

The HOA team reached out to us stating there was some perceived incongruities and deficiencies with the entrance water feature. We coordinated a site visit for today. I arrived at 11:15am. The water feature was operating. Met with Mr. St. Pierre. Walked the site, inspected the pump room, the site and the following is a brief report of what was found.

I received some questions:

The VFD trips with power surges and brown outs – yes that’s what they do, they retire to protect themselves and the equipment they run.

VFD’s need to reset after power loss – this is a set-up of both the VFD and the PLC (computer that runs the system) There are two unmatching VFDs in the pump control cabinet. Neither of which are wired or programmed to reset, VFD 2 doesn’t have an analog input, the run relay is wire incorrectly. It has over 800 “ON” hours and ZERO operational hours. This means -example- the light it plugged in for a year and never turned on. – photo of this to follow later in the report.

VFD 1 is old but still working – agreed, the VFD is set up for a conveyor belt or escalator, it ramps up to 57 Hz and sits there. It doesn’t do anything other than act as a soft starter.

--note: a VFD is like a rheostat on your ceiling fan, if you want more air movement it speeds up, less, it slows down, the same with a pump. More water = more speed, less water = less speed.

Wet well has a lot of organic matter in it – the water needs to be treated, not so much as a pool but pretty close, algaecide, flocculent, anti-surfactant etc. – hydro-vac ever 5-7 years, it will be cleaned during this proposed revitalization.

Access to wet well is 8” hole – typical, there is rarely a reason to access the wet well. On golf pump stations there is usually a 2’x4’ access port. But the bigger problem here is the roof – the roof was meant to be removed. It was designed to be removed. Someone recently poured concrete on the roof then poured water proofing media on the concrete. The roof must be removed to extract the pumps. They are several feet long and come straight up. The only way to rebuild them is to remove them from the top with a crane. If any work was done to them, it was to their packing glands. Only 1 unit has new packing. The other two have not been serviced in years. This is evident by the mineral build up on the side of the pump, this is YEARS or build up from lack of service.

In order to pump out the wet well, SHVi is who we use, Southern hydroVac inc, and their subsidiaries pump our stuff like this for us at One Wachovia in Charlotte, and Camp Lake James’s cisterns. There may need to be a larger access port made or lowering of the water level. But there are several other vac-truck type companies that specialize in cistern and vertical wet wells.

Pumps are oversized for the water feature, difficult to find vendors to work on the unit – these pumps are not oversized, the average water feature has from 30-50gpm per linear foot of fall coping. This system has 118 feet of fall coping, this is 2800gallons – the pumps are capable of 1000gpm at 10ft of head. The piping is rated for 1900gpm @ 5.5ft per second. The piping and pump are well suited for one another. This is a common Golf pump, with just one bowl and tiny motors and difficult working conditions due to the concrete on the roof and inappropriately set up control panel.

Only half the waterfall was stained – the entire fascia will need to be resurfaced, there are several cracks and entire wall shifts. That need to be remedied, it can be stained to match once its repaired.

Lack of sealant in basins – the covering mortar is flaking off, several thousand square feet will need to be chipped off, reapplied and properly sealed.

The center bowl leaks but was recently repaired – this area has water coming from behind the water feature, the facial repairs did nothing but force the water behind the water feature and accelerate the erosion and soil degradation

No dedicated meter to recharge the water feature – I spoke with the HOA managing partner and she pulled a meter reading and monthly invoices. The math associated with it shows about 7gpm loss every day, as its operating.

The water feature has a control panel that was attempted to be repaired, the ABB ACQ580 with Accuware software is a great vfd. It was installed some time ago, but it has not run the pump for more than 20 minutes its entire life. The controls were rewired in an attempt to get it to function, the digital trigger was wired, but the analog speed reference is not wired, and there cannot be more than 1 analog reference on a single circuit. The ABB vfd cannot share the analog output from the PLC.

There is a visual reference device on the front of the control panel that demonstrates the 3 legs of power and ground, L1 is anomalous and ground is too. L2 and L3 are fine.

Pump1 and Pump 2 vibration monitoring are within spec, motor 1 meggar reads appropriate megohms, Motor 2 reads as a failing motor winding, motor 3 reads dead short.

All 3 12” discharge check valves need to be replaced they SLAM shut and will eventually break into pieces and either drain the upper pool back into the lower pool or crack the case and drain the upper pool into the pump room. This may be just messy and drain into the wet well and not be an issue, or it could crack and spray directly into the motor and control panel creating an electrical life safety hazard.

I’m working to obtain the NC DEQ littoral shelf, entrance grade, and safety standards for a pool greater than 18” deep. The NC DEQ specifically calls out requirements of non-foot hold fence/protective enclosure for the lower pool. There are also water quality requirements for this water feature. There are several sediment/erosive areas leading from the upper pools and the lowers pools.

Every wall has fluorescence runs on their face. This is calcium from the concrete behind the face, being drawn through by water from behind the water feature face. Hydrostatic pressure from behind the wall/faces are pushing the concrete and cracking the faces and moving the walls. These will all need to be secured with wall anchors with a depth not less than the height of the wall itself. Paired with geotextile material for drainage, a J-drain for routing the water and 57 stone for gravity drain. Along nearly 200 linear feet of vertical wall(s).



- Needs: Drainage along rear of feature (trees removed, fence fixed)
- Sealed Pools and Falls areas
- Lower pool cleaned out
- Lower pool sealed
- Entire area to be sealed and stained to match itself
- Potential littoral shelf or guardrail along this area for safety and liability lessening.



Motor – reads nearly out of spec  
Pump is fine

Motor – reads within spec  
Pump is fine

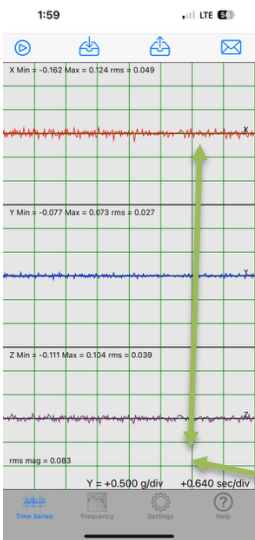
Motor – out of spec and pump unable to test.

These 12” check valves are all broken. Three of them they SLAM shut and will eventually fail and damage the equipment more.

All of this sediment is from years of no seal servicing.



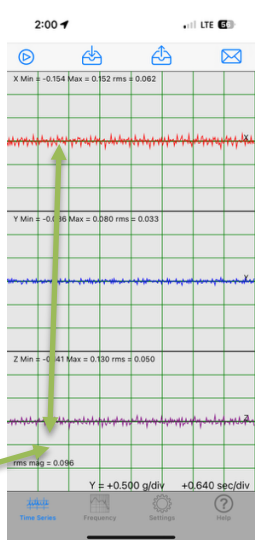
This roof WAS designed to be removable – someone thought it'd be a good idea to cover it in concrete. This will have to be jackhammered out to service the pumps.



left: Pump 1: there is less than 0.25mm of vibration per second at 57hz. Shown here at 0.162mm per second. this is well within spec for the pump and motor.

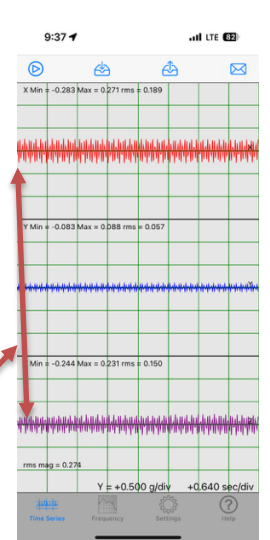
right: Pump 2: there is less than 0.25.. of vibration per second at 57hz. Shown here at 0.154mm per second. Also well within spec.

GOOD



For reference... here on the right is a motor/pump that is well out of spec and shakes the entire building. The 2 Legacy at Jordan Lake Pumps I was able to test are in good working order. (ex: Barbuda Ocean Club)

BAD



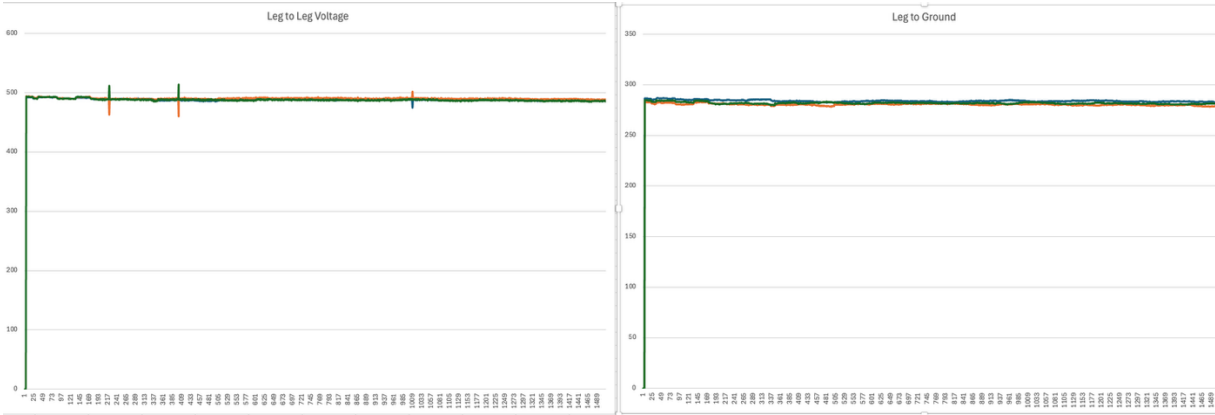


P1 and P2 have stuffing boxes with graphite seals. P2 hasn't been serviced in years.

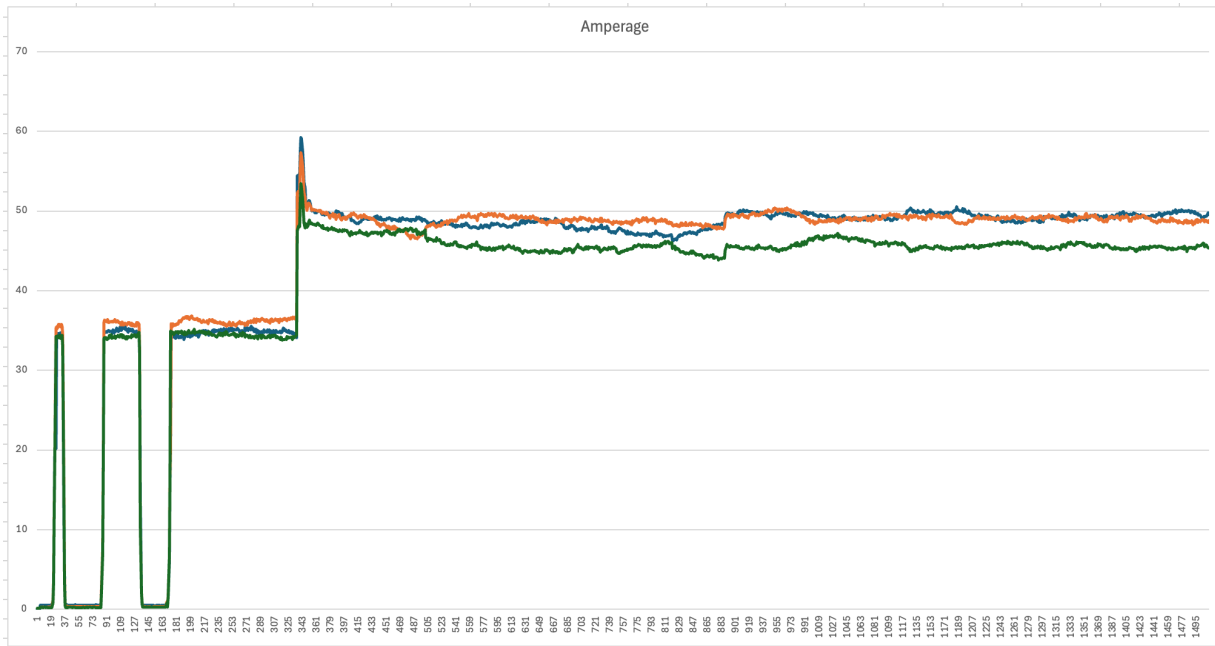
The only reason this one looks good is because it's been off for over a year.



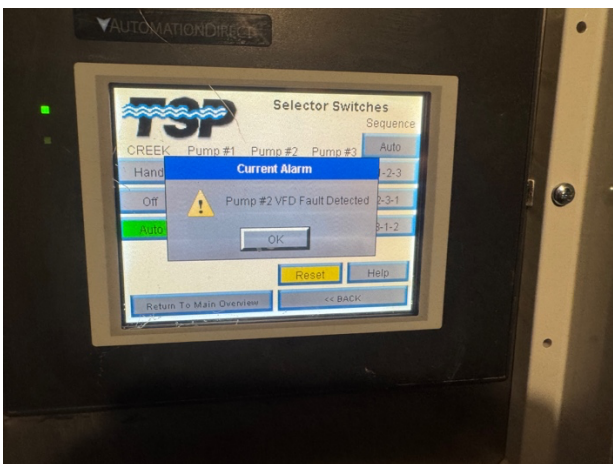
Every rear vertical coping edge on the high side of the water feature has been compromised and is eroding along the back of it. There are calcium deposit all over the face of the back walls.



There are a few voltage spikes. If we left this device on for a few days we could probably capture an actual input phase loss. There are several on the alarm screen.



There is an amperage variance on P2. The P1 unit is well within the tolerance, the P2 motor is 15-18% out on phase C/3. This paired with not knowing how to wire the ABB VFD may be why the #2 unit was never put back in service. I just programmed it to run to 25% out of phase. Its within the VFD capabilities. But will accelerate the motor failure.



The control panel claims there is a VFD 2 fault. This only tells part of the story. The alarm isn't wired to the vfd. It is wired to itself. The VFD was not wired properly. It will only run in -HAND- this means you must open the panel, press -hand- button then the up arrow to get to a useable motor speed. When the power goes out it'll retire and may not start back up unless the exercise is repeated.



This is an external/visual reference to know that the incoming power is -ok-. There are 2 damaged legs on this unit. That is evidence of lightning damage.

Brief Video of the damaged legs LED:



Going back to the graphs above... this is a photo of the power analyzing data logger. This unit samples ever 6 seconds and stores the power data for later review. We can see the amperage differential on that is shown in the graph on motor 2.

A3

Is 15-18% off when running at full load. Shown here it is about 9% off. The safeties are set to 3-5%. We overrode all safeties during this testing exercise.



There are a few lights that do not shine onto the water feature but are pointed at the traffic lanes. These need to be replaced with LED units and pointed at the area to be illuminated and not at drivers eyes...



This tree and the tree above/behind upper pool 1 will need to be removed. Other flowering media can be placed here but no more trees.. roots break concrete and cause problems...

Initial look in the pump house – this is before I looked at anything: <https://youtu.be/GIWHzPcRIBI?si=LsLLH-uxndDIg7t4>  
There are a few site anomalies that need to be addressed, upper Pool #1, you can see erosion and cracking of the rico rock and related support mortar: [https://youtu.be/-YvAUr9O1YY?si=fv\\_YHeXrNZpKN9Ba](https://youtu.be/-YvAUr9O1YY?si=fv_YHeXrNZpKN9Ba)  
Upper pool earth crack – shifted side of upper falls: <https://youtu.be/wXT2t3UQBac?si=vT209sRbHgL2JXqS>  
Left side of falls by the pump room, water coming through the Rico rock:  
<https://youtu.be/R83DRjaOuwc?si=HYKP4WbtODVUWFah>

We are working with RicoRock™, trying to determine NC-DOT water exposure requirements for the face of the water feature along the road, along with NCDEQ to make sure the water is treated within their requirements, making sure there is a safe pedestrian traffic area. Please bear with us as we dig into state codes and regulations.

Going forward, there needs to be someone to treat the water. Again – not like a pool but pretty close, antifungal, algacide, flocculent, anti-surfactant, I don't know that it would benefit from chlorine or a non-chlorine bromide sterilizer, but we are working to determine that. The lighting is haphazard and there are several exposed conductors on the wires throughout the water feature. This is not shocking hazard as they are 24volts DC, like a 9v battery it'll only shock you if you put it in your mouth, but it still needs to be fixed/replaced. The lights are halogen and LED mixture. They are not matched loads which means they are very inefficient. They should all be submersible/weatherproof IP67 brass fixtures. The lights should be pointed at the water feature and NOT into traffic. There are a couple that point into the street when is a whole other layer of liability. We are not going to quote replacing the plant material, we can communicate with a local ASLA Accredited Landscape Architect to determine appropriate replacement plant material for the micro-climate. We are not recommending the two plant islands have irrigation run in them, that would require sleeving and line boring at substantial additional costs.

To sum it all up, there are erosion issues that are causing structure issues. In our experience we do not feel the water feature is in danger of immanent collapse. Leaving the RicoRock™ as it will lead to further degradation and eventual serious pool damage and greater water loss. Controls related – the panel -was- very nice, until someone just threw parts at it with no plan or appropriate controls capability knowledge. The panel needs to be replaced. It doesn't meet National Electric Code anymore, and there are several safety, efficiency and reliability revisions to be included in a replacement unit. We are working with multiple vendors for a replacement. Thank you for your time and we appreciate the investigative project. We are working as hard as we can to get updated and correct safety regulations, once we have all that we can provide a correct and appropriate repair proposal.

Please email us with any questions.