ ]

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] WV

*G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

ALS ENVIRONMENTAL SHIPPING ADDRESS: 34 DOGWOOD LANE, MIDDLETOWN, PA 17057

Rev 10/14

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CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC #: 2156362-3 | 4 of 19
ALS Quote #:

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave
Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT: [X] Normal-Standard TAT is 10-12 business days. [ ] Rush-Subject to ALS approval and surcharges.
Date Required: 13-Jul-16 Approved By:
Email? [X]-Y Dfenstermacher@rettew.com
Fax? [ ]-Y No.:

Receipt Information (completed by Receiving Lab)
Cooler Temp: 26° Therm ID: TH-352
No. of Coolers:

	Y	N	Initial
Custody Seals Present?		✓	GS
(if present) Seals Intact?			
Received on Ice?		✓	
COC/Labels Complete/Accurate?			
Cont. In Good Cond.?			
Correct Containers?			
Correct Sample Volumes?			
Correct Preservation?			
Headspace/Volatiles?			

Courier/Tracking #:

ANALYSES/METHOD REQUESTED — Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)	Sample/COC Comments
P-069-160614-1158-sdd-S3B	6/14/2016	1158	G	SO	X	X	
P-069-160614-1158-sdd-S4B	6/14/2016	1158	G	SO	X	X	
P-069-160614-1158-sdd-S5B	6/14/2016	1158	G	SO	X	X	
P-100-160609-1105-del-S1B	6/9/2016	1105	G	SO	X	X	
P-100-160609-1105-del-S2B	6/9/2016	1105	G	SO	X	X	
P-100-160609-1105-del-S3B	6/9/2016	1105	G	SO	X	X	
P-121-160616-0950-mgw-S1B	6/16/2016	950	G	SO	X	X	
P-121-160616-0950-mgw-S2B	6/16/2016	950	G	SO	X	X	
P-121-160616-0950-mgw-S3B	6/16/2016	950	G	SO	X	X	
P-121-160616-0950-mgw-S4B	6/16/2016	950	G	SO	X	X	

ALS Field Services: _Pickup _Labor _Composite Sampling _Rental Equipment _Other:

Project Comments:

LOGGED BY(signature): Date: 7/16 Time:
REVIEWED BY(signature): Date: Time:

	Relinquished By / Company Name	Date	Time		Received By / Company Name	Date	Time
1	DFenstermacher Rettew	7/1/16	1100	2		7/5/16	1319
3				4			
5				6			
7				8			
9				10			

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]
Reportable to PADEP? Yes [ ]
PWSID #
EDDS: Format Type-

Special Processing: USACE [ ] Navy [ ] [ ]
Sample Disposal: Lab [ ] Special [ ]

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] WV/VA

* G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

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July 18, 2016

Mr. Duane Truax
Rettew Associates Inc.
3020 Columbia Avenue
Lancaster, PA 17603

Certificate of Analysis

Project Name:	**2016-TOC AND LOI ON SOILS**	Workorder:	**2156364**
Purchase Order:		Workorder ID:	**89962000**

Dear Mr. Truax:

Enclosed are the analytical results for samples received by the laboratory on Tuesday, July 5, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

This laboratory report may not be reproduced, except in full, without the written approval of ALS Environmental.

ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

CC: Mr. Dan Fenstermacher , Rettew

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

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SAMPLE SUMMARY

Workorder: 2156364 89962000

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2156364001	P-126-160615-1410-mgw-S1B	Solid	6/15/2016 14:10	7/5/2016 13:19	Collected by Client
2156364002	P-126-160615-1410-mgw-S2B	Solid	6/15/2016 14:10	7/5/2016 13:19	Collected by Client
2156364003	P-126-160615-1410-mgw-S3B	Solid	6/15/2016 14:10	7/5/2016 13:19	Collected by Client
2156364004	P-126-160615-1410-mgw-S4B	Solid	6/15/2016 14:10	7/5/2016 13:19	Collected by Client
2156364005	P-126-160615-1410-mgw-S5B	Solid	6/15/2016 14:10	7/5/2016 13:19	Collected by Client
2156364006	P-134-160615-1506-sdd-S1B	Solid	6/15/2016 15:06	7/5/2016 13:19	Collected by Client
2156364007	P-134-160615-1506-sdd-S2B	Solid	6/15/2016 15:06	7/5/2016 13:19	Collected by Client
2156364008	P-134-160615-1506-sdd-S3B	Solid	6/15/2016 15:06	7/5/2016 13:19	Collected by Client
2156364009	P-134-160615-1506-sdd-S4B	Solid	6/15/2016 15:06	7/5/2016 13:19	Collected by Client
2156364010	P-134-160615-1506-sdd-S5B	Solid	6/15/2016 15:06	7/5/2016 13:19	Collected by Client
2156364011	P-156-160606-1355-dat-S1B	Solid	6/6/2016 13:55	7/5/2016 13:19	Collected by Client
2156364012	P-156-160606-1355-dat-S2B	Solid	6/6/2016 13:55	7/5/2016 13:19	Collected by Client
2156364013	P-156-160606-1355-dat-S3B	Solid	6/6/2016 13:55	7/5/2016 13:19	Collected by Client
2156364014	P-156-160606-1355-dat-S4B	Solid	6/6/2016 13:55	7/5/2016 13:19	Collected by Client
2156364015	P-157-160606-1512-dat-S1B	Solid	6/6/2016 15:12	7/5/2016 13:19	Collected by Client
2156364016	P-157-160606-1512-dat-S2B	Solid	6/6/2016 15:12	7/5/2016 13:19	Collected by Client
2156364017	P-157-160606-1512-dat-S3B	Solid	6/6/2016 15:12	7/5/2016 13:19	Collected by Client
2156364018	P-157-160606-1512-dat-S4B	Solid	6/6/2016 15:12	7/5/2016 13:19	Collected by Client
2156364019	P-157-160606-1512-dat-S5B	Solid	6/6/2016 15:12	7/5/2016 13:19	Collected by Client
2156364020	P-157-160606-1512-dat-S6B	Solid	6/6/2016 15:12	7/5/2016 13:19	Collected by Client

SAMPLE SUMMARY

Workorder: 2156364 89962000

Notes

- -- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- -- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- -- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- -- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- -- The Chain of Custody document is included as part of this report.
- -- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- -- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are preformed in the laboratory and are therefore analyzed out of hold time.
- -- Method references listed on this report beginning with the prefix “S” followed by a method number (such as S2310B-97) refer to methods from “Standard Methods for the Examination of Water and Wastewater”.
- -- For microbiological analyses, the "Prepared" value is the date/time into the incurbator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

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ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364001** Date Collected: 6/15/2016 14:10 Matrix: Solid

Sample ID: **P-126-160615-1410-mgw-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	41.5		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	59.5	3	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	322000		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	58.5	1,2	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364002** Date Collected: 6/15/2016 14:10 Matrix: Solid
Sample ID: **P-126-160615-1410-mgw-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	24.5		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	10.9	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	106000		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	75.5	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364003** Date Collected: 6/15/2016 14:10 Matrix: Solid

Sample ID: **P-126-160615-1410-mgw-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	15.2		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	4.6	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	14600		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	84.8	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental

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ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364004** Date Collected: 6/15/2016 14:10 Matrix: Solid

Sample ID: **P-126-160615-1410-mgw-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	14.0		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	4.1	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	7330		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	86.0	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364005**
Sample ID: **P-126-160615-1410-mgw-S5B**
Date Collected: 6/15/2016 14:10
Date Received: 7/5/2016 13:19
Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	14.4		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	3.7	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	3310		mg/kg	500	SW846 9060A			7/8/16 08:30	CF	A
Total Solids	85.6	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

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State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364006** Date Collected: 6/15/2016 15:06 Matrix: Solid

Sample ID: **P-134-160615-1506-sdd-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	58.8		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	78.2	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	388000		mg/kg	500	SW846 9060A			7/7/16 09:00	CF	A
Total Solids	41.2	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

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State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364007** Date Collected: 6/15/2016 15:06 Matrix: Solid
Sample ID: **P-134-160615-1506-sdd-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	36.2		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	18.4	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	113000		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	63.8	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
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ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364008** Date Collected: 6/15/2016 15:06 Matrix: Solid

Sample ID: **P-134-160615-1506-sdd-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	18.3		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	3.8	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	5700		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	81.7	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364009** Date Collected: 6/15/2016 15:06 Matrix: Solid
Sample ID: **P-134-160615-1506-sdd-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	13.8		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	3.3	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	1720		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	86.2	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364010** Date Collected: 6/15/2016 15:06 Matrix: Solid

Sample ID: **P-134-160615-1506-sdd-S5B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	12.3		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	3.1	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	1650		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	87.7	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental

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ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364011** Date Collected: 6/6/2016 13:55 Matrix: Solid

Sample ID: **P-156-160606-1355-dat-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	75.6		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	80.2	3	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	373000		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	24.4	1,2	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364012**
Sample ID: **P-156-160606-1355-dat-S2B**
Date Collected: 6/6/2016 13:55
Date Received: 7/5/2016 13:19
Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	26.1		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	6.1	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	42000		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	73.9	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
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ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364013**   Date Collected: 6/6/2016 13:55   Matrix: Solid
Sample ID: **P-156-160606-1355-dat-S3B**   Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	16.3		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	1.7	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	2830		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	83.7	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364014** Date Collected: 6/6/2016 13:55 Matrix: Solid

Sample ID: **P-156-160606-1355-dat-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	15.1		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	1.5	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	1610	3	mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	84.9	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364015** Date Collected: 6/6/2016 15:12 Matrix: Solid
Sample ID: **P-157-160606-1512-dat-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	72.4		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	78.0	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	355000		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	27.6	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364016** Date Collected: 6/6/2016 15:12 Matrix: Solid
Sample ID: **P-157-160606-1512-dat-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	30.1		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	7.9	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	42800		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	69.9	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364017** Date Collected: 6/6/2016 15:12 Matrix: Solid

Sample ID: **P-157-160606-1512-dat-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	18.2		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	2.9	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	8340		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	81.8	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364018** Date Collected: 6/6/2016 15:12 Matrix: Solid
Sample ID: **P-157-160606-1512-dat-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	15.1		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	2.6	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	4370		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	84.9	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364019** Date Collected: 6/6/2016 15:12 Matrix: Solid

Sample ID: **P-157-160606-1512-dat-S5B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	19.9		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	3.4	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	1540		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	80.1	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156364 89962000

Lab ID: **2156364020** Date Collected: 6/6/2016 15:12 Matrix: Solid
Sample ID: **P-157-160606-1512-dat-S6B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	20.1		%	0.1	S2540G-11			7/8/16 17:06	SLC	A
Solids, Total Volatile	3.2	2	%	1.0	S2540G-11			7/8/16 17:06	SLC	A
Total Organic Carbon (TOC)	2300		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	79.9	1	%	0.1	S2540G-11			7/8/16 17:06	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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PARAMETER QUALIFIERS

Lab ID	#	Sample ID	Analytical Method	Analyte
2156364001	1	P-126-160615-1410-mgw-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364001	2	P-126-160615-1410-mgw-S1B	S2540G-11	Total Solids
The RPD associated with this sample was recovered at 17.8%. The RPD is outside method acceptance limits of 5.0%. The results used to calculate the RPD were 69.9 and 58.5%.				
2156364001	3	P-126-160615-1410-mgw-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364002	1	P-126-160615-1410-mgw-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364002	2	P-126-160615-1410-mgw-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364003	1	P-126-160615-1410-mgw-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364003	2	P-126-160615-1410-mgw-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364004	1	P-126-160615-1410-mgw-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364004	2	P-126-160615-1410-mgw-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364005	1	P-126-160615-1410-mgw-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364005	2	P-126-160615-1410-mgw-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364006	1	P-134-160615-1506-sdd-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364006	2	P-134-160615-1506-sdd-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364007	1	P-134-160615-1506-sdd-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364007	2	P-134-160615-1506-sdd-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364008	1	P-134-160615-1506-sdd-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364008	2	P-134-160615-1506-sdd-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364009	1	P-134-160615-1506-sdd-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364009	2	P-134-160615-1506-sdd-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364010	1	P-134-160615-1506-sdd-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364010	2	P-134-160615-1506-sdd-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

ANALYTICAL RESULTS

Workorder: 2156364 89962000

2156364011	1	P-156-160606-1355-dat-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364011	2	P-156-160606-1355-dat-S1B	S2540G-11	Total Solids
The RPD associated with this sample was recovered at 16.5%. The RPD is outside method acceptance limits of 5.0%. The results used to calculate the RPD were 28.8 and 24.2%.				
2156364011	3	P-156-160606-1355-dat-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364012	1	P-156-160606-1355-dat-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364012	2	P-156-160606-1355-dat-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364013	1	P-156-160606-1355-dat-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364013	2	P-156-160606-1355-dat-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364014	1	P-156-160606-1355-dat-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364014	2	P-156-160606-1355-dat-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364014	3	P-156-160606-1355-dat-S4B	SW846 9060A	Total Organic Carbon (TOC)
Due to sample matrix, an average of four individual injections were used to calculate the final result. No two injections met method criteria. JWB 7-17-16				
2156364015	1	P-157-160606-1512-dat-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364015	2	P-157-160606-1512-dat-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364016	1	P-157-160606-1512-dat-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364016	2	P-157-160606-1512-dat-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364017	1	P-157-160606-1512-dat-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364017	2	P-157-160606-1512-dat-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364018	1	P-157-160606-1512-dat-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364018	2	P-157-160606-1512-dat-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156364019	1	P-157-160606-1512-dat-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364019	2	P-157-160606-1512-dat-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

ANALYTICAL RESULTS

Workorder: 2156364 89962000

2156364020	1	P-157-160606-1512-dat-S6B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156364020	2	P-157-160606-1512-dat-S6B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

ALS Environmental

34 Dogwood Lane
Middletown, PA 17057
P. 717-944-5541
F. 717-944-1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC
ALS

2156364

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave
Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT [X] Normal-Standard TAT is 10-12 business days.
[ ] Rush-Subject to ALS approval and surcharges.

Date Required: 13-Jul-16 Approved By:
Email? [X]-Y Dfenstermacher@rettew.com
Fax? [ ]-Y No.:

Receipt Information (completed by Receiving Lab)
Cooler Temp: 2.6 Therm ID: TM-352
No. of Coolers:

	Y	N	Initial
Custody Seals Present?		✓	
(if present) Seals Intact?			
Received on Ice?		✓	
COC/Labels Complete/Accurate?	✓		
Cont. in Good Cond.?	✓		
Correct Containers?	✓		
Correct Sample Volumes?	✓		
Correct Preservation?	✓		
Headspace/Volatiles?			

Courier/Tracking #:

ANALYSES/METHOD REQUESTED (Container Type / Container Size / Preservative)

Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)	Sample/COC Comments
P-126-160615-1410-mgw-S1B	6/15/2016	1410	G	SO	X	X	
P-126-160615-1410-mgw-S2B	6/15/2016	1410	G	SO	X	X	
P-126-160615-1410-mgw-S3B	6/15/2016	1410	G	SO	X	X	
P-126-160615-1410-mgw-S4B	6/15/2016	1410	G	SO	X	X	
P-126-160615-1410-mgw-S5B	6/15/2016	1410	G	SO	X	X	
P-134-160615-1506-sdd-S1B	6/15/2016	1506	G	SO	X	X	
P-134-160615-1506-sdd-S2B	6/15/2016	1506	G	SO	X	X	
P-134-160615-1506-sdd-S3B	6/15/2016	1506	G	SO	X	X	
P-134-160615-1506-sdd-S4B	6/15/2016	1506	G	SO	X	X	
P-134-160615-1506-sdd-S5B	6/15/2016	1506	G	SO	X	X	

ALS Field Services: __Pickup __Labor __Composite Sampling __Rental Equipment __Other:

Project Comments:

LOGGED BY(signature): Date 7/1/16 Time
REVIEWED BY(signature): Date Time

Relinquished By / Company Name	Date	Time	Received By / Company Name	Date	Time
1 DFenstermacher Rettew	7/1/16	1100	2 ALS	7/1/16	1319
3			4		
5			6		
7			8		
9			10		

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]

Special Processing: USACE [ ] Navy [ ] [ ]

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] VA

Reportable to PADEP? Yes [ ]
PWSID #

Sample Disposal: Lab [ ] Special [ ]

EDDS: Format Type-

*G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

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ALS Environmental

34 Dogwood Lane
Middletown, PA 17057
P. 717-944-5541
F.717-944-1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC #: 21563624 | 6 of 19
ALS Quote #:

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave
Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT [X] Normal-Standard TAT is 10-12 business days.
[ ] Rush-Subject to ALS approval and surcharges.
Date Required: 13-Jul-16 Approved By:
Email? [X]-Y Dfenstermacher@rettew.com
Fax? [ ]-Y No.:

ANALYSES/METHOD REQUESTED (Container Type / Container Size / Preservative)

Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)	Sample/COC Comments
P-156-160606-1355-dat-S1B	6/6/2016	1355	G	SO	X	X	
P-156-160606-1355-dat-S2B	6/6/2016	1355	G	SO	X	X	
P-156-160606-1355-dat-S3B	6/6/2016	1355	G	SO	X	X	
P-156-160606-1355-dat-S4B	6/6/2016	1355	G	SO	X	X	
P-157-160606-1512-dat-S1B	6/6/2016	1512	G	SO	X	X	
P-157-160606-1512-dat-S2B	6/6/2016	1512	G	SO	X	X	
P-157-160606-1512-dat-S3B	6/6/2016	1512	G	SO	X	X	
P-157-160606-1512-dat-S4B	6/6/2016	1512	G	SO	X	X	
P-157-160606-1512-dat-S5B	6/6/2016	1512	G	SO	X	X	
P-157-160606-1512-dat-S6B	6/6/2016	1512	G	SO	X	X	

Receipt Information (completed by Receiving Lab)
Cooler Temp: 26.2 Therm ID: 352
No. of Coolers: Y N Initial
Custody Seals Present? CR
(if present) Seals Intact?
Received on Ice?
COC/Labels Complete/Accurate?
Cont. in Good Cond.?
Correct Containers?
Correct Sample Volumes?
Correct Preservation?
Headspace/Volatiles?
Courier/Tracking #:

ALS Field Services: _Pickup _Labor
_Composite Sampling _Rental Equipment
_Other:

Project Comments:

LOGGED BY(signature): DATE 7/6 TIME
REVIEWED BY(signature): DATE TIME

	Relinquished By / Company Name	Date	Time		Received By / Company Name	Date	Time
1	DFenstermacher Rettew	7/1/16	1100	2	ALS	7/3/16	1319
3				4			
5				6			
7				8			
9				10			

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]
Special Processing: USACE [ ] Navy [ ] [ ]
State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] VA
Reportable to PADEP? Yes [ ]
PWSID #
Sample Disposal: Lab [ ] Special [ ]
EDDS: Format Type-

* G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

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July 18, 2016

Mr. Duane Truax
Rettew Associates Inc.
3020 Columbia Avenue
Lancaster, PA 17603

Certificate of Analysis

Project Name:	**2016-TOC AND LOI ON SOILS**	Workorder:	**2156365**
Purchase Order:		Workorder ID:	**89962000**

Dear Mr. Truax:

Enclosed are the analytical results for samples received by the laboratory on Tuesday, July 5, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

This laboratory report may not be reproduced, except in full, without the written approval of ALS Environmental.

ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

CC: Mr. Dan Fenstermacher , Rettew

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
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SAMPLE SUMMARY

Workorder: 2156365 89962000

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2156365001	P-157-160606-1512-dat-S7B	Solid	6/6/2016 15:12	7/5/2016 13:19	Collected by Client
2156365002	P-162-160606-1040-jsw-S1B	Solid	6/6/2016 10:40	7/5/2016 13:19	Collected by Client
2156365003	P-162-160606-1040-jsw-S2B	Solid	6/6/2016 10:40	7/5/2016 13:19	Collected by Client
2156365004	P-162-160606-1040-jsw-SA3	Solid	6/6/2016 10:40	7/5/2016 13:19	Collected by Client
2156365005	P-162-160606-1040-jsw-SA4	Solid	6/6/2016 10:40	7/5/2016 13:19	Collected by Client
2156365006	P-162-160606-1040-jsw-SA5	Solid	6/6/2016 10:40	7/5/2016 13:19	Collected by Client
2156365007	P-170-160620-1122-def-S1B	Solid	6/20/2016 11:22	7/5/2016 13:19	Collected by Client
2156365008	P-170-160620-1122-def-S2B	Solid	6/20/2016 11:22	7/5/2016 13:19	Collected by Client
2156365009	P-170-160620-1122-def-S3B	Solid	6/20/2016 11:22	7/5/2016 13:19	Collected by Client
2156365010	P-170-160620-1122-def-S4B	Solid	6/20/2016 11:22	7/5/2016 13:19	Collected by Client
2156365011	P-170-160620-1122-def-S5B	Solid	6/20/2016 11:22	7/5/2016 13:19	Collected by Client
2156365012	P-170-160620-1122-def-S6B	Solid	6/20/2016 11:22	7/5/2016 13:19	Collected by Client
2156365013	P-173-160620-1112-def-S1B	Solid	6/20/2016 11:12	7/5/2016 13:19	Collected by Client
2156365014	P-173-160620-1112-def-S2B	Solid	6/20/2016 11:12	7/5/2016 13:19	Collected by Client
2156365015	P-173-160620-1112-def-S3B	Solid	6/20/2016 11:12	7/5/2016 13:19	Collected by Client
2156365016	P-173-160620-1112-def-S4B	Solid	6/20/2016 11:12	7/5/2016 13:19	Collected by Client
2156365017	P-176-160621-1155-rll-S1B	Solid	6/21/2016 11:55	7/5/2016 13:19	Collected by Client
2156365018	P-176-160621-1155-rll-S2B	Solid	6/21/2016 11:55	7/5/2016 13:19	Collected by Client
2156365019	P-176-160621-1155-rll-S3B	Solid	6/21/2016 11:55	7/5/2016 13:19	Collected by Client
2156365020	P-176-160621-1155-rll-S4B	Solid	6/21/2016 11:55	7/5/2016 13:19	Collected by Client

SAMPLE SUMMARY

Workorder: 2156365 89962000

Notes

- -- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- -- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- -- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- -- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- -- The Chain of Custody document is included as part of this report.
- -- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- -- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are preformed in the laboratory and are therefore analyzed out of hold time.
- -- Method references listed on this report beginning with the prefix “S” followed by a method number (such as S2310B-97) refer to methods from “Standard Methods for the Examination of Water and Wastewater”.
- -- For microbiological analyses, the "Prepared" value is the date/time into the incurbator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

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ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365001** Date Collected: 6/6/2016 15:12 Matrix: Solid
Sample ID: **P-157-160606-1512-dat-S7B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	21.3		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	3.9	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	2320		mg/kg	500	SW846 9060A			7/15/16 11:30	CF	A
Total Solids	78.7	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365002** Date Collected: 6/6/2016 10:40 Matrix: Solid
Sample ID: **P-162-160606-1040-jsw-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	74.2		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	84.2	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	501000		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	25.8	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365003** Date Collected: 6/6/2016 10:40 Matrix: Solid

Sample ID: **P-162-160606-1040-jsw-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	29.8		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	9.5	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	42500		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	70.2	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365004** Date Collected: 6/6/2016 10:40 Matrix: Solid
Sample ID: **P-162-160606-1040-jsw-SA3** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	21.6		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	5.7	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	12600		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	78.4	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365005** Date Collected: 6/6/2016 10:40 Matrix: Solid

Sample ID: **P-162-160606-1040-jsw-SA4** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	18.0		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	3.5	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	1100		mg/kg	500	SW846 9060A			7/11/16 15:00	CF	A
Total Solids	82.0	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365006** Date Collected: 6/6/2016 10:40 Matrix: Solid
Sample ID: **P-162-160606-1040-jsw-SA5** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	14.1		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	3.0	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	670		mg/kg	500	SW846 9060A			7/15/16 11:30	CF	A
Total Solids	85.9	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365007** Date Collected: 6/20/2016 11:22 Matrix: Solid

Sample ID: **P-170-160620-1122-def-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	61.1		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	95.8	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	507000		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	38.9	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365008** Date Collected: 6/20/2016 11:22 Matrix: Solid

Sample ID: **P-170-160620-1122-def-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	55.3		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	56.5	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	264000		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	44.7	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365009** Date Collected: 6/20/2016 11:22 Matrix: Solid

Sample ID: **P-170-160620-1122-def-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	11.9		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	3.2	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	14700		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	88.1	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365010** Date Collected: 6/20/2016 11:22 Matrix: Solid
Sample ID: **P-170-160620-1122-def-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	15.4		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	4.7	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	21300		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	84.6	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365011** Date Collected: 6/20/2016 11:22 Matrix: Solid
Sample ID: **P-170-160620-1122-def-S5B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	11.2		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	3.2	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	3050		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	88.8	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
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State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365012**
Sample ID: **P-170-160620-1122-def-S6B**
Date Collected: 6/20/2016 11:22
Date Received: 7/5/2016 13:19
Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	9.8		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	1.7	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	2340		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	90.2	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365013** Date Collected: 6/20/2016 11:12 Matrix: Solid
Sample ID: **P-173-160620-1112-def-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	45.2		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	76.3	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	371000		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	54.8	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

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NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365014** | Date Collected: 6/20/2016 11:12 | Matrix: Solid

Sample ID: **P-173-160620-1112-def-S2B** | Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	21.1		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	9.0	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	48400		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	78.9	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365015** Date Collected: 6/20/2016 11:12 Matrix: Solid
Sample ID: **P-173-160620-1112-def-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	14.5		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	4.3	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	8220		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	85.5	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

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Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID:	**2156365016**	Date Collected:	6/20/2016 11:12	Matrix:	Solid
Sample ID:	**P-173-160620-1112-def-S4B**	Date Received:	7/5/2016 13:19		

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	19.0		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	5.7	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	6020		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	81.0	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

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Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365017** Date Collected: 6/21/2016 11:55 Matrix: Solid
Sample ID: **P-176-160621-1155-rll-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	31.4		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	74.7	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	389000		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	68.6	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental

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NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365018** Date Collected: 6/21/2016 11:55 Matrix: Solid

Sample ID: **P-176-160621-1155-rll-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	29.1		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	12.2	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	57700		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	70.9	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365019** Date Collected: 6/21/2016 11:55 Matrix: Solid
Sample ID: **P-176-160621-1155-rll-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	12.5		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	1.0	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	1080		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	87.5	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
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ANALYTICAL RESULTS

Workorder: 2156365 89962000

Lab ID: **2156365020** Date Collected: 6/21/2016 11:55 Matrix: Solid
Sample ID: **P-176-160621-1155-rll-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	27.4		%	0.1	S2540G-11			7/8/16 19:06	SLC	A
Solids, Total Volatile	7.0	2	%	1.0	S2540G-11			7/8/16 19:06	SLC	A
Total Organic Carbon (TOC)	2220		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	72.6	1	%	0.1	S2540G-11			7/8/16 19:06	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

PARAMETER QUALIFIERS

Lab ID	#	Sample ID	Analytical Method	Analyte
2156365001	1	P-157-160606-1512-dat-S7B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365001	2	P-157-160606-1512-dat-S7B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365002	1	P-162-160606-1040-jsw-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365002	2	P-162-160606-1040-jsw-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365003	1	P-162-160606-1040-jsw-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365003	2	P-162-160606-1040-jsw-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365004	1	P-162-160606-1040-jsw-SA3	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365004	2	P-162-160606-1040-jsw-SA3	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365005	1	P-162-160606-1040-jsw-SA4	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365005	2	P-162-160606-1040-jsw-SA4	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365006	1	P-162-160606-1040-jsw-SA5	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365006	2	P-162-160606-1040-jsw-SA5	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365007	1	P-170-160620-1122-def-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365007	2	P-170-160620-1122-def-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365008	1	P-170-160620-1122-def-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365008	2	P-170-160620-1122-def-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365009	1	P-170-160620-1122-def-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365009	2	P-170-160620-1122-def-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365010	1	P-170-160620-1122-def-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365010	2	P-170-160620-1122-def-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365011	1	P-170-160620-1122-def-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365011	2	P-170-160620-1122-def-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

ANALYTICAL RESULTS

Workorder: 2156365 89962000

2156365012	1	P-170-160620-1122-def-S6B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365012	2	P-170-160620-1122-def-S6B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365013	1	P-173-160620-1112-def-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365013	2	P-173-160620-1112-def-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365014	1	P-173-160620-1112-def-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365014	2	P-173-160620-1112-def-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365015	1	P-173-160620-1112-def-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365015	2	P-173-160620-1112-def-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365016	1	P-173-160620-1112-def-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365016	2	P-173-160620-1112-def-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365017	1	P-176-160621-1155-rll-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365017	2	P-176-160621-1155-rll-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365018	1	P-176-160621-1155-rll-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365018	2	P-176-160621-1155-rll-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365019	1	P-176-160621-1155-rll-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365019	2	P-176-160621-1155-rll-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156365020	1	P-176-160621-1155-rll-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156365020	2	P-176-160621-1155-rll-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

ALS Environmental

34 Dogwood Lane
Middletown, PA 17057
P. 717-944-5541
F. 717-944-1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

* 2 1 5 6 3 6 5 *

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave
Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT: [X] Normal-Standard TAT is 10-12 business days. [ ] Rush-Subject to ALS approval and surcharges.
Date Required: 13-Jul-16 Approved By:
Email? [X] -Y Dfenstermacher@rettew.com
Fax? [ ] -Y No.:

Receipt Information (completed by Receiving Lab)
Cooler Temp: 26.2 Therm ID: TH-352
No. of Coolers:

	Y	N	Initial
Custody Seals Present?		✓	
(if present) Seals Intact?			
Received on Ice?		✓	
COC/Labels Complete/Accurate?	✓		
Cont. in Good Cond.?	✓		
Correct Containers?	✓		
Correct Sample Volumes?	✓		
Correct Preservation?	✓		
Headspace/Volatiles?			

Courier/Tracking #:

ANALYSES/METHOD REQUESTED (Container Type / Container Size / Preservative)

Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)	Sample/COC Comments
P-157-160606-1512-dat-S7B	6/6/2016	1512	G	SO	X	X	
P-162-160606-1040-jsw-S1B	6/6/2016	1040	G	SO	X	X	
P-162-160606-1040-jsw-S2B	6/6/2016	1040	G	SO	X	X	
P-162-160606-1040-jsw-SA3	6/6/2016	1040	G	SO	X	X	
P-162-160606-1040-jsw-SA4	6/6/2016	1040	G	SO	X	X	
P-162-160606-1040-jsw-SA5	6/6/2016	1040	G	SO	X	X	
P-170-160620-1122-def-S1B	6/20/2016	1122	G	SO	X	X	
P-170-160620-1122-def-S2B	6/20/2016	1122	G	SO	X	X	
P-170-160620-1122-def-S3B	6/20/2016	1122	G	SO	X	X	ALS Field Services: _Pickup _Labor _Composite Sampling _Rental Equipment _Other:
P-170-160620-1122-def-S4B	6/20/2016	1122	G	SO	X	X	

Project Comments:

LOGGED BY(signature): DATE 7/6 TIME
REVIEWED BY(signature): DATE TIME

	Relinquished By / Company Name	Date	Time		Received By / Company Name	Date	Time
1	D. Fenstermacher Rettew	7/1/16	1100	2	ALS	7/5/16	1319
3				4			
5				6			
7				8			
9				10			

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]
Reportable to PADEP? Yes [ ]
PWSID #
EDDS: Format Type-

Special Processing: USACE [ ] Navy [ ] [ ]
Sample Disposal: Lab [ ] Special [ ]

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] VA

* G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

ALS ENVIRONMENTAL SHIPPING ADDRESS: 34 DOGWOOD LANE, MIDDLETOWN, PA 17057

Rev 10/14

ALS Environmental

34 Dogwood Lane
Middletown, PA 17057
P.717-944-5541
F.717-944-1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC #: 2156365 | 8 of 19

ALS Quote #:

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave, Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT: [X] Normal-Standard TAT is 10-12 business days. [ ] Rush-Subject to ALS approval and surcharges.

Date Required: 13-Jul-16 Approved By:
Email? [X]-Y Dfenstermacher@rettew.com
Fax? [ ]-Y No.:

Container Type / Container Size / Preservative

ANALYSES/METHOD REQUESTED

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)	Sample/COC Comments
P-170-160620-1122-def-S5B	6/20/2016	1122	G	SO	X	X	
P-170-160620-1122-def-S6B	6/20/2016	1122	G	SO	X	X	
P-173-160620-1112-def-S1B	6/20/2016	1112	G	SO	X	X	
P-173-160620-1112-def-S2B	6/20/2016	1112	G	SO	X	X	
P-173-160620-1112-def-S3B	6/20/2016	1112	G	SO	X	X	
P-173-160620-1112-def-S4B	6/20/2016	1112	G	SO	X	X	
P-176-160621-1155-rll-S1B	6/21/2016	1155	G	SO	X	X	
P-176-160621-1155-rll-S2B	6/21/2016	1155	G	SO	X	X	
P-176-160621-1155-rll-S3B	6/21/2016	1155	G	SO	X	X	
P-176-160621-1155-rll-S4B	6/21/2016	1155	G	SO	X	X	

Enter Number of Containers Per Sample or Field Results Below.

Receipt Information (completed by Receiving Lab)
Cooler Temp: 26.2 Therm ID: TH-352
No. of Coolers:

	Y	N	Initial
Custody Seals Present?		✓	
(if present) Seals Intact?			
Received on Ice?			
COC/Labels Complete/Accurate?	✓		
Cont. in Good Cond.?	✓		
Correct Containers?	✓		
Correct Sample Volumes?	✓		
Correct Preservation?	✓		
Headspace/Volatiles?			

Courier/Tracking #:

ALS Field Services: _Pickup _Labor _Composite Sampling _Rental Equipment _Other:

Project Comments:

LOGGED BY(signature): DATE 7/6 TIME
REVIEWED BY(signature): DATE TIME

	Relinquished By / Company Name	Date	Time		Received By / Company Name	Date	Time
1	D Fenstermacher Rettew	7/1/16	1100	2	ALS	7/5/16	1319
3				4			
5				6			
7				8			
9				10			

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]
Reportable to PADEP? Yes [ ]
PWSID #
EDDS: Format Type-

Special Processing: USACE [ ] Navy [ ] [ ]
Sample Disposal: Lab [ ] Special [ ]

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] VA

* G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; Ol=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

ALS ENVIRONMENTAL SHIPPING ADDRESS: 34 DOGWOOD LANE, MIDDLETOWN, PA 17057

Rev 10/14

ALS

July 18, 2016

Mr. Duane Truax
Rettew Associates Inc.
3020 Columbia Avenue
Lancaster, PA 17603

Certificate of Analysis

Project Name:	**2016-TOC AND LOI ON SOILS**	Workorder:	**2156366**
Purchase Order:		Workorder ID:	**89962000**

Dear Mr. Truax:

Enclosed are the analytical results for samples received by the laboratory on Tuesday, July 5, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

This laboratory report may not be reproduced, except in full, without the written approval of ALS Environmental.

ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

CC: Mr. Dan Fenstermacher , Rettew

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Mr. Brad W Kintzer
Project Coordinator

SAMPLE SUMMARY

Workorder: 2156366 89962000

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2156366001	P-187-160607-1427-jsw-S1B	Solid	6/7/2016 14:27	7/5/2016 13:19	Collected by Client
2156366002	P-187-160607-1427-jsw-S2B	Solid	6/7/2016 14:27	7/5/2016 13:19	Collected by Client
2156366003	P-187-160607-1427-jsw-S3B	Solid	6/7/2016 14:27	7/5/2016 13:19	Collected by Client
2156366004	P-215-160602-1037-jsw-S1B	Solid	6/2/2016 10:37	7/5/2016 13:19	Collected by Client
2156366005	P-215-160602-1037-jsw-S2B	Solid	6/2/2016 10:37	7/5/2016 13:19	Collected by Client
2156366006	P-215-160602-1037-jsw-S3B	Solid	6/2/2016 10:37	7/5/2016 13:19	Collected by Client
2156366007	P-215-160602-1037-jsw-S4B	Solid	6/2/2016 10:37	7/5/2016 13:19	Collected by Client
2156366008	P-215-160602-1037-jsw-S5B	Solid	6/2/2016 10:37	7/5/2016 13:19	Collected by Client
2156366009	P-215-160602-1037-jsw-S6B	Solid	6/2/2016 10:37	7/5/2016 13:19	Collected by Client
2156366010	P-222-160607-1055-dat-S1B	Solid	6/7/2016 10:55	7/5/2016 13:19	Collected by Client
2156366011	P-222-160607-1055-dat-S2B	Solid	6/7/2016 10:25	7/5/2016 13:19	Collected by Client
2156366012	P-222-160607-1055-dat-S3B	Solid	6/7/2016 10:25	7/5/2016 13:19	Collected by Client
2156366013	P-222-160607-1055-dat-S4B	Solid	6/7/2016 10:25	7/5/2016 13:19	Collected by Client
2156366014	P-222-160607-1055-dat-S5B	Solid	6/7/2016 10:25	7/5/2016 13:19	Collected by Client
2156366015	P-225-160601-1130-mel-S1B	Solid	6/1/2016 11:30	7/5/2016 13:19	Collected by Client
2156366016	P-225-160601-1130-mel-S2B	Solid	6/1/2016 11:30	7/5/2016 13:19	Collected by Client
2156366017	P-225-160601-1130-mel-S3B	Solid	6/1/2016 11:30	7/5/2016 13:19	Collected by Client
2156366018	P-225-160601-1130-mel-S4B	Solid	6/1/2016 11:30	7/5/2016 13:19	Collected by Client
2156366019	P-225-160601-1130-mel-S5B	Solid	6/1/2016 11:30	7/5/2016 13:19	Collected by Client
2156366020	P-225-160601-1130-mel-S6B	Solid	6/1/2016 11:30	7/5/2016 13:19	Collected by Client

SAMPLE SUMMARY

Workorder: 2156366 89962000

Notes

- -- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- -- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- -- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- -- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- -- The Chain of Custody document is included as part of this report.
- -- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- -- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are preformed in the laboratory and are therefore analyzed out of hold time.
- -- Method references listed on this report beginning with the prefix “S” followed by a method number (such as S2310B-97) refer to methods from “Standard Methods for the Examination of Water and Wastewater”.
- -- For microbiological analyses, the "Prepared" value is the date/time into the incurbator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366001** Date Collected: 6/7/2016 14:27 Matrix: Solid

Sample ID: **P-187-160607-1427-jsw-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	55.5		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	52.5	3	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	311000		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	44.5	1,2	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental

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ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366002**	Date Collected: 6/7/2016 14:27	Matrix:	Solid
Sample ID: **P-187-160607-1427-jsw-S2B**	Date Received: 7/5/2016 13:19		

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	20.6		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	9.4	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	60300		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	79.4	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental

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ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID:	**2156366003**	Date Collected:	6/7/2016 14:27	Matrix:	Solid
Sample ID:	**P-187-160607-1427-jsw-S3B**	Date Received:	7/5/2016 13:19		

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	12.2		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	5.1	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	14600		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	87.8	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
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ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366004** Date Collected: 6/2/2016 10:37 Matrix: Solid
Sample ID: **P-215-160602-1037-jsw-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	66.7		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	82.7	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	505000		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	33.3	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366005** Date Collected: 6/2/2016 10:37 Matrix: Solid

Sample ID: **P-215-160602-1037-jsw-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	20.0		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	4.3	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	35800		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	80.0	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
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ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366006** Date Collected: 6/2/2016 10:37 Matrix: Solid
Sample ID: **P-215-160602-1037-jsw-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	22.9		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	6.9	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	39900		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	77.1	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366007** Date Collected: 6/2/2016 10:37 Matrix: Solid

Sample ID: **P-215-160602-1037-jsw-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	19.8		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	4.2	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	13500		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	80.2	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366008** Date Collected: 6/2/2016 10:37 Matrix: Solid

Sample ID: **P-215-160602-1037-jsw-S5B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	16.1		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	2.6	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	3700		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	83.9	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
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ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366009** Date Collected: 6/2/2016 10:37 Matrix: Solid

Sample ID: **P-215-160602-1037-jsw-S6B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	11.7		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	1.1	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	ND		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	88.3	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366010** Date Collected: 6/7/2016 10:55 Matrix: Solid

Sample ID: **P-222-160607-1055-dat-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	31.4		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	16.0	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	183000		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	68.6	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366011** Date Collected: 6/7/2016 10:25 Matrix: Solid
Sample ID: **P-222-160607-1055-dat-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	17.6		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	5.4	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	20300		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	82.4	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366012** Date Collected: 6/7/2016 10:25 Matrix: Solid
Sample ID: **P-222-160607-1055-dat-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	17.6		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	4.5	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	5660		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	82.4	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366013** Date Collected: 6/7/2016 10:25 Matrix: Solid

Sample ID: **P-222-160607-1055-dat-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	14.7		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	4.2	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	2790		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	85.3	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366014** Date Collected: 6/7/2016 10:25 Matrix: Solid
Sample ID: **P-222-160607-1055-dat-S5B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	15.6		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	4.2	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	1830		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	84.4	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366015** Date Collected: 6/1/2016 11:30 Matrix: Solid

Sample ID: **P-225-160601-1130-mel-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	29.1		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	8.6	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	34100		mg/kg	500	SW846 9060A			7/12/16 04:00	CF	A
Total Solids	70.9	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366016** Date Collected: 6/1/2016 11:30 Matrix: Solid
Sample ID: **P-225-160601-1130-mel-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	18.2		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	4.3	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	3960		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	81.8	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

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State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366017**
Sample ID: **P-225-160601-1130-mel-S3B**
Date Collected: 6/1/2016 11:30
Date Received: 7/5/2016 13:19
Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	9.7		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	3.7	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	1740		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	90.3	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Brad W. Kintzer

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Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366018** Date Collected: 6/1/2016 11:30 Matrix: Solid
Sample ID: **P-225-160601-1130-mel-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	17.3		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	4.4	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	3260		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	82.7	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

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Project Coordinator

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State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID: **2156366019** Date Collected: 6/1/2016 11:30 Matrix: Solid

Sample ID: **P-225-160601-1130-mel-S5B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	20.1		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	4.1	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	1910		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	79.9	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental

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ANALYTICAL RESULTS

Workorder: 2156366 89962000

Lab ID:	**2156366020**	Date Collected:	6/1/2016 11:30	Matrix:	Solid
Sample ID:	**P-225-160601-1130-mel-S6B**	Date Received:	7/5/2016 13:19		

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	20.1		%	0.1	S2540G-11			7/11/16 12:36	SLC	A
Solids, Total Volatile	3.9	2	%	1.0	S2540G-11			7/11/16 12:36	SLC	A
Total Organic Carbon (TOC)	2070		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	79.9	1	%	0.1	S2540G-11			7/11/16 12:36	SLC	A

Mr. Brad W Kintzer
Project Coordinator

PARAMETER QUALIFIERS

Lab ID	#	Sample ID	Analytical Method	Analyte
2156366001	1	P-187-160607-1427-jsw-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366001	2	P-187-160607-1427-jsw-S1B	S2540G-11	Total Solids
The RPD associated with this sample was recovered at 12.3%. The RPD is outside method acceptance limits of 5.0%. The results used to calculate the RPD were 50.3 and 44.5%.				
2156366001	3	P-187-160607-1427-jsw-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366002	1	P-187-160607-1427-jsw-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366002	2	P-187-160607-1427-jsw-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366003	1	P-187-160607-1427-jsw-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366003	2	P-187-160607-1427-jsw-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366004	1	P-215-160602-1037-jsw-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366004	2	P-215-160602-1037-jsw-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366005	1	P-215-160602-1037-jsw-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366005	2	P-215-160602-1037-jsw-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366006	1	P-215-160602-1037-jsw-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366006	2	P-215-160602-1037-jsw-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366007	1	P-215-160602-1037-jsw-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366007	2	P-215-160602-1037-jsw-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366008	1	P-215-160602-1037-jsw-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366008	2	P-215-160602-1037-jsw-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366009	1	P-215-160602-1037-jsw-S6B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366009	2	P-215-160602-1037-jsw-S6B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366010	1	P-222-160607-1055-dat-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366010	2	P-222-160607-1055-dat-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

ANALYTICAL RESULTS

Workorder: 2156366 89962000

2156366011	1	P-222-160607-1055-dat-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366011	2	P-222-160607-1055-dat-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366012	1	P-222-160607-1055-dat-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366012	2	P-222-160607-1055-dat-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366013	1	P-222-160607-1055-dat-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366013	2	P-222-160607-1055-dat-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366014	1	P-222-160607-1055-dat-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366014	2	P-222-160607-1055-dat-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366015	1	P-225-160601-1130-mel-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366015	2	P-225-160601-1130-mel-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366016	1	P-225-160601-1130-mel-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366016	2	P-225-160601-1130-mel-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366017	1	P-225-160601-1130-mel-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366017	2	P-225-160601-1130-mel-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366018	1	P-225-160601-1130-mel-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366018	2	P-225-160601-1130-mel-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366019	1	P-225-160601-1130-mel-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366019	2	P-225-160601-1130-mel-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156366020	1	P-225-160601-1130-mel-S6B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156366020	2	P-225-160601-1130-mel-S6B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

ALS Environmental

34 Dogwood Lane
Middletown, PA 17057
P. 717-944-5541
F. 717-944-1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC ALS *2156366*

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave
Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT [X] Normal-Standard TAT is 10-12 business days.
[ ] Rush-Subject to ALS approval and surcharges.
Date Required: 13-Jul-16 Approved By:
Email? [X] -Y Dfenstermacher@rettew.com
Fax? [ ] -Y No.:

Container Type / Container Size / Preservative

ANALYSES/METHOD REQUESTED

Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)	Sample/COC Comments
P-187-160607-1427-jsw-S1B	6/7/2016	1427	G	SO	X	X	
P-187-160607-1427-jsw-S2B	6/7/2016	1427	G	SO	X	X	
P-187-160607-1427-jsw-S3B	6/7/2016	1427	G	SO	X	X	
P-215-160602-1037-jsw-S1B	6/2/2016	1037	G	SO	X	X	
P-215-160602-1037-jsw-S2B	6/2/2016	1037	G	SO	X	X	
P-215-160602-1037-jsw-S3B	6/2/2016	1037	G	SO	X	X	
P-215-160602-1037-jsw-S4B	6/2/2016	1037	G	SO	X	X	
P-215-160602-1037-jsw-S5B	6/2/2016	1037	G	SO	X	X	
P-215-160602-1037-jsw-S6B	6/2/2016	1037	G	SO	X	X	
P-222-160607-1055-dat-S1B	6/7/2016	1055	G	SO	X	X	

Receipt Information (completed by Receiving Lab)
Cooler Temp: 26.2 Therm ID: TH-332
No. of Coolers: ______

	Y	N	Initial
Custody Seals Present?		✓	
(if present) Seals Intact?			
Received on Ice?		✓	
COC/Labels Complete/Accurate?	✓		
Cont. in Good Cond.?	✓		
Correct Containers?	✓		
Correct Sample Volumes?	✓		
Correct Preservation?	✓		
Headspace/Volatiles?			

Courier/Tracking #:

ALS Field Services: __Pickup __Labor __Composite Sampling __Rental Equipment __Other:

Project Comments:

LOGGED BY(signature): DATE 7/16 TIME
REVIEWED BY(signature): DATE TIME

Relinquished By / Company Name	Date	Time	Received By / Company Name	Date	Time
1 D Fenstermacher Rettew	7/1/16	1100	2 ALS	7/5/16	1319
3			4		
5			6		
7			8		
9			10		

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]
Reportable to PADEP? Yes [ ]
PWSID #
EDDS: Format Type-

Special Processing: USACE [ ] Navy [ ] [ ]
Sample Disposal: Lab [ ] Special [ ]

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] VA

* G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

ALS ENVIRONMENTAL SHIPPING ADDRESS: 34 DOGWOOD LANE, MIDDLETOWN, PA 17057

Rev 10/14

ALS Environmental

34 Dogwood Lane
Middletown, PA 17057
P. 717-944-5541
F. 717-944-1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC #: 2156326 | 10 of 19
ALS Quote #:

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave, Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT: [X] Normal-Standard TAT is 10-12 business days. [ ] Rush-Subject to ALS approval and surcharges.
Date Required: 13-Jul-16 Approved By:
Email? [X]-Y Dfenstermacher@rettew.com
Fax? [ ]-Y No.:

ANALYSES/METHOD REQUESTED (Container Type / Container Size / Preservative)

Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)	Sample/COC Comments
P-222-160607-1055-dat-S2B	6/7/2016	1025	G	SO	X	X	
P-222-160607-1055-dat-S3B	6/7/2016	1025	G	SO	X	X	
P-222-160607-1055-dat-S4B	6/7/2016	1025	G	SO	X	X	
P-222-160607-1055-dat-S5B	6/7/2016	1025	G	SO	X	X	
P-225-160601-1130-mel-S1B	6/1/2016	1130	G	SO	X	X	
P-225-160601-1130-mel-S2B	6/1/2016	1130	G	SO	X	X	
P-225-160601-1130-mel-S3B	6/1/2016	1130	G	SO	X	X	
P-225-160601-1130-mel-S4B	6/1/2016	1130	G	SO	X	X	
P-225-160601-1130-mel-S5B	6/1/2016	1130	G	SO	X	X	
P-225-160601-1130-mel-S6B	6/1/2016	1130	G	SO	X	X	

Receipt Information (completed by Receiving Lab)
Cooler Temp: 2.6 Therm ID: TA-35
No. of Coolers:

	Y	N	Initial
Custody Seals Present?		✓	
(if present) Seals Intact?			
Received on Ice?		✓	
COC/Labels Complete/Accurate?	✓		
Cont. in Good Cond.?	✓		
Correct Containers?	✓		
Correct Sample Volumes?	✓		
Correct Preservation?	✓		
Headspace/Volatiles?			

Courier/Tracking #:

ALS Field Services: __Pickup __Labor __Composite Sampling __Rental Equipment __Other:

Project Comments:

LOGGED BY(signature): DATE 7/6 TIME
REVIEWED BY(signature): DATE TIME

	Relinquished By / Company Name	Date	Time		Received By / Company Name	Date	Time
1	D. Fenstermacher Rettew	7/1/16	1100	2	ALS	7/5/16	1310
3				4			
5				6			
7				8			
9				10			

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]
Reportable to PADEP? Yes [ ]
PWSID #
EDDS: Format Type-

Special Processing: USACE [ ] Navy [ ] [ ]
Sample Disposal: Lab [ ] Special [ ]

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] VA

* G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

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NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

July 21, 2016

Mr. Duane Truax
Rettew Associates Inc.
3020 Columbia Avenue
Lancaster, PA 17603

Certificate of Analysis

Revised Report - 7/21/2016 9:59:53 AM - See workorder comment section for explanation

Project Name:	**2016-TOC AND LOI ON SOILS**	Workorder:	**2156367**
Purchase Order:		Workorder ID:	**89962000**

Dear Mr. Truax:

Enclosed are the analytical results for samples received by the laboratory on Tuesday, July 5, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

This laboratory report may not be reproduced, except in full, without the written approval of ALS Environmental.

ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

CC: Mr. Dan Fenstermacher , Rettew

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

SAMPLE SUMMARY

Workorder: 2156367 89962000

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2156367001	P-225B-160601-1312-sdd-S1B	Solid	6/1/2016 13:12	7/5/2016 13:19	Collected by Client
2156367002	P-225B-160601-1312-sdd-S2B	Solid	6/1/2016 13:12	7/5/2016 13:19	Collected by Client
2156367003	P-225B-160601-1312-sdd-S3B	Solid	6/1/2016 13:12	7/5/2016 13:19	Collected by Client
2156367004	P-225B-160601-1312-sdd-S4B	Solid	6/1/2016 13:12	7/5/2016 13:19	Collected by Client
2156367005	P-227-160601-1500-jsw-S1B	Solid	6/1/2016 15:00	7/5/2016 13:19	Collected by Client
2156367006	P-227-160601-1500-jsw-S2B	Solid	6/1/2016 15:00	7/5/2016 13:19	Collected by Client
2156367007	P-227-160601-1500-jsw-S3B	Solid	6/1/2016 15:00	7/5/2016 13:19	Collected by Client
2156367008	P-239-160607-1427-def-S1B	Solid	6/7/2016 14:27	7/5/2016 13:19	Collected by Client
2156367009	P-239-160607-1427-def-S2B	Solid	6/7/2016 14:27	7/5/2016 13:19	Collected by Client
2156367010	P-239-160607-1427-def-S3B	Solid	6/7/2016 14:27	7/5/2016 13:19	Collected by Client
2156367011	P-239-160607-1427-def-S4B	Solid	6/7/2016 14:27	7/5/2016 13:19	Collected by Client
2156367012	P-239A-160607-1430-def-S1B	Solid	6/7/2016 14:30	7/5/2016 13:19	Collected by Client
2156367013	P-239A-160607-1430-def-S2B	Solid	6/7/2016 14:30	7/5/2016 13:19	Collected by Client
2156367014	P-239A-160607-1430-def-S3B	Solid	6/7/2016 14:30	7/5/2016 13:19	Collected by Client
2156367015	P-239A-160607-1430-def-S4B	Solid	6/7/2016 14:30	7/5/2016 13:19	Collected by Client
2156367016	P-239A-160607-1430-def-S5B	Solid	6/7/2016 14:30	7/5/2016 13:19	Collected by Client
2156367017	P-253-160608-0950-mel-S1B	Solid	6/8/2016 09:50	7/5/2016 13:19	Collected by Client
2156367018	P-253-160608-0950-mel-S2B	Solid	6/8/2016 09:50	7/5/2016 13:19	Collected by Client
2156367019	P-253-160608-0950-mel-S3B	Solid	6/8/2016 09:50	7/5/2016 13:19	Collected by Client
2156367020	P-253-160608-0950-mel-S4B	Solid	6/8/2016 09:50	7/5/2016 13:19	Collected by Client
2156367021	P-227-160601-1500-jsw-S4B	Solid	6/1/2016 15:00	7/5/2016 13:19	Collected by Client

SAMPLE SUMMARY

Workorder: 2156367 89962000

Notes

- -- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- -- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- -- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- -- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- -- The Chain of Custody document is included as part of this report.
- -- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- -- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are preformed in the laboratory and are therefore analyzed out of hold time.
- -- Method references listed on this report beginning with the prefix “S” followed by a method number (such as S2310B-97) refer to methods from “Standard Methods for the Examination of Water and Wastewater”.
- -- For microbiological analyses, the "Prepared" value is the date/time into the incurbator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

PROJECT SUMMARY

Workorder: 2156367 89962000

Workorder Comments

This report was modified on 7/21/16 correct the Sample ID on 021. BWK

ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367001** Date Collected: 6/1/2016 13:12 Matrix: Solid

Sample ID: **P-225B-160601-1312-sdd-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	50.0		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	21.8	3	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	140000		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	50.0	1,2	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367002**
Sample ID: **P-225B-160601-1312-sdd-S2B**
Date Collected: 6/1/2016 13:12
Date Received: 7/5/2016 13:19
Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	17.2		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	3.4	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	3990		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	82.8	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
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ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367003** Date Collected: 6/1/2016 13:12 Matrix: Solid
Sample ID: **P-225B-160601-1312-sdd-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	16.7		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	3.2	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	2070		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	83.3	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367004** Date Collected: 6/1/2016 13:12 Matrix: Solid
Sample ID: **P-225B-160601-1312-sdd-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	15.2		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	2.9	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	790		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	84.8	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367005** Date Collected: 6/1/2016 15:00 Matrix: Solid

Sample ID: **P-227-160601-1500-jsw-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	56.8		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	59.1	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	233000		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	43.2	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
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ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367006**
Sample ID: **P-227-160601-1500-jsw-S2B**
Date Collected: 6/1/2016 15:00
Date Received: 7/5/2016 13:19
Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	36.4		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	32.5	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	119000		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	63.6	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367007** Date Collected: 6/1/2016 15:00 Matrix: Solid
Sample ID: **P-227-160601-1500-jsw-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	15.8		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	5.9	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	20000		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	84.2	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367008** Date Collected: 6/7/2016 14:27 Matrix: Solid

Sample ID: **P-239-160607-1427-def-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	34.0		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	13.8	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	70900		mg/kg	500	SW846 9060A			7/15/16 11:30	CF	A
Total Solids	66.0	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367009**
Sample ID: **P-239-160607-1427-def-S2B**
Date Collected: 6/7/2016 14:27
Date Received: 7/5/2016 13:19
Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	14.8		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	4.6	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	5050		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	85.2	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367010** Date Collected: 6/7/2016 14:27 Matrix: Solid
Sample ID: **P-239-160607-1427-def-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	8.8		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	3.9	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	980		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	91.2	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367011** Date Collected: 6/7/2016 14:27 Matrix: Solid

Sample ID: **P-239-160607-1427-def-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	11.9		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	3.8	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	24800	3	mg/kg	500	SW846 9060A			7/15/16 11:30	CF	A
Total Solids	88.1	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367012** Date Collected: 6/7/2016 14:30 Matrix: Solid
Sample ID: **P-239A-160607-1430-def-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	28.5		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	10.6	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	69900		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	71.5	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367013** Date Collected: 6/7/2016 14:30 Matrix: Solid
Sample ID: **P-239A-160607-1430-def-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	12.9		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	4.0	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	6120		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	87.1	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367014** Date Collected: 6/7/2016 14:30 Matrix: Solid

Sample ID: **P-239A-160607-1430-def-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	7.5		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	2.6	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	2990		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	92.5	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367015** Date Collected: 6/7/2016 14:30 Matrix: Solid
Sample ID: **P-239A-160607-1430-def-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	21.8		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	4.1	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	4190		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	78.2	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367016**
Sample ID: **P-239A-160607-1430-def-S5B**
Date Collected: 6/7/2016 14:30
Date Received: 7/5/2016 13:19
Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	24.4		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	4.3	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	4350		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	75.6	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
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ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367017** Date Collected: 6/8/2016 09:50 Matrix: Solid
Sample ID: **P-253-160608-0950-mel-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	46.7		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	27.6	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	273000		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	53.3	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367018** Date Collected: 6/8/2016 09:50 Matrix: Solid
Sample ID: **P-253-160608-0950-mel-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	20.3		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	6.7	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	35400		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	79.7	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367019** Date Collected: 6/8/2016 09:50 Matrix: Solid

Sample ID: **P-253-160608-0950-mel-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	14.0		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	4.1	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	9800		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	86.0	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID:	**2156367020**	Date Collected:	6/8/2016 09:50	Matrix:	Solid
Sample ID:	**P-253-160608-0950-mel-S4B**	Date Received:	7/5/2016 13:19		

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	11.0		%	0.1	S2540G-11			7/11/16 14:42	SLC	A
Solids, Total Volatile	2.8	2	%	1.0	S2540G-11			7/11/16 14:42	SLC	A
Total Organic Carbon (TOC)	4740		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	89.0	1	%	0.1	S2540G-11			7/11/16 14:42	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

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NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156367 89962000

Lab ID: **2156367021** Date Collected: 6/1/2016 15:00 Matrix: Solid

Sample ID: **P-227-160601-1500-jsw-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	12.9		%	0.1	S2540G-11			7/12/16 13:51	SLC	A
Solids, Total Volatile	3.7	2	%	1.0	S2540G-11			7/12/16 13:51	SLC	A
Total Organic Carbon (TOC)	2860		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	87.1	1	%	0.1	S2540G-11			7/12/16 13:51	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

PARAMETER QUALIFIERS

Lab ID	#	Sample ID	Analytical Method	Analyte
2156367001	1	P-225B-160601-1312-sdd-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367001	2	P-225B-160601-1312-sdd-S1B	S2540G-11	Total Solids
The RPD associated with this sample was recovered at 5.6%. The RPD is outside method acceptance limits of 5.0%. The results used to calculate the RPD were 50 and 52.9%.				
2156367001	3	P-225B-160601-1312-sdd-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367002	1	P-225B-160601-1312-sdd-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367002	2	P-225B-160601-1312-sdd-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367003	1	P-225B-160601-1312-sdd-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367003	2	P-225B-160601-1312-sdd-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367004	1	P-225B-160601-1312-sdd-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367004	2	P-225B-160601-1312-sdd-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367005	1	P-227-160601-1500-jsw-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367005	2	P-227-160601-1500-jsw-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367006	1	P-227-160601-1500-jsw-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367006	2	P-227-160601-1500-jsw-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367007	1	P-227-160601-1500-jsw-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367007	2	P-227-160601-1500-jsw-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367008	1	P-239-160607-1427-def-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367008	2	P-239-160607-1427-def-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367009	1	P-239-160607-1427-def-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367009	2	P-239-160607-1427-def-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367010	1	P-239-160607-1427-def-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367010	2	P-239-160607-1427-def-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

ANALYTICAL RESULTS

Workorder: 2156367 89962000

2156367011	1	P-239-160607-1427-def-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367011	2	P-239-160607-1427-def-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367011	3	P-239-160607-1427-def-S4B	SW846 9060A	Total Organic Carbon (TOC)
Due to sample matrix, an average of four individual injections were used to calculate the final result. No two injections met method criteria. JWB 7-17-16				
2156367012	1	P-239A-160607-1430-def-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367012	2	P-239A-160607-1430-def-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367013	1	P-239A-160607-1430-def-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367013	2	P-239A-160607-1430-def-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367014	1	P-239A-160607-1430-def-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367014	2	P-239A-160607-1430-def-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367015	1	P-239A-160607-1430-def-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367015	2	P-239A-160607-1430-def-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367016	1	P-239A-160607-1430-def-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367016	2	P-239A-160607-1430-def-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367017	1	P-253-160608-0950-mel-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367017	2	P-253-160608-0950-mel-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367018	1	P-253-160608-0950-mel-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367018	2	P-253-160608-0950-mel-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367019	1	P-253-160608-0950-mel-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367019	2	P-253-160608-0950-mel-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367020	1	P-253-160608-0950-mel-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				

ANALYTICAL RESULTS

Workorder: 2156367 89962000

2156367020	2	P-253-160608-0950-mel-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156367021	1	P-227-160601-1500-jsw-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156367021	2	P-227-160601-1500-jsw-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

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P. 717-944-5541
F. 717-944-1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC #: 1 of 9

ALS Qu... * 2 1 5 6 3 6 7 *

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave
Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT: [X] Normal-Standard TAT is 10-12 business days. [ ] Rush-Subject to ALS approval and surcharges.

Date Required: 13-Jul-16 Approved By:

Email? [X]-Y Dfenstermacher@rettew.com

Fax? [ ]-Y No.:

Container Type / Container Size / Preservative

ANALYSES/METHOD REQUESTED

Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)
P-225B-160601-1312-sdd-S1B	6/1/2016	1312	G	SO	X	X
P-225B-160601-1312-sdd-S2B	6/1/2016	1312	G	SO	X	X
P-225B-160601-1312-sdd-S3B	6/1/2016	1312	G	SO	X	X
P-225B-160601-1312-sdd-S4B	6/1/2016	1312	G	SO	X	X
P-227-160601-1500-jsw-S1B	6/1/2016	1500	G	SO	X	X
P-227-160601-1500-jsw-S2B	6/1/2016	1500	G	SO	X	X
P-227-160601-1500-jsw-S3B	6/1/2016	1500	G	SO	X	X
P-239-160607-1427-def-S1B	6/7/2016	1427	G	SO	X	X
P-239-160607-1427-def-S2B	6/7/2016	1427	G	SO	X	X
P-239-160607-1427-def-S3B	6/7/2016	1427	G	SO	X	X

Receipt Information (completed by Receiving Lab)

Cooler Temp: 2.6°C Therm ID: TH-352
No. of Coolers:

	Y	N	Initial
Custody Seals Present?		✓	[illegible]
(if present) Seals Intact?			
Received on Ice?		✓	
COC/Labels Complete/Accurate?	✓		
Cont. in Good Cond.?	✓		
Correct Containers?	✓		
Correct Sample Volumes?	✓		
Correct Preservation?	✓		
Headspace/Volatiles?			

Courier/Tracking #:

Sample/COC Comments

ALS Field Services: _Pickup _Labor _Composite Sampling _Rental Equipment _Other:

Project Comments: Rec'd P-227-160601-1500-DEF-S4B

LOGGED BY(signature): [signature] Date: 7/6

REVIEWED BY(signature):

Relinquished By / Company Name	Date	Time	Received By / Company Name	Date	Time
1 DFenstermacher / Rettew	7/1/16	1109	2 [signature] ALS	7/5/16	1315
3			4		
5			6		
7			8		
9			10		

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]

Reportable to PADEP? Yes [ ]
PWSID #

EDDS: Format Type-

Special Processing: USACE [ ] Navy [ ] [ ]

Sample Disposal: Lab [ ] Special [ ]

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] VA

*G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

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F.717-944-1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC #: 2156367 — 12 of 19

ALS Quote #:

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave
Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT: [X] Normal-Standard TAT is 10-12 business days. [ ] Rush-Subject to ALS approval and surcharges.
Date Required: 13-Jul-16 Approved By:
Email? [X]-Y Dfenstermacher@rettew.com
Fax? [ ]-Y No.:

ANALYSES/METHOD REQUESTED

Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)	Sample/COC Comments
P-239-160607-1427-def-S4B	6/7/2016	1427	G	SO	X	X	
P-239A-160607-1430-def-S1B	6/7/2016	1430	G	SO	X	X	
P-239A-160607-1430-def-S2B	6/7/2016	1430	G	SO	X	X	
P-239A-160607-1430-def-S3B	6/7/2016	1430	G	SO	X	X	
P-239A-160607-1430-def-S4B	6/7/2016	1430	G	SO	X	X	
P-239A-160607-1430-def-S5B	6/7/2016	1430	G	SO	X	X	
P-253-160608-0950-mel-S1B	6/8/2016	950	G	SO	X	X	
P-253-160608-0950-mel-S2B	6/8/2016	950	G	SO	X	X	
P-253-160608-0950-mel-S3B	6/8/2016	950	G	SO	X	X	
P-253-160608-0950-mel-S4B	6/8/2016	950	G	SO	X	X	

Receipt Information (completed by Receiving Lab)
Cooler Temp: 26.2 Therm ID: TH-352
No. of Coolers:

	Y	N	Initial
Custody Seals Present?		✓	JS
(if present) Seals Intact?			
Received on Ice?		✓	
COC/Labels Complete/Accurate?	✓		
Cont. In Good Cond.?	✓		
Correct Containers?	✓		
Correct Sample Volumes?	✓		
Correct Preservation?	✓		
Headspace/Volatiles?			

Courier/Tracking #:

ALS Field Services: _Pickup _Labor _Composite Sampling _Rental Equipment _Other:

Project Comments:

LOGGED BY(signature): Date: 7/6
REVIEWED BY(signature):

	Relinquished By / Company Name	Date	Time		Received By / Company Name	Date	Time
1	D Fenstermacher Rettew	7/1/16	1100	2	ALS	7/5/16	1350
3				4			
5				6			
7				8			
9				10			

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]
Special Processing: USACE [ ] Navy [ ] [ ]
State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] VA
Reportable to PADEP? Yes [ ]
PWSID #
Sample Disposal: Lab [ ] Special [ ]
EDDS: Format Type-

* G=Grab; C=Composite **Matrix - AI=Air, DW=Drinking Water, GW=Groundwater, OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

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State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

July 18, 2016

Mr. Duane Truax
Rettew Associates Inc.
3020 Columbia Avenue
Lancaster, PA 17603

Certificate of Analysis

Project Name:	**2016-TOC AND LOI ON SOILS**	Workorder:	**2156368**
Purchase Order:		Workorder ID:	**89962000**

Dear Mr. Truax:

Enclosed are the analytical results for samples received by the laboratory on Tuesday, July 5, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

This laboratory report may not be reproduced, except in full, without the written approval of ALS Environmental.

ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

CC: Mr. Dan Fenstermacher , Rettew

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

SAMPLE SUMMARY

Workorder: 2156368 89962000

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2156368001	P-254-160608-1050-mel-S1B	Solid	6/8/2016 10:50	7/5/2016 13:19	Collected by Client
2156368002	P-254-160608-1050-mel-S2B	Solid	6/8/2016 10:50	7/5/2016 13:19	Collected by Client
2156368003	P-254-160608-1050-mel-S3B	Solid	6/8/2016 10:50	7/5/2016 13:19	Collected by Client
2156368004	P-254-160608-1050-mel-S4B	Solid	6/8/2016 10:50	7/5/2016 13:19	Collected by Client
2156368005	P-276-160610-0838-jsw-S1B	Solid	6/10/2016 08:38	7/5/2016 13:19	Collected by Client
2156368006	P-276-160610-0838-jsw-S2B	Solid	6/10/2016 08:38	7/5/2016 13:19	Collected by Client
2156368007	P-276-160610-0838-jsw-S3B	Solid	6/10/2016 08:38	7/5/2016 13:19	Collected by Client
2156368008	P-276-160610-0838-jsw-S4B	Solid	6/10/2016 08:38	7/5/2016 13:19	Collected by Client
2156368009	P-276-160610-0838-jsw-S5B	Solid	6/10/2016 08:38	7/5/2016 13:19	Collected by Client
2156368010	P-279-160610-1359-dat-S1B	Solid	6/10/2016 13:59	7/5/2016 13:19	Collected by Client
2156368011	P-279-160610-1359-dat-S2B	Solid	6/10/2016 13:59	7/5/2016 13:19	Collected by Client
2156368012	P-279-160610-1359-dat-S3B	Solid	6/10/2016 13:59	7/5/2016 13:19	Collected by Client
2156368013	P-279-160610-1359-dat-S4B	Solid	6/10/2016 13:59	7/5/2016 13:19	Collected by Client
2156368014	P-279-160610-1359-dat-S5B	Solid	6/10/2016 13:59	7/5/2016 13:19	Collected by Client
2156368015	P-279A-160610-1450-def-S1B	Solid	6/10/2016 14:50	7/5/2016 13:19	Collected by Client
2156368016	P-279A-160610-1450-def-S2B	Solid	6/10/2016 14:50	7/5/2016 13:19	Collected by Client
2156368017	P-279A-160610-1450-def-S3B	Solid	6/10/2016 14:50	7/5/2016 13:19	Collected by Client
2156368018	P-279A-160610-1450-def-S4B	Solid	6/10/2016 14:50	7/5/2016 13:19	Collected by Client
2156368019	P-283-160606-0743-def-S1B	Solid	6/6/2016 07:43	7/5/2016 13:19	Collected by Client
2156368020	P-283-160606-0743-def-S2B	Solid	6/6/2016 07:43	7/5/2016 13:19	Collected by Client

SAMPLE SUMMARY

Workorder: 2156368 89962000

Notes

- -- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- -- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- -- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- -- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- -- The Chain of Custody document is included as part of this report.
- -- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- -- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are preformed in the laboratory and are therefore analyzed out of hold time.
- -- Method references listed on this report beginning with the prefix “S” followed by a method number (such as S2310B-97) refer to methods from “Standard Methods for the Examination of Water and Wastewater”.
- -- For microbiological analyses, the "Prepared" value is the date/time into the incurbator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

ALS Environmental
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NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID: **2156368001** Date Collected: 6/8/2016 10:50 Matrix: Solid

Sample ID: **P-254-160608-1050-mel-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	59.9		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	67.8	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	300000		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	40.1	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID: **2156368002** Date Collected: 6/8/2016 10:50 Matrix: Solid

Sample ID: **P-254-160608-1050-mel-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	20.1		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	8.7	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	29400		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	79.9	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID: **2156368003**
Date Collected: 6/8/2016 10:50
Matrix: Solid
Sample ID: **P-254-160608-1050-mel-S3B**
Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	14.4		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	4.4	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	10800		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	85.6	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID:	**2156368004**	Date Collected:	6/8/2016 10:50
Sample ID:	**P-254-160608-1050-mel-S4B**	Date Received:	7/5/2016 13:19

Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	13.2		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	4.4	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	6940		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	86.8	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID: **2156368005** Date Collected: 6/10/2016 08:38 Matrix: Solid
Sample ID: **P-276-160610-0838-jsw-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	40.3		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	20.8	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	86500		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	59.7	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID: **2156368006** Date Collected: 6/10/2016 08:38 Matrix: Solid
Sample ID: **P-276-160610-0838-jsw-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	13.9		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	4.5	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	25700		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	86.1	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID: **2156368007** Date Collected: 6/10/2016 08:38 Matrix: Solid
Sample ID: **P-276-160610-0838-jsw-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	9.6		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	3.2	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	7530		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	90.4	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID: **2156368008** Date Collected: 6/10/2016 08:38 Matrix: Solid

Sample ID: **P-276-160610-0838-jsw-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	16.0		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	4.9	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	11000		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	84.0	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID: **2156368009** Date Collected: 6/10/2016 08:38 Matrix: Solid

Sample ID: **P-276-160610-0838-jsw-S5B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	8.6		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	3.1	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	2800		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	91.4	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID:	**2156368010**	Date Collected:	6/10/2016 13:59	Matrix:	Solid
Sample ID:	**P-279-160610-1359-dat-S1B**	Date Received:	7/5/2016 13:19		

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	47.4		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	36.3	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	212000		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	52.6	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID:	**2156368011**	Date Collected:	6/10/2016 13:59
Sample ID:	**P-279-160610-1359-dat-S2B**	Date Received:	7/5/2016 13:19

Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	31.3		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	17.3	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	92400		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	68.7	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID: **2156368012** Date Collected: 6/10/2016 13:59 Matrix: Solid
Sample ID: **P-279-160610-1359-dat-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	14.4		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	4.5	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	19400		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	85.6	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID: **2156368013** Date Collected: 6/10/2016 13:59 Matrix: Solid

Sample ID: **P-279-160610-1359-dat-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	10.7		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	2.8	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	3870		mg/kg	500	SW846 9060A			7/12/16 16:00	CF	A
Total Solids	89.3	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID:	**2156368014**	Date Collected:	6/10/2016 13:59	Matrix:	Solid
Sample ID:	**P-279-160610-1359-dat-S5B**	Date Received:	7/5/2016 13:19		

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	6.9		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	2.7	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	2050		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	93.1	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID: **2156368015** Date Collected: 6/10/2016 14:50 Matrix: Solid
Sample ID: **P-279A-160610-1450-def-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	26.6		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	11.4	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	83900		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	73.4	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
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ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID: **2156368016**　Date Collected: 6/10/2016 14:50　Matrix: Solid

Sample ID: **P-279A-160610-1450-def-S2B**　Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	15.1		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	3.2	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	5870		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	84.9	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID: **2156368017**
Sample ID: **P-279A-160610-1450-def-S3B**

Date Collected: 6/10/2016 14:50
Date Received: 7/5/2016 13:19
Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	9.9		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	3.0	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	2880		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	90.1	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
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ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID: **2156368018**
Sample ID: **P-279A-160610-1450-def-S4B**
Date Collected: 6/10/2016 14:50
Date Received: 7/5/2016 13:19
Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	15.1		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	3.6	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	1040		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	84.9	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID: **2156368019** Date Collected: 6/6/2016 07:43 Matrix: Solid

Sample ID: **P-283-160606-0743-def-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	72.8		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	89.8	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	453000		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	27.2	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156368 89962000

Lab ID: **2156368020** Date Collected: 6/6/2016 07:43 Matrix: Solid

Sample ID: **P-283-160606-0743-def-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	23.0		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	7.6	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	35600		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	77.0	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

PARAMETER QUALIFIERS

Lab ID	#	Sample ID	Analytical Method	Analyte
2156368001	1	P-254-160608-1050-mel-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368001	2	P-254-160608-1050-mel-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368002	1	P-254-160608-1050-mel-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368002	2	P-254-160608-1050-mel-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368003	1	P-254-160608-1050-mel-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368003	2	P-254-160608-1050-mel-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368004	1	P-254-160608-1050-mel-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368004	2	P-254-160608-1050-mel-S4B	S2540G-11	Solids, Total Volatile
WETC-103				
2156368005	1	P-276-160610-0838-jsw-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368005	2	P-276-160610-0838-jsw-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368006	1	P-276-160610-0838-jsw-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368006	2	P-276-160610-0838-jsw-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368007	1	P-276-160610-0838-jsw-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368007	2	P-276-160610-0838-jsw-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368008	1	P-276-160610-0838-jsw-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368008	2	P-276-160610-0838-jsw-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368009	1	P-276-160610-0838-jsw-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368009	2	P-276-160610-0838-jsw-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368010	1	P-279-160610-1359-dat-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368010	2	P-279-160610-1359-dat-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368011	1	P-279-160610-1359-dat-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368011	2	P-279-160610-1359-dat-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

ANALYTICAL RESULTS

Workorder: 2156368 89962000

2156368012	1	P-279-160610-1359-dat-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368012	2	P-279-160610-1359-dat-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368013	1	P-279-160610-1359-dat-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368013	2	P-279-160610-1359-dat-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368014	1	P-279-160610-1359-dat-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368014	2	P-279-160610-1359-dat-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368015	1	P-279A-160610-1450-def-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368015	2	P-279A-160610-1450-def-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368016	1	P-279A-160610-1450-def-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368016	2	P-279A-160610-1450-def-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368017	1	P-279A-160610-1450-def-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368017	2	P-279A-160610-1450-def-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368018	1	P-279A-160610-1450-def-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368018	2	P-279A-160610-1450-def-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368019	1	P-283-160606-0743-def-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368019	2	P-283-160606-0743-def-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156368020	1	P-283-160606-0743-def-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156368020	2	P-283-160606-0743-def-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

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F.717-944-1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

* 2 1 5 6 3 6 8 *

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave
Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT [X] Normal-Standard TAT is 10-12 business days.
[ ] Rush-Subject to ALS approval and surcharges.
Date Required: 13-Jul-16 Approved By:
Email? [X]-Y Dfenstermacher@rettew.com
Fax? [ ]-Y No.:

Receiving Lab)
Cooler Temp: 2.6 Therm ID: TH-352
No. of Coolers:

	Y	N	Initial
Custody Seals Present?		✓	JS
(If present) Seals Intact?			
Received on Ice?		✓	
COC/Labels Complete/Accurate?	✓		
Cont. in Good Cond.?	✓		
Correct Containers?	✓		
Correct Sample Volumes?	✓		
Correct Preservation?	✓		
Headspace/Volatiles?			

Courier/Tracking #:

ANALYSES/METHOD REQUESTED — Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)	Sample/COC Comments
P-254-160608-1050-mel-S1B	6/8/2016	1050	G	SO	X	X	
P-254-160608-1050-mel-S2B	6/8/2016	1050	G	SO	X	X	
P-254-160608-1050-mel-S3B	6/8/2016	1050	G	SO	X	X	
P-254-160608-1050-mel-S4B	6/8/2016	1050	G	SO	X	X	
P-276-160610-0838-jsw-S1B	6/10/2016	838	G	SO	X	X	
P-276-160610-0838-jsw-S2B	6/10/2016	838	G	SO	X	X	
P-276-160610-0838-jsw-S3B	6/10/2016	838	G	SO	X	X	
P-276-160610-0838-jsw-S4B	6/10/2016	838	G	SO	X	X	
P-276-160610-0838-jsw-S5B	6/10/2016	838	G	SO	X	X	
P-279-160610-1359-dat-S1B	6/10/2016	1359	G	SO	X	X	

ALS Field Services: __Pickup __Labor __Composite Sampling __Rental Equipment __Other:

Project Comments:

LOGGED BY(signature): Date 7/12
REVIEWED BY(signature):

Relinquished By / Company Name	Date	Time	Received By / Company Name	Date	Time
1 DFenstermacher Rettew	7/1/16	1104	2	7/1/16	1319
3			4		
5			6		
7			8		
9			10		

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]

Special Processing: USACE [ ] Navy [ ]

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] VA

Reportable to PADEP? Yes [ ]
PWSID #

Sample Disposal: Lab [ ] Special [ ]

EDDS: Format Type-

* G=Grab; C=Composite **Matrix - Al=Air; DW=Drinking Water; GW=Groundwater; Ol=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

ALS ENVIRONMENTAL SHIPPING ADDRESS: 34 DOGWOOD LANE, MIDDLETOWN, PA 17057

Rev 10/14

ALS Environmental

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Middletown, PA 17057
P. 717-944-5541
F. 717-944-1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC #: 2156368
ALS Quote #:

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave
Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-276-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT: [X] Normal-Standard TAT is 10-12 business days. [ ] Rush-Subject to ALS approval and surcharges.
Date Required: 13-Jul-16 Approved By:
Email? [X] -Y Dfenstermacher@rettew.com
Fax? [ ] -Y No.:

Container Type / Container Size / Preservative

ANALYSES/METHOD REQUESTED

Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)	Sample/COC Comments
P-279-160610-1359-dat-S2B	6/10/2016	1359	G	SO	X	X	
P-279-160610-1359-dat-S3B	6/10/2016	1359	G	SO	X	X	
P-279-160610-1359-dat-S4B	6/10/2016	1359	G	SO	X	X	
P-279-160610-1359-dat-S5B	6/10/2016	1359	G	SO	X	X	
P-279A-160610-1450-def-S1B	6/10/2016	1450	G	SO	X	X	
P-279A-160610-1450-def-S2B	6/10/2016	1450	G	SO	X	X	
P-279A-160610-1450-def-S3B	6/10/2016	1450	G	SO	X	X	
P-279A-160610-1450-def-S4B	6/10/2016	1450	G	SO	X	X	
P-283-160606-0743-def-S1B	6/6/2016	743	G	SO	X	X	
P-283-160606-0743-def-S2B	6/6/2016	743	G	SO	X	X	

Receipt Information (completed by Receiving Lab)
Cooler Temp: 26°C Therm ID: TH-352
No. of Coolers: ____

	Y	N	Initial
Custody Seals Present?		✓	
(if present) Seals Intact?			
Received on Ice?		✓	
COC/Labels Complete/Accurate?	✓		
Cont. in Good Cond.?	✓		
Correct Containers?	✓		
Correct Sample Volumes?	✓		
Correct Preservation?			
Headspace/Volatiles?			

Courier/Tracking #:

ALS Field Services: __Pickup __Labor __Composite Sampling __Rental Equipment __Other:

Project Comments:
LOGGED BY(signature): DATE 7/1/16 TIME
REVIEWED BY(signature): DATE TIME

	Relinquished By / Company Name	Date	Time		Received By / Company Name	Date	Time
1	DFenstermacher - Rettew	7/1/16	[illegible]	2	[signature] ALS	7/5/16	1319
3				4			
5				6			
7				8			
9				10			

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]
Reportable to PADEP? Yes [ ]
PWSID #
EDDS: Format Type-

Special Processing: USACE [ ] Navy [ ] [ ]
Sample Disposal: Lab [ ] Special [ ]

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] VA

* G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

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July 18, 2016

Mr. Duane Truax
Rettew Associates Inc.
3020 Columbia Avenue
Lancaster, PA 17603

Certificate of Analysis

Project Name:	**2016-TOC AND LOI ON SOILS**	Workorder:	**2156369**
Purchase Order:		Workorder ID:	**89962000**

Dear Mr. Truax:

Enclosed are the analytical results for samples received by the laboratory on Tuesday, July 5, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

This laboratory report may not be reproduced, except in full, without the written approval of ALS Environmental.

ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

CC: Mr. Dan Fenstermacher , Rettew

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental

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State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

SAMPLE SUMMARY

Workorder: 2156369 89962000

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2156369001	P-283-160606-0743-def-S3B	Solid	6/6/2016 07:43	7/5/2016 13:19	Collected by Client
2156369002	P-283-160606-0743-def-S4B	Solid	6/6/2016 07:43	7/5/2016 13:19	Collected by Client
2156369003	P-283-160606-0743-def-S5B	Solid	6/6/2016 07:43	7/5/2016 13:19	Collected by Client
2156369004	P-283-160606-0743-def-S6B	Solid	6/6/2016 07:43	7/5/2016 13:19	Collected by Client
2156369005	P-286-160606-0808-def-S1B	Solid	6/6/2016 08:08	7/5/2016 13:19	Collected by Client
2156369006	P-286-160606-0808-def-S2B	Solid	6/6/2016 08:08	7/5/2016 13:19	Collected by Client
2156369007	P-286-160606-0808-def-S3B	Solid	6/6/2016 08:08	7/5/2016 13:19	Collected by Client
2156369008	P-286-160606-0808-def-S4B	Solid	6/6/2016 08:08	7/5/2016 13:19	Collected by Client
2156369009	P-290-160606-1445-mel-S1B	Solid	6/6/2016 14:45	7/5/2016 13:19	Collected by Client
2156369010	P-290-160606-1445-mel-S2B	Solid	6/6/2016 14:45	7/5/2016 13:19	Collected by Client
2156369011	P-290-160606-1445-mel-S3B	Solid	6/6/2016 14:45	7/5/2016 13:19	Collected by Client
2156369012	P-290-160606-1445-mel-S4B	Solid	6/6/2016 14:45	7/5/2016 13:19	Collected by Client
2156369013	P-291-160606-1330-mel-S1B	Solid	6/6/2016 13:30	7/5/2016 13:19	Collected by Client
2156369014	P-291-160606-1330-mel-S2B	Solid	6/6/2016 13:30	7/5/2016 13:19	Collected by Client
2156369015	P-291-160606-1330-mel-S3B	Solid	6/6/2016 13:30	7/5/2016 13:19	Collected by Client
2156369016	P-291-160606-1330-mel-S4B	Solid	6/6/2016 13:30	7/5/2016 13:19	Collected by Client
2156369017	P-347-160621-1409-def-S1B	Solid	6/21/2016 14:09	7/5/2016 13:19	Collected by Client
2156369018	P-347-160621-1409-def-S2B	Solid	6/21/2016 14:09	7/5/2016 13:19	Collected by Client
2156369019	P-352-160621-1145-def-S1B	Solid	6/21/2016 11:45	7/5/2016 13:19	Collected by Client
2156369020	P-352-160621-1145-def-S2B	Solid	6/21/2016 11:45	7/5/2016 13:19	Collected by Client

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SAMPLE SUMMARY

Workorder: 2156369 89962000

Notes

- -- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- -- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- -- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- -- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- -- The Chain of Custody document is included as part of this report.
- -- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- -- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are preformed in the laboratory and are therefore analyzed out of hold time.
- -- Method references listed on this report beginning with the prefix “S” followed by a method number (such as S2310B-97) refer to methods from “Standard Methods for the Examination of Water and Wastewater”.
- -- For microbiological analyses, the "Prepared" value is the date/time into the incurbator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

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ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369001** Date Collected: 6/6/2016 07:43 Matrix: Solid
Sample ID: **P-283-160606-0743-def-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	13.2		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	3.8		%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	6890		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	86.8	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369002** Date Collected: 6/6/2016 07:43 Matrix: Solid

Sample ID: **P-283-160606-0743-def-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	11.9		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	4.2	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	1360		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	88.1	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

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State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369003** Date Collected: 6/6/2016 07:43 Matrix: Solid

Sample ID: **P-283-160606-0743-def-S5B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	13.3		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	4.3	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	1030		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	86.7	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369004** | Date Collected: 6/6/2016 07:43 | Matrix: Solid
Sample ID: **P-283-160606-0743-def-S6B** | Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	9.7		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	3.7	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	1610		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	90.3	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
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ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369005** Date Collected: 6/6/2016 08:08 Matrix: Solid

Sample ID: **P-286-160606-0808-def-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	65.1		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	91.1	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	470000		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	34.9	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369006** Date Collected: 6/6/2016 08:08 Matrix: Solid
Sample ID: **P-286-160606-0808-def-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	18.3		%	0.1	S2540G-11			7/7/16 10:31	SLC	A
Solids, Total Volatile	3.8	2	%	1.0	S2540G-11			7/7/16 10:31	SLC	A
Total Organic Carbon (TOC)	6910		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	81.7	1	%	0.1	S2540G-11			7/7/16 10:31	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369007** Date Collected: 6/6/2016 08:08 Matrix: Solid

Sample ID: **P-286-160606-0808-def-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	13.5		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	1.8	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	1450		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	86.5	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369008** Date Collected: 6/6/2016 08:08 Matrix: Solid

Sample ID: **P-286-160606-0808-def-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	12.7		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	3.6	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	1950		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	87.3	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369009**

Sample ID: **P-290-160606-1445-mel-S1B**

Date Collected: 6/6/2016 14:45

Date Received: 7/5/2016 13:19

Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	67.5		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	97.1	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	526000		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	32.5	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID:	**2156369010**	Date Collected:	6/6/2016 14:45	Matrix:	Solid
Sample ID:	**P-290-160606-1445-mel-S2B**	Date Received:	7/5/2016 13:19		

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	27.9		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	8.2	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	36800		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	72.1	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369011** Date Collected: 6/6/2016 14:45 Matrix: Solid
Sample ID: **P-290-160606-1445-mel-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	20.2		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	2.7	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	7620		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	79.8	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369012** Date Collected: 6/6/2016 14:45 Matrix: Solid

Sample ID: **P-290-160606-1445-mel-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	17.4		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	3.4	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	2730		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	82.6	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369013** Date Collected: 6/6/2016 13:30 Matrix: Solid

Sample ID: **P-291-160606-1330-mel-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	29.1		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	11.8	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	82800		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	70.9	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental

34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
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ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369014** Date Collected: 6/6/2016 13:30 Matrix: Solid

Sample ID: **P-291-160606-1330-mel-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	20.4		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	4.1	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	10300		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	79.6	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369015** Date Collected: 6/6/2016 13:30 Matrix: Solid
Sample ID: **P-291-160606-1330-mel-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	21.8		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	5.5	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	4500		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	78.2	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369016** Date Collected: 6/6/2016 13:30 Matrix: Solid

Sample ID: **P-291-160606-1330-mel-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	11.9		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	3.3	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	1260		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	88.1	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369017**
Sample ID: **P-347-160621-1409-def-S1B**

Date Collected: 6/21/2016 14:09
Date Received: 7/5/2016 13:19
Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	17.5		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	17.9	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	198000		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	82.5	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369018** Date Collected: 6/21/2016 14:09 Matrix: Solid

Sample ID: **P-347-160621-1409-def-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	15.6		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	6.1	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	14100		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	84.4	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental

34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID: **2156369019** Date Collected: 6/21/2016 11:45 Matrix: Solid

Sample ID: **P-352-160621-1145-def-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	69.6		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	66.8	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	324000		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	30.4	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156369 89962000

Lab ID:	**2156369020**	Date Collected: 6/21/2016 11:45	Matrix: Solid
Sample ID:	**P-352-160621-1145-def-S2B**	Date Received: 7/5/2016 13:19	

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	28.1		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	10.7	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	54800		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	71.9	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

PARAMETER QUALIFIERS

Lab ID	#	Sample ID	Analytical Method	Analyte
2156369001	1	P-283-160606-0743-def-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369002	1	P-283-160606-0743-def-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369002	2	P-283-160606-0743-def-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369003	1	P-283-160606-0743-def-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369003	2	P-283-160606-0743-def-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369004	1	P-283-160606-0743-def-S6B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369004	2	P-283-160606-0743-def-S6B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369005	1	P-286-160606-0808-def-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369005	2	P-286-160606-0808-def-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369006	1	P-286-160606-0808-def-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369006	2	P-286-160606-0808-def-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369007	1	P-286-160606-0808-def-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369007	2	P-286-160606-0808-def-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369008	1	P-286-160606-0808-def-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369008	2	P-286-160606-0808-def-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369009	1	P-290-160606-1445-mel-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369009	2	P-290-160606-1445-mel-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369010	1	P-290-160606-1445-mel-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369010	2	P-290-160606-1445-mel-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369011	1	P-290-160606-1445-mel-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369011	2	P-290-160606-1445-mel-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369012	1	P-290-160606-1445-mel-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				

ANALYTICAL RESULTS

Workorder: 2156369 89962000

2156369012	2	P-290-160606-1445-mel-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369013	1	P-291-160606-1330-mel-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369013	2	P-291-160606-1330-mel-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369014	1	P-291-160606-1330-mel-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369014	2	P-291-160606-1330-mel-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369015	1	P-291-160606-1330-mel-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369015	2	P-291-160606-1330-mel-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369016	1	P-291-160606-1330-mel-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369016	2	P-291-160606-1330-mel-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369017	1	P-347-160621-1409-def-S1B	S2540G-11	Total Solids
The RPD associated with this sample was recovered at 6.4%. The RPD is outside method acceptance limits of 5.0%. The results used to calculate the RPD were 87.9 and 82.5%.				
2156369017	2	P-347-160621-1409-def-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369018	1	P-347-160621-1409-def-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369018	2	P-347-160621-1409-def-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369019	1	P-352-160621-1145-def-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369019	2	P-352-160621-1145-def-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156369020	1	P-352-160621-1145-def-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156369020	2	P-352-160621-1145-def-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

ALS Environmental
34 Dogwood Lane
Middletown, PA 17057
P. 717-944-5541
F. 717-944-1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

* 2 1 5 6 3 6 9 *

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave
Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT: [X] Normal-Standard TAT is 10-12 business days. [ ] Rush-Subject to ALS approval and surcharges.
Date Required: 13-Jul-16 Approved By:
Email? [X] -Y Dfenstermacher@rettew.com
Fax? [ ] -Y No.:

ANALYSES/METHOD REQUESTED (Container Type / Container Size / Preservative)

Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)	Sample/COC Comments
P-283-160606-0743-def-S3B	6/6/2016	743	G	SO	X	X	
P-283-160606-0743-def-S4B	6/6/2016	743	G	SO	X	X	
P-283-160606-0743-def-S5B	6/6/2016	743	G	SO	X	X	
P-283-160606-0743-def-S6B	6/6/2016	743	G	SO	X	X	
P-286-160606-0808-del-S1B	6/6/2016	808	G	SO	X	X	
P-286-160606-0808-del-S2B	6/6/2016	808	G	SO	X	X	
P-286-160606-0808-def-S3B	6/6/2016	808	G	SO	X	X	
P-286-160606-0808-def-S4B	6/6/2016	808	G	SO	X	X	
P-290-160606-1445-mel-S1B	6/6/2016	1445	G	SO	X	X	
P-290-160606-1445-mel-S2B	6/6/2016	1445	G	SO	X	X	

Receipt Information (completed by Receiving Lab)
Cooler Temp: ____ Therm ID: 74-352
No. of Coolers: ____ Y N Initial
Custody Seals Present? ✓ OS
(If present) Seals Intact?
Received on Ice? ✓
COC/Labels Complete/Accurate? ✓
Cont. in Good Cond.? ✓
Correct Containers? ✓
Correct Sample Volumes? ✓
Correct Preservation? ✓
Headspace/Volatiles?
Courier/Tracking #:

ALS Field Services: __Pickup __Labor __Composite Sampling __Rental Equipment __Other:

Project Comments:

LOGGED BY(signature): 9/10
REVIEWED BY(signature):

	Relinquished By / Company Name	Date	Time		Received By / Company Name	Date	Time
1	Dfenstermacher Rettew	7/1/16	1100	2	ALS	7/5/16	1319
3				4			
5				6			
7				8			
9				10			

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]
Special Processing: USACE [ ] Navy [ ]
State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] VA
Reportable to PADEP? Yes [ ] PWSID #
Sample Disposal: Lab [ ] Special [ ]
EDDS: Format Type-

*G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

ALS ENVIRONMENTAL SHIPPING ADDRESS: 34 DOGWOOD LANE, MIDDLETOWN, PA 17057

Rev 10/14

ALS Environmental

34 Dogwood Lane
Middletown, PA 17057
P. 717-944-5541
F. 717-944-1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC #: 2156369 | 16 of 19

ALS Quote #:

Client Name: RETTEW Associates, Inc.

Address: 3020 Columbia Ave
Lancaster, PA 17603

Contact: Dan Fenstermacher or Duane Truax

Phone#: 412-275-2219 or 717-205-2228

Project Name/#: 89962000

Bill To:

TAT: [X] Normal-Standard TAT is 10-12 business days. [ ] Rush-Subject to ALS approval and surcharges.

Date Required: 13-Jul-16 Approved By:

Email? [X] -Y Dfenstermacher@rettew.com

Fax? [ ] -Y No.:

Container Type / Container Size / Preservative

ANALYSES/METHOD REQUESTED

Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)
P-290-160606-1445-mel-S3B	6/66/16	1445	G	SO	X	X
P-290-160606-1445-mel-S4B	6/66/16	1445	G	SO	X	X
P-291-160606-1330-mel-S1B	6/66/16	1330	G	SO	X	X
P-291-160606-1330-mel-S2B	6/66/16	1330	G	SO	X	X
P-291-160606-1330-mel-S3B	6/66/16	1330	G	SO	X	X
P-291-160606-1330-mel-S4B	6/66/16	1330	G	SO	X	X
P-347-160621-1409-def-S1B	6/21/2016	1409	G	SO	X	X
P-347-160621-1409-def-S2B	6/21/2016	1409	G	SO	X	X
P-352-160621-1145-def-S1B	6/21/2016	1145	G	SO	X	X
P-352-160621-1145-def-S2B	6/21/2016	1145	G	SO	X	X

Receipt Information (completed by Receiving Lab)

Cooler Temp: 3.6 Therm ID: TH-352

No. of Coolers: ______

	Y	N	Initial
Custody Seals Present?		✓	
(if present) Seals Intact?			
Received on Ice?		✓	
COC/Labels Complete/Accurate?	✓		
Cont. in Good Cond.?	✓		
Correct Containers?	✓		
Correct Sample Volumes?	✓		
Correct Preservation?	✓		
Headspace/Volatiles?			

Courier/Tracking #:

Sample/COC Comments

ALS Field Services: __Pickup __Labor __Composite Sampling __Rental Equipment __Other:

Project Comments:

LOGGED BY(signature): DATE 7/6 TIME

REVIEWED BY(signature): DATE TIME

	Relinquished By / Company Name	Date	Time		Received By / Company Name	Date	Time
1	DFenstermacher Rettew	7/1/16	1000	2	ALS	7/5/16	1315
3				4			
5				6			
7				8			
9				10			

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]

Special Processing: USACE [ ] Navy [ ] [ ]

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] VA

Reportable to PADEP? Yes [ ]

PWSID #

Sample Disposal: Lab [ ] Special [ ]

EDDS: Format Type-

* G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

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July 21, 2016

Mr. Duane Truax
Rettew Associates Inc.
3020 Columbia Avenue
Lancaster, PA 17603

Certificate of Analysis

Project Name:	**2016-TOC AND LOI ON SOILS**	Workorder:	**2156370**
Purchase Order:		Workorder ID:	**89962000**

Dear Mr. Truax:

Enclosed are the analytical results for samples received by the laboratory on Tuesday, July 5, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

This laboratory report may not be reproduced, except in full, without the written approval of ALS Environmental.

ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

CC: Mr. Dan Fenstermacher , Rettew

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
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SAMPLE SUMMARY

Workorder: 2156370 89962000

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2156370001	P-352-160621-1145-def-S3B	Solid	6/21/2016 11:45	7/5/2016 13:19	Collected by Client
2156370002	P-352-160621-1145-def-S4B	Solid	6/21/2016 11:45	7/5/2016 13:19	Collected by Client
2156370003	P-352-160621-1145-def-S5B	Solid	6/21/2016 11:45	7/5/2016 13:19	Collected by Client
2156370004	P-352-160621-1145-def-S6B	Solid	6/21/2016 11:45	7/5/2016 13:19	Collected by Client
2156370005	P-010-160620-1315-mgw-S1B	Solid	6/20/2016 13:15	7/5/2016 13:19	Collected by Client
2156370006	P-010-160620-1315-mgw-S2B	Solid	6/20/2016 13:15	7/5/2016 13:19	Collected by Client
2156370007	P-010-160620-1315-mgw-S3B	Solid	6/20/2016 13:15	7/5/2016 13:19	Collected by Client
2156370008	P-010-160620-1315-mgw-S4B	Solid	6/20/2016 13:15	7/5/2016 13:19	Collected by Client
2156370009	P-010-160620-1315-mgw-S5B	Solid	6/20/2016 13:15	7/5/2016 13:19	Collected by Client
2156370010	P-010-160620-1315-mgw-S6B	Solid	6/20/2016 13:15	7/5/2016 13:19	Collected by Client
2156370011	P-010-160620-1315-mgw-S7B	Solid	6/20/2016 13:15	7/5/2016 13:19	Collected by Client
2156370012	P-010-160620-1315-mgw-S8B	Solid	6/20/2016 13:15	7/5/2016 13:19	Collected by Client
2156370013	P-045-160614-1019-jcr-S1B	Solid	6/14/2016 10:19	7/5/2016 13:19	Collected by Client
2156370014	P-045-160614-1019-jcr-S2B	Solid	6/14/2016 10:19	7/5/2016 13:19	Collected by Client
2156370015	P-045-160614-1019-jcr-S3B	Solid	6/14/2016 10:19	7/5/2016 13:19	Collected by Client
2156370016	P-045-160614-1019-jcr-S4B	Solid	6/14/2016 10:19	7/5/2016 13:19	Collected by Client
2156370017	P-077-160617-1035-sdd-S1B	Solid	6/17/2016 10:35	7/5/2016 13:19	Collected by Client
2156370018	P-077-160617-1035-sdd-S2B	Solid	6/17/2016 10:35	7/5/2016 13:19	Collected by Client
2156370019	P-077-160617-1035-sdd-S3B	Solid	6/17/2016 10:35	7/5/2016 13:19	Collected by Client
2156370020	P-077-160617-1035-sdd-S4B	Solid	6/17/2016 10:35	7/5/2016 13:19	Collected by Client

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SAMPLE SUMMARY

Workorder: 2156370 89962000

Notes

- -- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- -- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- -- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- -- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- -- The Chain of Custody document is included as part of this report.
- -- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- -- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are preformed in the laboratory and are therefore analyzed out of hold time.
- -- Method references listed on this report beginning with the prefix “S” followed by a method number (such as S2310B-97) refer to methods from “Standard Methods for the Examination of Water and Wastewater”.
- -- For microbiological analyses, the "Prepared" value is the date/time into the incurbator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370001** Date Collected: 6/21/2016 11:45 Matrix: Solid

Sample ID: **P-352-160621-1145-def-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	15.9		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	5.5	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	17600		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	84.1	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370002**	Date Collected: 6/21/2016 11:45	Matrix: Solid	
Sample ID: **P-352-160621-1145-def-S4B**	Date Received: 7/5/2016 13:19		

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	18.3		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	4.9	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	15700		mg/kg	500	SW846 9060A			7/13/16 17:15	CF	A
Total Solids	81.7	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
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ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370003** Date Collected: 6/21/2016 11:45 Matrix: Solid

Sample ID: **P-352-160621-1145-def-S5B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	8.9		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	10.8	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	5570		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	91.1	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

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Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370004** Date Collected: 6/21/2016 11:45 Matrix: Solid

Sample ID: **P-352-160621-1145-def-S6B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	14.2		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	5.8	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	6060		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	85.8	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

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Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID:	**2156370005**	Date Collected:	6/20/2016 13:15	Matrix:	Solid
Sample ID:	**P-010-160620-1315-mgw-S1B**	Date Received:	7/5/2016 13:19		

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	60.8		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	86.3	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	476000		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	39.2	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

Mr. Brad W Kintzer
Project Coordinator

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34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370006**
Sample ID: **P-010-160620-1315-mgw-S2B**
Date Collected: 6/20/2016 13:15
Date Received: 7/5/2016 13:19
Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	52.4		%	0.1	S2540G-11			7/7/16 13:00	SLC	A
Solids, Total Volatile	41.4	2	%	1.0	S2540G-11			7/7/16 13:00	SLC	A
Total Organic Carbon (TOC)	185000		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	47.6	1	%	0.1	S2540G-11			7/7/16 13:00	SLC	A

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Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370007** Date Collected: 6/20/2016 13:15 Matrix: Solid

Sample ID: **P-010-160620-1315-mgw-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	36.0		%	0.1	S2540G-11			7/12/16 13:51	SLC	A
Solids, Total Volatile	14.8	2	%	1.0	S2540G-11			7/12/16 13:51	SLC	A
Total Organic Carbon (TOC)	67200		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	64.0	1	%	0.1	S2540G-11			7/12/16 13:51	SLC	A

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ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370008**
Sample ID: **P-010-160620-1315-mgw-S4B**
Date Collected: 6/20/2016 13:15
Date Received: 7/5/2016 13:19
Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	29.6		%	0.1	S2540G-11			7/12/16 13:51	SLC	A
Solids, Total Volatile	8.1	2	%	1.0	S2540G-11			7/12/16 13:51	SLC	A
Total Organic Carbon (TOC)	30500		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	70.4	1	%	0.1	S2540G-11			7/12/16 13:51	SLC	A

Mr. Brad W Kintzer
Project Coordinator

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ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370009** Date Collected: 6/20/2016 13:15 Matrix: Solid
Sample ID: **P-010-160620-1315-mgw-S5B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	21.7		%	0.1	S2540G-11			7/12/16 13:51	SLC	A
Solids, Total Volatile	5.1	2	%	1.0	S2540G-11			7/12/16 13:51	SLC	A
Total Organic Carbon (TOC)	7200		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	78.3	1	%	0.1	S2540G-11			7/12/16 13:51	SLC	A

Mr. Brad W Kintzer
Project Coordinator

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State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370010** Date Collected: 6/20/2016 13:15 Matrix: Solid
Sample ID: **P-010-160620-1315-mgw-S6B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	16.9		%	0.1	S2540G-11			7/12/16 13:51	SLC	A
Solids, Total Volatile	4.3	2	%	1.0	S2540G-11			7/12/16 13:51	SLC	A
Total Organic Carbon (TOC)	3280		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	83.1	1	%	0.1	S2540G-11			7/12/16 13:51	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370011** Date Collected: 6/20/2016 13:15 Matrix: Solid

Sample ID: **P-010-160620-1315-mgw-S7B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	17.0		%	0.1	S2540G-11			7/12/16 13:51	SLC	A
Solids, Total Volatile	5.9	2	%	1.0	S2540G-11			7/12/16 13:51	SLC	A
Total Organic Carbon (TOC)	2360		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	83.0	1	%	0.1	S2540G-11			7/12/16 13:51	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370012** Date Collected: 6/20/2016 13:15 Matrix: Solid

Sample ID: **P-010-160620-1315-mgw-S8B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	16.0		%	0.1	S2540G-11			7/20/16 08:13	VKB	A
Solids, Total Volatile	5.0	2	%	1.0	S2540G-11			7/12/16 13:51	SLC	A
Total Organic Carbon (TOC)	2810		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	84.0		%	0.1	S2540G-11			7/20/16 08:13	VKB	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370013** Date Collected: 6/14/2016 10:19 Matrix: Solid
Sample ID: **P-045-160614-1019-jcr-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	44.4		%	0.1	S2540G-11			7/12/16 13:51	SLC	A
Solids, Total Volatile	49.4	2	%	1.0	S2540G-11			7/12/16 13:51	SLC	A
Total Organic Carbon (TOC)	273000		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	55.6	1	%	0.1	S2540G-11			7/12/16 13:51	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370014** Date Collected: 6/14/2016 10:19 Matrix: Solid
Sample ID: **P-045-160614-1019-jcr-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	18.5		%	0.1	S2540G-11			7/12/16 13:51	SLC	A
Solids, Total Volatile	9.6	2	%	1.0	S2540G-11			7/12/16 13:51	SLC	A
Total Organic Carbon (TOC)	53700		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	81.5	1	%	0.1	S2540G-11			7/12/16 13:51	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370015** Date Collected: 6/14/2016 10:19 Matrix: Solid
Sample ID: **P-045-160614-1019-jcr-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	8.6		%	0.1	S2540G-11			7/12/16 13:51	SLC	A
Solids, Total Volatile	3.2	2	%	1.0	S2540G-11			7/12/16 13:51	SLC	A
Total Organic Carbon (TOC)	4230		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	91.4	1	%	0.1	S2540G-11			7/12/16 13:51	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370016** Date Collected: 6/14/2016 10:19 Matrix: Solid
Sample ID: **P-045-160614-1019-jcr-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	10.0		%	0.1	S2540G-11			7/12/16 13:51	SLC	A
Solids, Total Volatile	3.8	2	%	1.0	S2540G-11			7/12/16 13:51	SLC	A
Total Organic Carbon (TOC)	3480		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	90.0	1	%	0.1	S2540G-11			7/12/16 13:51	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ALS Environmental
34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370017** Date Collected: 6/17/2016 10:35 Matrix: Solid
Sample ID: **P-077-160617-1035-sdd-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	66.9		%	0.1	S2540G-11			7/12/16 13:51	SLC	A
Solids, Total Volatile	87.2	2	%	1.0	S2540G-11			7/12/16 13:51	SLC	A
Total Organic Carbon (TOC)	194000		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	33.1	1	%	0.1	S2540G-11			7/12/16 13:51	SLC	A

Mr. Brad W Kintzer
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ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370018** Date Collected: 6/17/2016 10:35 Matrix: Solid
Sample ID: **P-077-160617-1035-sdd-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	21.5		%	0.1	S2540G-11			7/12/16 13:51	SLC	A
Solids, Total Volatile	8.7	2	%	1.0	S2540G-11			7/12/16 13:51	SLC	A
Total Organic Carbon (TOC)	68700		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	78.5	1	%	0.1	S2540G-11			7/12/16 13:51	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

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State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370019** Date Collected: 6/17/2016 10:35 Matrix: Solid
Sample ID: **P-077-160617-1035-sdd-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	11.0		%	0.1	S2540G-11			7/12/16 13:51	SLC	A
Solids, Total Volatile	3.6	2	%	1.0	S2540G-11			7/12/16 13:51	SLC	A
Total Organic Carbon (TOC)	6160		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	89.0	1	%	0.1	S2540G-11			7/12/16 13:51	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156370 89962000

Lab ID: **2156370020** Date Collected: 6/17/2016 10:35 Matrix: Solid

Sample ID: **P-077-160617-1035-sdd-S4B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	11.8		%	0.1	S2540G-11			7/12/16 13:51	SLC	A
Solids, Total Volatile	3.7	2	%	1.0	S2540G-11			7/12/16 13:51	SLC	A
Total Organic Carbon (TOC)	5130		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	88.2	1	%	0.1	S2540G-11			7/12/16 13:51	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

PARAMETER QUALIFIERS

Lab ID	#	Sample ID	Analytical Method	Analyte
2156370001	1	P-352-160621-1145-def-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370001	2	P-352-160621-1145-def-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370002	1	P-352-160621-1145-def-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370002	2	P-352-160621-1145-def-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370003	1	P-352-160621-1145-def-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370003	2	P-352-160621-1145-def-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370004	1	P-352-160621-1145-def-S6B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370004	2	P-352-160621-1145-def-S6B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370005	1	P-010-160620-1315-mgw-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370005	2	P-010-160620-1315-mgw-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370006	1	P-010-160620-1315-mgw-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370006	2	P-010-160620-1315-mgw-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370007	1	P-010-160620-1315-mgw-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370007	2	P-010-160620-1315-mgw-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370008	1	P-010-160620-1315-mgw-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370008	2	P-010-160620-1315-mgw-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370009	1	P-010-160620-1315-mgw-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370009	2	P-010-160620-1315-mgw-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370010	1	P-010-160620-1315-mgw-S6B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370010	2	P-010-160620-1315-mgw-S6B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370011	1	P-010-160620-1315-mgw-S7B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370011	2	P-010-160620-1315-mgw-S7B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

ANALYTICAL RESULTS

Workorder: 2156370 89962000

2156370012	2	P-010-160620-1315-mgw-S8B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370013	1	P-045-160614-1019-jcr-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370013	2	P-045-160614-1019-jcr-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370014	1	P-045-160614-1019-jcr-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370014	2	P-045-160614-1019-jcr-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370015	1	P-045-160614-1019-jcr-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370015	2	P-045-160614-1019-jcr-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370016	1	P-045-160614-1019-jcr-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370016	2	P-045-160614-1019-jcr-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370017	1	P-077-160617-1035-sdd-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370017	2	P-077-160617-1035-sdd-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370018	1	P-077-160617-1035-sdd-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370018	2	P-077-160617-1035-sdd-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370019	1	P-077-160617-1035-sdd-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370019	2	P-077-160617-1035-sdd-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156370020	1	P-077-160617-1035-sdd-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156370020	2	P-077-160617-1035-sdd-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

ALS Environmental
34 Dogwood Lane
Middletown, PA 17057
P. 717-944-5541
F. 717-944-1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC
ALS
* 2 1 5 6 3 7 0 *

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave
Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT: [X] Normal-Standard TAT is 10-12 business days. [ ] Rush-Subject to ALS approval and surcharges.
Date Required: 13-Jul-16 Approved By:
Email? [X] -Y Dienstermacher@rettew.com
Fax? [ ] -Y No.:

Container Type / Container Size / Preservative

ANALYSES/METHOD REQUESTED

Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)	Sample/COC Comments
P-352-160621-1145-def-S3B	6/21/2016	1145	G	SO	X	X	
P-352-160621-1145-def-S4B	6/21/2016	1145	G	SO	X	X	
P-352-160621-1145-def-S5B	6/21/2016	1145	G	SO	X	X	
P-352-160621-1145-def-S6B	6/21/2016	1145	G	SO	X	X	
P-010-160620-1315-mgw-S1B	6/20/2016	1315	G	SO	X	X	
P-010-160620-1315-mgw-S2B	6/20/2016	1315	G	SO	X	X	
P-010-160620-1315-mgw-S3B	6/20/2016	1315	G	SO	X	X	
P-010-160620-1315-mgw-S4B	6/20/2016	1315	G	SO	X	X	
P-010-160620-1315-mgw-S5B	6/20/2016	1315	G	SO	X	X	
P-010-160620-1315-mgw-S6B	6/20/2016	1315	G	SO	X	X	

Receipt Information (completed by Receiving Lab)
Cooler Temp: 26°c Therm ID: TH-352
No. of Coolers: ______

	Y	N	Initial
Custody Seals Present?		✓	
(if present) Seals Intact?			
Received on Ice?		✓	
COC/Labels Complete/Accurate?	✓		
Cont. in Good Cond.?	✓		
Correct Containers?	✓		
Correct Sample Volumes?	✓		
Correct Preservation?	✓		
Headspace/Volatiles?			

Courier/Tracking #:

ALS Field Services: __Pickup __Labor __Composite Sampling __Rental Equipment __Other:

Project Comments:

LOGGED BY(signature): DATE 7/1 TIME
REVIEWED BY(signature): DATE TIME

	Relinquished By / Company Name	Date	Time		Received By / Company Name	Date	Time
1	Dienstermacher Rettew	7/1/16	1100	2	AS	7/1/16	1319
3				4			
5				6			
7				8			
9				10			

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]
Reportable to PADEP? Yes [ ]
PWSID #
EDDS: Format Type-

Special Processing: USACE [ ] Navy [ ] [ ]
Sample Disposal: Lab [ ] Special [ ]

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] WV/va

* G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

ALS ENVIRONMENTAL SHIPPING ADDRESS: 34 DOGWOOD LANE, MIDDLETOWN, PA 17057

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P. 717-944-5541
F. 717-944-1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC #: 2156370 | 18 of 19

ALS Quote #:

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave, Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT: [X] Normal-Standard TAT is 10-12 business days. [ ] Rush-Subject to ALS approval and surcharges.
Date Required: 13-Jul-16 Approved By:
Email? [X]-Y Dfenstermacher@rettew.com
Fax? [ ]-Y No.:

Container Type / Container Size / Preservative

ANALYSES/METHOD REQUESTED

Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)	Sample/COC Comments
P-010-160620-1315-mgw-S7B	6/20/2016	1315	G	SO	X	X	
P-010-160620-1315-mgw-S8B	6/20/2016	1315	G	SO	X	X	
P-045-160614-1019-jcr-S1B	6/14/2016	1019	G	SO	X	X	
P-045-160614-1019-jcr-S2B	6/14/2016	1019	G	SO	X	X	
P-045-160614-1019-jcr-S3B	6/14/2016	1019	G	SO	X	X	
P-045-160614-1019-jcr-S4B	6/14/2016	1019	G	SO	X	X	
P-077-160617-1035-sdd-S1B	6/17/2016	1035	G	SO	X	X	
P-077-160617-1035-sdd-S2B	6/17/2016	1035	G	SO	X	X	
P-077-160617-1035-sdd-S3B	6/17/2016	1035	G	SO	X	X	
P-077-160617-1035-sdd-S4B	6/17/2016	1035	G	SO	X	X	

Receipt Information (completed by Receiving Lab)
Cooler Temp: 26°C Therm ID: 77-352
No. of Coolers:

	Y	N	Initial
Custody Seals Present?		✓	GS
(if present) Seals Intact?			
Received on Ice?		✓	
COC/Labels Complete/Accurate?			
Cont. in Good Cond.?			
Correct Containers?			
Correct Sample Volumes?			
Correct Preservation?			
Headspace/Volatiles?			

Courier/Tracking #:

ALS Field Services: _Pickup _Labor _Composite Sampling _Rental Equipment _Other:

Project Comments:

LOGGED BY(signature): DATE 7/1/16 TIME
REVIEWED BY(signature): DATE TIME

Relinquished By / Company Name	Date	Time	Received By / Company Name	Date	Time
1 D. Fenstermacher @ Rettew	7/1/16	1009	2 ALS	7/1/16	1319
3			4		
5			6		
7			8		
9			10		

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]

Special Processing: USACE [ ] Navy [ ] [ ]

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] WV

Reportable to PADEP? Yes [ ]
PWSID #

Sample Disposal: Lab [ ] Special [ ]

EDDS: Format Type-

* G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

ALS ENVIRONMENTAL SHIPPING ADDRESS: 34 DOGWOOD LANE, MIDDLETOWN, PA 17057

Rev 10/14

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State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

July 18, 2016

Mr. Duane Truax
Rettew Associates Inc.
3020 Columbia Avenue
Lancaster, PA 17603

Certificate of Analysis

Project Name:	**2016-TOC AND LOI ON SOILS**	Workorder:	**2156371**
Purchase Order:		Workorder ID:	**89962000**

Dear Mr. Truax:

Enclosed are the analytical results for samples received by the laboratory on Tuesday, July 5, 2016.

The ALS Environmental laboratory in Middletown, Pennsylvania is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Mr. Brad W Kintzer (Project Coordinator) at (717) 944-5541.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable. For a specific list of accredited analytes, refer to the certifications section of the ALS website at www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads.

This laboratory report may not be reproduced, except in full, without the written approval of ALS Environmental.

ALS Spring City: 10 Riverside Drive, Spring City, PA 19475 610-948-4903

CC: Mr. Dan Fenstermacher , Rettew

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Brad W. Kintzer
Mr. Brad W Kintzer
Project Coordinator

SAMPLE SUMMARY

Workorder: 2156371 89962000

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
2156371001	P-077-160617-1035-sdd-S5B	Solid	6/17/2016 10:35	7/5/2016 13:19	Collected by Client
2156371002	P-293-160606-1056-mel-S1B	Solid	6/6/2016 10:56	7/5/2016 13:19	Collected by Client
2156371003	P-293-160606-1056-mel-S2B	Solid	6/6/2016 10:56	7/5/2016 13:19	Collected by Client
2156371004	P-293-160606-1056-mel-S3B	Solid	6/6/2016 10:56	7/5/2016 13:19	Collected by Client
2156371005	P-293-160606-1056-mel-S4B	Solid	6/6/2016 10:56	7/5/2016 13:19	Collected by Client
2156371006	P-293-160606-1056-mel-S5B	Solid	6/6/2016 10:56	7/5/2016 13:19	Collected by Client
2156371007	P-225A-160601-1130-jcr-S1B	Solid	6/1/2016 11:30	7/5/2016 13:19	Collected by Client
2156371008	P-225A-160601-1130-jcr-S2B	Solid	6/1/2016 11:30	7/5/2016 13:19	Collected by Client
2156371009	P-225A-160601-1130-jcr-S3B	Solid	6/1/2016 11:30	7/5/2016 13:19	Collected by Client

SAMPLE SUMMARY

Workorder: 2156371 89962000

Notes

- -- Samples collected by ALS personnel are done so in accordance with the procedures set forth in the ALS Field Sampling Plan (20 - Field Services Sampling Plan).
- -- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
- -- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
- -- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
- -- The Chain of Custody document is included as part of this report.
- -- All Library Search analytes should be regarded as tentative identifications based on the presumptive evidence of the mass spectra. Concentrations reported are estimated values.
- -- Parameters identified as "analyze immediately" require analysis within 15 minutes of collection. Any "analyze immediately" parameters not listed under the header "Field Parameters" are preformed in the laboratory and are therefore analyzed out of hold time.
- -- Method references listed on this report beginning with the prefix “S” followed by a method number (such as S2310B-97) refer to methods from “Standard Methods for the Examination of Water and Wastewater”.
- -- For microbiological analyses, the "Prepared" value is the date/time into the incurbator and the "Analyzed" value is the date/time out the incubator.

Standard Acronyms/Flags

J	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
N	Indicates presumptive evidence of the presence of a compound
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference
LOD	DoD Limit of Detection
LOQ	DoD Limit of Quantitation
DL	DoD Detection Limit
I	Indicates reported value is greater than or equal to the Method Detection Limit (MDL) but less than the Report Detection Limit (RDL)
(S)	Surrogate Compound
NC	Not Calculated
*	Result outside of QC limits

ALS Environmental
34 Dogwood Lane ▪ Middletown, PA 17057 ▪ Phone: 717-944-5541 ▪ Fax: 717-944-1430 ▪ www.alsglobal.com

NELAP Certifications: NJ PA010 , NY 11759 , PA 22-293 DoD ELAP: A2LA 0818.01
State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156371 89962000

Lab ID: **2156371001** Date Collected: 6/17/2016 10:35 Matrix: Solid

Sample ID: **P-077-160617-1035-sdd-S5B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	14.3		%	0.1	S2540G-11			7/12/16 14:37	SLC	A
Solids, Total Volatile	3.7	2	%	1.0	S2540G-11			7/12/16 14:37	SLC	A
Total Organic Carbon (TOC)	1300		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	85.7	1	%	0.1	S2540G-11			7/12/16 14:37	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156371 89962000

Lab ID: **2156371002** Date Collected: 6/6/2016 10:56 Matrix: Solid
Sample ID: **P-293-160606-1056-mel-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	69.7		%	0.1	S2540G-11			7/12/16 14:37	SLC	A
Solids, Total Volatile	66.7	2	%	1.0	S2540G-11			7/12/16 14:37	SLC	A
Total Organic Carbon (TOC)	333000		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	30.3	1	%	0.1	S2540G-11			7/12/16 14:37	SLC	A

Brad W. Kintzer
Mr. Brad W Kintzer
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ANALYTICAL RESULTS

Workorder: 2156371 89962000

Lab ID: **2156371003** Date Collected: 6/6/2016 10:56 Matrix: Solid
Sample ID: **P-293-160606-1056-mel-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	32.2		%	0.1	S2540G-11			7/12/16 14:37	SLC	A
Solids, Total Volatile	11.5	2	%	1.0	S2540G-11			7/12/16 14:37	SLC	A
Total Organic Carbon (TOC)	57100		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	67.8	1	%	0.1	S2540G-11			7/12/16 14:37	SLC	A

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34 Dogwood Lane ■ Middletown, PA 17057 ■ Phone: 717-944-5541 ■ Fax: 717-944-1430 ■ www.alsglobal.com

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ANALYTICAL RESULTS

Workorder: 2156371 89962000

Lab ID: **2156371004** Date Collected: 6/6/2016 10:56 Matrix: Solid

Sample ID: **P-293-160606-1056-mel-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	16.6		%	0.1	S2540G-11			7/12/16 14:37	SLC	A
Solids, Total Volatile	4.0	2	%	1.0	S2540G-11			7/12/16 14:37	SLC	A
Total Organic Carbon (TOC)	9790		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	83.4	1	%	0.1	S2540G-11			7/12/16 14:37	SLC	A

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ANALYTICAL RESULTS

Workorder: 2156371 89962000

Lab ID: **2156371005**
Sample ID: **P-293-160606-1056-mel-S4B**
Date Collected: 6/6/2016 10:56
Date Received: 7/5/2016 13:19
Matrix: Solid

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	13.2		%	0.1	S2540G-11			7/12/16 14:37	SLC	A
Solids, Total Volatile	3.7	2	%	1.0	S2540G-11			7/12/16 14:37	SLC	A
Total Organic Carbon (TOC)	5700		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	86.8	1	%	0.1	S2540G-11			7/12/16 14:37	SLC	A

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ANALYTICAL RESULTS

Workorder: 2156371 89962000

Lab ID:	**2156371006**	Date Collected: 6/6/2016 10:56	Matrix: Solid
Sample ID:	**P-293-160606-1056-mel-S5B**	Date Received: 7/5/2016 13:19	

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	13.0		%	0.1	S2540G-11			7/12/16 14:37	SLC	A
Solids, Total Volatile	2.5	2	%	1.0	S2540G-11			7/12/16 14:37	SLC	A
Total Organic Carbon (TOC)	3740		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	87.0	1	%	0.1	S2540G-11			7/12/16 14:37	SLC	A

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156371 89962000

Lab ID: **2156371007** Date Collected: 6/1/2016 11:30 Matrix: Solid
Sample ID: **P-225A-160601-1130-jcr-S1B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	31.3		%	0.1	S2540G-11			7/12/16 14:37	SLC	A
Solids, Total Volatile	10.7	2	%	1.0	S2540G-11			7/12/16 14:37	SLC	A
Total Organic Carbon (TOC)	55300		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	68.7	1	%	0.1	S2540G-11			7/12/16 14:37	SLC	A

Brad W. Kintzer

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Project Coordinator

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State Certifications: DE ID 11 , MA PA0102 , MD 128 , VA 460157 , WV 343

ANALYTICAL RESULTS

Workorder: 2156371 89962000

Lab ID: **2156371008** Date Collected: 6/1/2016 11:30 Matrix: Solid
Sample ID: **P-225A-160601-1130-jcr-S2B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	7.4		%	0.1	S2540G-11			7/12/16 14:37	SLC	A
Solids, Total Volatile	11.2	2	%	1.0	S2540G-11			7/12/16 14:37	SLC	A
Total Organic Carbon (TOC)	4780		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	92.6	1	%	0.1	S2540G-11			7/12/16 14:37	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

ANALYTICAL RESULTS

Workorder: 2156371 89962000

Lab ID: **2156371009** Date Collected: 6/1/2016 11:30 Matrix: Solid

Sample ID: **P-225A-160601-1130-jcr-S3B** Date Received: 7/5/2016 13:19

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	*Cntr*
WET CHEMISTRY										
Moisture	14.9		%	0.1	S2540G-11			7/12/16 14:37	SLC	A
Solids, Total Volatile	4.2	2	%	1.0	S2540G-11			7/12/16 14:37	SLC	A
Total Organic Carbon (TOC)	4040		mg/kg	500	SW846 9060A			7/14/16 17:00	CF	A
Total Solids	85.1	1	%	0.1	S2540G-11			7/12/16 14:37	SLC	A

Brad W. Kintzer

Mr. Brad W Kintzer
Project Coordinator

PARAMETER QUALIFIERS

Lab ID	#	Sample ID	Analytical Method	Analyte
2156371001	1	P-077-160617-1035-sdd-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156371001	2	P-077-160617-1035-sdd-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156371002	1	P-293-160606-1056-mel-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156371002	2	P-293-160606-1056-mel-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156371003	1	P-293-160606-1056-mel-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156371003	2	P-293-160606-1056-mel-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156371004	1	P-293-160606-1056-mel-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156371004	2	P-293-160606-1056-mel-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156371005	1	P-293-160606-1056-mel-S4B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156371005	2	P-293-160606-1056-mel-S4B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156371006	1	P-293-160606-1056-mel-S5B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156371006	2	P-293-160606-1056-mel-S5B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156371007	1	P-225A-160601-1130-jcr-S1B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156371007	2	P-225A-160601-1130-jcr-S1B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156371008	1	P-225A-160601-1130-jcr-S2B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156371008	2	P-225A-160601-1130-jcr-S2B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				
2156371009	1	P-225A-160601-1130-jcr-S3B	S2540G-11	Total Solids
Analyte was analyzed past the 7 day holding time.				
2156371009	2	P-225A-160601-1130-jcr-S3B	S2540G-11	Solids, Total Volatile
Analyte was analyzed past the 7 day holding time.				

ALS Environmental

34 Dogwood Lane
Middletown, PA 17057
P.717-944-5541
F.717-944-1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

COC ALS *2156371*

Client Name: RETTEW Associates, Inc.
Address: 3020 Columbia Ave
Lancaster, PA 17603
Contact: Dan Fenstermacher or Duane Truax
Phone#: 412-275-2219 or 717-205-2228
Project Name/#: 89962000
Bill To:

TAT [X] Normal-Standard TAT is 10-12 business days.
[ ] Rush-Subject to ALS approval and surcharges.
Date Required: 13-Jul-16 Approved By:
Email? [X]-Y Dfenstermacher@rettew.com
Fax? [ ]-Y No.:

Container Type / Container Size / Preservative

ANALYSES/METHOD REQUESTED

Enter Number of Containers Per Sample or Field Results Below.

Sample Description/Location (as it will appear on the lab report)	Sample Date	Time	*G or C	**Matrix	TOC	Total Volatile Solids (Organic -C loss on ignition)	Sample/COC Comments
P-077-160617-1035-sdd-S5B	6/17/2016	1035	G	SO	X	X	
P-293-160606-1056-mel-S1B	6/6/2016	1056	G	SO	X	X	
P-293-160606-1056-mel-S2B	6/6/2016	1056	G	SO	X	X	
P-293-160606-1056-mel-S3B	6/6/2016	1056	G	SO	X	X	
P-293-160606-1056-mel-S4B	6/6/2016	1056	G	SO	X	X	
P-293-160606-1056-mel-S5B	6/6/2016	1056	G	SO	X	X	
P-225A-160601-1130-jcr-S1B	6/1/2016	1130	G	SO	X	X	
P-225A-160601-1130-jcr-S2B	6/1/2016	1130	G	SO	X	X	
P-225A-160601-1130-jcr-S3B	6/1/2016	1130	G	SO	X	X	

Cooler Temp: 26.2 Therm ID: TH-352
No. of Coolers:

	Y	N	Initial
Custody Seals Present?		✓	
(If present) Seals Intact?			
Received on Ice?		✓	
COC/Labels Complete/Accurate?	✓		
Cont. in Good Cond.?	✓		
Correct Containers?	✓		
Correct Sample Volumes?	✓		
Correct Preservation?	✓		
Headspace/Volatiles?			

Courier/Tracking #:

ALS Field Services: _Pickup _Labor _Composite Sampling _Rental Equipment _Other:

Project Comments:

LOGGED BY(signature): DATE 9/16 TIME
REVIEWED BY(signature): DATE TIME

	Relinquished By / Company Name	Date	Time		Received By / Company Name	Date	Time
1	D. Fenstermacher Rettew	7/1/16	1100	2	J. SMITH ALS	7/5/16	1375
3				4			
5				6			
7				8			
9				10			

Data Deliverables: [X] Standard [ ] CLP-like [ ] USACE [ ]

Special Processing: USACE [ ] Navy [ ]

State Samples Collected In: [ ] NY [ ] NJ [ ] PA [ ] NC [X] WV/VA

Reportable to PADEP? Yes [ ]
PWSID #

Sample Disposal: Lab [ ] Special [ ]

EDDS: Format Type-

* G=Grab; C=Composite **Matrix - AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

ALS ENVIRONMENTAL SHIPPING ADDRESS: 34 DOGWOOD LANE, MIDDLETOWN, PA 17057

Rev 10/14

Attachment 11
ACP Soil Mapping Key – Observation Summary

Attachment 11
Order 1 Soil Mapping Key - Observation Summary

Parent Material Types			Slope Class			Drainage Class			Diagnostic Subsurface Horizon			Restrictive Layer Type			Depth to Restrictive Layer			Family Particle Size Class		
PM	**MNF**	**GWNF**	**Slope**	**MNF**	**GWNF**	**Class**	**MNF**	**GWNF**	**Symbol**	**MNF**	**GWNF**	**Type**	**MNF**	**GWNF**	**Class**	**MNF**	**GWNF**	**Class**	**MNF**	**GWNF**
1	33	101	**A**	10	14	**1**	0	0	**A**	22	73	**0**	22	83	**1**	2	9	**A**	0	0
2	0	4	**B**	9	46	**2**	0	1	**B**	0	1	**1**	62	186	**2**	11	78	**B**	0	0
3	5	42	**C**	12	31	**3**	3	14	**C**	55	180	**2**	1	6	**3**	32	83	**C**	13	45
4	45	120	**D**	21	53	**4**	6	23	**D**	1	1				**4**	16	37	**D**	21	45
5	0	1	**E**	24	88	**5**	73	174	**E**	0	12				**5**	24	68	**E**	0	0
6	0	0	**F**	8	43	**6**	3	56	**C/A**	5	3							**F**	2	4
7	0	0	**G**	1	0	**7**	0	7	**AB**	1	5							**G**	0	0
8	0	6							**D/A**	1	0							**H**	0	3
9	2	0																**I**	47	176
10	0	1																**J**	0	0
																		K	0	0
																		E/D/K	1	0
																		I/K	0	1
																		C/K	0	1
																		C/B	1	0

ACP Order 1 Soil Mapping Key

Parent Material	Slope Class	Drainage Class	Diagnostic Subsurface	Restrictive Layer Type	Depth to Restrictive Layer	Family Particle Size Class
1 – Residuum	A – 0-3%	1 – Very Poorly	A – Argillic	0 – None	1 – ≤12"	A – Coarse Silty
2 – Alluvium	B – >3-8%	2 – Poorly	B – Fragipan	1 – Bedrock	2 – >12-24"	B – Fine Silty
3 – Colluvium	C – >8-15%	3 – Somewhat Poorly	C – Cambic	2 – Fragipan	3 – >24-36"	C – Coarse Loamy
4 – Colluvium over Residuum	D – >15-25%	4 – Moderately Well	D – Spodic		4 – >36-48"	D – Fine Loamy
5 – Colluvium over Alluvium	E – >25-45%	5 – Well	E – None		5 – >48"	E – Sandy
6 – Human Transported Materials (HTM)	F – >45-70%	6 – Somewhat Excessively				F – Fine
7 – Organic Soil Materials	G – >70%	7 – Excessively				G – Very Fine
8 – Alluvium over Colluvium						H – Sandy-Skeletal
9 – HTM over Colluvium						I – Loamy-Skeletal
10 – Alluvium over Residuum						J – Clayey-Skeletal
						K – Clayey

Supplemental Document A
ACP Soil Survey Protocols

Prepared for:

Dominion Transmission, Inc.
707 East Main Street
Richmond, VA 23219

ATLANTIC COAST PIPELINE

ORDER 1 SOIL SURVEY PROTOCOLS

MONONGAHELA NATIONAL FOREST, WV AND GEORGE WASHINGTON NATIONAL FOREST, VA

April 2016
Updated May 23, 2016
Addendum 1 – June 30, 2106

Prepared by:

RETTEW

Geosyntec consultants

engineers | scientists | innovators

Reviewed by:

The Nicholas Putnam Group

U.S. Forest Service, Monongahela National Forest and George Washington National Forest

TABLE OF CONTENTS

Order 1 Soil Survey Protocols
Atlantic Coast Pipeline Project
Updated May 23, 2016

1.0 INTRODUCTION

Addendum: A June 30, 2016 Addendum to The Order 1 Soil Survey Protocols, dated April 2016, and Revised May 23, 2016 for the Atlantic Coast Pipeline Project includes the resume of an additional soil scientist that participated in the Order 1 Soil Survey. This resume is an addendum to "Attachment 2 – Soil Scientist Resumes" of the Soil Survey Protocols. The soil scientist resume was submitted and approved by the U.S. Forest Service on June 14, 2016.

Updated: The Order 1 Soil Survey Protocols for the Atlantic Coast Pipeline Project have been updated based on meetings with the U.S. Forest Service to reflect new information gathered during the Preliminary Field Reconnaissance conducted May 9-13, as well as recent personnel changes. The report sections with updated information are as follows:

- 1.0 – Introduction: updated special use permits
- 1.2 – Soil Survey Team: updated Soil Scientist Team Project Manager/Team Lead
- 2.2 – Preliminary Field Reconnaissance: updated language regarding transects and taxonomic groups
- 2.2 – Soil Test Pit Excavation: included language for encountering water table
- 2.3.4 – Soil Logging: addition of profile descriptors
- 2.3.5 – Chemical Analysis: addition of alternative soil test laboratory
- 4.0 – Schedule: updated language and timeline to reflect activities completed to date
- Attachment 1 – Organizational Charts: updated Soil Scientist Team Project Manager/Team Lead
- Attachment 4 – Figures: updated figures to reflect updated schedule

An Order 1 Soil Survey will be performed along the approximately 20-mile portion of the Rev 10 reroute between MP 47 and MP 115 on the proposed Atlantic Coast Pipeline (ACP) route that crosses through parts of the Marlinton Ranger District in the Monongahela National Forest (MNF) and parts of the Warm Springs, North River, and Pedlar Ranger Districts in the George Washington National Forest (GWNF). Approximately 5.42 miles of the Rev 10 reroute crosses parts of the MNF and about 14.47 miles crosses parts of the GWNF.

The soil survey activities have been planned to be compliant with the requirements outlined in special use permit #GBR205003, dated April 22, 2015 issued by U.S. Forest Service for surveys in the MNF, and the requirements outlined in special use permit #GWP433201T, dated March 31, 2015 issued by the U.S. Forest Service for surveys in the GWNF. The MNF special use permit #GBR2050003 was updated by special use permit #MAR205001 issued by the U.S.

Forest Service on April 13, 2016. The GWNF special use permit #GWP433201T was updated by special use permit #GWP433202T issued by the U.S. Forest Service on April 11, 2016. The Order 1 Soil Survey will follow the methods outlined in the U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS) Soil Survey Manual for an Order 1 Survey (Soil Survey Division Staff. 1993. Soil Survey Manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18).

The certified professional soil scientists (CPSSs) or North Carolina (NC) or Virginia (VA) licensed soil scientists (LSSs) pre-approved by the Forest Service for this project will be responsible for the Order 1 Soil Survey including selection of excavation locations, observation, logging, and description of excavations, photographic documentation of the excavations, collection and laboratory assignment of samples, interpretation of findings, and preparation of the Order 1 Soil Survey Report. It is understood that although Geosyntec is serving in the role of Program Manager, it will not influence, provide interpretations or edit the soil data or data collection efforts. All technical soil activities that affect the outcome and results of the Order 1 Soil Survey will be conducted by the soil survey team listed in this survey protocol. These activities include soil pit location identification, determination of pit dimensions, number of soil pits to be excavated, all soil classification determinations, data interpretations, and principle technical authorship of the Order 1 Soil Survey report.

Geosyntec personnel will provide field support for the soil survey team, but will not conduct technical soil activities that affect the outcome and results of the Order 1 Soil Survey. Geosyntec's team will also be observing the Order 1 Soil Survey activities in support of ACP's geohazard program.

1.1 Purpose

The purpose of the Order 1 Soil Survey is to provide more site-specific soil data for the proposed pipeline corridor to support construction of the 42-inch diameter pipeline. The site-specific soil data will be used to update the Soil Resource Section for the Final Environmental Impact Statement (EIS), and to make more informed decisions related to design, construction, restoration, and maintenance of the proposed pipeline, right-of-way, and other project components. The Order 1 Soil Survey is not intended to replace the published soil survey information, but rather to supplement it.

1.2 Soil Survey Team

The soil survey will be conducted by a team of CPSSs or NC or VA LSSs. Daniel Fenstermacher, CPSS with RETTEW will serve as the Soil Scientist Team Project Manager/ Team Lead. John Stipe III, CPSS will serve as the Soil Scientist Team QA/QC Lead. Dr. John Galbraith will act as the Technical Advisor. Stephen Carpenter and Charles Delp with the Nicholas Putnam Group will provide Third Party Review. Kathleen Harrison, PG with Geosyntec Consultants Inc. (Geosyntec) will serve as the overall Program Manager and programmatic liaison between Dominion and the soil scientist team and associated subcontractors. The soils scientist team will be supported by Triple H Enterprises providing laborers to assist with soil pit excavation. Organizational charts are presented in Attachment 1. Soil Scientist resumes are presented in Attachment 2.

If during the project there is a need to include other qualified professional soil scientist on the soil survey team, the names and resumes for those individuals will be provided to the Forest Service for review and acceptance prior to their involvement on the project.

2.0 SOIL SURVEY PROTOCOLS

This section outlines the protocols that will be used to complete the Order 1 Soil Survey. Soil units will be mapped at a scale appropriate to capture inclusions and not-to-exceed a scale of 1:12,000. The minimum soil polygon area will be 2.5 acres or less, with no minimum delineation size. Special symbols will be used to identify restrictive features such as wet spots, caves, sinkholes, rock outcrop, etc. and to identify ephemeral drainage ways to perennial waters across the entire width of the corridor, as defined in the Soil Survey Manual. Hydric soils will be identified across the entire width of the corridor following the National Technical committee for Hydric Soil (NTCHS) Field Indicators of Hydric Soils Ver. 7.0.

2.1 Desktop Survey

A preliminary desktop evaluation will be conducted using the collected topographic data, detailed geologic maps, existing SSURGO soil map unit boundaries, aerial photography, and other pertinent remotely- sensed data to highlight potential landscape trends and to aid in field location of test pits.

Preliminary GIS-generated maps will be developed that include topographic contours, SSURGO map units, the pipeline centerline, and the limits of the 300-foot survey corridor. Preliminary survey sample locations will be identified along the center line of the pipeline at 350-foot intervals to assess initial map unit coverage. Actual soil pit locations will be field determined by the soil scientist.

The findings of the desktop evaluation will be shared with the Forest Service, the Technical Advisors, and the Nicholas Putnam Group.

2.2 Preliminary Field Reconnaissance

The soil team leads under the direction of the Team Lead and advised by the Technical Advisor and the Nicholas Putnam Group, will conduct a preliminary field reconnaissance along the pipeline corridor to do a coarse evaluation of the soil resources using select test pit locations based on the desktop evaluation to help develop preliminary, reconnaissance-level soil-landscape relationships for the project area.

Results of the field reconnaissance will be used to generate a list of the main soil taxonomic groups and a draft mapping unit legend for the project personnel to use when conducting mapping exercises. The preliminary soil pit location map developed during the desktop study will be developed into a more refined soil test pit sampling plan based on the preliminary field reconnaissance. The 350-foot spacing interval of the soil pits may be modified by the soil scientist. The actual spacing and location of the test pits will be determined based on field conditions (e.g. topography, vegetation trends). If any modifications are made to the location of test pits, it will be for the purpose of gathering more data where necessary. At no point will the modifications result in fewer test pits sampled or result in a less intensive assessment of soil properties.

The Forest Service, the Technical Advisor, and the Nicholas Putnam Group will review the results of the reconnaissance findings and the proposed soil test pit sampling plan prior to commencement of the remainder of the soil survey.

2.3 Soil Survey

2.3.1 Training

Prior to the start of the full-scale mapping effort, the soil scientist field teams will be provided with in-field training led by the Team Lead and supported by the Technical Advisor, and the Nicholas Putnam Group. The purpose of the training is to highlight unique soil properties that might be encountered, provide guidance on soil profile description best practices, develop a map unit identification matrix and naming system, discuss the soil-landscape relationships that are likely to be encountered during the soil survey, and to discuss other pertinent information gathered during the reconnaissance phase, including criteria for identifying the soil map unit boundaries and composition.

All training materials will be provided to the Forest Service, the Technical Advisor, and the Nicholas Putnam Group for review and comment prior to the initiation of any training activities.

2.3.2 Soil Test Pit Placement

Proposed soil test pits will be field located within the 300-foot wide corridor and mapped with a GPS (sub-meter accuracy). In the field, soil scientists will confirm the soil test pit locations and modify the location as required based on changes in topography, vegetation, geology, rock outcrops, or other features that would indicate a change in soil type. All sample locations will be located in the field using a mapping grade hand-held GPS device (sub-meter accuracy).

Based on a minimum of one sampling location per 2.5 acres, it is anticipated that up to 290 soil test pits will be observed; with 80 soil test pits in the MNF and 210 test pits in the GWNF. Additional soil test pits may be required to ensure survey accuracy along the centerline. In addition to the soil test pits, periodic additional shovel excavations or auger holes may be required to confirm the continued presence and/or boundary of a specific soil type.

The tables below summarize the approximate number of soil sampling locations (soil test pits) per soil map unit in the MNF and GWNF. These estimates are based on the SSURGO mapped soil series traversed by the proposed pipeline center line. The actual number of soil test pits in each soil series will vary based on the actual placement of the soil test pits within the 300-foot wide corridor and placement of soil test pits based on field observations.

Monongahela NF Map Units	Number of Sampling Locations
Berks	39
Berks-Weikert	3
Calvin-Dekalb-Berks	4
Cateache	16
Dekalb-Hazelton	1
Elliber	2
Weikert	15

Monongahela NF Map Units	**Number of Sampling Locations**
Total	**80**

George Washington NF Map Units	**Number of Sampling Locations**
Berks-Weikert	7
Berks	82
Caneyville	3
Cataska	4
Craigsville	3
Dekalb-Alticrest	2
Dekalb-Lily-McClung	1
Dekalb-Watahala-McClung	4
Gilpin	2
Hartleton	1
Hazleton	6
Lehew-Berks	2
Lew	12
Lily-McClung-Dekalb	1
Macove-Berks	2
Macove	3
Madsheep	1
McClung-Watahala-Dekalb	5
Monongahela	3
Oriskany-Murrill	2
Oriskany	10
Shelocta-Berks	1
Weikert-Berks-Rough	20
Weikert-Berks	31
Weikert	2
Total	**210**

2.3.3 Soil Test Pit Excavation

Soil test pits will be excavated to bedrock, a water table, or 50 inches, whichever is encountered first, to expose the soil profile. Soil test pits will be excavated with hand tools by laborers. The soil scientist will confirm the adequacy of the depth of the soil test pit.

2.3.4 Soil Logging

The exposed soil profile and site properties will be described using the USDA-NRCS protocols in accordance with the Field Book for Describing and Sampling Soils, Version 3.0 (Schoeneberger, P.J., D.A. Wysocki, E.C. Benham, and Soil Survey Staff, 2012, Natural Resources Conservation Service, Natural Resources Conservation Service, National Soil Survey, Lincoln NE). Additional reference is the NRCS National Soil Survey Handbook Section 629 Glossary of Landform and Geomorphic Terms. Photographs of all test pits will be taken and categorized with the descriptions.

Soil profile descriptions will be prepared for all excavated test pits. Soil profile descriptions will not be recorded for any supplemental shovel probes or auger holes used for the purpose of refining the placement of soil map unit boundaries unless the soil scientist deems the information necessary or they are part of a transect. Soil profile descriptions of master horizons will be recorded in shovel probes or auger holes related to transect. The location of supplemental testing and special symbols such as rock outcrops will be recorded with a GPS with sub-meter accuracy in either case.

Soil profile descriptions within soil test pits will include the following:

- Horizon depth and thickness
- Horizon nomenclature
- Matrix color (moist)
- Rock fragment type, size, and abundance (surface and subsurface)
- Rock outcrops
- USDA soil texture class
- Soil structure type, grade, and size
- Moist consistence (e.g. friable, firm, very firm, etc.)
- Boundary topography and distinctness
- Depth to, abundance, and contrast of redoximorphic features

- Soil pH (field determination at select locations)
- Fragipans or water-restrictive subsoil features
- Slope and Aspect
- Estimate of soil mineralogy
- Soil stickiness and plasticity estimates
- Root size and abundance
- Parent material type
- Bedrock type and characteristics
- Depth to bedrock and bedrock structure/ dip slope and strike
- Determination of drainage class
- Topographic position
- Indications of past shallow slope failures both natural and those attributed to anthropogenic disturbance such as road building, logging, mining and other activities
- Presence of apparent subsurface water tables. Seasonal water tables will be indicated by drainage class or wetness class
- Dominant vegetation
- Observations of special features (wet spots, springs, etc.)
- Pocket penetrometer measurements

Upon completion of soil observations, the excavated soil pits and supplemental shovel probes or auger holes will be backfilled with the excavated soil.

2.3.5 Chemical Analysis

In addition to the soil profile descriptions logged at each test pit location, soil samples will be collected from representative soil profiles for each major soil unit, soils representative of identified potentially problematic areas, and soils that are representative of the geologic or parent material changes along the proposed pipeline route. The collected soil samples will be prepared for shipment to Virginia Tech Soil Testing Laboratory, the Penn State Agricultural Analytical Laboratory, or another accredited laboratory. Once mapping commences, a determination will be made on the number of soil units present in the pipeline corridor, the location of any potentially problematic areas, and the location of major geologic landform changes. Based on a preliminary review of the SSURGO database, approximately 35 soil series are located along the proposed pipeline route within the MNF and GWNF. Assuming five horizons per soil series, an estimated 175 to 200 soil samples will be submitted for laboratory analysis and evaluated for effectiveness in use for reclamation such as vegetation establishment. The intent of the laboratory analysis is to characterize the soil chemical properties associated with the differing soil and geologic conditions along the proposed pipeline route as well as to identify any potentially problematic conditions that may be encountered and provide data that will help determine the appropriate seed mixtures and application rates for lime and fertilizer.

Soil samples will be analyzed for:

- Total organic carbon (TOC), and loss on ignition (LOI)
- Soil texture classification
- Soil pH
- Standard soil fertility analysis

The laboratory methodologies are included Attachment 3 to this Soil Survey Protocols document.

2.3.6 Quality Assurance/Quality Control

The following quality assurance/quality control (QA/QC) protocols will be implemented:

- The findings of the soil survey will be reviewed by the Technical Advisor. Reviews will occur at 10%, 50%, and 100% completion at a minimum.
- Independent verification and review of soil classification by third-party review (Nicholas Putnam Group).
- The Forest Service will be provided access to all information shared with the Technical Advisor and the Nicholas Putnam Group, as well as the review comments generated by those parties.

3.0 REPORTING

The field collected data will be used to further refine the soil-landscape relationships to aid in developing the soil map unit polygons. Field data will be shared with the Technical Advisor, the Nicholas Putnam Group, and the Forest Service on at least a weekly basis.

A soil survey report will be completed that will provide information on the soil map units and the collected data to accompany the soil survey map. The soil survey report will be formatted similar to the guidance provided in the Standards and Procedures for Site Specific Soil Mapping in Rhode Island (Stolt, 2007).

4.0 SCHEDULE

The anticipated schedule for completion of the Order 1 Soil Survey is outlined below.

Kick-Off Meeting with Forest Service: 1 day (March 9, 2016 - completed).

Desktop Survey (completed): The desktop survey will be conducted a minimum of two weeks prior to the Field Reconnaissance phase.

Preliminary Field Reconnaissance (completed): The preliminary field reconnaissance was following the completion of the desktop survey. Three days were spent in the GWNF and two days were spent in the MNF.

Soil Scientist Team Training (June 1, 2016): Soil scientist team members will be provided site-specific soil training by the Team Lead supported by the team's Technical Advisor and the Nicholas Putnam Group. Soil training will be conducted on June 1, 2016 on a site in the GWNF and may be supplemented with written information. All training materials will be provided to the Forest Service, the Technical Advisor, and the Nicholas Putnam Group for review and comment.

Soil Survey (June 2 – 22, 2016): Eight soil scientists have been identified to conduct the soil survey. For the purposes of determining the project schedule, it is assumed that five soil scientists will operate in any given week. Additionally, if needed, one soil scientist will be dedicated to locating the soil pits to be dug and staying with the digging crews until they can be sure each pit is representative of the soil and is not disturbed, substandard, or non-representative. To account for time needed to access the test pit locations, excavation time by the laborers, and the potential need for confirmatory augering/digging, it is assumed that each soil scientist will be able to describe four test pits and map approximately six to seven acres per day. Based on five soil scientists per day and travel time, it is assumed that the field work can be conducted in approximately three weeks, weather permitting. During the soil survey investigation, field data will be sent to the team's Technical Advisor, to the Nicholas Putnam Group, and to the Forest Service for review. If necessary, the soil survey field work may be paused to address areas of concern or additional investigations may be warranted based on the reviewer's feedback. Soil samples will be submitted for laboratory analysis periodically throughout the duration of the soil survey.

Deliverable: The findings of the field investigation will be used to generate a GIS based Order 1 soil survey map with accompanying written documentation detailing the composition of map units, the results of the laboratory data, and other pertinent information. The GIS attribute data will include parameters specific to the analysis of the feasibility of constructing a natural gas pipeline, such as, but not be limited to, depth to bedrock, depth of topsoil, soil acidity, indications of soil slippage, soil wetness issues, etc. The map and report will be reviewed, at a minimum, by the Soil Scientist Team Lead, the QA/QC Lead, the Technical Advisor and the Nicholas Putnam Group prior to submission to the Forest Service for review.

Timeline

- Kick-Off Meeting: March 9, 2016
- Desktop Survey: April 25 – May 6, 2016
- Preliminary Field Reconnaissance: May 9 - 13, 2016
- Update Protocols and Prepare Field Training Program based on Field Reconnaissance Findings: May 16 - May 27, 2016
- Soil Training: June 1, 2016
- Soil Survey: June 2 – June 22, 2016 (assuming completion of soil survey in 3 weeks)

A preliminary schedule of the soil survey by milepost is outlined in the table below and illustrated on Figures 1 and 2 in Attachment 4.

<table>
<tr><th>Survey Date</th><th>Date</th><th>Team 1</th><th>Team 2</th><th>Team 3</th><th>Team 4</th><th>Team 5</th><th>Forest</th></tr>
<tr><td>Training</td><td>6/1/2016</td><td colspan="5">All Teams</td><td>GWNF/MNF</td></tr>
<tr><td>1</td><td>6/2/2016</td><td colspan="5">Mile 154-158</td><td>GWNF</td></tr>
<tr><td>2</td><td>6/3/2016</td><td colspan="5">Mile 121.75-123</td><td>GWNF</td></tr>
<tr><td>3</td><td>6/6/2016</td><td colspan="5">Mile 120-121.75</td><td>GWNF</td></tr>
<tr><td>4</td><td>6/7/2016</td><td colspan="5">Mile 118.75-120</td><td>GWNF</td></tr>
<tr><td>5</td><td>6/8/2016</td><td colspan="5">Mile 117.25-118.75</td><td>GWNF</td></tr>
<tr><td>6</td><td>6/9/2016</td><td>Mile 106</td><td colspan="4">Mile 115.75-117.25</td><td>GWNF</td></tr>
<tr><td>7</td><td>6/10/2016</td><td colspan="3">Mile 96.5-97.5</td><td colspan="2">Mile 99.25-99.75</td><td>GWNF</td></tr>
<tr><td>8</td><td>6/13/2016</td><td>Mile 86.5-87</td><td colspan="3">Mile 93.5-94.5</td><td>Mile 96-96.25</td><td>GWNF</td></tr>
</table>

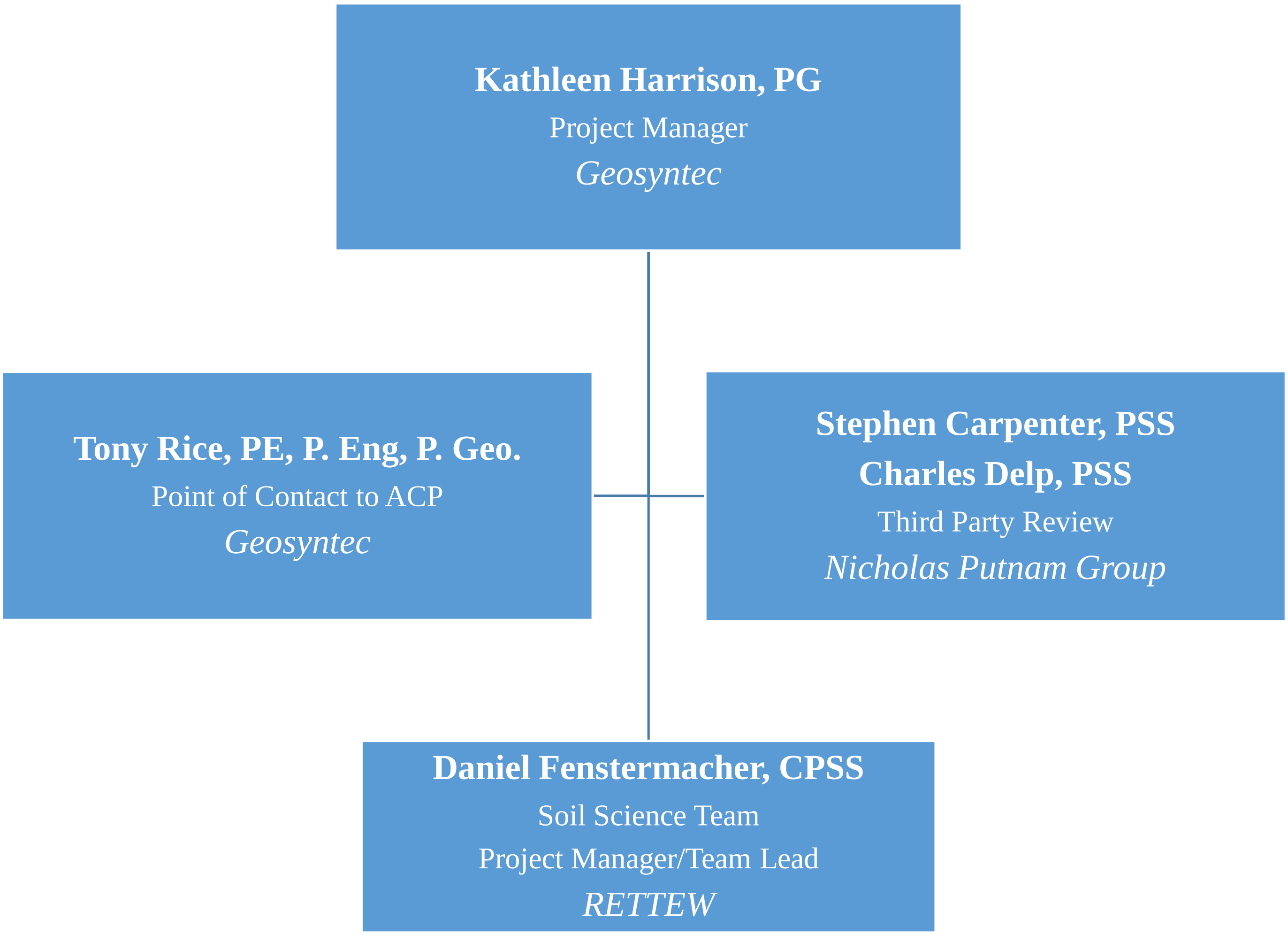
Survey Date	Date	Team 1	Team 2	Team 3	Team 4	Team 5	Forest
9	6/14/2016	Mile 85.75-86.75					GWNF
10	6/15/2016	Mile 84.75-85.75					GWNF
11	6/16/2016	Mile 83.75-84	Mile 84-84.75				GWNF/MNF
12	6/17/2016	Mile 82.75-83.75					MNF
13	6/20/2016	Mile 81.75-82.75					MNF
14	6/21/2016	Mile 80-81		Mile 81.25-81.75			MNF
15	6/22/2016	Mile 71-72		Mile 73-74			MNF

ATTACHMENTS

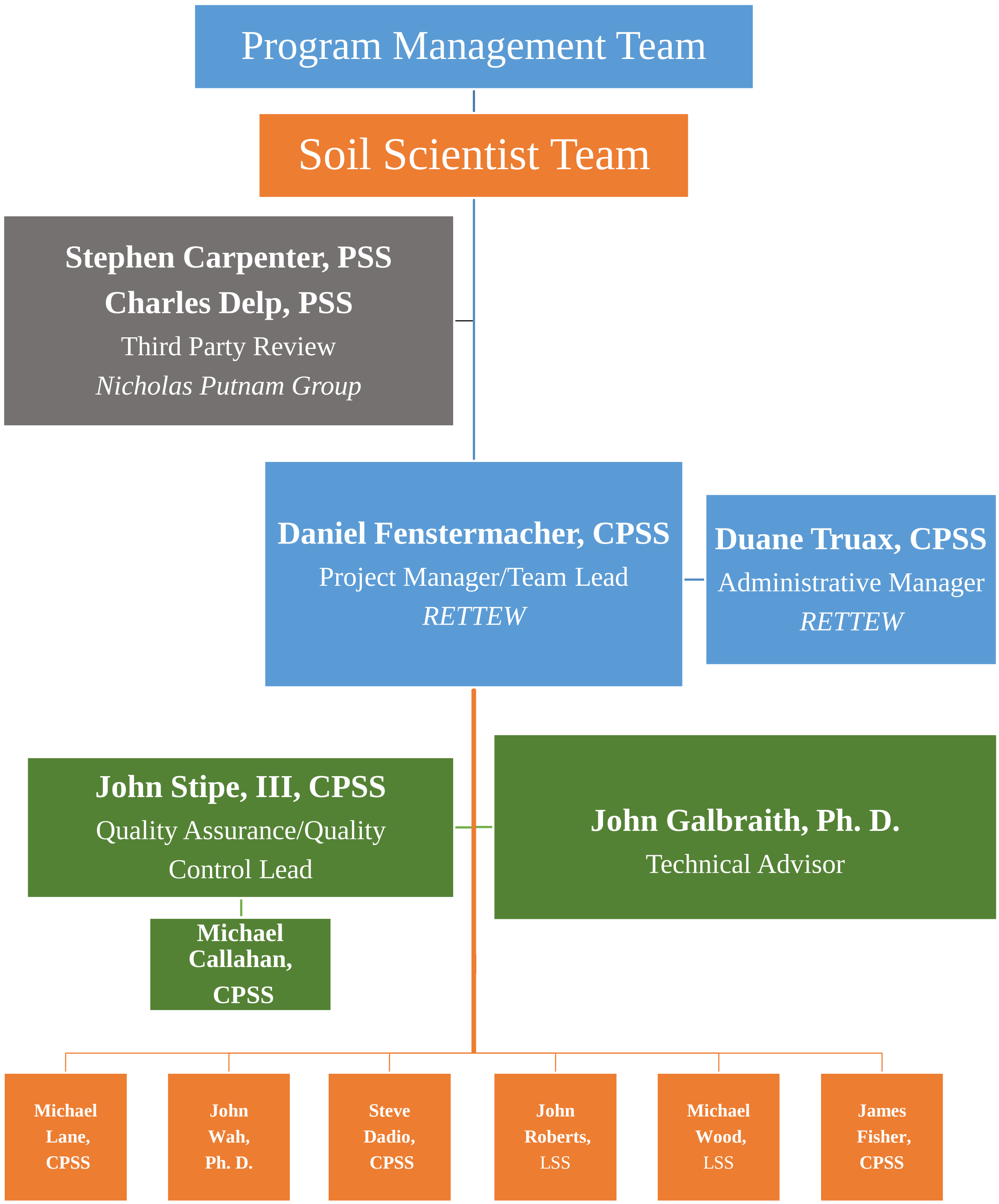
1. Organizational Charts
2. Soil Scientist Resumes
3. Laboratory Methodologies
4. Figures

Attachment 1
Organizational Charts

Atlantic Coast Pipeline Project
Order 1 Soil Survey
Organizational Chart – Management Team



Atlantic Coast Pipeline Project
Order 1 Soil Survey
Organizational Chart – Soil Science Team



Attachment 2
Soil Scientist Resumes

John B. Stipe III, CPSS
Director of Geosciences

RETTEW

Education
B.S., Environmental Resource Management, 1998, The Pennsylvania State University
Post Baccalaureate Studies in Geology and Soil Science, 2004-2006, Millersville University

Affiliations
SSSA - Soil Science Society of America
PAPSS - Pennsylvania Association of Professional Soil Scientists
Air and Waste Management Association
Marcellus Shale Coalition (MSC)

Training
OSHA, 40-Hour HAZWOPER
OSHA, 8-Hour HAZWOPER Supervisor
SafeLandUSA, First Aid/CPR
PA DEP, Advanced Soils Training
Dauphin County Conservation District, Site Evaluation, Soil Testing, and Infiltration: Applying the PA Stormwater BMP Manual
PAPSS, Interim Regional Supplement to the USACE Wetland Delineation Manual

Certifications
SSSA, Certified Professional Soil Scientist (CPSS)
PA Sewage Enforcement Officer (SEO)

Experience
Mr. Stipe is the Director of Geosciences at RETTEW with more than 17 years of experience as an environmental consultant. As a consulting soil scientist, Mr. Stipe provides detailed evaluations for site development including site evaluations for stormwater management and infiltration best management practices (BMPs), infiltration testing, geologic and karst hazard evaluations, soil mapping and classification, site investigations for on-site sewage disposal, soil permeability and percolation testing, on-lot septic system design, soil investigations for sewage sludge disposal, and soil investigations for hazardous waste disposal. With his understanding of the land development process and state and local policies, Mr. Stipe provides recommendations to consulting engineers and developers for planning, site feasibility, and design.

Mr. Stipe also serves the firm's energy clients engaged in the exploration of the Marcellus and Utica Shale Plays in Pennsylvania, Ohio, and West Virginia. Services provided to both exploration and production and midstream clients include the design and implementation of baseline water quality sampling programs, large-scale Phase I and II ESAs, soil quality investigations, remedial actions, environmental permitting, waste reporting, geotechnical investigations related to oil and gas field development and appurtenances, landslide and slip repair, surface and groundwater water source development, and SPCC plans.

Related experience includes the following projects:

Soil Mapping Investigation, Lancaster County, PA. Completed a soil mapping exercise to evaluate the accuracy of soil boundaries mapped by the U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS) in the Soil Survey of Lancaster County. The client intended to construct a commercial building in a floodplain soil type. However, because of ordinance restrictions, construction in the soil type was not permitted. The investigation confirmed the soils at the site differed from the floodplain soil type indicated by the County soil survey. Following review of the soils report, the Township issued the client a building permit.

Soil Mapping Investigation, Chester County, PA. Completed a soil mapping exercise to evaluate the accuracy of soil boundaries mapped by USDA-NRCS in the Soil Survey of Chester County. The client intended to construct a stormwater infiltration BMP (rain garden) in a floodplain soil type. However, because of ordinance restrictions, construction in the soil type was not permitted. The investigation confirmed the soils at the site differed from the floodplain soil type indicated by the County soil survey. Following review of the soils report, the local municipality approved the stormwater management plan.

Soil Investigations for Stormwater Management, Multiple Clients, Multiple Locations, PA. Served as Project Manager and technical lead for hundreds of feasibility studies to evaluate soil and geologic suitability for the design and construction of stormwater BMPs in karst and non-karst areas. Field activities included infiltration testing, soil classification, mapping and interpretation, field view, and field truthing of mapped soil and geologic features. Infiltration testing procedures included double-ring infiltrometer tests, permeameter tests, and standpipe tests.

Soil Investigation for Community On-Site Sewage Disposal, Drip Irrigation of Wastewater, Chester County, PA. While serving as Project Manager, conducted an investigation to evaluate large agricultural tracts for drip irrigation of 40,000 gpd of wastewater from a proposed athletic training facility. Coordinated the investigation closely with PA DEP and the County Health Department. Project included soil mapping, soil morphology evaluations, permeability testing, percolation testing, preparation of water balance calculations, and calculation of hydraulic loading rates for disposal.

Geotechnical Investigations, Proposed Natural Gas Facilities, Confidential Natural Gas Clients, Marcellus Shale Play, PA and WV. Provided technical oversight for the completion of multiple geotechnical investigations at multiple proposed natural gas facilities including well pads, compressor stations, metering sites, and pipeline facilities. Completed the investigations to evaluate subsurface conditions and site constraints to facilitate construction activities.

Soil Investigation for Community On-Site Sewage Disposal, Drip Irrigation of Wastewater, Chester County, PA. While serving as Project Manager, conducted an investigation to evaluate a 3-acre site for drip irrigation of 6,000 gpd of wastewater from an educational facility. Coordinated the investigation closely with PA DEP and the County Health Department. Project included a soil morphology evaluation, soil mapping exercise, and permeability testing. Prepared water balance calculations and assigned loading rates for disposal based on the observed soil morphology and measured soil hydraulic conductivities. Worked closely with environmental engineers to provide input for the system design and obtain the needed sewage permit from PA DEP.

Daniel E. Fenstermacher, CPSS
Soil Scientist

RETTEW

Education
B.S., Environmental Biology, 2009, Delaware Valley College
M.S., Soil and Watershed Science, 2012, University of Maryland

Affiliations
MAHSC - Mid-Atlantic Hydric Soils Committee
MAPSS - Mid-Atlantic Association of Professional Soil Scientists
SSSA - Soil Science Society of America
SWS - Society of Wetland Scientists

Training
Excavation and Trenching Awareness
MAPSS, Field Indicators of Hydric Soils in the Northern Piedmont
OSHA, 40-Hour HAZWOPER
OSHA, 8-Hour HAZWOPER Refresher
SafeLandUSA

Certifications
SSSA, Certified Professional Soil Scientist (CPSS)

Experience
Mr. Fenstermacher is a Soil Scientist in RETTEW's Geosciences group with five years of environmental consulting experience. Mr. Fenstermacher conducts soil classification, stormwater testing, geotechnical investigations, wetland delineations, and water sampling for the firm's oil and gas exploration and production clients. Through this experience, as well as his wetland restoration involvement, he has built relationships with numerous regulatory agencies including PA DEP and USDA's Agricultural Research Service.

Related experience includes the following projects:

Delmarva Bay Carbon Study, University of Maryland, Caroline County, MD. Led research to assess the impact of the historical conversion to agriculture on soil carbon and how that impact has altered the Delmarva Bay landscape. Examined the soils of Delmarva Bay wetlands under natural and agricultural land uses, including prior converted cropland, to determine if the conversion to agriculture affected carbon stocks and the potential for carbon sequestration through ecosystem restoration.

Conservation Effects Assessment Project, USDA, Multiple Counties, Multiple States. Conducted research to assess the effectiveness of depressional wetland restoration along the coastal plain. Focused on carbon sequestration and sedimentation as a component of a much larger collaborative study. Examined and determined carbon stocks for soils of natural, agricultural, and restored wetlands and analyzed data for these groups to examine the effects of land use change and restoration techniques.

Delmarva Bay Hydroperiod Study, USDA, Caroline County, MD. Examined soils and carbon stocks of wetlands to determine if soils influenced the hydroperiod and how the hydroperiod influenced carbon stocks.

Well Pad, Confidential Natural Gas Client, Columbiana County, OH. Served as Environmental Scientist responsible for conducting geotechnical investigations including soil classification via test pits and soil core borings.

Natural Gas Well Pad and Impoundment Wetland Delineations, Confidential Natural Gas Client, Multiple Counties, PA. Served as Environmental Scientist for conducting wetland delineations, habitat assessments, and top soil surveys for multiple oil and gas well pads and impoundments.

Cellular Tower Sites, Verizon Wireless, Multiple Counties, PA. Served as Soil Scientist for multiple proposed cell phone towers. Conducted soil classification and stormwater infiltration testing for stormwater management plans.

Natural Gas Well Pads Geotechnical Investigations, Confidential Natural Gas Client, Multiple Counties, WV. Served as Environmental Scientist for conducting geotechnical investigations for multiple oil and gas projects. Work included soil penetration testing, rock coring, logging bores, and collection of samples.

Well Pad, Confidential Natural Gas Client, Mercer County, PA. Served as Environmental Scientist responsible for conducting soil characterization and infiltration testing for designing stormwater management features.

Michael Callahan, CPSS
Senior Soil Scientist

RETTEW

Education
B.S., Environmental Soil Science, 2001, The Pennsylvania State University
M.S., Soil Science, 2004, The Pennsylvania State University

Affiliations
NOWRA - National On-Site Wastewater Recycling Association
PAPSS - Pennsylvania Association of Professional Soil Scientists
POWRA - Pennsylvania On-Site Wastewater Recycling Association
SSSA - Soil Science Society of America

Training
SafeLandUSA

Certifications
SSSA, Certified Professional Soil Scientist (CPSS)
Sewage Enforcement Officer (SEO)

Experience
Mr. Callahan is a Certified Professional Soil Scientist, with more than ten years of experience evaluating soils and landscapes in multiple locations in the U.S. His responsibilities include the classification and interpretation of soil morphological properties, the implementation of field data collection, analysis of field and laboratory data, and the preparation of environmental permits. Mr. Callahan has mapped soils on sites ranging from less than 1 acre to more than 1,000 acres. He has coupled his soil morphology experience with remote data technologies to facilitate more accurate findings and more focused investigations. He also has extensive experience in soil phosphorous. Mr. Callahan has served as an officer for many professional organizations; participated in industry workgroups on special topics of concern; and routinely interacts with federal, state, and local agency personnel in the soil science and environmental science arenas. He also serves as an Adjunct Professor of Soil Science at the Delaware Valley University.

Related experience includes the following projects:

Soil Investigations for Community On-Site Sewage Disposal Systems, West Penn Township, Schuylkill County, PA. To evaluate the potential for a community land application option as a long-term solution for sewage disposal, evaluated a prioritized list of 53 potential land application sites with Township officials and PA DEP to complete detailed investigations at the ten highest-priority sites. Investigations included soil classification, soil mapping, permeability testing, and percolation testing. Following the completion of the detailed investigations, completed a cost benefit analysis to determine if public sewer or a land-based application is the best long-term solution for community sewage disposal.

Soil and Site Evaluation for Community-Scale Septic System, Haywood County, NC. As Lead Soil Scientist, conducted a preliminary soil and site evaluation for an 800-acre property. The investigation characterized the soil in site conditions in relation to their suitability to serve as an infiltration drain field for residential sewage effluent. Based on the results of the preliminary study, conducted an additional detailed soil and site evaluation on 8 acres to gather the data needed to properly locate and size the drain field. During this phase of testing, examined backhoe-excavated soil test pits, conducted constant head-saturated hydraulic conductivity tests, and analyzed collected data in a comprehensive environmental and regulatory framework that balanced the needs of the facility with the natural constraints of the landscape. The analysis included an agronomic analysis of the soil and water balance for the site that incorporated the effluent volume.

Hydric Soil Investigation, Union County, NC. Conducted a detailed soil mapping of hydric soil boundary on several potential stream and wetland restoration sites. The focus was to accurately determine the extent of hydric and relict hydric soils on the properties to determine the potential for stream and wetland restoration for a mitigation banking company. Incorporated results into a decision support matrix to aid the client in determining the most effective sites to pursue.

Stormwater Feasibility, Fort Bragg, Cumberland County, NC. Evaluated potential stormwater infiltration sites to determine potential depth of infiltration structure and design loading rate. Analyzed backhoe-excavated soil test pits and conducted saturated hydraulic conductivity measurements according to the results of the morphological evaluation. Relayed results to the project design engineer to aid in overall site design.

General Permit, Forsyth County, NC. Worked in conjunction with field biologist to delineate jurisdictional streams and wetlands on the site and prepared the permit applications for federal and state agencies for an abandoned firing range. The need for the removal of lead- and chromium-contaminated soil behind an abandoned firing range prompted an evaluation of the environmental resources of the site. Field investigations revealed the presence of a wetland in the vicinity of the contaminated soil. Prepared general permit for removal of the contaminated soil and placement of fill material. Used GPS in the field to collect data points and in the office to prepare map products for the client and permit application.

Bench-Scale Incubation Study, USDA-Agricultural Research Service, University Park, Centre County, PA. Served as the Project Support Scientist. Aided in the design, construction, implementation, data analysis, and preparation of results of a bench-scale soil incubation study. The study investigated the efficacy of various industrial byproducts to increase the retention time of soil phosphorus in high phosphorus concentration agricultural soils. Analyzed results in the context of the bench-scale study as well as in relation to separate plot- and field-scale studies to determine efficacy across scales.

Curriculum Vitae John M. Galbraith

Education

- Ph. D. Cornell University 1997 Soil Science, Agronomy, Geomorphology
- M.S. Texas Tech University 1983 Range Science
- B.S. Texas Tech University 1978 Range and Wildlife Management

Professional appointments (60% teaching, 30% extension, 10% research)

- Associate Professor, Crop and Soil Envir Sci , Virginia Tech, Blacksburg, VA, 2005-present
- Assistant Professor, Crop and Soil Envir Sci, Virginia Tech, Blacksburg, VA, 1999-2005
- Post-Doctoral Associate, Soil and Water Science, Univ. of Florida, Gainesville, FL, 1998-1999
- Post- Doctoral Associate, Crop, Soil, and Atmos. Sci., Cornell University, Ithaca, NY, 1997-1998
- Research Support Specialist, Crop, Soil, and Atmos. Sci., Cornell Univ., Ithaca, NY, 1990-1997
- Supervisory Soil Scientist, USDA-SCS, Havre, MT, 1987-1990
- Soil Scientist, USDA-SCS, Pearsall and Kenedy, TX, 1983-1987
- Range Conservationist, USDA-SCS, Menard and Andrews, TX, 1977-1979

Awards

- Elected Fundamental Soil Sci. Group, Repr. to the Soil Sci. Soc. Am. Board Directors. 2013-2016.
- Elected Chair, Div. 1.4 Soil Classification, Int. Union Soil Sci. 2010-2014.
- Elected Chair, Div. S-5 (Pedology), Soil Sci. Soc. Am. 2008.
- NE Cooperative Soil Survey Conference - Silver Spade Award presented for outstanding regional and/or national service to soil survey. 2008.
- Harry A. McDonald Award for Excellence in Teaching, Dept. Soil, Crop, and Atmospheric Sci., Cornell University. 1997.

Publications (refereed journal articles since 2006) * indicates student author. (10 of 23 total)

- Mikhailova, E., Post, C., Schlautman, M.A., and J.M. Galbraith. 2013. Potential Contribution of Combined Atmospheric Ca^{2+} and Mg^{2+} Wet deposition within the Continental U.S. to Soil Inorganic Carbon Sequestration. Pedosphere. Accepted Aug. 2013.
- Kayastha, N., Thomas, V.A., and J.M. Galbraith. 2012. Monitoring wetland change using inter annual Landsat timeseries data. Wetlands 32:1149–1162. DOI 10.1007/s13157-012-0345-1
- Galbraith, J.M. 2012. Shepherding Undergraduate Students Through a Research Experience. No. Am. Col. Teach. Agric. J. 56 (2): 76-82
- Galbraith, J.M. 2012. Using Student Competition Field Trips to Increase Teaching and Learning Effectiveness. J. Nat. Res. Life Sci. Edu. 41(1): 54-58
- Chakraborty, S., Weindorf, D.C., Zhu, Y., Li, B., Morgan, C.L.S., Ge, Y., and J.M. Galbraith. 2012. Assessing spatial variability of soil petroleum contamination using visible near-infrared diffuse reflectance spectroscopy. J. Envir. Monit. 14: 2886-2892. DOI 10.1039/c2em30330b
- Chakraborty, S., Weindorf, D.C., Zhu, Y., Li, B., Morgan, C.L.S., Ge, Y., and J.M. Galbraith. 2012. Spectral reflectance variability from soil physicochemical properties in oil contaminated soils. Geoderma 177-178: 80-89. DOI 10.1016/
- Chakraborty, S., Weindorf, D.C., Morgan, C.L.S., Ge, Y., Galbraith, J.M., Li, B., and C.S. Kahlon. 2010. Rapid Identification of Oil-Contaminated Soils Using Visible Near-Infrared Diffuse Reflectance Spectroscopy. J. Environ. Qual. Vol 39(4): 1378-1387.

- Goddard, M.A.*, Mikhailova, E.M., Post, C.J., Schlautman, M.A., and J.M. Galbraith. 2009. Continental United States Atmospheric Wet Calcium Deposition and Soil Inorganic Carbon Stocks. Soil Sci. Soc. Am. J. 73:989-994.
- Pantaleoni, E.*, R. Wynne, J. Galbraith, and J. Campbell. 2009. A logit model for predicting wetland location using ASTER and GIS. Inter. J. of Rem. Sens. 30(9): 2215-2236
- Pantaleoni, E.*, R. Wynne, J. Galbraith, and J. Campbell. 2009. A comparison of CART and logistic regression for mapping wetland types in the Coastal Plain of Virginia using the ASTER sensor. Inter. J. of Rem. Sens. 30(13): 3423-3440.
- Showalter, J.M.*, J.A. Burger, C.E. Zipper, J.M. Galbraith, and P.F. Donovan. 2007. Influence of Mine Soil Properties on White Oak Seedling Growth: A Proposed Mine Soil Classification Model. So. J. Appl. For. 31(2): 99-107.
- Galang*, J., C.Zipper, S. Prisley, J. Galbraith, and P. Donovan. 2006. Evaluating Terrestrial Carbon Sequestration Options for Virginia. Env. Mngmnt. 39(2):139-150
- Casselman*, C.N., T.R. Fox, Burger, J.A., Jones, A.T., and J.M. Galbraith. 2006. Effects of silvicultural treatments on survival and growth of trees planted on reclaimed mine lands in the Appalachians. For. Ecol. and Mngmnt. 223:403-414.
- Burdt*, A.C., J.M. Galbraith, and J.P. Megonigal. 2006. CO_2 efflux rates by land-use treatment in wet flats of Southeast Virginia. Wetl. Ecol. and Mngmnt. 14(2):133–145.

Competitive grants (current)

- J. Galbraith, 100%, USDA-NRCS, $11,089, 9/01/13 to 8/30/15, Soil Taxonomy Forum Update, maintenance, and Hosting (CESU).
- J. Galbraith, 100%, NPS, $10,000, 7/30/12 to 9/30/13, Geological and Soils Study of Mound Sites, Canaveral National Seashore (CESU).
- Fike J., J. Galbraith, 20%, DOE/Sungrant, $175,999, 4/1/10 to 3/31/15, Switchgrass Feedstock Research.
- Fike J., J. Galbraith, 20%, NC Sungrant/DOE, $106,499, 4/1/10 to 3/31/15, Miscanthus Feedstock Research.
- Sanders, K., J. Galbraith, A. Abaye, S. Cook, J. McKenna, B. Potter , 25%, Terry Lynn Poerner Charitable Foundation, $50,000, 10/01/08 to 09/30/13, Virginia Indians Pre-College Outreach Initiative.

Courses taught (100% involvement unless otherwise indicated)

- Soils (40%)
- Soil Description and Interpretation
- Soil Description and Sampling
- Advanced Wetland Soils (70%)
- Soils in the Landscape (40%)
- Soil Genesis and Classification
- Wetland Soils and Mitigation
- Advanced Wetland Soils [on-line] (70%)

Student advising (summary)

- Co-major advisor for doctoral candidates [Kayastha]; on four other committees [Bartens; Chakraborty; Zheng; Severson].
- Major or co-major advisor for master's candidates [Liu; Troyer; Morrow; Stephenson; Teany; Morgan; Templeton]; on one other M.S. committee [Bonzey].
- Former Advisor to 15 undergraduates, now to all CSES Soil and Land Rehabilitation students
- Major advisor to one Doctoral and five Masters students who completed their degree.

Diversity initiatives or contributions (selected)

- Developed relationship to assist Oglala Lakota College (Tribal College, 1994 Land Grant) in reestablishing Basic Soils and add a summer school Wetlands class
- Voluntary teacher for one-week at Red Cloud Indian School, Pine Ridge, SD 2014
- Member of Virginia Indians Pre-College Outreach Initiative Planning Team
- Member Native @ VT student organization
- Attendee, Virginia Indian Nations Summit on Higher Education (VINSHE)
- Successfully co-authored a $50,000 grant from a private foundation for initial funding of theVirginia Indians Pre-College Outreach Initiative
- Association of Women Soil Scientists 2008-present

Outreach and professional service (summary, arranged by date)

- Appointed representative to Virginia Sewage Handling and Disposal Advisory Committee 2013-present
- Meeting Associate Editor for Divisions S-10 and S-5. Soil Sci. Soc. Am. J. 2005-2008
- Appointed by the Virginia Governor's Office for the Board for Professional Soil Scientists and Wetland Professionals 2004-2007
- Associate Editor for the Southern Region. Soil Survey Horizons (published by the American Society of Agronomy) 2002-2006
- Member of one international, four national, four regional, five state, one university, and two departmental committees 1998-present
- Nine outreach-related publications and nine outreach-related websites 1999-present
- Appointed to Comm. to develop Universal Soil Classification System 2010-2018
- Appointed to Comm. to write a simplified version of Soil Taxonomy 2011-present
- Appointed William H. Patrick Lectureship selection committee 2008-present
- Southeast Region representative - Soil Judging Committee 1999-2002
- Soil Judging Committee 1999-2002
- Soil Geomorphology Committee 2002-present
- Northeast Region - Research Needs Committee 2000-present
- Northeast Region – Standards and Procedures/Soil Tax. Committee 1996-present

Associations and society memberships (arranged alphabetically, appointed positions indicated)

- Affiliated Faculty – Conservation Management Inst., Center for Geospatial Info. Technologies, and Center for Envir. Applications of Remote Sensing 2006 -present.
- Association of Women Soil Scientists 2008-present
- International Union of Soil Scientists (formerly ISSS) 1977-present
- North American Colleges and Teachers of Agriculture 1999-present
- Soil Science Society of America 1977-present
- Society of Wetland Scientists 2000-present
- Virginia Association of Professional Soil Scientists 1999-present
- Virginia Association of Wetland Professionals 2000-present
- Wetland Mapping Consortium co-founder, web site manager 2008-present

Duane A. Truax, CPSS
Senior Soil Scientist

RETTEW

Education
B.S., Soil Science, 2000, The Pennsylvania State University
B.S., Turfgrass Science, 2000, The Pennsylvania State University

Affiliations
ASA - American Society of Agronomy
CSSA - Crop Science Society of America
MAPSS - Maryland Association of Professional Soil Scientists
PAPSS - Pennsylvania Association of Professional Soil Scientists
PTC - Pennsylvania Turfgrass Council
SSSA - Soil Science Society of America

Training
Maryland E&S Control
SafeLandUSA
USACE, Wetland Delineation

Certifications
SSSA, Certified Professional Soil Scientist (CPSS)
PDA, Licensed Pennsylvania Pesticide Applicator, Category No. 7

Experience
Mr. Truax is a Soil Scientist in RETTEW's Geosciences group with 15 years of experience in soils and geotechnical consulting. His geotechnical engineering experience includes proposal preparation, project management, drilling inspection, test pit monitoring and documentation, soil classification and logging, in situ infiltration testing, data analysis and evaluation, and report preparation. He has worked with single and multistory commercial buildings, warehouses, freshwater impoundments for natural gas production, stormwater management facilities, retaining walls, and roadways. Mr. Truax manages testing and inspection for construction materials including soils, foundation subgrade, rebar reinforcement, concrete, masonry, structural steel, precast-concrete, sprayed-on fire-resistive materials, and intumescent paint projects.

Related experience includes the following projects:

Commercial Site Development, High Real Estate Group, Lancaster County, PA. Provided on-site test pit observation and infiltration testing for the proposed commercial development of a parcel of land located in East Lampeter Township. Based on the requirements of the Township stormwater management ordnance, the bottoms of stormwater BMPs must be located a minimum of 4 feet above any observed limiting zone such as bedrock and seasonal high water tables. Assisted with identifying limiting zones in the soil profiles at the site and completed full soil profile descriptions based on USDA soil classification system.

Tanger Outlet Center Lancaster Expansion, Tanger Outlet Centers, Lancaster County, PA. Served as Senior Soil Scientist on both the geotechnical investigation and stormwater infiltration testing phases at this site. Proposed improvements included construction of three single-story retail buildings and associated parking and access areas, as well as stormwater management facilities to accommodate the new construction. The majority of this expansion project is proposed on the property adjacent to the existing outlet retail center. This site is underlain by karst (carbonate) geology, which is susceptible to sinkhole development.

Proposed Townhouse Development Soil and Geotechnical Investigation, Hovnanian Enterprises, Chester County, PA. Served as Senior Soil Scientist for the soils investigation. Proposed improvements included construction of townhouses and associated access roads and stormwater management facilities. Client used the results of site investigation, consisting of test pits, and subsequent analysis, to plan for the proposed townhouse foundations as well as other earthwork requirements related to the project.

Signature Senior Living Community Development, SDR Development, Inc., Lancaster County, PA. Served as Senior Soil Scientist on both the geotechnical investigation and stormwater infiltration testing phases at this site. Project included construction of a new single-story, assisted-living facility with associated parking and access areas. Stormwater management facilities are also proposed to accommodate the new construction. The site is underlain by karst (carbonate) geology, which is susceptible to sinkhole development.

SpringHill Suites at Saucon Valley, High Hotels, Ltd., Lehigh County, PA. Served as Senior Soil Scientist on both the geotechnical investigation and stormwater infiltration testing phases at this site. Proposed improvements included two hotels with associated parking and access areas, as well as stormwater management facilities to accommodate the new construction. This site posed several unique challenges to the proposed development including its underlying karst (carbonate) geology, which is susceptible to sinkholes and subsidence. Investigated a historic quarry at the site using geotechnical borings and geophysical techniques to determine its extent.

Geotechnical and Soil Investigations, Confidential Natural Gas Client, Multiple Counties, PA. Completed site investigations and analyses on an accelerated schedule while maintaining a high level of accuracy. Conducted soil investigations for proposed freshwater impoundments and provided on-site documentation of test pit and drill logging during the site investigation. Prepared detailed reports including findings, conclusions, and recommendations relative to the construction of freshwater impoundments.

Freshwater Impoundment, Confidential Natural Gas Client, Hunt Marcellus Operating Co., LLC, Marcellus Shale Play, PA. As Project Soil Scientist, provided a subsurface investigation and evaluation of this proposed freshwater impoundment in support of natural gas operations. Used data obtained from the test pit observations and laboratory analysis of soil samples obtained at the site to provide recommendations for the design and construction of the impoundment.

Natural Gas Well Pad, Confidential Natural Gas Client, Shell Exploration & Production Company, Utica Shale Play, PA. As Project Soil Scientist, performed test pits and infiltration testing at this future natural gas well pad site. Used the data obtained from the test pit observations and infiltration testing to provide recommendations for the design and construction of stormwater management BMPs.

JOHN S. WAH

P.O. Box 186, Shippensburg, PA 17257 ∴ (240) 604-6639

matapeake.soil@gmail.com

Summary of Experience

Trained in pedology and archaeology. Over 10 years post-Ph.D. experience in soil/geomorphological investigations for archaeological research and cultural resource management with a focus on the Northeast and Mid-Atlantic regions including PA, NY, NJ, MD, DE, VA and WV. Experience in the physical, chemical, and mineralogical laboratory characterization of soils. Preparation of technical and scientific reports and presentations. Teaching in field, laboratory, and classroom settings.

Education

Ph.D. (2003), Soil Science, University of Maryland, College Park.
Dissertation: "Origin and Pedogenic History of Quaternary Silts on the Maryland Coastal Plain."
Advisor: Dr. M.C. Rabenhorst

M.S. (1998), Soil Science, University of Tennessee, Knoxville.
Thesis: "Characteristics of Soils along the Elk River, Southcentral Tennessee: Implications for Soil and Landscape Genesis, and Archaeology."
Advisor: Dr. J.E. Foss

B.A. (1993), Anthropology and Medieval Studies, Pennsylvania State University, University Park.

Experience

Soil Scientist, Principal Investigator, Matapeake Soil and Environmental Consultants, LLC, Shippensburg, PA (2008 to present)

- Responsible for project design, budgeting, and implementation
- Performed soil/geomorphological field research in archaeological investigations
- Prepared technical and scientific reports and presentations
- Laboratory analysis of physical and mineralogical soil properties
- Provided soils training for Penn State, Juniata College, Washington College, and PBS Time Team America archaeological Field Schools

Research Collaborator, Smithsonian Institution National Museum of Natural History, Washington, D.C. (2010 to present)

- Soils and geomorphological research in interdisciplinary archeological investigations

Assistant Professor, Adjunct, Shippensburg University, Department of Geography & Earth Science, Shippensburg, PA (2008, 2010, 2011).

- Developed and taught ESS393/594 'Environmental Field Soils' a field, laboratory, and classroom course for graduate and undergraduate students
- Developed and taught ESS594-21 'Soils, Sediments, and Landscapes: Processes and the Archaeological Record' a graduate seminar course

Assistant Professor, Adjunct, Wilson College, Department of Environmental Sciences, Chambersburg, PA (2011)

- Developed and taught ENV370 'Stewardship of Watershed Ecosystems'

Soil Scientist, Principal Investigator, AXIS Research, Inc., James Creek, PA (2005 to 2008)

- Responsible for project design, budgeting, and implementation.
- Performed soil/geomorphological field research in archaeological investigations.
- Prepared technical and scientific reports and presentations.
- Managed soil research laboratory, physical and chemical soil analysis.
- Guest instructor for Field Methods course at Shippensburg University and Archaeological Field Schools at Penn State and Washington College.

Soil Scientist, Geo-Sci Consultants, Inc., University Park, MD (2001 to 2006).

- Performed field research in soil-archaeology investigations.
- Detailed soil mapping and hydraulic conductivity testing for spray irrigation.

Research Assistant, Department of Natural Resource Sciences, University of Maryland, College, Park, MD (1998 to 2003).

- Performed field and laboratory research in examination of soil genesis, morphology, classification, hydric soils, and soils in archaeology.
- Oversaw daily operations of pedology laboratory: physical, chemical, and mineralogical analysis of soils.
- Assistant coach University of Maryland Soil Judging Team (1998-2001).
- Teaching assistant for NRSC 424: Field Study in Soil Morphology (Summer 2000, 2002).

Research Assistant, Department of Plant and Soil Science, University of Tennessee, Knoxville (1994 to 1998).

- Performed field and laboratory research in examination of soil genesis, soil geomorphology, and soils in archaeology.
- Instructor for PSS 211: Introduction to Soil Science Lab (Fall 1997).

Field and Teaching Assistant, State Museum of Pennsylvania/Elizabethtown College, Ephrata, PA (June 1995 to August 1995 and June 1994 to August 1994)

- Oversaw daily excavation activities at field school in historical archaeology at Ephrata Cloister.
- Instructed students in field and laboratory techniques.

Archaeologist, Archaeological and Historical Consultants, Inc., Centre Hall, PA (1994).

- Performed phase I and II cultural resource survey.

Archaeologist, Heberling Associates, Huntingdon, PA (1993).

- Performed phase I and II cultural resource survey.

Archaeologist, Friends of the State Museum, Harrisburg, PA (June 1993 to August 1993)

- Assistant on the State Museum of Pennsylvania/Pennsylvania State University field school in historical archaeology at Ephrata Cloister.

Publications, Abstracts, and Presentations

Lowery, D.L., T.C. Rick, M. Barber, J.S. Wah, and M. Madden. 2015. Meadowood South of the Mason-Dixon Line: An Early Woodland Meadowood presence on the Delmarva Peninsula. Archaeology of Eastern North America (In press).

Rick, T.C., M. Barber., D.L. Lowery, J.S. Wah, and M. Madden. 2015. Early Woodland coastal foraging at the Savage Neck Shell Midden (44NH478), Chesapeake Bay, Virginia. Archaeology of Eastern North America 43:23-38 (In press).

Wah, J.S., D.L. Lowery, and D.P. Wagner. 2014. Loess, Landscape Evolution, and Pre-Clovis on the Delmarva Peninsula. p. 32-48. *In* D.J. Stanford and A.T. Stenger (eds.) Pre-Clovis in the Americas, International Science Conference Proceedings, Smithsonian Institution, Washington, D.C.

Lowery, D.L., D.J. Stanford, D.P. Wagner, and J.S. Wah. 2013. Paleo-Americans on the Coastal Plain: A Perspective from the Middle Atlantic and Delmarva Peninsula (Part II). Paleoamerican Odyssey Conference, Santa Fe, New Mexico, October 17-19.

Rick, T.C., J.S. Wah, and J.M. Erlandson. 2012. Re-evaluating the origins of late Pleistocene fire areas on Santa Rosa Island, California, USA. Quaternary Research 78:353-362.

Lowery, D.L., J.S. Wah, and T.C. Rick. 2011. Post-Last Glacial Maximum Dune Sequence for the "Parsonburg" Formation at Elliots Island, Maryland. Current Research in the Pleistocene 28:103-104.

Rick, T.C., D.L. Lowery, G.A. Henkes, and J.S. Wah. 2011. A Late Holocene radiocarbon chronology for the shell middens of Fishing Bay, Maryland. Archaeology of Eastern North America, 39:153-167.

Wah, J.S. (editor). 2011. Michaux State Forest Soils, Sediments, and Landscapes Field Tour. Guidebook for the Mid-Atlantic Association of Professional Soil Scientists Soils Field Tour, September 10-11, 2011. Shippensburg, PA.

Blewett, W.L. and J.S. Wah. 2011. Geology, Landscape, Soils of Michaux State Forest and South Mountain, Pennsylvania. p. 3-15. *In* J.S. Wah (ed.) Michaux State Forest Soils, Sediments, and Landscapes Field Tour. Guidebook for the Mid-Atlantic Association of Professional Soil Scientists Soils Field Tour, September 10-11, 2011. Shippensburg, PA.

Wah, J.S. 2010. A tale of two soils: Soil morphology and physical, chemical, and mineralogical characteristics to reconstruct landscape evolution on the Delmarva. 40th Annual Middle Atlantic Archaeological Conference, Ocean City, MD, March 18-21.

Lowery, D.L., M.A. O'Neal, J.S. Wah, D.P. Wagner and D.J. Stanford. 2010. Late Pleistocene upland stratigraphy of the western Delmarva Peninsula, USA. Quaternary Science Reviews, 29: 1472-1480

Wah, J.S. 2009. The use of landforms, sediments, and soils in the interpretation of archaeological sites. 76th Annual Meeting of the Eastern States Archaeological Federation, Johnstown, PA, November 5-8, 2009.

Wah, J.S. D.P. Wagner, D.L. Lowery, and M.C. Rabenhorst. 2008. Paleosols, Prehistory, and Climate Change in Late Quaternary Loess on the Delmarva Peninsula. p. 216. *In* American Quaternary Association Program and Abstracts of the 2008 Biennial Meeting. Pennsylvania State University, State College, PA.

Wagner, D.P., D.L. Lowery, J. Gingerich, and J.S. Wah. 2008. Soil and landscape modification during the Younger Dryas chronozone and the demise of Clovis: Evidence from Cactus Hill, the Delmarva Peninsula, and Shawnee Minisink. A Symposium to Honor the Work of William M. Gardener, Shepherdstown, WV, September 26-28.

Burns, J.A., J.S. Wah, and R.E. Kruchoski. 2007. The Madness Behind the Method: Interdisciplinary Rockshelter Research in the Northeastern United States. *In* M. Kornfeld, S. Vasil'ev, and L. Miotti (eds.) On Shelter's Ledge: Histories, Theories and Methods of Rockshelter Research. Proceedings of the XV World Congress (Lisbon, 4-9 September 2006). Archaeopress, Oxford, England.

Wah, J.S. and J.A. Burns. 2006. An introduction to the cultural history of Pennsylvania and the Mid-Atlantic. p. 36-42. *In* D.S. Fanning (ed.) Acid Sulfate Soils of the U.S. Mid-Atlantic/Chesapeake Bay Region._ Guidebook for the 18th World Congress of Soil Science Acid Sulfate Soils Tour, July 6-8, 2006. College Park, MD.

Wagner, D.P., J.S. Wah., D.L. Lowery, and J. Gingerich. 2005. Burial of Clovis surfaces during the Younger Dryas - A discussion of three locations: Cactus Hill, the Delmarva Peninsula, and Shawnee Minisink. Clovis in the Southeast, Columbia, SC, October 26-29, 2005.

Kruchoski, R.E., J.S. Wah, and J.A. Burns. 2005. Interdisciplinary science at Camelback Rockshelter (36MR180), Monroe County, Pennsylvania. 35th Annual Meeting of the Middle Atlantic Archaeological Conference. Rehoboth Beach, DE, March 11-13, 2005.

Fanning, D.S., J.S. Wah, and P.K. Zurheide. 2004. Characteristics of an extremely glauconitic soil from Burlington County, NJ. Annual Meeting, Northeastern Branch ASA-SSSA. Bordentown, NJ, July 11-14, 2004.

Wah, J.S. 2003. Introduction to biogenic opal in soils and archaeology. West Virginia Association of Professional Soil Scientists Annual Meeting, Shepherdstown, WV. June 6-7, 2003. (Invited).

Wah, J.S. 2003. Biogenic opal in soils on the Delmarva Peninsula, Maryland. West Virginia Association of Professional Soil Scientists Annual Meeting, Shepherdstown, WV. June 6-7, 2003. (Invited).

Wah, J.S. and M.C. Rabenhorst. 2002. Light mineral assessment of soils formed in Quaternary silts in Maryland. *In* 2002 Agronomy abstracts (CD-ROM). ASA, Madison, WI.

Wah, J.S. 2002. Origin and pedogenic history of Quaternary silts on the Delmarva Peninsula, MD. Maryland/Delaware Soil Survey Work Planning Conference, Wye Mills, Maryland. April 2-3, 2002.

Wah, J.S. and M.C. Rabenhorst. 2001. Origin and pedogenic history of Quaternary silts on the Maryland Coastal Plain. *In* 2001 Agronomy abstracts (CD-ROM). ASA, Madison, WI.

Wagner, D.P., D.L. Lowery, J.E. Foss and J.S. Wah. 2001. A time of dust: Paleoindians and loess on the Eastern Shore of Maryland. p. 22-23. *In* Abstracts, Mid-Atlantic Archaeological Conference, Ocean City, Maryland. March 23-25, 2001.

Phillips, D.H., J.E. Foss, C.A. Stiles, J.S. Wah, and R. Evans. 1999. Characteristics of soils in an Oak dominated forest subject to long-term prescribed fires in Franklin Co., Tennessee. *In* W.K. Moser (ed.) Fire and forest ecology: innovative silviculture and

vegetation management. Tall Timbers Fire Ecology Conference Proceedings. No. 21. Tall Timbers Research Station, Tallahassee, Florida.

Foss, J.E. and J.S. Wah. 1998. The uniqueness of soil systems: application to archaeology and forensic science. p. 319. *In* 1998 Agronomy abstracts. ASA, Madison, WI.

Phillips, D.H., J.E. Foss, J.T. Ammons, J.S. Wah, and J.L. Branson. 1998. Pedogenesis of a loess derived soil from the eastern Highland Rim in Tennessee. p. 269. *In* 1998 Agronomy abstracts. ASA, Madison, WI.

Wah, J.S., J.E. Foss, S.Y. Lee, and Y. Roh. 1998. Characteristics of soils along the Elk River, southcentral Tennessee: Implications for soil and landscape genesis, and archaeology. p.260. *In* 1998 Agronomy abstracts. ASA, Madison, WI.

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Reports

Wah, J.S. Soils and geomorphology through the Pine Barrens for the Southern Reliability Link, NJNG, Ocean County, New Jersey. Report submitted to URS Corporation, Burlington, NJ. 35 p.

Wah, J.S. 2014. Soils and geomorphology at the confluence of the Driftwood Branch and Bennett Branch of Sinnemahoning Creek, Driftwood, Cameron County, Pennsylvania. Report submitted to Rettew Associates, Inc., Lancaster, PA. 16 p.

Wah, J.S. 2014. Soils and geomorphology for the Pequea Lane Bridge Replacement over Pequea Creek northeast of Paradise, Lancaster County, Pennsylvania. Report submitted to Rettew Associates, Inc., Lancaster, PA. 16 p.

Wah, J.S. 2013. Soils, sediments, and landforms west of Ischua Creek, Cattaraugus County, New York. Report submitted to Panamerican Consultants, Inc., Buffalo, NY. 26 p.

Wah, J.S. 2013. Soils and landscapes northwest of Lycoming Creek for the Lycoming Creek Frozen Run Surface Water Withdrawal, Lycoming County, Pennsylvania. Report submitted to Rettew Associates, Inc., Lancaster, PA. 16 p.

Wah, J.S. 2013. Soils and geomorphology for the proposed Hungry Pipeline, Armstrong County, Pennsylvania. Report submitted to Rettew Associates, Inc., Lancaster, PA. 23 p.

Wah, J.S. 2013. An investigation of soils, sediments, and landforms east and west of the Tioga River, Steuben County, New York. Report submitted to Panamerican Consultants, Inc., Buffalo, NY. 23 p.

Wah, J.S. 2013. Soils, sediments, and landforms along the Susquehanna River East of Towanda, Bradford County, Pennsylvania. Report submitted to Panamerican Consultants, Inc., Buffalo, NY. 19 p.

Wah, J.S. 2013. Soils and geomorphology for the proposed Ohio River to Annie Waterline, Tyler, Pleasants, and Ritchie Counties, West Virginia. Report submitted to Rettew Associates, Inc., Lancaster, PA. 47 p.

Wah, J.S. 2012. Soils and geomorphology west of the Hudson River, Greene County, New York. Report submitted to Historical Archaeological Zoological EXplorations, Ithaca, NY. 20 p.

Wah, J.S. 2012. Soils on a Pleistocene Susquehanna River terrace, Lycoming County, Pennsylvania. Report submitted to Panamerican Consultants, Inc., Buffalo, NY. 17 p.

Wah, J.S. 2012. Soils and geomorphology north of the West Branch of the Delaware River, Delaware County, New York. Report submitted to Panamerican Consultants, Inc., Buffalo, NY. 17 p.

Wah, J.S. 2012. Soils and geomorphology for the proposed Hungry Pipeline, Armstrong County, Pennsylvania. Report submitted to Rettew Associates, Inc., Lancaster, PA. 23 p.

Wah, J.S. 2012. Soils and geomorphology for the proposed Wickward Pipeline, Bradford County, Pennsylvania. Report submitted to Rettew Associates, Inc., Lancaster, PA. 10 p.

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Wah, J.S. 2012. Assessment of soils and landscapes northeast of Meshoppen, Susquehanna County, Pennsylvania. Report submitted to Rettew Associates, Inc., Lancaster, PA. 14 p.

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Wah, J.S. 2012. Soils and geomorphology along Chickies Creek southwest of Manheim, Lancaster County, Pennsylvania. Report submitted to Rettew Associates, Inc., Lancaster, PA. 16 p.

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Wah, J.S. 2012. Soils and geomorphology along Pine Creek, Potter County, Pennsylvania. Report submitted to Rettew Associates, Inc., Lancaster, PA. 14 p.

Wah, J.S. 2012. Soils and geomorphology along Satterlee Creek, Bradford County, Pennsylvania. Report submitted to Rettew Associates, Inc., Lancaster, PA. 13 p.

Wah, J.S. 2012. An assessment of soils and geomorphology along a proposed pipeline corridor in the Allegheny National Forest, Elk County, Pennsylvania. Report submitted to Rettew Associates, Inc., Lancaster, PA. 17 p.

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Wah, J.S. 2011. Soils and geomorphology along the WB Linden to Seeley Trunkline, Lycoming County, Pennsylvania. Report submitted to Rettew Associates, Inc., Lancaster, PA. 14 p.

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Wah, J.S. 2011. Investigation of soils and geomorphology along the Marsh Creek Water Line Corridor on Oak Ridge, Tioga County, Pennsylvania. Report submitted to Rettew Associates, Inc., Lancaster, PA. 9 p.

Wah, J.S. 2011. Investigation of soils and geomorphology along the Oelschlager Lateral Pipeline, Westmoreland County, Pennsylvania. Report submitted to Rettew Associates, Inc., Lancaster, PA. 24 p.

Wah, J.S. 2011. Soils and landscape evaluation along Swatara Creek, Dauphin County, Pennsylvania. Report submitted to Heberling Associates, Inc., Alexandria, PA. 31 p.

Wah, J.S. 2010. An evaluation of soils and the potential for deeply buried cultural materials on the floodplain of the Susquehanna River southeast of Wyalusing, Bradford County, Pennsylvania. Report submitted to Environment & Archaeology, Florence, KY. 15 p.

Wah, J.S. 2010. An evaluation of soils and the potential for deeply buried cultural materials along the Chemung River South of Corning, Steuben County, New York. Report submitted to Environment & Archaeology, Florence, KY. 29 p.

Wah, J.S. 2008. An evaluation of soils and the potential for deeply buried landscapes along Catharine Creek south of Montour Falls, Schuyler County, New York. Report submitted to Historical Archaeological Zoological EXplorations, Ithaca, NY. 10 p.

Wah, J.S. 2008. Soils and geomorphology along the Canisteo River, Steuben County, New York. Report submitted to Environment & Archaeology, Florence, KY. 33 p.

Wah, J.S. 2007. Soils and geomorphology along the Tioga River at Lindley, Steuben County, New York. Report submitted to Historical Archaeological Zoological EXplorations, Ithaca, NY. 13 p.

Wah, J.S. 2007. Investigation of soils and landscapes at the confluence of the Seneca and Oneida rivers, Onondaga County, New York. Report submitted to Panamerican Consultants, Inc., Buffalo, NY. 15 p.

Wah, J.S. 2007. Investigation of soils and landscapes along Conewago Creek, East Berlin, York County, Pennsylvania. Report submitted to McCormick Taylor, Inc., Harrisburg, PA. 12 p.

Wah, J.S. 2006. Investigation of soils and geomorphology along a tributary of Skippack Creek, Montgomery County, Pennsylvania. Report submitted to McCormick Taylor, Inc., Harrisburg, PA. 10 p.

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Wah, J.S. 2006. Soil and geomorphologic testing along the Chadakoin River in Jamestown, Chautauqua County, New York. Report submitted to Panamerican Consultants, Inc., Buffalo, NY. 7 p.

Wah, J.S. 2006. Soil and geomorphic investigation of the proposed site of the Ambassador Niagara Signature Bridge in Buffalo, Erie County, New York. Report submitted to Panamerican Consultants, Inc., Buffalo, NY. 12 p.

Wah, J.S. 2006. Soils and geomorphology deep testing on the floodplain of Ganargua Creek, Ontario County, New York. Report submitted to Panamerican Consultants, Inc., Buffalo, NY. 15 p.

Wah, J.S. 2006. Soils and geomorphology of Avon Park Business Property, Livingston County, New York. Report submitted to Panamerican Consultants, Inc., Buffalo, NY. 15 p.

Wah, J.S. 2006. Soils and geomorphology deep testing along the South Branch of the Raritan River, Somerset County, New Jersey. Report submitted to Panamerican Consultants, Inc., Buffalo, NY. 11 p.

Wah, J.S. 2006. Soils and geomorphology of the H.E. Ervin WRP project area along the Ohio River, Union County, Kentucky. Report submitted to Environment & Archaeology, Florence, KY. 15 p.

Wah, J.S. 2006. Soils and geomorphology of the Phillip English WRP project, Crittenden County, Kentucky. Report submitted to Environment & Archaeology, Florence, KY. 13 p.

Wah, J.S. 2006. Soils and geomorphology of the Mitchell Steward WRP project area, Webster County, Kentucky. Report submitted to Environment & Archaeology, Florence, KY. 11 p.

Wah, J.S. 2006. An investigation of soils for the Oriskany Ecosystem Restoration Project, Oneida County, New York. Report submitted to Panamerican Consultants, Inc., Buffalo, NY. 14 p.

Wah, J.S. 2006. An initial investigation of soils and landforms at stream crossings of the proposed route of the Empire Pipeline, New York. Report submitted to Panamerican Consultants, Inc., Buffalo, NY. 19 p.

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Wah, J.S. 2005. Soils of the Akzo property, Genesee River Valley, Livingston County, New York. Report submitted to Panamerican Consultants, Inc., Buffalo, NY. 13 p.

Wah, J.S. 2005. An Investigation of Soils at Fishing Bay Wildlife Management Area and Fairmount Wildlife Management Area, Maryland. Report submitted to Washington College, Chestertown, MD. 34 p.

Wah, J.S. 2004. Investigation of soils and geomorphology for the Hudson River Project, Rensselaer County, New York. Report submitted to Panamerican Consultants, Inc., Buffalo, NY. 15 p.

Wah, J.S. 2003. Report of soils investigation in the East Trappe Annexation Project Area, Talbot County, Maryland. Report submitted to the Chesapeake Bay Watershed Archaeological Research Foundation, Inc., Tilghman, MD. 14 p.

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Professional Societies
Pennsylvania Association of Professional Soil Scientists
Mid-Atlantic Association of Professional Soil Scientists (2011 President)
The American Quaternary Association

References

Dr. Martin C. Rabenhorst
Professor of Pedology
Department of Environmental Science & Technology
University of Maryland
1109 H.J. Patterson Hall
College Park, MD 20742
(301) 405-1343
mrabenho@umd.edu

Dr. Daniel P. Wagner
President
Geo-Sci Consultants, Inc.
4410 Van Buren St.
University Park, MD 20782
(301)277-3731
danwagner@juno.com

Dr. Delvin S. Fanning
Emeritus Professor of Pedology and Soil Mineralogy
Department of Environmental Science & Technology
University of Maryland
1109 H.J. Patterson Hall
College Park, MD 20742
(301) 405-1342
delvindel@aol.com

Dr. John E. Foss
Emeritus Professor of Pedology,
Department of Plant and Soil Science
University of Tennessee
P.O. Box 22026
Knoxville, TN 27933
(865) 966-6182
fossjohne@aol.com

Mr. Stephen G. Warfel
Senior Curator of Archaeology (retired)
The State Museum of Pennsylvania
619 Haldeman Blvd.
New Cumberland, PA 17070
(717) 774-5559
sgwarfel@yahoo.com

Brickhouse Environmental

MICHAEL E. LANE, CPSS

SENIOR SOIL SCIENTIST

Education:
B.S., Environmental Resource Management, The Pennsylvania State University, 1994
Professional Licenses and Certifications:
SSSA Certified Professional Soil Scientist 34591
Certified Sewage Enforcement Officer, Pennsylvania 02679
OSHA 40 Hour Health and Safety Training and Annual Refresher
Memberships:
Pennsylvania Association of Professional Soil Scientists,
President 2011-2012, Treasurer 2013-2016, Board of Directors 2008-present
Soil Science Society of America
Continuing Education:
PA Association of Sewage Enforcement Officers Annual Conference, presenter 2009, 2013
PA Septage Management Association Annual Conference, presenter 2006
PA Association of Professional Soil Scientists Technical Sessions, 2005-2015
40-Hour U.S. Army Corps Wetland Delineator Certification Preparatory Training
U.S. Army Corps Wetland Delineation Regional Supplement Training, 2010-2015
Publications:
White, Ruble, and Lane. The effect of changes in land use on nitrate concentration in water supply wells in southern Chester County, Pennsylvania. Environmental Monitoring and Assessment, March 6, 2012.
Lane, Which Came First? The License or the Rules? Soil Science Licensing. Soil Survey Horizons, Spring 2010, v51 no1.
References:
Ms. Karen Vickers, KV Excavating, Aston, PA 610-494-8600
Mr. Thomas Quinn, Chester County Health Department, 610-344-6526

Mr. Lane is a Senior Soil Scientist with Brickhouse Environmental. He is experienced in the evaluation of the physical properties of soils and interpretation of those properties for soil mapping and site characterization. His project experience ranges from wastewater and stormwater investigations for land development projects, to identification and mapping of hydric and alluvial soils, to groundwater and soil sampling for environmental remediation projects, to landfill monitoring and permitting. He has provided testimony before Township boards and commissions and has presented expert testimony before the Pennsylvania Environmental Hearing Board.

Mr. Lane has completed Phase I and Phase II environmental site assessments, environmental impact assessments, sewage facilities planning and design, wetland delineation and permitting, tree surveys, and habitat assessments for endangered and threatened species.

PROJECT EXPERIENCE

Artesian Water Company, Sussex County, DE
Developed and implemented a soil mapping plan comprising soil sampling for nutrients, backhoe test pits, infiltration tests, and several hundred auger borings to create detailed soil mapping of 1,600 acres. Responsible for preparation of a Site Investigation Report for a proposed spray irrigation wastewater disposal system to service 4,000 homes generating 7 million gallons of wastewater per day. The Site Investigation Report was approved by the Delaware Department of Natural Resources and Environmental Control.

Qualified Professional Soil Science Consultant, Chester County Health Department, PA
On behalf of Chester County, responsible for examination of soils for suitability for onlot sewage disposal systems and submission of written reports for subdivisions of more than 10 lots, for multi-residential and commercial projects where sewage flows are greater than 4,000 gallons per day, and for morphological evaluations of soils as required by the PA DEP. Also responsible for providing technical resolution of soils evaluation disputes for all individual lots at the request of the Health Department.

Expert Report in Support of Litigation, Lycoming County, PA
On behalf of a pipeline construction company, prepared an expert rebuttal report related to the construction of a 30-mile natural gas transmission pipeline and appurtenant facilities. Brickhouse was retained by the construction company in support of their efforts to collect over $17 million in unpaid invoices. The pipeline owner alleged that errors in erosion and sedimentation control and obtaining environmental permits by the construction company and its subcontractors directly resulted in project delays and significant additional costs. Brickhouse found that the wetland delineation and permitting was proper and was conducted in accordance with the industry standard. Brickhouse used detailed reviews of the plan drawings and daily precipitation records, along with a flyover site inspection, to confirm that the construction conformed to accepted practices. The expert rebuttal report and real-time trial support provided by Brickhouse resulted in a court victory for the construction company on all counts, with a total award in excess of $20 million.

Southeastern Chester County Refuse Authority (SECCRA), Chester County, PA
Responsible for detailed soils mapping of hydric and alluvial soils and preparation of a water budget for constructed wetland and stream recharge components of stormwater management system for permitted landfill expansion. Responsible for detailed soils testing, spray irrigation design, and water quality permitting for land application of treated landfill leachate. Assists with quarterly groundwater surface water and leachate sampling events for compliance with PADEP solid waste regulations and SECCRA’s solid waste permit.

Artesian Water Company, New Castle County, DE
Responsible for preparation of a Site Investigation Report for a proposed rapid infiltration basin (RIB) wastewater system capable of disposing of 1.5 million gallons of wastewater per day. Developed and implemented a site testing plan comprising soil borings, test pits, and infiltration tests on multiple disposal sites. Provided oversight during construction of four full-sized test RIBs. Preliminary dosing of the test RIBs has confirmed the results of the investigation.

Crane Property Soil Mapping, Delaware County, PA
Conducted deep test pit evaluations along proposed roadway to determine ease of excavation and depth to bedrock for proposed residential development.

Kemblesville Wastewater, Franklin Township, Chester County, PA
Responsible for soils evaluations and permeability testing for a proposed drip irrigation sewage disposal system for combined sewage flows of 128,000 gallons per day. The detailed testing plan involved multiple sites and coordination with the PADEP soil scientist and the Township's wastewater engineer.

Anson B. Nixon Park and Cloud Landfill, Chester County, PA
Responsible for soils evaluation and reporting for stormwater facilities and wetland delineation for beneficial reuse of closed sanitary trench landfills located in southeastern Pennsylvania.

Kennett Development Group, Kennett Township, Chester County, PA
Completed wetland delineation, tree survey, soils testing for stormwater management, sewage facilities planning, and pump station design for a 500,000-square foot office complex.

Pennsylvania Emergency Management Headquarters, Dauphin County, PA
Responsible for wetland delineation and jurisdictional determination submission for the proposed 100,000-square foot state-wide emergency operations facility.

Swatara Creek Bridge Replacement (SR 1022, Section 001), Lebanon County, PA
Performed wetland delineation and categorical exclusion evaluation for the replacement of an existing twin-span bridge over Swatara Creek.

M.O.T. Water Farm No. 1 and Lea Eara Farms, New Castle County, DE
Developed and implemented a soil sampling and vegetation sampling plan for two spray irrigation wastewater disposal sites. Provide annual reporting for soil fertility and vegetation monitoring, including recommendations to optimize treatment and crop yield. The two facilities are permitted to provide 165 acres of spray irrigation disposal for 1.2 million gallons per day of treated residential, commercial, and industrial sewage.

Smith Memorial Playhouse and Playground, Philadelphia, PA
Responsible for site selection, test pit evaluations, percolation testing, system design, and permitting for the replacement onlot sewage disposal system for the 100-year-old children's playhouse and playground in Fairmount Park. Tree removal was minimized through the use of directional boring techniques and conveyors to place the system aggregate.

Heritage Building Group, Warwick Township, Chester County, PA
Provided testimony before the Township planning commission, and provided expert testimony before the Environmental Hearing Board for the proposed on-site community wastewater disposal system.

Delaware Solid Waste Authority, DE
Assists with coordination and implementation of the groundwater, surface water, landfill gas migration, and leachate monitoring programs for four municipal waste landfills operated by the Delaware Solid Waste Authority. These extensive monitoring programs include monthly leachate monitoring and landfill inspections, as well as quarterly monitoring of groundwater. Groundwater sampling includes the collection of groundwater samples for dissolved methane gas analysis from select monitoring wells using low-flow well purging techniques.

Stephen D. Dadio, CPSS - Environmental Manager

CEDARVILLE Engineering Group, LLC

EDUCATION

M.S.– Soil Science
Pennsylvania State University

B.S. - Soil Science
Cornell University

PROFESSIONAL CERTIFICATIONS

SSSA (ARCPACS) Certified Professional Soil Scientist

SSSA (ARCPACS) Certified Professional Soil Classifier

PAPSS Registered Professional Soil Scientist

Delaware DNREC Licensed Class D Soil Classifier

Pennsylvania Licensed Sewage Enforcement Officer

NICET Certified in Highway Construction and E&S Control

SUMMARY OF EXPERIENCE

Mr. Dadio, Environmental Manager at CEDARVILLE Engineering Group, LLC, has 17 years of professional experience and leads our environmental department. He has used his extensive technical knowledge in ecological and hydrological fields for wetland delineations, watershed studies, environmental site assessments, and nonpoint source pollution prevention programs. Mr. Dadio has extensive experience in the field of soil science for a wide variety of land uses. Specializing in urban and disturbed landscapes, his career has focused on green infrastructure solutions in maintaining natural hydrologic conditions. He also regularly serves as a Construction Manager, with experience in estimating, field management, site inspection and quality control.

PROFESSIONAL AFFILIATIONS

- Adjunct Faculty, Delaware Valley University, Doylestown, PA
- Pennsylvania Association of Professional Soil Scientists, President - 2009, 2010
- Member, DEP Stormwater Loading Re-Write Workgroup
- Member, Soil Science Society of America
- Member, W.B. Saul Agricultural High School (Philadelphia) Natural Resources Curriculum Advisory Board

CEDARVILLE EXPERIENCE

United States Environmental Protection Agency, Cincinnati, Ohio – CEDARVILLE Engineering Group, LLC conducted detailed soil surveys and hydrologic investigations in the cities of Phoenix, AZ, Atlanta, GA, New Orleans, LA, Portland, ME, Detroit, MI, Omaha, NE, Camden, NJ, Cincinnati, OH, Cleveland, OH, San Juan, PR, and Tacoma, WA to determine the stormwater management potential for the soils in vacant lots in order to mitigate Combined Sewer Overflow (CSO) events. The urbanized soils collected from the sites were analyzed to identify feature classifications that are similar to native material, to develop a database of soil information on a regional basis for planning.

NPDES Program Manager-City of Coatesville – Plan all stormwater activities required to maintain compliance with the MS-4; PAG Permit. This includes the development of a TMDL plan for sediments, nitrogen, and phosphorous. Also served on the Christina Basin TMDL Improvement Committee (CTIP) as a municipal representative.

NPDES Program Manager-Westtown Township – Plan all stormwater activities required to maintain compliance with the MS-4; PAI Permit. This includes the development of a TMDL plan for phosphorous.

NPDES Program Manager-West Norriton Township – Plan all stormwater activities required to maintain compliance with the MS-4; PAG Permit. This includes the development of a Pollutant Reduction Plan for impaired waters.

On-Lot Sewage Sewage Management Program, Newlin Township – Developed a Sewage Management Program for Newlin Township. This program involves the implementation of an ordinance, resident education, and associated record documentation.

Grant Writing, City of Coatesville—Successfully procured two grants for the City of Coatesville to repair aging infrastructure, particularly stormwater inlets. These grants totaled $277,500 from both the PA DCED WRPP Program ($127,500) and PA DEP Growing Greener ($150,000).

CONTACT

1033 S. Hanover Street
Suite 300
North Coventry, PA 19465

P: 610.705.4500 · F: 610.705.4900
sdadio@cedarvilleeng.com

www.cedarvilleeng.com

Construction Manager, Several Municipalities—Supervised three construction inspectors working on various land development projects throughout southeastern Pennsylvania. Coordinated work with both municipal officials as well as private construction managers.

Timber Harvest Reviewer, West Nantmeal Township—Review and inspect timber harvests in accordance with local regulations. Interact with Chester County Conservation District in the facilitation of these unique permits.

Stargazer Road land acquisition, Newlin Township – Conducted Phase 1 Environmental Site Assessment for property that was purchased by Newlin Township.

305 Kimberton Road Phase 1 and Phase 2, Schuylkill Township – Conducted Phase 1 and Phase 2 Environmental Site Assessment for property that was purchased for a private land development. These tasks include detailed site characterization for possible contaminants.

USDA Agricultural Research Service (USDA-ARS) – Completed detailed evaluation of soils in central Pennsylvania to determine the presence of dense, brittle soil horizons (fragipans). This project involved detailed site characterization and sampling to assist with the greater research project.

Valley Forge Distribution Center – Supervised the design of a water line extension from an existing facility to the main several hundred feet away. This involved the design of a water meter pit and also required extensive coordination with PA American.

Wetland Delineation for Giant, Lower Paxton Township, Dauphin County – Completed a wetland delineation for the construction of a supermarket. This included field delineation and submission of a completed wetland report.

Geotechnical Borings, 827 Carpenter Street, Philadelphia, PA – Completed geotechnical borings and produced soil bearing capacity calculations for the construction of a 3-story residence in South Philadelphia.

Historic Resources Evaluation, Whitehall Inn, Spring City, PA – Completed all forms and documentation as required by the PHMC for this redevelopment project.

On-Site Sewage System Testing and Design, West Bradford Township – Completed detailed soil testing to determine the suitability of on-site sewage disposal. Completed a design for an in-ground system that was required by the Chester County Health Department in order to receive a permit.

Stormwater Management and Loading Rate Determination, Phoenxiville, PA - Completed soil testing for a stormwater infiltration basin. Produced report with a justification of enhanced loading rates in accordance with PADEP guidance. When the basin encountered problems, completed a forensics investigation to determine the problem source (compaction); developed a remediation strategy to restore the functionality of the basin.

Stormwater Streetscape Project in Port Richmond, Philadelphia, PA - Completed detailed soil and stormwater evaluation for a PWD-funded streetscape project in the Port Richmond section of Philadelphia. This involved detailed urban soil investigation as well as permeability testing in accordance with PWD regulations.

Environmental Permitting, Brandywine Branch Distillery, Elverson, PA - Completed detailed soil and stormwater evaluation, wetland determination, PNDI clearance, and archaeological screening for the repurposing of a barn to a craft distillery. Interacted with local, state, and federal agencies to gain approvals.

Environmental Permitting, Flourtown Road Project, Lafayette Hill, PA - Completed detailed soil and geologic investigation for stormwater evaluation and wetland investigation for proposed land development.

Environmental Permitting, Brandywine, Lower Moreland High School, Huntington Valley, PA - Completed detailed soil and stormwater evaluation, wetland determination, and PNDI clearance for the redevelopment of Lower Moreland High School. Interacted with local, state, and federal agencies to gain approvals.

Construction Supervision, Barley Sheaf Apartment Complex, Coatesville, PA - Completed evaluation of failing stormwater infrastructure at this complex. Prepared bid documents and solicited bids from local contractors. Inspected remediation work and approved quantities in accordance with the contract.

RECENT PUBLICATIONS & PRESENTATIONS

2015. Dadio S., Barkasi, A. Urban Soils: The Foundation for Green Infrastructure. Villanova Urban Stormwater Partnership Symposium, VUSP, Villanova, PA.

2014. Shuster W., Dadio, S., Urban fingerprints on soil morphology and hydrology – a summary of field investigations in US cities, across different soil orders. Soils in the City Conference. IEWA, Chicago, Illinois.

2012. Dadio S., Drohan, P.J., Utilizing Ground Penetrating Radar and EM to Supplement Deep Borings in Urban Soil Surveys. Abstract 287-1, Soil Science Society of America, Cincinnati, Ohio, poster presentation and abstract.

2012. Losco, R., S, Dadio., A Contrasting Study of Ohio Urban Soils - Cleveland Vs. Cincinnati. Abstract 287-2, Soil Science Society of America, Cincinnati, Ohio, poster presentation and abstract.

2011. Barkasi, A, S. Dadio, W. Shuster, R. Losco. Urban Soils and Vacant Land as an Urban Stormwater Resource, Abstract 89, ASCE-EWRI World Environmental and Water Resources Congress, Albuquerque, New Mexico, oral presentation (published)

2011. Shuster, W., A. Barkasi, S. Dadio, P.J. Drohan, T. Gerber, T. Houser, R. Losco, K. Reinhold, J. Wander, and M. Wigington. Moving beyond the udorthent – a proposed protocol for surveying urban soils to service contemporary urban ecosystem management data needs. Soil Survey Horizons, 52:1-8.

2010. Drohan, P.J., Ciolkosz, E.J., Lindeburg, K. S.; Waltman, W.J.; Dadio, S.D. Last glacial aeolian deposits in the conterminous U.S. Abstract 227-4 E. Soil Science Society of America, Long Beach, CA. Poster presentation.

2010. Drohan, P.J. A Pedologist's perspective of the Critical Zone. Abstract 111-5. Soil Science Society of America, Long Beach, CA. Poster presentation.

2009. Drohan, P., Dadio, S., Lindbo, D., Ciolkosz, E., Waltman, W., Braun, D., and S. Waltman. The Unified Theory of Fragipan Genesis. Soil Science Society of America, Pittsburgh, PA. #2009.52729, oral presentation and abstract.

2009. Dadio, S., Waltman, W., Drohan, P., Lindbo, D., Ciolkosz, E., and S. Waltman. Testing the Unified Theory of Fragipan Genesis: Geomorphic Trends Between Fragipans, Eolian Affected Soils, and Periglacial Landscapes. Soil Science Society of America, Pittsburgh, PA. #2009.5341, poster and abstract.

2009. Lindeburg, K., Young, A., Drohan, P., Waltman, W., Ciolkosz, E., Dadio, S., Lupton, M., and E. Erich. Mineralogical and Geochemical Trends Associated with Fragipan Prism Morphology in a Late Wisconsinan Glacial till. Soil Science Society of America, Pittsburgh, PA. #2009.52773, poster and abstract.

Drohan, P.J., Waltman, S., and S. Dadio. Identifying marginal lands suitable for biofuels production in the North-Central Appalachian region, USA.

Drohan, P.J., Ciolkosz, E., Dadio, S., Waltman, S., and K. Lindeburg. Extent and depth of loess additions to soils across the lower 48 U.S.

2008. Drohan, P.J., Bills, B., Miller, D., Waltman, S., Dadio, S., and E. White. Soil Science Society of America, Houston, TX: Geomorphic Relationships in the Fragi taxon across Pennsylvania: Clues to Genesis and Cementation Mechanisms. 140938. Oral presentation. (published).

2008. Dadio, S., Drohan, P. J., Clark, T., and S. Ogden. Soil Science Society of America, Houston, TX: Chemical and mineralogical cementing agents in fragipans from Pennsylvania parent materials. 140920. Oral presentation. (published).

2008. Drohan, P.J., Waltman, S., Bills, B., Miller, D., Foster, C., Dadio, S., and E. White. Soil Science Society of America, Houston, TX: Extent of fragi taxons on CRP/CREP lands and potential environmental, management and economic effects on biofuels production due to fragipan soil limitations. 141041. Oral presentation. (published).

RUSSELL L. LOSCO, M.A., P.G., C.P.S.S.

Principal Fields of Expertise:

Applied Soil Science Investigation, Applied Geomorphology, Soil Mapping and Classification, Indicators of Seasonal High Water Tables, Permeability Testing, Characterization of Soils for Recycling of Treated Wastewater and Stormwater, Innovative Solutions to Wastewater Recycling on Challenging Sites, Mapping and Characterization of Alluvial, Upland and Urban Soils, Anthropogenic Influences on Soil Development, Paleo-geomorphology and Peri-glacial Features, Environmental Site Remediation, Wetlands, Karst Analysis, Hydrogeology, Urban Soils, Green Infrastructure.

Qualifications:

Mr. Losco is a seasoned soil scientist and geologist with over 29 years of experience in soil mapping, site investigation, geomorphology, soil testing, on-site wastewater disposal and recycling testing and design, environmental investigation and soil and geologic research. He is active in numerous professional organizations and has served on advisory working groups to aid regulatory agencies in Pennsylvania and Delaware to draft sound, science-based regulations. He freely donates time to train both regulators and peer scientists and consultants and is an adjunct faculty member at the Delaware County Community College. He is active in research and publishes regularly and is the lead author of the **PAPSS Manual for Soil Investigation in Pennsylvania**.

Mr. Losco has handled high definition soil mapping and geomorphological analysis projects ranging in size from less than one acre to several thousand acres. He has accurately and consistently mapped upland, urban and alluvial soils, correcting and updating published maps. Through original research he has discovered unique geologic features in the Delmarva Peninsula and previously unknown processes in soil development. He has handled projects ranging from single residential lot septic systems to 7 million gallon per day wastewater recycling projects. He has spearheaded the use of new and innovative technologies for efficient and environmentally sound solutions to wastewater disposal and recycling. In collaboration with the United States Environmental Protection Agency, he has developed and implemented a protocol for characterizing and mapping urban soils for use in green infrastructure and urban renewal. He is a member of the Board of Directors of the Pennsylvania Stormwater Technical Working Group and has spearheaded the development of soil testing protocols for stormwater management and is co-author of the proposed **Pennsylvania Stormwater Best Management Practices Manual** (in prep.).

PROFESSIONAL EXPERIENCE:

Adjunct Professor — **August 2015 to Present**
West Chester University of PA — **West Chester, PA**

Teach ESS 490/590, Fundamentals of Soil.

Adjunct Professor — **August 2011 to Present**
Delaware County Community College, Pennocks Bridge Campus — **West Grove, PA**

Teach ESS 100, Introduction to Earth Science. I have based the content of this class upon the model of West Chester University's ESS 101 and structured the class so that they would be equivalent to each other.

Principal Soil Scientist & Geologist — **July 1993 to Present**
Lanchester Soil Consultants, Inc. — **West Grove, PA**

Conduct soil profile description, evaluation, mapping, and classification. Perform soil and geomorphological analysis of land development sites. Perform site evaluations and morphological soil assessments for individual and community drip irrigation sewage disposal systems and ABS systems in Pennsylvania and for all systems in Delaware. Perform feasibility studies and site investigation reports for individual and community on-site sewage disposal systems. Perform wetland delineations. Design individual and community on-lot sewage disposal systems including drip irrigation and

ABS systems in both Pennsylvania and Delaware. Perform topographic survey, layout, stakeout, and inspection and installation supervision of sewage disposal systems. Perform percolation and soil permeability testing for on-lot sewage disposal and stormwater infiltration. Assist in design of land developments, green infrastructure, stormwater infiltration structures and sewage treatment plants. Represent clients at municipal, county and state meetings. Provide expert testimony in the fields of soil science, geology and wastewater treatment and disposal. Conduct urban soil assessments as a sub-contractor to Cedarville Engineering for the United States Environmental Protection Agency, Office of Research and Development. Delineate wetlands. Planned and supervised rehabilitation of Penn Township municipal Rapid Infiltration Basins (RIBs). Assist in development of science-based regulations and ordinances for Delaware and Pennsylvania. Conduct Environmental Site Remediation and Hydrogeologic analysis and groundwater monitoring. Conduct urban soils mapping and assessment. Conduct hydrogeological analyses for quantity and quality of groundwater. Conduct site remediation (Act 2). Conduct karst analysis for sinkholes in carbonate bedrock areas.

Served on the Board of Directors of the Pennsylvania Association of Professional Soil Scientists (PAPSS), the Pennsylvania On-Site Wastewater Recycling Association (POWRA) and Pennsylvania Association of Sewage Enforcement Officers (PASEO). Instrumental in organizing successful Technical Conferences for PAPSS and POWRA. Provided commentary on proposed regulatory changes in sewage disposal regulations and stormwater infiltration regulations in PA. Member of London Grove Township Environmental Advisory Committee.

Consulting soil scientist for Penn Township, Chester County from 2001 to present. Sewage Enforcement Officer for East Earl Township, Lancaster County from 1996 to 1997. Alternate Sewage Enforcement Officer Edgmont Township, Delaware County from 1994 to 1996. Perform sewage needs study for Sadsbury Township, Chester County.

<u>Environmental Designer/ Soil Scientist</u> **July 1989 to July 1993**
James C. Kelly & Associates, Inc. **Glen Mills, PA**

Conducted soil profile description, classification, mapping, and percolation testing. Designed on-lot sewage disposal systems ranging from individual lots to large-volume community systems. Inspected and supervised installation of on-lot sewage disposal systems ranging from individual systems to large-volume community systems. Assisted in design of stream discharge sewage treatment plants ranging from 400 to 40,000 gallons per day. Performed wetlands delineations and determinations. Designed wetlands for mitigation and stormwater treatment. Sewage Enforcement Officer for Birmingham Township, Delaware County from November 1989 to December 1993. Alternate S.E.O. for Upper Providence Township, Delaware County from November 1989 to July 1993.Wrote Act 537 Sewage Facilities Plans. Worked under direction of staff Geologist.

<u>Environmental Health Specialist</u> **March 1987 to July 1989**
Chester County Health Department **West Chester, PA**

Sewage Enforcement Officer for up to 15 municipalities. Evaluate and describe soil profiles to determine suitability for on-lot sewage disposal. Describe soil profiles on subdivisions in cooperation with county's consulting soil scientists. Enforce County Health Code as pertained to sewage disposal, water wells, and environmental health. Cooperated with federal, state, county, and municipal governments and agencies. Instrumental in revising county environmental health regulations, employee job descriptions, and policies.

<u>Project Manager</u> **September 1985 to March 1987**
Federated Medical Resources **Honey Brook, PA**

Manage breeding colony of approximately 550 African Green monkeys. Supervise 30+ employees. Responsible for overseeing daily medical care of monkeys, ordering supplies, monitoring blood pressure and maintaining records for research project.

Research Instructor — **March 1982 to September 1985**
Hahnemann University Medical School — **Philadelphia, PA**

Conduct blood pressure monitoring of 30-50 African Green monkeys as part of long-term research project funded by the National Institute of Health. Conduct blood chemistry analysis and maintain records. Lecture on selected topics in the School of Allied Health.

EDUCATION:

Indiana University of Pennsylvania
Bachelor of Arts in Anthropology/Archaeology — 1981

West Chester University
Master of Arts in Physical Science-Earth Science — 2009
Graduate Assistant in Department of Geology and Astronomy — **2007-2009**

Research Focus:

- Soil genesis
- Anthropogenic influences on soil development
- Paleo-geomorphology
- Indicators of seasonal high water tables

University of Delaware
Graduate Coursework in Soil Science — 1995-96

Delaware Valley College
Coursework in Soil Science — 1992-93

Temple University
Coursework in Plant Science — 1996-97

Gloucester County College
Coursework in Chemistry — 1983-84

Glassboro State College (now Rowan University)
Graduate Coursework in Genetics — 1985

Cecil Community College — 2001
Coursework in AutoCAD

CREDENTIALS:

SSSA Certified Professional Soil Scientist — #22586

Pennsylvania Professional Geologist — #PG004953

Delaware Department of Natural Resources
And Environmental Control
Class 'A' Percolation Tester License — #2202

Class 'B' Sewage System Designer License — #2202

Class 'D' Site Evaluator License — #2202
(Soil Scientist) License

Pennsylvania Department of Environmental Resources
Certified Sewage Enforcement Officer #01941

Pennsylvania Registered Sanitarian #255

Pennsylvania Nutrient Management Program
Certified Commercial Nutrient Management Consultant #1714-NMC

PROFESSIONAL AFFILIATIONS:

Member – Sigma Gamma Epsilon – National Honor Society for Earth Sciences – Beta Zeta Chapter

Pennsylvania Association of Professional Soil Scientists
Associate Member 1994 to 1997
Professional Member 1997 to Present
Board of Directors Member 2003 to 2012
Vice President 2004, 2012
President 2005, 2006
Chairman of Committee to review Best Management Practices in Stormwater Management - 2004 to 2009
Chairman of Committee to Draft a State Manual for Standardized Soil Investigations - 2008 to Present
Chairman of Licensing Committee – 2010 to 2015

Soil Science Society of America / American Society of Agronomy
Member 1994 to Present
Member of SSSA S493 Hubert J. Byrd Sr. Scholarship Committee 2012-Present
Chair of SSSA S493 Hubert J. Byrd Sr. Scholarship Committee 2012-2014

Pennsylvania Council of Professional Geologists
Member 2008 to Present
Board of Directors Member 2015 to present
Member of Education Committee 2012 to present

National Society of Consulting Soil Scientists (Now part of SSSA)
Affiliate Member 1995 to 1997
Professional Member 1997 to Present

Pennsylvania Association of Sewage Enforcement Officers
Member 1988 to 2008
Director-At-Large for Delaware and Philadelphia Counties
February 1993 to February 1997

Geological Society of America
Member 2006 to Present

Pennsylvania Stormwater Technical Working Group
Charter Member 2009 to Present
Board of Directors Member 2009 to Present
Chair of Subgroup for Infiltration and Site Evaluation 2009 to Present
Chair of Subgroup for Karst 2015 to Present

DISTINCTIONS AND ACHIEVEMENTS:

Awarded 2015 United States Environmental Protection Agency Scientific and Technological Achievement Award – Honorable Mention for Research on Understanding the Nature of Urban Soils and Their Role in Stormwater and Sewer Management

Member of Soil Certification Task Force to Develop New Soil Credentialing Program for the Soil Science Society of America, 2016

Associate Editor Soil Survey Horizons
2008 to 2012

Member of West Chester University of Pennsylvania
Professional Science Master's Program Advisory Board

Assistant Coach of West Chester University of Pennsylvania Soil Judging Team 2010 & 2014

Member of Advisory Committee to Develop Performance Objectives for Soil Scientist Examinees – Soil Science Society of America, 2012

Nominated for the Gould Award for Teaching Excellence at Delaware County Community College – 2012

1993 Northeast Regional Collegiate Soil Judging Contest
Individual High Score - 10th Place

Proficient in following computer applications:

- MS Excel
- MS Word
- MS Powerpoint
- AutoCAD 2007
- Corel Paint Shop Pro X
- DraftSight
- WebStudy Certified

SELECTED PUBLICATIONS:

Shuster, W., Burkman, C., Grosshans, J., Dadio, S., and Losco, R. (2015). **Green Residential Demolitions: Case Study of Vacant Land Reuse in Storm Water Management in Cleveland.** J. Constr. Eng. Manage., 141(3), 06014011. March 2015.

Shuster, W.D., Dadio, S. Drohan, P. Losco, R. and Shaffer, J. **Residential demolition and its impact on vacant lot hydrology: Implications for the management of stormwater and sewer system overflows.** Landscape and Urban Planning, Volume 125, May 2014, Pages 48–56

Helmke, M.F. and Losco, R.L. **Soil, Water and Human Health,** a chapter in **Soil and Human Health**, ed. E. Brevik & L. Burgess, 2013 published by CRC Press.

Barkasi, A., Dadio, S., Losco, R., and Shuster, W. (2012) **Urban Soils and Vacant Land As Stormwater Resources**. World Environmental and Water Resources Congress 2012: pp. 569-579.
doi: 10.1061/9780784412312.061

D. Nikitina, L. Remizove, and R. Losco; **A Preliminary Investigation of the Soils and Geomorphology of a Portion of the Madre de Dios Region, Peru.** Soil Survey Horizons, Volume 52, Number 2, Summer 2011.

W.D. Shuster, A. Barkasi, P. Clark, S. Dadio, P. Drohan, T. Gerber, T. Houser, A. Kelty, R. Losco, K. Reinhold, J. Shaffer and J. Wander; **Moving Beyond the Udorthent, a Proposed Protocol for Surveying Urban Soils to Service Data Needs for Contemporary Urban Ecosystem Management** Soil Survey Horizons, Volume 52, Number 1, Spring 2011.

Losco, R.L., Whitman, C., Drohan, P. and Cronce, R.; **The Manual for Site Specific Soil Investigation in Pennsylvania.** September 19, 2010 A publication of the Pennsylvania Association of Professional Soil Scientists.

Losco, R.L. , Stephens, W., and Helmke, M. F.; **Periglacial Features and Landforms in the Subsurface of the Delmarva Peninsula,** Southeastern Geology, Volume 47, No. 2, p. 85-94, May 2010.

Losco, R.L. and Helmke, M. F.; **Tillage-Enhanced Argillic Horizon Development in Piedmont Soils,** Soil Survey Horizons, Volume 51, Number 2, p. 53-55, Summer 2010.

Losco, R.L.; **Soil Science and Martial Arts,** Soil Survey Horizons, Volume 49, Number 4, Winter 2008.

Losco, R.L.; **Soil Science on Vacation…Or Soil Science with a (Minor) Language Barrier** Soil Survey Horizons, Volume 49, Number 3, Fall 2008.

Losco, R.L.; **Soil Science on Vacation – North to Alaska** Soil Survey Horizons, Volume 49, Number 2, Summer 2008.

Losco, R.L.; **Soil Science on Vacation** Soil Survey Horizons, Volume 48, Number 2, Summer 2007.

Losco, R.L.; **Soil Science and Antique Houses or Where Have All the Albic Horizons Gone?** Soil Survey Horizons, Volume 48, Number 1, Spring 2007.

Losco, R.L.; **Soil Science and Antique Houses or Where Have All the Albic Horizons Gone?** Pennsoils, Fall 2005.

Losco, R.L.; Losco, C.T.; Ibach, J.R. Jr.; and Green, A.A. **A Report of Existing On-Lot Sewage Systems in Sadsbury Township**, Chester County. 1996.

Kelly, J.C.; Losco, R.L.; Ibach, J.R. **Official Sewage Facilities (Act 537) Plan for Upper Providence Township, Delaware County (Draft)**. 1993.

Kelly, J.C.; Sech, K.R.; Losco, R.L.; Morrison, L.B. **Official Sewage Facilities (Act 537) Plan for Birmingham Township, Delaware County**. 1991.

SELECTED PRESENTATIONS:

Losco, R.L. **Soil Science: A Brief Introduction to the Stuff Underfoot** Guest lecture at Bryn Mawr College March 26, 2015.

Losco, R.L. **Morphological Soil Investigations, A Guide for Sewage Enforcement Officers** PADEP Approved Training Course for Sewage Enforcement Officers ID# 110-00005, Presented 7 times to Sewage Enforcement Officers 2014-2016.

Losco, R.L. **Biochar: An Ancient Solution To The New Problems of Climate Change and Food Security,** Delaware County Community College STEM Speaker Series, November 26, 2013.

Losco, R.L., Kribbs, G., and Witouski, B. **Soil Science: Basic and Practical Field Methodologies and Applications,** Professional Development Course for the Pennsylvania Council of Professional Geologists, July 23, 2013 & June 20, 2014.

Losco, R.L., Dadio, S. & Barkasi, A. **Urban Soil Survey to Facilitate Green Infrastructure to Alleviate Combined Sewer Overflows in Urban Settings,** Presentation to the 2013 Association for Environmental Studies & Sciences Meeting, June 19-22, 2013.

Losco, R.L. and Dadio, S. **A Contrasting Study of Ohio Urban Soils – Cleveland Vs. Cincinnati,** Poster Presentation to the 2012 Agronomy Society of America, Crop Science Society of America, Soil Science Society of America Meeting, October 22-24, 2012.
S. Brown, S. Cannon, R. Losco and J. Sturniolo **The Good, the Bad and the Ugly – A panel discussion on Stormwater Best Management Practices**, 20th Annual Pennsylvania Housing and Land Development Conference, Pennsylvania Housing Research Council, Penn State University, February 22, 2012.

Field trainer at 2011 PAPSS Army Corps of Engineers Wetland Delineation Training Conference, June 27-28, 2011 at Raystown Lake, Huntingdon County, PA.

R. Losco, **Determination of Seasonal High Water Tables.** A Webinar presented to the Soil Science Society of America, April 27, 2011.

S. Dadio, A. Barkasi, R. Losco and W.D. Shuster; **Urban Soil Investigations for Ecosystem Management: Vacant Lots, Soils and the Sustainable Management of Stormwater.** Poster Presentation to the Brownfields 2011 Conference, Philadelphia, PA. April 3-5, 2011.

Losco, R.L.; **Soil Evaluation for Effective Stormwater Infiltration and Management.** Educational Seminar presented to the Pennsylvania Society of Professional Engineers, September 24, 2010.

Losco, R.L.; **Critical Aspects of Stormwater Infiltration: Getting it Right From the Ground Up**. Educational Seminar presented to the Adams County Conservation District, May 5, 2010.

Losco, R.L.; **Critical Aspects of Stormwater Infiltration: Getting it Right From the Ground Up**. Educational Seminar presented to the Chester County Engineers, March 24, 2010.

Losco, R.L.; **Critical Aspects of Stormwater Infiltration: Starting From the Ground Up**. Educational Seminar presented to the Pennsylvania Department of Environmental Protection and the Staffs of the County Conservation Districts of Southeastern Pennsylvania, December 10, 2009.

Losco, R.L., Whitman, C., Drohan, P. and Cronce, R.; **A Manual for Site Specific Soil Investigation in Pennsylvania.** Poster Presentation to the 2009 Agronomy Society of America, Crop Science Society of America, Soil Science Society of America Meeting, November 3, 2009.

Losco R. L. and Helmke, M. F.; **Drip Irrigation for On-Site Disposal of Wastewater in Serpentine Derived Soil.** Oral Presentation to the 2009 Agronomy Society of America, Crop Science Society of America, Soil Science Society of America Meeting, November 4, 2009.

Helmke, M. F, Losco R. L. and Reed, A.M.; **Application of Soil Physics to Improve Efficiency of Ground-Source Heat Pumps in Fractured Saprolite.** Poster Presentation to the 2009 Agronomy Society of America, Crop Science Society of America, Soil Science Society of America Meeting, November 2, 2009.

Losco, R.L.; **Critical Aspects of Stormwater Infiltration: Getting it Right from the Start**. Presentation to the 2009 Pennsylvania Stormwater Management Symposium, Villanova University, October 14, 2009.

Losco, R.L.; **Perspectives From Another State – Drip Irrigation Installations in Delaware**. Presentation to the 2009 Pennsylvania Association of Professional Soil Scientists Summer Technical Session, July 9, 2009.

Losco R. L. and Helmke, M. F.; **Tillage as a Mechanism for Enhancement of Clay Translocation and Argillic Horizon Development,** Oral Presentation to the 2008 Joint Geological Society of America, Agronomy Society of America, Crop Science Society of America, Soil Science Society of America, Gulf Coast Association of Geological Societies and Houston Geological Society Meeting, October 6, 2008.

Losco R. L., Helmke, M. F. and Stephens, W. J., Jr; **Correlation of Redoximorphic Features with Seasonal Water Tables in the Coastal Plain of Delaware,** Poster Presentation to the 2008 Joint Geological Society of America, Agronomy Society of America, Crop Science Society of America, Soil Science Society of America, Gulf Coast Association of Geological Societies and Houston Geological Society Meeting, October 7, 2008.

Stephens, W. J., Jr and Losco R. L.; **Late Pliocene (?) Landforms in the Subsurface, Sussex County Delaware,** Oral Presentation to the 2008 Joint Geological Society of America, Agronomy Society of America, Crop Science Society of America, Soil Science Society of America, Gulf Coast Association of Geological Societies and Houston Geological Society Meeting, October 8, 2008.

Field Trip 20, **"New Frontiers of Soil Science"** at 18th World Congress of Soil Science, co-presenter.

Losco, R.L.; Neiley, M.; **The Four Year Fill Fiasco or I Spent Four Years Waiting and All I Have to Show For It is This Pile of Dirt.** Presentation to the 2005 Pennsylvania Association of Sewage Enforcement Officers Conference. February 28, 2005. Re-presented as an instructional seminar to the Chester County Health Department, Bureau of Environmental Protection May 2, 2005.

Losco, R.L.; **The Sewage Enforcement Officer's Role in the Morphological Assessment Process**. Presentation to the 2004 Pennsylvania Association of Sewage Enforcement Officers Conference March 2, 2004.

Losco, R.L.; Valentine, J.A. **Stormwater Infiltration and the Soil-Landscape Connection**. Pennsylvania Stormwater Management Symposium, Villanova University. 2003.

Losco, R.L.: **Fear of Pressure Dosing**. Instructional seminar on evaluation of pressure-dosed sewage system designs presented to the Chester County Health Department, Bureau of Environmental Protection. June 5, 1996.

Losco, R.L. **Community On-Lot Sewage Disposal, Beyond the Written Regulations**. Presentation to Seventh Annual On-Site Sewage Treatment Conference, Penn State University, 2/15/93.

PERSONAL:

Married with two step-children and one grandchild

Nidan (Second Degree Black Belt) in Shotokan Karate

Hobbies: Fishing
Hiking
History & Archaeology

Member:
International Shotokan Karate Federation
Chester County Shotokan Karate Club
West Chester University Shotokan Karate Club

Co-Advisor of West Chester University Shotokan Karate Club

Curriculum Vitae

James D. Fisher, M.Sc. Soil Science, CPSS

P.O. Box 203 Birchrunville, PA 19421 fisher.soils@gmail.com 610-656-2936

SUMMARY

Accomplished soil scientist, pedologist, agronomist. Experienced field program officer and agricultural advisor with proficiency mapping soils and working in USAID programs. Experienced project manager of vineyard design, vineyard establishment, and vineyard management. Skilled communicator – both written and oral.
Currently holds Secret security clearance (USA).
Field experience in Afghanistan, Panamá, Ecuador, Brasíl, North America, Australia.

AGRIBUSINESS OVERVIEW

- Focus on agricultural value chain activities, soil conservation, and sustainable irrigation techniques.
- Language skills in order of increasing proficiency: Portuguese, French, Spanish.
- Agronomic and environmental consultation to viticulture, irrigation, forage, grains, livestock, cover-cropping, pomegranate, pistachio, almond, apricot, and general agriculture.
- International development focusing on environmentally sustainable methods.

ACADEMIC DEGREES

M.Sc., Soil science, University of Delaware
B.Sc., Plant science, University of Delaware

PROFESSIONAL CERTIFICATIONS

- Certified Professional Soil Scientist, Certified Professional Agronomist, Certified Nutrient Consultant, Certified Pesticide Applicator, Certified Irrigation Evaluator, Cal-Poly Tech.
- Secret Security Clearance.
- Field training for Afghanistan: RS415, AR421, Civ-Mil RS510, FACT OT610, ADAPT

RESEARCH FIELDWORK

- Mornington Peninsula Vigneron Association, Victoria, Australia. Viticultural consultant and lead trainer in soil benchmark program.
- Kandahar Province, Afghanistan. Lead project designer of soil salinization assessment.
- Zhari District, Afghanistan. Developed low-volume / high-frequency irrigation management program to mitigate soil salinization, and improve crop production.
- IDIAP, Piriati, Panama, 2005. Participant in hydrogeology project providing fresh water to community of 700 people.
- Zapallo Grande Medical Center, Ecuador, 2002-2003. Participant in onchocerciasis research, location of the vector *Simuliides exiguum*.
- Yasuni Research Station, Amazon jungle, 2003. Participant in research of forest ecology and ethnobotany.
- Research cruise with USNS H.H. Hess, OCUNIT 6, Merchant Seaman, US Merchant Marines, 1988.

James D. Fisher, M.Sc. Soil Science, CPSS

PROFESSIONAL EXPERIENCE

2015:

Soil Scientist / Agronomist: Soil Solutions, LLC – Malvern PA

- Viticultural pedologist, soil mapping, agronomic consultant.

2014:

Viticultural consultant: MPVA - Victoria, Australia

- Lead trainer in soil benchmark program. Viticultural consultation to 42 individual vineyards.

2012-2013:

Agricultural advisor: USDA-FAS-OFSO, Washington, DC

- Agricultural advisor in Zhari District, Kandahar Province, Afghanistan.
- Developed sustainable irrigation methodologies to mitigate the effects of soil salinization, crop loss, and desertification.
- Developed counternarcotics program by promoting cultivation of licit crops, improving productivity, and enhancing associated ag value chains.
- Provided technical expertise to entire Southern Regional Platform (pomegranate, livestock, vineyard, irrigation, pistachio, agricultural value chain operations, post-harvest processing, livelihood augmentation, and general agriculture).
- Skilled communicator (written and oral). Experience working extensively with USAID programs, proficiency with reporting, monitoring, and evaluation.

2005-2012:

Soil Scientist / Agronomist: Soil Solutions, LLC – Malvern PA

- Viticultural consultant specializing in pedology, soil chemistry, irrigation, soil biology, soil physics, hydrogeology, geospatial mapping via electromagnetic induction (EMI), integrated pest management, crop quality, soil potential index.
- Client base in California, Washington, New York, Maryland, Pennsylvania

2003-2005:

Soil Consultant, Self-employed

- Specializing in pedology, forensic agronomy, fertility programs, irrigation design.

2002- 2003:

Field researcher, Amazon Forest and Zapallo Grande Medical Center

- Conducted field research locating nesting sites of *Simuliides exiguum,* vector for onchocerciasis.

AWARDS

- Non-Article 5 NATO Medal for civilian service for ISAF Operations
- Certificate of excellence from Afghanistan Regional Platform South
- Medal of excellence from 3rd BAT, 41st ID, OEF 2013, for Civ-Mil collaboration on agricultural development and counternarcotics programs
- Medal of excellence USDA soil salinization project southern Afghanistan

James D. Fisher, M.Sc. Soil Science, CPSS

INDUSTRY HIGHLIGHTS

November 4, 2013: Presented an oral presentation at the SSSA annual meeting in Tampa, FL, entitled "Promoting Food Security and Environmental Quality in Afghanistan;" and a research poster entitled "Uniting cross-cutting objectives with capacity-building in Afghanistan" – both of which depicted the use of sound soil science as a foundational tool in capacity building.

October 17-19, 2011: Presented research entitled "Using NASA Data for Viticulture: Measuring *Terroir* from Space" at NASA's presentation in the Crop Science Society of America's annual meetings in San Antonio, TX, highlighting remote sensing techniques which are both rapid and effective in viticultural site selection.

February 23, 2011: Presented research entitled "Mapping Vineyard *Terroir*" to a joint meeting of Maryland Association of Professional Soil Scientists (MAPSS) and Maryland Wineries Association (MWA), highlighting soil mapping techniques which are both rapid and effective in viticultural site selection.

November 4, 2010: Presented research entitled "Pedogenetic Indicators of *Terroir*" at the Soil Science Society of America annual meeting at Long Beach, CA.

August 6, 2010: Presented research "Geospatial mapping of vineyard soils via electromagnetic induction and scaling of terroir" at the 19th World Congress of Soil Science, Brisbane, Australia.

April 15, 2010: Presented in session entitled "Sustainable wine: Carbon neutrality, organic, biodynamic production and *terroir*" to American Association of Geographers, entitled "Assessing vineyard *terroir* via geospatial mapping"

November 19, 2009: Leading speaker at Congressional Soils Caucus briefing, entitled "Pedogenesis & *Terroir*," addressing the issues of winegrowing to 500 Congressional staff members in the Gold Room at Rayburn House Office Building, Washington, D.C.

November 4, 2009: Two (2) oral presentations to Soil Science Society of America (SSSA) annual meeting in Pittsburgh PA, entitled "Orogeny and Pedogenesis of Southeastern Pennsylvania Viticultural *Terroir*" and "*Terroir* of Southeastern Pennsylvania Viticulture: An Analytical Hierarchy in a Udic Soil Moisture Regime", and poster presentation "Electromagnetic induction (EMI) methods for Geospatial Mapping of Vineyard Soils".

January 15, 2009: Oral presentations in educational seminar hosted by Penn State University Viticultural Program, co-hosted by Cornell University Dept. of Viticulture at the annual Pennsylvania Association of Winegrowers (PAW) meeting, entitled "Soil Chemistry in Viticulture" (A case study using adjustments of soil chemistry to initiate chemical reaction mechanisms favorable to the deprotonation of previously unavailable nutrients.), and "Hydrogeology in Viticulture" (A discussion of hydrologic flux within the soil-plant-atmospheric continuum using a mathematical treatment to illustrate the association of solar flux and soil water flux.)

July 1998: Authored article on equine nutrition published in national publication: Rocky Mountain Horse entitled, "Equine Nutrition."

ACTIVITIES & HOBBIES

- Horsemanship, Kitesurfing, Cooking, Snowkiting, Rock climbing ("trad-style" lead-climber), Paragliding (advanced P-4 paragliding license), SCUBA (open-water certification), Watercolors, Rugby (University of Delaware Rugby Club, USARU-sanctioned Brandywine Rugby), Sailing, Gardening, Fitness, Fishing, Nature hiking.

James D. Fisher, M.Sc. Soil Science, CPSS

REFERENCES

- Daryl Brehm, USDA Coordinator for Agriculture, Embassy of the USA, Kabul, Afghanistan. Email: daryl.brehm@usda.gov
- Donald L. Sparks, Ph.D., Professor of Plant and Soil Sciences, Chemistry and Biochemistry, 531 South College Ave., 152 Townsend Hall, University of Delaware, Newark, DE 19716-2170. Phone: (302) 831-6378. Email:dlsparks@udel.edu
- Hugo Rodriguez, U.S. Department of State, Division Chief, Room 4113, 2100 Pennsylvania Ave., N.W., Washington, DC 20037. 202-736-4996. Email: hugorodriguezjr@yahoo.com
- Adam Smith, USAID Field Program Officer, 14018 Flying Feather Court, Gainesville, VA 20155. 203-503-4508. Email: pdt110@gmail.com
- Mark L. Chien, State-wide Viticulture Extension Educator, Penn State Cooperative Extension, College of Agricultural Sciences, 1383 Arcadia Road, Lancaster, PA 17601, Tel: 717-394-6851. Email: mlc12@psu.edu
- Tim Powers, Director Strategic Operations, Office of Civilian Deployment Operations, U.S. Department of Agriculture - Foreign Agricultural Service, 1400 Independence Ave, SW, Washington, D.C. 20250, Tel: (540) 273-2769. Email: Timothy.Powers@fas.usda.gov
- Tina Kaarsberg, PhD., Policy Analyst, US Department of Energy, Washington, D.C., Tel: 240-205-3948, Email: TINA.KAARSBERG@hq.doe.gov

John C. Roberts, LSS

Soil Scientist

General Qualifications

Education

M.S., Soil Science, North Carolina State University, 2005

B.S., Natural Resources - Soil Science, North Carolina State University, 2001

Licenses/Certifications/Affiliations

North Carolina Licensed Soil Scientist #1292

South Carolina Professional Soil Classifier #97

NCDWR/NCSU Surface Water Identification and Training Class (SWITC) version 4.11. 06/2012

Stormwater BMP Inspection & Maintenance Certification (NCSU Biological & Ag. Engineering) 05/2012

NCDOT/NCSU Level I: Certified Erosion and Sediment Control/Stormwater Installer 06/2013

NCDOT/NCSU Level II: Certified Erosion and Sediment Control/Stormwater Site Manager 06/2013

Previous Work History

09/10-Present. Soil Scientist, The Catena Group/Three Oaks Engineering, Hillsborough, NC

04/10 – 09/10 Research Technician, NC Department of Agriculture – Agronomics Division. Raleigh, NC

07/05 – 4/10. Soil Scientist, Hal Owen & Associates, Inc. – Soil and Environmental Scientists. Lillington, NC

7/02-5/15. Research Assistant, North Carolina State University. Raleigh, NC

Experience & Qualifications

John is a Licensed Soil Scientist/Project Manager for Three Oaks Engineering. His primary duties include managing soil and site investigations using knowledge in soil classification and morphology throughout the mountain, piedmont and coastal plain regions of North Carolina. His soil investigation experience includes determining suitable areas for surface/subsurface wastewater systems, stormwater structures, wetland delineations and hydric soil determinations. John is proficient in interpreting soil and landscape relationships crucial for creating detailed soil suitability maps. He is experienced in designing and permitting on-site septic systems and performing saturated hydraulic conductivity tests. He is also knowledgeable in Nutrient Management Planning and is certified for NuMASS software and the Phosphorus Loss Assessment Tool.

Project Experience

Midlands Tract - Soil & Site Evaluation, Cabarrus County, North Carolina. Served as Project Manager; conducted a detailed Soil & Site Evaluation on the 640+ acre project site to map soil units suitable for subsurface wastewater disposal.

Elm City Wastewater Treatment Plant - Receiving Fields, Elm City, Nash and Wilson Counties, North Carolina. Served as Project Manager; conducted a detailed Soil & Site Evaluation on 250+ acres of the existing wastewater receiving fields and potential expansion fields; collected soil data (physical and chemical) to determine appropriate wastewater application rates and cover crops.

Shepherds Tree Mitigation Site - Hydric Soil Delineation and Classification, Iredell County, North Carolina. Served as Project Manager, delineated hydric soil units within 160+ acres of an existing wetland mitigation site in the close-out in order to more accurately determine mitigation credits; created a site specific hydric soil indicator using onsite groundwater gage data and soil characteristics.

Michael G. Wood, LSS

Principal and Soil Scientist

General Qualifications

Education

M.S. Soil Science, 1996, University of Rhode Island at Kingston

B.S. Recreation Management, 1986, University of Vermont

Licenses/Certifications/Affiliations

North Carolina Licensed Soil Scientist #1219

North Carolina Freshwater Mussel Survey and Collection Permit - NC-2011 ES 34

USACE Wetland Delineation Training

Soil Science Society of North Carolina

National Society for Consulting Soil Scientists

Michael is a principal and soil scientist at Three Oaks Engineering, with over 20 years experience working in both the public and private sector. He worked for the North Carolina Division of Coastal Management and the North Carolina Department of Transportation before founding The Catena Group. At Three Oaks Engineering, Michael's responsibilities include environmental permitting, wetland delineation and mitigation, evaluation of hydric soils, detailed soil mapping and interpretation, groundwater modeling, threatened and endangered species surveys (Permit NC-2010 ES 34), as well as project oversight/compliance. A former permit coordinator for NCDOT, Michael has garnered every type of roadway permit, including federal 404 permits, state 401 certifications, and CAMA Major Permits. As project manager, he has demonstrated the ability to work with both regulatory personnel and project designers on methods to avoid and minimize impacts to significant natural areas while still meeting the purpose and needs of the project. Michael has taken projects from the early design phase to final submission of permit applications and provided environmental monitoring throughout construction to ensure compliance with project commitments and permit conditions. He is well versed in the NEPA Merger Process, as well as the unique challenges posed by Design-Build projects.

Project Experience

USACE Regional Supplement – Eastern Mountains and Piedmont Region.

Michael Wood of Three Oaks was selected by the U.S. Army Corps of Engineers (USACE) to be part of the part of the peer review team for the Regional Supplement to the Corps of Engineers Wetland Delineation Manual. The supplement is part of a nationwide effort to address regional wetland characteristics and improve the accuracy and efficiency of wetland delineation procedures. Michael was selected particularly for his years of experience in wetland delineations combined with his knowledge of soils with regards to wetland delineations, especially problem wetland sites.

Monroe Bypass: 22-miles of new location in Union County, North Carolina. *North Carolina Department of Transportation.* Michael performed the wetland and stream delineations on approximately half the project (11 miles), and obtained necessary environmental permits and monitored compliance during the development and construction of a new toll road extending from Mecklenburg County to Union County; provided assistance to federal and state agencies during permit reviews and modifications.

Mitigation Site Monitoring, Throughout North Carolina. *North Carolina Department of Mitigation Services.* Provided yearly vegetation and hydrologic monitoring of multiple DMS (formerly Ecosystem Enhancement Program) stream and wetland mitigation sites. Work included development of recommendations to enhance/improve site performance relative to compliance success criteria.

White Irisette Soil Mapping, Polk County, **North Carolina**. *North Carolina Department of Transportation*. In an effort to find appropriate relocation sites for the federally Endangered white irisette (*Sisyrinchium dichotomum*) due to a roadway project, Michael investigated, mapped, and rated over 80 acres. Each site was rated based upon soil texture, horizon depths, and parent material.

Previous Work History

08/96 – 08/01	North Carolina Department of Transportation, Environmental Specialist, Soils Rover
03/95 – 08/96	North Carolina Division of Coastal Management, Soil Scientist

Stephen G. Carpenter

304-906-8260

The Nicholas Putnam Group, LLC
P.O. Box 4611
Morgantown, WV 26504
npgsoils.com

Objectives

Provide Consulting Services on Soil and Soil-related Issues for Industry, Forestry, and Agriculture

Education

May 1977 | BS West Virginia University, College of Agriculture and Forestry
May 1999 | MS West Virginia University, Eberly College, Division of Geology and Geography

Experience

June 1977 – January 2011 | Soil Scientist
U.S. Department of Agriculture | Natural Resources Conservation Service

January 2011 – Present | Soil Scientist

The Nicholas Putnam Group, LLC

Positions held: Field Soil Scientist, Survey Project Leader, GIS Specialist, State Soil Scientist, MLRA Regional Staff Leader/Technical Staff Supervisor

Skills and Affiliations

- Detailed Soil Mapping
- Soil Interpretation for Agriculture and Industry
- Soil Classification and Genesis
- Forest Soils
- Geomorphology
- Soil Monolith Extraction and Finishing
- GIS and Remote Sensing
- American Society of Agronomy and Soil Science Society of America Affiliate

CHARLES H. DELP

304-678-0015
THE NICHOLAS PUTNAM GROUP, LLC
P.O. BOX 4611
MORGANTOWN, WV 26504
NPGSOILS.COM

Objectives

Provide Consulting Services on Soil and Soil-related Issues for Industry, Forestry, and Agriculture

Education

May 1969 – BS Soil Science West Virginia University, College of Agriculture and Forestry
May 1975 – MS Soil Genesis and Classification, West Virginia University, College of Agriculture and Forestry

Experience

May 1968 to December 2011 – Soil Scientist
U.S. Department of Agriculture – Natural Resources Conservation Service

December 2011 to Present –Soil Scientist
The Nicholas Putnam Group, LLC

Positions Held – Field Soil Scientist, Survey Project Leader, Assistant State Soil Scientist, Supervisor Map Compilation and Finishing Unit

Skills

- Detailed Soil Mapping
- Soil Interpretation for Agriculture and Industry
- Soil Genesis and Classification
- Forest Soils
- Geomorphology
- Soil Forensics
- GIS and Remote Sensing
- Soil Geography
- Soil Monolith Extraction and Finishing
- Soil Map Compilation and Finishing
- Technical Staff Supervision

Attachment 3
Laboratory Methodologies

Laboratory Procedures

Virginia Tech
Soil Testing Laboratory

Rory O. Maguire, Extension Nutrient Management Specialist, Virginia Tech

Steven E. Heckendorn, Manager, Soil Testing Laboratory, Virginia Tech

Publication 452-881

Virginia Cooperative Extension

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www.ext.vt.edu

Produced by Communications and Marketing, College of Agriculture and Life Sciences,
Virginia Polytechnic Institute and State University, 2011

Introduction

Most of the procedures for soil analysis used in the Soil Testing Laboratory were established in the early 1950s*. Although the chemical principles have not changed, procedures have been revised over the years to utilize advances in instrumentation which allow more accurate and rapid chemical determinations.

A routine test, consisting of eleven analyses, is performed on all samples. In addition, two separate tests are offered on a request basis. These tests are applicable only under certain conditions for which research and calibration work has been conducted. The routine and special tests consist of the following:

Routine Test

- soil/water pH (WpH)
- buffer index/ pH (BpH)
- phosphorus (P)
- potassium (K)
- calcium (Ca)
- magnesium (Mg)
- zinc (Zn)
- manganese (Mn)
- copper (Cu)
- iron (Fe)
- boron (B)

Special Tests

- soluble salts
- organic matter

*Rich, C.I., 1955. Rapid soil testing procedures used at Virginia Polytechnic Institute. Virginia Agriculture Experiment Station. Bull. 475, p. 8.

Sample Preparation

Soil samples arrive in 1/2-pint cardboard cartons. Generally, Soil Sample Information Sheets (SSIS) are packaged with the samples. The cartons are opened in a separate preparation area and placed in drying trays. Twenty-eight unknown samples plus two control samples are placed in each drying tray. The two control samples are one known internal reference sample and either a blank or replicate sample. At this time, each sample is assigned a laboratory number which, along with the year, is stamped on the SSIS. The samples are numbered consecutively each calendar year, beginning with 1 on January 1.

The trays of samples are placed in a cross-flow forced-air drying cabinet through which room-temperature filtered air is drawn. The air can be heated 5° to 8°C above the ambient temperature for drying extremely wet samples. Samples remain in the drying cabinet overnight or until air dry.

Air-dried (at 20° to 40°C) samples are crushed with a stainless steel hammer mill-type crushing machine and passed through a 10-mesh (2-mm opening) stainless steel sieve. The samples are then returned to the original sample boxes until the various subsamples are measured out.

Water pH (WpH) Determination

Buffer Solutions: Color-coded buffer solutions of pH 4.0, 7.0, and 10.0 are purchased from commercial sources.

Electrode Internal Filling Solution: Use Thermo Orion's 3 M KCl, (with no silver), Ross™ Sure-Flow® Internal Filling Solution, Cat. No. 810007.

Procedure:

Daily, do a two-point calibration of the pH meter using fresh buffer solutions of pH 4 and 7, and ensure the calibration before starting every batch of samples.

Scoop 10 cm^3 of soil from the prepared sample into a 50-ml beaker. With an automatic pipetting machine add 10 ml of distilled water for a 1:1 (vol/vol) ratio. Thoroughly mix the solution with a glass/plastic rod or mechanical stirrer and allow it to sit for a minimum of 10 minutes and a maximum of 2 hours.

The automated pH analyzer is set to stir solutions for a 5-second equilibration delay before starting to take pH readings. It then continues to stir the soil suspension while the software waits for 10 readings to be stable within 0.02 pH units. Probes are automatically washed after a pH reading greater than 8.0 or less than 4.0. Readings are electronically recorded to the 0.01 pH unit. The pH readings of quality-control soil samples are manually checked before uploading the sample data to verify that they are within current expected values.

Notes:

- For fine-textured soils containing a high level of organic matter, it may be necessary to add an additional 10 ml of distilled water to make a suspension.
- The TPS pH meter has a temperature sensor for automatic temperature compensation (ATC). This ATC probe should sit in a flask of ambient temperature water within the LabFit pH Analyser next to the soil samples being measured.
- If a pH probe's reading becomes sluggish, unstable, or not reproducible (possibly indicating that the liquid reference junction has become clogged), depress the electrode's top cap to flush the junction.

Buffer Index/ pH (BpH) Determination

Mehlich Buffer Preparation:

Using a 4-liter volumetric flask, add:

~ 2 liters of distilled water (DW);

10 ml of glacial acetic acid, CH3COOH, 99.5%, 17.4N;

39 ml of 50% triethanolamine (1 TEA : 1 DW);

72.0 g of sodium glycerophosphate, hydrate, $C_3H_5(OH)_2PO_4Na_2 \cdot xH_2O$, FW=216.04(anhy.); or 1,2,3-Propanetiol mono (dihydrogen phosphate) disodium salt, $(HOCH_2)_2CHOPO_3Na_2$; or Glycerol phosphate Disodium salt Hydrate, $C_3H_7O_6PNa_2$, CAS #: 154804-51-0 or 1555-56-2 for alpha structure {Gallard-Schlesinger's 50 kg GSODGLYERO via Doe & Ingalls, or City Chemical's 2.5 kg S8040, or Sigma's 1 kg G 6501};

172.0 g of ammonium chloride (NH_4Cl);

48.0 g of calcium chloride dihydrate ($CaCl_2 \cdot 2H_2O$); {or alternatively use 80.0 g $BaCl_2 \cdot 2H_2O$}.

Stir using a stir-bar and stir-plate until all salts are dissolved and allow the solution to warm up to room temperature.

Bring to the 4-liter volume with distilled water.

Adjust to pH 6.60 ±0.04 when diluted 1:1 with distilled water. Use drops of acetic acid to lower the pH or drops of 1:1 aqueous TEA to raise the pH.

Use an acid standard to check the preparation of the buffer mixture as follows: combine 10 ml of buffer, 10 ml of distilled water, and 10 ml of commercially prepared 0.05N HCl solution. This mixture should drop the initial buffer pH by 1.40±0.1 units. If the pH is not within these limits, check the preparation of the buffer reagent to make certain that all ingredients were added properly.

Make only what will be needed for a week to prevent microbial growth in storage. When calcium chloride is used instead of barium chloride, containers and dispensers may need to be disinfected with dilute (10%) chlorine bleach (sodium hypochlorite) between batches of solution. Rinse very well with distilled water.

Procedure:

On samples with a WpH ≤6.94, add 10 ±0.2 ml of the Mehlich buffer solution using the 1:1 (vol/vol) soil-water mix from the water pH determination. Thoroughly mix the solution with a glass/plastic rod and allow it to sit for a minimum of 30 minutes. Stir the solution again immediately before reading and while the pH probe is equilibrating in the soil suspension. Record the first stable pH reading to the nearest 0.01 unit. Verify calibration of pH electrodes before measuring buffer pH's. Check the pH of the buffer solution on the daily blank sample. A rise in its pH indicates fungal growth in the buffer.

Determination of P, K, Ca, Mg, Zn, Mn, Cu, Fe, B, and Al

Extracting Solution (Mehlich 1, 0.05N HCl in 0.025N H_2SO_4):

Measure approximately 15 liters of distilled water into a 20-liter plastic container. Add 14.0 ml of concentrated sulfuric acid (H_2SO_4), 82.0 ml of concentrated hydrochloric acid (HCl), and distilled water to make a 20-liter volume and mix thoroughly.

Extraction Procedure:

Measure one 4-cm^3 scoop of prepared soil into a 60-ml straight-walled plastic extracting beaker, and add 20 ml of the Mehlich 1 extracting solution with an automatic pipetting machine. The samples are shaken on a reciprocating shaker with a stroke length of 3.8 cm for 5 minutes at 180 oscillations per minute and filtered through Whatman No. 2 (or equivalent), 11-cm filter paper soon after the shaking stops.

Analysis Procedure:

All elements are analyzed in the same extract by an ICP (inductively coupled plasma atomic emission spectrometer). Transfer filtrate from the extraction beaker to an ICP autosampler cup by using a disposable polyethylene pipette. The transfer is a two-step procedure with the first aliquot being a rinse and the second aliquot for the actual transfer. Pipette 4 ml of filtrate and discard into a waste beaker. Pipette another 4 ml of the same filtrate into the autosampler rack's polystyrene sample cups.

Once all sample filtrates have been transferred, cover the autosampler rack with plastic wrap to prevent air-borne contaminants (dust, lint, etc.) from getting into the solutions. This is important to prevent ICP nebulizer clogging and contamination.

Samples may be stored overnight by covering them with plastic wrap, parafilm, or capping and placing them in a refrigerator. After refrigeration, allow the samples to equilibrate to room temperature before ICP analysis.

Elemental Analysis by ICP:

An ICP instrument, equipped with an autosampler, is set up to analyze 30 samples for 10 elements in about 20 minutes. Each sample has a 24 second preflush with a 10 second integration time to read the element and background spectral lines, and there is approximately a 10 second rinse that mainly occurs during the integration time. A quality control solution is read and verified after every tray of 30 samples.

ICP Working Standards:

The ICP is calibrated with the following series of standards (Note: atomic absorption standards are not sufficiently pure for ICP standards; use only spectrally pure, plasma-quality standards).

Soil #1: Final solution concentration: 0.05 N HCl and 0.025 N H_2SO_4.

Use the Mehlich 1 (M1) extracting solution or to approximately 250 ml of deionized water in a half-liter volumetric flask, add 2 ml of concentrated reagent grade HCl, and 0.35 ml of concentrated reagent grade H_2SO_4, dilute to volume with deionized water and mix well.

Soil #2: Final elemental concentration in solution: 30 $\mu g\ ml^{-1}$ P, 2 $\mu g\ ml^{-1}$ Zn, 2 $\mu g\ ml^{-1}$ B.

> To approximately 250 ml of M1 extracting solution in a half-liter volumetric flask, add 15 ml of 1000 $\mu g\ ml^{-1}$ P calibration standard, 1 ml of 1000 $\mu g\ ml^{-1}$ Zn calibration standard, 1 ml of 1000 $\mu g\ ml^{-1}$ B calibration standard and dilute to volume with extracting solution and mix.

Soil #3: Final elemental concentration in solution: 300 µg ml^{-1} Ca, 100 µg ml^{-1} K, 50 µg ml^{-1} Mg, 10 µg ml^{-1} Al, 10 µg ml^{-1} Mn.

Add to a half-liter volumetric flask with approximately 250 ml of M1 extracting solution 15 ml of 10,000 µg ml^{-1} Ca calibration standard, 5 ml of 10,000 µg ml^{-1} K calibration standard, 2.5 ml of 10,000 µg ml^{-1} Mg calibration standard, 5 ml of 1,000 µg ml^{-1} Al calibration standard, and 5 ml of 1000 µg ml^{-1} Mn calibration standard; dilute to volume with extracting solution and mix.

Soil #4: Final elemental concentration in solution: 10 µg ml^{-1} Cu, 25 µg ml^{-1} Fe.

Add to a half-liter volumetric flask with approximately 250 ml of M1 extracting solution 5 ml of 1000 µg ml^{-1} Cu calibration standard and 12.5 ml of 1000 µg ml^{-1} Fe calibration standard; dilute to volume with extracting solution and mix.

ICP Quality Control Standard:

The quality control solution is prepared with spectrally pure, ICP-quality, calibration stock solutions. (Note: For the elements P, K, Ca, and Mg, use standard stock solutions from a manufacturing source other than the one used to prepare the working standards.) Add to a half-liter volumetric flask with approximately 250 ml of Mehlich 1 extracting solution the following amounts of each stock solution then dilute to volume with extracting solution and mix well:

Element	Final Concentration (µg ml^{-1})	High Purity Reference Solution
P	10	5 ml of 1,000 µg ml^{-1}
K	30	1.5 ml of 10,000 µg ml^{-1}
Ca	200	10 ml of 10,000 µg ml^{-1}
Mg	20	1 ml of 10,000 µg ml^{-1}
Zn	1	0.5 ml of 1,000 µg ml^{-1}
Mn	1	0.5 ml of 1,000 µg ml^{-1}
Cu	1	0.5 ml of 1,000 µg ml^{-1}
Fe	5	2.5 ml of 1,000 µg ml^{-1}
B	1	0.5 ml of 1,000 µg ml^{-1}

Calculation of Elemental Concentrations:

For each element, the calculation for ppm in soil is as follows:

ppm in solution x 5 = ppm in soil on a volume basis (mg/dm3)
ppm in solution x 4 = ppm in soil on a weight basis (mg/kg)
where 4 is the dilution factor assuming a soil scoop density of 1.25 g/cm3.

To convert from ppm (wt. basis) to lbs/acre the equation is:

ppm in soil x 2 = lbs/acre
where weight of an acre furrow slice (6 2/3-inch depth) is assumed to be 2 million pounds.

Estimation of CEC by Summation

Theory:

The Cation Exchange Capacity (CEC) can be reasonably estimated by summation of the Mehlich 1 extractable bases, or non-acid generating cations (Ca, Mg and K), plus the acidity estimated from the Mehlich soil-buffer pH after conversion of all analytical results to meq/100 cm^3 or cmol(+)/kg.

This calculated method is closer to an Effective CEC, which is measured at the present pH of the soil, than it is to the soil's potential CEC, which is measured in solutions buffered at pH 7.0 or higher.

This method is inappropriate for soils with a high soluble salts level or for alkaline soils because these soils may be over-fertilized, calcareous, gypsiferous, or relatively unweathered and could result in an erroneously high CEC value by the release of nonexchangeable cations.

Calculation:

Estimated Soil CEC = Acidity + Ca + Mg + K (in the units of meq/100 g soil or cmol/kg)

Acidity (meq/100 g of soil) = 37.94 - (5.928 x BpH)
where BpH = Mehlich soil-buffer pH reading for an individual soil sample.

meq Ca/100 g = lb Ca per Acre ÷ 401

meq Mg/100 g = lb Mg per Acre ÷ 243

meq K/100 g = lb K per Acre ÷ 782

Sodium is not included in the equations since it is not routinely determined in the Mehlich 1 extract in routine analysis. Since exchangeable Na is usually at a very low concentration, its omission is not considered to be a cause of error in the calculated CEC. If sodium was included , then the calculation would be meq Na/100 g = lb Na per Acre ÷ 460.

The commonly used unit of meq/100 g is equivalent to the SI accepted unit of cmol/kg.
1 meq/100 g = 1 cmol(+)/kg

Soluble Salts

Conductivity Standard:

Use a commercially prepared NIST traceable conductivity standard of 1,000 or 1,420 µsiemens/cm.

or

Prepare potassium chloride standard solution (0.01 N KCl): Dissolve 0.7456 g of potassium chloride (KCl) in deionized water in a 1-liter volumetric flask. Mix well and dilute to volume. The conductivity of this solution at 25°C is 1,412 µsiemens/cm.

Procedure:

Measure one 20-cm^3 scoop of prepared soil into a 50-ml beaker, add 40 ml of distilled water for a soil:water ratio of 1:2 (vol/vol). Include at least one internal soil reference ("test") sample per batch of unknown soil samples. Stir the solution and allow the suspension to settle for at least 1 hour. Check the conductivity meter's calibration against the conductivity standard. At 25°C, the standard has an electrical conductivity of 1.00 or 1.41 mmho/cm (or mS/cm). Set the meter in the Temperature Compensation Conductivity mode, and cell constant (C) to 1.00/cm. The electrical conductivity (EC) of the supernatant liquid of the soil-water solution is determined with the meter set on the µS/cm scale. Use the bulb to draw the supernatant into the cell. Dispose of this aliquot into a waste beaker. Draw a second aliquot of the sample into the cell and when the meter stabilizes, record the EC as one tenth of the meter's reading, (move the decimal one place to the left on the meter's display), in order to give the results in mhos x 10^{-5} units. The ppm soluble salts in the soil are calculated from the following equation:

$$\text{ppm soluble salts in soil} = EC \times 6.4 \times 2$$

In this equation, EC represents the conductivity reading in mhos x 10^{-5}, 6.4 is the factor for converting the conductivity measurement to ppm soluble salts, and 2 represents the water volume dilution factor. Report as ppm soluble salts in soil.

Useful Equations:

$$EC\ (\text{mho} \times 10^{-5}/\text{cm}) / 100 = \text{mmho/cm}$$

$$\text{ppm (mg salt/liter)} / 1280 = \text{mmho/cm}$$

$$0.1\ \text{S/m} = 1\ \text{dS/m} = 1\ \text{mS/cm} = 1\ \text{mmho/cm}$$

Resistance of a solution is the reciprocal of the electrical conductivity; therefore,

$$0.1\ \mu\text{mho} = 10.0\ \text{Mohm}.$$

Soil Organic Matter (SOM) by Walkley-Black (WB)

Reagent A: Sodium dichromate solution (0.67M): Dissolve 500 g of reagent grade sodium dichromate ($Na_2Cr_2O_7 \cdot 2H_2O$) in tap water to a volume of 2 1/2 liters.

Reagent B: Concentrated reagent grade sulfuric acid (H_2SO_4).

Procedure:

The procedure is a modified Walkley-Black method. Measure one 1.5-cm^3 scoop of prepared soil into a 200-ml test tube. Under a hood, add 20 ml of Reagent A to the soil followed by 20 ml of Reagent B. Allow the solution to cool at least 40 minutes. After cooling, add 100 ml of tap water, mix the solution, and allow to stand overnight (or at least 8 hours). After incubation, withdraw an aliquot of the supernatant using a syringe-type pipette and transfer it to a colorimeter vial. Take readings using a colorimeter set to a 645 nm wavelength. The percentage of organic matter is determined by reference to the following table.

Colorimeter readings and percent organic matter.

Colorimeter Reading	Organic Matter, %	Colorimeter Reading	Organic Matter, %	Colorimeter Reading	Organic Matter, %
100	0.0	56	2.6	30	6.4
99-95	0.1	55	2.7	29	6.6
94-91	0.2	54	2.8	28	6.8
90-88	0.3	53	2.9	27	7.0
87-86	0.4	52	3.0	26	7.2
85	0.5	51	3.1	25	7.4
84-83	0.6	50	3.2	24	7.6
82	0.7	49	3.3	23	7.8
81-80	0.8	48	3.4	22	8.0
79	0.9	47	3.5	21	8.3
78-77	1.0	46	3.6	20	8.7
76	1.1	45	3.7	19	9.0
75-74	1.2	44	3.8	18	9.4
73	1.3	43	3.9	17	9.7
72-71	1.4	42	4.0	16	10.1
70	1.5	41	4.2	15	10.4
69-68	1.6	40	4.4	14	10.8
67	1.7	39	4.6	13	11.1
66-65	1.8	38	4.8	12	11.5
64	1.9	37	5.0	11	11.8
63-62	2.0	36	5.2	10	12.2
61	2.1	35	5.4	9	12.5
60	2.2	34	5.6	8	13.0
59	2.3	33	5.8	7	13.5
58	2.4	32	6.0	6	14.0
57	2.5	31	6.2	5-1	15.0

Soil Organic Matter (SOM) by Weight Loss On Ignition (LOI)

Procedure:

Tare balance and weigh 50-mL beakers. Scoop 5 cm^3 of air-dried, 2-mm sieved soil into a beaker. Dry for a minimum of two hours at 150°C ±5°C. Maintain at 100°C until weighing. Record the weight of the beaker plus the warm soil sample to ±1 mg. Heat at 360°C for two hours after the temperature reaches 360°C ±5°C. Cool to 105°C and maintain at 105°C until weighing. Weigh the beaker and warm ash in a draft-free environment to ±1 mg. Calculate and report %LOI as percent organic matter to the nearest tenth of a percent.

Calculations:

Dried Soil ($Soil_d$) = (Wt of Beaker + Wt of Soil at 150°C) - Wt of Beaker

Ashed Soil ($Soil_a$) = (Wt of Beaker + Wt of Soil at 360°C) - Wt of Beaker

Percent weight loss on ignition (%LOI):

$$\text{LOI (\%)} = \frac{Soil_d - Soil_a}{Soil_d} \times 100$$

Note:

The LOI (a gravimetric, dry oxidation) method is used to estimate the soil organic matter content for all samples except for those coming from commercial farmland in the Piedmont counties of Virginia. The Walkley-Black (a wet, chemical oxidation) method is used in those cases, due to the presence of gibbsite ($Al_2O_3 \cdot 3H_2O$) in the clay fraction of soil material in that area of the state. Gibbsite has been reported to lose substantial amounts of water at around 300°C.

Instruments for Soil Analyses

Analysis	Instrument
Soil Drying	Cross-flow forced-air soil drying cabinet, developed at Virginia Tech
Soil Grinding	Agvise soil grinder
pH Auto-analyzer	LabFit Pty Ltd, model AS-3000 Automated Dual pH Analyser
pH Meter	TPS Pty Ltd, model WP-80D, Dual pH-mV and temp. meter
pH Electrode	Thermo Orion model 8165BNWP, Ross™ combination pH electrode, Sure-Flow®, with epoxy body and BNC connector
Nutrient Extraction	Eberbach Reciprocating, Variable Speed Shaker No. 6000
Elemental Analysis of P, K, Ca, Mg, Zn, Mn, Cu, Fe, B & Al	ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectrometer), CirOS VISION model with a SOP (radial) view of the plasma, made by Spectro Analytical Instruments and equipped with a CETAC ASX520-HS autosampler.
Soluble Salts	YSI 3100 Conductivity Instrument with a YSI 3254 Pyrex 5-ml Fill Cell
Organic Matter - WB	Thermo Scientific Genesys 20 Colorimete
Organic Matter – LOI	Blue M Electric High Temperature (up to 704°C), Ultra-Temp, forced-air drying oven, model CW-6680F, with Pro 550 microprocessor-based controller.
Organic Matter – LOI	PG503-SDR Mettler Toledo (MT) analytical balance controlled by MT's BalanceLink software (v2.20).

ICP Parameters

The ICP is housed in an instrument room maintained at 21°C (70°F) ± 1°C (2°F). Extreme swings in both temperature and humidity can affect the analytical results. Solutions are introduced to a cross flow nebulizer and Scott spray chamber with a peristaltic pump.

The following analytical lines are used:

Element	Wavelength (nm)
P	178.287
K	766.491
Ca	373.690
Mg	279.079
Zn	213.856
Mn	257.610
Cu	324.754
Fe	259.940
B	249.678
Al	308.215

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SOP Title: Volatile (or Fixed) Solids

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Validator- Chad Firment

Approved By: ______________________ Date: 8/7/15
Wet Chemistry Supervisor- Jason Badman

Approved By: ______________________ Date: 8/25/2015
Quality Assurance Manager- Anna Milliken

Annual Review:

Reviewed By: ______________________ Date: ____________

Reviewed By: ______________________ Date: ____________

Reviewed By: ______________________ Date: ____________

Reviewed By: ______________________ Date: ____________

Reviewed By: ______________________ Date: ____________

Reviewed By: ______________________ Date: ____________

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1 Scope and Application

1.1 This method is for the determination of volatile solids on solids and waters and also volatile suspended solids. Volatile solids, when measured in mg, is the weight of material combustible at 550ºC.

Applicable matrices include drinking, surface, and saline waters, domestic and industrial wastes, as well as soils, sludges, solid waste samples, river and lake sediments, and sludge cakes.

1.2 This method is adapted from the U.S. EPA Method 160.4 1971, "Residue, Volatile (Gravimetric, Ignition at 550ºC)", Standard Methods for the Examination of Water and Wastewater Method 2540E 2011, "Fixed and Volatile Solids Ignited at 550ºC," and 2540G 2011, "Total, Fixed and Volatile Solids in Solid and Semisolid Samples."

1.3 This document states the laboratory's policies and procedures established in order to meet the requirements of all certifications/accreditations currently held by the laboratory, including the most current standards in effect for the National Environmental Laboratory Accreditation Program (NELAP).

1.4 Individual project requirements may override criteria listed in this SOP.

2 Summary of Method

2.1 The residue obtained from the determination of TDS, TS, or TSS is ignited at 550ºC in a muffle furnace. The loss of weight on ignition is reported as volatile residue. Volatile residue is a combination of organic matter and volatile inorganic salts.

2.2 The remaining solids represent the fixed total, dissolved, or suspended solids. The determination is useful in control of wastewater treatment plant operation because it offers a rough approximation of the amount of organic matter present in the solid fraction of wastewater, activated sludge, and industrial wastes.

3 Interferences

3.1 The principal source of error in the determination is failure to obtain a representative sample. When running this test, the analyst shall do their best to obtain as representative a sample as possible.

3.2 The test is subject to errors due to loss of water of crystallization, loss of volatile organic matter prior to combustion, incomplete oxidation of certain complex organics, and decomposition of mineral salts during combustion. Therefore, the results shall not be considered an accurate measure of organic carbon in the sample, but may be useful in the control of plant operations.

3.3 Determination of low concentrations of volatile solids in the presence of high fixed solids concentrations may be subject to considerable error. In such cases, measure for suspect volatile components by another test, for example, total organic carbon.

4 Safety

4.1 ALS-Middletown maintains Safety Data Sheets (SDSs) on all chemicals used in this procedure. ALS-Middletown recommends that all individuals performing this SOP familiarize themselves with the SDSs associated with the procedure prior to SOP performance. SDSs are available to all staff and are located in hard copy in the QA reference library and electronically on the ALS-Middletown server in the Common>Health & Safety>SDS folder.

4.2 All possible steps shall be taken to limit the analyst contact with chemicals and samples. The minimum personal protective equipment (PPE) requirements are appropriate chemical resistant gloves, safety glasses and a fully buttoned lab coat. This PPE shall reduce the possibility of contact to a safe level, but the analyst shall not limit themselves to these PPE minimums. Refer to SOP 90-PPE-PROTOCOL for detailed PPE information.

4.3 Injuries from glass cuts are a serious concern in the laboratory. Several types of cut-resistant gloves are available in all the laboratory work areas. Wells Lamont part# Y1700 or equivalent should be worn as an under glove to provide cut protection when nitrile, latex or vinyl gloves are worn for chemical protection. The use of cut-resistant gloves is mandatory throughout the entire laboratory when handling glass sample containers and reusable labware constructed of glass. The handling of VOA and extract vials does not require cut-resistant gloves unless a cut hazard is evident. For example, loading capped vials unto an instrument does not require the use of cut-resistant gloves, but capping extract vials does.

4.4 In addition to the PPE minimums required above, a face shield shall be worn at all times while dispensing, diluting or handling any quantity of concentrated acid.

4.5 Analysts should always exercise caution when handling samples since the chemical and biological composition of the samples is unknown.

4.6 The health hazards of each substance used in this method may not have been fully established. Each substance shall be regarded as a potential health hazard and exposure shall be as low as reasonably achievable.

5 Apparatus and Materials

5.3 Muffle furnace, operation temperature 550ºC ± 50ºC- Vulcan, serial #3-1750 NEY, or equivalent.

5.4 Wax pencils- Fisher Scientific #S45652, or equivalent.

5.5 Tongs, extra long- VWR scientific # 62452-045, or equivalent.

5.4 Evaporating dishes, porcelain, 125-mL- VWR Scientific #25310-132, or equivalent. Vycor or platinum dishes may be substituted and smaller size dishes may be used if required. Dishes must be cooked for a minimum of one hour at 550ºC and stored in a desiccator prior to use.

5.5 Analytical Balance, capable of weighing to 0.0001g– OHaus Adventurer AR 2140, or equivalent.

5.6 Desiccator– VWR #24982-000, or equivalent.

5.7 Aluminum weighing dishes- VWR #25433-008, or equivalent.

5.8 Pre-weighed 47 mm volatile fiber filters- Environmental Express #F93447VOL, or equivalent.

5.9 Computer software capable of processing all associated tasks- Microsoft Excel and Access, or equivalent; Horizon LIMS, version 11, or equivalent.

5.10 Computer hardware capable of processing all associated software- Dell Dimension 8800, or equivalent.

6 Reagents

6.1 Not applicable.

7 Instrument Calibration

7.1 The balances must be calibrated daily. See the appropriate balance SOP for procedures regarding balance calibrations and verifications. The balances must be calibrated by an outside source annually.

8 Quality Control

8.1 All policies and procedures in the most current revision of the ALS-Middletown QA Manual shall be followed when performing this procedure.

8.2 Demonstration of Capability (DOC)

8.2.1 Initial Demonstration of Capability (IDOC): Each analyst shall complete a successful IDOC to become a qualified analyst and work independently to conduct this method.

8.2.1.1 Select four representative samples for the type of analysis being performed (total volatile solids aqueous, total volatile solids non-aqueous, volatile suspended solids, or volatile dissolved solids). Analyze these samples and compare the results with the results for the same samples obtained by an experienced analyst who has already completed the demonstration of capability requirements for the selected analysis.

8.2.1.2 Acceptance Criterion
Precision: Each RPD shall be ≤10%.

If this acceptance criterion is met, performance is judged acceptable and independent sample analysis may begin. If data is not acceptable, find and correct the source of the problem, then repeat the analysis. The DOC must be acceptable before independent analysis begins.

8.2.2 Continuing DOC (DOC): Each qualified analyst shall perform an annual DOC for ongoing proficiency or when significant changes in instrumentation are made.

8.2.2.1 Use the same procedure and acceptance criterion as the IDOC or the successful analysis of a blind performance sample (PT).

If this acceptance criterion is met, performance is judged acceptable and independent sample analysis may continue. If data is not acceptable, analyst shall work under supervision of a qualified analyst, find and correct the source of the problem, then repeat the analysis. The DOC must be acceptable before independent analysis begins.

8.3 Quality Control Requirements

Quality Control Requirements

(Specific Project Requirements may override these requirements)

Parameter	Concentration	Frequency	Control Limits	Corrective Action
Method Blank (Aqueous Samples Only)	---	One per twenty samples with a minimum of one per batch	<Reporting Limit (5 mg/L)	Reanalyze the blank and any associated samples. If reanalysis is not possible report with a qualifying statement.
Duplicate	---	1 per 10 samples with a minimum of one per batch	RPD ≤ 5%	Reanalyze once. If reanalysis is not possible or if RPD is still unacceptable report with a qualifying statement.

8.4 Method Blank- Analysis required with aqueous samples only.

8.4.1 If the Method Blank concentration is greater than or equal to the reporting limit AND is greater than $^{1}/_{10}$ the sample concentration, the source of contamination must be investigated and measures taken to minimize or eliminate the problem and affected samples reanalyzed. If reanalysis is not possible, data shall be reported with a qualifying statement.

8.5 Duplicate

8.5.1 Samples selected for duplicate analysis shall be rotated among client samples so that various matrix problems may be noted and/or addressed. Poor performance in a duplicate or spike may indicate a problem with the sample composition and shall be reported to the client whose sample produced the poor recovery.

8.6 Acceptance limits were developed based on the reference methods and control charts.

9 Sample Collection, Preservation and Handling

9.1 Sample collection, preservation, and handling is performed according to SOP-20 Field Services Plan for Sample Collection.

9.2 Samples shall be collected in glass or plastic containers. A minimum of 200 mL is required for aqueous samples and a minimum of 25 grams is required for solid samples.

9.3 Preserve samples by storing above the freezing point of water up to 6 °C.

9.4 The maximum holding time is seven days.

10 Procedure

10.1 Prepare the solids by following the appropriate procedure for TS, TDS or TSS. The same dish can be used for both analyses.

10.2 Volatile Total Solids on Solids:

10.2.1 Transfer the dish containing the dried residue to a cool muffle furnace.

10.2.2 Heat the furnace to 550ºC ± 50ºC allowing the sample to come up to temperature at the same speed as the furnace and ignite the sample for one hour after the furnace first reaches 550 ºC.

NOTE: On the first burn, place a watch glass over the dish to contain particles that may pop out of the dish due to the expansion of air trapped in the sample matrix. After temperature of 550 ºC is achieved and 15 minutes have passed, the watch glass can be removed. Let the dish cool partially in air until most of the heat has dissipated and then transfer to a desiccator.

10.2.3 Weigh the dish as soon as it has cooled to room temperature.

10.2.4 Repeat igniting (1 hour), cooling, desiccating, and weighing steps until the weight change is less than 4% or 50 mg, whichever is less.

10.3 Volatile Total Solids on Waters & Volatile Suspended Solids:

10.3.1 Preheat muffle furnace to 550ºC ± 50ºC.

10.3.2 Place the sample in the preheated oven and ignite for 15 minutes.

10.3.3 Let the dish cool partially in air until most of the heat has dissipated and then transfer to a desiccator.

10.3.4 Weigh the dish as soon as it has cooled to room temperature, which takes approximately 2 hours.

10.3.5 Repeat igniting (15 minutes), cooling, desiccating, and weighing steps until the weight change is less than 4% or 0.5 mg, whichever is less.

10.4 Record the appropriate sample information from the original procedure for TS, TDS or TSS to the appropriate Volatile Solids spreadsheet, see Appendices.

11 Calculations

11.1 $$\text{mg/L Volatile Solids (Aqueous)} = \frac{(A-B) \times 10^6}{\text{mL sample}}$$

$$\text{mg/L Fixed Solids (Aqueous)} = \frac{(B-C) \times 10^6}{\text{mL sample}}$$

where:
A = weight of residue and dish before ignition (grams)
B = weight of residue and dish after ignition (grams)
C = weight of dish (grams)

11.2 $$\text{\% Volatile Solids (Solids)} = \frac{(A-D)}{(A-B)} \times 100$$

$$\text{\% Fixed Solids (Solids)} = \frac{(D-B)}{(A-B)} \times 100$$

where:
A = weight of dried residue and dish (grams)
B = weight of dish
C = weight of wet sample and dish (grams)
D = weight of residue and dish after ignition (grams)

11.3 Precision, Relative Percent Difference (RPD):

$$RPD = \frac{\text{Difference between results}}{\text{Average}} \times 100$$

12 Reporting Results

12.1 All raw data used for reporting results must be dated and initialed by the qualified laboratory personnel performing first and second review.

12.2 When entering data into Horizon LIMS do not round off results: Horizon will automatically perform rounding appropriate to the method. Horizon LIMS results are reported to three significant figures but limited to the number of decimal places in the reporting limit for the individual compound or analyte.

12.3 Report the actual result, even if it is less than the reporting limit. Any sample with a result less than the reporting limit is reported as ND (non-detectable); LIMS will automatically report the appropriate detection limit.

13 Waste Management

13.1 Refer to ALS-Middletown SOP 19-Waste Disposal

14 Pollution Prevention

14.1 Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operations. Management shall consider pollution prevention a high priority. Extended storage of unused chemicals increases the risk of accidents. The laboratory shall consider smaller quantity purchases which will result in fewer unused chemicals being stored and reduce the potential for exposure by employees. ALS-Middletown tracks chemicals when received by recording their receipt in a traceable logbook. Each chemical is then labeled according to required procedures and stored in assigned locations for proper laboratory use.

15 Definitions

15.1 Refer to ALS-Middletown QA Manual for general definitions.

16 Maintenance and Troubleshooting

16.1 Refer to maintenance logs and instrument manuals for guidance in troubleshooting specific problems related to the instrumentation used in this method.

Appendix A

Appendix A

TOTAL SOLIDS

Sample	Weight of dish and sample (g) or Volume of sample (ml)	Dish Wt. (g)	1st Dish + Sample Wt. (g)	2nd Dish + Sample Wt. (g)	TS (%) or (mg/L)	Date/Tech	1st Time in	1st Temp In (C)	1st Time Out	1st Temp Out (C)	2nd Time In	2nd Temp In (C)	2nd Time Out	2nd Temp Out (C)

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Appendix B

Appendix B

TOTAL DISSOLVED SOLIDS

Sample Number	Volume (ml)	Weight dish (g)	Weight dish and sample (g)	TDS (mg/l)	Date/ Technician	104ºC			108ºC			
						Time In	Temp in ºC	Temp out ºC	Time in/ Date/ Initials	Temp in ºC	Temp out ºC	Time out/ Date/ Initials

Comments: Solids cannot be reweighed until the temperature blank is plus or minus 0.0005g.

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Page #:____

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Date Approved: ________

Appendix C

Appendix C

TOTAL SUSPENDED SOLIDS

Sample	Vol (mL)	Initial Wt. (g)	1st Final Wt. (g)	2nd Final W. (g)	Final Net Wt. (g)	TSS (mg/L)	Date/Tech	1st Time In	1st Temp in (C)	1st Time Out	1st Temp Out (C)	2nd Time In	2nd Temp In (C)	2nd Time Out	2nd Temp Out (C)

Page____

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Appendix D

Volatile Total Solids on Solids

Queue:	WETC
Rule:	S2540GSVTS
Batch:	
HBN:	
VTSS Analyst:	
Date:	

1st		2nd		3rd	
Time In:		Time In:		Time In:	
Temp (°C):		Temp In (°C):		Temp In (°C):	
Time Out:		Time Out:		Time Out:	
Temp Out (°C):		Temp Out (°C):		Temp Out (°C):	
Analysts:		Analysts:		Analysts:	

Sample	Dish Wt. (g)	Final Wt. 104 (g)	1st Wt. 550 (g)	2nd Wt. 550 (g)	3rd Wt. 550 (g)	VTSS (%)	TS Date/Time	TS Tech	3rd Wt? (Y/N)

Comments:

Reviewed By: ____________
Reviewed Date: ____________
Approved By: ____________
Approved Date: ____________

Rev 12/10 Volatile Total Solids on Solids Template for sop.xls Val 0076

Appendix E

Volatile Total Solids on Waters

Queue:	WETC
Rule:	VTSW
Batch:	
HBN:	
VTSW Analyst:	
Date:	

1st		2nd		3rd	
Time In:		Time In:		Time In:	
Temp (°C):		Temp In (°C):		Temp In (°C):	
Time Out:		Time Out:		Time Out:	
Temp Out (°C):		Temp Out (°C):		Temp Out (°C):	
Analyst:		Analyst:		Analyst:	

Sample	Volume (mL)	Final Wt. 104 (g)	1st Wt. 550 (g)	2nd Wt. 550 (g)	3rd Wt. 550 (g)	VTSW (%) or (mg/L)	TSW Date/Time	TSW Tech	3rd Wt? (Y/N)

Comments:

Reviewed By: __________
Reviewed Date: __________
Approved By: __________
Approved Date: __________

Rev. 12/10 Volatile Total Solids on Waters Template for sop.xls Val 0094

Appendix F

Volatile Suspended Solids

Queue:	WETC
Rule:	VSS
Batch:	
HBN:	
VSS Analyst:	
Date:	

1st		2nd		3rd	
Time In:		Time In:		Time In:	
Temp (°C):		Temp In (°C):		Temp In (°C):	
Time Out:		Time Out:		Time Out:	
Temp Out (°C):		Temp Out (°C):		Temp Out (°C):	
Analysts:		Analysts:		Analysts:	

Sample	Volume (mL)	Final Wt. 104 (g)	1st Wt. 550 (g)	2nd Wt. 550 (g)	3rd Wt. 550 (g)	VSS (mg/L)	TSS Date/Time	TSS Tech	3rd Wt? (Y/N)

Comments:

Reviewed By: ______
Reviewed Date: ______
Approved By: ______
Approved Date: ______

Rev 12/10 Volatile Suspended Solids Template for sop.xls Val 0095

Summary of Changes

Revision 7

Section Number	Section	Description of Change
Spelling, grammar, and formatting changes may have been made throughout SOP for clarity, correctness, and conformity.		
	Footer	Updated to Corporate format
	Signature page	Updated Validator, QA Manager
1.2	Scope & Application	Added reference method years
4.1-.6	Safety	Updated Safety standard verbiage
5.8	Apparatus and Materials	Updated filters
5.9	Apparatus and Materials	Updated LIMS version
8.2	Quality Control	Added DOC standard verbiage
	Concurrence Form	Removed due to change in procedure

Concurrence Form

I acknowledge that I have read, undersood, and I concur with the standard operating procedure (SOP) listed below.

Employee Name	
SOP	04-vs
Revision	7
E-mail	
Date Concurred	

Submit

DOCUMENT TITLE:	*DETERMINATION OF TOTAL & DISSOLVED ORGANIC CARBON AND TOTAL CARBON IN WATER*
SOP ID:	*07-TOC*
REVISION NUMBER:	*14*
REVISION DATE:	*05/11/20105*
INSTITUTED DATE:	*09/03/2015*
DOC. CONTROL#:	*_____________*
ARCHIVAL DATE:	

SOP Title: The Determination of Total & Dissolved Organic Carbon and Total Carbon in Water

SOP ID: 07-TOC Revision #: 14

Approved By: Patrick A. Glaser Date: 9-3-15
Validator- Patrick Glaser

Approved By: Date: 7/20/15
Wet Chemistry Supervisor- Jason Badman

Approved By: Date: 8/25/2015
Quality Assurance Manager- Anna Milliken

Annual Review:

Reviewed By: ______________________ Date: ____________

Reviewed By: ______________________ Date: ____________

Reviewed By: ______________________ Date: ____________

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Reviewed By: ______________________ Date: ____________

Reviewed By: ______________________ Date: ____________

TABLE OF CONTENTS

1 Scope and Application

1.1 This method is used to estimate the total amount of non-purgeable organic carbon present in drinking, surface, and saline waters, as well as domestic and industrial wastes. This method can be modified to estimate the dissolved organic carbon of a sample. This method also outlines steps to be performed to determine total carbon and inorganic carbon.

This TOC method is independent of the oxidation state of the organic matter and does not measure other organically bound elements, such as nitrogen and hydrogen, and inorganics that can contribute to the oxygen demand measured by BOD and COD.

1.2 This method is adapted from the U.S. EPA Method 415.1 1974, "Organic Carbon, Total (Combustion or Oxidation)", and Standard Methods for the Examination of Water and Wastewater, Method 5310 B 2011. The quality control requirements specified in Standard Methods for the Examination of Water and Wastewater, 5310B 2011 are implemented for drinking water samples. This method, when analyzed in quadruplicate, is adapted from U.S. EPA SW-846, Method 9060A rev 1 2004, Total Organic Carbon.

1.3 This document states the laboratory's policies and procedures established in order to meet requirements of all certifications/accreditations currently held by the laboratory, including the most current standards in effect for the National Environmental Laboratory Accreditation Program (NELAP).

1.4 This method is restricted for use by or under the supervision of analysts experienced in the use of the total organic carbon analyzer.

1.6 Individual project requirements may override criteria listed in this SOP.

2 Summary of Method

2.1 Combustion (as performed by the Elementor Vario TOC Cube) - Initially any inorganic carbon compounds present are removed from the sample by purging with oxygen. The sample is then injected into a heated reaction chamber packed with an oxidative catalyst and vaporized. The organic carbon is then oxidized to CO_2 and H_2O. The CO_2 is transported in the carrier gas stream and measured by means of a non-dispersive infrared analyzer specifically tuned to the absorptive wavelengths of CO_2. The instrument calculates the area of the peaks produced by the analyzer, compares them to the peak area of the calibration standards, and prints out a calibrated organic carbon value in mg/L. The amount of CO_2 is directly proportional to the concentration of carbonaceous material in the sample.

2.2 Carbon measurement assesses the potential oxygen- demanding load of organic material on a receiving stream. This statement applies whether the carbon measurement is made on a sewage plant effluent, industrial waste, or on water taken directly from the stream. In this light, carbonate and bicarbonate carbon are not a part of the oxygen demand in the stream and therefore shall be discounted in the final calculation or removed prior to analysis. The manner of preliminary treatment of the sample and instrument settings defines the types of carbon which are measured. Instrument manufacturer's instructions shall be followed.

3 Interferences

3.1 Carbonate and bicarbonate carbon represent an interference under the terms of this test and must be removed or accounted for in the final calculation. Removal of carbonates and bicarbonates by acidification and purging with purified gas may result in the loss of volatile organic substances.

3.2 Volatiles can also be lost during sample blending, particularly if the temperature is allowed to rise.

3.3 A loss can occur if large carbon-containing particles fail to enter the syringe used for injection.

3.4 Chloric acids and salines will omit chlorine when injected into the combustion tube. If these components are contained in a very high concentration, they may not be removed completely by the IC solution in the reaction vessel. These samples shall be diluted.

3.5 Contamination during sample handling and treatment is a likely source of interference. Extreme care shall be taken when sampling, handling, and analyzing, particularly for trace analysis of samples below 1 mg TOC/L.

3.6 The carbonaceous analyzer measures all of the carbon in a sample. Because of various properties of carbon-containing compounds in liquid samples, preliminary treatment of the sample prior to analysis dictates the definition of the carbon as it is measured. Forms of carbon that are measured by the method are:

3.6.1 Soluble, nonvolatile organic carbon; for instance, natural sugars.

3.6.2 Soluble, volatile organic carbon; for instance, mercaptans.

3.6.3 Insoluble, partially volatile carbon; for instance, oils.

3.6.4 Insoluble, particulate carbonaceous materials; for instance, cellulose fibers.

3.6.5 Soluble or insoluble carbonaceous materials absorbed or entrapped on insoluble inorganic suspended matter; for instance, oily matter absorbed on silt particles.

4 Safety

4.1 ALS-Middletown maintains Safety Data Sheets (SDSs) on all chemicals used in this procedure. ALS-Middletown recommends that all individuals performing this SOP familiarize themselves with the SDSs associated with the procedure prior to SOP performance. SDSs are available to all staff and are located in hard copy in the QA reference library and electronically on the ALS-Middletown server in the Common>Health & Safety>SDS folder.

4.2 All possible steps shall be taken to limit the analyst contact with chemicals and samples. The minimum personal protective equipment (PPE) requirements are appropriate chemical resistant gloves, safety glasses and a fully buttoned lab coat. This PPE shall reduce the possibility of contact to a safe level, but the analyst shall not limit themselves to these PPE minimums. Refer to SOP 90-PPE-PROTOCOL for detailed PPE information.

4.3 Injuries from glass cuts are a serious concern in the laboratory. Several types of cut-resistant gloves are available in all the laboratory work areas. Wells Lamont part# Y1700 or equivalent should be worn as an under glove to provide cut protection when nitrile, latex or vinyl gloves are worn for chemical protection. The use of cut-resistant gloves is mandatory throughout the entire laboratory when handling glass sample containers and reusable labware constructed of glass. The handling of VOA and extract vials does not require cut-resistant gloves unless a cut hazard is evident. For example, loading capped vials unto an instrument does not require the use of cut-resistant gloves, but capping extract vials does.

4.4 In addition to the PPE minimums required above, a face shield shall be worn at all times while dispensing, diluting or handling any quantity of concentrated acid.

4.5 Analysts should always exercise caution when handling samples of unknown composition.

4.6 The health hazards of each substance used in this method may not have been fully established. Each substance shall be regarded as a potential health hazard and exposure shall be as low as reasonably achievable.

5 Apparatus and Materials

5.1 Total Organic Carbon Analyzer- Elementar TOC Vario Cube, or equivalent.

5.2 Syringe, 5 mL- Hamilton Gastight Syringe, Elementar #38.00-0068, or equivalent.

5.3 Assorted Class A pipets and volumetric flasks.

5.4 Filters, 0.45-µm glass fiber syringe filters- Whatman #6894-2504, or equivalent.

5.5 10-mL interchangeable syringe- Micro-Mate, or equivalent.

5.6 Sample Vials, 40 mL precleaned amber- Scientific Specialties, or equivalent.

5.7 Automatic Pipets- various sources. If an automatic pipet is used, it must be calibrated monthly according to the protocol listed SOP 99-AP for calibration checks for Autopipetters and Dispensers.

5.8 Computer software-
5.8.1 Microsoft Excel, or equivalent
5.8.2 Horizon LIMS, version 11, or equivalent
5.8.3 Vario TOC Software V2.2.3(ef16cd0),2012-06-18, or equivalent.

5.9 Computer hardware- Dell Dimension 9200, or equivalent.

6 Reagents

NOTE: Unless otherwise noted in this section all chemicals are stored at room temperature and labeled with an expiration date of five years from receipt. Manufacturer's labeled expiration dates, when provided, take precedent over all other expiration dates.

6.1 Reagent Water - ALS-MIDDLETOWN uses a Filson Water Purification System which provides analyte-free, greater than 16.0 megohm-cm DI water on demand. Ion exchanged waters are not recommended because of possible contamination with organics from resin materials.

6.2 Potassium biphthalate (KHP), ACS grade- VWR catalog #JT2958-0, or equivalent.

6.2.1 Total Carbon Standard (1000 mg/L) – Dissolve 2.1254 g KHP into 1 L of reagent water. Store above the freezing point of water up to 6 ˚C for up to 2 weeks.

6.3 Hydrochloric acid (HCl), Reagent Grade- Baker, VWR catalog #JT9535-33, or equivalent.

6.4 Stock Standard Solution (1000 mg carbon/L) – NIST Traceable purchased from Lab Chem Catalog #LC12910-1 or equivalent. Store refrigerated above the freezing point of water up to 6 ºC.

6.5 Working Standard Solutions (7) – Prepare 7 Working Standard Solutions according to the directions below in reagent water. Acidify with HCl to pH < 2 and store above the freezing point of water up to 6 ºC for up to one month.

- Solution 1 (100 mg/L) – 50 mL Stock Standard Solution in 500-mL volumetric flask.
- Solution 2 (10 mg/L) – 50 mL Working Standard Solution 1 in 500-mL volumetric flask.
- Solution 3 (5 mg/L) – 25 mL Working Standard Solution 1 in 500-mL volumetric flask.

- Solution 4 (1 mg/L) – 5 mL Working Standard Solution 1 in 500-mL volumetric flask.
- Solution 5 (0.5 mg/L) – 2.5 mL Working Standard Solution 1 in 500-mL volumetric flask.

6.6 Second Source Stock Standard Solution (1000 mg/L) – NIST Traceable purchased from Lab Chem catalog #LC12910-1. NOTE: must be a separate lot number from section 6.4.

6.6.1 Second Source Check Standard #1 (100 mg/L) - Pipet 50 mL of Second Source Stock Standard Solution into a 500-mL volumetric flask and acidify with HCl to pH < 2. Dilute to volume with reagent water. Store refrigerated above the freezing point of water up to 6 ºC for up to one month.

6.6.2 Second Source Check Standard #2 (1 mg/L) - Pipet 5 mL of Second Source Check Standard #1 (6.8.1) into a 500-mL volumetric flask and acidify with HCl to pH < 2. Dilute to volume with reagent water. Store refrigerated above the freezing point of water up to 6 ºC for up to one month.

6.6.3 Second Source QC Sample (5 mg/L) – Pipet 25 mL of Second Source Check Standard #1 (6.8.1) into a 500-mL volumetric flask and acidify with HCl to pH < 2. Dilute to volume with reagent water. Store refrigerated above the freezing point of water up to 6 ºC for up to one month.

6.6.4 Second Source QC Sample (8 mg/L) – Pipet 40 mL of Second Source Check Standard #1 (6.8.1) into a 500-mL volumetric flask and acidify with HCl to pH < 2. Dilute to volume with reagent water. Store refrigerated above the freezing point of water up to 6 ºC for up to one month.

6.7 Carrier Gas - Purified oxygen or air, CO_2 free and containing less than 1 ppm hydrocarbon (as methane). All gases are purchased from Airgas or equivalent. The oxygen used is UHP oxygen. A standard 220 cubic foot cylinder will provide continuous operation for approximately fifty days of manual operation, based on eight-hour daily usage. Consistent pressure of 30 psig is necessary for proper operation.

7 Instrument Calibration

7.1 Calibrate the instrument once per month, after instrument catalyst changeout or as necessary. The instrument is capable of generating a 4-point calibration curve. The r value must be 0.995 or greater for each curve. The calibration curve is validated with a Second Source 1.0 QC Standard that must be within +/- 15% of the true value.

7.2 Calibration curve- Place the following standards in the appropriate hole positions on the carousel autosampler:

7.3.1 10 mg/L (Working Standard Solution 2)

7.3.2 5 mg/L (Working Standard Solution 3)

7.3.3 1 mg/L (Working Standard Solution 4)

7.3.4 0.5 mg/L (Working Standard Solution 5)

7.3 Calibration for Total Inorganic Carbon – TIC is typically determined by calculation (see section 11.5).

8 Quality Control

8.1 All policies and procedures in the most current revision of the ALS-Middletown QA Manual shall be followed when performing this procedure.

8.2 Method Detection Limit (MDL)

8.2.1 For this method, the MDL study must be conducted and evaluated annually according to SOP 99-MDL.

8.2.2 Analyze seven (7) replicates of the MDL standard according to the sample preparation and analysis procedure. The spiking level can be adjusted to achieve optimal results. The MDL (for each analyte) shall be calculated from the collected results.

8.2.3 The analytical department shall provide the MDL study to the QA Department. The detection limit for a specific sample may differ from those listed due to the nature of interferences in a particular sample matrix.

8.3 Demonstration of Capability (DOC)

8.3.1 Each analyst shall complete a successful Initial Demonstration of Capability (IDOC) before working independently to conduct this method. Each qualified analyst shall perform an annual DOC for ongoing proficiency as specified in the QA Manual, Technical Training.

8.3.2 Analyze four replicates of the 1 mg/L Working Standard Solution (6.6.2) according to the sample preparation and analysis procedure. Calculate the recovery and the relative standard deviation (RSD) for each analyte.

8.3.3 Acceptance Criteria:

Accuracy: All four results shall be within ± 15% of the true value.
Precision: RSD shall be <15% for all analytes.

If this acceptance criteria is met, performance is judged acceptable and sample analysis may begin. If the results do not meet these requirements, the DOC shall be repeated before independent analysis of samples begins. If for recertification, this process is repeated until the DOCs are completed successfully.

8.4 Quality Control Requirements:
(Specific project requirements may override these requirements.)

Parameter	Concentration	Frequency	Control Limits	Corrective Action
Method Blank	---	Beginning of the run, every 10 samples, and at the end of the run	<0.5 mg/L DoD samples: <1/2 the LOQ	If the method blank concentration is greater than or equal to the reporting limit AND is greater than $^{1}/_{10}$ the sample concentration, the source of contamination must be investigated and measures taken to minimize or eliminate the problem and affected samples reanalyzed. If reanalysis is not possible, data shall be reported with a qualifying statement.
Second Source Check Standard	1.0 mg/L	After each applicable calibration curve	± 15% of true value.	Rerun. If it fails again, recalibrate and rerun.
Check Standard	0.5 mg/L	When reporting DEP samples, After each applicable calibration curve	± 20% of true value.	Rerun. If it fails again, recalibrate and rerun.
Second Source QC Sample	5.0 mg/L or 8.0 mg/L	Every ten samples (or 10 quadruplicates). Alternate between 5.0 mg/L and 8.0 mg/L standards.	± 10% of true value.	If fails, reanalyze all samples run since last acceptable QC Sample. DoD: Recalibrate, and reanalyze all affected samples since the last acceptable SS QC Sample OR Immediately analyze two additional consecutive SS QC Samples. If both pass, samples may be reported without re-analysis. If either fails, take corrective action and re-calibrate; then re-analyze all affected samples since the last acceptable SS QC Sample.

Parameter	Concentration	Frequency	Control Limits	Corrective Action
Matrix Spike	6.0 mg/L	Every ten samples (or 10 quadruplicates), minimum 1 per batch.	± 15% of true value.	Rerun. If fails again, report with a comment indicating matrix interference. If the LCS is acceptable and the specific matrix interference is identified, report with a qualifying statement. If the specific matrix interference is unknown, reanalyze the sample and matrix spike to determine matrix effect or analytical error.
Matrix Spike Duplicate	6.0 mg/L	Every ten samples (or 10 quadruplicates), minimum 1 per batch.	RPD ≤ 15%	Rerun. If fails again, report with a comment.
Filtered Blank	---	Every 20 DOC samples, minimum 1 per DOC batch.	<0.5 mg/L	Rerun. If fails again, refilter. Also refilter all samples in the batch with acceptable filter.

8.5 Samples selected for MS and MSD analysis shall be rotated among client samples so that various matrix problems may be noted and/or addressed. Poor performance in a duplicate or spike may indicate a problem with the sample composition and shall be reported to the client whose sample produced the poor recovery.

8.6 To prepare a MS/MSD, pipet 300 µL of the Stock Standard Solution (6.4) into a 50-mL volumetric flask containing the sample to be spiked, shake well. This is the sample to be analyzed as the spike.

8.6.1 To prepare a Total Carbon MS/MSD, pipet 300 µL of the Total Carbon Standard (6.2.1.) into a50-mL volumetric flask containing the sample. Shake well. This is the sample to be analyzed as the spike.

8.7 DoD accreditation requires the quarterly verification of the LOD and a LOQ.

9 Sample Collection, Preservation and Handling

9.1 Refer to SOP 20-Field Services Sampling Plan for sampling information.

9.2 Sampling and storage of samples in amber glass bottles is preferred. All bottles for TOC analysis shall be preserved to a pH <2 with HCl. The minimum sample required shall be two 40 mL vials filled to zero headspace. Do not preserve samples submitted for total carbon, inorganic carbon, or dissolved carbon determination.

9.3 Because of possibility of decomposition of some components of aqueous samples, the lapse of time between collection and analysis shall be kept to a minimum. Samples shall be kept refrigerated above the freezing point of water up to 6 °C and protected from sunlight and atmospheric conditions. Analyze preserved samples within 28 days. Unpreserved samples submitted for total carbon and inorganic carbon shall be analyzed within 7 days.

10 Procedure

10.1 Start-up and calibration of the Elementar Vario TOC Cube.

10.1.1 Turn on the power switch located on the right side of the analyzer.

10.1.2 Activate the Vario TOC software by clicking the icon on the computer desktop. After communication is established between the software and the instrument, wait until the furnace reaches set temperature of 850º C and the IR detector reaches stabilization. This is indicated when the “IR” icon stops flashing on the desktop.

10.1.3 Confirm the oxygen carrier gas is set at 1100 to 1200 mbar on the software desktop. Adjust if necessary at the valve on top of the oxygen cylinder. Since peak area varies inversely to carrier gas flow rate, do not change the flow rate during measurement.

10.1.4 After initialization and the calibration standards have been placed on the autosampler carousel, click MATH on the top toolbar followed by COEFFICIENTS. Pick an old curve from the list on the left side of the window. Rename the curve in the lower left box with the current date followed by an underscore and the word “CAL”. Example: 022613_CAL. Type the required run-in, liquid blanks, standard names, qc checks, and initial calibration blank onto the software run sheet. Click the green “START ANALYSIS” button on the top toolbar and calibration will proceed automatically.

10.1.5 After calibration is completed, Click MATH followed by CALIBRATE. Click the NEXT button and then click NPOC and “OK”. Print the calibration curve. Click MATH and then click STATISTICS. Print the statistics page for the calibration run. Click the open new file button followed by MATH and then COEFFICIENTS. Select the DEFAULT curve in the box on the left of the window. Click NPOC and then click the COPY button. Select the calibration curve with the current date in the left window that was set up earlier.Click paste and then “OK”. The calibration curve is now designated for the current date.

10.1.6 For specific start –up and calibration procedures please see the Vario TOC Cube operating instructions available on the computer desktop.

10.2 Measurement of samples

10.2.1 Place samples to be analyzed in the appropriate hole positions on the autosampler carousel. Type the run-in, liquid blanks, initial qc checks, initial calibration blanks, sample numbers, matrix spikes and continuing calibration verification standards and blanks onto the software run-sheet. Designate the required method from the drop-down menu in the middle column of the run sheet. Select the current applicable calibration curve from the drop-down menu on the right hand column. Click FILE and then SAVE AS. Designate the sample batch with the current date followed by an underscore and the word "RUN". Example: 022613_RUN. Click the green START ANALYSIS button and sample analysis will proceed automatically.

10.2.2 For specific analysis procedures please refer to the Vario TOC Cube operating instructions available on the computer desktop.

10.2.3 Each standard and sample is analyzed in triplicate or quadruplicate as required by client request. A replicate value can be rejected if mis-injection is obvious. A minimum of two injections must be usable and all usable injections must yield a relative standard deviation of less than 10%. If a deviation less than 10% cannot be obtained, the standard or sample must be rerun. The average of all acceptable injections is reported as the result.

10.2.4 All standards and samples are sparged with O_2 for 10 minutes prior to TOC Analysis.

10.2.5 All samples shall be diluted so that results fall within calibration range.

10.3 Total Carbon is determined using the same working standards that are utilized for Total Organic Carbon and following the steps listed in sections 10.1 and 10.2, except that all samples requiring Total Carbon analysis shall be submitted without HCl acid preservative and the samples shall not require sparging with oxygen during the analysis procedure.

10.4 Total Inorganic Carbon shall be determined, as necessary, by subtracting the TOC result from the TC result; see section 11.5.

10.5. To prepare dissolved samples, filter an un-acidified sample through a 0.45-µm glass microfiber syringe filter. Prepare filtered blanks at a frequency of one per 20 samples with a minimum of one per batch using reagent water. Acidify with HCl to a pH below 2 and keep refrigerated above the freezing point of water up to 6 ºC

11 Calculations

11.1 If a dilution was performed, the sample result and RL must be multiplied by the dilution factor.

11.2 LCS Recovery

$$\% R = \frac{C_m}{C_n} x\ 100$$

Where: C_m = measured concentration of LCS
C_n = spiking concentration

11.3 Spike Recovery

$$\% \text{ Recovery} = \frac{(C_s - C_u)}{C_n} x\ 100$$

Where: C_s = measured concentration of spiked sample aliquot
C_u = measured concentration of unspiked sample aliquot
C_n = spiking concentration

11.4 Precision (RPD)

$$\% RPD = \frac{|(R_1 - R_2)|}{(R_1 + R_2) \div 2} x\ 100$$

Where: R_1 = sample or spike result
R_2 = duplicate or spike duplicate result

11.5 Total Inorganic Carbon

Total Inorganic Carbon = Total Carbon – Total Organic Carbon

12 Reporting Results

12.1 All raw data used for reporting results must be initialed and dated by the qualified laboratory personnel performing first and second review.

12.2 When entering data into Horizon LIMS, do not round off results: Horizon will automatically perform rounding appropriate to the method. Horizon LIMS results are reported to three significant figures but limited to the number of decimal places in the reporting limit for the individual compound or analyte.

12.3 Report the actual result, even if it is less than the reporting limit. Any sample with a result less than the reporting limit is reported as ND (non-detectable); LIMS will automatically report the appropriate detection limit.

13 Waste Disposal

13.1 Refer to SOP 19 – Waste Disposal

14 Pollution Prevention

14.1 Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operations. Management shall consider pollution prevention a high priority. Extended storage of unused chemicals increases the risk of accidents. The laboratory shall consider smaller quantity purchases which will result in fewer unused chemicals being stored and reduce the potential for exposure by employees. ALS-MIDDLETOWN tracks chemicals when received by recording their receipt in a traceable logbook. Each chemical is then labeled according to required procedures and stored in assigned locations for proper laboratory use.

15 Definitions

15.1 Refer to ALS-MIDDLETOWN QA Manual for general definitions.

16 Maintenance and Troubleshooting

16.1 Refer to maintenance logs and instrument manuals for guidance regarding general maintenance and troubleshooting specific problems related to instrumentation used in this method.

Appendix A

Run Log

Document: 020215_CAL (varioTOC) from: --.--.-- (modified)

analytic functional testing
varioTOC cube
serial number: 38133026

Statistic report

No. Name	NPOC [mg/l]	TC [mg/l]
1 RUN IN 1	0.660	~~0.000~~
2 RUN IN 1	0.434	~~0.000~~
3 RUN IN 1	0.360	~~0.000~~
4 RUN IN 1	0.230	~~0.000~~
Mean value	0.421	0.000
Deviation, abs.	0.180	-1.#IO
Deviation, rel. [%]	42.849	0.000
5 RUN IN 2	0.362	~~0.000~~
6 RUN IN 2	0.337	~~0.000~~
7 RUN IN 2	0.319	~~0.000~~
8 RUN IN 2	0.269	~~0.000~~
Mean value	0.322	0.000
Deviation, abs.	0.039	-1.#IO
Deviation, rel. [%]	12.171	0.000
9 RUN IN 3	0.244	~~0.000~~
10 RUN IN 3	0.136	~~0.000~~
11 RUN IN 3	0.172	~~0.000~~
12 RUN IN 3	0.176	~~0.000~~
Mean value	0.182	0.000
Deviation, abs.	0.045	-1.#IO
Deviation, rel. [%]	24.768	0.000
13 RUN IN 4	0.239	~~0.000~~
14 RUN IN 4	0.088	~~0.000~~
15 RUN IN 4	0.093	~~0.000~~
16 RUN IN 4	0.093	~~0.000~~
Mean value	0.128	0.000
Deviation, abs.	0.074	-1.#IO
Deviation, rel. [%]	57.554	0.000
17 RUN IN 5	0.216	~~0.000~~
18 RUN IN 5	0.116	~~0.000~~

Name: eassuperuser, Access: varioTOC superuser 2/2/2015 2:41:51 PM

vario TOC V3.0.7 (987e28c)2013-07-11, Liquid Mode, Ser. No.: 38133026
Elementar Analysensysteme GmbH

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Summary of Changes

Revision 14

Section Number	Section	Description of Change
Spelling, grammar, and formatting changes may have been made throughout SOP for clarity, correctness, and conformity.		
5	Apparatus and Materials	Added 'or equivalent' in places
5.6	Apparatus and Materials	Changed jars to 40 mL vials
5.8.2	Apparatus and Materials	Updated LIMS version
6.5	Reagents & Standards	Changed Solution 2 to Solution 1
7.1	Instrument Calibration	Added validation with Second Source
8.4	Quality Control	Added DoD requirement
8.7	Quality Control	Added DoD LOD LOQ verification requirement
9.2	Sample Coll, Pres, Hand	Added minimum sample amount requirement; added dissolved organic carbon
10.1.3	Procedure	Changed gas setting
10.1.3	Procedure	Clarified injection evaluation, RSD requirement and reporting procedure
	Appendix A	Removed General Conditions, Added Run Log

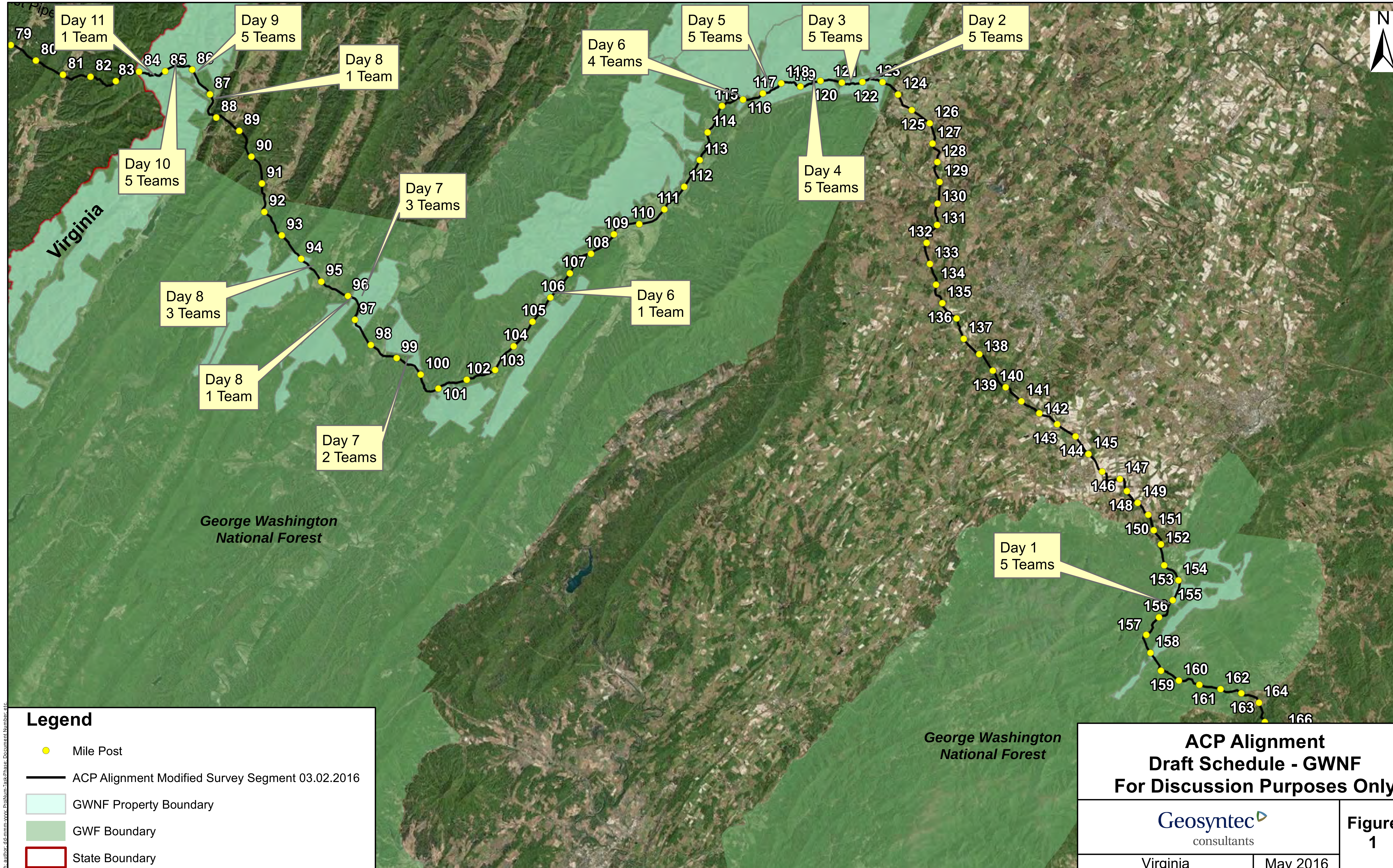
Concurrence Form

I acknowledge that I have read, undersood, and I concur with the standard operating procedure (SOP) listed below.

Employee Name	
SOP	04-vs
Revision	7
E-mail	
Date Concurred	

Submit

Attachment 4
Figures



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Mile Post
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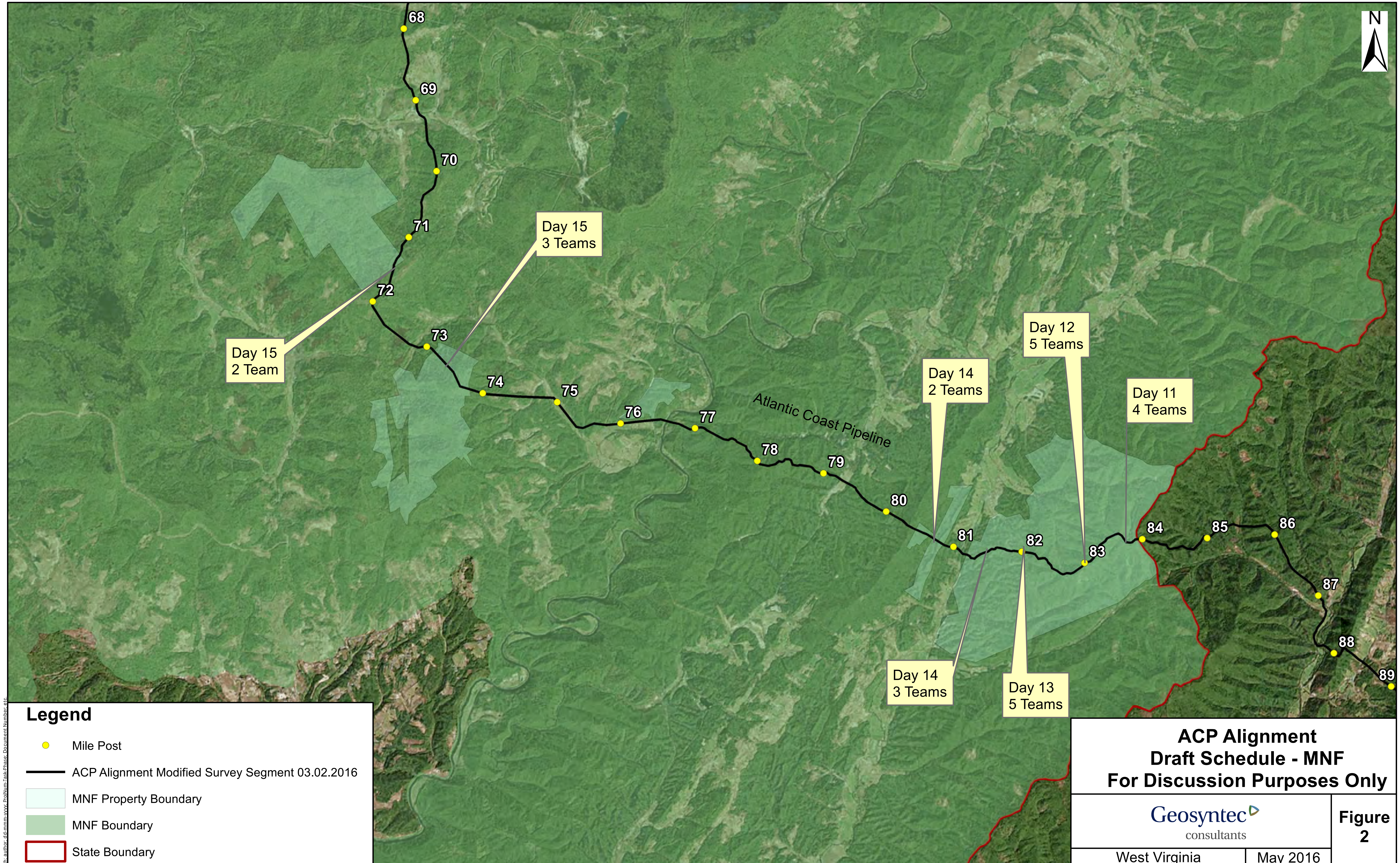
May 2016



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3 Teams
Day 13
5 Teams
Legend
Mile Post
ACP Alignment Modified Survey Segment 03.02.2016
MNF Property Boundary
MNF Boundary
State Boundary
ACP Alignment
Draft Schedule - MNF
For Discussion Purposes Only
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