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IRRIGATION

Irrigation is a costly item and should be designed

with the ultimate intent for water distribution to be adequate and consistent. However, it's widely understood that irrigation systems are designed with a worst-case scenario in mind. An irrigation system must be developed to provide

water during the most difficult times of the year – July and August. Pumping systems and head distribution are determined with an extended dry period in mind.

THE GREAT CHALLENGE

So what draws us to golf? Nervous anticipation? Pleasure? Beauty? Wonder?

Is it the game, the camaraderie or the interaction with nature? It's all of the above. The most compelling aspect of golf is the infinite variety of possibilities during play. The personality of a golf course is determined greatly by the architect with the routing plan, as well as the details of the functional and golf-specific matters.

The game was meant to be enjoyed with friends, recreating more than competing and enjoying nature. It can rejuvenate our senses. It's a gentleman's game with a proud legacy. It should be accepted as a difficult game to be enjoyed. Therefore, it's incumbent upon architects to make the game as enjoyable as possible for as many people as possible. This is a great challenge and a dilemma.

Clearly, there are exceptions. Some courses need to be more difficult and others less devious. However, the great golf course design debate isn't about risk and reward; rather, it's about playability and difficulty.

Architects spend just as much time determining the balance of challenge, the budget and the degree of difficulty as they do contemplating the details of the grading, drainage and bunkers, the subtleties of the green contours, the widths of the fairways, the tee positions, the hazard locations, etc. Why? Because these items have a direct impact on the fun factor of a golf course.

A golf course without features or challenges won't engage the better golfer. Therefore, it's the architect's goal to create a valuable golf experience that will challenge every golfer to a degree equal to his ability. Each project and site requires distinct choices and a different tact to implement the appropriate level of challenge, recreation, quality and beauty. Good golf architecture isn't swiftly identifiable, but it's most certainly felt. **GCI**

Cameron MacKellar, a member of the USGA, is a golf course architect with Martin Design Partnership. MacKellar, who's based in Batavia, Ill., can be reached at c-mac@mdpltd.com.

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Preparing for the
unexpected

Simple steps to
creating a plan
that will minimize
downtime in case
of a disaster

By Marisa Palmieri



Despite Eric Bauer's host of experience as a golf course superintendent – including completing grow-ins, serving as a project manager and working on Jack Nicklaus' home practice facilities – he discovered one area where he lacked skills as Hurricane Rita was bearing in on Houston in September 2005.

"I never had a hurricane threat when I was working in North Palm Beach (Fla.)," says the director of grounds at the Club at Carlton Woods in The Woodlands, Texas. "There was always a possibility for a tornado when I worked in Memphis. But you tend to get wiser as you get older, and I didn't think of those things then. Even when I first moved to Houston in 2000, I didn't think of hurricanes."

Though the impact of Hurricane Rita thankfully didn't devastate the Club at Carlton Woods, it did leave Bauer feeling vulnerable.

"Being my first hurricane, you see how little time you have when you're actually in that situation," he says. "It made me realize I wasn't prepared. If it had hit, we were probably 70-percent ready."

Bauer and his crew learned from that experience and developed a plan of attack, including a checklist to begin preparing for future disasters five days before they're expected to hit (see "Disaster preparation checklist" on page 56).

"If you just have to execute a checklist, it makes your job that much less hectic," he says.

Bauer's plan paid off. This year, when Hurricane Ike hit, he and his team were prepared. Despite the 263 trees that were damaged – some of them blown over completely, exposing the root balls – the facility's Fazio course was back in operation within days, and its Nicklaus course was running within two weeks. Many of the area's courses took weeks to reopen.

Thanks to the five-day plan, the facility had tree service within 24 hours, fuel within 72 hours and a generator within 36 hours.

But more than anything else, a quick recovery was possible thanks to Bauer's staff.

"The day after the storm I had four employees show up," he says. "Within 36 hours, we had 85 percent, and we were fully staffed within 72 hours."

Bauer attributes staff preparedness to the plan, which tells employees to contact him within 24 hours during a disaster. After determining no one needs assistance and everyone's families are safe, Bauer shares the game plan for returning to work.

"When they see you're calm and prepared, that's going to make it less stressful for them, and they'll be at work," he says. "Your employees respect the plan. They look at you to be the leader, be prepared and think of these things. They're not paid to worry about these kinds of things; that's what you're there for. If you show them that, they'll respond the way they do every day. If they see you changing your mind and being indecisive, then they're not going to respond well."

WHERE TO START

If a golf course doesn't have some type of general disaster plan, it's behind the times, says Mitchell Fenton, a security consultant and executive security director for Baltusrol Golf Club in Springfield, N.J.

"Katrina was the biggest lesson for the golf industry," Fenton says. "It woke up a lot of managers and superintendents because of what happens when a natural disaster hits."

Unfortunately, many facilities are vigilant shortly after a disaster, but attention to the issue wanes before long, Fenton says. It's common for managers to create disaster recovery plans and let them fall out of date, collecting dust on a shelf.

"Instead of having a giant book that never gets updated, consider more of a flow chart to provide employees so they can look at what they can actively do," Fenton says, adding that all disaster plans should be updated annually.

"It needs to be reviewed regularly and exercised by all staff," says Ken Koch, owner of the disaster recovery consulting firm Business Resource Management in Eagan, Minn., noting this task can be particularly challenging in the golf industry where temporary and seasonal employees are common. "They need to know where copies of the plan are and what their duties are if a disaster occurs."

All disaster plans should start with a threat assessment.

"Ask, what are the risks to the golf course, and

then you can identify ways to mitigate the risks and have a plan in place," Koch says.

When identifying risks, look beyond the obvious. A club in the Midwest may not seem like a candidate for hurricane damage, but every state in the continental U.S. may be affected by hurricanes. Last fall, Hurricane Ike blew down trees and knocked over a TV tower at Valhalla Golf Club in Louisville, Ky., just days before the club hosted the Ryder Cup.

In addition to hurricanes, fires, tornadoes, earthquakes and nonnatural disasters, such as civil disturbances and gas leaks, there are other circumstances to consider. Whether a facility is a public, private or a resort course may affect the plan's details and who's involved creating it.

While the superintendent will have his own agenda for the maintenance department, it's important he considers how that will work within the scope of the entire operation. Most importantly, senior management has to buy into developing the plan.

At Brasstown Valley Golf Club, a resort course in Georgia's Blue Ridge Mountains, the golf course maintenance staff takes part in the resort's disaster plan. The worst-case scenario involves evacuating guests.

Thankfully, golf course superintendent Steve Gonyea hasn't had to do that yet, but he says he's always in touch with the resort manager about how many guests are in house.

No matter the type of facility, it's important maintenance departments consider how their own disaster recovery plans work within the scope of the entire operations' plan. They should focus on the safety of guests, golfers and staff first and on minimizing down time and damage to the course second.

GATHERING INFORMATION

Because, as Bauer's experience shows, employee preparation is central to recovery efforts, no plan is complete without a current list of staff contact information. Don't forget area codes. Also, provide details for what to do in case phone lines are down. Cell phone numbers, e-mail addresses (cable Internet may still be available during a disaster), home addresses for door-to-door notification or establishing a rally point are all other things to consider.

"This is where the little things count," says Paul Sullivan, vice president and general manager with Agility Recovery Solutions, a disaster recovery planning company. He suggests man-

agers print all the pertinent details on a card employees can keep in their wallets so they know exactly what's expected of them.

Creating a list of complete contact information for vendors is essential, too.

"Sometimes disasters are frustrating because the facility is fine, but you might not be able to get any supplies," Sullivan says. "In the golf course world, if you can't maintain your grass, you could end up with a bad reputation in the marketplace."

Having a generator supplier on call was essential to the recovery of the Club at Carlton Woods. The irrigation system ran on a generator for two weeks.

To learn more about what every disaster plan should include and get a downloadable version of Bauer's five-day plan, visit golfcourseindustry.com/disasterprep.



Facilities should ensure they're equipped to run a generator; typically, a transfer switch is required, Sullivan says.

In addition to staff and power concerns, Sullivan provides other questions to consider when developing a recovery plan:

- Space – if the maintenance facility were destroyed, what would serve as the central point for staff?
- Off-site or digital backup of critical files – budget, irrigation schedules, etc.
- Technology/connectivity – how many and what type of computers/servers are needed to continue operations?

Because downed tree limbs and those that are vulnerable to falling can be a safety hazard, it's critical to have a tree service on standby, says Chris Hughes, superintendent at Old Corkscrew Golf Club in Estero, Fla.

"Safety is the foremost concern when you're

The maintenance crew at the Club at Carlton Woods wasn't prepared for Hurricane Rita, which didn't devastate the club but left superintendent Eric Bauer feeling vulnerable.



Disaster preparation checklist

Eric Bauer, director of grounds at the Club at Carlton Woods in The Woodlands, Texas, shares the checklist he developed after being unprepared for his first hurricane in Houston in 2005.

"You can retrofit this plan to any kind of catastrophe," he says. "It doesn't have to be a hurricane. It could be flooding or tornadoes – anything that can impact the operation at a golf facility. The more prepared you are going into it, the better and faster you're going to come out of it."

Five days away

- Contact tree companies to be put on their list for clean-up work following the storm.
- Contact a generator rental company for an industrial-sized generator to run the pump house in case of an extended power outage.
- Purchase a battery-powered or manual pump to remove fuel from tanks to fill up equipment.
- Ensure all chain saws are in working order and have plenty of spare chains, bars, bar and chain oil, and mixed gas on hand.
- Ensure onsite generators are operational.
- Ensure all pumps used to move water are operational.
- Ensure operation of a water cart or modified spray rig with a hose to hand-water if the pump station is down.
- Have extra hoses and quick coupler connections for hand-watering.
- Check inventory of safety supplies including work gloves, rain suits, ear plugs, safety glasses and order more if necessary.
- Purchase flashlights and batteries.
- Purchase two-by-fours and landscape timbers to stand up any trees worth saving and plywood to board up exposed windows on the maintenance building.
- Update list of employee phone numbers to contact them after the storm.
- Inventory all chemicals and ensure MSDS sheets are current.

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trying to reestablish your business,” says Mark Iwinski, the general manager at Old Corkscrew.

Maintaining a supply of inputs is necessary, too, in case of any supply chain disruptions. For Bauer, wetting agents were key.

“You’re typically not thinking of the grass right away – it’s more about course cleanup – but you want to be confident your grass is going to make it two or three days while you’re not there,” he says. **GCI**

- Schedule a fuel delivery to fill up gas and diesel tanks, preferably after all of the equipment and fuel containers have been topped off.

Three days away

- Remove any course accessories not essential for daily play that have the potential to be flying objects.
- Purchase any fungicides, wetting agents, fertilizers or other chemicals that you may need following the storm that may become temporarily unavailable.
- Top off all vehicles and fuel containers and refill main tanks.
- Save all pertinent files to a disc including a back-up copy of the irrigation database.

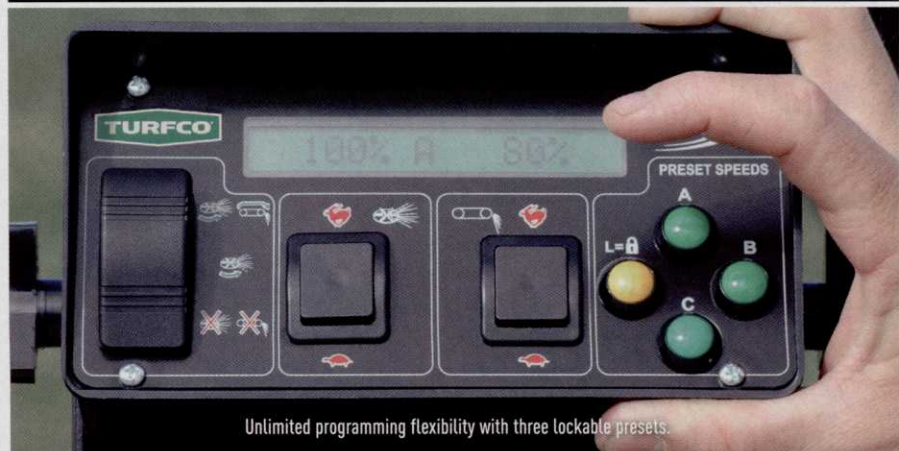
Two days away

- Spray greens with a preventative fungicide application if necessary.
- Remove remaining course accessories that have the potential to be flying objects. This includes, but isn’t limited to, tee markers, tee signs, flagsticks, rakes, ropes and stakes, water coolers, trash receptacles and bag stands on the driving range tee.
- Remove any satellites and/or lower any antennas from the roof of the maintenance building.
- Clean out all drains on the course.
- Board up exposed windows on the maintenance building.
- Store all possible equipment inside. Park all of the rest of the equipment against the building in a protected area away from potential flying debris.

One day away

- Depressurize the irrigation system and shut off power to all satellites and the pump station.
- Open weirs to drop level of lakes if possible.
- Turn off power to all computers. **GCI**

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COURSE RENOVATION

At Normandy Shores, stormwater collects in ponds before being pumped into wells and injected more than 100 feet below ground.

Injecting life into Normandy Shores

Drainage solution improves conditions on a Florida municipal course

By Peter Blais

Beauty may be skin deep, but meaningful course renovations usually delve deeper. The recent renovation of Normandy Shores Municipal Golf Course in Miami Beach, Fla., delved even deeper. Normandy Shores reopened Dec. 12 after lying fallow for the past five years.

The far-reaching refurbishment plan at Normandy Shores, directed by the architects at Arthur Hills/Steve Forrest and Associates, called for reimagining and rebuilding every course feature, installing a new irrigation system, and replanting the bermudagrass playing surfaces with seashore paspalum.

But one of the significant issues at Normandy Shores lay deeper. The 18-hole layout sits largely on man-made Normandy Isle, which consists of clay soil originally dredged from the bottom of Miami's Biscayne Bay 70 years ago. Historically, the clay underpinning made it difficult for stormwater to percolate. When heavy rains struck the

municipal layout – where some areas protrude just 3 to 4 feet above sea level – rain water pooled on fairways and greens. Depending on a storm's severity, runoff could ride atop the heavy clay soils for days, weeks and even months.

Further complicating drainage issues, the 12 on-course lakes were connected directly to the bay without an outlet. Consequently, a typical South Florida summer rain turned the course into a mosquito bathtub.

Pumping the stormwater directly into the bay or allowing the flooding to carry it into the Intercoastal Waterway would have upset environmentalists, fearing pesticides used on the course would mix with the bay waters. Using French drains or the like to rid the runoff just below ground wasn't an option because the fresh water would simply float above the shallow, salty water table, leaving the course soggy and unplayable.

Together, Hills/Forrest and CH2M Hill Engineering devised a solution believed to be the

first of its kind used on a golf course, according to Hills/Forrest senior design associate Ken Williams and CH2M Hill principal technologist Mitchell Griffin.

INJECTION WELLS

To reduce the chance of any potential environmental, drainage or insect issues, Hills/Forrest and CH2M Hill partnered to design a system of injection wells fed by stormwater collected in the lakes (that have been disconnected from Biscayne Bay to reduce salt content) and then injected more than 100 feet into the underlying limestone bedrock.

Safely removed well below the island's surface, the system doesn't harm the surrounding beaches, bays and waterways. And it leaves the course dry enough for play to resume quickly following a rain event. Basically, water drains into catch basins and then into the ponds, says David Duffy, golf course superintendent of Normandy

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Shores. From the ponds, it feeds into a collection area where it's pumped into one of three underground injection wells.

The island technically has no natural water table or aquifer because it's man-made, Williams says. The underlying limestone bedrock acts as a natural sponge, filtering impurities out of the injected drainage even if some migrate up into what passes for a water table. Having the ponds sealed off from the bay further reduces any impurities in the injected water.

THE RIGHT CONDITIONS

What made the injection-well system possible was the course's proximity to the coast and the fact it's an island in the middle of Biscayne Bay, Griffin says. The island's geology allows for the injection of stormwater down the 120-foot-deep wells into the porous subsurface bedrock, well below the island's shallow aquifer. Doing so maintains surface-water quality and doesn't hurt the already low-quality groundwater.

Few places in Florida allow for this technology, says Griffin, a Gainesville-based engineer who has designed three systems and has another dozen in the planning stages – all primarily in urban areas. It's possible only where the aquifer

has greater than 10,000 milligrams per liter of total dissolved solids, where the groundwater is salty.

Florida regulates what's put into the ground because of ground-water contamination concerns. But when the groundwater is already salty and has no users, then one is simply adding stormwater to it at worst, Griffin says. Miami-Dade County gets its drinking water from inland sources because the groundwater along the coast is too salty. No one is using the groundwater along the coast, he says.

"You have to have the right underground conditions," he says. "You need porous layers of rock or old seabed that accept the pumped water as you pump it down into the ground. Normandy Shores has that."

PUMPING THE WATER

The first order of business with injection wells is finding a good place to collect stormwater, usually a central spot that minimizes the number of needed wells because drilling wells can be expensive, Griffin says. At Normandy Shores, water is collected in ponds. Debris settles out of the water bodies; although in other situations, some type of screening may be needed to filter

debris that could clog pipes.

The pump station receives water piped from ponds located east and west of the station. The station has three pumps leading to three separate wells, which are interconnected so the pressure is stabilized between them. Only one pump operates most of the time. During a large storm, all three pumps may operate simultaneously for a short time. The pumps are necessary to move the mostly fresh drainage water through the underlying salty water table. Gravity alone won't do it, necessitating the pressurized drainage well system.

The 24-inch-diameter wells are encased by metal pipe to depths of 50 to 60 feet and grouted in with cement. The grouted casing keeps the water from percolating up.

Beyond the metal casing, the well is drilled another 50 to 75 feet into the bedrock to reach a permeable, geologic layer that will accept the water.

Test wells are needed beforehand to determine the geology of the site. Most of the stormwater pumped into the wells remains below ground where it doesn't harm the environment or course conditions.

"No other golf courses I know of use this tech-



Normandy Shores' injection-well system was possible because the course sits on a man-made island in the middle of Biscayne Bay.