

SPRING 2016
Data Collection Report
Soil & Water Consulting



— Est. 1947 —

Tucson Country Club



SOIL and WATER CONSULTING

Course Name: Tucson Country Club

Date of Visit: March 12, 2016

	<u>6/9/15</u>	<u>9/14/15</u>	<u>3/12/16</u>
Humidity/Air Temperature	62%/90°	52%/90°	46%/72°
Greens Temperature	76.4°	75.7°	51.6°
Fairway Temperature	76.7°	75°	52.8°

	Acceptable Range For Water Sample	Potable Lake <u>6/9/15</u>	Effluent Water <u>6/9/15</u>	Potable Lake <u>9/14/15</u>	Effluent Lake <u>9/14/15</u>	Potable Lake <u>3/12/16</u>	Effluent Lake <u>3/12/16</u>
EC	<2.25 mmhos/cm	0.44	1.22	0.40	0.46	0.39	0.44
Sodium		51.20	126.90	49.96	73.45	30.79	55.70
Calcium	20 - 60 ppm	33.22	91.61	25.38	14.50	34.87	25.08
Magnesium	10 - 25 ppm	2.26	16.11	2.29	3.48	2.80	1.76
Potassium	5 - 20 ppm	2.50	8.50	2.50	3.24	2.28	1.93
Nitrate	10 - 25 ppm	1.60	6.27	0.34	<0.10	n/t	1.15
Phosphorus	5 - 20 ppm	<0.20	0.76	<0.20	0.22	n/t	<0.20
Sulfur	30 - 90 ppm	37.05	158.01	42.51	49.59	39.69	35.88
Bicarbonate	<120 ppm	137.94	279.52	102.61	84.90	125.99	143.98
Boron	<0.67 ppm	0.01	0.28	0.10	0.13	0.06	0.11
Chloride	<177 ppm	30.81	142.29	32.00	40.68	22.30	30.98



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TEE	Acceptable Range For Alkaline Soils Sample	1,8,14 (avg) 6/9/15	2 9/14/15	5 3/12/16
Organic Matter (Humus)	2 - 3%	2.78	2.13	2.92
Sulfur	12 - 16 ppm	23.00	27.00	18.00
Olsen - Phosphorus	13 - 20 ppm	13.33	13.00	14.00
Calcium - TEC of 6 - 12	1,000 lbs/acre	2,468.00	4,890.00	5,064.00
Magnesium	>7% base saturation or at least 200 lbs/acre	8.06%/152.27	6.82%/250	7.13%/262
Potassium - TEC of 0 - 35	100 ppm	83.00	217.00	150.00
Copper	>0.8 ppm	0.78	1.05	0.95
Manganese	>1 ppm	2.00	3.00	2.00
Zinc	>1 - 2 ppm	4.89	3.79	4.71

FAIRWAY	Acceptable Range For Alkaline Soils Sample	1,8,14 (avg) 6/9/15	2 9/14/15	5 3/12/16
Organic Matter (Humus)	2 - 3%	3.45	3.15	4.11
Sulfur	12 - 16 ppm	35.00	30.00	22.00
Olsen - Phosphorus	13 - 20 ppm	25.33	17.00	28.00
Calcium - TEC of 6 - 12	1,000 lbs/acre	2,892.67	4,364.00	3,462.00
Magnesium	>7% base saturation or at least 200 lbs/acre	7.83%/176.67	8.26%/276	9.09%/246
Potassium - TEC of 0 - 35	100 ppm	157.00	225.00	213.00
Copper	>0.8 ppm	1.12	1.06	1.72
Manganese	>1 ppm	2.33	3.00	3.00
Zinc	>1 - 2 ppm	4.12	3.49	6.15

GREENS	Acceptable Range For Alkaline Soils Sample	1,8,14 (avg) 6/9/15	2 9/14/15	5 3/12/16
Organic Matter (Humus)	2 - 3%	0.69	0.83	0.52
Sulfur	12 - 16 ppm	25.00	9.00	15.00
Olsen - Phosphorus	13 - 20 ppm	20.00	17.00	16.00
Calcium - TEC of 6 - 12	1,000 lbs/acre	2,019.33	1,908.00	2,492.00
Magnesium	>7% base saturation or at least 200 lbs/acre	6.14%/105	7.94%/120	7.25%/148
Potassium - TEC of 0 - 35	150 ppm	373.00	217.00	384.00
Copper	>0.8 ppm	1.11	1.37	1.32
Manganese	4 ppm or more	1.00	2.00	1.00
Zinc	>1 - 2 ppm	3.46	4.81	3.18



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TEE	Acceptable Range For Saturated Paste Sample	2,11 (avg) 9/14/15	5,15 (avg) 3/12/16
Nitrate - Ryegrass	5 - 10 ppm		1.00
Nitrate - Bermudagrass	10 -15 ppm	5.55	
Phosphorus	2 - 10 ppm	2.46	1.16
Potassium	40 - 100 ppm	21.57	7.39
Calcium	60 - 200 ppm	53.03	42.29
Magnesium	20 - 70 ppm	7.43	5.88
Sodium	0 - 30 ppm	132.35	74.09
Soluble Salts	<1,920 ppm	634.00	338.50
Bicarbonate	<60 ppm	300.17	197.67
Chloride	<1,000 ppm	75.50	27.00
SAR	<4%	4.51	2.84

FAIRWAY	Acceptable Range For Saturated Paste Sample	2,11 (avg) 9/14/15	5,15 (avg) 3/12/16
Nitrate - Ryegrass	5 - 10 ppm		1.00
Nitrate - Bermudagrass	10 -15 ppm	66.25	
Phosphorus	2 - 10 ppm	2.46	1.95
Potassium	40 - 100 ppm	48.84	13.64
Calcium	60 - 200 ppm	87.14	28.31
Magnesium	20 - 70 ppm	14.06	4.78
Sodium	0 - 30 ppm	144.78	77.55
Soluble Salts	<1,920 ppm	904.50	329.50
Bicarbonate	<60 ppm	255.02	142.77
Chloride	<1,000 ppm	92.00	29.50
SAR	<4%	3.78	3.54

GREENS	Acceptable Range For Saturated Paste Sample	2,11 (avg) 9/14/15	5,15 (avg) 3/12/16
Nitrate - Bentgrass	1-3 ppm	1.65	<0.5
Phosphorus	2 - 7 ppm	4.07	2.07
Potassium	25-40 ppm	28.06	14.44
Calcium	50- 75 ppm	24.42	23.54
Magnesium	15-30 ppm	3.10	2.94
Sodium	0 - 30 ppm	41.04	33.93
Soluble Salts	<1,000 ppm	261.00	209.00
Bicarbonate	<60 ppm	153.75	96.40
Chloride	<200 ppm	23.00	18.50
SAR	<4%	2.08	1.76



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TEE	Acceptable Range For Tissue Sample	5,14 (avg) 3/12/2016
Nitrogen	3.34%-5.10%	4.25
Phosphorus	0.35% - 0.55%	0.56
Potassium	2.0% - 3.42%	2.94
Calcium	0.25%-0.5%	0.49
Magnesium	0.16%-0.32%	0.17
Sulfur	0.27% - 0.56%	0.47
Boron	5-17 ppm	8.80
Iron	97-934 ppm	545.50
Manganese	30-73 ppm	55.85
Copper	6-38 ppm	14.65
Zinc	16-84ppm	48.85
Aluminum	52-92 ppm	379.50
Sodium	229-1107 ppm	1,225.00

FAIRWAY	Acceptable Range For Tissue Sample	5,14 (avg) 3/12/2016
Nitrogen	3.34%-5.10%	4.83
Phosphorus	0.35% - 0.55%	0.48
Potassium	2.0% - 3.42%	2.86
Calcium	0.25%-0.5%	0.35
Magnesium	0.16%-0.32%	0.17
Sulfur	0.27% - 0.56%	0.46
Boron	5-17 ppm	10.70
Iron	97-934 ppm	367.50
Manganese	30-73 ppm	56.00
Copper	6-38 ppm	14.90
Zinc	16-84ppm	44.85
Aluminum	52-92 ppm	178.50
Sodium	229-1107 ppm	1,580.00

GREENS	Acceptable Range For Tissue Sample	5,14 (avg) 3/12/2016
Nitrogen	3.0%-6.5%	3.44
Phosphorus	0.2%-0.55%	0.50
Potassium	0.86%-2.55%	2.29
Calcium	0.21%-0.50%	0.58
Magnesium	0.09%-0.22%	0.16
Sulfur	0.23%-0.39%	0.41
Boron	5-24 ppm	15.70
Iron	99-500 ppm	661.00
Manganese	30-160 ppm	116.50
Copper	9-40 ppm	21.05
Zinc	5-60 ppm	60.40
Aluminum	63- 408 ppm	335.00
Sodium	506- 2264 ppm	924.00



RECOMMENDATIONS



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Thoughts on the course visit

This is your first Spring in Tucson and mine as well. I feel like I am still learning the property and the climate. I thought you would be further along in soil temperatures but it was about the same as what I have been seeing in Southern California and Las Vegas. Your overnight lows keep soil temperatures moderated from your much higher daytime temperatures. So I see no "hurry" to get out there and make things happen- the course was green and growing when I was there. The fertility recommendations for tees and fairways are some things you can spread out over the next 3 months. I would like to have you apply one application of the K-Mag soon to help the ryegrass and then one sometime in late June to help the bermudagrass. (the timing may need to move to early June if weather dictates)

The picture shows a profile of #4 green. You can see one of the holes from the deep tine machine that reached down into the original greens-mix. These greens need more of that and for those holes to be filled with new sand. You can see where the tine sort of pushed the topsoil down into the lower layer. We did discuss Drill and Fill helping immensely, but if there is any thought that these greens would be renovated, then that would be a waste of resources for now.



Focus of This Report

This Spring, every client that I visited I took a profile section out of one of their greens. Because I work with all ages of golf courses I have seen anything from a new sod layer to the typical 4-5" pan layer where it was a USGA recommended/constructed green. The picture of your profile (above) is not unusual but it does pose some problems. If you remember from school, the video that showed water moving through a soil profile. Even if there was coarse material layered over finer material, (which is the good rule of thumb when selecting topdressing sands) whenever the water hit a layer, it had to fill the first layer before it drained into the next layer and so on through the soil. It seems like simple physics and gravity, but it does matter to you with regards to moving water in and out of your greens. I see much more dead grass from too much water that from not enough and when you have 2 or more perched water tables in a 12-14" soil profile, that can wreak havoc on the turf. Then add the traffic from machines and people to that, it is reasonable to get disease and worn areas on the greens. So, how can you fix it? Nothing will be quick but you can work on it and improve drainage as time goes on. Cultivate in every layer. Verti-cutting and topdressing works on the thatch, 3-5" core aeration will help the current root zone and most of all below 5"! It is the layer least worked on and the area can show the most dramatic results.

Notes from the visit

- Deep tined greens on Monday 3/7...very little disruption was visible.
- Roto-knifed the fairways one time.
- 0.120" greens mowing height.
- Air2G2 rental to do greens and wet and cart traffic areas in rough and fairways.
- Kyle had announced his leaving the Club.

Fertilizer and Product Recommendations

Tee & Fairways

Nitrogen- Apply a N-P-K for bermudagrass as weather dictates.

Calcium- 500 pounds of product per acre. (Gypsum)

Magnesium/Potassium- 800 pounds of product per acre. (0-0-22; K-Mag) Apply in 2 applications before July 1st

Greens (Monthly applications)

Calcium- 5 pounds of product per 1,000 square feet. (Gypsum)

Magnesium- 3 pounds of product per 1,000 square feet. (Pro-mag)

Potassium- 2 pounds of product per 1,000 square feet (0-0-50)

Minor Nutrients- Spray 3 ounces per 1,000 square feet. (Tech-Magnum) **WATER IN!!!**

*** Synthetic acid spray and water in every two weeks**