Appendix C: Surf Lagoon Water Systems Narrative

Wavegarden Surf Farm – Newport Beach, CA – Surf Lagoon Water Systems Narrative July 18, 2025

General Description:

The proposed Surf Farm surf lagoon project will utilize proprietary Wavegarden wave generation technology to create surfable waves within a large manmade body of water. This will be a purpose-built facility, dedicated to the activity of surfing. The configuration of the lagoon, including the plan layout, water depth profile, perimeter design, and water circulation and treatment systems are critical to the operation of the lagoon and wave generation characteristics. The overall lagoon water surface area will be approximately 220,427 SF (5.06 ac) and the total lagoon water volume will be approximately 10,200,000 gallons (38,600 m^3).

The Wavegarden Cove wave basin design for this project will include two separate lagoon areas each operating as independent bodies of water with dedicated recirculation and water treatment systems. Each of the two lagoon areas (left and right side) will be equivalent in design and operation. Each lagoon area will have a water surface of 110,213.5 SF and contain a total of approximately 5,100,000 gallons (19,300 m^3) of water, continuously circulated, filtered, chemically treated, and monitored for water quality.

The lagoon water quality will be continuously monitored via an automated water chemistry control system, maintaining the following water quality parameters at all times during facility operation:

- Water clarity/turbidity: < 5 NTU
- Oxidation Reduction Potential (ORP): minimum 650 mV - maximum 850 mV
- Sanitizer Residual: minimum 0.5 ppm FAC
- pH level: 7.0 to 7.6

Filling of the Lagoon:

The primary water source for initial filling of the lagoon will be the City of Newport Beach domestic water supply. The peak water demand and associated service size/capacity is to be determined based on desired fill time of the lagoon. In considering such a large lagoon water volume of 10.2 million gallons, it is possible that a supplemental water supply may be necessary or desirable to increase the flow rate for initial filling of the lagoon. Fill rate may be supplemented by use of a fire hydrant to increase water flow available for initial filling. Filling schedule (date/duration) would likely require coordination with OCWD. Below is a chart indicating required water service flow rate based on a total fill time ranging from 18 days at approximately 400 GPM, to 2 days at approximately 3,500 GPM.

Initial Fill Rate Study:								
Lagoon Volume (gallons):	10,200,000							
Fill time (days)	18	14	10	8	6	4	3	2
Fill time (hours)	432	336	240	192	144	96	72	48
Avg. water elev. rise (in/hr)	0.17	0.22	0.31	0.39	0.52	0.77	1.03	1.55
Fill rate (gallons/min)	394	506	708	885	1,181	1,771	2,361	3,542

Make-up Water:

Make-up water will be required to maintain an appropriate water level in the lagoon as water is consumed during normal operation. Water consumption will be due primarily to evaporation and wastewater expelled during periodic filtration system cleaning cycles. There will also be some water volume lost to waste due to water carried out of the lagoon when surfers exit, as well as "splash out" from wave action terminating at the shore of the lagoon. The latter is somewhat undefined at this point in the design process as this will be influenced by configuration of the lagoon shoreline, drainage systems, wave type and duration of wave generation during general operation. Each of these factors will also vary dependent on number of users, weather patterns and environmental conditions. A very rough estimation for average water consumption by the lagoon systems is as follows:

Evaporation: Approximately 37,700 gallons per day (annual average)

Splash Out: Approximately 30,800 gallons per day (depending on use)

Filter Wastewater: Approximately 10,570 gallons per cycle (cycle duration varies)

Based on these criteria, it is estimated that make-up water service supplying a flow rate of 95 GPM will be adequate to maintain water level in the lagoon during normal operating conditions. Water level in the lagoon will be continuously monitored and make-up water introduced via an automated water level control system. When lagoon water level drops below setpoint the autofill valve will open and run as needed to make up the required water volume. The flow rate calculation is based on replenishing the anticipated water loss over a 12-hour period.

Lagoon Water Treatment:

Water balance and sanitation of the lagoon water volume will be maintained via automated water chemistry monitoring and control systems. The lagoon water characteristics will be similar to that of a traditional swimming pool in terms of water balance, water clarity, and sanitation. Sodium Hypochlorite will be utilized as the primary sanitizer and is one of the most common chemical compounds used to maintain a chlorine residual in traditional swimming pool facilities. Muriatic acid will be utilized for pH maintenance. Both chemicals will be dosed to the lagoon water through automated feeders in order to maintain a free available chlorine (FAC) residual of minimum 0.5 ppm, an oxidation reduction potential (ORP) of minimum 600 mV, and a pH in the range of 7.0 to 7.6. Water clarity/turbidity will be maintained below 5 NTU with aid of the filtration technology described below. Balanced swimming pool water is generally considered safe to discharge to the storm sewer system once the pool volume has been dechlorinated to a residual of zero.

An ultraviolet (UV) light system will be utilized as supplemental sanitation of the lagoon water. This system will be designed to treat 100% of the recirculation flow rate of the lagoon filtration system and will serve to inactivate chlorine resistant pathogens such as cryptosporidium.

Lagoon Water Filtration:

The lagoon water volume will be continuously filtered utilizing a proprietary state-of-the-art perlite regenerative media filtration system capable of capturing particulate and removing contaminants from the lagoon water down to the 1-5 micron range. Perlite filter media has been tested to be 99% effective at removing pathogens such as cryptosporidium from the filtered water and therefore serves as an additional method of sanitation for the lagoon water volume. Perlite filter media is derived from naturally occurring volcanic rock, is non-toxic and environmentally friendly.

The proposed recirculation rate of the filtration system is 8,800 GPM resulting in approximately a 19.3-hour turnover rate for the 10,200,000-gallon lagoon volume. The perlite filter media will need to be changed

periodically. Filter cycle duration will vary with user loading, weather, and other environmental factors. It is anticipated that the filter cleaning procedure will take place on average once every two weeks, but filter cycle durations may be extended based on the factors mentioned above. When the filter media is changed, the process will drain approximately 2,650 gallons of wastewater to the sanitary sewer system per filter (four filters total). This wastewater volume will contain the spent perlite media. Filter backwash wastewater will be discharged through an air gap to the sanitary sewer system managed by Costa Mesa Sanitation District. Local utility elevation and capacity will be studied to determine the most suitable method of conveying filter wastewater to the sewer system. Most jurisdictions will allow spent perlite media to be discharged into the sanitary sewer system, but in some cases the spent perlite media must be strained out and disposed of separately. Approximately 520 lbs of perlite media will be discharged with the wastewater flow for each filter per backwash cycle.

Lagoon Maintenance Drainage:

There will be limited occasions when the lagoon may need to be partially or completely drained for maintenance or for operations related reasons, such as a storm event introducing additional water volume to the system. In a worst-case scenario when the entire lagoon would need to drained for repairs or maintenance, the 10,200,000 gallon water volume would first be dechlorinated by dosing sodium thiosulfate prior to pumping the water out to the storm sewer system. Approximately 575 lbs of sodium thiosulfate would be required to dechlorinate the entire lagoon volume to a zero-chlorine residual. Granular sodium thiosulfate can be dosed to the lagoon by hand or mixed as a slurry and fed via metering pump. The drain pump rate is to be determined and would be dictated by the storm sewer or detention system capacity which will receive the dechlorinated lagoon water. Dechlorinated lagoon water would be pumped to drain at an appropriate rate and the timing of this would be coordinated by operations staff according to local utility requirements. Drain rates and duration would be equivalent to the fill rate summary included above.

In the case of a storm event introducing additional water volume to the lagoon, the lagoon wave generation systems can remain operational with a water level fluctuation up to 2-inches. Wavegarden proprietary water management systems include meteorological monitoring to automatically restrict autofilling of the lagoon in anticipation of heavy rainfall. For example, if we assume there is a torrential rain event expected for the coming Friday, on Monday the system will automatically begin restricting autofill water introduction to the lagoon, and by close of operations on Thursday the water level in the lagoon will have been reduced in anticipation of the pending rainfall event. This system reduces the likelihood of water needing to be discharged to waste due to a storm event. However, if there is a very large or unexpected rain event, a water level rise in the lagoon greater than 2” would require water to be discharged to waste prior to restarting surfing operations. That said, the lagoon basin is capable of receiving up to 11.8 inches of rainwater above normal operating level before overflowing, so in the event of a major storm, the lagoon can hold a significant volume of water while operations are paused allowing storm surge to dissipate prior to draining lagoon water and restarting surfing operations. Any excess water would be pumped to drain at an appropriate rate and the timing of this would be coordinated by operations staff according to local utility requirements. Prior to discharge the lagoon water would be allowed to dechlorinate through natural dissipation during days of non-use, or alternatively sodium thiosulfate could be dosed in the pipe flow or holding tank as the water is discharged. For every inch of excess water elevation contained in the lagoon, the equivalent volume is approximately 137,409 gallons.

End of Surf Lagoon Water Systems Narrative