PEISCIA FALL POTASH PROJECT

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FALL POTASH PROJECT

Full project title is “Investigating the practice of fall application of KCl and the potential for nutrient leaching from PEI soils over winter”

Attempt to quantify the amount of potassium and chloride that leaches from PEI soils after fall application of 0-0-60

Project in partnership with the PEI Soil & Crop Improvement Association

Partially funded by the Innovation Research Fund

2 year project

ROLE OF POTASSIUM

Enzyme activation

Promotes water uptake, regulates opening of leaf stomata, maintains cell turgor

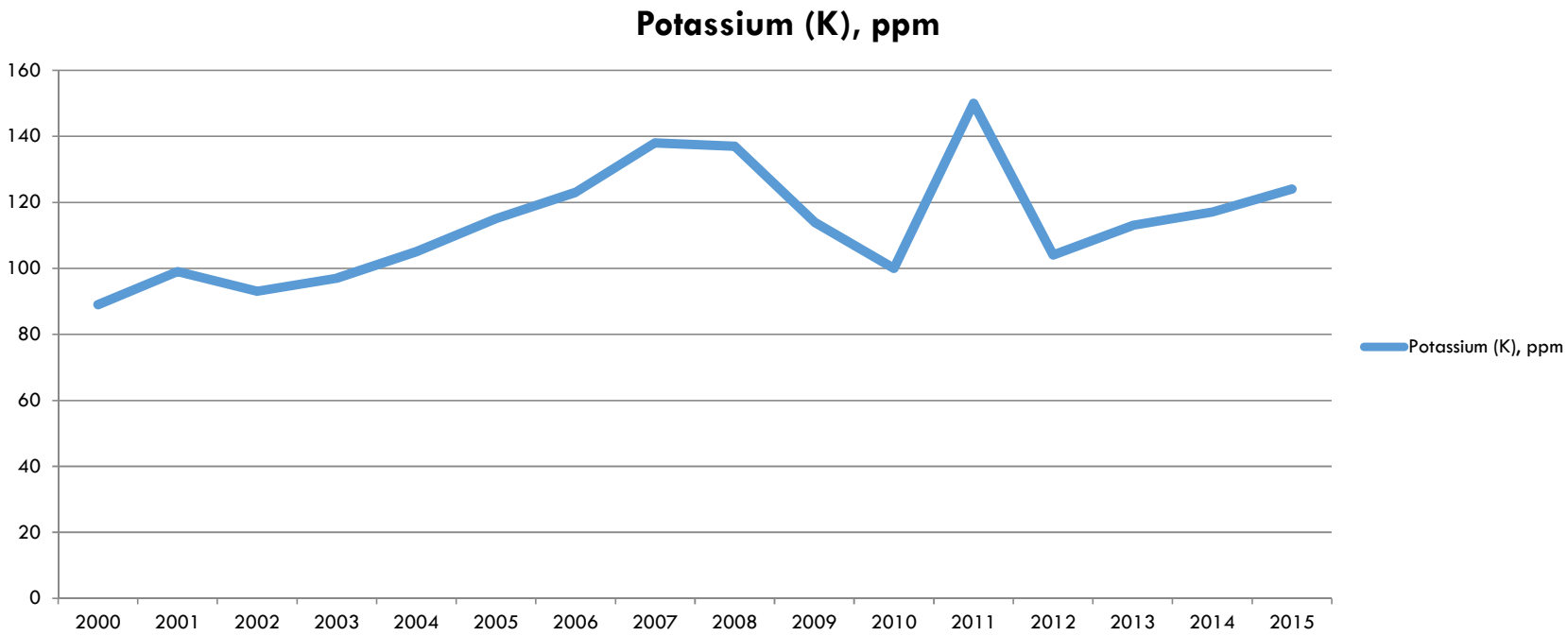
Regulates nutrient translocation, helps with transport of sugars

Aids with photosynthesis

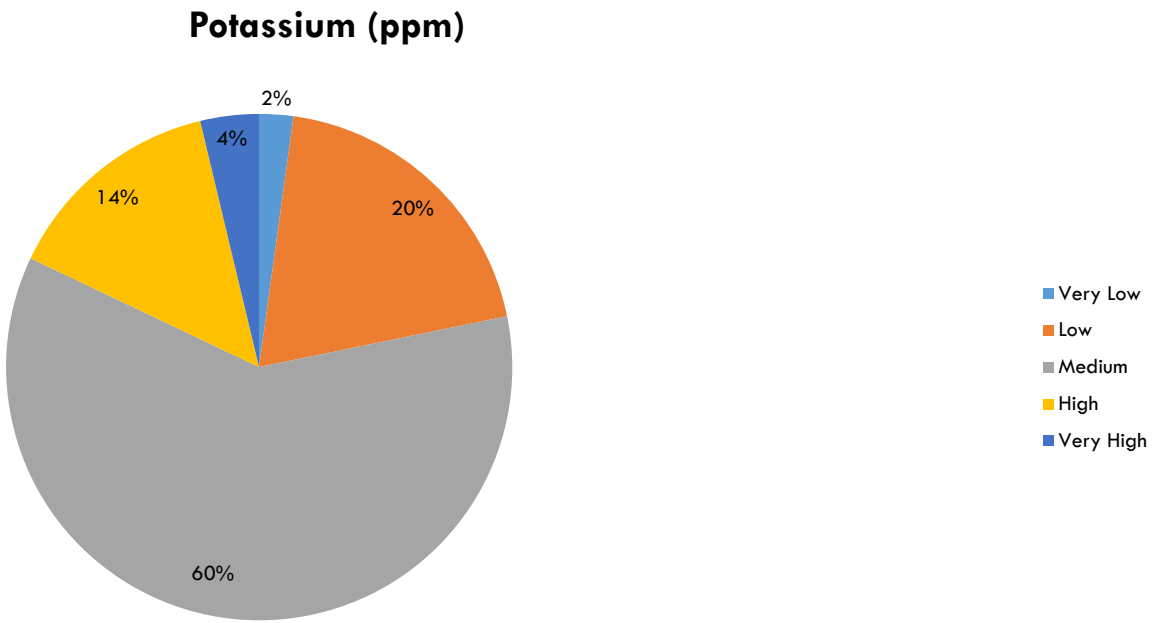
Enhance N uptake and protein synthesis

Can have an effect on crop yield and quality

POTASSIUM (PPM)

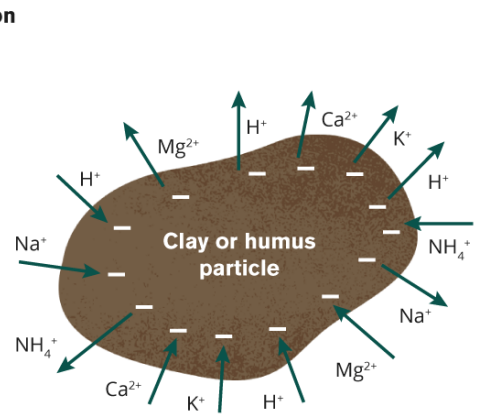


POTASSIUM (PPM)



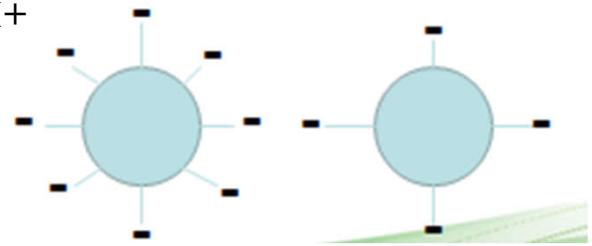
CEC

PEI soil has a low CEC (cation exchange capacity)

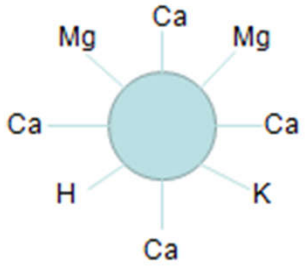


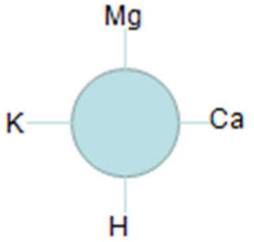
Mg++

K+



Ca++ H+





SOIL OPTIMUM LEVELS BASED ON CEC

FACT SHEET

		CEC			
		0-6	7-15	16-25	26+
PPM SOIL					
p	POOR	0 - 25	0 - 23	0 - 18	0 - 13
	MED	26 - 55	24 - 43	19 - 33	24 - 23
	GOOD	56 - 93	44 - 83	34 - 55	24 - 43
	HIGH	94 +	84+	56 +	44+
K	POOR	0 - 45	0 - 60	0 - 80	0 - 100
	MED	46 - 90	61 - 120	81 - 160	101 - 200
	GOOD	91 - 180	121 - 240	161 - 320	201 - 400
	HIGH	181+	241 +	321+	401+
Ca	POOR	0 - 200	0 - 400	0 - 600	0 - 1000
	MED	201 - 400	401 - 800	601 - 1200	1001 - 2000
	GOOD	401 - 800	801 - 1600	1201 - 2400	2001 - 6000
	HIGH	801+	1600 +	2400+	6000+
Mg	POOR	0 - 25	0 - 50	0 - 75	0 - 100
	MED	26 - 50	51 - 100	76 - 150	101 - 200
	GOOD	51 - 100	101 - 200	151 - 300	201 - 600
	HIGH	101+	201+	301+	601+
% SATURATION OF CATIONS					
% K Saturation		4 - 6	3 - 5	2 - 4	2 - 3

FALL POTASH PROJECT

Potassium is somewhat mobile in sandy soil and subject to leaching

Some fall application of KCl being done in PEI

Conflicting opinions on leaching potential

Some say potassium may leach just as much as nitrate

No local research being done

FALL POTASH PROJECT

Chose 5 fields that had been site specific sampled in 2014, and KCl had been fall applied at a variable rate

- 2 east, 1 central, 2 west
- Not plowed prior to sampling
- One sampling depth only

Resampled 5 points from each field in spring 2015

- Sample points chosen based on CEC

Sampled 3 depths at each sample point

- 0-6 inches, 6-12 inches, 12-18 inches

Each sample analysed using a complete soil package + chloride

FALL POTASH PROJECT

5 new fields selected in fall 2015 and site specific sampled prior to application of KCl

- 3 east, 2 west

5 sample points per field at 3 depths after plowing

Each sample analysed using a complete soil package + nitrate

These same fields were sampled in spring of 2016 and the samples analysed using a complete soil package + nitrate + chloride

Potash did not end up being spread in the west until spring of 2016 and the two fields were sampled shortly after the applications of product

FALL POTASH PROJECT GOALS

Attempt to identify potassium leaching trends in PEI soils based on CEC

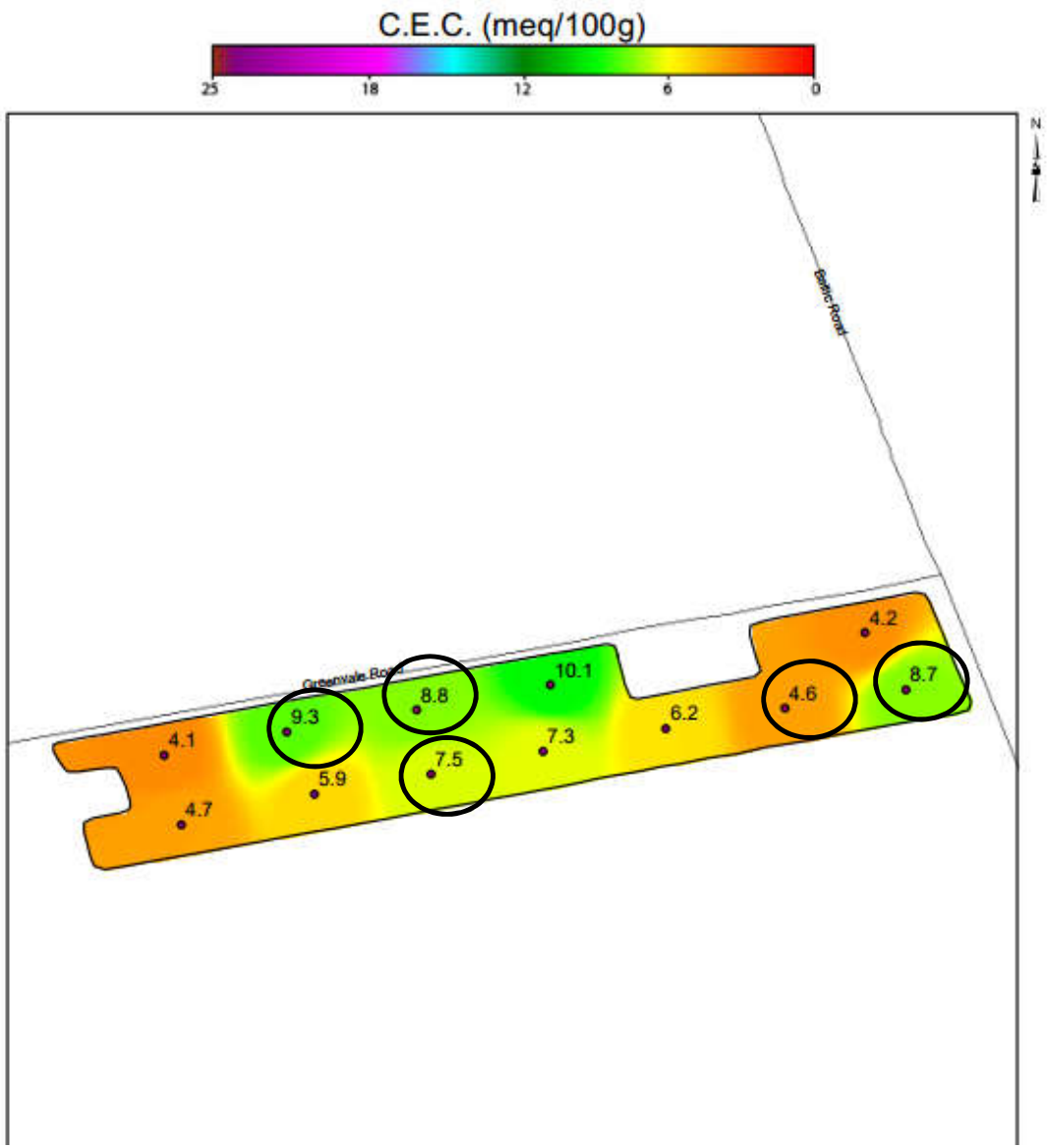
Verify the expectation that chloride will leach from KCl over winter

Compare the potential of potassium and nitrate to leach over winter

Promote good management practices of nutrients

Provide the best and most accurate information to clients when they're making decisions on when to apply potash

Field ID: MR


C.E.C. (meq/100g)
25
18
12
6
0
N
Bellfield Road
Greenvale Road
4.2
8.7
10.1
8.8
4.6
9.3
6.2
4.1
7.3
7.5
5.9
4.7

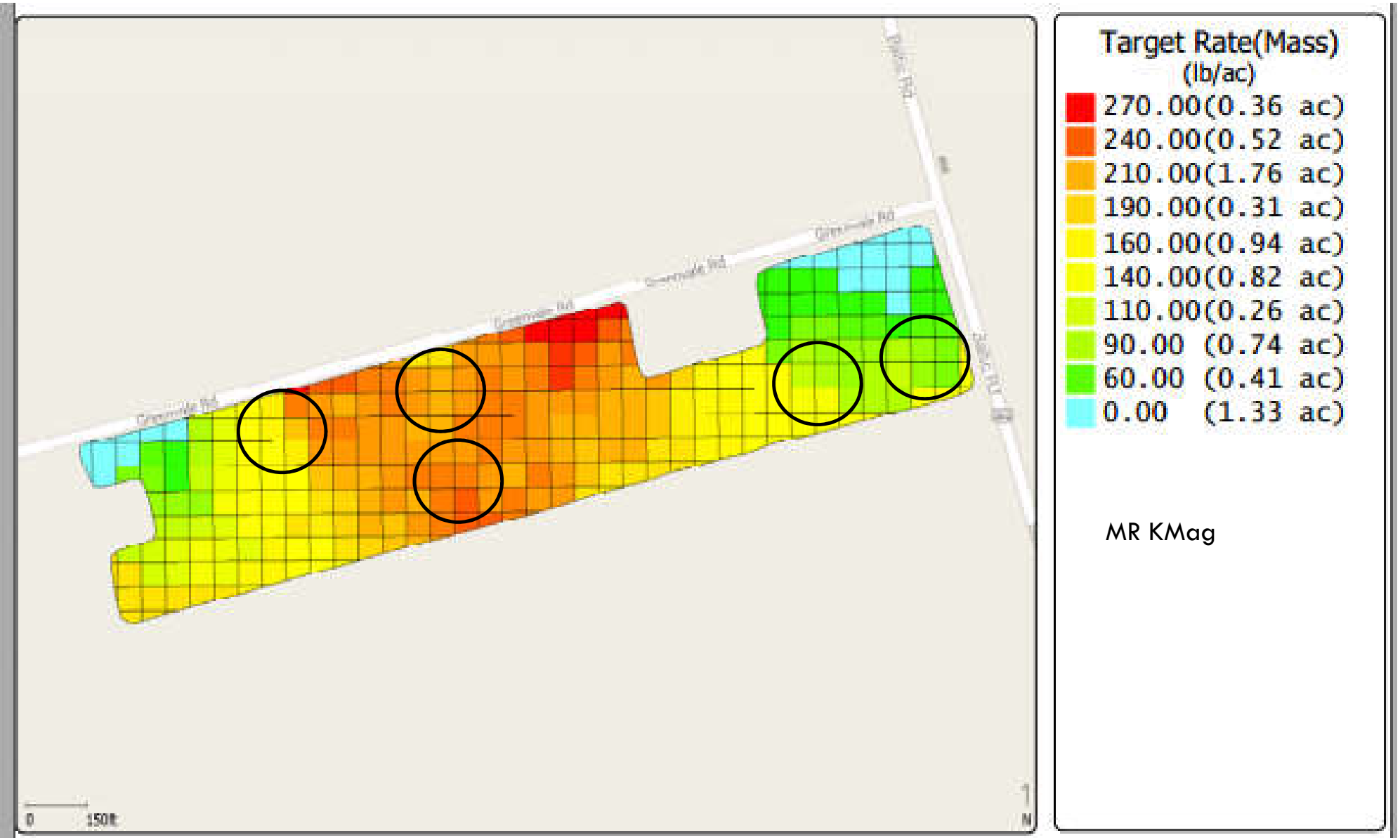
K2O RECOMMENDATIONS

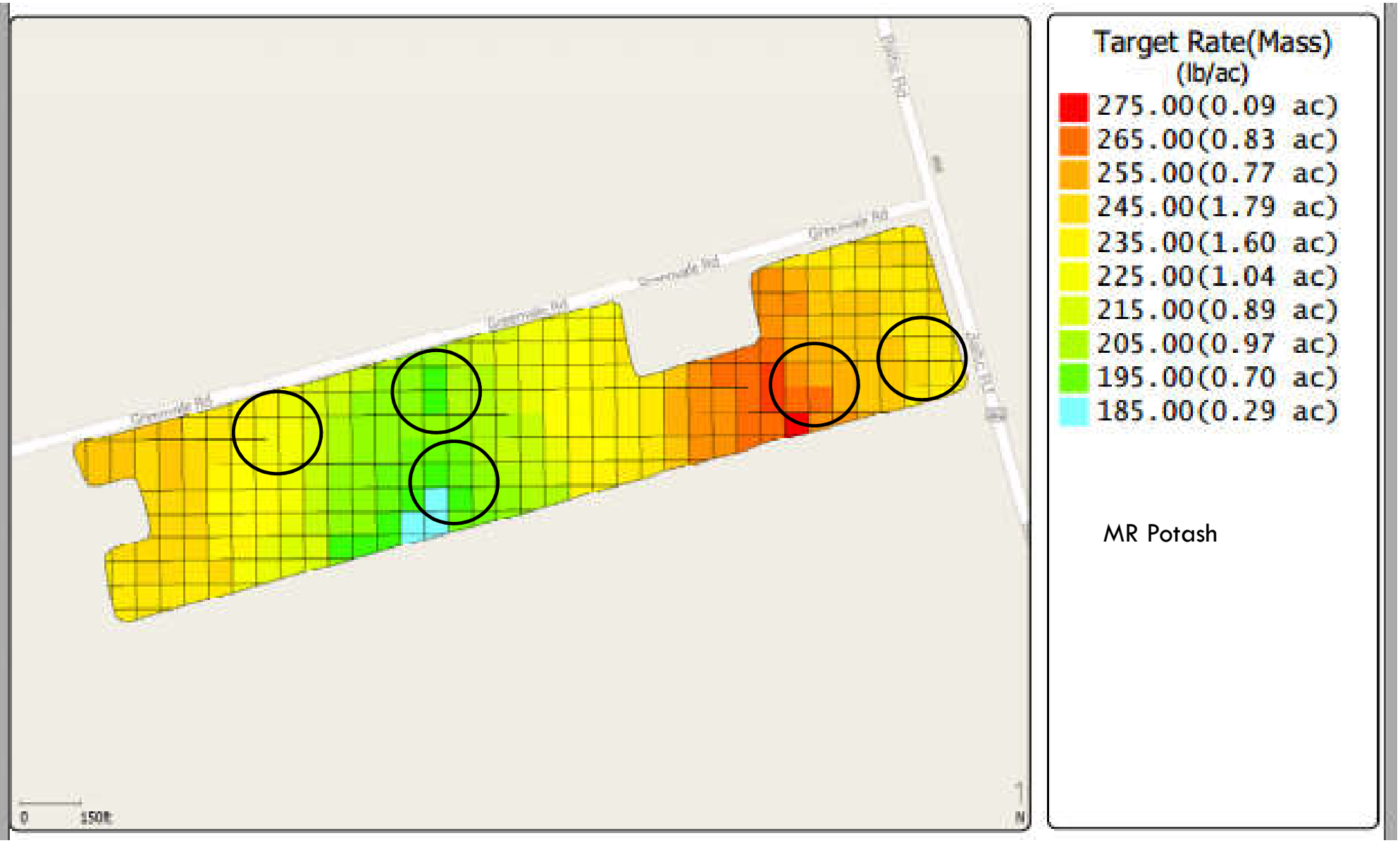
A&L nutrient recommendations

C.E.C. x ppm to build = Pounds K2O required

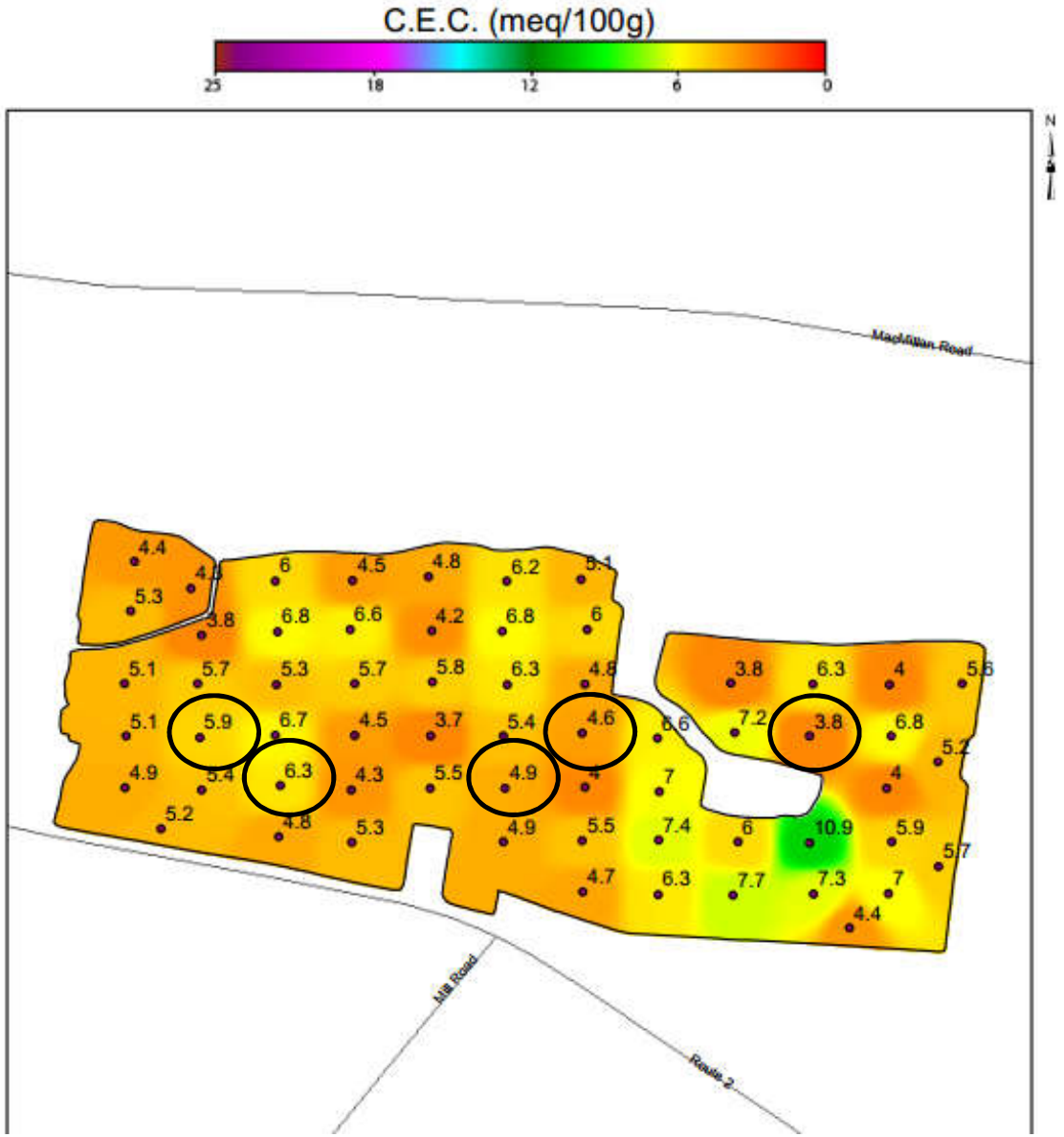
Divide by number of years to build

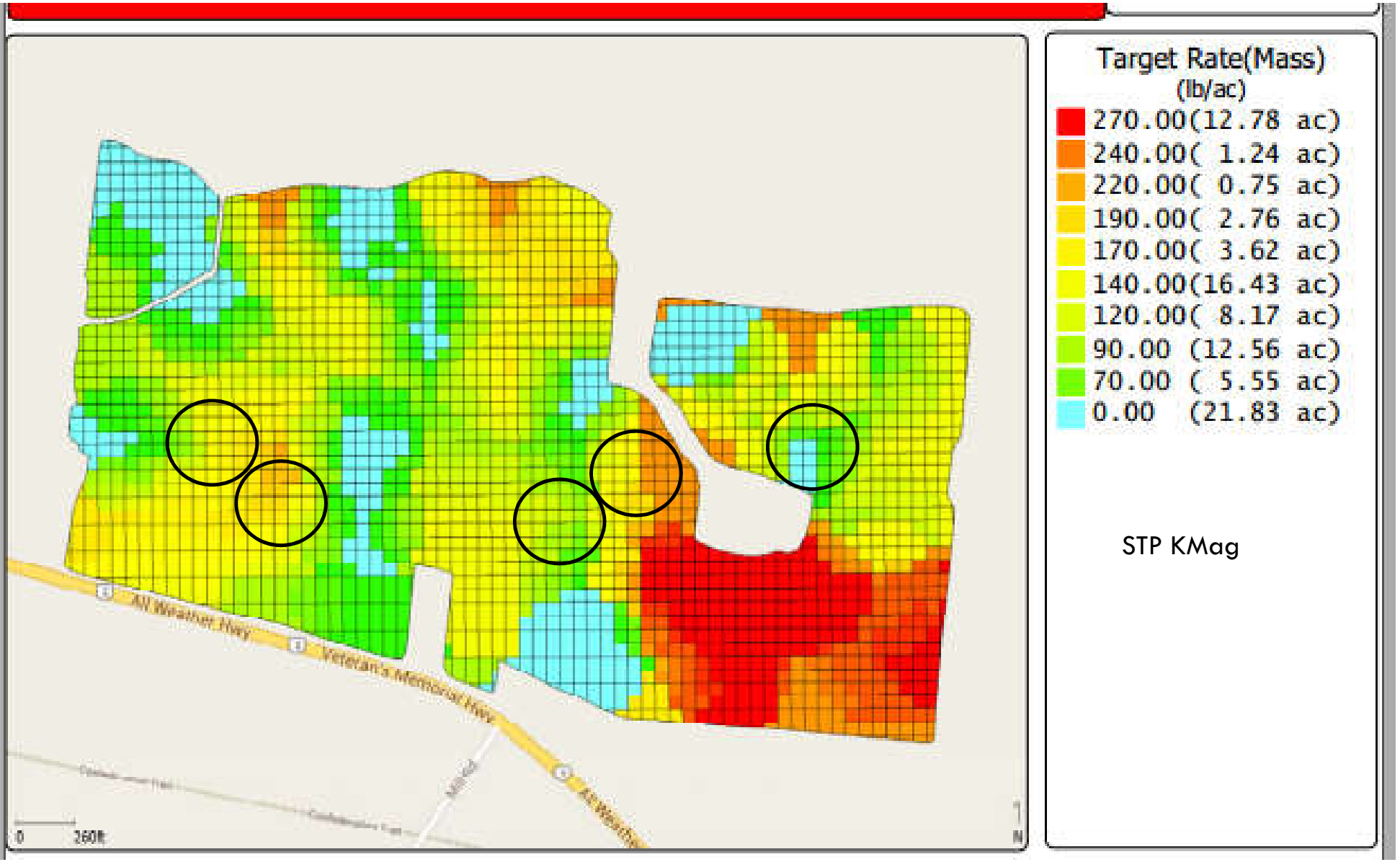
Total recommendation = Crop removal + build

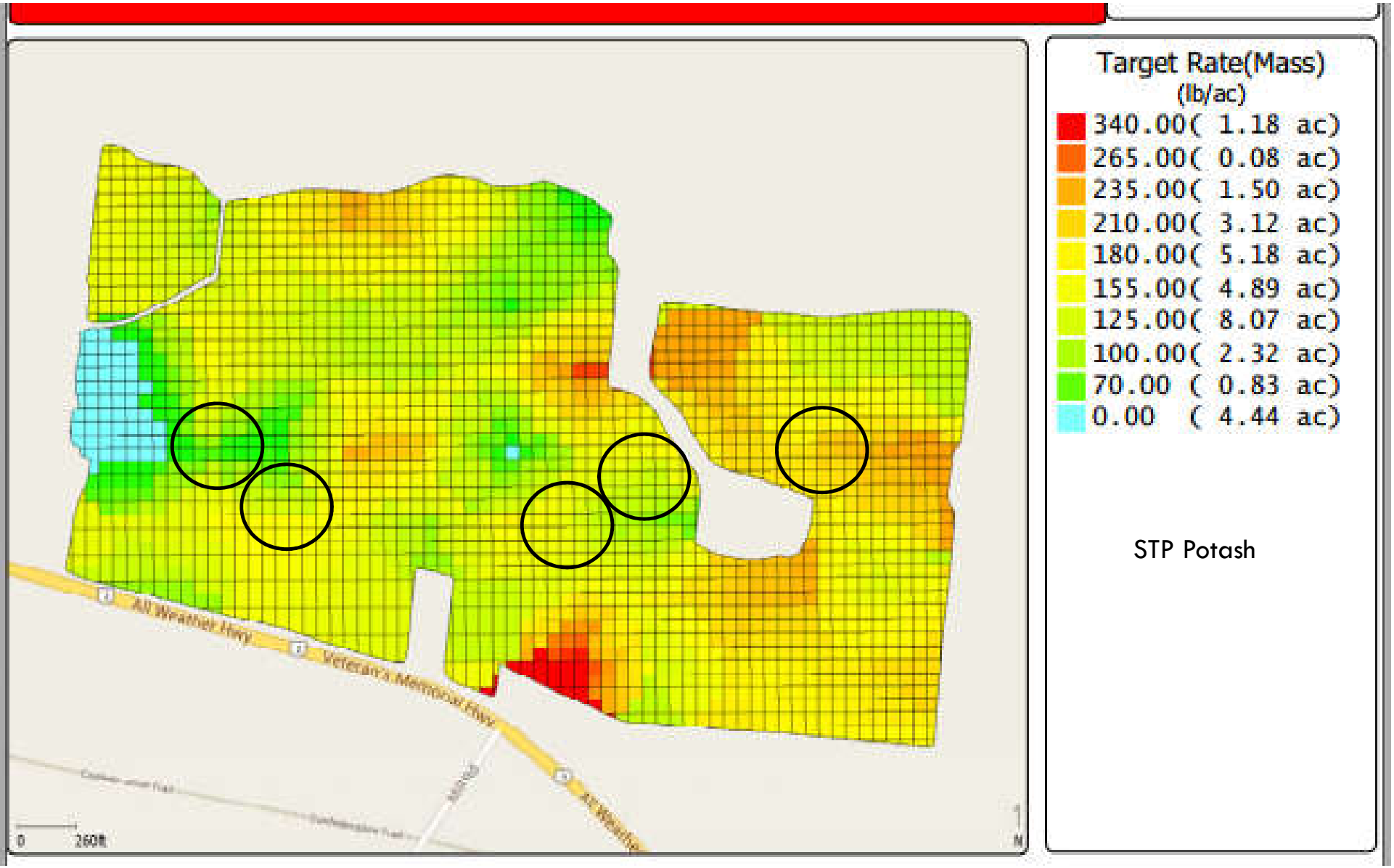

Target Rate(Mass)
(lb/ac)
270.00(0.36 ac)
240.00(0.52 ac)
210.00(1.76 ac)
190.00(0.31 ac)
160.00(0.94 ac)
140.00(0.82 ac)
110.00(0.26 ac)
90.00 (0.74 ac)
60.00 (0.41 ac)
0.00 (1.33 ac)
MR KMag
0
150ft
N


Target Rate(Mass)
(lb/ac)
275.00(0.09 ac)
265.00(0.83 ac)
255.00(0.77 ac)
245.00(1.79 ac)
235.00(1.60 ac)
225.00(1.04 ac)
215.00(0.89 ac)
205.00(0.97 ac)
195.00(0.70 ac)
185.00(0.29 ac)
MR Potash
0
150ft
N

Field ID: STP

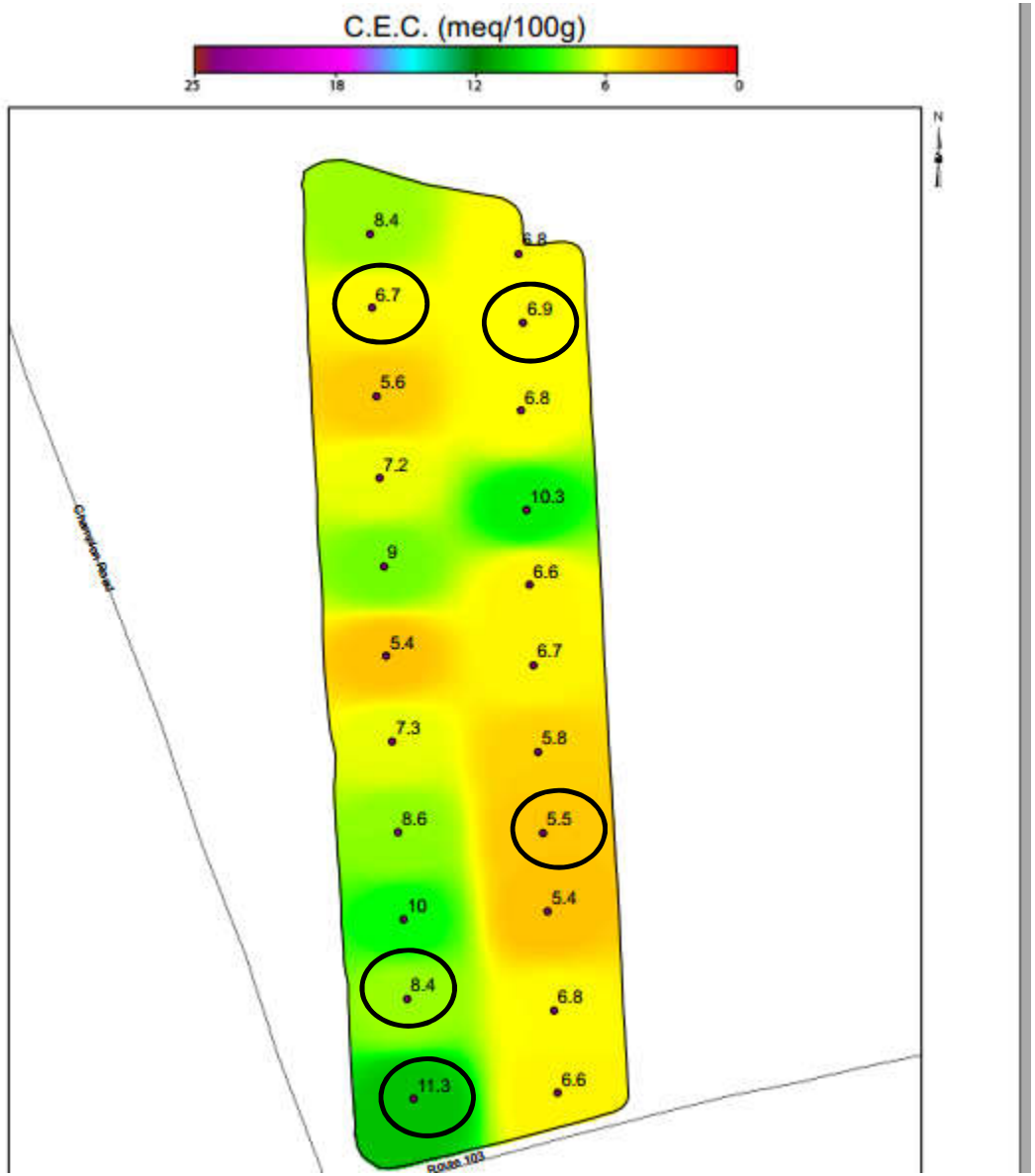

C.E.C. (meq/100g)
25
18
12
6
0
N
MacMillan Road
Mill Road
Route 2
4.4
5.3
6
4.5
4.8
6.2
3.8
6.8
6.6
4.2
6.8
6
5.1
5.7
5.3
5.7
5.8
6.3
4.8
5.1
5.9
6.7
4.5
3.7
5.4
4.6
6.6
4.9
5.4
6.3
4.3
5.5
4.9
7
5.2
4.8
5.3
4.9
5.5
7.4
6
3.8
6.3
4
7.2
3.8
6.8
4
4.7
6.3
7.7
7.3
7
4.4
10.9
5.9

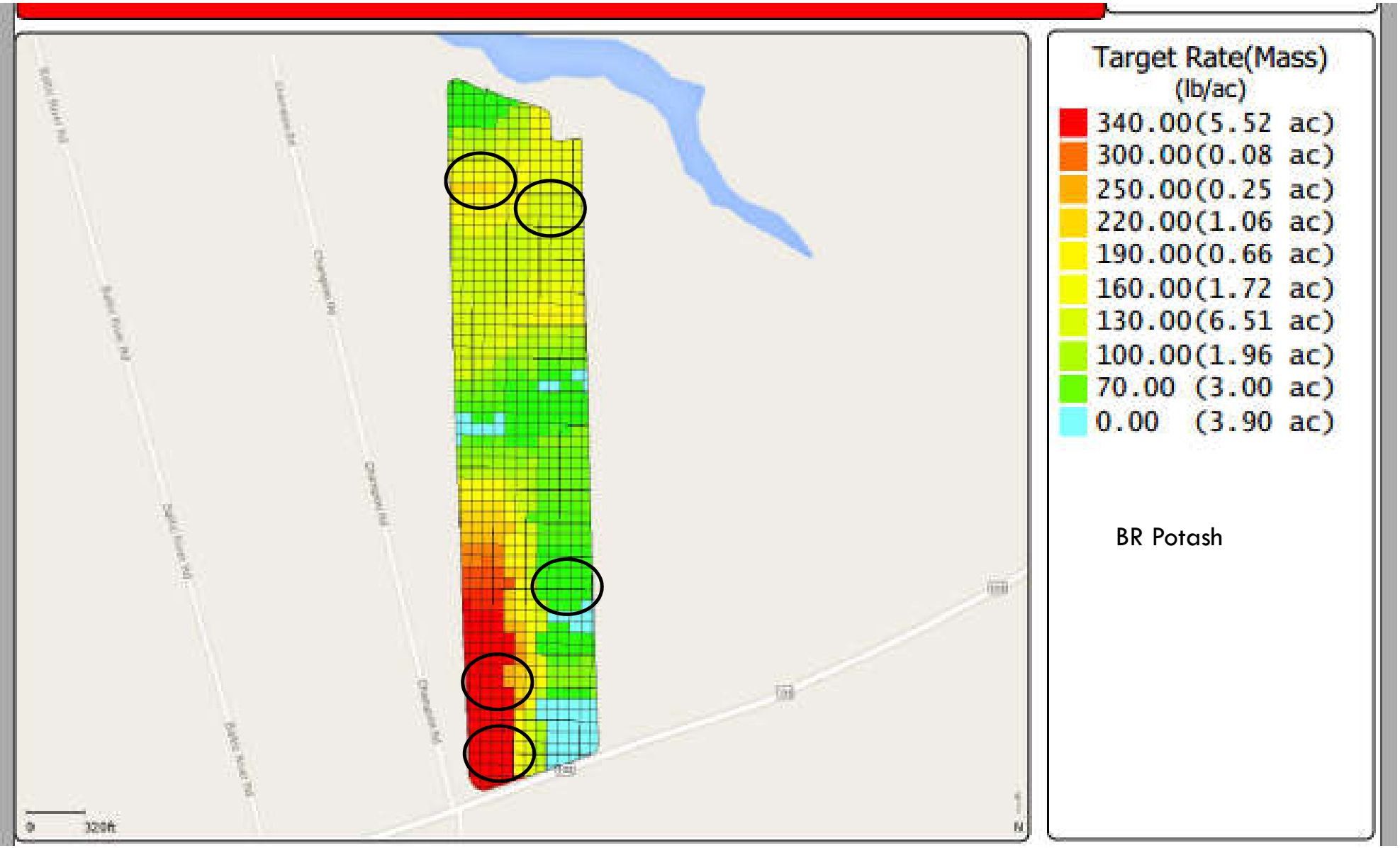

Target Rate(Mass)
(lb/ac)
270.00(12.78 ac)
240.00(1.24 ac)
220.00(0.75 ac)
190.00(2.76 ac)
170.00(3.62 ac)
140.00(16.43 ac)
120.00(8.17 ac)
90.00 (12.56 ac)
70.00 (5.55 ac)
0.00 (21.83 ac)
STP KMag
All Weather Hwy
Veteran's Memorial Hwy
0
360ft
N


Target Rate(Mass)
(lb/ac)
340.00(1.18 ac)
265.00(0.08 ac)
235.00(1.50 ac)
210.00(3.12 ac)
180.00(5.18 ac)
155.00(4.89 ac)
125.00(8.07 ac)
100.00(2.32 ac)
70.00 (0.83 ac)
0.00 (4.44 ac)
All Weather Hwy
Veterans Memorial Hwy
0
260ft
N

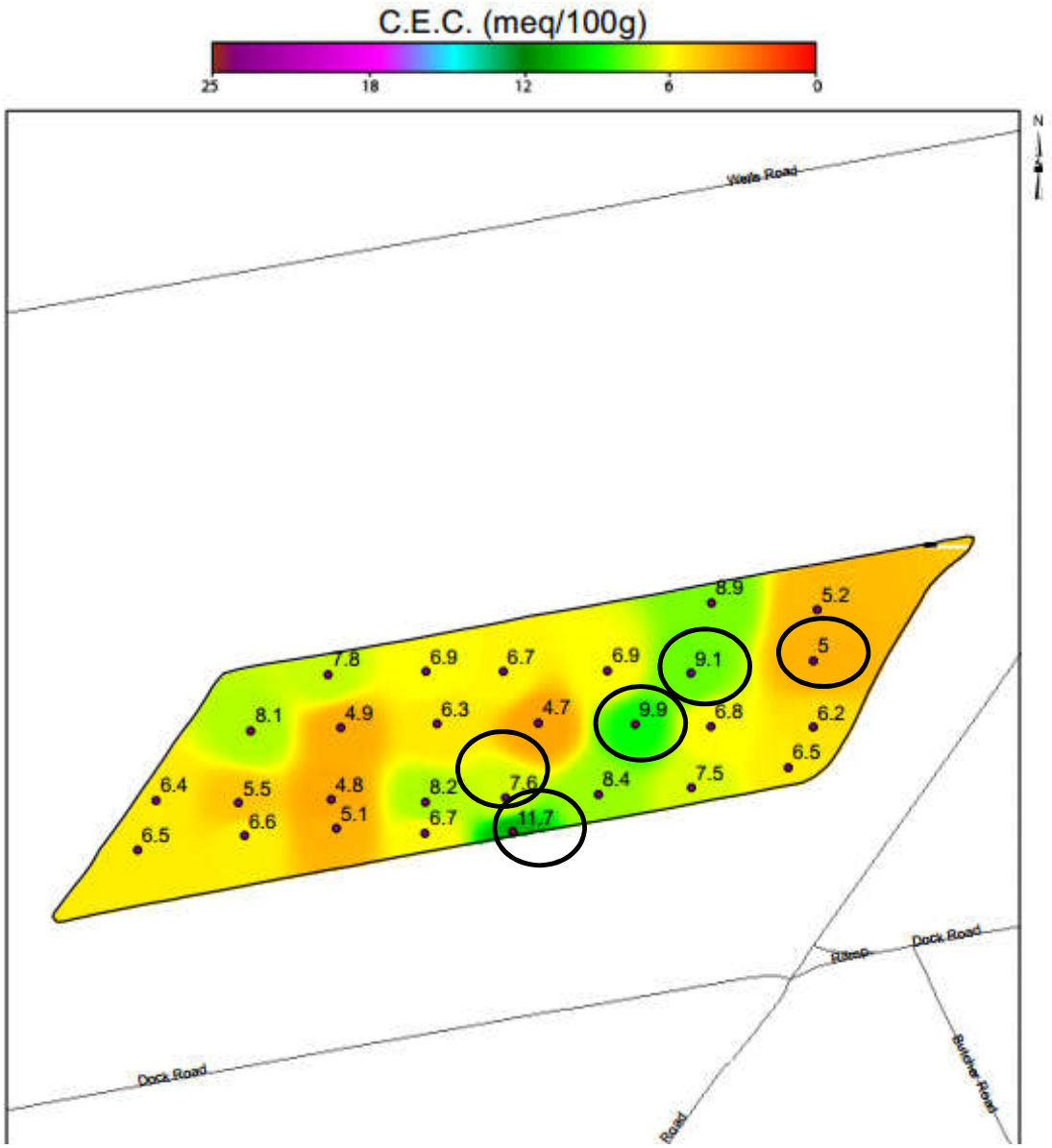
STP Potash

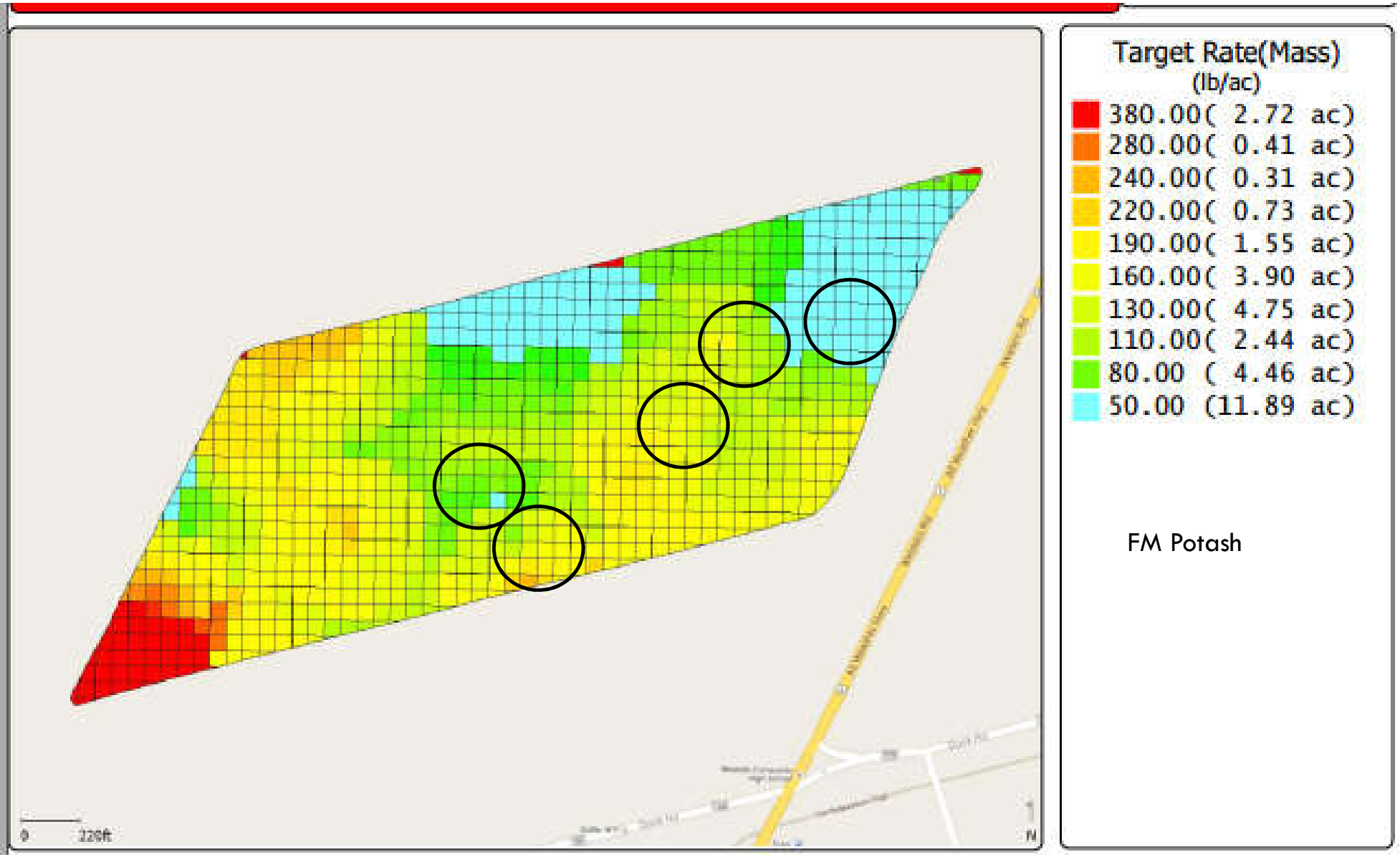
Field ID: BR


C.E.C. (meq/100g)
25
18
12
6
0
8.4
6.8
6.7
6.9
5.6
6.8
7.2
10.3
9
6.6
5.4
6.7
7.3
5.8
8.6
5.5
10
5.4
8.4
6.8
11.3
6.6
Route 103

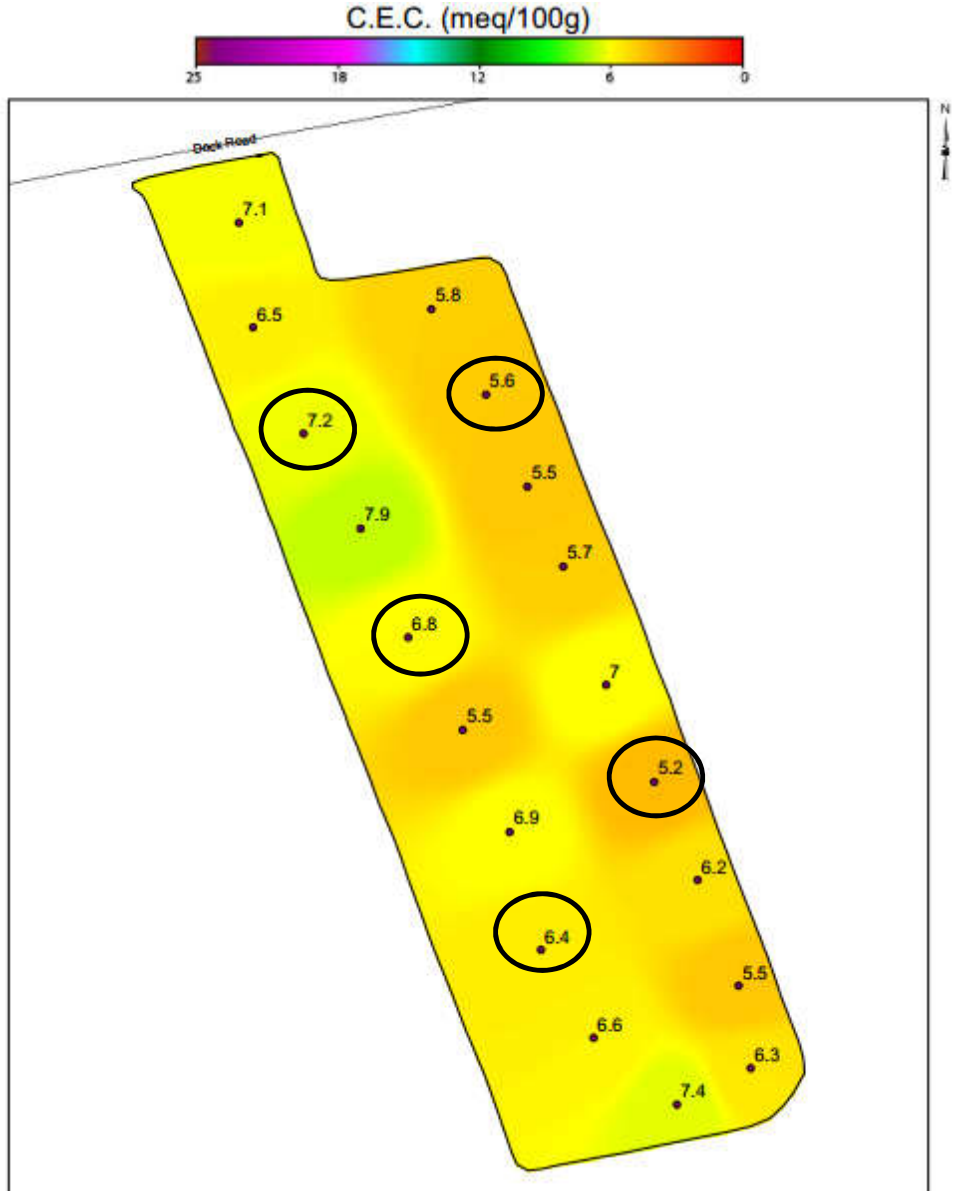

Target Rate(Mass)
(lb/ac)
340.00(5.52 ac)
300.00(0.08 ac)
250.00(0.25 ac)
220.00(1.06 ac)
190.00(0.66 ac)
160.00(1.72 ac)
130.00(6.51 ac)
100.00(1.96 ac)
70.00 (3.00 ac)
0.00 (3.90 ac)
BR Potash

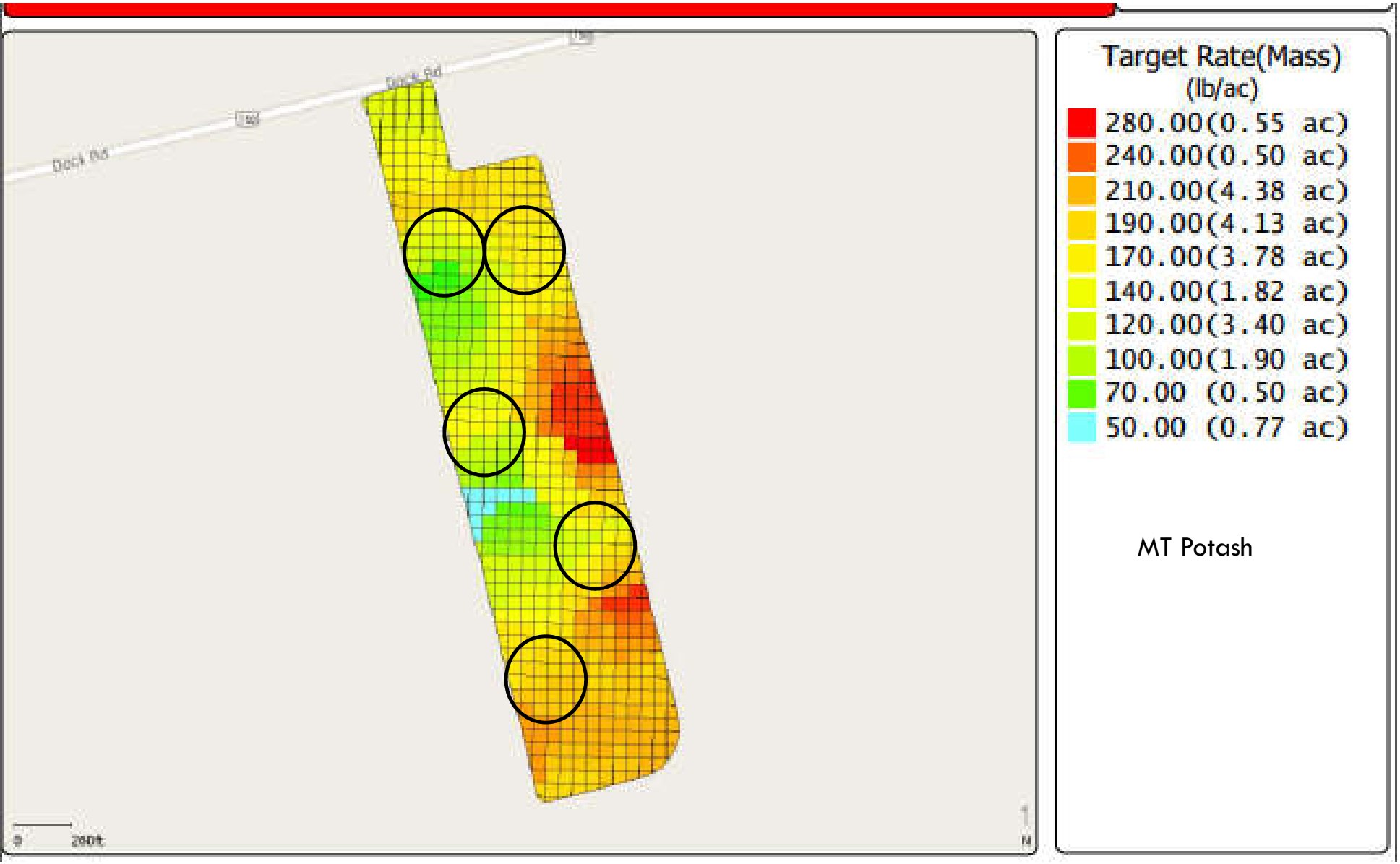
Field ID: FM


C.E.C. (meq/100g)
25
18
12
6
0
N
Wells Road
Dock Road
Dock Road
Ridge
Butcher Road
Road
8.9
5.2
5
7.8
6.9
6.7
6.9
9.1
8.1
4.9
6.3
4.7
9.9
6.8
6.2
6.5
6.4
5.5
4.8
8.2
7.6
8.4
7.5
6.5
6.6
5.1
6.7
11.7


Target Rate(Mass)
(lb/ac)
380.00(2.72 ac)
280.00(0.41 ac)
240.00(0.31 ac)
220.00(0.73 ac)
190.00(1.55 ac)
160.00(3.90 ac)
130.00(4.75 ac)
110.00(2.44 ac)
80.00 (4.46 ac)
50.00 (11.89 ac)
FM Potash
0
220ft
N

Field ID: MT


C.E.C. (meq/100g)
25
18
12
6
0
Dock Road
N
7.1
6.5
5.8
5.6
7.2
5.5
7.9
5.7
6.8
7
5.5
5.2
6.9
6.2
6.4
5.5
6.6
6.3
7.4


Dock Rd
Dock Rd
Target Rate(Mass)
(lb/ac)
280.00(0.55 ac)
240.00(0.50 ac)
210.00(4.38 ac)
190.00(4.13 ac)
170.00(3.78 ac)
140.00(1.82 ac)
120.00(3.40 ac)
100.00(1.90 ac)
70.00 (0.50 ac)
50.00 (0.77 ac)
MT Potash
0
200ft
N

PRELIMINARY RESULTS

The level of potash in the soil decreases as you move deeper throughout the soil profile

- 23/25 sample points

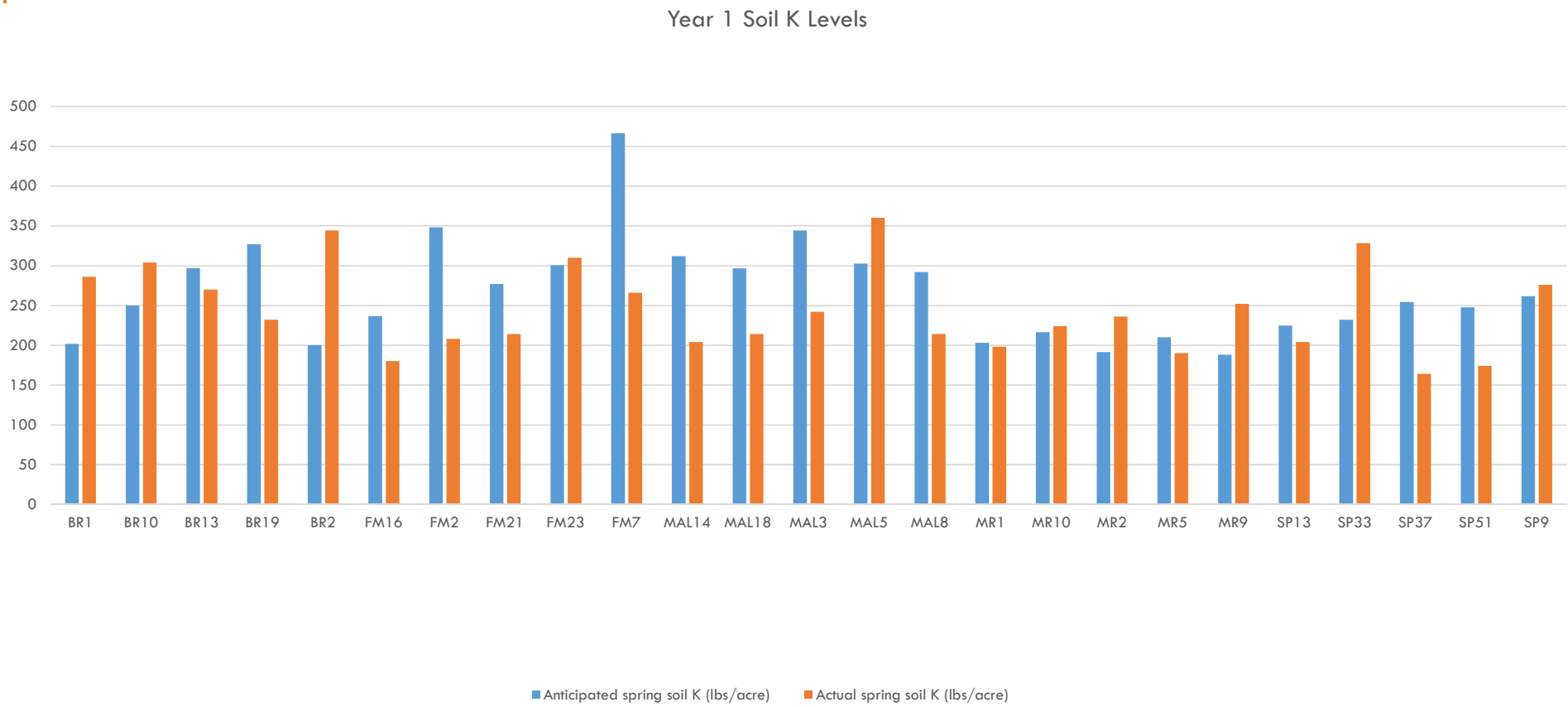
There is very little chloride remaining in the soil after winter

- No correlation between how much was fall applied
- Eastern fields had the lowest Cl- remaining

Expecting better data from new fields sampled fall 2015

- Comparing 3 depths
- Sampled after plowing

RESULTS

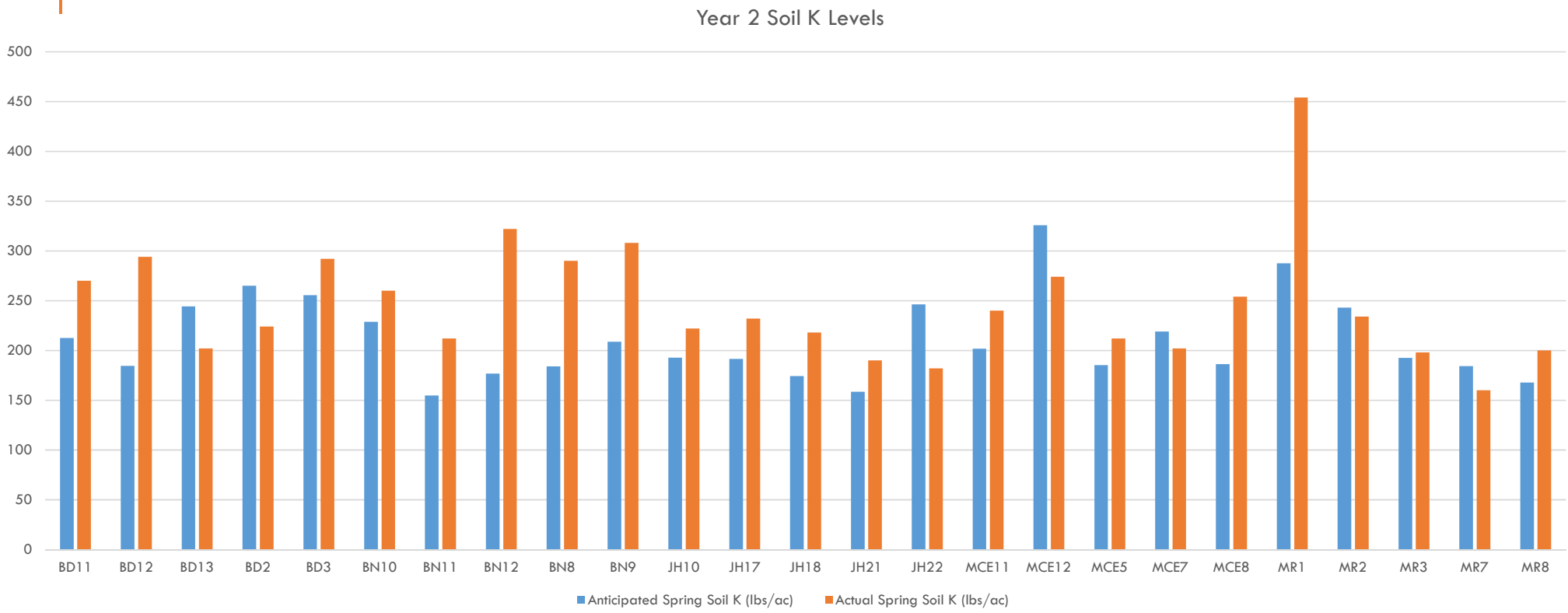

Year 1 Soil K Levels
500
450
400
350
300
250
200
150
100
50
0
BR1
BR10
BR13
BR19
BR2
FM16
FM2
FM21
FM23
FM7
MAL14
MAL18
MAL3
MAL5
MAL8
MR1
MR10
MR2
MR5
MR9
SP13
SP33
SP37
SP51
SP9
Anticipated spring soil K (lbs/acre)
Actual spring soil K (lbs/acre)

SPRING ANTICIPATED SOIL K LEVELS

Fall soil K levels (lbs/ac) + Increase from fall applied potash (lbs/ac)

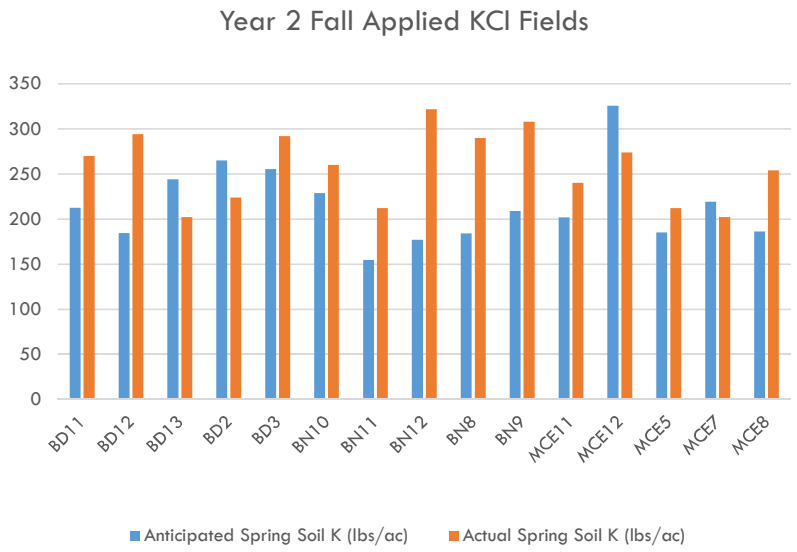
Increase from fall applied potash = (Fall applied K (lbs/ac) / CEC) * 2

RESULTS

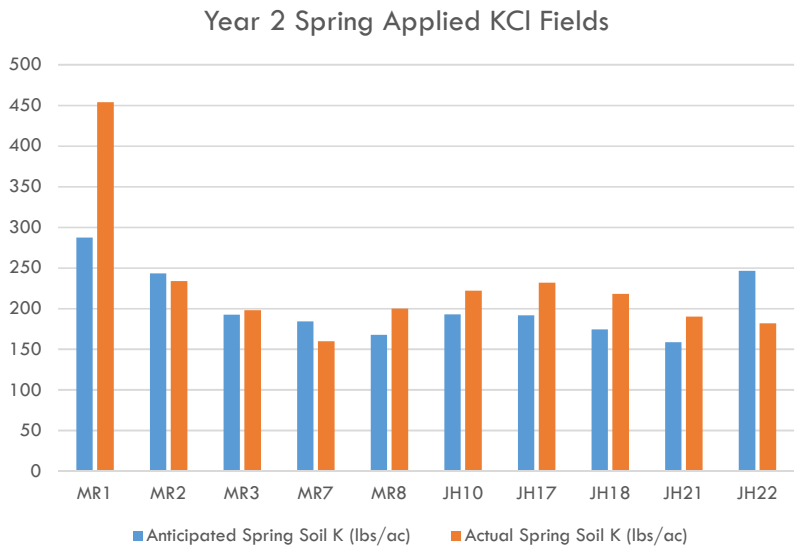

Year 2 Soil K Levels
500
450
400
350
300
250
200
150
100
50
0
BD11
BD12
BD13
BD2
BD3
BN10
BN11
BN12
BN8
BN9
JH10
JH17
JH18
JH21
JH22
MCE11
MCE12
MCE5
MCE7
MCE8
MR1
MR2
MR3
MR7
MR8
Anticipated Spring Soil K (lbs/ac)
Actual Spring Soil K (lbs/ac)

FALL POTASH PROJECT

Fall applied KCl

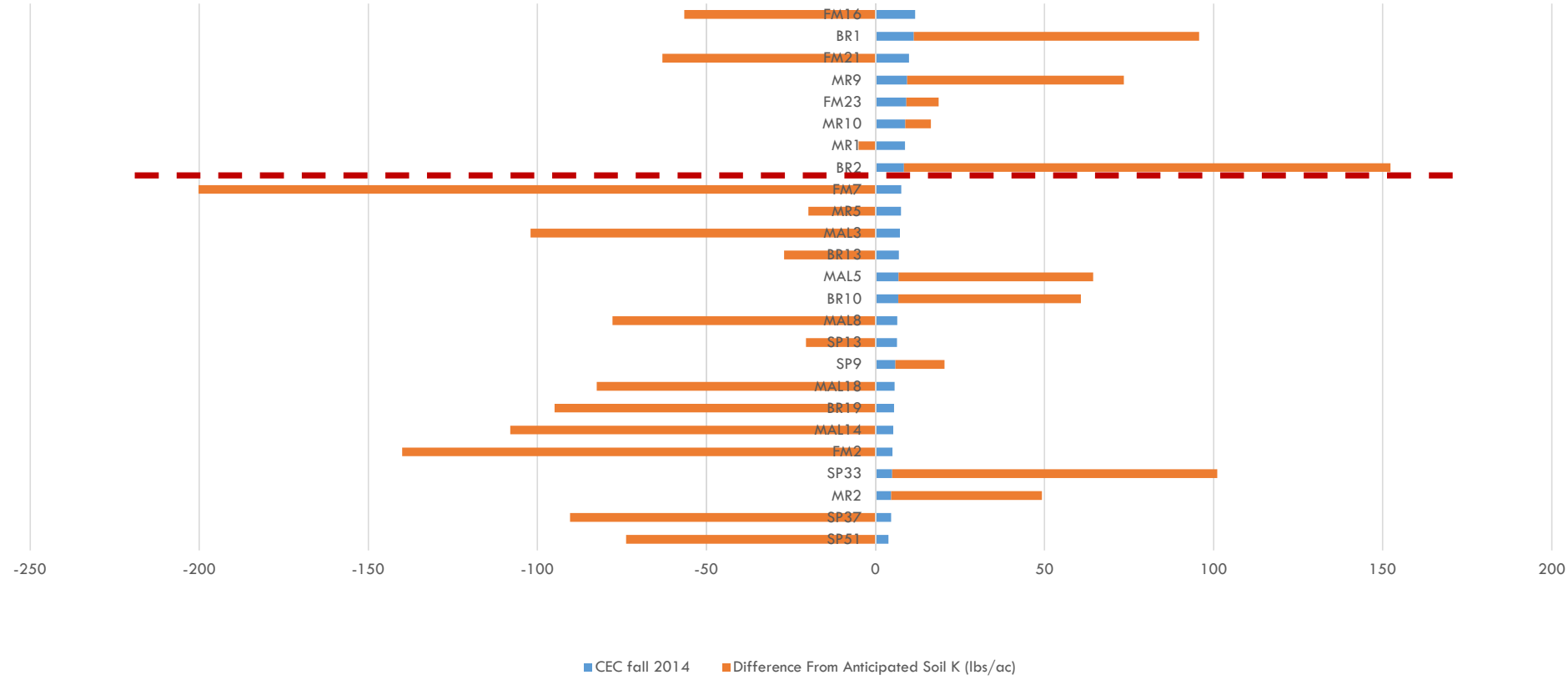


Spring applied KCl



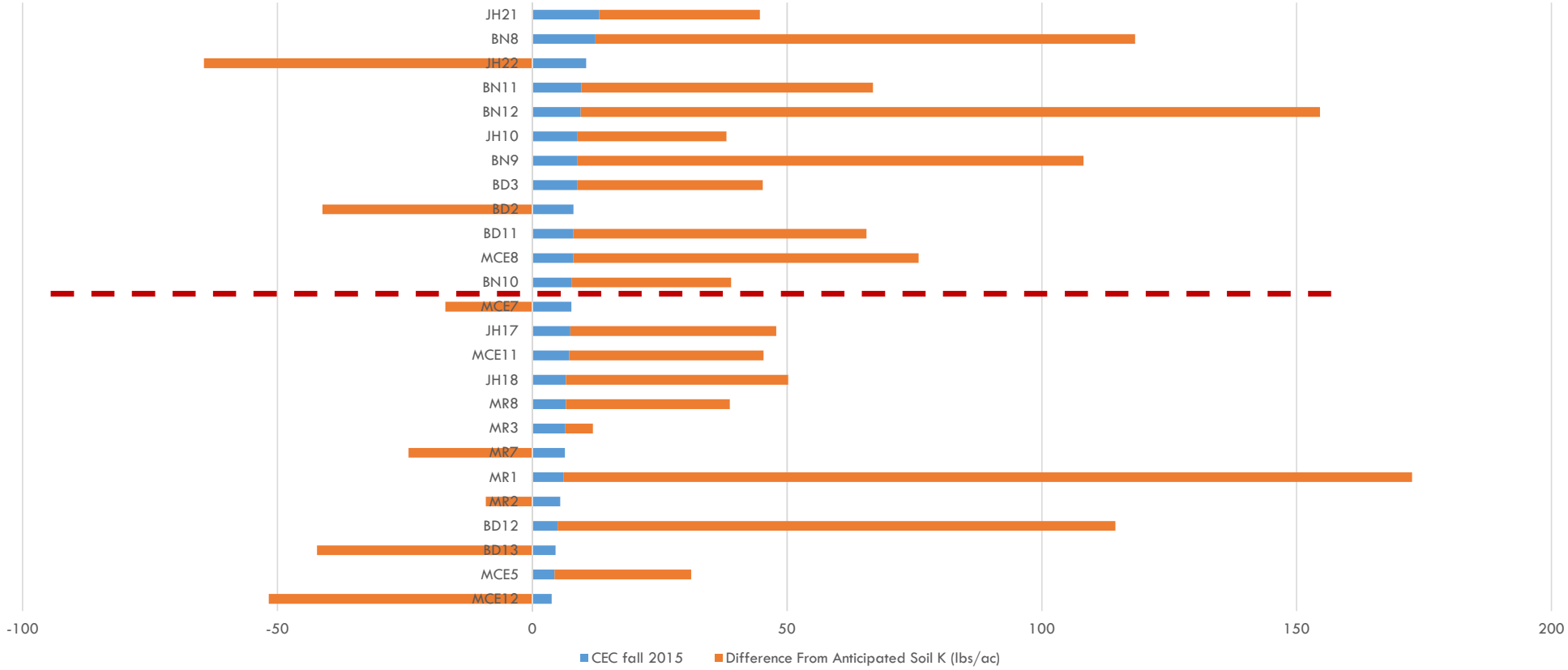
RESULTS

Year 1 CEC VS Diff in Anticipated Soil K

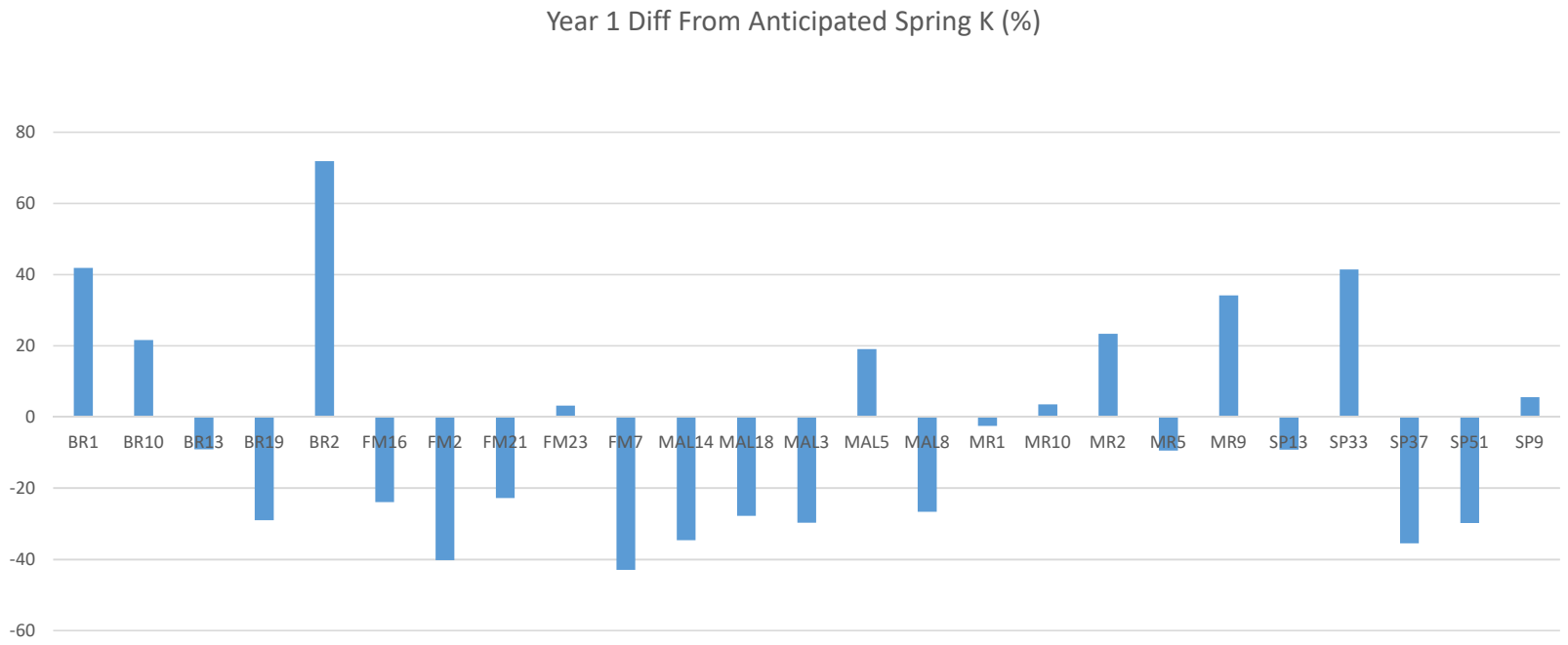


RESULTS

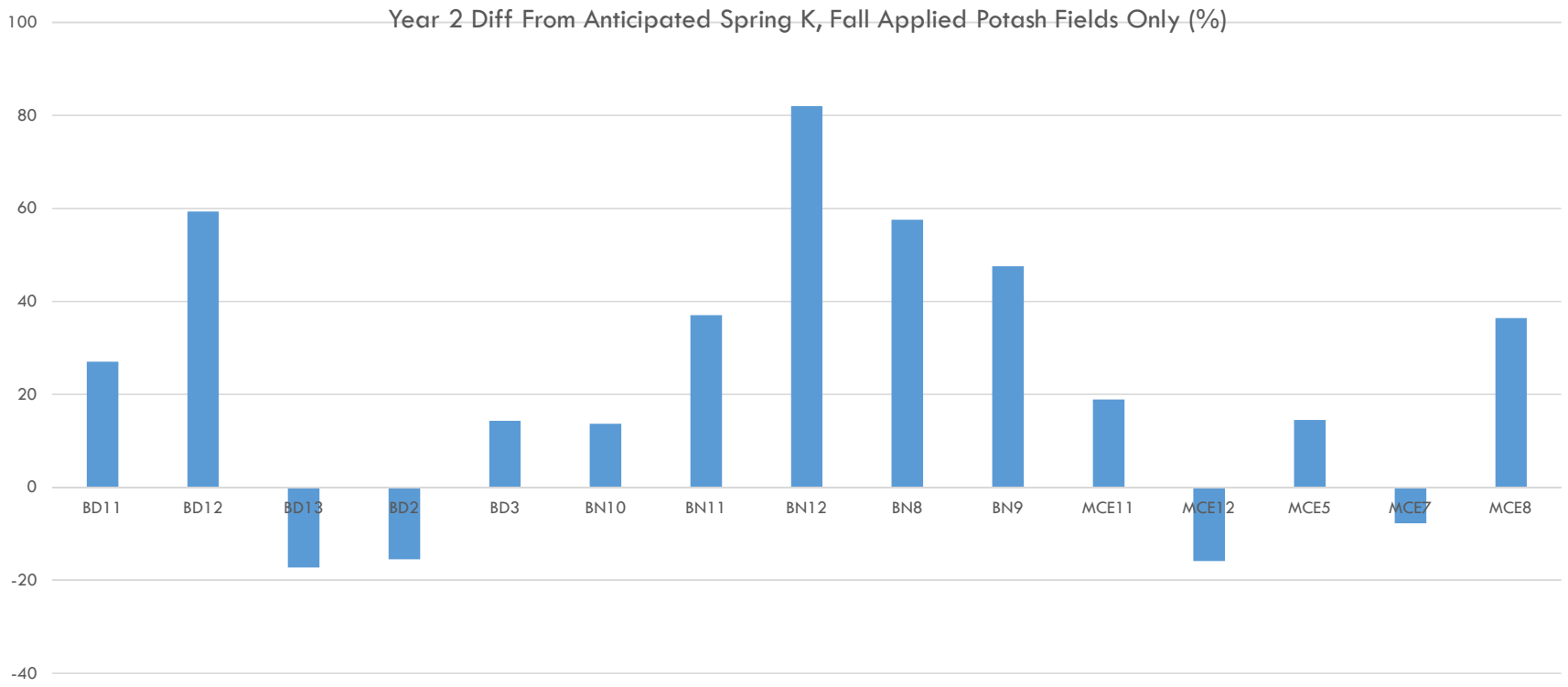
Year 2 CEC VS Diff in Anticipated Soil K



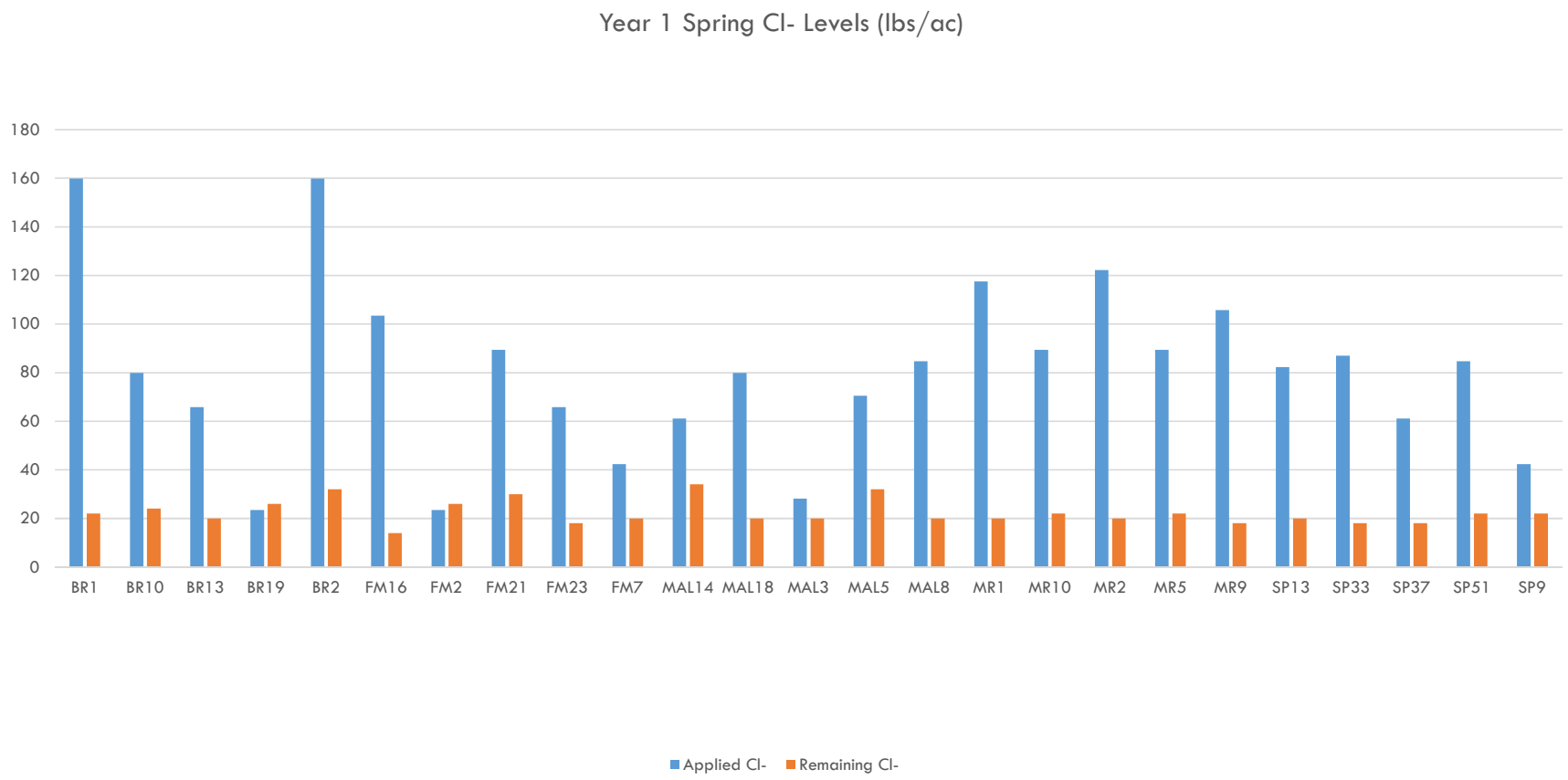
FALL POTASH PROJECT



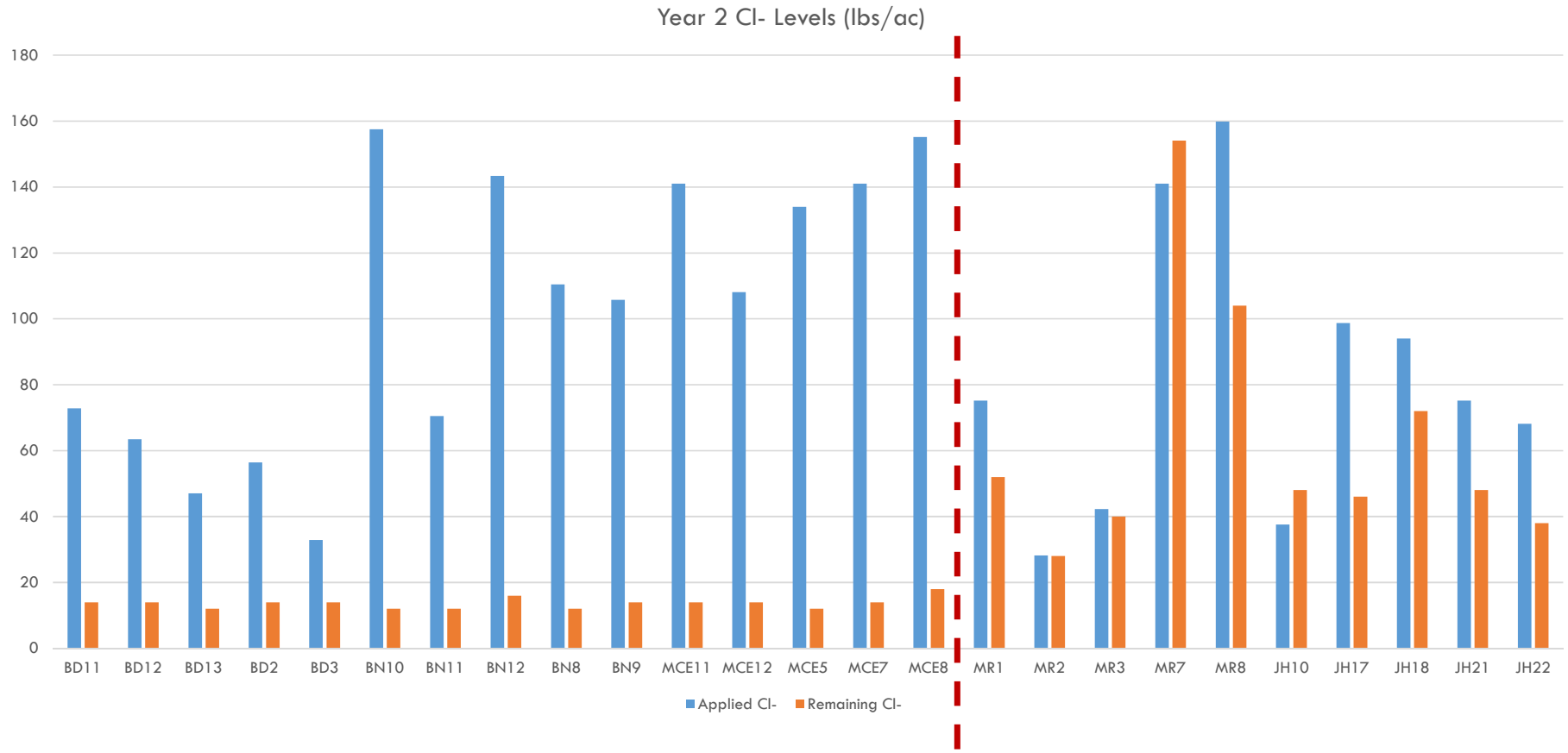
RESULTS


Year 2 Diff From Anticipated Spring K, Fall Applied Potash Fields Only (%)
100
80
60
40
20
0
-20
-40
BD11
BD12
BD13
BD2
BD3
BN10
BN11
BN12
BN8
BN9
MCE11
MCE12
MCE5
MCE7
MCE8

RESULTS


Year 1 Spring Cl- Levels (lbs/ac)
180
160
140
120
100
80
60
40
20
0
BR1
BR10
BR13
BR19
BR2
FM16
FM2
FM21
FM23
FM7
MAL14
MAL18
MAL3
MAL5
MAL8
MR1
MR10
MR2
MR5
MR9
SP13
SP33
SP37
SP51
SP9
Applied Cl-
Remaining Cl-

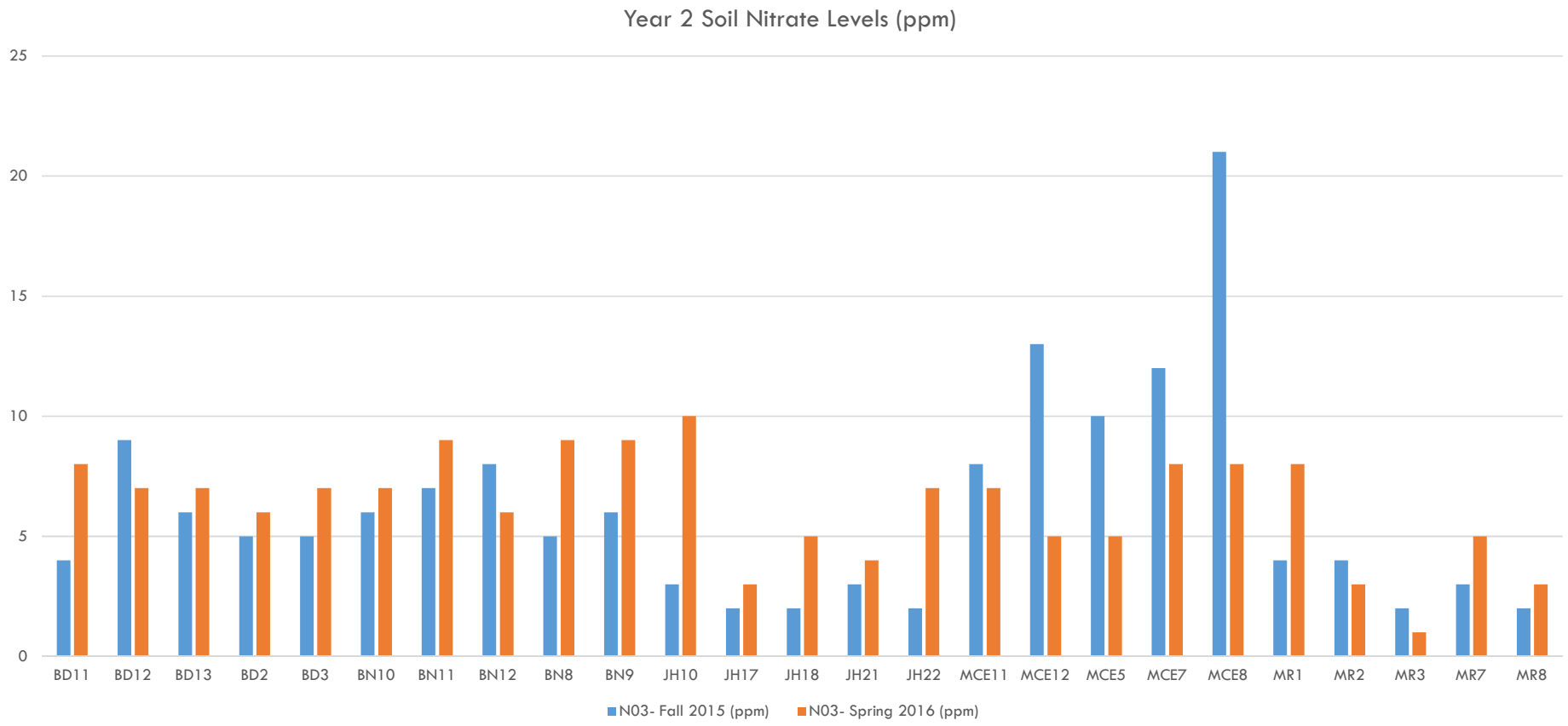
RESULTS


Year 2 Cl- Levels (lbs/ac)
180
160
140
120
100
80
60
40
20
0
BD11
BD12
BD13
BD2
BD3
BN10
BN11
BN12
BN8
BN9
MCE11
MCE12
MCE5
MCE7
MCE8
MR1
MR2
MR3
MR7
MR8
JH10
JH17
JH18
JH21
JH22
Applied Cl-
Remaining Cl-

CHLORIDE LEVELS

Chloride Levels in Soils in ppm	
Very Low	0-7 ppm
Low	8-15 ppm
Medium	16-22 ppm
High	22 - 30 ppm
Very High	30+ ppm

RESULTS


Year 2 Soil Nitrate Levels (ppm)
25
20
15
10
5
0
BD11
BD12
BD13
BD2
BD3
BN10
BN11
BN12
BN8
BN9
JH10
JH17
JH18
JH21
JH22
MCE11
MCE12
MCE5
MCE7
MCE8
MR1
MR2
MR3
MR7
MR8
N03- Fall 2015 (ppm)
N03- Spring 2016 (ppm)

CONCLUSION

Year 1

Sampled before plowing

5 fields spread VRA fall KCl

60% of sample points had lower spring soil K

- Most points 20-30% lower levels than expected

80% of lower spring K samples ranged between CEC of 3.8-7.6

- Note 17/25 or 68% of all samples points were 7.6 or lower

Year 2

Sampled after plowing

3 fields spread VRA fall KCl

28% of sample points had lower spring soil K

- Most points < 20% lower levels than expected

71-75% of lower spring K samples ranged between CEC of 3.8-7.7

- Note 14/25 or 56% of all samples points were 7.7 or lower

QUESTIONS???

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SOIL SUMMARY

Organic matter, potash levels and boron have been up and down over time

Phosphorous and calcium levels have been increasing

Magnesium, sulfur, manganese, copper and iron levels have stayed steady with the odd spike

pH has been steady, but declining since 2012

- Samples close to evenly split between low and medium ratings

SOIL SUMMARY

Our soils are very low in calcium and boron

Our soils are low in organic matter, magnesium and zinc

Our soils are medium in potassium and copper

Our soils are high in sulfur and manganese

Our soils are very high in phosphorous and iron

Table 15. MICRONUTRIENT SOIL TEST RATINGS AND SOIL APPLICATION RECOMMENDATION GUIDE

MINERAL	SOIL TEST PPM	SOIL TEST PPM	APPLICATION RATE*	
	Hot Water Extraction	D.T.P.A Extraction	High Response Crops	Low Response Crops
BORON	0-0.3 VL		1.5-2.0 lbs	0.5-1.0 lbs
	0.4-0.5 L		1.0-2.0 lbs	0-0.5 lbs
	0.6-1.2 M		0.5-1.0 lbs	0
	1.3-2.0 H		0-1.0 lbs	0
	2.0+ VH		0	0
	0.1 N HCl Extraction			
COPPER	0-0.3 VL	0-0.3 VL	2.0-5.0 lbs	1.0-3.0 lbs
	0.4-0.8 L	0.3-0.8 L	1.0-4.0 lbs	0.5-2.0 lbs
	0.9-1.5 M	0.9-1.2 M	0.5-3.0 lbs	0.-1.0 lbs
	1.6-3.0 H	1.3-2.5 H	0.-1.0 lbs	0
	3.0+ VH	2.5+ VH	0	0
IRON	0-3 VL	0-5 VL	1.0-2.0 lbs	1.0-3.0 lbs
	4-11 L	6-10 L	0-1.0 lbs	0-2.0 lbs
	12-24 M	11-16 M	0	0
	25-50 H	17-25 H		
	50+ VH	25+ VH		
MANGANESE	0-5 VL	0-4 VL	5.0-10.0 lbs	2.0 -6.0 lbs
	6-14 L	5-8 L	3.0-8.0 lbs	1.0-4.0 lbs
	15-29 M	9-12 M	2.0-4.0 lbs	0-2.0 lbs
	30-49 H	13-30 H	0-3.0 lbs	0-1.0 lbs
	50+ VH	30+ VH	0	0
ZINC	0.-0.9 VL	0-0.5 VL	5.0-8.0 lbs	3.0-5.0 lbs
	1.0-2.9 L	0.5-1.0 L	3.0-5.0 lbs	2.0-3.0 lbs
	3.0-4.9 M	1.1-3.0 M	2.0-3.0 lbs	1.0-2.0 lbs
	5.0-7.9 H	3.1-6.0 H	1.0-2.0 lbs	0
	7.9+ VH	6.0+ VH	0	0
	Ammonium Acid Oxalate 1N			
MOLYBDENUM	0-0.05 VL		3.0-4.0 oz	
	0.06-0.10 L		2.0-3.0 oz	
	0.11-0.20 M		1.0-2.0 oz	
	0.21-0.40 H		0	
	0.40+ VH		0	

* All recommendations are on a broadcast basis.
For banded application, divide the listed values by two or three.

SOIL BUILD FOR K

C.E.C. x ppm to build = Pounds K_2O required

Divide by years to build

Build + removal = total recommendation