

**NEVADA DIVISION OF ENVIRONMENTAL PROTECTION**

**GUIDANCE DOCUMENT FOR RECLAIMED WATER STORAGE PONDS**

This guidance document outlines a suggested list of areas for incorporation into the O&M program at permitted facilities, which operate reclaimed water storage ponds (e.g., golf courses & effluent storage reservoirs).

1. Posting: Reclaimed water warning (advisory) signs need to be checked periodically and replaced when damaged or the printed lettering is illegible because of weathering.
2. Fencing: Where public access control is achieved by fencing, a minimum height of 6 feet shall be used. Parks which have ponds containing category B and lower water quality must maintain fencing in good condition to keep out the public, livestock, and large wildlife.
3. Emergency Egress: An escape plan (e.g., textured liner surface, life preserver rings, sidewall ladders, etc.) is recommended for all storage ponds especially when the presence of an exposed membrane liner surface makes for slick conditions.
4. Liner Maintenance: Liner integrity is important to minimize seepage loss. Clay-lined ponds need to be kept free of weeds and the basins wetted at all operating times to prevent clay desiccation (cracking). Membrane liners need to be securely fastened into the anchor trenches to prevent wind uplift and liner tearing. If the liner is covered (e.g., compacted soil, spray-on concrete), the cover needs to be maintained in a good shape to minimize liner surface weathering. A thorough liner inspection is recommended periodically and generally requires the pond to be drained, cleaned, and the working conditions made safe for the inspection personnel.
5. Berms: Maintain the embankment (sidewalls) to prevent erosion and failure (slumping). Contact a wildlife specialist to humanely trap and remove any burrowing animals.
6. Sludge Removal: Pond sludge is to be removed in a manner, which is protective of the liner material. Heavy equipment and sharp tool edges are not recommended when working, with membrane liners. The sludge depth should be measured and recorded periodically using a measurement device such as a Sludge Judge<sup>®</sup> tube and the pond cleaned when the sludge depth is  $\geq 20\%$  of the pond's design operating depth.

7. **Freeboard:** Maintenance of a minimum freeboard (2 ft. for ponds  $\leq$  1 acre or 3 ft. for ponds  $>$  1 acre) limits wave overtopping in high winds and provides for precipitation storage under normal operating scenario. Release of reclaimed water from a pond to a surface watercourse or storm drain is prohibited without prior Division approval. At all times, the water level must be maintained below the top of the liner material to prevent seepage loss.
8. **Pond Color:** Frequent visual inspection of the pond's surface appearance provides the facility operator with an indication of the overall ecosystem health in the pond. The following table indicates various pond color conditions that may be encountered:

<b>Surface Appearance</b>	<b>Condition</b>	<b>Comment</b>
Colorless or light green	Optimal	Acceptable algae level
Pea soup green	Algae Bloom	Excessive algae growth
Floating sludge	Seasonal Turnover	Sludge buildup in pond
Black	Low or no dissolved oxygen	Septic pond (toxic)
Yellow or fluorescent green	Low oxygen & pH levels	Blue-green algae (toxic)
Tan or muddy	Storm inflow	Sediment buildup in pond

9. **Algae:** The control of excess pond algae growth is important to limit objectionable odor and maintain good pond aesthetic conditions. Algae control methods can include aeration, circulation (mixing), ozone addition, ultrasonic devices, biological control (e.g., barley straw or duckweed), algae filters, chemical addition, and denitrification (nitrogen removal). If the surrounding landscaping is fertilized, minimize any irrigation runoff into the storage pond, which can be laden with nutrients (nitrogen and phosphorus) conducive to promoting algae blooms.
10. **Chemical Control:** The usage of water treatment chemicals is to be conducted in accordance with the manufacturer's instructions and all applicable environmental regulations. The application of copper-based chemicals (e.g., copper sulfate) in unlined ponds is not recommended due to seepage and potential groundwater contamination with high copper level.
11. **Monitoring Wells:** A groundwater monitoring program may be required to monitor pond seepage loss and/or surrounding landscape irrigation practices especially when the reclaimed water source is not denitrified.
12. **Vector Control:** If your pond is a source of vector breeding (e.g., mosquitoes), consult with your local health department or county extension program to see if a vector control program is recommended to prevent the transmission of waterborne illness. Mosquito prevention measures include aeration, mixing, chemical or pesticide addition, and stocking of mosquito fish (i.e., *Gambusia affinis*).
13. **Vegetation Control:** The seasonal removal of aquatic vegetation aids in preventing berm erosion and liner damage, and limits organic debris accumulation. Overgrown

ponds can inhibit natural wind aeration and promote vector growth if the water surface is quiescent. To prevent organic overloading, remove all leaf litter, wind-blown weeds, and lawn clippings in and around the vicinity of the storage pond.

14. Pond Odor: Objectionable pond odor is generally the result of a high oxygen demand condition in the water and less frequently from a toxic upset (e.g., illicit discharge). High oxygen demand in the pond can result from excess sludge buildup, seasonal pond turnover, a non-denitrified effluent source, or an overloaded wastewater treatment system. Near-surface dissolved oxygen (D.O.) levels can be read with a handheld meter and need to be maintained  $\geq 2$  mg/l of D.O. to maintain aerobic conditions in the pond at all times.
15. Worker Hygiene: A sample Worker Safety Fact Sheet is available on the NDEP website in reuse guidance documents WTS-1A or WTS-1B. Direct public contact with the storage ponds (e.g., golf ball retrieval) needs to be controlled by the facility since the public may not be properly immunized and have received the proper training to safely contact reclaimed water.
16. Wildlife Issues: A waterfowl management program may be needed if high bacterial levels in the ponds are due to excessive waterfowl manure loading. Stocking of ornamental fish in the pond may be inappropriate if the effluent source contains residual levels of chlorine and/or ammonia considered detrimental to aquatic life.
17. Water Sampling: Generally, the effluent provider is in charge of sampling and reporting the effluent quality at the time of the plant's discharge (i.e., end-of-pipe sampling). Over time, poor pond management practices can deteriorate an acceptable effluent source to that of a less suitable level considered unacceptable for spray irrigation discharge.
18. Aerators: If mechanical aerators are used, the facility operator needs to implement the manufacturer's O&M recommendations including a preventive maintenance program and stocking of sufficient spare parts inventory.