Del Rio Golf and Country Club
Drought Response Plan

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Property Contact
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I. Site Assessment- Area, Plants, General Factors

- **Greens** - Total – 148,944 square feet / 3.42 square acres
  A1 – A4 Bent Grass (Low drought tolerance)
  Soil Types – 95/5 USGA Greens mix
  Cutting height - .095" - .110"
  Technology – Quick couplers for hand watering, small flat greens with multiple cup locations, use of wetting agents, aggressive cultural practices (aeration, topdressing, and verticutting), and scouting and utilizing Fieldscout computerized hand held moisture meter to check field moisture levels of soils. The daily maintenance of mowers ensures maximum quality of cut to improve plant health and conserve water. Multiple sprinkler controls that include Motorola radios and computerized central (Lynxs program by Toro) controls.

- **Tees** – 138,902 square feet / 3.19 square acres,
  Pennlinks Bent Grass (Low drought tolerance)
  Soil – Sand capped on a sandy loam soil.
  Cutting height .25" to .40"
  Technology – Several tee surfaces are shaded heavily and uses less water. Most of the tee surfaces are in direct sun light. Tees are well irrigated and properly drained, and scouting and utilizing Fieldscout computerized hand held moisture meter to check field moisture levels of soils. Divots are replaced and topdressed daily to improve overall turf health. Mowers are serviced prior to each use to ensure quality of cut improving plant health and conserving water. Multiple sprinkler controls that include Motorola radios and computerized central (Lynxs program by Toro) controls.

- **Fairways** – 1,776,036 square feet / 40.77 square acres
  #1 Oak Course fairway is Tifway II Hybrid Bermuda grass (High drought tolerance). The balances of the fairways are Common Bermuda (High drought tolerance).
  Soil – Sixteen fairways are on sandy loam soils which have a low water holding capacity. Eleven fairways are on native clay that provides good water holding capacity
  Cutting height - .5"
  Technology – Cycle and soak features within the central irrigation program, efficient sprinkler head placement and nozzle size selection per manufactures specifications. Mowers are serviced prior to each use to ensure quality of cut to improve plant health and conserve water. Multiple sprinkler controls that include satellites, Motorola radios, manual bypass, and central (Lynxs by Toro) computer controls.

- **Collars and Approaches** – 54,319 square feet / 1.25 square acres
  Oak Course is Penncross Bent Grass which was recently renovated (Low drought tolerance). Bluff and River Courses are Pennlinks Bent Grass (Low drought tolerance). Plans are to renovate the Bluff Course collars and approaches this fall. The River Course will be renovated in 2015.
  Soils- Oak approaches was sand capped and drained. Bluff Course was built on sandy loam soils. River Course was built on native clay soil.
  Cutting height - .4"
  Technology – Quick couplers for hand watering, use of wetting agents, and scouting and utilizing Fieldscout computerized hand held moisture meter to check field moisture levels of soil. Collars and approaches are well irrigated and properly drained. Mowers are serviced prior to each use to ensure quality of cut improving plant health and conserving water. Multiple sprinkler controls that include Motorola radios and computerized central (Lynxs program by Toro) controls.

- **Rough** – 122 Acres, Combination of Common Bermuda grass, Rye
  Grass and Poa Annua (Medium drought tolerance). The roughs are over seeded with Rye Grass in the fall (Medium drought tolerance). Cutting height is one and a half inches. Cycle and soak features within the central irrigation controls mark slope areas in the rough and allow more water to be absorbed by preventing runoff through shorter, multiple run times.

  Driving Range – 8.26 Acres, Hybrid Bermuda Tee and Common Bermuda Landing Area (High Drought Tolerance). The tee and target greens are over seeded each fall (Medium drought tolerance). Cutting height is .4" on the tee surface and one and a half inches in the landing area. Cycle and soak features within the central irrigation controls mark slope areas in the rough and allow more water to be absorbed by preventing runoff through shorter, multiple run times.

- **Clubhouse Lawns** -18,450 square feet /.42 acres
  Fescue – Bluegrass Mix (Medium drought tolerance)
  Soil Types – Sandy Loam
  Cutting height - 1"
  Technology – Quick couplers for hand watering, use of wetting agents, and scouting and utilizing Fieldscout computerized hand held moisture meter to check field moisture levels of soil.

- **Landscape** – 47,916 square feet /1.1 acres
  Mixture of flowers and ornamental plant selections that are part of our Integrated Pest Management Program, soils are sandy loam based and amended with organic soil conditioners to improve water holding capacity.

  Total Irrigated turf is 179.31 acres

II. Irrigation Audit Summary

- **Pump Station** - Flowtronex Programmable Logic Controller (PLC) panel with four 75 horse power centrifical variable speed on demand pumps and a jockey pressure maintenance pump. This system also features a silt- separation system. The main discharge line is 12 inches. The pump station during the summer months is program to operate at 2,000 GPM at a line pressure of 125psi. Spring, Winter and Fall we operate at 1,500 GPM.

- **Wells** – The main well is a 40 horse power pump located behind the homes left of #5 golf hole on the River Course. The well is 80 feet deep. The water is pumped into a 6.14 surface acre lake located between golf holes #4, #5 and #6 on the River Course. This well was rebuilt last year. We

also have three original wells on the property. One located by maintenance facility, another is right of #6 green on the Oak Course and the third is behind #2 green on the Bluff Course. These three wells are currently not in service.

- **Controls** – Toro Lynxs Central Controls with T Mapping and Toro NSN Service Plan for 24 hour a day technical support. Field controls of 60 field Osmac satellites and four Motorola radios. The control package was replaced last year.

- **Irrigation System Statistics** – Inside/outside loops on water mainlines, Quick couplers at each green and tees complex for hand watering, Toro Lynxs Central Control, and 3,346 Toro golf course sprinkler and hundreds of landscape pop up sprinklers.

- **Distribution Uniformity Test (DUT):** – The DUT on the Oak and Bluff Courses is estimated at 80%. The DUT on the River Course and Driving Range is estimated at 60%. Certified irrigation auditor should be brought in to confirm the DUT percentage soon.

III. Measuring Water Usage

- **Metering** – We use the actual water flow through the meter at the pump house for our record keeping. We use sprinkler flow management information on Lynxs computer for water daily use.
- **Record Keeping**-Irrigation usage in the past was recorded monthly. Now we're recording weekly meter reading. Total water used in 2013 was 247,147,369 gallons / 756.49 acre feet.

IV. Water Conservation Management Practices

- **Mowing standards** - By keeping standard heights of cut (do not mow lower than needed) to reduce plant stress.
- **Create new irrigation programs** – Develop on Lynxs computer a new program that is specifically for drought.
- **Soil cultivation** – Aerate and topdress to promote good root depth enhancing water efficiency of the plant – Greens three times per year, tees twice per year and fairways twice per year using a deep core aerator and a Graden verticutter.
- **Evapotranspiration** – Utilize CIMIS as a guide line. Weather data to help schedule irrigation cycles based on evapotranspiration.
- **Landscape Material Selection** – Install only strong plant material adapted to the climate for water use efficiency. Use mulch to hold moisture.
- **Fertilization** – Do not over fertilize turf to keep from using too much water. Maintain low levels of nitrogen (3 lbs on roughs, 5 lbs on fairways and 2 to 3 lbs on greens and tees per growing season)
- **Pest Management** – Scout for indicators, use precise applications, apply early morning or in the evening (when irrigating in) to reduce water loss. Utilize an integrated pest management plan that starts with plant selections.
- **Wetting Agents** – Utilize wetting agents to enhance water applications to hydrophobic areas reducing water runoff and loss. Current wetting agent program consist on greens, collars, approaches, tees, fairways and lawns.
- **Rainfall** - Plan to utilize natural rainfall to support fertilizer applications whenever possible to conserve water.
- **Over Seeding** – Limit fall over seeding to green surrounds, tee surrounds, intermediate roughs and around the clubhouse approximately 18 acres. Prior over seeding consisted of the entire rough of 120 acres.

- **Turf Conversion** – Following Golf Course Architect Forrest Richardson recommendations on "Mow What Matters". Selectively remove well-manicured turf grass and replace it with native, drought tolerant un-mowed natural planting. Del Rio is considering converting 12 acres in the future.
- **Water Testing** – Bi-annually water samples taken by DRCC staff following water testing protocols. These samples at sent to Logan Labs for evaluation. Knowing the quality of water we are able to treat the water or soil to maximize the water usage. The last testing was completed 6-18-13.

V. Record Keeping

- Man hours involved with scouting
- Man hours involved with handwatering
- Man hours involved with irrigation repairs
- Total irrigation repair cost for 2013 was $10,063
- Total pump station repair and maintenance for 2013 was $3,256.
- Total water well repair cost for 2013 was $13,500.
- Weekly, Monthly and Yearly water usage
- Water quality tests
- Pesticide and fertilizer applications (in relation to irrigation)

VI. Best Management Practices and Current Irrigation Cost

- **Pump Station** - ($292,000) Pump station with low pressure and high flow shut down, control technology to keep loss down from high pressure relief and leaks. Smart pump monitoring system that detects leaks, water loss and displays overall pump status.

- **Toro Lynxs Central and Radio Controls** – The computer, program and radios was replaced last year ($75,000) for efficient night watering and daily watering of isolated hot spots.

- **Staffing** – Full time irrigation assistant to handle repairs, inventory, scheduling, etc…($30,000), part time help on repairs, inspections, and preventive maintenance ($9,000), Assistant Superintendent Supervisor time ($50,000). Irrigation technician Raudle Guardado and Golf Course Superintendent David Bermudez are certified as a Toro Central Control Operator.

- **Scouting** – Daily scouting for wet spots, dry spots or signs of malfunction within the irrigation system ($50,000)

- **Hand watering** – Two seasonal help working 1,052 hours each from middle of April to middle of October to hand water flowers, sod, dry spots on greens, tees and fairways ($23,670)

- **Night water** – Water course at night to reduce loss of waters from evaporation and to keep from extending the natural free moisture range. (disease pressure reduced) No overhead watering from 9:00 am to 7:00 pm.

- **Rain, Leak, etc…Loss controls** – See scouting, pump controls, irrigation controls.

- **Traffic Controls** – Reduction of traffic stress by utilizing signs, ropes, cart path restrictions, multiple mowing directions and rerouting of maintenance equipment. These efforts reduce compaction and plant stress while increasing drought tolerance and efficient water use. Total cost ($4,500)

VII. Educational Programs- What people need to know about golf courses and water

- **Benefits of Golf Course and Turf in our Community**
  - Economic contributor
  - Carbon dioxide exchange for oxygen
  - Temperature moderation
  - Erosion control
  - Water filter for improved water quality
  - Wildlife sanctuary
  - Recreational benefits of reduced stress and increased health
  - Community outreach (first tee programs, garden clubs, school
  - projects, property tours)

- **Develop Member Education Programs**
  Publish this Best Management Plan for use at club in the monthly newsletter.
  During drought have papers on water conservation in the pro shop and locker rooms for members and patrons to use at home.
  Inform the membership that our staff attends over 100 hours of continuing education in Environmental/Best Management Practices each year. This keeps us current with industry Best Management Practices.

VIII. Water Conservation Plan

- **Del Rio Golf and Country Club Philosophy** – Proper water management dictates that OVER WATERING is unacceptable. Playability dictates that dry is better therefore over watering is bad for the game. Over watering will break down the environment and microenvironment that are essential for the success of turf and landscape plant.
  Economics – Watering and water management costs money.
  Economics – Players reject wet golf courses.
  Environmental - Water is a natural resource that is limited.
  The Cornerstone of Environmental Stewardship is Effective Water Management.

- **Strategies to Improve Water Stewardship- C**ounter measures that reduces effects of a drought
  - Raise mowing heights where possible
  - Stop mowing in areas that are cut off or greatly reduced.
  - Increase handwatering
  - Reduce golf cart traffic
  - Reduce fertility
  - Keep mowers sharp, service mower prior to use. Ensure parts are in good working order.
  - Education of patrons
  - Utilize more landscape features (stone, rock, timbers, statues etc…) to reduce square footage of live flower plantings thereby conserving water.

- **Water Conservation Levels -** Immediately implement Level II water reduction. Proceed with Level III if mandated.
  - **Level I 10% Reduction**
    Reduce perimeter of the golf course by – 25%
    Reduce the driving range landing area by - 25%
    Reduce out of play areas by – 25%
    Reduce landscaping by - 25%
    Irrigate at 80% evapotranspiration

- **Level II 20% Reduction**
  Reduce perimeter by an additional 15%.
  Reduce the driving range landing area an additional 15%
  Reduce out of play areas an additional 15%
  Reduce landscape areas an additional 15%
  Reduce roughs by – 10%
  Reduce fairways by – 10%
  Irrigate at 70% to 75% evapotranspiration

- **Level III 30% Reduction**
  Turn off perimeter of golf course
  Turn off the driving range landing area.
  Turn off the out of play areas
  Reduce fairways by an additional 10%.
  Reduce roughs by an additional 10% (Be careful not to hurt the mature trees).
  Reduce area between tees and fairways by - 30%
  Irrigate at 65% - 70% evapotranspiration

Actual water used in 2013.

Date	Meter Read	Amt Used	
1/1/2013	3048397285	583,407	Jan-13
2/1/2013	3048980692	10,231,421	Feb-13
3/1/2013	3059212113	16,253,415	Mar-13
4/1/2013	3075465528	30,529,999	Apr-13
5/1/2013	3105995527	25,183,263	May-13
6/1/2013	3131178790	33,629,013	Jun-13
7/1/2013	3164807803	46,167,213	Jul-13
8/1/2013	3210975016	37,996,833	Aug-13
9/1/2013	3248971849	23,177,085	Sep-13
10/1/2013	3272148934	15,800,043	Oct-13
11/1/2013	3287948977	4,790,170	Nov-13
12/1/2013	3292739147	2,805,507	Dec-13
Total gallons		**247,147,369**	
Total Acre Feet		**756**	**326,700 gallons = 1 acre foot.**

New Water Allocations

New Water Allocations

Month	10 % Reduction	20% Reduction	30% Reduction
January	2,000,000	1,800,000	1,620,000
February	2,000,000	1,800,000	1,620,000
March	5,000,000	4,500,000	4,050,000
April	18,000,000	16,200,000	14,580,000
May	25,000,000	22,500,000	20,250,000
June	35,000,000	31,500,000	28,350,000
July	40,000,000	36,000,000	32,400,000
August	40,000,000	36,000,000	32,400,000
September	35,000,000	31,500,000	28,350,000
November	3,000,000	2,700,000	2,430,000
December	2,000,000	1,800,000	1,620,000
Total Gallons	**222,000,000**	**199,800,000**	**179,820,000**
Total Acre Feet	**680**	**612**	**551**

The water reductions are based off 2013 total actual water used.