USGA

USGA Recommendations For a Method of

PUTTING GREEN CONSTRUCTION

2004 revision of the USGA Recommendations for a Method of Putting Green Construction

by the

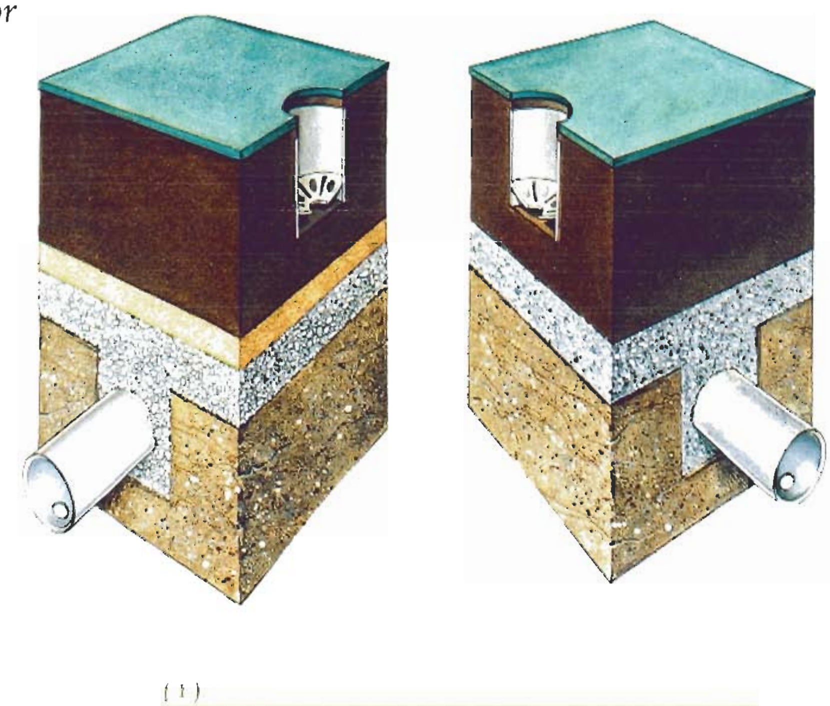
United States Golf Association Green Section Staff

PG 1110

Attachment 2

For more than 40 years *the USGA recommendations for green construction have been the most widely used method of green construction throughout the United States and in other parts of the world. When built and maintained properly, USGA greens have provided consistently good results for golf courses over a period of many years. These guidelines are periodically reviewed and updated as a result of scientific research and as new techniques and materials are proven reliable.*

This document specifically represents the USGA Green Section's recommendations for green construction. It does not include a discussion of construction techniques or methods. Additional documents are available from the USGA that describe construction methods, offering tips for success and providing guidance for green management.



Step 1 ■ The Subgrade

The slope of the subgrade should conform to the general slope of the finished grade. The subgrade should be established approximately 16 inches (400 mm) below the proposed surface grade - 18 to 20 inches (450 to 500 mm) when an intermediate layer is necessary - and should be thoroughly compacted to prevent further settling. Water collecting depressions should be avoided.

If the subsoil is unstable, such as with an expanding clay, sand, or muck soil, geotextile fabrics may be used as a barrier between the subsoil and the gravel blanket. Install the fabric as outlined in Step 2.

Construct collar areas around the green to the same standards as the putting surface itself.

Figure 1 – The subgrade must be smooth, firmly compacted, and be free of water-collecting hollows.

Step 2 ■ Drainage

A subsurface drainage system is required in USGA greens. The pattern of drainage pipes should be designed so that the main drain(s) is placed along the line of maximum fall, and laterals are installed at an angle across the slope of the subgrade, allowing a natural fall to the main. Lateral drains shall be spaced not more than 15 feet (5 m) apart and extended to the perimeter of the green. Laterals should also be placed in water-collecting depressions if they exist. At the low end of the gradient, where the main drain exits the green, drainage pipe should be placed along the perimeter of the green, extending to the ends of the first set of laterals. This will facilitate drainage of water that may accumulate at the low end of that drainage area. Drainage design considerations should be given to disposal of drainage waters away from play areas, and to the laws regulating drainage water disposal.

Figure 2 – Lateral lines should be spaced not more than 15 feet (5m) apart and have a natural fall to the mainline of at least 0.5%.

Drainage pipe shall be perforated plastic, minimally conforming to ASTM 2729 or ASTM F 405, with a minimum diameter of 4 inches (100 mm). Waffle drains or any tubing encased in geotextile sleeves are not recommended. Drainage trenches minimally 6 inches (150 mm) wide and 8 inches (200 mm) deep shall be cut into a thoroughly compacted subgrade so that drainage pipes maintain a consistent slope to the outlet of at least 0.5%. Spoil from the trenches should be removed from the subgrade cavity, and the floor of the trench should be smooth and clean. If a geotextile fabric is to be used as a barrier between unstable subsoil and the gravel drainage blanket, it should be installed at this time. Under no circumstances should the fabric cover the drainage pipes or trenches. A layer of gravel (see Step 3 for size recommendations) should be placed in the trench to a minimum depth of 1 inch (25 mm). It may be deeper, as necessary, to ensure minimal slope requirements. All drainage pipes should be placed on the gravel bed in the trench. PVC drainpipe, if used, should be placed in the trench with the holes facing down. Pipe connections shall not impair the overall function of the pipeline. The trenches should then be backfilled with additional gravel, taking care not to displace any of the drainage pipes.

As an alternative to round pipe placed in a trench, flat pipe placed directly on the prepared subgrade may be employed, provided the flat pipe conforms to ASTM D 7001 (provisional), is a minimum of 12 inches (300 mm) in width, and is not covered by a geotextile sleeve. The flat pipe shall be stapled to the subgrade, or otherwise held in place to prevent shifting during construction. Rational combinations of round and flat pipe may be employed within a greens drainage system. All other guidelines for drainage system installation shall apply for this alternative construction method.

Step 3 ■ Gravel and Intermediate Layers

Place grade stakes at frequent intervals over the subgrade and mark them for the gravel drainage blanket layer, intermediate layer (if included), and root zone layer.

The entire subgrade then shall be covered with a layer of clean, washed, crushed stone or pea gravel to a minimum thickness of four inches (100 mm), conforming to the proposed final surface grade to a tolerance of ±1 inch.

Soft limestones, sandstones, or shales are not acceptable. Questionable materials should be tested for weathering stability using the sulfate soundness test (ASTM C-88). A loss of material greater than a 12% by weight is unacceptable.

The LA Abrasion test (ASTM C-131) should be performed on any materials suspected of having insufficient mechanical stability to withstand ordinary construction traffic. The value obtained using this procedure should not exceed 40. Soil engineering laboratories can provide this information.

The need for an intermediate layer is based on the particle size distribution of the root zone mix relative to that of the gravel. When properly sized gravel (see Table 1) is available, the intermediate layer is not necessary. **If the properly sized gravel cannot be found, an intermediate layer must be used.**

Figure 3 – Gravel drainage blanket installed to proper depth by using grade stakes.

TABLE 1

PARTICLE SIZE DESCRIPTION OF GRAVEL AND INTERMEDIATE LAYER MATERIAL	
Material	**Description**
Gravel: Intermediate layer is used	Not more than 10% of the particles greater than ½" (12 mm)
	At least 65% of the particles between ¼" (6 mm) and ⅜" (9 mm)
	Not more than 10% of the particles less than 2 mm
Intermediate Layer Material	At least 90% of the particles between 1 mm and 4 mm

TABLE 2

SIZE RECOMMENDATIONS FOR GRAVEL WHEN INTERMEDIATE LAYER IS NOT USED	
Performance Factors	**Recommendation**
Bridging Factor	D15 (gravel) less than or equal to 8 X D85 (root zone)
Permeability Factor	D15 (gravel) greater than or equal to 5 X D15 (root zone)
Uniformity Factors	D90 (gravel) / D15 (gravel) is less than or equal to 3.0
	No particles greater than 12 mm
	Not more than 10% less than 2 mm
	Not more than 5% less than 1 mm

A. Selection and Placement of Materials When the Intermediate Layer Is Used

Table 1 describes the particle size requirements of the gravel and the intermediate layer material when the intermediate layer is required.

The intermediate layer shall be spread to a uniform thickness of two to four inches (50 to 100 mm) over the gravel drainage blanket (*e.g.*, if a 3-inch depth is selected, the material shall be kept at that depth across the entire area), and the surface shall conform to the contours of the proposed finished grade.

B. Selection of Gravel When the Intermediate Layer Is Not Used

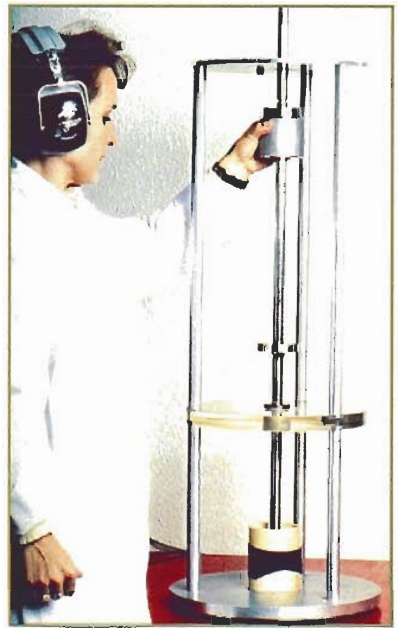


Figure 4 – Laboratory testing of gravel and rootzone materials is mandatory to ensure the success of a green built to USGA guidelines.

If an appropriate gravel can be identified (see Table 2), the intermediate layer need not be included in the construction of the green. In some instances, this can save a considerable amount of time and money.

Selection of this gravel is based on the particle size distribution of the root zone material. The architect and/or construction superintendent must work closely with the soil testing laboratory in selecting the appropriate gravel. Either of the following two methods may be used:

Send samples of different gravel materials to the lab when submitting samples of components for the root zone mix. As a general guideline, look for gravel in the 2 mm to 9.5 mm range. The lab first will determine the best root zone mix, and then will test the gravel samples to determine if any meet the guidelines outlined below.

Submit samples of the components for the root zone mix, and ask the laboratory to provide a description, based on the root zone mix tests, of the particle size distribution required of the gravel. Use the description to locate one or more appropriate gravel materials, and submit them to the laboratory for confirmation.

Gravel meeting the criteria below will not require the intermediate layer. It is not necessary to understand the details of these recommendations; the key is to work closely with the soil testing laboratory in selecting the gravel. **Strict adherence to these criteria is imperative; failure to follow these guidelines could result in greens failure**.

The criteria are based on engineering principles that rely on the largest 15% of the root zone particles "bridging" with the smallest 15% of the gravel particles. Smaller voids are produced, and they prevent migration of root zone particles into the gravel yet maintain adequate permeability. The D85 (root zone) is defined as the particle diameter below which 85% of the soil particles (by weight) are smaller. The D15 (gravel) is defined as the particle diameter below which 15% of the gravel particles (by weight) are smaller.

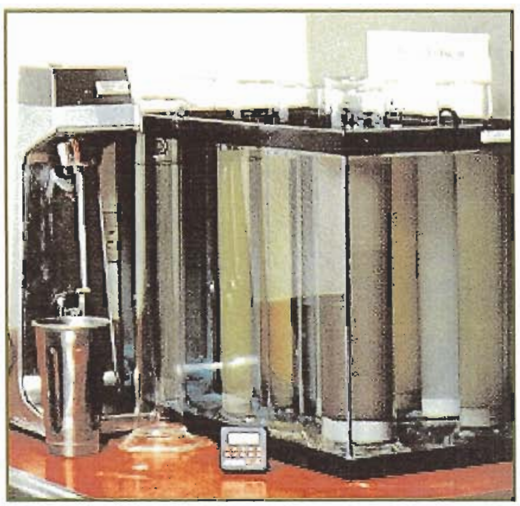


Figure 5 – Testing requires specialized equipment and skills and should be accomplished only by an accredited laboratory.

- For **bridging** to occur, the D15 (gravel) must be less than or equal to eight times the D85 (root zone).
- To maintain adequate **permeability** across the root zone/gravel interface, the D15 (gravel) shall be greater than or equal to five times the D15 (root zone).
- The gravel shall have a **uniformity coefficient** (Gravel D90/Gravel D15) of less than or equal to 3.0.

Furthermore, any gravel selected shall have 100% passing a 1/2" (12 mm) sieve and not more than 10% passing a No. 10 (2mm) sieve, including not more than 5% passing a No. 18 (1mm) sieve.

Sand Selection:

The sand used in a USGA root zone mix shall be selected so that the particle size distribution of the **final root zone mixture** is as described in Table 3.

TABLE 3

Particle Size Distribution of USGA Root Zone Mix

Name	Particle Diameter	Recommendation (by weight)
Fine Gravel	2.0 – 3.4 mm	Not more than 10% of the total particles in this range, including a maximum of 3% fine gravel (preferably none)
Very Coarse Sand	1.0 – 2.0 mm	
Coarse Sand	0.5 – 1.0 mm	Minimum of 60% of the particles must fall in this range
Medium Sand	0.25 – 0.50 mm	
Fine Sand	0.15 – 0.25 mm	Not more than 20% of the particles may fall within this range
Very Fine Sand	0.05 – 0.15 mm	Not more than 5%
Silt	0.002 – 0.05 mm	Not more than 5%
Clay	less than 0.002 mm	Not more than 3%
Total Fines	very fine sand + silt + clay	Less than or equal to 10%

Soil Selection:

If soil is used in the root zone mix, it shall have a minimum sand content of 60%, and a clay content of 5% to 20%. The final particle size distribution of the sand/soil/peat mix shall conform to that outlined in these recommendations, and meet the physical properties described herein.

Organic Matter Selection:

Peats – The most commonly used organic component is a peat. If selected, it shall have a minimum organic matter content of 85% by weight as determined by loss on ignition (ASTM D 2974 Method D).

Figure 6 – Rootzone components must be blended uniformly. Mechanical blenders are best suited to this task.

Other organic sources – Organic sources such as rice hulls, finely ground bark, sawdust, or other organic waste products are acceptable if composted through a thermophilic stage, to a mesophilic stabilization phase, and with the approval of the soil physical testing laboratory. Composts shall be aged for at least one year. Furthermore, the root zone mix with compost as the organic amendment must meet the physical properties as defined in these recommendations.

Composts can vary not only with source, but also from batch to batch within a source. Extreme caution must be exercised when selecting a compost material. Unproven composts must be shown to be nonphytotoxic using a bentgrass or bermudagrass bioassay on the compost extract.

Inorganic and Other Amendments:

Porous inorganic amendments such as calcined clays (porous ceramics), calcined diatomites, and zeolites may be used in place of or in conjunction with peat in root zone mixes, provided that the particle size and performance criterion of the mix are met. Users of these products should be aware that there are considerable differences among products, and long term experience with some of these materials is lacking. It should also be noted that the USGA requires any such amendment to be incorporated throughout the full 12-inch (300 mm) depth of the root zone mixture. Polyacrylamides and reinforcement materials are not recommended.

Physical Properties of the Root Zone Mix:

The root zone mix shall have the properties summarized in Table 4, as tested by USGA protocol (proposed ASTM Standards).

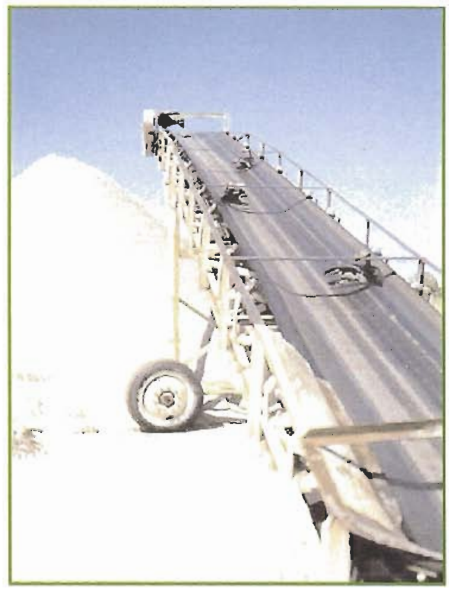


Figure 7 – The final product.

TABLE 4

PHYSICAL PROPERTIES OF THE ROOT ZONE MIX

Physical Property	Recommended Range
Total Porosity	35% – 55%
Air-filled Porosity	15% – 30%
Capillary Porosity	15% – 25%
Saturated Hydraulic Conductivity	Minimum of 6 inches/hr (150 mm/hr)

Related Concerns

IT IS ABSOLUTELY ESSENTIAL TO MIX ALL ROOT ZONE COMPONENTS OFF-SITE. No valid justification can be made for on-site mixing, since a homogeneous mixture is essential for success.

A QUALITY CONTROL PROGRAM DURING CONSTRUCTION IS STRONGLY RECOMMENDED. Documents describing quality control programs in detail can be found on the USGA's Web site at *www.usga.org/green/coned.* Arrangements should be made with a competent laboratory to routinely check gravel and root zone mixtures during production and blending. It is imperative that these materials conform to the recommendations approved by the laboratory in all respects.

Care should be taken to avoid overshredding the peat, since it may influence performance of the mix in the field. Peat should be moist during the mixing stage to ensure uniform mixing and to minimize peat and sand separation.

Step 5 ■ Top Mix Covering, Placement, Smoothing, and Firming

The thoroughly mixed root zone material shall be placed on the green site and firmed to a uniform depth of 12 inches (300 mm), with a tolerance of ± 1 inch (25 mm). Be sure that the mix is moist when spread to discourage migration into the gravel and to assist in firming.

Step 6 ■ Seed Bed Preparation

Sterilization: Sterilization of the root zone mix by fumigation should be decided on a case by case basis, depending on regional factors. Fumigation always should be performed:

In areas prone to severe nematode problems.

In areas with severe weedy grass or nutsedge problems.

When root zone mixes contain unsterilized soil.

Check with your regional office of the USGA Green Section for more information and advice specific to your area.

Step 7 ■ Fertilization

Contact your regional USGA Green Section office for establishment fertilizer recommendations and grow-in procedures.

Conclusion

This document details the recommendations of the USGA Green Section for the construction of golf greens. A great deal more information regarding various construction techniques used to build the USGA green can be obtained from the regional Green Section offices and the Green Section's Construction Education Program. The Construction Education Program can be reached at the following address:

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Appendix I

Test Methods and Material Specifications

ASTM C 88-99a. Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulfate. American Society for Testing and Materials.

ASTM C 131-03. Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine. American Society for Testing and Materials.

ASTM C 136-96a. Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates. American Society for Testing and Materials

ASTM D 75.-97. Standard Practice for Sampling Aggregates. American Society for Testing and Materials.

ASTM D 854-02. Standard Test Method for Specific Gravity of Soil Solids by Water Pycnometer. American Society for Testing and Materials.

ASTM D 2729-03. Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings. American Society for Testing and Materials.

ASTM D 2974-00. Standard Test Methods for Moisture, Ash, Organic Matter of Peat and Other Organic Soils. American Society for Testing and Materials.

ASTM D 2976-71. Standard Test Method for pH of Peat Materials. American Society for Testing and Materials.

ASTM 4972-01. Standard Test Method for pH of Soils. American Society for Testing and Materials.

ASTM D 7001-XX. Standard Specification for Geocomposites for Pavement Edge Drains and Other High-Flow Applications

ASTM F 405-97. Standard Specification for Corrugated Polyethylene (PE) Pipe and Fittings. American Society for Testing and Materials.

ASTM F 1632-03. Standard Test Method for Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sports Field Rootzone Mixes. American Society for Testing and Materials.

ASTM F 1647-02a. Standard Test Method for Organic Matter Content of Putting Green and Sports Turf Root Zone Mixes. American Society for Testing and Materials.

ASTM F 1815-97. Standard Test Methods for Saturated Hydraulic Conductivity, Water Retention, Porosity, Particle Density, and Bulk Density of Putting Green and Sports Turf Root Zone Mixes. American Society for Testing and Materials.

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Plans & Specifications For

Adding a Golf Course to Private Airport

Middletown, California

TABLE OF CONTENTS

1. INTRODUCTION

This document contains plans and specifications for adding a golf course to the private airport property located at 19970 S. Hwy 29 in Middletown. Following a series of consultations with the Lake County Planning Department, and many discussions with our neighbors and friends in Middletown, we are excited to present these details about what we believe is the ideal complement to the existing and future best and highest uses of our property. These can broadly be summarized as (a) agriculture, (b) aviation, (c) fire prevention and abatement, and (d) recreation including golf and lodging.

We are thrilled about this addition to our property and would like to thank everyone who has expressed support and encouragement for our plans.

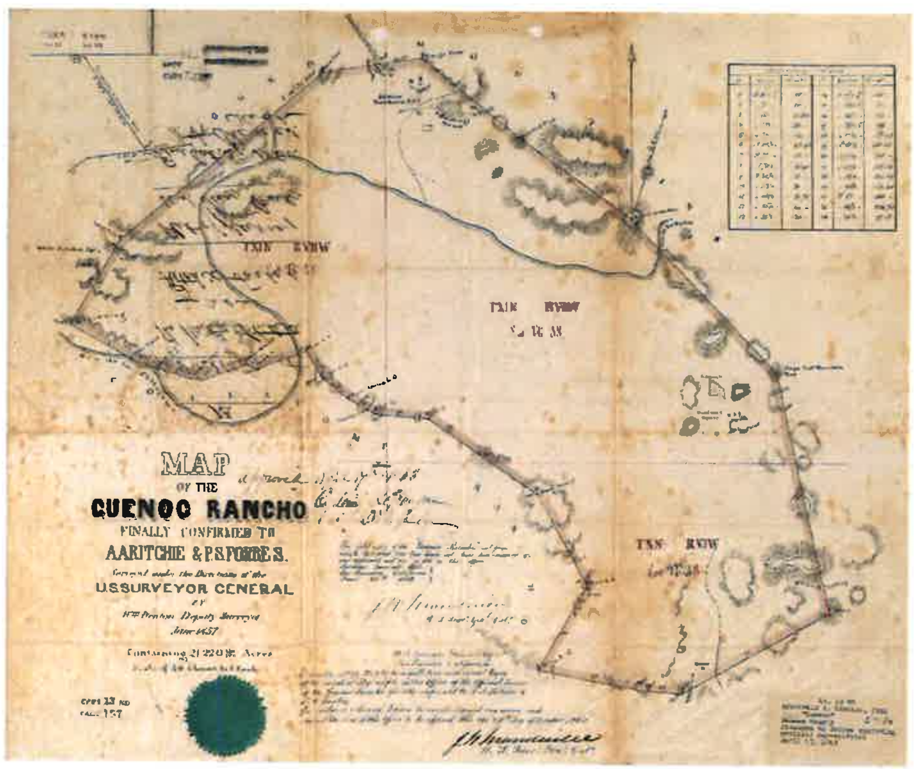
Respectfully submitted,

Eric Berridge & James Duncan
Middletown, California
December 10, 2018

2. NARRATIVE DESCRIBING PROJECT

Background

Since before the beginning of recorded history, the Middletown region has been inhabited by the Wappo and the Pomo. In more recent times, the private airport property was part of Rancho Guenoc, a Mexican land grant given in 1845 by Governor Pico to one Mr. George Rock. Rock soon abandoned his claim which was taken up by Messrs. Ritchie and Forbes, in 1852. Parcels were thereafter sold off incrementally during the second half of the 19th century. In 1888 Lillie Langtry, the famous actress, purchased a plot that is now part of Langtry Estate & Vineyard, for purposes of raising horses and growing grapes.



Map of Rancho Guenoc. The gliderport property is located almost exactly in the middle of the map.

Until recently, the property was grazed and irrigated for growing crops when it was part of a large ranch that later became Diamond D Ranch. We have testimony that parents and grandparents of current Middletown residents worked on the property running cattle, making hay and tending to crops. These were some of the few available jobs in the region, at a time when it was unthinkable to commute out of the area for work. We have even heard that rice used to be grown in the valley. The irrigation system was comprised of a flume that ran at a fixed elevation above and around the perimeter of the valley. The flume is now overgrown and missing in sections, but it is still very much in evidence and remarkably well-preserved in certain areas. Water would have been pumped into this flume and moved around to irrigate the various parts of the valley. In 1925 the State of California took over Hwy 29 and gradually extended north of Middletown thereby separating the private airport property from Putah Creek. At that time or shortly thereafter, wells were established on the property to replace the water from Putah Creek. Crazy Creek was seasonal, so there were many better places for homesteading, most notably by Clearlake and along Putah Creek such as in Middletown.

The property existed in this fashion until 1990 when it was purchased by Connie and Jim Indrebo who previously operated the Calistoga Airport and now established the Crazy Creek Gliderport. The Indrebos retired in March of 2017. Cattle grazing has been ongoing on the property, supplemented by sheep grazing in the last half dozen years. In October of 2017, Eric Berridge of Garden Rd, LLC purchased the property, for purposes of embarking on a collaboration with James Duncan of 20771 Big Canyon Rd in Middletown. Both avid golfers and longtime friends, Eric and James recognized the possibility of preserving the existing activities on the property and supporting these by introducing *a very specific type of golf course*. The airport permit has been continued and the next phase in the life of the property is now ready to be realized.

<u>Adding Golf</u>

The current combination of grazing and aviation has not generated sufficient commercial activity to ensure proper maintenance of our property. The proper maintenance of a large property such as ours is time-consuming and expensive. Under the previous ownership, only aviation-related maintenance has taken place, resulting in compromised drainage systems, muddy ranch roads and similar deficiencies on other parts of the property. For many years there were plans to build a residential subdivision on the property, thereby allowing aviation enthusiasts to live within a private airport community. For various reasons such plans were not realized. We envisage adding golf to complement and support the existing agricultural and aviation activities, as opposed to completely changing the land use. The chief benefits of adding golf we consider the following:

1. Reducing the risk of fires in the region, both by creating an active, managed fire break and by improving fire abatement capabilities. The '15 Valley Fire ripped right through the middle of our property. We propose not sitting idly by and waiting for this to happen again.
2. Enabling the preservation and management of open space that is *self-funded and not dependent upon public services or public funding.*
3. Respecting the Scenic Corridor zoning overlay for the property.
4. Limiting the risk of unsuitable future development of the property.
5. Supporting existing private aviation on the property, including the upkeep and improvement of aviation facilities.
6. Creating opportunities for jobs, commerce and education.

7. Enabling the use of Regenerative Design. In our view there is such a clear opportunity to improve a degraded property, and to support some of its historical uses including grazing and aviation, as opposed to not managing the property or altering a previously unused property.
8. Creating Biodiversity Net Gain and a more diverse ecology on the property than at present.
9. Enabling a modest amount of appropriate tourism, both in direct use of golf, lodging and aviation facilities but also indirectly by supporting surrounding local businesses.

A Specific Type of Golf Course

To a non-golfer, mention of a golf course likely conjures up images of green grass and white sand traps, trees and ponds, and people chasing little white balls in golf carts. To golfers, however, there is a specific type of golf course that is very different from this and that evokes a sense of being in a natural landscape, on foot, perhaps with a caddie, on a course that is rugged and almost austere in appearance, often treeless and impacted by the wind. This type of golf is sometimes referred to as "purist golf", "original golf" or even "golf as it was meant to be" as is the slogan at a golf destination called Bandon Dunes in Southwest Oregon. To the purist this is the ultimate and original form of golf. At the private airport *we envisage a version of this experience.*

Royal Dornoch Golf Club, Sutherland, Scotland. Golf has been played here continually for over 400 years. It is this type of experience we wish to build at the private airport.

St. Andrews, Scotland is considered the Cradle of Golf. It is another example of what is possible on our property. Golf in St. Andrews dates back to at least 1457 when the King outlawed golf and football in favor of less frivolous archery practice.

National Golf Links of America, Southampton, New York. One of America's pioneering and historic golf courses.

It is a type of golf course that changes with the seasons. It will be green in spring when everything else is green, brown in summer when it's hot and dry, turning greyish and yellowish and reddish in the fall as the surrounding landscape does the same. It is a type of golf course where the conditions for playing golf, *the way that the ball reacts in the air and on the ground, is far more important than how the golf course looks.* It is about playing golf, not about impressing your neighbors or selling real estate.

To achieve this type of golf, careful attention must be given to selecting the best architects and specialists who understand these subtle differences and have the expertise to deliver the right results. The best use of the natural property must be found, by *incorporating as many of the suitable natural features of the property as possible*. Drought-tolerant grasses must be selected, soils must be properly managed, the proper type of drainage must be used, and so on and so forth. Our architects are Coore & Crenshaw, who have spent the last 30 years designing and building not only some of the finest new golf courses in the world but also the type that is fitting for our property. We are thrilled to have retained the services of this world-class firm. We are committed to using the indigenous soils for most of the project and selecting grasses that will perform well in such soils with far less irrigation than other grasses, as opposed to capping the property with sand, which is a common practice, and growing grasses that are not well suited for the region.

National Golf Links. Devoid of palm trees and waterfalls, it is nonetheless considered one of the finest golf courses in the world.

Royal Dornoch Golf Club in mid-summer. While brown and unattractive to many, to the golfing purist these are ideal conditions.

Another picture of dry, firm, fast Royal Dornoch Golf Club This is what the golf course at the private airport might look like in mid-summer.

Hoylake (Royal Liverpool). Host of the 2014 Open Championship, the oldest and largest tournament in golf. Sections of this property are very similar to the private airport property.

An old-fashioned bunker and tee. Color and turf uniformity matter far less than the locations and shapes of these features, and how these relate to playing golf. Walton Heath, Old Course.

Details About Our Specific Goals

1. Preventing & Abating Fires

The last few years we have seen numerous and very large fires threaten or burn entire regions of Lake County. We know that fires will happen again. The *degree to which we prepare* for these future events will determine our ability to avoid and combat fires going forward. A golf course is an excellent fire break. The property has staged fire abatement and clean-up efforts in the past, most recently in connection with the '15 Jerusalem and Valley Fires. Due to the current absence of properly developed water resources, however, the property has not yet been useful for prevention. In fact, the Valley Fire went right through the middle of our property. We wish to take measures to prevent this from happening again.

Remnants of the old barn on our property shortly after the Valley Fire, September '15.
This is generally where we plan to re-instate a ranch management compound, including facilities for golf course and aviation maintenance.

Another view of this area just after the Valley Fire.

The Valley Fire threatening downtown Middletown. September 12, 2015. Mandatory evacuations in process.

Last picture of an old barn on Knowles Lane in downtown Middletown. This barn has since been replaced by a new barn.

Calfire equipment staged on the property during the '15 Jerusalem Fire.

FEMA wood chip processing efforts staged at the private airport property after the '15 Valley Fire.

2. Preserving Open Space

While it may seem as though the sprawl of development is a long way from reaching Middletown and the private airport property, in reality the next 20-30 years will likely see considerable change in the region. Planning ahead and preserving the private airport property as *self-funded, managed open space* we see as a very good thing indeed, as opposed to seeing the property broken up and developed, or as unmanaged potential fire hazard.

3. Respecting The Scenic Corridor Zoning Overlay

Adding a golf course respects the Scenic Corridor zoning overlay that is in effect along rural sections of Hwy 29. Few other development types can deliver this.

4. Limiting The Risk Of Unsuitable Future Development

Previous plans for the private airport property have called for the development of an aviation-centered residential community. We submit that adding a golf course at the property is a far superior land use that supports the existing residential communities, most notably Hidden Valley Lake and Middletown, instead of competing with them.

5. Supporting Existing Private Aviation

There is already a strong community of aviation enthusiasts in the area. Folks fly single engine planes, gliders, vintage biplanes, "spiders" (tricycles with wings and motors) and a variety of other types of aircraft. There is also a community of model plane enthusiasts. So even though aviation will be limited to private flying, we wish to preserve and possibly even expand these functions.

6. Creating Opportunities For Jobs, Commerce & Education

A thriving golf course will create both permanent and seasonal jobs. Our planned operations model is a golf club that encourages unaccompanied guest play as well as limited outside play. The outside play may be governed by a daily ballot, or lottery of sorts. The plan is to have a caddie program, which may be comprised both of experienced caddies who can really assist the player with all aspects of play, and inexperienced caddies who will function essentially as bag carriers. The spectrum of knowledge and skill requirement will therefore span from the highly technical role of the Head Greenkeeper who will be in charge of the golf course, to showing up with a good attitude to do a good day's work, and everything in between. Caddying is "gig" employment, which has proven very popular at other golf courses that have caddie programs, since it permits caddies to work as little or as much as they wish, to supplement their income from somewhere else, or to caddie while transitioning from one job or situation to another. Depending on the level of food service and lodging that may be additional to the golf at the private airport, the facility is expected to generate between 30 and 100 jobs.

The extent to which our project can create local employment will impact the need to commute away from the area for work, which is very common. Every job we can create will result in one more person who may not need to commute 50-60 miles each day to Santa Rosa or somewhere similar for work. Each person who does not need to commute for an hour each way each day over the hill for work frees up time that can be spent more productively within the community. We submit that *this factor is of considerable hidden civic value*. The opportunity to work where you live is increasingly becoming a luxury. Commuting over the hill is not only time-consuming, dangerous and stressful, it is also requires a significant amount of fuel energy. 50 cars commuting 50 miles each day at an average of 10 miles per gallon per car, adds up to 250 gallons of fuel each day, which is far in excess of what is required to operate a golf course facility.

Typical morning commuter traffic heading South from just North of Middletown.

The commerce opportunities can be separated into direct and indirect opportunities. The direct opportunities are easily identified, and fairly limited in scope. These are aviation and golf fees, merchandise, food & beverage, some lodging, caddies. The facility is expected to generate about 10,000 annual golf rounds. If each round generates $300 in sales then total revenue for the golf course operation will be $3M. The indirect opportunity, however, while much more difficult to quantify, is also potentially much greater. 10,000 rounds of golf equates to ten thousand potential opportunities for business engagement, ten thousand potential customers. Lodging facilities, gas stations, local convenience stores and restaurants, these are all establishments that may benefit from golfers coming to the private airport to play golf. The caddie program is a considerable potential economic generator in its own right, by virtue of caddies spending their earnings in the community.

The educational opportunities will be mainly in the fields of greenkeeping and caddying. Greenkeeping is a traditional system of apprenticeship in which (mostly) young assistants train under the guidance of a Head Greenkeeper and then go on to find their own head position. Because our approach will be so very different from that of most other golf courses, we expect a healthy interest in the educational opportunities that our project will provide.

Zero Waste Composting Facility at the municipal Dairy Creek Golf Course in San Luis Obispo.
The golf course makes its own fertilizer "tea" and mulch from composted food waste.

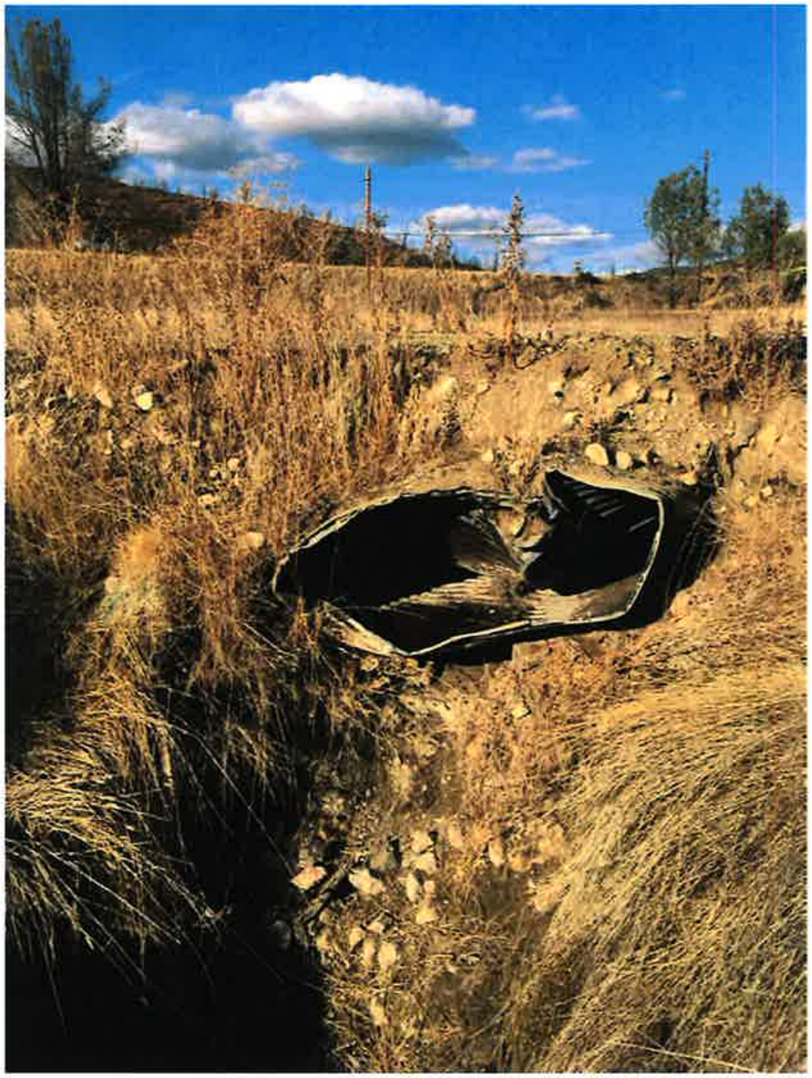
Now, of course there will be those who prefer that nothing happens on the private airport property, and that it simply sit there as countryside. Those who voice such opinions, however, are usually not the ones who benefit from the jobs or economic activity that is created (at least not directly although maybe through bolstered tax revenues). Nor are they those who can take advantage of the educational opportunities that are associated with an active place that requires skill to operate such as an airport and a golf course.

Greenkeepers hard at work. There is an element of skill involved in all facets of this work.

7. Regenerative Design

There will be an opportunity to combine agriculture with aviation and golf, which in our view is one of the most interesting parts of the project. Such interconnectivity has been a large part of the history of golf since its beginnings. On the original golf courses, which were generally laid out on public lands near coastal towns, locals would quarry for building materials, do hunting and trapping, and sometimes even bleach and dry their laundry.

The opportunity with regenerative design at the private airport is to take elements of its historical uses—irrigated pastures, grazing and aviation—and combining these in a sensible way with golf to make improvements. Our property will remain a working ranch with a range of activities including golf. The course mainly uses portions of the property that are currently used for grazing, not aviation. In fact, the proposed golf course loops around the aviation facilities, including the runways. We do not wish to materially alter our property. Its natural beauty and interest is part of what makes it so ideal for adding a certain type of golf course in the first place. Similar to the design edict for the Natural Parks Service, our design challenge is to allow people to experience the best features while at the same time ensuring that those very same features are preserved and properly managed.



One of several broken culverts on the property that have not been replaced.
The golf project will permit making much needed improvements

8. Creating Biodiversity Net Gain

Biodiversity net gain champions the idea that proper ecological resource management is generally better than no or poor land management. Management practices can be used to create improved ecological conditions, particularly by creating increased habitat diversity. In the case of the private airport there are many areas which, if properly managed using regenerative design methods, could be significantly more valuable from an ecological point of view than at present.

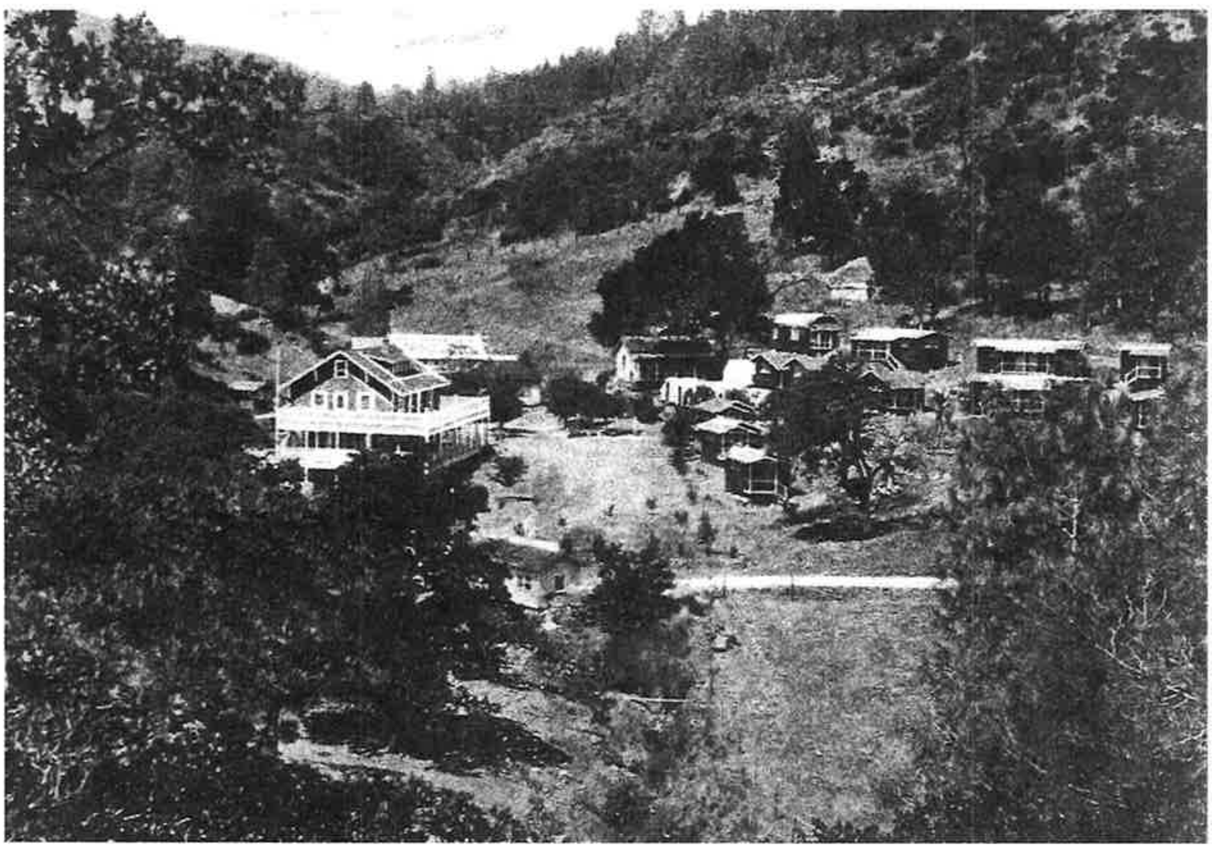
One such example is the aviation area. Every winter some of the staging and approach areas get flooded, due to failed and unmaintained drainage structures. Every spring, once these areas dry up, they are smoothed and cleaned up for functional purposes. Such areas have very limited ecological value, if any. If such systems were reviewed and improved from an ecological point of view, then it would be very easy to make significant biodiversity net gains. This is just one example of several opportunities that will be reviewed in co-operation with our biologist.

Another broken and clogged pipe causing seasonal flooding that is currently cleaned up in spring as part of the airport maintenance. The project will enable finding better ways to ensure correct functions and at the same time prevent avoidable disturbances.

Biodiversity gains sometimes come in small packages. Bees gathering around a standpipe and a sprinkler head on our property.

9. Tourism

Although Middletown and South County have a long history of tourism dating back to the heyday of the hot springs and multiple resorts in the area, tourism that is triggered by adding the golf course it is a happy side-effect for us, not a direct goal. Our goal is to add golf to the private airport so that the combination of agriculture, aviation, golf and other forms of recreation will allow realizing the full potential of the property. Who will come and play? This remains to be seen but it will likely be a mixture of club members, their guests, golf enthusiasts from the Bay Area, folks visiting the wine country, and the most ardent local golf fanatics. One of the great things about Bandon Dunes in southwestern Oregon is that for every rental car with groups from out of town there is a pickup truck on Oregon plates with a group that has decided that every once in while they're going to go and play at Bandon Dunes. We hope to stimulate a similar type of reaction.



Howard Springs, one of many historic former resorts in South County. If we add lodging at the private airport (and we may not) it could be modeled on the examples of these grand old resorts, with a main lodge and a series of cabins or cottages.

Golf Course Construction & Grow-In

1. Suitability of the property

An essential part of the plan to add a golf course at Crazy Creek is the suitability of the property in its current state. The gentle topography of the valley floor is ideal for the type of golf that is planned. While it will be necessary to build so-called "greens", "tees", "bunkers" and other types of hazards and features that are particular to golf, there is no need to substantively alter the topography or character of the property. One of our core goals is to preserve and highlight the most interesting and attractive existing features of the property, such as the rise and fall of the land, the different vistas, the trees, the natural drainage patterns and the seasonal Crazy Creek which the golf course will cross on two occasions, namely on the 2nd hole going out onto the golf course and then on the 17th coming back in.

On-going sheep grazing.

The style of the new golf course is different from any existing golf course in California. Instead of featuring ornamental trees, ponds and paved cart paths, which are typical golf course elements, the new course will generally be treeless except for existing small groupings of oaks in certain areas. Ponds and lakes will not be features of the course. If there will be any paved paths, and there may not be, these will mainly be for maintenance purposes since we envisage that golfers will walk the golf course. Sheep grazing, which is a current activity on the property, will be continued as part of the property management.

Many of the natural features of the property are ideal for golf.

Whereas the indigenous soils are generally clayey in nature (sand is typically the ideal for golf) the soils are sufficiently suitable that they can be used without the need for the common practice in golf course construction of extensive stripping or capping of soils. The potential for naturally occurring asbestos (NOA) in the region must be managed for construction purposes. The types of mitigation measures that are desirable and necessary, however, namely dust control and shallow topsoil capping, are precisely what is required for quality golf course construction as well. Far from being a pristine ecological resource, the property has been intensively used for many decades, and is moderately to heavily degraded in sections. A portion of the property is even zoned for Heavy Commercial use. The private airport is a going concern. The property has power, water and good access off a side road (Grange) from one of the busiest thoroughfares in the County, namely Hwy 29. The highway currently carries ±11,000 daily trips. Even at the busiest times, adding golf traffic will have an impact of less than 1% on the total traffic volume.

Taken together, all these elements we submit enable the sensible addition and operation of a golf course, without meaningfully altering the landscape, the soils profiles, without cutting trees, without changing natural drainage patterns, and without causing a strain on the existing traffic infrastructure. Aviation has been an existing feature of the property for almost thirty years.

2. Erosion Control, Mobilization, Staging, Signage

The plan is to start construction in April of 2019. The first step will be mobilizing materials and equipment, and protecting any resources on the property that could be negatively impacted by construction, including potential wetlands and cultural resources. Materials, equipment and fuel storage will generally occur in areas where such activities are already in evidence, such as in the vicinity of the Gliderport Replacement Building, the existing airport offices and the runway. Signage will be posted as required by County's permit conditions. Erosion control measures will be put in place in accordance with County's best management practices.

3. Irrigation

Next step will be to start mainline irrigation. Ordinarily on a golf course development project, irrigation follows in behind earthworks and drainage. In our case, considering the very limited need for earthworks, the nature of the existing soils, the potential for NOA and the hot, dry summer season, we plan to start the construction of the primary irrigation components immediately, so that we can use water to manage construction in the various sections of the property as early as possible. Water from two existing wells on the property will be used for construction and maintenance. Additional water from existing wells on adjacent properties to the south will be used if necessary.

4. Golf Course Shaping

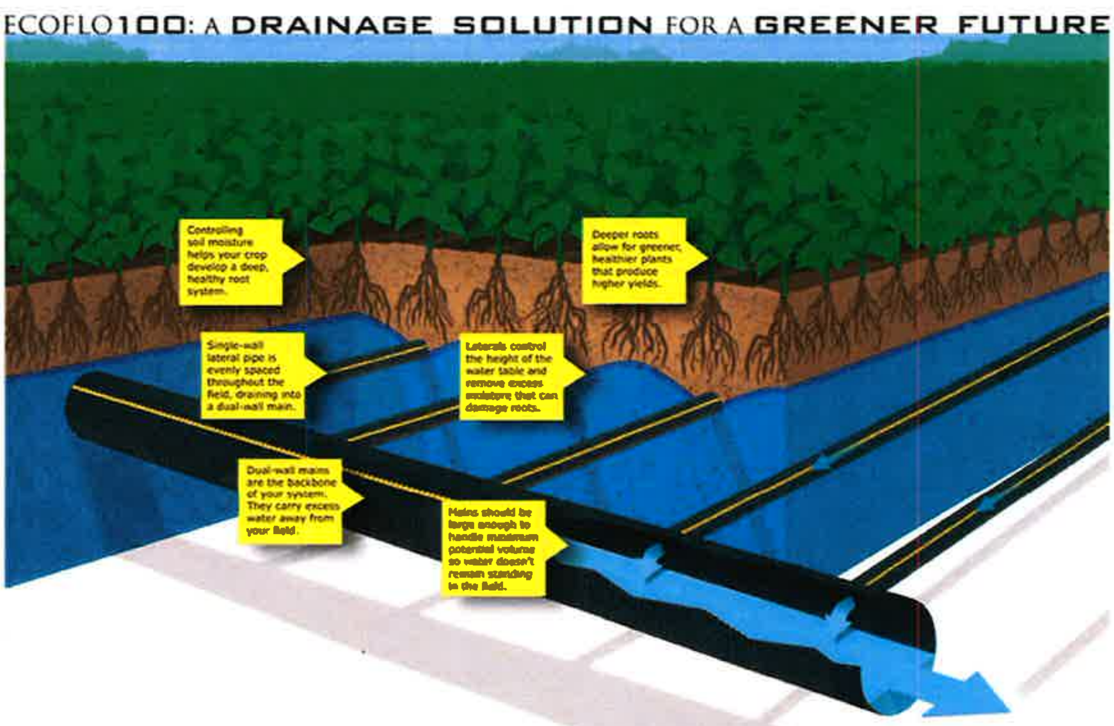
Following the installation of protective measures and mainline irrigation, the construction of golf course features can commence. Greens (target areas), tees (starting points) and other types of golf-specific features will be built, while using water to manage the soils and avoid dust. With the exception of specialty sands that are needed to build the greens and tees, for drainage, to bed certain irrigation pipe, and for sand in the so-called bunkers, existing soils on the property will be used to build the golf course.

5. Feature Construction

Feature construction involves building the greens and tees with proper drainage and a soil profile that will support the establishment of first rate turf. This work involves installing drainage, removing rocks, and capping certain isolated areas with good soils. We expect to import approximately 20,000 cubic yards of specialty sands for feature construction. This is equivalent to about 10%-15% of the requirements for a normal project where sand capping is required.

6. Drainage

Except for in the wet winter months, there is very little need for drainage on the property. In order to allow the golf course to be playable for as much of the wet season as possible, however, and for the golf course to transition quickly from wet season to dry season, an extensive system of pipe drainage will be installed. The method is essentially agricultural field drainage. Water is removed from the surface and collected in small pipes (1"-2") into transfer pipes (typically 4") to various collection areas from which drainage water is then gradually released to the natural drainage patterns. While it will be necessary to create vehicular and pedestrian crossings (culverts, small bridges) here and there where needed, we do not foresee altering any of the natural drainage patterns.



Ag style drainage schematic similar to the method that will generally be used for the golf course.

Example of golf course drainage construction. Dumbarnie Links, currently under construction.

7. Finishing

Finishing involves relieving compaction, preparing and smoothing areas that will be grassed with small tractors and a variety of agricultural implements (discs, rakes, drags, etc). This is not unlike agricultural practices that are commonly in evidence locally and regionally.

8. Grassing

The primary grass type that is being considered for the golf course is zoysia, or so-called Korean lawn grass. This warm-season grass is gaining in prominence as a golf course grass due to its drought tolerance, tolerance for heavy soils, and its characteristics for playing golf. Grass will be either turfed or installed by means of shredding turf that is then cultivated to knit together over a period of time. We expect to have regularly mowed grass on a maximum of 15% of the total property acreage.

Test plots of four types of grass, namely one type of Bermuda grass (warm season), two types of zoysia (warm season), and one type of fine fescue (cool season).

9. Grow-In

The grow-in period is the period between grassing and when the turf is ready for golf. For a slow-growing, drought-tolerant grass such as zoysia, this period can be up to a full year, but the reward is that once established this type of grass is extremely resilient and requires very few inputs. Our aim is to complete all grassing in '19. In the event that construction is delayed a portion of the golf course may be finished and grassed in '20. If construction is commenced in April of '19 then the course should be ready for introductory play by the summer of '20.

3. APPENDICES

A. Copy of Permit Application
B. Property Title Report
C. Site Plan (including utilities and future lodging)
D. Biological Study (including introduction, photo & Wetlands Ordinance)
E. Cultural Resources Study (including introduction)
F. Select Property Images

APPENDIX A
COPY OF PERMIT APPLICATION