

Contaminant of Concern	Concentrations	D. Brophy 41-21 Sample #1 Line Leak 01-13-16	D. Brophy 41-21 Sample #2 Line Leak 01-13-16	D. Brophy 41-21 Background 01-13-16
Organic Compounds in Soil				
Inorganics in Soils				
Electrical Conductivity (EC)	<4 mmhos/cm or 2x background	9.12	0.33	0.32
Sodium Adsorption Ratio (SAR)	<12 _s	110	0.2	0.2
pH	6-9	8.3	7.7	7.8

SOIL ANALYSIS REPORT



CLIENT:
18250
AUGUSTUS ENERGY RESOURCES
LLC
36695 HWY 385
PO BOX 250
WRAY, CO 80758

1816 E. Wyatt Earp
PO Box 1397
Dodge City, KS 67801
800.557.7509
620.227.7123
Fax 620.227.2047

LAB NO: 53132 - 53134
INVOICE NO: 207223
DATE RECEIVED: 01/18/2016
DATE REPORTED: 01/22/2016

SOIL ANALYSIS RESULTS FOR:

FIELD IDENTIFICATION: D BROPHY 41-21

METHOD USED:			1:1 Water-Soil		1:1 Water-Soil						Ammonium Acetate			Ammonium Acetate							
Lab Number	Sample ID	Sample Depth	Soil pH	Buffer pH	Sol. Salts mmho/cm	Excess Lime	% Organic Matter			Phosphorus ppm P	Potassium ppm K			Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na	Zinc ppm Zn	Iron ppm Fe	Manganese ppm Mn	Copper ppm Cu	Boron ppm B
53132	1	0 - 6	8.9		1.97	No					85			272	42	1324					
53133	2	0 - 6	8.1		0.07	No					94			1128	30	6					
53134	BACKGROUND	0 - 6	8.2		0.10	Lo					120			2884	61	9					

METHOD USED:

Sat. Paste

Lab Number	Sample ID	Sample Depth	Saturation % Sat	Soil pH	Electrical Conductivity mmho/cm	Potassium mg/L K	Sulfur mg/L S	Calcium mg/L Ca	Magnesium mg/L Mg	Sodium mg/L Na	Carbonate mg/L CO ₃	Bicarbonate mg/L HCO ₃	Chloride mg/L Cl	Boron mg/L B	Sodium Adsorption Ratio	Cation:Anion					
53132	1	0 - 6	28	8.3	9.12	20	9	19	6.3	2160	<10	290	2310	7.56	110	95.9 / 72.5					
53133	2	0 - 6	28	7.7	0.33	18	2	65	3.1	6	<10	180	8	0.11	0.2	4.2 / 3.3					
53134	BACKGROUND	0 - 6	31	7.8	0.32	12	1	62	3.6	6	<10	220	8	0.08	0.2	4.0 / 3.9					

FERTILIZER RECOMMENDATIONS:

POUNDS ACTUAL NUTRIENT PER ACRE

Lab Number	Sample ID	Crop To Be Grown	Yield Goal	Lime, ECC Tons/A to raise pH to:			N	P ₂ O ₅	K ₂ O	Zn	S	Mn	Cu	MgO	B	Ca	Cl
				6.0	6.5	7.0											
53132	1																
53133	2																
53134	BACKGROUND																

Cation Exchange Capacity

CEC	%H	%K	%Ca	%Mg	%Na
8	0	3	18	5	75
6	0	4	92	4	0
15	0	2	94	3	0

SPECIAL COMMENTS AND SUGGESTIONS:

Lab Number(s): 53132

WARNING: Soil sodium (% Na) is very high. Typical symptoms of a sodic soil are surface crusting, soil sealing, and poor water penetration. Additional soil analysis can determine the proper rate of gypsum or other soil amendment. If irrigated, water analysis can help identify the sodium source. Contact the laboratory for more information.

Lab Number(s): 53132, 53133, 53134

Servi-Tech Laboratory fertilizer recommendations were not requested.

Analyses are representative of the samples submitted

Samples are retained 30 days after report of analysis

Explanations of soil analysis terms are available upon request

Reviewed and
Approved By:

Steve Harrold
Laboratory Manager

Page 1 of 1
01/22/2016 5:02 pm




Servi-Tech Laboratories

1816 E. Wyatt Earp • PO Box 1397 • Dodge City, KS 67801
www.servitechlabs.com

Phone: 620.227.7123

800.557.7509

Fax: 620.227.2047

Lab No.: 53132		SOIL ANALYSIS RESULTS		Date Reported: 01/22/2016	
Send To: 18250		AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758		 Steve Harrold Laboratory Manager	
Results For: Sample Identification: 1 Sample Depth: 0-6"		Invoice No.: 207223 Date Received: 01/18/2016 Field ID D BROPHY 41-21			

Exchangable:					
	<u>ppm</u>	<u>%</u>			
Calcium, Ca	272	18	Cation Exchange Capacity, CEC meq/100g		8
Magnesium, Mg	42	5	Soil pH - 1:1		8.9
Potassium, K	85	3	Soil pH - Saturated Paste		8.3
Sodium, Na	1324	75	Soluble Salts, mmho/cm		1.97
Excess Lime Rating		NO	Exchangable Sodium Percent, ESP		75

Extractable (from saturated paste, based on 28% water saturation):

	mg/L	meq/L
Calcium (Ca)	19	0.9
Magnesium (Mg)	6.3	0.5
Sodium (Na)	2160	93.9
Chloride (Cl)	2310	65.2
Sulfur (S)	9	0.6
Boron (B)	7.56	
Potassium (K)	20	0.5
Bicarbonate (HCO ₃)	290	4.8
Carbonate (CO ₃)	<10	<0.3

Sodium Adsorption Ratio (SAR)	110
Electrical Conductivity (ECe), mmho/cm	9.12
Cation:Anion	95.9 / 72.5

Calculated Gypsum Recommendation (from ESP and CEC)		
Soil Texture	Gypsum Rec. T/A	
COARSE (sands, loamy sands, sandy loams)	10.1	To 10.5
MEDIUM (loams, silt loams, clay loams)	11.0	To 11.4
FINE (silty clay, clay loams, clays)	11.5	To 11.9

This soil is considered: SALINE/SODIC

GYPSUM SUGGESTIONS: If soil has good internal drainage, full gypsum rate can be used to reclaim the affected area, but keep applications below 2 to 3 tons in a single year. Reclamation may not be feasible if a high water table is present, but applying 1/2 to 1 ton of gypsum every one to two years may help prevent crusting and surface "sealing".




Servi-Tech Laboratories

1816 E. Wyatt Earp • PO Box 1397 • Dodge City, KS 67801
www.servitechlabs.com

Phone: 620.227.7123

800.557.7509

Fax: 620.227.2047

Lab No.: 53132		SOIL ANALYSIS RESULTS		Date Reported: 01/22/2016	
Send To: 18250		AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758		 Steve Harrold Laboratory Manager	
Results For:		Invoice No.: 207223		Date Received: 01/18/2016	
Sample Identification: 1		Date Received: 01/18/2016		Field ID D BROPHY 41-21	
Sample Depth: 0-6"		Field ID D BROPHY 41-21			
SOIL PERMEABILITY HAZARD (based on ESP and SAR):					
Soil texture		Potential hazard			
-----		-----			
COARSE (sands, loamy sands, sandy loams)		CAUTION			
MEDIUM (loams, silt loams, clay loams)		HIGH			
FINE (silty clay loams, clays)		HIGH			
SOIL SALINITY: Saline soils can be managed by choosing tolerant crops, keeping the seedbed moist until crop establishment, and/or irrigating with relatively good quality irrigation water. Good internal soil drainage is needed to reclaim saline areas, so lowering water tables may be necessary. Test soil (and water) annually to monitor changes in salinity levels.					
SOIL SALINITY HAZARD (based on extractable salts, ECe):					
Crop type		Potential hazard			
-----		-----			
SALT SENSITIVE (onions, carrots, many ornamentals, many fruit crops, etc.)		HIGH			
MODERATELY SENSITIVE (seedling alfalfa, corn, soybeans, many vegetables, etc.)		HIGH			
MODERATELY TOLERANT (wheat, wheatgrass, sudangrass,					
sorghum, fescue, oats, brome grass, etc.)		HIGH			
SALT TOLERANT (barley, bermudagrass, sugarbeets, cotton, etc.)		CAUTION			
CHLORIDE: Excess soil chloride may cause toxicity symptoms in sensitive plants. Toxicity should be verified by plant tissue analysis. High chloride soils can be managed by choosing tolerant crops, keeping the seed bed moist until crop establishment, and/or by irrigating with relatively good quality irrigation water.					
EXTRACTABLE CHLORIDE HAZARD (based on soil extractable chloride, Cl):					
HIGH for chloride sensitive crops (includes berries, fruit trees, grapes, citrus, etc.)					
HIGH for moderately tolerant crops (includes alfalfa, beans, rice, sorghum, etc.)					
HIGH for chloride tolerant crops (includes wheat, flax, tomato, cotton, barley, corn, beets, etc.)					
BORON: Excess soil boron may cause toxicity symptoms in sensitive plants. Toxicity should be verified by plant tissue analysis. If toxicity is a problem, choose boron tolerant crops and/or irrigate with relatively good quality irrigation water.					



Fax: 620.227.2047



Servi-Tech Laboratories


1816 E. Wyatt Earp • PO Box 1397 • Dodge City, KS 67801

www.servitechlabs.com

Phone: 620.227.7123

800.557.7509

Fax: 620.227.2047

Lab No.: 53133		SOIL ANALYSIS RESULTS		Date Reported: 01/22/2016	
Send To: 18250		AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758		 Steve Harrold Laboratory Manager	
Results For:		Invoice No.: 207223		Date Received: 01/18/2016	
Sample Identification: 2		Date Received: 01/18/2016		Field ID: D BROPHY 41-21	
Sample Depth: 0-6"					
Exchangable:					
	ppm	%			
Calcium, Ca	1128	92	Cation Exchange Capacity, CEC meq/100g		6
Magnesium, Mg	30	4	Soil pH - 1:1		8.1
Potassium, K	94	4	Soil pH - Saturated Paste		7.7
Sodium, Na	6	0	Soluble Salts, mmho/cm		0.07
Excess Lime Rating		NO	Exchangable Sodium Percent, ESP		0
Extractable (from saturated paste, based on 28% water saturation):					
	mg/L		meq/L		
Calcium (Ca)	65		3.2		
Magnesium (Mg)	3.1		0.3		
Sodium (Na)	6		0.3		
Chloride (Cl)	8		0.2		
Sulfur (S)	2		0.1		
Boron (B)	0.11				
Potassium (K)	18		0.5		
Bicarbonate (HCO ₃)	180		2.9		
Carbonate (CO ₃)	<10		<0.3		
Sodium Adsorption Ratio (SAR) 0.2					
Electrical Conductivity (ECe), mmho/cm 0.33					
Cation:Anion 4.2 / 3.3					
Calculated Gypsum Recommendation (from ESP and CEC)					
Soil Texture			Gypsum Rec. T/A		
COARSE	(sands, loamy sands, sandy loams)		0.0	To	0.0
MEDIUM	(loams, silt loams, clay loams)		0.0	To	0.0
FINE	(silty clay, clay loams, clays)		0.0	To	0.0
This soil is considered: NON-SALINE/NON-SODIC					
SOIL PERMEABILITY HAZARD (based on ESP and SAR):					
Soil texture		Potential hazard			
COARSE (sands, loamy sands, sandy loams)		LOW			
MEDIUM (loams, silt loams, clay loams)		LOW			
FINE (silty clay loams, clays)		LOW			




Servi-Tech Laboratories

1816 E. Wyatt Earp • PO Box 1397 • Dodge City, KS 67801
www.servitechlabs.com

Phone: 620.227.7123

800.557.7509

Fax: 620.227.2047

Lab No.: 53133		SOIL ANALYSIS RESULTS		Date Reported: 01/22/2016											
Send To: 18250		AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758		 Steve Harrold Laboratory Manager											
Results For:		Invoice No.: 207223		Date Received: 01/18/2016											
Sample Identification: 2		Date Received: 01/18/2016		Field ID: D BROPHY 41-21											
Sample Depth: 0-6"		Field ID: D BROPHY 41-21													
SOIL SALINITY HAZARD (based on extractable salts, ECe):															
<table><thead><tr><th>Crop type</th><th>Potential hazard</th></tr></thead><tbody><tr><td>SALT SENSITIVE (onions, carrots, many ornamentals, many fruit crops, etc.)</td><td>LOW</td></tr><tr><td>MODERATELY SENSITIVE (seedling alfalfa, corn, soybeans, many vegetables, etc.)</td><td>LOW</td></tr><tr><td>MODERATELY TOLERANT (wheat, wheatgrass, sudangrass, sorghum, fescue, oats, brome grass, etc.)</td><td>LOW</td></tr><tr><td>SALT TOLERANT (barley, bermudagrass, sugarbeets, cotton, etc.)</td><td>LOW</td></tr></tbody></table>						Crop type	Potential hazard	SALT SENSITIVE (onions, carrots, many ornamentals, many fruit crops, etc.)	LOW	MODERATELY SENSITIVE (seedling alfalfa, corn, soybeans, many vegetables, etc.)	LOW	MODERATELY TOLERANT (wheat, wheatgrass, sudangrass, sorghum, fescue, oats, brome grass, etc.)	LOW	SALT TOLERANT (barley, bermudagrass, sugarbeets, cotton, etc.)	LOW
Crop type	Potential hazard														
SALT SENSITIVE (onions, carrots, many ornamentals, many fruit crops, etc.)	LOW														
MODERATELY SENSITIVE (seedling alfalfa, corn, soybeans, many vegetables, etc.)	LOW														
MODERATELY TOLERANT (wheat, wheatgrass, sudangrass, sorghum, fescue, oats, brome grass, etc.)	LOW														
SALT TOLERANT (barley, bermudagrass, sugarbeets, cotton, etc.)	LOW														
EXTRACTABLE CHLORIDE HAZARD (based on soil extractable chloride, Cl):															
LOW for chloride sensitive crops (includes berries, fruit trees, grapes, citrus, etc.)															
LOW for moderately tolerant crops (includes alfalfa, beans, rice, sorghum, etc.)															
LOW for chloride tolerant crops (includes wheat, flax, tomato, cotton, barley, corn, beets, etc.)															
EXTRACTABLE BORON HAZARD (based on soil extractable boron, B):															
<table><thead><tr><th>Crop type</th><th>Potential hazard</th></tr></thead><tbody><tr><td>BORON SENSITIVE (such as sunflower, barley, onions, citrus, fruit trees, grapes, etc.)</td><td>LOW</td></tr><tr><td>MODERATELY SENSITIVE (such as potatoes, peppers, peas, radishes, etc.)</td><td>LOW</td></tr><tr><td>MODERATELY TOLERANT (such as wheat, corn, oats, clover, lettuce, turnips, celery, etc.)</td><td>LOW</td></tr><tr><td>BORON TOLERANT (such as alfalfa, beets, cotton, grain sorghum, tomatoes, vetch, etc.)</td><td>LOW</td></tr></tbody></table>						Crop type	Potential hazard	BORON SENSITIVE (such as sunflower, barley, onions, citrus, fruit trees, grapes, etc.)	LOW	MODERATELY SENSITIVE (such as potatoes, peppers, peas, radishes, etc.)	LOW	MODERATELY TOLERANT (such as wheat, corn, oats, clover, lettuce, turnips, celery, etc.)	LOW	BORON TOLERANT (such as alfalfa, beets, cotton, grain sorghum, tomatoes, vetch, etc.)	LOW
Crop type	Potential hazard														
BORON SENSITIVE (such as sunflower, barley, onions, citrus, fruit trees, grapes, etc.)	LOW														
MODERATELY SENSITIVE (such as potatoes, peppers, peas, radishes, etc.)	LOW														
MODERATELY TOLERANT (such as wheat, corn, oats, clover, lettuce, turnips, celery, etc.)	LOW														
BORON TOLERANT (such as alfalfa, beets, cotton, grain sorghum, tomatoes, vetch, etc.)	LOW														




Servi-Tech Laboratories

1816 E. Wyatt Earp • PO Box 1397 • Dodge City, KS 67801
www.servitechlabs.com

Phone: 620.227.7123

800.557.7509

Fax: 620.227.2047

Lab No.: 53134		SOIL ANALYSIS RESULTS		Date Reported: 01/22/2016	
Send To: 18250		AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758		 Steve Harrold Laboratory Manager	
Results For: Sample Identification: BACKGROUND Sample Depth: 0-6"		Invoice No.: 207223 Date Received: 01/18/2016 Field ID D BROPHY 41-21			

Exchangable:					
	<u>ppm</u>	<u>%</u>			
Calcium, Ca	2884	94	Cation Exchange Capacity, CEC meq/100g		15
Magnesium, Mg	61	3	Soil pH - 1:1		8.2
Potassium, K	120	2	Soil pH - Saturated Paste		7.8
Sodium, Na	9	0	Soluble Salts, mmho/cm		0.10
Excess Lime Rating		LOW	Exchangable Sodium Percent, ESP		0

Extractable (from saturated paste, based on 31% water saturation):					
	<u>mg/L</u>	<u>meq/L</u>			
Calcium (Ca)	62	3.1			
Magnesium (Mg)	3.6	0.3			
Sodium (Na)	6	0.3			
Chloride (Cl)	8	0.2			
Sulfur (S)	1	<0.1			
Boron (B)	0.08				
Potassium (K)	12	0.3			
Bicarbonate (HCO ₃)	220	3.6			
Carbonate (CO ₃)	<10	<0.3			

Sodium Adsorption Ratio (SAR)	0.2
Electrical Conductivity (ECe), mmho/cm	0.32
Cation:Anion	4.0 / 3.9

Calculated Gypsum Recommendation (from ESP and CEC)					
Soil Texture			Gypsum Rec. T/A		
COARSE	(sands, loamy sands, sandy loams)	0.0	To	0.0	
MEDIUM	(loams, silt loams, clay loams)	0.0	To	0.0	
FINE	(silty clay, clay loams, clays)	0.0	To	0.0	

This soil is considered: NON-SALINE/NON-SODIC	
---	--

SOIL PERMEABILITY HAZARD (based on ESP and SAR):	
Soil texture	Potential hazard

COARSE (sands, loamy sands, sandy loams)	LOW
MEDIUM (loams, silt loams, clay loams)	LOW
FINE (silty clay loams, clays)	LOW




Servi-Tech Laboratories

1816 E. Wyatt Earp • PO Box 1397 • Dodge City, KS 67801
www.servitechlabs.com

Phone: 620.227.7123

800.557.7509

Fax: 620.227.2047

Lab No.: 53134		SOIL ANALYSIS RESULTS		Date Reported: 01/22/2016	
Send To: 18250		AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758		 Steve Harrold Laboratory Manager	
Results For: Sample Identification: BACKGROUND Sample Depth: 0-6"		Invoice No.: 207223 Date Received: 01/18/2016 Field ID: D BROPHY 41-21			
SOIL SALINITY HAZARD (based on extractable salts, ECe):					
Crop type		Potential hazard			
SALT SENSITIVE (onions, carrots, many ornamentals, many fruit crops, etc.)		LOW			
MODERATELY SENSITIVE (seedling alfalfa, corn, soybeans, many vegetables, etc.)		LOW			
MODERATELY TOLERANT (wheat, wheatgrass, sudangrass, sorghum, fescue, oats, brome grass, etc.)		LOW			
SALT TOLERANT (barley, bermudagrass, sugarbeets, cotton, etc.)		LOW			
EXTRACTABLE CHLORIDE HAZARD (based on soil extractable chloride, Cl):					
LOW for chloride sensitive crops (includes berries, fruit trees, grapes, citrus, etc.)					
LOW for moderately tolerant crops (includes alfalfa, beans, rice, sorghum, etc.)					
LOW for chloride tolerant crops (includes wheat, flax, tomato, cotton, barley, corn, beets, etc.)					
EXTRACTABLE BORON HAZARD (based on soil extractable boron, B):					
Crop type		Potential hazard			
BORON SENSITIVE (such as sunflower, barley, onions, citrus, fruit trees, grapes, etc.)		LOW			
MODERATELY SENSITIVE (such as potatoes, peppers, peas, radishes, etc.)		LOW			
MODERATELY TOLERANT (such as wheat, corn, oats, clover, lettuce, turnips, celery, etc.)		LOW			
BORON TOLERANT (such as alfalfa, beets, cotton, grain sorghum, tomatoes, vetch, etc.)		LOW			