

Soil Technology Comparison

**Grid Sampling vs. Electrical Conductivity
vs. SoilOptix®**

By Dr. Viacheslav Adamchuk

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2015**



Ontario

Ministry of Agriculture,
Food and Rural Affairs

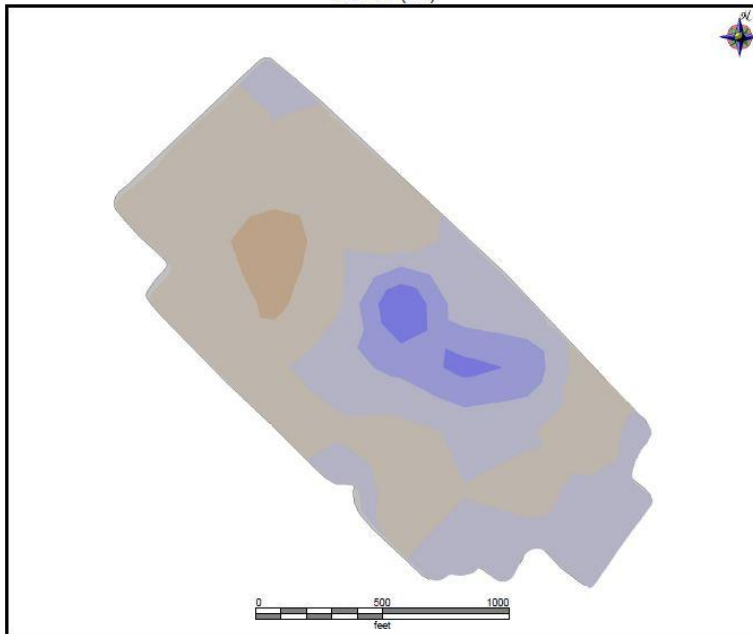
SOILOPTIX®
FIELD INTELLIGENCE



Technology Difference

	Grid Sampling	EC – Zone Sampling	SoilOptix®
Measuring	<ul style="list-style-type: none"> • Soil Nutrients 	<ul style="list-style-type: none"> • Electrical Conductivity 	<ul style="list-style-type: none"> • Gamma Radiation
Frequency	<ul style="list-style-type: none"> • Every crop cycle 	<ul style="list-style-type: none"> • Year 1 – EC survey • Zone sample after (yearly or every crop cycle) 	<ul style="list-style-type: none"> • Survey year one – good for 10 years • Soil sample every year or every crop cycle
Collection Process	<ul style="list-style-type: none"> • Industry standard – 1 sample per 2.5 acres 	<ul style="list-style-type: none"> • 40'-80' swath widths • Soil sample after zones have been determined 	<ul style="list-style-type: none"> • 40' swaths (narrower on special cases) • Soil sample done immediately after survey of the field complete • Sample locations derived from in-field radiation variability
Data Resolution	<ul style="list-style-type: none"> • Statistics fill in data between points 	<ul style="list-style-type: none"> • 1 sample per zone • 3 – 7 Zones per field 	<ul style="list-style-type: none"> • 1 sample per 8 acres surveyed • 335 data points per acre

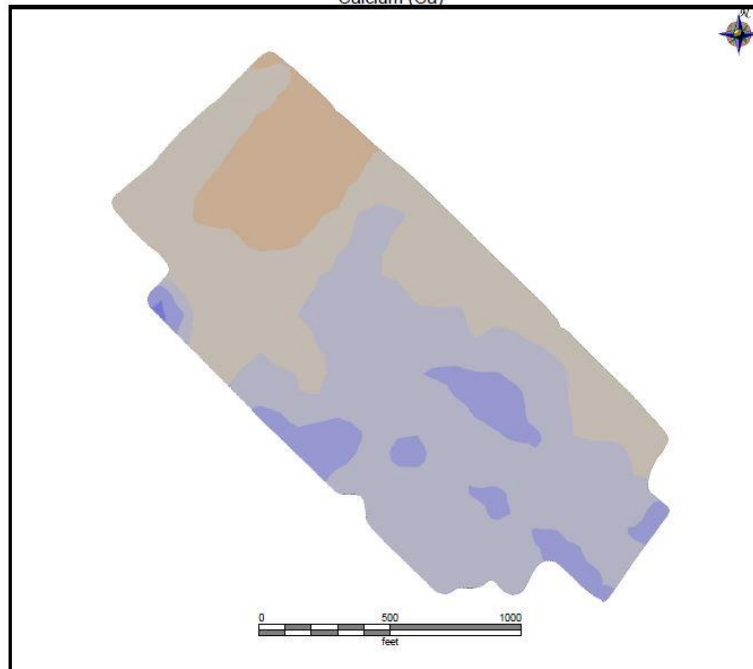
Zone Smart Calcium (Ca)



Client: SoilOptix	Above 2999.9 ppm	0.00 ac
Farm: Zone Smart	2750.0 - 2999.9 ppm	0.00 ac
Field: Zone Smart	2500.0 - 2749.9 ppm	0.00 ac
Name: One Acre Grid	2250.0 - 2499.9 ppm	1.07 ac
Min: 1236.0 ppm	2000.0 - 2249.9 ppm	4.46 ac
Max: 2995.0 ppm	1750.0 - 1999.9 ppm	17.11 ac
Avg: 1741.9 ppm	1500.0 - 1749.9 ppm	27.15 ac
	1250.0 - 1499.9 ppm	2.03 ac
	1000.0 - 1249.9 ppm	0.00 ac
	750.0 - 999.9 ppm	0.00 ac
	500.0 - 749.9 ppm	0.00 ac
	Below 500.0 ppm	0.00 ac



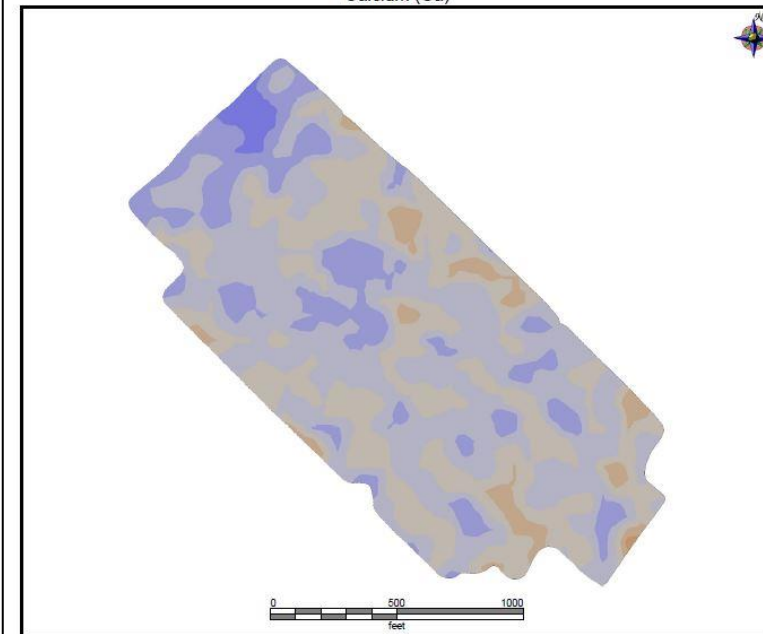
Zone Smart Calcium (Ca)



Client: SoilOptix	Above 2999.9 ppm	0.00 ac
Farm: Zone Smart	2750.0 - 2999.9 ppm	0.00 ac
Field: Zone Smart	2500.0 - 2749.9 ppm	0.00 ac
Name: Zone Smart - Veris	2250.0 - 2499.9 ppm	0.05 ac
Min: 1412.0 ppm	2000.0 - 2249.9 ppm	4.48 ac
Max: 2427.0 ppm	1750.0 - 1999.9 ppm	23.16 ac
Avg: 1752.2 ppm	1500.0 - 1749.9 ppm	17.91 ac
	1250.0 - 1499.9 ppm	6.20 ac
	1000.0 - 1249.9 ppm	0.00 ac
	750.0 - 999.9 ppm	0.00 ac
	500.0 - 749.9 ppm	0.00 ac
	Below 500.0 ppm	0.00 ac



Zone Smart Calcium (Ca)



Client: SoilOptix	Above 2999.9 ppm	0.00 ac
Farm: Zone Smart	2750.0 - 2999.9 ppm	0.00 ac
Field: Zone Smart	2500.0 - 2749.9 ppm	0.00 ac
Name: Combined Nutrients	2250.0 - 2499.9 ppm	0.83 ac
Min: 934.1 ppm	2000.0 - 2249.9 ppm	8.06 ac
Max: 2300.0 ppm	1750.0 - 1999.9 ppm	23.72 ac
Avg: 1815.3 ppm	1500.0 - 1749.9 ppm	16.98 ac
	1250.0 - 1499.9 ppm	2.18 ac
	1000.0 - 1249.9 ppm	0.04 ac
	750.0 - 999.9 ppm	0.00 ac
	500.0 - 749.9 ppm	0.00 ac
	Below 500.0 ppm	0.00 ac



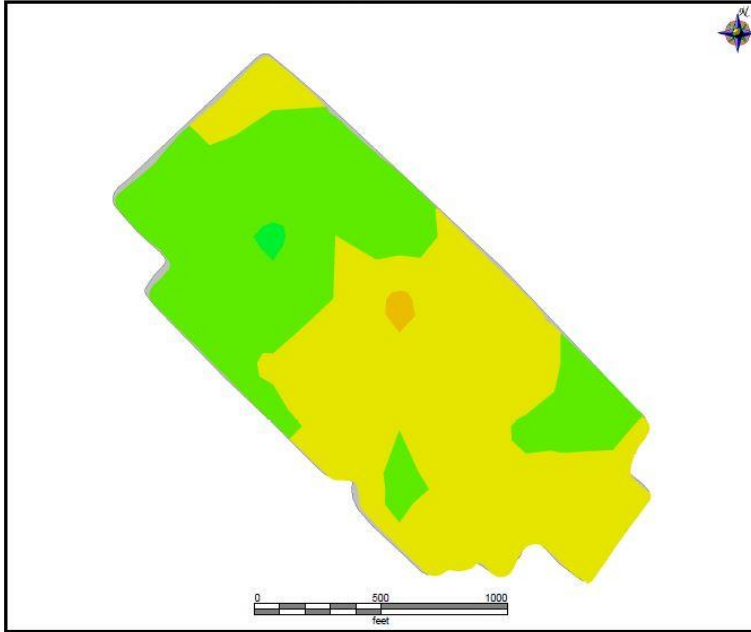
One Acre Grid

EC

SoilOptix®



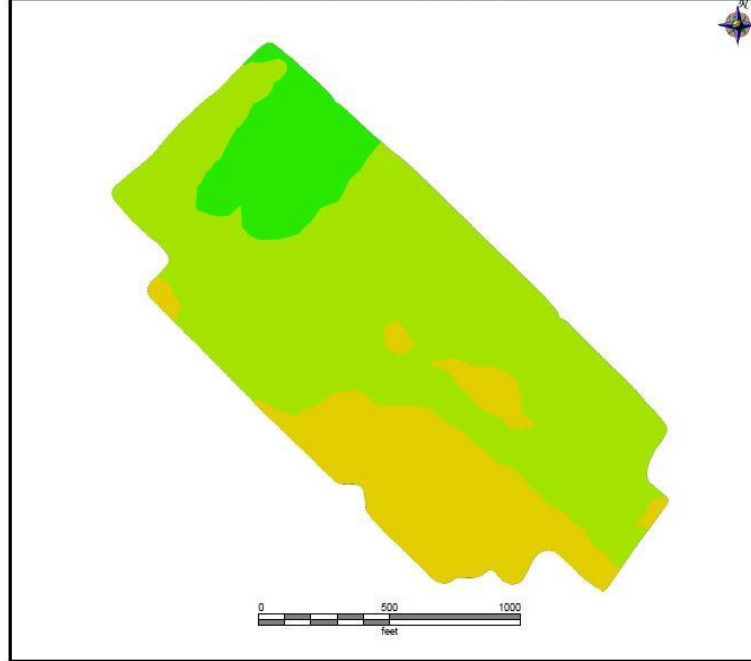
Zone Smart Cation Exchange Capacity (CEC)



Client: SoilOptix	Above 24.9 mEq/100g	0.00 ac
Farm: Zone Smart	22.5 - 24.9 mEq/100g	0.00 ac
Field: Zone Smart	20.0 - 22.4 mEq/100g	0.00 ac
Name: One Acre Grid	17.5 - 19.9 mEq/100g	0.00 ac
Min: 9.1 mEq/100g	15.0 - 17.4 mEq/100g	0.31 ac
Max: 17.6 mEq/100g	12.5 - 14.9 mEq/100g	29.21 ac
Avg: 12.6 mEq/100g	10.0 - 12.4 mEq/100g	22.02 ac
	7.5 - 9.9 mEq/100g	0.27 ac
	5.0 - 7.4 mEq/100g	0.00 ac
	2.5 - 4.9 mEq/100g	0.00 ac
	Below 2.5 mEq/100g	0.00 ac



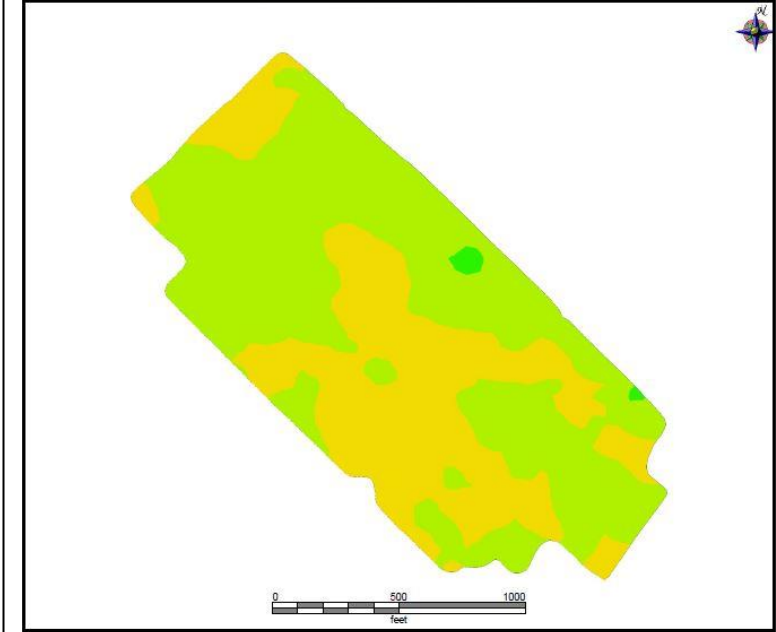
Zone Smart Cation Exchange Capacity (CEC)



Client: SoilOptix	Above 24.9 mEq/100g	0.00 ac
Farm: Zone Smart	22.5 - 24.9 mEq/100g	0.00 ac
Field: Zone Smart	20.0 - 22.4 mEq/100g	0.00 ac
Name: Zone Smart - Veris	17.5 - 19.9 mEq/100g	0.00 ac
Min: 8.9 mEq/100g	15.0 - 17.4 mEq/100g	0.00 ac
Max: 15.2 mEq/100g	12.5 - 14.9 mEq/100g	12.33 ac
Avg: 11.7 mEq/100g	10.0 - 12.4 mEq/100g	33.22 ac
	7.5 - 9.9 mEq/100g	6.26 ac
	5.0 - 7.4 mEq/100g	0.00 ac
	2.5 - 4.9 mEq/100g	0.00 ac
	0.0 - 2.4 mEq/100g	0.00 ac
	Below 0.0 mEq/100g	0.00 ac



Zone Smart Cation Exchange Capacity (CEC)



Client: SoilOptix	Above 24.9 mEq/100g	0.00 ac
Farm: Zone Smart	22.5 - 24.9 mEq/100g	0.00 ac
Field: Zone Smart	20.0 - 22.4 mEq/100g	0.00 ac
Name: Combined Nutrients	17.5 - 19.9 mEq/100g	0.00 ac
Min: 7.0 mEq/100g	15.0 - 17.4 mEq/100g	0.00 ac
Max: 15.2 mEq/100g	12.5 - 14.9 mEq/100g	20.13 ac
Avg: 12.2 mEq/100g	10.0 - 12.4 mEq/100g	31.37 ac
	7.5 - 9.9 mEq/100g	0.31 ac
	5.0 - 7.4 mEq/100g	0.00 ac
	2.5 - 4.9 mEq/100g	0.00 ac
	0.0 - 2.4 mEq/100g	0.00 ac
	Below 0.0 mEq/100g	0.00 ac



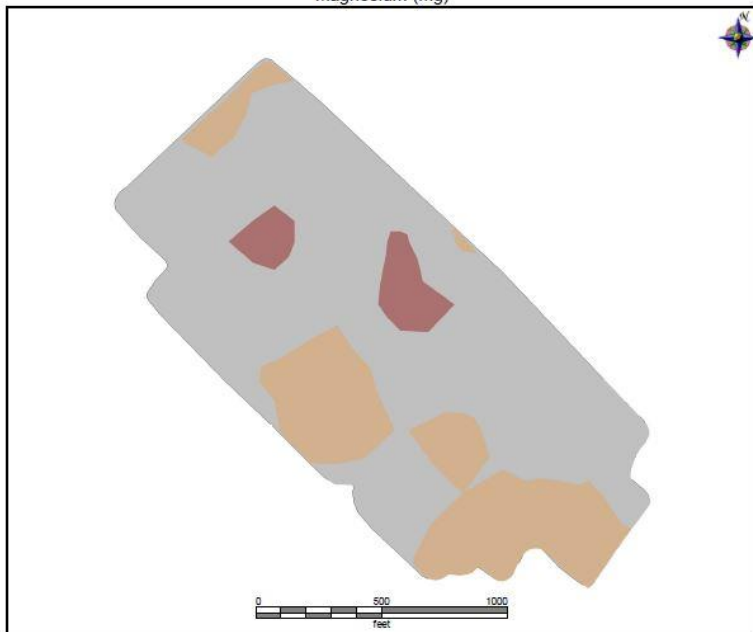
One Acre Grid

EC

SoilOptix®



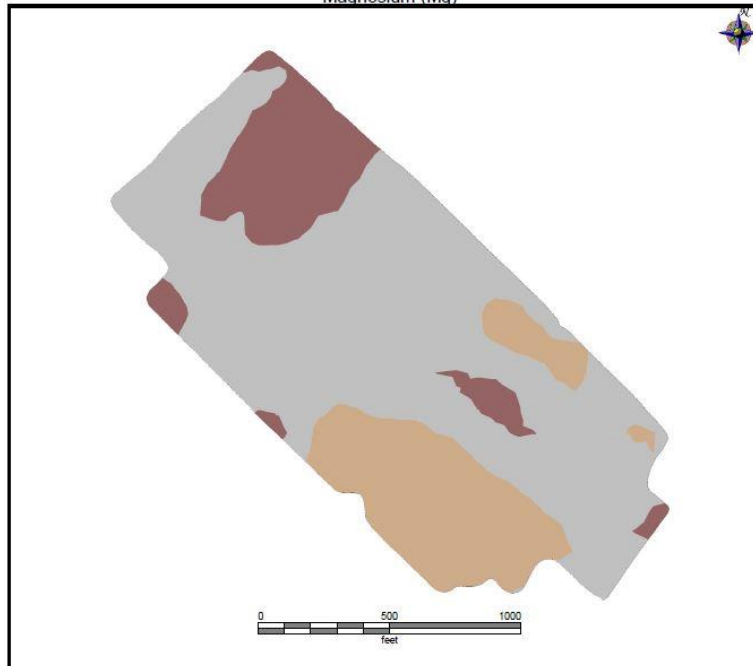
Zone Smart
Magnesium (Mg)



Client: SoilOptix	Above 499.9 ppm	0.00 ac
Farm: Zone Smart	400.0 - 499.9 ppm	0.00 ac
Field: Zone Smart	300.0 - 399.9 ppm	12.71 ac
Name: One Acre Grid	200.0 - 299.9 ppm	36.60 ac
Min: 123.0 ppm	100.0 - 199.9 ppm	2.49 ac
Max: 393.0 ppm	0.0 - 99.9 ppm	0.00 ac
Avg: 267.7 ppm	Below 0.0 ppm	0.00 ac



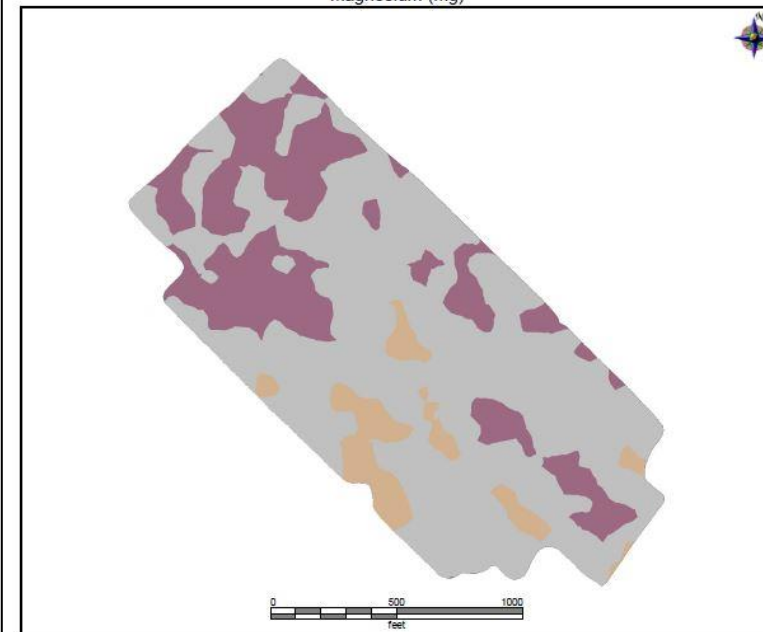
Zone Smart
Magnesium (Mg)



Client: SoilOptix	Above 499.9 ppm	0.00 ac
Farm: Zone Smart	400.0 - 499.9 ppm	0.00 ac
Field: Zone Smart	300.0 - 399.9 ppm	10.54 ac
Name: Zone Smart - Veris	200.0 - 299.9 ppm	33.68 ac
Min: 147.0 ppm	100.0 - 199.9 ppm	7.58 ac
Max: 376.0 ppm	0.0 - 99.9 ppm	0.00 ac
Avg: 260.5 ppm	Below 0.0 ppm	0.00 ac



Zone Smart
Magnesium (Mg)



Client: SoilOptix	Above 499.9 ppm	0.00 ac
Farm: Zone Smart	400.0 - 499.9 ppm	0.00 ac
Field: Zone Smart	300.0 - 399.9 ppm	3.70 ac
Name: Combined Nutrients	200.0 - 299.9 ppm	35.35 ac
Min: 157.8 ppm	100.0 - 199.9 ppm	12.75 ac
Max: 480.0 ppm	0.0 - 99.9 ppm	0.00 ac
Avg: 229.1 ppm	Below 0.0 ppm	0.00 ac



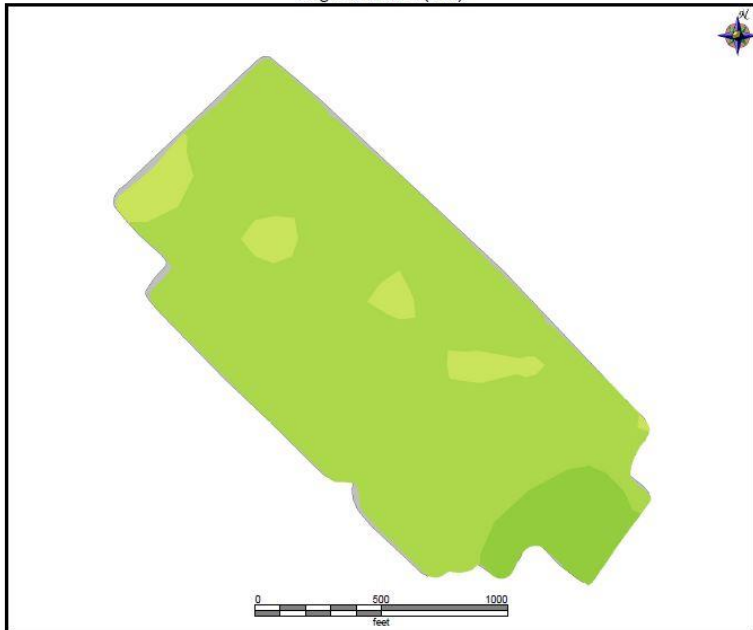
One Acre Grid

EC

SoilOptix®



Zone Smart Organic Matter (OM)

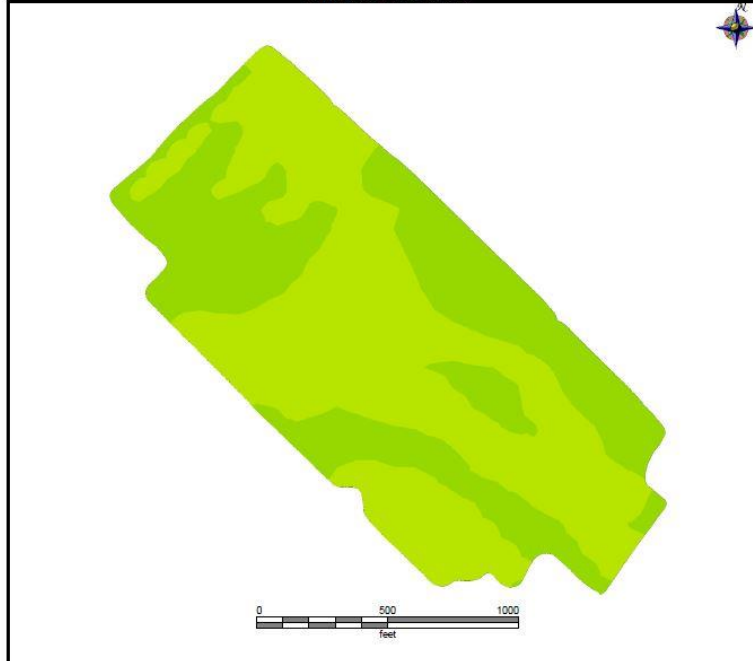


Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: One Acre Grid
Min: 1.9 %
Max: 4.6 %
Avg: 3.4 %

Above 9.9 %	0.00 ac
9.0 - 9.9 %	0.00 ac
8.0 - 8.9 %	0.00 ac
7.0 - 7.9 %	0.00 ac
6.0 - 6.9 %	0.00 ac
5.0 - 5.9 %	0.00 ac
4.0 - 4.9 %	4.03 ac
3.0 - 3.9 %	44.41 ac
2.0 - 2.9 %	3.36 ac
1.0 - 1.9 %	0.00 ac
Below 1.0 %	0.00 ac



Zone Smart Organic Matter (OM)

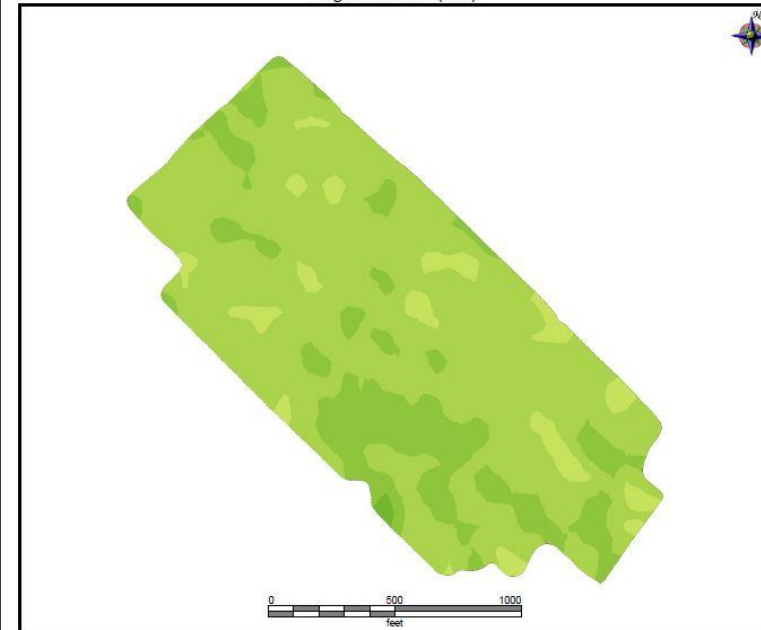


Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: Zone Smart - Veris
Min: 2.2 %
Max: 4.1 %
Avg: 3.0 %

Above 9.9 %	0.00 ac
9.0 - 9.9 %	0.00 ac
8.0 - 8.9 %	0.00 ac
7.0 - 7.9 %	0.00 ac
6.0 - 6.9 %	0.00 ac
5.0 - 5.9 %	0.00 ac
4.0 - 4.9 %	0.00 ac
3.0 - 3.9 %	21.92 ac
2.0 - 2.9 %	29.89 ac
1.0 - 1.9 %	0.00 ac
Below 1.0 %	0.00 ac



Zone Smart Organic Matter (OM)



Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: Combined Nutrients
Min: 2.2 %
Max: 5.6 %
Avg: 3.6 %

Above 9.9 %	0.00 ac
9.0 - 9.9 %	0.00 ac
8.0 - 8.9 %	0.00 ac
7.0 - 7.9 %	0.00 ac
6.0 - 6.9 %	0.00 ac
5.0 - 5.9 %	0.14 ac
4.0 - 4.9 %	9.90 ac
3.0 - 3.9 %	38.25 ac
2.0 - 2.9 %	3.52 ac
1.0 - 1.9 %	0.00 ac
Below 1.0 %	0.00 ac

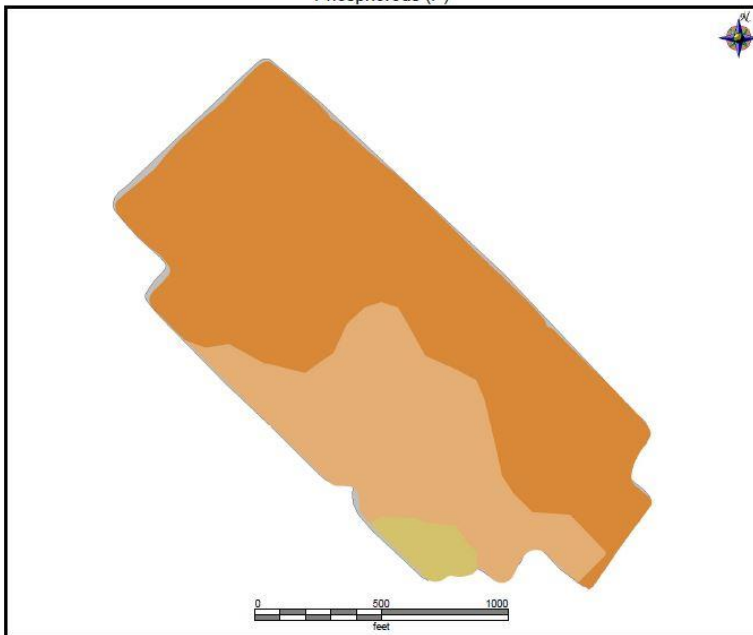


One Acre Grid

EC

SoilOptix®

Zone Smart Phosphorous (P)

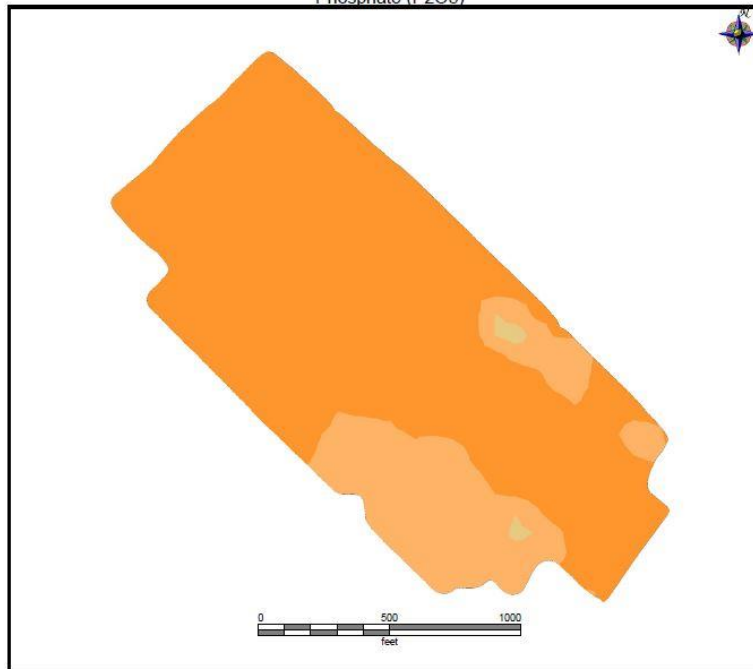


Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: One Acre Grid
Min: 15.0 ppm
Max: 70.0 ppm
Avg: 36.9 ppm

Above 99.9 ppm	0.00 ac
80.0 - 99.9 ppm	0.00 ac
60.0 - 79.9 ppm	1.51 ac
40.0 - 59.9 ppm	15.59 ac
20.0 - 39.9 ppm	34.70 ac
15.0 - 19.9 ppm	0.00 ac



Zone Smart Phosphate (P2O5)

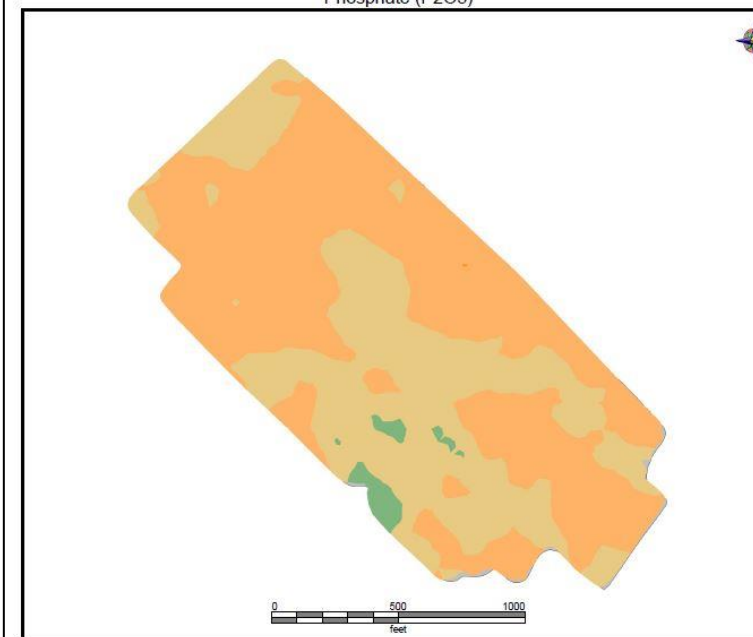


Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: Zone Smart - Veris
Min: 5.0 ppm
Max: 51.8 ppm
Avg: 13.1 ppm

Above 89.9 ppm	0.00 ac
75.0 - 89.9 ppm	0.00 ac
60.0 - 74.9 ppm	0.00 ac
45.0 - 59.9 ppm	0.00 ac
30.0 - 44.9 ppm	0.29 ac
15.0 - 29.9 ppm	10.59 ac
0.0 - 14.9 ppm	40.92 ac
Below 0.0 ppm	0.00 ac



Zone Smart Phosphate (P2O5)



Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: Combined Nutrients
Min: 14.0 ppm
Max: 57.6 ppm
Avg: 29.2 ppm

Above 89.9 ppm	0.00 ac
75.0 - 89.9 ppm	0.00 ac
60.0 - 74.9 ppm	0.00 ac
45.0 - 59.9 ppm	0.89 ac
30.0 - 44.9 ppm	20.62 ac
15.0 - 29.9 ppm	31.11 ac
0.0 - 14.9 ppm	0.00 ac
Below 0.0 ppm	0.00 ac



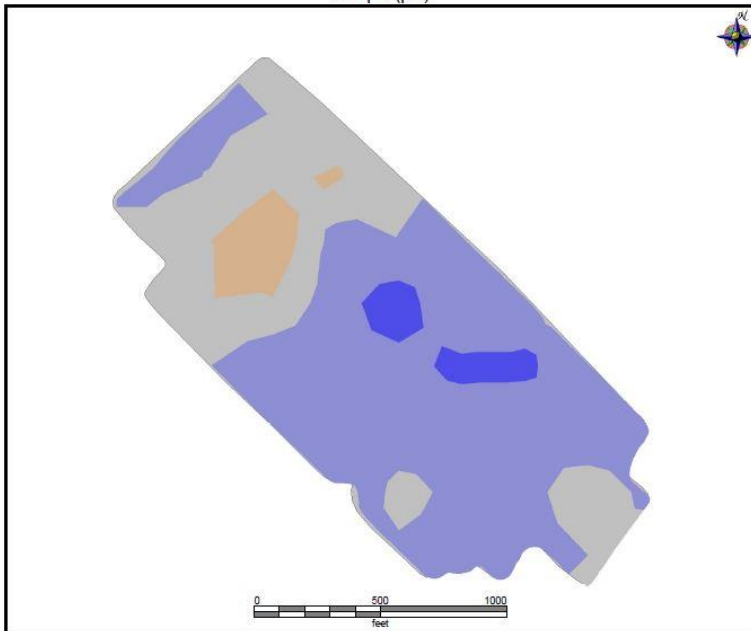
One Acre Grid

EC

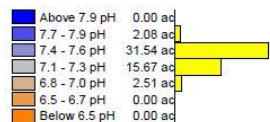
SoilOptix®



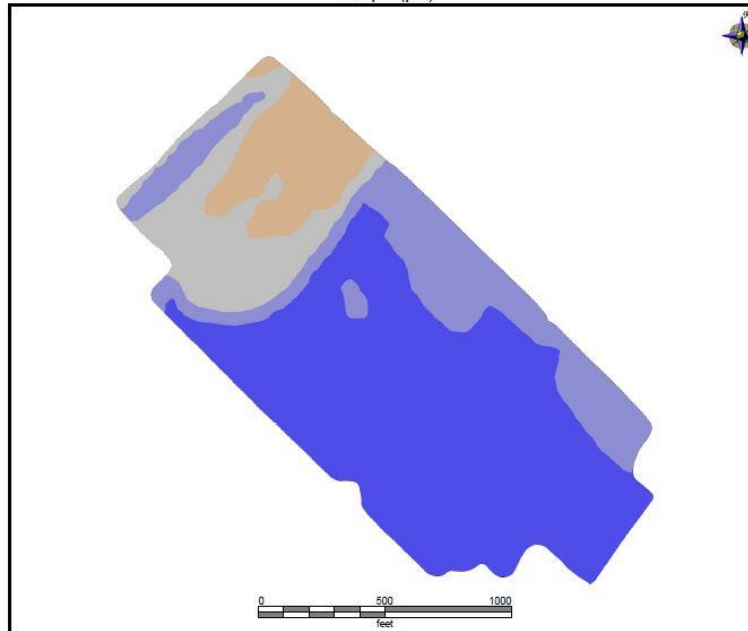
Zone Smart
Soil pH (pH)



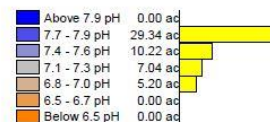
Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: One Acre Grid
Min: 6.5 pH
Max: 7.9 pH
Avg: 7.4 pH



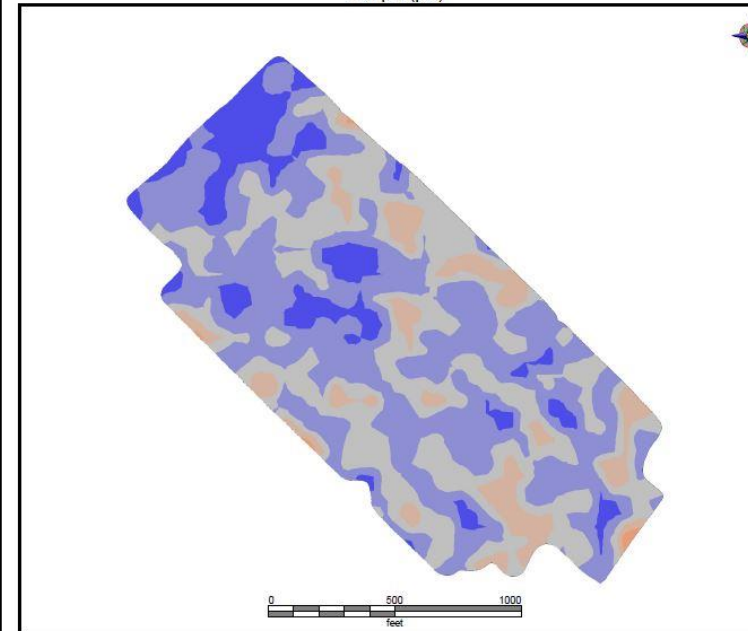
Zone Smart
Soil pH (pH)



Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: ZoneSmart_Veris
Min: 6.9 pH
Max: 7.9 pH
Avg: 7.6 pH



Zone Smart
Soil pH (pH)



Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: Combined Nutrients
Min: 6.5 pH
Max: 7.8 pH
Avg: 7.4 pH



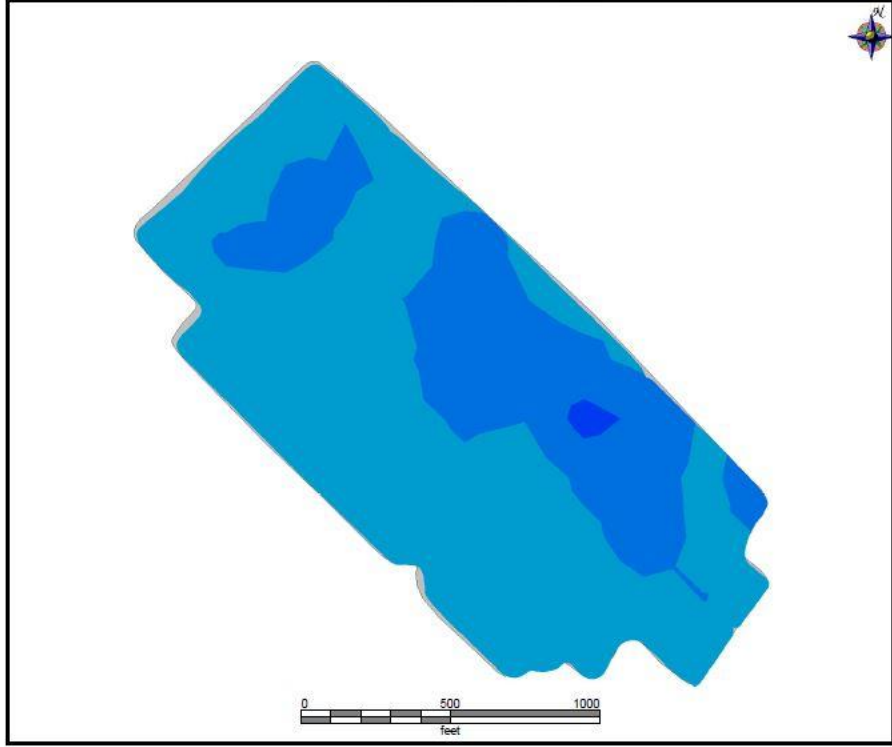
One Acre Grid

EC

SoilOptix®



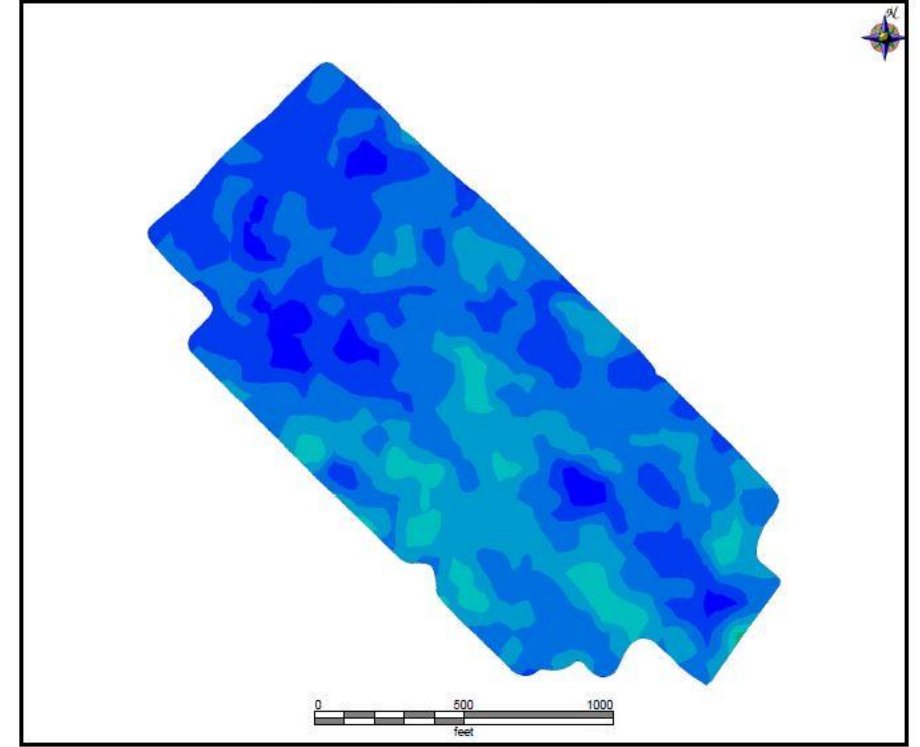
Zone Smart Calcium (Ca) Base Saturation



Client: SoilOptix	Above 89.9 %	0.00 ac
Farm: Zone Smart	80.0 - 89.9 %	0.32 ac
Field: Zone Smart	70.0 - 79.9 %	15.48 ac
Name: One Acre Grid	60.0 - 69.9 %	35.99 ac
Min: 63.0 %	50.0 - 59.9 %	0.00 ac
Max: 85.0 %	40.0 - 49.9 %	0.00 ac
Avg: 68.9 %	30.0 - 39.9 %	0.00 ac
	20.0 - 29.9 %	0.00 ac
	Below 20.0 %	0.00 ac



Zone Smart Calcium (Ca) Base Saturation



Client: SoilOptix	90.0 - 99.9 %	1.96 ac
Farm: Zone Smart	80.0 - 89.9 %	13.93 ac
Field: Zone Smart	70.0 - 79.9 %	21.25 ac
Name: Combined Nutrients	60.0 - 69.9 %	12.06 ac
Min: 37.1 %	50.0 - 59.9 %	2.58 ac
Max: 99.9 %	40.0 - 49.9 %	0.02 ac
Avg: 75.0 %	30.0 - 39.9 %	0.00 ac
	20.0 - 29.9 %	0.00 ac
	Below 20.0 %	0.00 ac

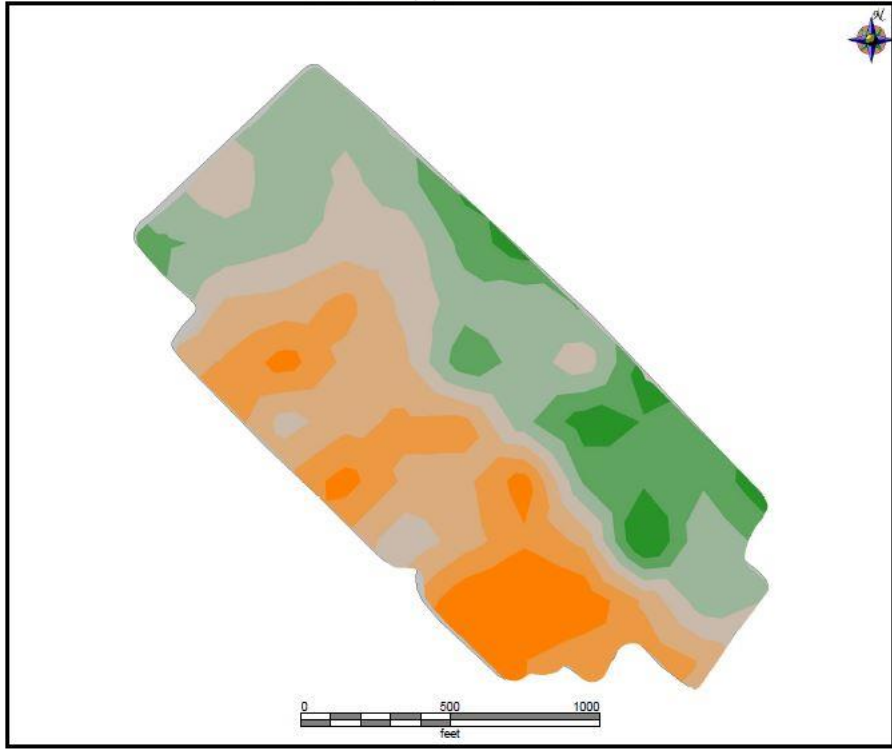


One Acre Grid

SoilOptix®



Zone Smart Potassium (K) Base Saturation



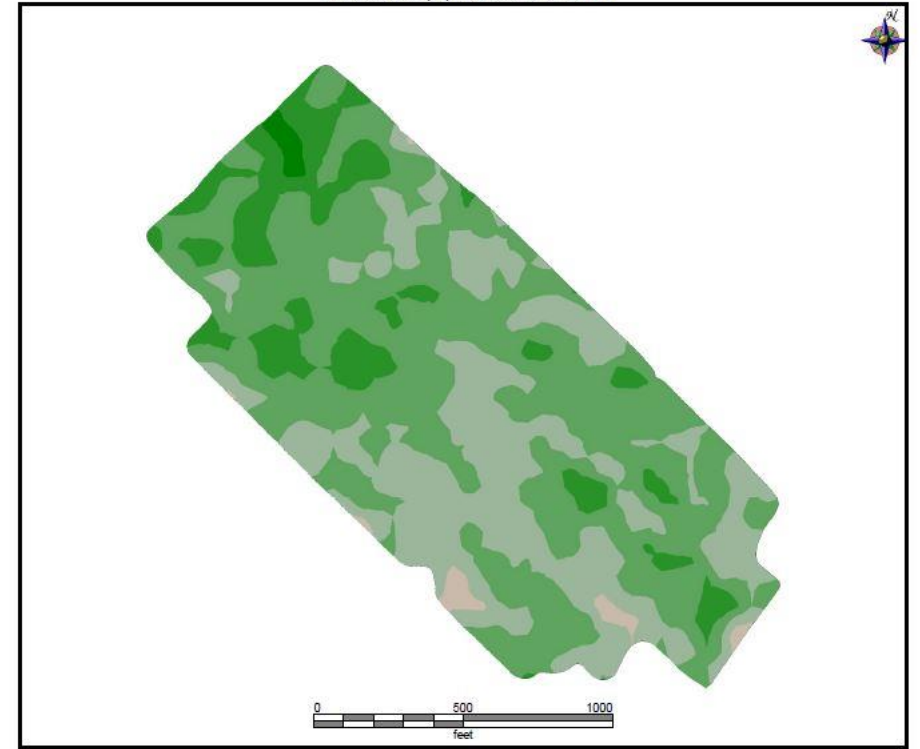
Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: One Acre Grid
Min: 1.6 %
Max: 6.2 %
Avg: 3.7 %

5.0 - 6.2 %	3.94 ac	
4.5 - 4.9 %	8.20 ac	
4.0 - 4.4 %	9.95 ac	
3.5 - 3.9 %	7.65 ac	
3.0 - 3.4 %	13.75 ac	
2.5 - 2.9 %	6.74 ac	
2.0 - 2.4 %	1.57 ac	
1.6 - 1.9 %	0.00 ac	



One Acre Grid

Zone Smart Potassium (K) Base Saturation



Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: Combined Nutrients
Min: 1.7 %
Max: 4.2 %
Avg: 2.9 %

Above 4.9 %	0.00 ac	
4.5 - 4.9 %	0.00 ac	
4.0 - 4.4 %	0.00 ac	
3.5 - 3.9 %	0.62 ac	
3.0 - 3.4 %	16.29 ac	
2.5 - 2.9 %	27.77 ac	
2.0 - 2.4 %	6.75 ac	
1.7 - 1.9 %	0.37 ac	



SoilOptix®



Zone Smart Magnesium (Mg) Base Saturation



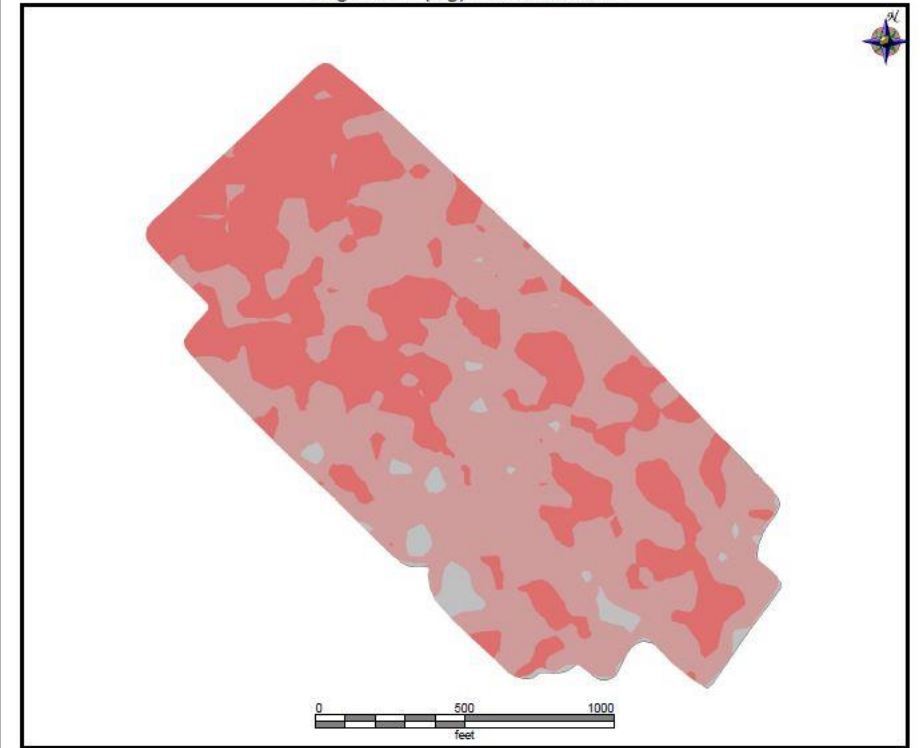
Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: One Acre Grid
Min: 6.0 %
Max: 24.0 %
Avg: 17.8 %

Above 39.9 %	0.00 ac
35.0 - 39.9 %	0.00 ac
30.0 - 34.9 %	0.00 ac
25.0 - 29.9 %	0.00 ac
20.0 - 24.9 %	6.75 ac
15.0 - 19.9 %	38.09 ac
10.0 - 14.9 %	6.56 ac
5.0 - 9.9 %	0.41 ac
Below 5.0 %	0.00 ac



One Acre Grid

Zone Smart Magnesium (Mg) Base Saturation



Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: Combined Nutrients
Min: 9.9 %
Max: 26.0 %
Avg: 15.7 %

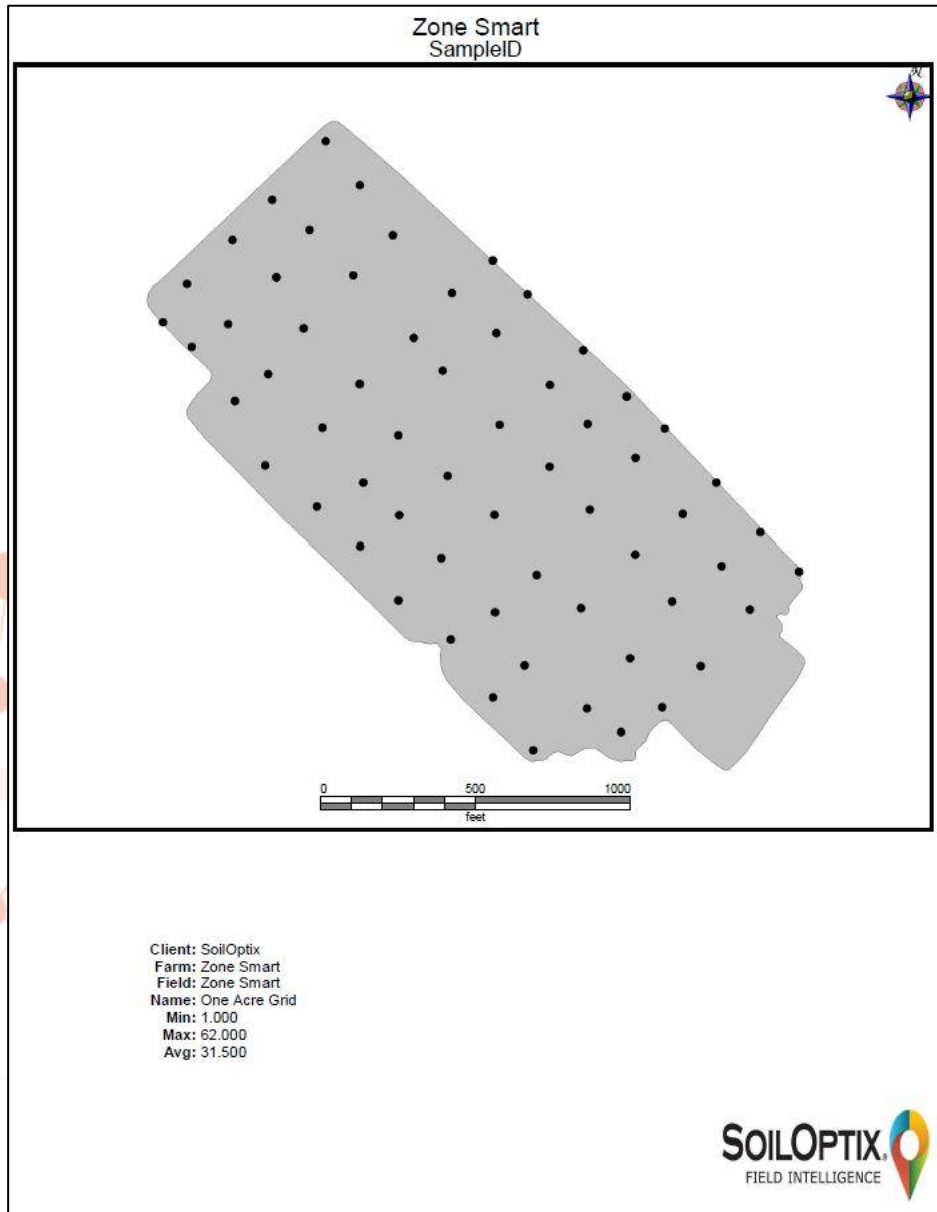
Above 39.9 %	0.00 ac
35.0 - 39.9 %	0.00 ac
30.0 - 34.9 %	0.00 ac
25.0 - 29.9 %	0.00 ac
20.0 - 24.9 %	1.31 ac
15.0 - 19.9 %	30.92 ac
10.0 - 14.9 %	20.49 ac
5.0 - 9.9 %	0.00 ac
Below 5.0 %	0.00 ac



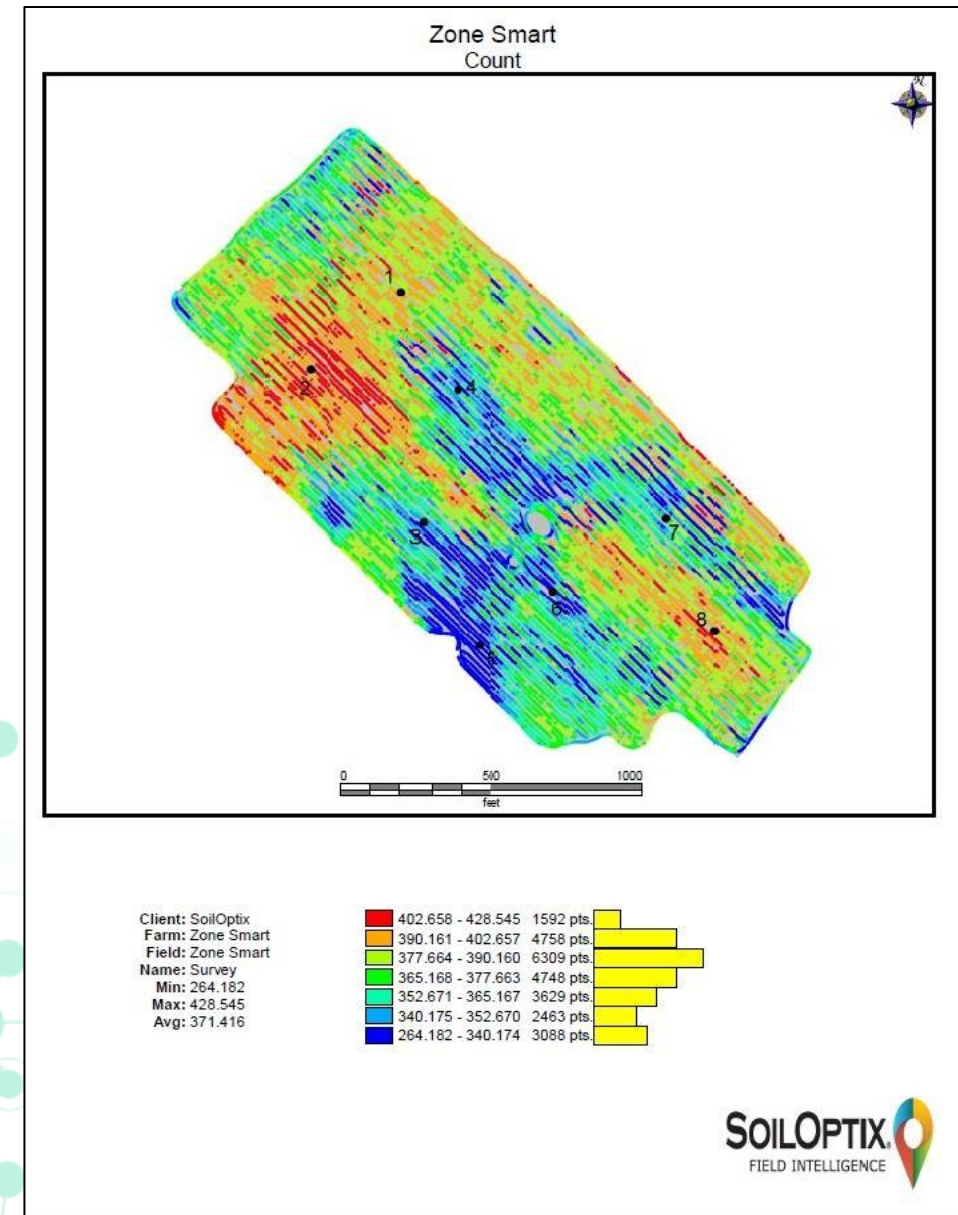
SoilOptix®



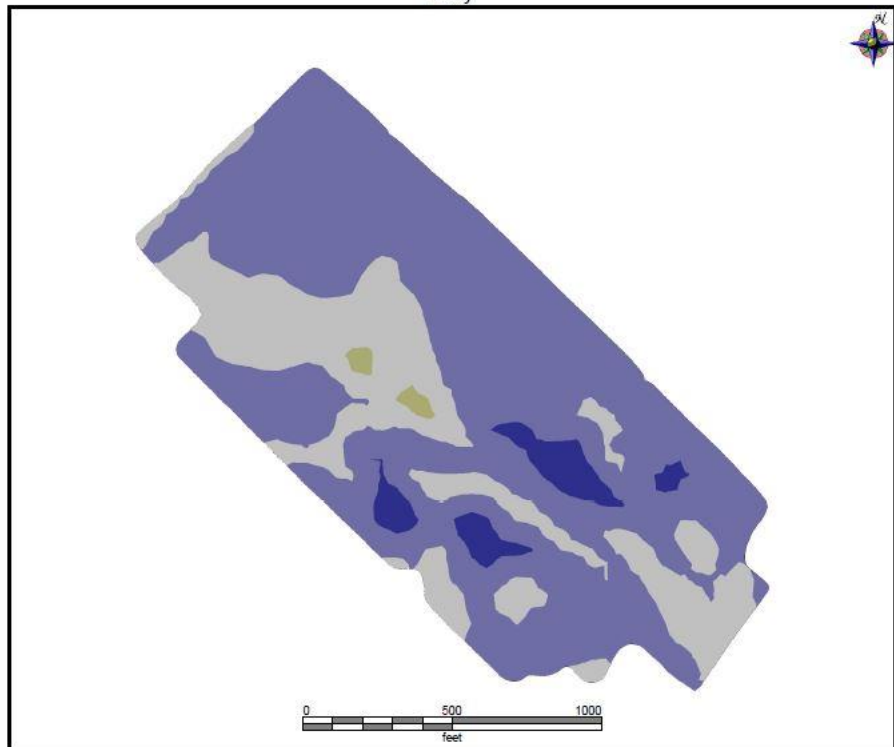
Survey Maps



One Acre Grid



Zone Smart Clay



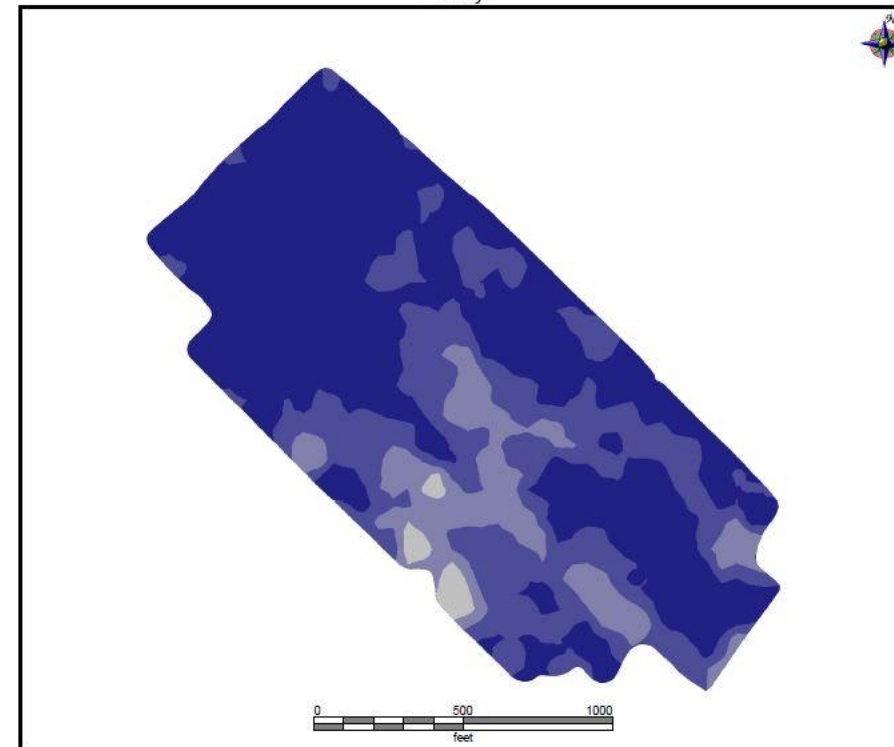
Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: ZoneSmart_Veris
Min: 7.00
Max: 19.00
Avg: 13.28

Above 19.99	0.00 ac
16.00 - 19.99	2.15 ac
12.00 - 15.99	36.10 ac
8.00 - 11.99	13.23 ac
4.00 - 7.99	0.32 ac
0.00 - 3.99	0.00 ac
Below 0.00	0.00 ac



EC

Zone Smart Clay



Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: Combined Texture
Min: 9.58 %
Max: 19.00 %
Avg: 17.03 %

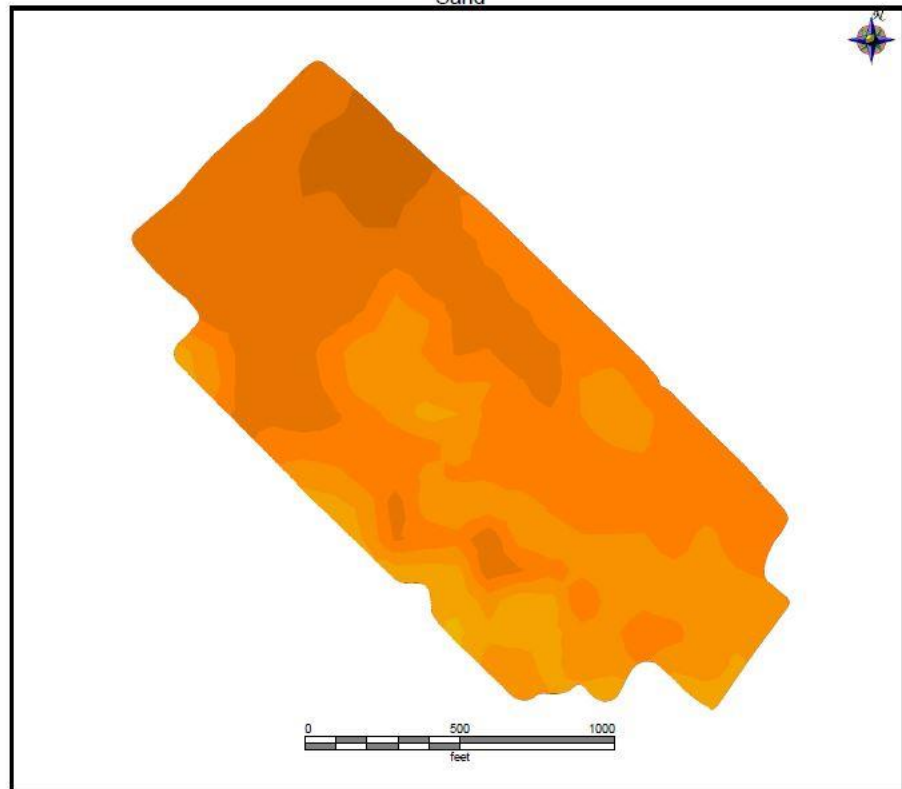
Above 18.99 %	0.00 ac
17.00 - 18.99 %	29.82 ac
15.00 - 16.99 %	15.44 ac
13.00 - 14.99 %	5.87 ac
11.00 - 12.99 %	0.68 ac
9.00 - 10.99 %	0.00 ac
7.00 - 8.99 %	0.00 ac
5.00 - 6.99 %	0.00 ac
Below 5.00 %	0.00 ac



SoilOptix®



Zone Smart Sand



Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: Zone Smart - Veris
Min: 37.00 %
Max: 62.00 %
Avg: 47.34 %

Above 74.99 %	0.00 ac
70.00 - 74.99 %	0.00 ac
65.00 - 69.99 %	0.00 ac
60.00 - 64.99 %	0.08 ac
55.00 - 59.99 %	3.16 ac
50.00 - 54.99 %	13.16 ac
45.00 - 49.99 %	17.17 ac
40.00 - 44.99 %	15.63 ac
35.00 - 39.99 %	2.59 ac
30.00 - 34.99 %	0.00 ac
25.00 - 29.99 %	0.00 ac
20.00 - 24.99 %	0.00 ac
Below 20.00 %	0.00 ac



EC

Zone Smart Sand



Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: Combined Texture
Min: 35.84 %
Max: 47.72 %
Avg: 41.16 %

Above 47.99 %	0.00 ac
45.00 - 47.99 %	0.56 ac
42.00 - 44.99 %	14.89 ac
39.00 - 41.99 %	31.29 ac
36.00 - 38.99 %	5.07 ac
33.00 - 35.99 %	0.00 ac
30.00 - 32.99 %	0.00 ac
Below 30.00 %	0.00 ac

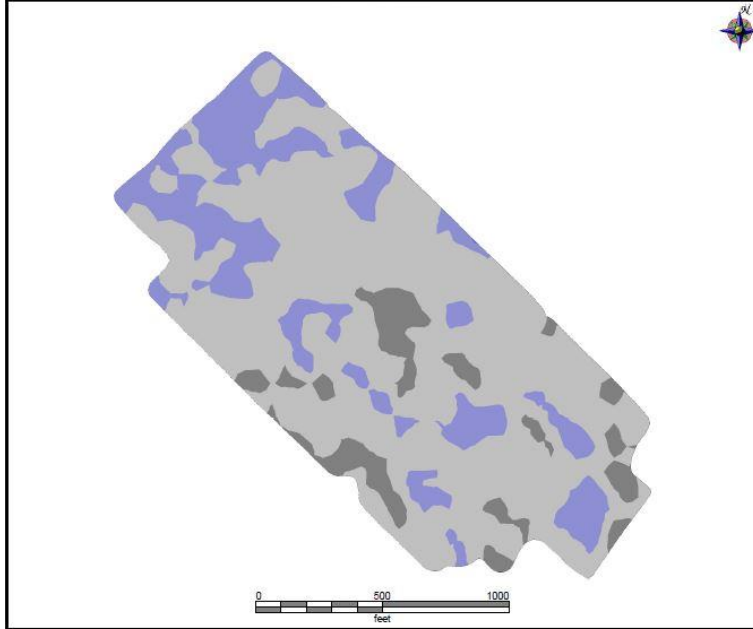


SoilOptix®

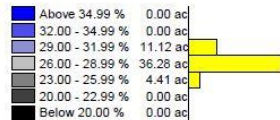


Additional SoilOptix® Layers

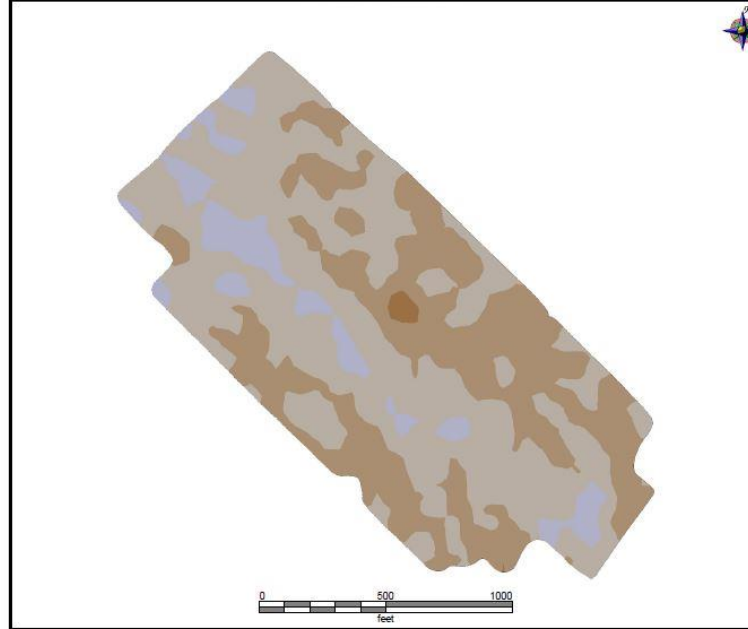
Zone Smart
Leakability



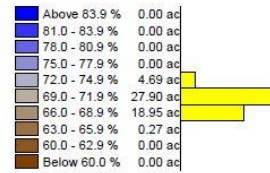
Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: Combined Texture
Min: 21.64 %
Max: 34.98 %
Avg: 27.91 %



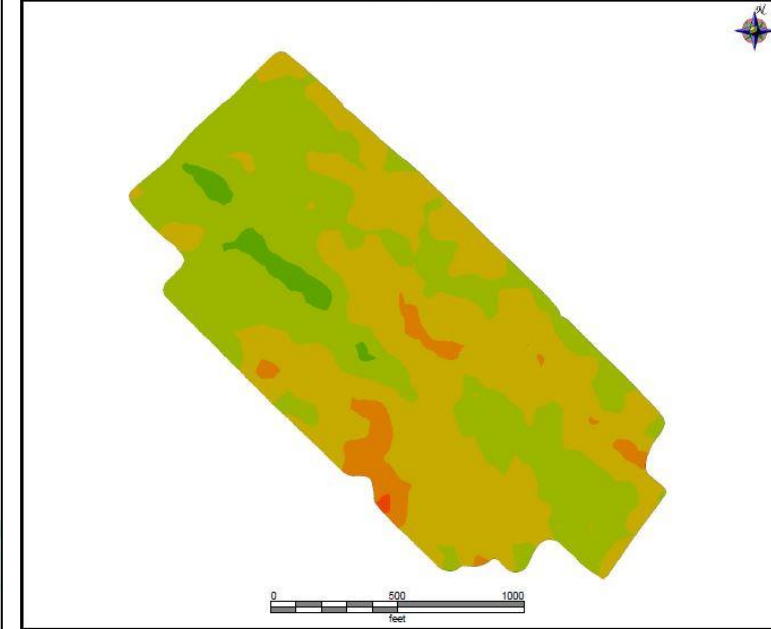
Zone Smart
Plant Available Water



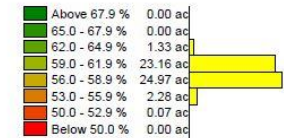
Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: Combined Texture
Min: 62.9 %
Max: 76.1 %
Avg: 69.7 %



Zone Smart
Loam



Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: Combined Texture
Min: 52.3 %
Max: 64.2 %
Avg: 58.8 %



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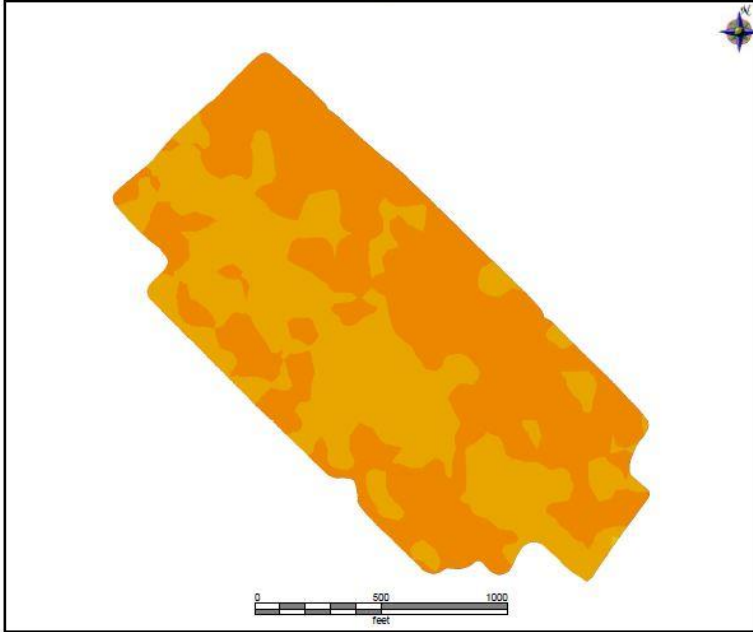
SoilOptix®

SoilOptix®



Additional SoilOptix® Layers

Zone Smart
Silt

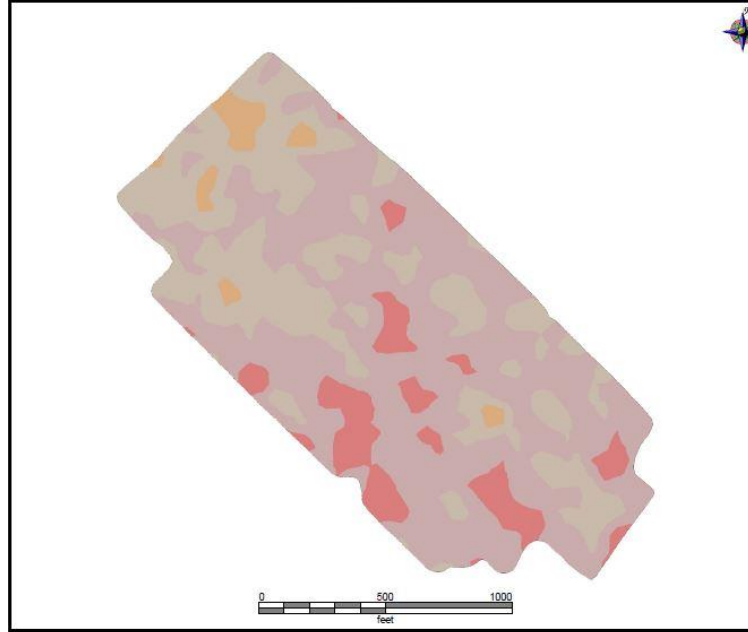


Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: Combined Texture
Min: 37.7 %
Max: 46.9 %
Avg: 41.8 %

Above 47.9 %	0.00 ac
45.0 - 47.9 %	0.02 ac
42.0 - 44.9 %	22.37 ac
39.0 - 41.9 %	29.42 ac
36.0 - 38.9 %	0.00 ac
33.0 - 35.9 %	0.00 ac
30.0 - 32.9 %	0.00 ac
Below 30.0 %	0.00 ac



Zone Smart
CaMg_Ratio

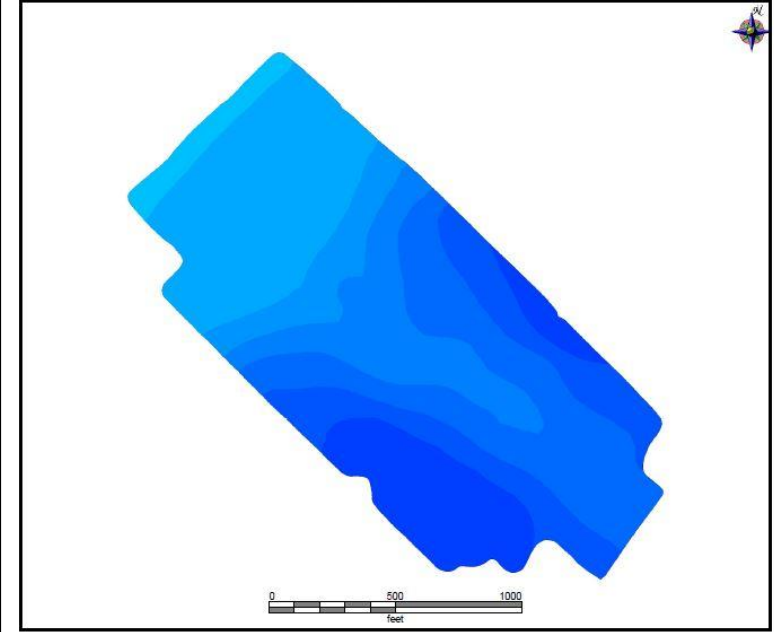


Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: Combined Nutrients
Min: 2.448
Max: 14.579
Avg: 8.302

Above 17.999	0.00 ac
15.000 - 17.999	0.00 ac
12.000 - 14.999	1.48 ac
9.000 - 11.999	16.17 ac
6.000 - 8.999	29.13 ac
3.000 - 5.999	5.03 ac
0.000 - 2.999	0.00 ac
Below 0.000	0.00 ac



Zone Smart
Elevation



Client: SoilOptix
Farm: Zone Smart
Field: Zone Smart
Name: Combined Nutrients
Min: 1091.88 ft
Max: 1160.73 ft
Avg: 1128.99 ft

Above 1179.99 ft	0.00 ac
1170.00 - 1179.99 ft	0.00 ac
1160.00 - 1169.99 ft	0.00 ac
1150.00 - 1159.99 ft	7.49 ac
1140.00 - 1149.99 ft	7.99 ac
1130.00 - 1139.99 ft	11.79 ac
1120.00 - 1129.99 ft	6.92 ac
1110.00 - 1119.99 ft	3.39 ac
1100.00 - 1109.99 ft	12.46 ac
1090.00 - 1099.99 ft	1.77 ac
1080.00 - 1089.99 ft	0.00 ac
1070.00 - 1079.99 ft	0.00 ac
Below 1070.00 ft	0.00 ac



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Why SoilOptix®?

- Highest definition soil nutrient and texture maps available
 - 335 data points per acre
 - More precise data for VRA prescriptions
- Over 30 different data layers offered
- Pre-calibrated sensor - Easy to use; Optimizes field time
- Measures stable isotopes
 - Minimal interference from soil moisture
 - Survey in up to 5 inches of light snow
 - No interference caused by field vegetation/residue