

NEVADA DIVISION OF ENVIRONMENTAL PROTECTION**GUIDANCE DOCUMENT FOR WASTEWATER POND SYSTEM O&M**

This guidance document outlines a suggested list of areas for the pond operator to regularly check on in order to maintain a properly operated pond (lagoon) treatment facility.

1. **Fencing/Posting**: Periodically inspect the fencing to make sure that it is of an adequate height and condition to keep out livestock and the public. Warning signs should be legible and posted at the entrance gate and on all sides of the fence at a reasonable spacing interval.
2. **Landscaping**: Keep all trees and bushes away from any berm where root damage can occur. For proper aeration and wind mixing, remove any vegetation, which overhangs onto or shades the water surface since beneficial algae require sunlight to produce oxygen. Remove any dead leaves or bushes from the water surface, as decaying vegetation only adds to the organic load the pond has to treat.
3. **Aquatic Vegetation**: Plants such as cattails and bulrush hinder proper pond operations by shading algae growth, limiting wind mixing over the water surface, increasing yearly sludge buildup and providing habitat for nuisance vectors (e.g., mosquitoes) and burrowing animals. Yearly, all aquatic vegetation is to be removed from ponds by a program of cutting, burning and/or herbicide application. When weeds are removed, the earthwork should be inspected and any root damage repaired. Aquatic vegetation growth is generally permissible only in constructed wetlands, which are designed to polish secondary effluent.
4. **Earthwork**: Maintain the top of the service berm in a weed-free condition to permit access for the facility's personnel, vehicles and equipment. The embankment sidewalls are to be maintained to prevent erosion and failure. Minimum freeboard levels of 2 ft. (\leq 1 acre of surface area) and 3 ft. ($>$ 1 acre of surface area) in the pond allow for storage of incident precipitation and normal fluctuations in influent flow. Inspect the earthwork regularly for animal burrow holes, relocate the burrowing animals and then fill-in the holes as needed to prevent catastrophic berm failure.
5. **Color**: Visual inspection of the pond's surface color offers the operator an indication of the pond's operating condition. Ideally, a properly loaded facultative pond is maintained with a dark to bright sparkling green algae color. The following table provides a summary of various color schemes that may occur.

Color	Condition	Comment
Dark or sparkling green	Optimal	Abundant algae
Brown	Less than ideal	Overloading / excess sludge
Floating Sludge	Spring/fall turnover	Odor & poor effluent
Black	Worst	Septic (toxicity)
Yellow or fluorescent green	Blue-green algae	Low pH & D.O.
Tan	Storm inflow	Sediment buildup
Purple to pink	Sulfur bacteria	High loading (low D.O.)
Red	1. Bloodworms or 2. Daphnia	1. Midge Fly Hatch 2. Water Fleas

6. **Odor:** Objectionable odor can be the result of organic overloading or toxic chemical input. To address toxic chemical input, the facility's pre-treatment coordinator needs to be promptly contacted and all potential industrial/commercial dischargers consulted (if the facility does not have or is unsure of the local pre-treatment coordinator to contact, please contact NDEP-BWPC Technical Services for further assistance with industrial/commercial dischargers). When organic loading conditions exceed the facility's design capacity and dischargers cannot reduce their flow, additional pond capacity and/or aeration capacity may be required as specified by the facility's design engineer. Pond systems may also experience biannual pond turnover due to complete water column mixing (turnover) in spring and fall. Oxygen demand is increased during this period as sludge is mixed towards the surface increasing odor and reducing effluent quality. To limit pond turnover odor, the operator should evaluate increasing the available aeration capacity and aerator operation time during this period. Where mechanical aeration is unavailable in facultative ponds, pond turnover odor is limited by maintaining sludge accumulation through regular sludge depth monitoring and removal to limit sludge depth accumulation to $\leq 20\%$ of the available operating depth.
7. **Aerators:** Equipment needs vary, so consult with the manufacturer to maintain the recommended service schedule and spare parts inventory. For aerated ponds, influent screening is recommended to remove rags and other debris, which can foul or damage rotating mechanical equipment. Periodically, check the aerator's placement and anchoring to maintain optimal oxygen transfer efficiency. For this task, a boat and appropriate safety equipment (e.g., flotation device) is required. D.O. (dissolved oxygen) levels should be checked periodically to maintain aerobic conditions of ≥ 2 mg/l or higher at or near the water surface.
8. **Sludge:** Ponds are designed to store and digest sludge requiring that the sludge depth be periodically surveyed using tools such as a Sludge Judge™ (plastic coring tube) or measuring stick with white cloth. NDEP recommends that this survey be performed annually. Recommended sludge removal occurs when the average sludge depth level exceeds 20% of the overall operating depth, at which

- point poor effluent quality and groundwater nitrate contamination can occur. Sludge disposal is to occur in a manner approved by NDEP (e.g., permitted landfill or agricultural application site). Whenever a sludge inventory is conducted, always include a safety plan, work partner(s) and appropriate personal protective equipment (PPE) such as gloves and disposable coveralls.
9. Debris Removal: Equipment such as measurement flumes, screens, aerators and outlet/transfer gates trap debris and should be inspected daily to remove any build-up or blockage. A leak-proof trash receptacle with tight fitting lid should be furnished. Periodically, the pond perimeter should be inspected with any floating debris skimmed out to minimize wind-strewn trash at your facility.
 10. Synthetic Liners: Synthetic liners (e.g., HDPE & PVC) generally offer superior leakage resistance over clay (bentonite). When the liner is properly anchored (keyed) into the berm, weed growth is reduced due to less exposed soil surface where weeds can take root. Periodically, the facility should inspect its liners to document UV (sunlight) damage and promptly repair any tearing or holes. A full liner inspection is only permissible when the pond is drained, clean and safe to enter. Sludge removal is to be conducted in a manner protective of the liner material. Since the liner surface can be slick when wet, the operator needs to take care when working around or on top of the liner surface. Since falls can occur, an emergency egress system should be incorporated (e.g., knotted ropes, corner escape steps/ladders and life buoys).
 11. Earthen or Clay Liners: If present, implement regular inspections to check for erosion, burrowing animals and weed growth. Clay liners should be maintained wet at all times when in service to avoid surface cracking. When off-line, clay-lined ponds may have to be re-compacted with fresh clay material to repair holes and cracks prior to being put back on-line.
 12. Operating Depth: The operating depth (i.e., water level) is typically tracked using a staff gage, sidewall mark or other measuring device. Typical depth range for ponds is 6-20 ft. Shallow ponds (< 5 ft.) offer less sludge storage capacity and require increased sludge removal frequency. If a staff gage is supplied, its position should be checked annually as gages can be knocked over by ice activity or wind.
 13. CBOD: Refer to your discharge permit for specific effluent limits. Secondary treatment standards for ponds generally limit CBOD (inhibited BOD) levels to 30 / 45 mg/l (i.e., 30-day average / daily maximum limits). Conditions, which can affect the effluent quality, include organic overloading, insufficient detention time, cold operating temperatures and excessive sludge buildup. If high CBOD is noted in your effluent, contact your engineer to identify and correct.

14. TSS Removal: Secondary treatment standards for ponds generally limit TSS (Total Suspended Solids) levels to 90 mg/l. High TSS levels can be caused by excessive algae growth or poor solids settling. Algae control includes surface aeration, reduction in detention time in summer and barley straw addition (natural algaeicide). Periodically, infiltration basins need to be disked (scarified) to breakup weed growth and surface matting (crusting) from discharge of pond algae.
15. Algae Blooms: Algae blooms can be problematic in warm sunny weather from nutrient (nitrogen and phosphorus) conversion. If algae growth is unchecked, a sudden algal bloom and die-off can cause anaerobic, odorous conditions. Since blue-green algae release toxins upon die-off, all livestock and animals (e.g., wild horses) should be fenced out of treatment ponds and disposal basins.
16. Mosquitoes: Mosquito control is necessary to prevent the transmission of waterborne illnesses such as West Nile Virus. Consult with your local health department for controlling mosquito activity at your facility. Mosquito prevention measures include aeration (i.e., reduce stagnation), aerial spraying, larvacide application, chlorination and introduction of mosquito fish (*Gambusia affinis*) if the water quality allows, e.g., pond ammonia levels can be toxic to fish.
17. Pond Hydraulics: Stagnant areas in a treatment pond should be noted and addressed, e.g., aerator relocation or addition of extra aeration capacity. Stagnant spots in a pond increase trash buildup and odors and also reduce overall treatment efficiency.
18. Sampling: CBOD and TSS measurements require a State-certified laboratory for compliance sampling analysis. Portable and relatively inexpensive sampling equipment the operator may want to investigate for a facility include hand-held pH and D.O. meters and a sludge measurement device.
19. Other Equipment: Flow measurement devices need to be inspected and calibrated at the manufacturer's recommended interval. Transfer valves and diversion gates need to be regularly exercised and maintained (e.g., lubrication) to ensure proper functioning.
20. Monitoring Wells: Monitoring wells, installed in accordance with guidance document WTS-4, monitor groundwater impacts from pond liner leakage and effluent disposal.