**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD**

**SAN FRANCSICO BAY REGION**

**ORDER NO. R2-2017-XXXX**

**General Waste Discharge Requirements For Discharges of**

**Winery Waste to Land within the San Francisco Bay Region**

**FACT SHEET**

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# SCOPE OF COVERAGE

1. The General Waste Discharge Requirements for Discharges of Winery Waste to Land within the San Francisco Bay Region (Winery Order or Order) prescribes general waste discharge requirements for facilities discharging winery waste to land within the San Francisco Bay Region (Region). Within the Region, there are wineries located in areas not served by community sewers and centralized wastewater systems. Wastewater generated from these facilities is managed by decentralized wastewater systems, typically discrete systems associated with individual wineries. The treated wastewater can be discharged to land as a means of further treatment and disposal. Discharges of waste to land are subject to regulation by the Regional Water Board pursuant to the California Water Code (Water Code). The Order provides general waste discharge requirements for these surface and subsurface discharges to land from enrolled facilities’ winery wastewater treatment and discharge systems.
2. This Fact Sheet is a companion document to the Winery Order. It provides additional information on the following:

* Decisions made by the Regional Water Board while drafting the general permit.
* Regulatory and technical basis for the Regional Water Board’s decisions.
* The nature of the proposed discharges conditionally authorized by the general permit.
* The legal and technical basis for the issuance of the Order.

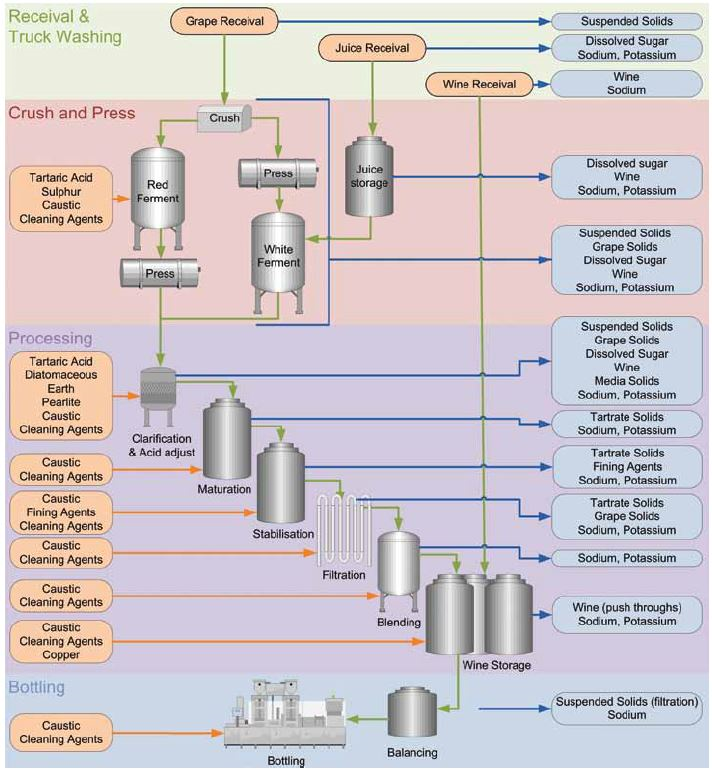
1. The Regional Water Board anticipates that Dischargers implementation of the requirements of the Order will likely result in improved waste management systems and practices, and discharges that do **not:**

* Cause or contribute to violations of the Regional Water Board’s water quality objectives.
* Cause water quality impacts to groundwater aquifers.
* Damage soil and vegetation.

1. The following are subject to the Order:
2. Existing, new, and expanding facilities.
3. Commercial, non-commercial, and residential wineries that engage in any or all steps of processing grapes into wine, including, but not limited to, crushing grapes to extract juice, fermentation, chemical manipulation, storage, aging, and bottling.
4. Land application of winery process solid waste.
5. Discharges of domestic wastewater and winery process wastewater if the domestic wastewater is treated separately from the winery wastewater or combined in a package wastewater treatment plant.
6. **Winery operations in the Region vary greatly in production and waste volume.** The ratio of winery wastewater generated per gallon of wine produced depends upon the wine processing and conservation operations and grape varietal operations, but generally ranges from two to eight gallons of wastewater per gallon of wine produced. Thus, winery wastewater produced by a facility may range from 10 to 500,000 gpd. Larger volume discharges typically involve more complicated treatment and discharge systems that require a higher level of oversight, and pose a greater potential threat to water quality. The Order takes into account the diversity of conditions, such as location, treatment methods, and environmental setting, under which wineries operate within the Region.

**Figure 1** depicts a schematic of possible sources of waste generated during the wine production process.

**Figure 1: Schematic of Typical Sources of Winery Wastes[[1]](#footnote-1)**



1. **The known inventory of wineries that will need coverage under the Order is approximately 1,000.**

Per information provided by the counties, the approximate number of locally‑permitted wineries that discharge to land within the Region is about 976, which is in addition to those permitted by the Regional Water Board. The number of permitted facilities per county is summarized in **Table 1**. **Table 1** also includes the wineries that currently have individual WDRs.

Table 1: Wineries that Discharge to Land in Region 2

|  |  |
| --- | --- |
| **County** | **No. Wineries Discharge to Land** |
| Alameda | 53 |
| Contra Costa | 0 |
| Napa | 491 |
| Marin | 0 |
| San Francisco | 0 |
| San Mateo | 4 |
| Santa Clara | 20 |
| Solano | 8 |
| Sonoma | 400 |
| Regional Water Board | 16 |
| Total Permitted Wineries in Region | 992 |

# REGULATORY FRAMEWORK

1. **Groundwater Protection.** Groundwater is increasingly important as a source of drinking water. The Order regulates winery wastewater discharges to groundwater, and is, thus, a step towards protecting drinking water resources. The Order allows the Regional Water Board to effectively manage and mitigate the localized and potentially cumulative impacts of winery discharges on groundwater resources. Changing climate patterns and the threat of prolonged droughts are likely to lead to increased reliance on groundwater for drinking uses and other beneficial uses to meet California’s future water supply needs. Such pressures on groundwater resources require that the ties between land use, human activity, water quality, and water supplies be managed to promote the sustainable use of groundwater resources. Wineries that exist outside of sewered areas contribute wastewater into these groundwater basins, thus adding to the importance of regulating winery discharges.
2. **General Orders**. Water Code Section 13263(i) allows a regional board to prescribe general waste discharge requirements for a category of discharges for which the following criteria are found to apply:

a. The discharges are produced by same or similar operations;

b. The discharges involve the same or similar types of waste;

c. The discharges involve the same or similar treatment standards; and

d. The discharges are more appropriately regulated under general discharge requirements than individual discharge requirements.

1. **Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan).** The Basin Plan is the Regional Water Board’s master water quality control planning document. It designates beneficial uses and water quality objectives for waters of the State, including surface waters and groundwater. The Basin Plan was duly adopted by the Regional Water Board and approved by the State Water Board, the Office of Administrative Law, and U.S. EPA. The Order implements the objectives and provisions of the Basin Plan. The Order includes effluent limits and discharge requirements intended to protect existing and potential beneficial uses of waters of the State, as well as to protect public health and the environment.

California's regulatory framework uses water quality objectives both to define appropriate levels of environmental quality and to control activities that can adversely affect water resources. **Figures 2‑10** through **2-10D** in Basin Plan Chapter 2 depict the groundwater basins and the groundwater-bearing volcanic areas within the Region. The latest version can be found on the Regional Water Board’s website at <http://www.waterboards.ca.gov/sanfranciscobay/basin_planning.shtml>.

1. **Onsite Wastewater Treatment System Policy.** The statewide Onsite Wastewater Treatment System Policy (OWTS Policy) is a driver for the establishment of this Order. The OWTS Policy does not authorize local agencies to permit onsite wastewater treatment systems that accept industrial or commercial process water. The State Water Resources Control Board (State Water Board) adopted the “Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems” (OWTS Policy) through Resolution No. 2012‑0032, which became effective on May 13, 2013. The OWTS Policy establishes a statewide, risk-based, tiered approach for the regulation and management of OWTS installations and replacements, and sets the level of performance and protection required of these systems in each tier. The OWTS Policy requires Dischargers to use the best practicable treatment or control of the discharge necessary to avoid creating a condition of pollution or nuisance and to maintain the highest water quality consistent with the maximum benefit to the people of the State.
2. **Wineries produce high-strength wastewater.** The strengthof wastewater refers to the concentration of the water quality pollutants in the wastewater.OWTS Policy Section 2.63 states that any OWTS that receives high-strength wastewater shall notify the Regional Water Board by submitting a Report of Waste Discharge. The OWTS Policy defines high-strength wastewater as wastewater having a 30-day average concentration of biochemical oxygen demand (BOD) greater than 300 milligrams per liter (mg/L), or of total suspended solids greater than 330 mg/L, or a fats, oil, and grease concentration greater than 100 mg/L prior to the septic tank or other OWTS treatment component. Winery wastewater is considered high‑strength wastewater because it contains high concentrations of BOD and TSS.
3. **Three tiers of regulation.** The Order regulates wineries in three tiers as follows:

Tier One: Dischargers discharging less than 1,500 gallons per day (gpd) monthly average of winery waste during crush season and 1,500 gpd daily maximum during non-crush season.

Tier Two: All other Dischargers discharging greater than a crush season monthly average and non-crush season daily maximum of 1,500 gpd, except for those in Tier Three.

Tier Three: Dischargers with facilities located in a County that is authorized as program administrator, pursuant to a county oversight program that has been approved by the Regional Water Board Executive Officer.

1. **County Oversight (Tier Three).** The Order includes an authorization process for County Oversight (Tier Three) of the discharges of winery wastewater to land by counties that have comprehensive winery wastewater regulatory programs. Tier Three facilities are subject to enforcement by the Regional Water Board via the authority of the Order. Tier Three is intended to support local oversight of the permitting, inspection, and administrative services of the winery permitting program by county agencies, through an authorized County agency, of wineries covered by the Order.
2. **Other Water Boards permits that wineries are or may be required to obtain include stormwater permits and 401 water quality certifications.**

a. **Industrial Storm Water Permit.** Many wineries have tanks, crush pads, commodity storage areas, wash areas, etc. located where they are or could be exposed to precipitation and run-on. Some wineries have all or most of their processing equipment protected from precipitation. In either case, these facilities are engaged in industrial activity (40 CFR § 122.26) and are subject to stormwater permitting requirements if there is a discharge to surface waters of the United States. In California, wineries are subject to the Statewide NPDES General Permit for Storm Water Discharges Associated with Industrial Activities (Order No. 2014-0057-DWQ or the latest version, commonly referred to as the “Industrial Stormwater Permit”). The Industrial Stormwater Permit and associated guidance documents are available online at <http://www.waterboards.ca.gov/water_issues/programs/stormwater/industrial.shtml>. The Order requires Dischargers to comply with the Industrial Stormwater Permit, as applicable.

b. **Construction Storm Water Permit if construction activities occur onsite.** If a winery undertakes a construction project (for any reason, including expansion of or change to the facility or wastewater treatment system), and the construction activities involve land disturbance (excluding agricultural activity) of one acre or more, the Discharger is required to obtain permit coverage under NPDES General Permit No. CAS00002, Waste Discharge Requirements For Discharges Of Storm Water Runoff Associated With Construction Activity (Construction Stormwater Permit), Order No. 2009-00009-DWQ as amended by Order Nos. [2010‑0014‑DWQ](http://www.swrcb.ca.gov/water_issues/programs/stormwater/construction.shtml) and 2012-0006-DWQ, prior to commencement of construction. Construction activity subject to the Construction Stormwater Permit includes clearing, grading, and disturbances to the ground such as stockpiling, or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility. The Order requires Dischargers to comply with the Construction Stormwater Permit, as applicable.

**c. Clean Water Act Section 401 Water Quality Certification if construction work occurs in or around creeks or wetlands**. When an activity results in dredge or fill material discharge to waters of the United States (U.S.), and this includes any activity that results or may result in a discharge that directly or indirectly impacts waters of the U.S., the Discharger may be required to obtain a Clean Water Act section 404 permit and section 401 water quality certification. Examples or work requiring this certification include any construction work in or placement of structures (such as a bridge, an outfall, or a culvert) into, over, or adjacent to a creek, wetland, or other water of the United States. Regional Water Board policy requires that impacts to wetlands and other waters of the State be avoided and minimized to the maximum extent practicable. This Winery Order does not provide coverage for discharges of dredge or fill material to waters of the U.S. Additional information about the 401 water quality certification is available online at <http://www.waterboards.ca.gov/rwqcb2/certs.shtml>.

1. **U.S. EPA requirement applicable to wineries that discharge via a septic system**. The U.S. Environmental Protection Agency (U.S. EPA) states that a Class V well is used to inject or dispose of non‑hazardous fluids underground. Septic system leachfields are considered a Class V well. Additional information on when the U.S. EPA regulates a septic system as a Class V well is accessible online at <https://www.epa.gov/sites/production/files/2015-08/documents/fs_septic_sys.pdf>.

# WINERY WASTEWATER TREATMENT CONSIDERATIONS

1. **Wastewater system.** The term *wastewater system* refers to the collection and conveyance system, treatment equipment and systems, pumping stations, monitoring systems, and other systems associated with the collection, treatment, storage, and discharge of wastewater. Wastewater systems may include, but are not limited to:

a. Slow rate land treatment;

b. Land surface applications such as vineyard and field irrigation, and land spreading;

c. Subsurface applications such as septic tanks/leachfields and subsurface drip irrigation;

d. Aerated ponds or aerobic facultative lagoons;

e. Onsite tank storage and off-site disposal;

f. High-rate system bioreactors/activated sludge or biodigesters;

g. Package treatment plants;

h. Constructed wetlands;

i. Aerobic treatment systems; and

j. Sand/media filters.

1. **The Order requires secondary treatment, or greater, for winery waste discharges**. Secondary treatment is a wastewater treatment process to achieve a certain degree of effluent quality by using a wastewater treatment system with physical phase separation to remove settleable solids (primary treatment) and a biological process to remove organic matter (secondary treatment). Due to the high strength of winery wastewater, the supplemental treatment that is achieved in the soil column may not, by itself, be sufficient to treat the winery wastewater sufficient to achieve water quality objectives.
2. Primary and secondary treatment remove the majority of biochemical oxygen demand (BOD) and suspended solids in wastewaters. Advanced wastewater treatment is any process designed to produce an effluent of higher quality than normally achieved by secondary treatment processes or containing unit operations not normally found in secondary treatment. Advanced wastewater treatment is used for additional organic and suspended solids removal, nutrient removal, and removal of toxic materials.
3. **Alternative septic systems may be used by facilities covered under the Order, but conventional septic systems are only allowable under certain conditions.**

a. **Alternative septic systems are designed to accommodate winery (high-strength) waste.** Per U.S. EPA, an alternative septic system is a wastewater treatment system that includes components different from those typically used in a conventional septic tank and subsurface wastewater infiltration system. An alternative system is used to achieve acceptable treatment and dispersal of wastewater where conventional systems either may not be capable of protecting public health and water quality or are inappropriate for properties with shallow soils over ground water or bedrock or soils with low permeability. Examples of components that can be used in alternative systems are sand filters, aerobic treatment units, disinfection devices, and alternative subsurface infiltration designs such as mounds, gravelless trenches, and pressure and drip distribution.[[2]](#footnote-2)

b. **Using a conventional septic tank designed for domestic wastewater for the treatment of winery wastewater is prohibited in the Order unless the winery is existing, enrolled under Tier 1 and meets wastewater limitations.** Differences between a conventional septic system used for domestic wastewater and a septic system designed for winery wastewater can include, but are not limited to: additional treatment processes such as filtration or textile media for biological growth, ability to handle highly variable or seasonal flow, and the addition of nutrients such as carbon to speed up the rate of degradation of a constituent. Additionally, the more acidic nature of winery wastewater and its high soluble oxygen demand do not support a microbial population that can adequately digest sugars and other organics, which is a treatment process in a conventional domestic septic system.

High-strength wastewater as defined by the OWTS Policy is wastewater that has a 30-day average concentration of biochemical oxygen demand greater (BOD) than 300 mg/L or of total suspended solids (TSS) greater than 330 mg/L prior to entering the septic system. These limits are included in the Order as a condition to using the conventional septic system. If the wastewater entering the septic system designed for domestic wastewater has a BOD concentration less than 300 mg/L and a TSS concentration less than 330 mg/L, then the use of the septic system is acceptable. The wastewater quality is demonstrated by a one-time sampling event for BOD and TSS.

# WINERY WASTEWATER CHARACTERISTICS

1. **Winery wastewater has variable chemistry.** Discharged winery process wastewater is likely to be high in waste organic material, which consumes oxygen in the receiving water as it breaks down. Winery process wastewater may alter water chemistry by shifting the acid/base balance and adding nutrients and salts.
2. Typical raw winery wastewater during the crush or non-crush may have the following characteristics:

Table 2: Winery Wastewater Characteristics[[3]](#footnote-3)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | 1. **Units** | **Crush Season[[4]](#footnote-4)** | | | **Non-Crush Season[[5]](#footnote-5)** | | |
| **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| Biochemical Oxygen Demand | mg/L | 1,790 | 6.1 | 15,400 | 1,390 | 3.9 | 41,000 |
| pH | s.u. | 6.9 | 3.6 | 12.9 | 7.1 | 3.6 | 11.3 |
| Total Suspended Solids | mg/L | 300 | 5 | 660 | 260 | 5 | 720 |
| Nitrogen | mg/L | - | 1 | 40 | - | 1 | 40 |
| Nitrate | mg/L | 3.0 | 0.00 | 15.8 | 0.5 | 0.0 | 6.4 |
| Chloride | mg/L | 48.8 | 2.3 | 1,050 | 23.0 | 3.4 | 143 |
| Total Dissolved Solids | mg/L | - | 80 - 315 | 1,240 - 2,900 | - | 80 - 214 | 720 - 2,900 |
| Sodium | mg/L | 137 | 6.8 | 3,060 | 86.6 | 5.4 | 714 |
| Sodium Adsorption Ratio | mEq/L | 2.4 | 0.2 | 46.9 | 1.5 | 0.2 | 9.5 |

1. Wineries covered by the Order are permitted to discharge treated domestic wastewater to land if the domestic wastewater is generated in support of winery operations and events and treated separately from the winery wastewater. **Table 3** summarizes general characteristics of raw domestic wastewater:

Table 3: Domestic Wastewater Characteristics

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Units** | **Raw Domestic Wastewater Concentration[[6]](#footnote-6)** | |
| **Range** | **Typical** |
| Biochemical Oxygen Demand | mg/L | 110 - 440 | 210 |
| pH | s.u. | 6.7 – 7.5 | 7.0 |
| Total Suspended Solids | mg/L | 120 - 360 | 230 |
| Nitrogen | mg/L | 20 - 85 | 40 |
| Nitrate and Nitrite | mg/L | 0 to small | 0 |
| Chloride | mg/L | 30 - 100 | 50 |
| Coliform | MPN/100 mL | 103-106 |  |
| Total Dissolved Solids | mg/L | 250 - 800 | 500 |
| Sodium[[7]](#footnote-7) | mg/L | 40 - 70 | - |

1. **Water Quality Constituents of Interest: Characteristics and Management**. The following is a discussion of water quality constituents that may be discharged in winery wastewater. It is intended to describe those constituents most likely to be discharged, but is not exhaustive.

a. **Organic / Biochemical Oxygen Demand (BOD) loading can lead to anaerobic conditions, which slows the soil’s natural wastewater treatment processes.** Excessive organic loading in discharges to land can lead to depletion of oxygen in soil, which causes anaerobic conditions. Anaerobic conditions can mobilize naturally-occurring metals. Excessive organic loading leads to ineffective wastewater treatment because anaerobic bacteria degrade organic material at a slower rate than aerobic bacteria, and soil clogs with organic matter and suspended solids.

Thus, organic dose loading and the need for a hydraulic rest period must be assessed during treatment system design and properly managed during operation. Alternating loading with hydraulic rest periods can create aerobic conditions in soil that can prevent metals leaching and still provide anaerobic conditions that can lead to denitrification.

Since the additional treatment of wastewater through land application is basically biological, the soil has a renewable capacity for BOD removal as long as the loading rate and cycle allow for preservation and/or restoration of aerobic conditions in the system. In the Order, BOD loading is regulated by effluent limitations and discharge specifications with the goal to achieve the balance between wastewater discharges that provide BOD to the receiving soil at a rate that can be assimilated by that soil. Furthermore, by requiring a dosing pattern that includes periods of rest, the natural nitrogen conversion process is also optimized.

b. **Low or high pH** **can deteriorate soil health and mobilize metals.** The pH of water determines the solubility (amount that can be dissolved in the water) and biological availability of chemical constituents such as nutrients and heavy metals.[[8]](#footnote-8) pH has a scale of 0 to 14. A pH of 7 is neutral; a pH greater than 7 indicates alkaline water; and a pH less than 7 represents acidic water. Activities and materials that can affect the pH of winery wastewater include ion exchange (acidic), product loss (juice, wine, and lees) (acidic), cleaning agents (basic or acidic), and the microbial metabolism of organic substrates during storage of wastewater further acidifies the wastewater.

Soil pH levels that are too high or too low, which can be influenced by the pH of the discharge, lead to deficiency of nutrients, decline in microbial activity, and deterioration of soil health. Additionally, low pH water can dissolve metals from soil that would then be mobilized in the groundwater. The lower pH limit will reduce the potential for metals to be mobilized. The pH range suitable for biological treatment is typically between 5 and 9 and the optimum pH for crop growth is 6.4 and 8.4.[[9]](#footnote-9)

c. **Total suspended solids are filtered by the soil, but they can also clog the soil, which decreases the soil’s ability to receive and treat wastewater.**

i. Wastewater is physically filtered by soil in land application systems. Suspended solids in wastewater can be retained near the surface and limit oxygen transport into the soil, promoting anaerobic conditions. Over time, the addition of organic matter can cause a change in soil type chemical and physical properties. Suspended solids, including organic matter in wastewater, may clog the soil. Also, the addition of organic matter to soil can increase the moisture retention capacity. These changes can cause ponding, odors, and a reduction in the ability of the wastewater to move through and be treated by the soil.

ii. The Order contains a suspended solids technology-based effluent limitation. The Order Discharge Specifications, in particular, the hydraulic loading discharge specifications, requires the Dischargers to design a system that manages the application rate of total suspended solids to avoid anoxic conditions and ponding that can result from clogging.

d. **Nitrate in groundwater can be a health hazard.**

1. Nitrate is a water-soluble anion that is not sorbed to the negatively charged sites on soil particles, thus is mobile and moves with percolating water.
2. Nitrate concentrations greater than the drinking water standard of 10 mg/L nitrate as nitrogen (NO3-N)can pose significant health risks. Nitrate concentrations must be reduced either before application to the ground or via the ground before it reaches the receiving groundwater body. Generally, domestic wastewater contains higher levels of nitrate than winery process wastewater, but wineries also may have high enough nitrate levels that nitrogen removal treatment may be necessary prior to discharging to land.

ii. Factors that influence whether the nitrate in the wastewater will impact the groundwater include: effluent quality, plant uptake, and the conditions and ability of the vadose zone below the discharge area to convert the effluent nitrogen to nitrate, which is then converted to nitrogen gas prior to reaching the groundwater table. The ability of a plant to capture nitrogen from the soil depends on soil type, environment, and species. The highest nitrogen removal rates happen when the vadose zone has areas (or times) of alternating wet (reducing) and dry (oxidizing) zones. Denitrification occurs when oxygen levels are depleted and nitrate becomes the primary oxygen source for microorganisms.

1. Groundwater degradation due to nitrogen can by controlled by various methods, such as, but not limited to, appropriate screening, settling, and slow rate land application with cropping activities when crops are harvested and removed from the discharge area. Unless groundwater is very shallow, groundwater degradation caused by nitrate can be prevented by minimizing percolation below the root zone of the crops and ensuring that the total nitrogen load does not exceed crop needs over the course of a typical year. Where there is sufficient unsaturated soil in the vadose zone, excess nitrogen can be mineralized and denitrified by soil microorganisms.
2. Nitrogen undergoes transformations in the soil. Ammonium (NH4+) is another form of nitrogen that can transform into nitrate in the soil by the soil microbes. Ammonium is slower than nitrate and can bind to clay particles in the soil or be directly absorbed by plants.[[10]](#footnote-10)

iv. The Order contains a numeric action level for nitrate for facilities in Tiers 2 and 3, except for facilities that discharge to groundwater with known nitrate concentrations greater than the Basin Plan water quality objectives. For those facilities, the Order contains effluent nitrate concentration and nitrogen loading limitations.

e. **High concentrations of salinity/total dissolved solids have the potential to result in adverse impacts to soil and water quality.** Of the different types of salts and dissolved solids, sodium chloride and fixed dissolved solids have a greater potential of impacting soil and groundwater. The fixed dissolved solids are primarily the portion of the total dissolved solids that consists of inorganic constituents, which can accumulate in the soil.

i. Salinity is the total concentration of all dissolved salts in water, which include the major ions of chloride, sodium, magnesium, sulfate, calcium, potassium, bicarbonate, and bromine. Salinity due to sodium chloride is treated separately from other dissolved solids, some of which may be beneficial to soil. Total dissolved solids (TDS) combines the sum of all ion particles that are smaller than two microns and can include organic solutes in addition to the salt ions. TDS is composed of both volatile dissolved solids and the inorganic dissolved salts, or fixed dissolved solids. The volatile dissolved solids can be biologically treated by soil microorganisms and can be beneficial for the soil. Therefore, the remaining fraction, the fixed dissolved solids, is a more representative measurement of the salinity that could negatively impact groundwater.

ii. The Order includes required best management practices to minimize the introduction of salinity into the wastewater.

iii. In addition, the Order includes an effluent quality monitoring requirement for fixed dissolved solids, which is addressed in the Monitoring and Reporting Program (**Attachment A**). When required by the Executive Officer, total dissolved solids must be included as a groundwater monitoring parameter as stated in **Table 12** of the Monitoring Program. This data collection requirement will inform practical, data-supported decisions regarding the assessment of potential impacts to groundwater and operational alternatives that can be implemented in response.

iv. Potential future areas of concern for impacts due to elevated salinity levels are in the southern regions of the Napa Valley and Sonoma Valley groundwater basins. Following the development of the Salt and Nutrient Management Plans for those groundwater basins, Regional Water Board staff will work collaboratively with Napa County and the Sonoma County Water Agency, as appropriate, to determine if additional monitoring or effluent limitations should be implemented for dischargers in these areas.

f. **Chloride and sodium are of particular concern because excess sodium can restrict water movement through the soil.**

i. Chloride and sodium are key salinity constituents in winery wastewater. Sources of sodium in winery wastewater include cleaning and sterilization products, ion exchange waste, and the source water or water supplied to the winery that is used for cleaning. When winery wastewater is applied via irrigation, sodium can negatively affect soil chemistry and physical structure and can reduce hydraulic conductivity. Sodium accumulation in soils can induce swelling, dispersion, and infiltration, all of which restrict water movement through the soil. The removal of salt from the wastewater can be accomplished via electrodialysis, ion exchange, and reverse osmosis, but these types of systems require specialized equipment, higher costs, large energy inputs, and generate a concentrated brine waste stream. Source control of salts is preferable since salts are persistent in solution.

ii. Chloride may be added to wastewater from cleaning products, sanitizing agents, and various other products. Chloride can be concentrated in cooling towers, boilers, reverse osmosis units, and other processes, which result in elevated chloride concentrations in winery wastewater. Chloride can increase the corrosivity of water and is linked to hypertension in people. Chloride can impact groundwater when vertical migration from the near surface soil through the vadose zone to the underlying water table occurs.

iii. The Order addresses chloride and sodium with an effluent quality monitoring requirement for chloride and sodium in select tiers, which is addressed in the Monitoring and Reporting Program (**Attachment A**). The Order also requires the Discharger to provide a chemical inventory that identifies chemicals that contain chloride and sodium.

iv. Dischargers that are land applying wastewater as irrigation are required to determine the Sodium Adsorption Ratio and electrical conductivity level. If the combination of the winery wastewater electrical conductivity level and the SAR correlate to the Numeric Action Levels as stated in **Table 9**, the Discharger shall prepare and implement a Sodicity Management Plan, which is discussed in **Attachment H**. These requirements will prevent degradation of groundwater by limiting the amount of constituents that contribute to salinity and by supporting soil conditions that can provide additional treatment.

# DISCHARGE PROHIBITIONS

Wastewater discharges from wineries have high levels of oxygen-demanding organic material, dissolved solids like salt, and suspended solids like bentonite and diatomaceous earth. They also have ranges in water pH due to naturally acidic grape juice and wineries use caustic cleaning materials. Additionally, winemaking activities are seasonal so wastewater may not be discharged continuously throughout the year, and the volume discharged can vary greatly.

To ensure wastewater discharges from permitted wineries do not degrade groundwater quality, the Order establishes prohibited activities and discharges.

# EFFLUENT LIMITATIONS AND NUMERIC ACTION LEVELS

1. **General Concepts.**
2. **Numeric action levels.** Numeric action levelsprovide water quality benchmarks for wineries that, if exceeded, trigger a requirement for additional action. If a Discharger exceeds a numeric action level, then they must perform the required adaptive management action. The adaptive management action will aid the Discharger in determining what caused the exceedance, how to correct it, and what to do to prevent the exceedance from repeating.Three exceedances of a numeric action level within a 12-month period triggers requirements for further investigation and adaptive management actions. The assessment includes determining what caused the exceedance, how to correct it, and what to do to prevent the exceedance from repeating. Measuring constituent concentrations at the point the effluent reaches groundwater may not be representative of impacts related to the discharge. This form of adaptive management is a way for facilities to manage their wastewater and avoid negative impacts to the environment and permit violations.
3. **Numeric action levels measured at the discharge point allow the Regional Water Board to regulate and also collect information for future iterations of the Order.** The Order contains numeric action levels for certain constituents in recognition of the difference between the constituent concentration in the effluent at the point of discharge to land and the concentration when it reaches the receiving groundwater body following movement through the soil. The numeric action levels, and related investigation and management practice requirements, allow the Regional Water Board to provide reasonable flexibility to the Dischargers while also collecting needed information. The information collected through this process will inform future iterations of the Order, both in potential numeric effluent limitations as well as additional discharge specifications and provisions.
4. **Technology- and water quality-based effluent limitations.** Effluent limitations are established based upon the technology used to treat the wastewater or by the water quality protection needs of the receiving water body. The Order contains both technology-based effluent limitations (TBELs) and water quality-based effluent limitations (WBELs).
5. **Tier 1, Low Volume Wineries.** Wineries that discharge less than 1,500 gallons a day are considered a lower threat to the soil and ground water quality, and, therefore, are subject to a minimum set of effluent limitations.
6. **Tier 2 and Tier 3 wineries,** which have discharges of greater than or equal to 1,500 gallons a day, must comply with the Order’s full set of effluent limitations.
7. **BOD Loading Limitation.** A mass‑based limitation is also referred to as a loading rate limitation, which is determined based on the concentration of the constituent and the discharge flow rate. The mass-based limitation for BOD was selected from U.S. EPA guidance and also to be consistent with Order No. R1-2016-0002 issued by the North Coast Regional Water Board. The U.S. EPA recommended 100 lbs BOD/acre/day for well aerated soil[[11]](#footnote-11) and a BOD loading rate less than or equal to 300 lbs BOD/acre/day[[12]](#footnote-12) to prevent nuisance or odor conditions. The Order prohibition of continuously discharging effluent and the requirement for rest periods when no discharge occurs will support soil aeration. The more conservative of the U.S. EPA’s organic loading rate recommendations, 100 lbs/acre/day, is included in the Order to provide reasonable assurance that winery wastewater will not result in excessive organic loading of the soil. Overloading reduces the soil column’s ability to provide additional treatment. This loading rate is consistent with the North Coast Regional Water Board.

Another basis for a BOD loading limit is that high hydraulic loads in combination with high BOD loading rates and insufficient resting periods can impact the denitrification process.[[13]](#footnote-13)

1. **Technology-based effluent limitations – Tiers 2 and 3.** The Order includes technology-based effluent limitations for BOD and total suspended solids that apply to facilities covered under Tiers 2 and 3 of the Order.

i. U.S. EPA establishes regulations for industrial categories based on the performance of treatment and control technologies. Treated wastewater that is discharged to land or a water body is also referred to as effluent. Technology-based effluent limits are requirements under Section 301 of the federal Clean Water Act, and represent the minimum level of control that must be achieved by industrial dischargers discharging to surface water bodies. These levels of control are based on Best Practical Control Technology Currently Available, Best Conventional Pollutant Control Technology, and Best Available Technology Economically Achievable.

ii. The intent of a TBEL is to require a minimum level of treatment for industrial point sources based on currently available treatment technologies, while allowing a Discharger to use any available control technique to meet the limitations. While the U.S. EPA’s TBELs were developed for discharges to surface water, because the technology for treating wastewater that discharges to land is based on the same principles, the BOD and total suspended solids TBELs also apply to the discharges to land covered by Tiers 2 and 3 of the Order.

1. **Technology-based effluent limitation – secondary treatment systems.** The Order includes TBELs that apply to Dischargers in Tiers 2 and 3 using secondary treatment systems.

i. U.S. EPA has not established TBELs for wineries, but limits have been set for activated sludge, membrane biological reactor, or similar domestic secondary wastewater treatment technologies, which may be used to treat combined domestic and winery wastewater. These biochemical oxygen demand and total suspended solids limits are included herein and in the State Board-adopted General Waste Discharge Requirements for Small Domestic Wastewater Treatment Systems (Order No. WQ 2014-0153-DWQ).

1. **Technology-based effluent limitations and other numeric requirements – ponds.** Ponds can be used alone or in combination with other wastewater treatment processes. Ponds are designed to enhance the growth of natural ecosystems that are any of these three types:

* Anaerobic, which provides conditions for bacteria to grow in the absence of oxygen;
* Aerobic, which promotes the growth of oxygen producing and/or requiring organisms; or
* Facultative, which is a combination of anaerobic and aerobic.

a. **Algae impacts total suspended solids removal in ponds.** Per U.S. EPA,[[14]](#footnote-14) wastewater treatment pond performance with respect to total suspended solids can be impacted by the presence of algae in the pond effluent. Wastewater treatment ponds that are the sole process for secondary treatment and with maximum facility design capacity of two million gallons per day and which meet the effluent BOD limitations of 30 mg/L (30-day average) and 45 mg/L (7-day average), are required to meet the California alternative total suspended solids limit of 95 mg/L (30-day average).

b. **Ponds need adequate freeboard in order to not overflow.** Pond system management is necessary to ensure proper functioning of pond systems. If the ponds are not managed for the proper freeboard level recommended by the water balance for the start of winter, the likelihood of the ponds overflowing increases. The Order requires a minimum freeboard requirement of two feet at all times.

Freeboard is intended to ensure that excess holding capacity is available to protect against high-rainfall events of shorter than seasonal duration. Freeboard also protects against unanticipated short-term increases in wastewater flow and protects the berm from wave erosion. One foot minimum or less leaves a lower margin to accommodate for unpredictable excess loadings. Two feet of minimum freeboard is generally sufficient to handle the effects of such elements.[[15]](#footnote-15)

c. **Ponds need to be managed to control odors, which means they may need to be aerated.** Odors can occur when there is insufficient dissolved oxygen in the upper layers of the pond and may require measures to add oxygen to the pond, such as mechanical aerators. Floating aerators can supplement a pond's oxygen concentration during periods of peak loading (e.g., crush season) or other unfavorable conditions. The Order requires a minimum dissolved oxygen concentration of 2.0 mg/L to reduce the potential of ponds to generate odors. The Monitoring and Reporting Program (**Attachment A**) requires that observations such as checking for odors are conducted for any wastewater treatment system that has a pond.

1. **Various causes can lead to pond failure, and the Order contains requirements that safeguard against the common causes of pond failure.** Pond failure can result from causes including, but not limited to, extremely wet winters, an increase in wastewater flows above design capacity, a process upset wherein an inordinately large volume of wastewater is sent to the ponds, a flood flow greater than the pond levees can withstand, or greater than the pond capacity, improper levee maintenance against erosion, and improper pond system management. The Order includes requirements for ponds such as a minimum freeboard of two feet and that ponds are protected from erosion, washout, and flooding from a rainfall event of a predicted frequency of once in 100 years. **Section H** of the Monitoring Program (**Attachment A**) requires that observations such as checking for seepage are conducted for any wastewater treatment system ponds.

e. **Ponds may contribute to groundwater contamination, and therefore, the Order requires an infiltration rate assessment.** The Order requires that the Discharger conduct a pond infiltration rate assessment for all existing ponds. Based upon the results of the assessment, additional actions, such as lining the pond or conducting groundwater monitoring, may be required.

f. **The Order contains further requirements that safeguard against ponds causing groundwater degradation.** Pond water quality limitations, freeboard requirements, and visual structural and operational inspections as required by the Order provide assurance that ponds will not cause groundwater degradation.

1. **Water Quality-based effluent limitations.** A water quality-based effluent limitation is designed to protect the quality of the receiving water by ensuring that State water quality objectives are met.[[16]](#footnote-16)

a. **Groundwater-driven water quality-based effluent limitations.** A groundwater-driven water quality-based effluent limitation is established to prevent a constituent such as nitrate in the effluent applied to land from exceeding the Basin Plan ground water quality objective.

i. **Nitrate numeric action level and effluent limits**. The Order contains nitrate numeric action levels or numeric effluent limitations if the winery discharges to an area with nitrate-impacted groundwater. The effluent limits and numeric action levels are applicable to Tier 2 and Tier 3 facilities that discharge more than 1,500 gallons per day.

1. **Discharges to areas with groundwater nitrate concentrations greater than the water quality objective have nitrogen effluent limitations.** For facilities that do not discharge to areas with elevated groundwater nitrate concentrations, the nitrate value is a numeric action level. Exceedance of the numeric action level three times within a 12-month period triggers the requirement to submit and implement a Nitrogen Assessment and Management Plan. For facilities that discharge to a known area with elevated concentrations of nitrate in groundwater, the nitrate value is a numeric effluent limit.
2. **The nitrate effluent limit or numeric action level of 12.5 mg/L with no managed vegetative cover, and it is 20 mg/L with managed vegetative cover.** Managed vegetation, whether as a crop or landscape, indicates that established vegetation that requires some level of human intervention covers the discharge area. Since plants can remove nitrogen from the soil, if the discharge area does not contain vegetative or crop cover, a lower, more conservative nitrate numeric action limit or effluent limitation is required.

Discharge area **not** located in a nitrate-impacted groundwater area:

The Order establishes a **nitrate-nitrogen numeric action level** of **12.5 mg/L-N** when wastewater is discharged to land in an area with **no managed vegetation** or crop.

The Order establishes **a nitrate-nitrogen numeric action level** of **20 mg/L‑N** when wastewater is discharged to land in an area with **managed vegetation** or crop. The numeric action levels do not have a depth to groundwater requirement.

Discharge area is located in a nitrate-impacted groundwater area:

The Order establishes a **nitrate-nitrogen effluent limit** of **10 mg/L-N** for discharges to a nitrate-impacted groundwater area when the **depth to groundwater is less than five feet**.

The Order establishes a **nitrate-nitrogen effluent limit** of **12.5 mg/L-N** for discharges to a nitrate-impacted groundwater area when the **depth to groundwater is greater than five feet** and when wastewater is discharged to an area with **no managed vegetation** or crop.

The Order establishes a **nitrate-nitrogen effluent limit** of **20 mg/L-N** for discharges to a nitrate-impacted groundwater area when the **depth to groundwater is greater than five feet** and when wastewater is discharged to an area with **managed vegetation** or crop.

b) **The values of 12.5 mg/L (no managed vegetation) and 20 mg/L (managed vegetation) at the point of discharge assumes that nitrogen will be reduced by the soil before the discharge reaches the groundwater table.** If there are managed crops, the nitrogen reduction is greater. Laboratory and field studies indicate that approximately 20 percent of nitrogen is lost from wastewater percolating through soil. The nitrate groundwater water quality objective per the Basin Plan is 10 mg/L as nitrogen. The nitrate limit of 12.5 mg/L is 20 percent greater than the Basin Plan objective of 10 mg/L. This accounts for the reduction of nitrate following movement through the soil column to groundwater.

Depending on the type of vegetation, it has been estimated that plants can uptake approximately 30 to 50 percent of nitrogen applied as fertilizer.[[17]](#footnote-17) Additionally, approximately 20 percent of nitrogen is lost from wastewater percolating through soil. If plants are growing in the discharge area, an estimate of 50 to 70 percent of the nitrogen concentration may be reduced prior to reaching groundwater. Based on a study conducted by UC Davis and the State Water Board on municipal wastewater applied to land, up to 32 percent of the applied nitrogen was lost during the passage of the wastewater through the soil columns as a result of denitrification.[[18]](#footnote-18) This accounts for the expected nitrogen removal by plant uptake and retention and microbial transformation in the soil column.

The groundwater nitrate-nitrite water quality objective per the Basin Plan is 10 mg/L as nitrogen. As explained above, it is reasonable to expect a concentration of 20 mg/L at soil surface to attenuate to 10 mg/L once it reaches groundwater due to plant uptake and retention and transformation in the soil matrix.

ii. **Chloride Numeric Action Limit.** The Order establishes a numeric action level for chloride. The numeric action level and resulting chloride assessment requirements will achieve responsible groundwater resource management while gaining more information in this permit cycle, which could lead to the establishment of a chloride numeric effluent limit in the future.

1. The Order establishes, applicable to all facilities, a **chloride** numeric action level of **250 mg/L**. If a facility exceeds the numeric action level, the facility will be required to perform a Chloride Assessment and Management Plan (**Attachment G**).
2. Basin Plan Table 3-5 states a chloride water quality objective for municipal supply of 250 mg/L as a recommended level based upon the Secondary Maximum Contaminant Levels as specified in Table 64449-B of Section 64449, Title 22 of the California Code of Regulations. Table 64449-B states an upper chloride contaminant level of 500 mg/L as acceptable if it is neither reasonable nor feasible to provide more suitable waters. For a beneficial use of agricultural supply, Table 3-6 of the Basin Plan states a chloride water quality objective of 355 mg/L.
3. The management of salinity is necessary to prevent degradation of basin groundwater and the action limit of 250 mg/L is the lower, more conservative chloride water quality objective. This provides assurance that salinity management measures will be triggered at a level that when acted upon can result in mitigation of chloride levels prior to reaching the maximum value. Although chloride is only one compound that contributes to the overall salinity level, water quality objectives have not been established for all constituents that contribute to salinity.
4. Chloride concentrations can be influenced by plant uptake, physical and chemical characteristics of the soil, water quality of the winery and irrigation supply water and the treated wastewater (effluent) quality. The background chloride concentration in the groundwater should also be assessed when determining an effluent limit. Because of all these variables and the fact that wineries in the Region have not been assigned a numeric effluent limit for chloride in the past, the Order implements a numeric action level for chloride instead of setting an effluent limitation.
5. **Impacted Groundwater – Livermore Valley, Pescadero Valley, and Petaluma Valley.** Some areas in the Region have concentrations of winery wastewater constituents in groundwater that exceed the associated Basin Plan water quality objectives for nitrate, salinity, and pathogens. The Order requires management efforts to reduce the concentrations of such constituents through methods such as wastewater treatment, best management practices, assessments, effluent monitoring, and effluent limitations.
   1. At the time of the adoption of the Order, nitrate-impacted groundwater has been identified in the Livermore Valley Groundwater Basin within Alameda County, the Pescadero Valley Groundwater Basin underlying the town of Pescadero in San Mateo County, and the portion of the Petaluma Valley Groundwater Basin overlying the unincorporated upland area of West Petaluma in Sonoma County. **Figure 2-1** of the Order depicts the groundwater basin boundaries. **Figures 3** through **5** in **Attachment J** depicts the nitrate-impacted groundwater areas. As additional data are collected and applied to inform further development of a science-based understanding of nitrate concentrations in the Region, the location and size of the nitrate-impacted groundwater areas may change. If the impacted groundwater basins change following adoption of the Order, current Dischargers will be contacted by Regional Water Board staff and the updated maps will be posted to the Regional Water Board website.
   2. Zone 7 Water Agency’s July 2015 Nutrient Management Plan (Nutrient Management Plan) for the Livermore Valley Groundwater Basin[[19]](#footnote-19) Identifies ten localized areas of nitrate-impacted groundwater, also referred to as Areas of Concern, in the Livermore Valley Groundwater Basin. In these areas, groundwater nitrate concentrations exceed the drinking water Maximum Contamination Limit and the Basin Plan objective for nitrate in a municipal and domestic water supply, a beneficial use for which the groundwater basin is listed.

The Nutrient Management Plan recommends that the Alameda County Environmental Health Department incorporate special onsite wastewater treatment system permit requirements in five (5) of the Areas of Concern. **Figure 3** in the Order (**Attachment J**) depicts the Livermore Valley nitrate-impacted groundwater areas from the Zone 7 Nutrient Management Plan. The Areas of Concern in the Livermore Valley include the center point of the highest nitrate concentration and the plume of decreasing concentration radiating out from the center. This nitrate-impacted areas cover applies to the entire nitrate plume from the highest concentration to where the nitrate concentration falls below 10 mg/L as N, which is equivalent to a nitrate concentration of 45 mg/L as NO3.

Nitrogen loading limitations for wineries that discharge in areas with nitrate‑impacted groundwater are included in the Order’s Effluent Limitations section. The loading limitations are based upon Zone 7 Water Agency’s Nutrient Management Plan.[[20]](#footnote-20)

* 1. **Nitrogen Assessment.** For discharges of wastewater to known nitrate-impacted groundwater, the Discharger shall conduct a site-specific assessment of nitrogen. The Nitrogen Assessment and Management Plan (Nitrogen Assessment) will identify practices that can minimize adverse impacts to groundwater from the land application of nutrients found in process wastewater and process solids. The Nitrogen Assessment shall describe the agronomic rate application of the process and domestic wastewater and process solids to land and document compliance with the Order requirements. It shall identify information such as, but not limited to, the land application area, depth to groundwater, the crop or vegetation being grown, the nutrient requirements of that crop or vegetation, and the land application method. **Attachment F** outlines the requirements of the Nitrogen Assessment.
  2. **Additional Alameda County requirements may apply in nitrate-impacted groundwater areas.** If a facility discharges to a nitrate-impacted groundwater Area of Concern in Alameda County, additional requirements may be required by the Alameda County Department of Environmental Health. Additional information on the Alameda County onsite wastewater treatment system permitting process is located online at [www.acgov.org/aceh/landuse/](http://www.acgov.org/aceh/landuse/).

1. **Pathogens.** The Order allows for the permitting of the discharge of treated domestic wastewater when associated with winery operations. Pathogens are not a constituent of concern with winery processing wastewater, but are when domestic wastewater is discharged to land.
2. **Total coliform effluent limitation for treated domestic wastewater used for irrigation.** Vineyard crops may be irrigated with water that meets the requirements of disinfected secondary-2.2 recycled water. Title 22, California Code of Regulations, section 60301.220, defines secondary-2.2 recycled water and the required total coliform limits that must be met prior to irrigation. These limits apply when domestic wastewater is combined with winery process wastewater and used for irrigation of vineyards.

# DISCHARGE SPECIFICATIONS

1. **Wastewater application timing related to rain.** The Order requires that treated winery process wastewater shall not be discharged to land by irrigation within 24 hours of a forecasted rain event with greater than 50 percent probability of rain, during rainfall, 24 hours after a rainfall event, or when soils are saturated based on visual observations. This method does not take into consideration runoff potential related to soil type or may require additional storage capacity to hold the wastewater until the conditions are satisfied. The Discharger may submit an alternative site-specific method for determining weather-related wastewater discharge timing with the NOI Package.
2. **Solids disposal requires proper management to ensure that groundwater is protected.** To provide assurance that the solids disposal do not create an adverse effect on public health and safety or the environment, the Order’s Discharge Specifications include winery solid waste disposal and storage requirements.
3. **Winery solid waste is defined as the following:[[21]](#footnote-21)**
4. Grape marc: the grape material that primarily consists of skin, pulp and seeds that remains after grape crushing and pressing;
5. Lees, which are the material that accumulates in the bottom of grape juice or wine fermentation tanks;
6. Filtered solids, which are generally diatomaceous earth and bentonite clay filter media;
7. Stalks, which are separated from the grapes during the crushing process;
8. Winery wastewater sludge, which is composed mainly of microbial cells and grape residues;
9. Inorganic solids such as bentonite and diatomaceous earth, used in the ''racking" or fining of wines, and these inorganic solids combine with the organic solids removed from the wine to form a sludge at the bottom of the tanks;
10. Residual solid wastes that are generated at the facility, including pomace (the crushed pulp of grapes), grape stems and leaves, and screenings recovered from wastewater screens.
11. **Surface Discharges – soil water storage capacity.** The Order requires that the maximum soil water capacity for the site between the discharge land surface and a depth of five feet below land surface is not exceeded. Soil water storage capacity is the total amount of water stored in the soil within the plant’s root zone. The soil water storage capacity can be used to determine the quantity of water to apply at a time and the time until the next discharge event. Applying more water to the soil than can be stored results in a loss of water to deep percolation and leaching of nutrients beyond the root zone. The duration of irrigation is affected by the infiltration rate and water storage capacity of the soil. The infiltration rate establishes how much irrigation can be applied per hour. The capacity sets the cumulative amount that can be applied.[[22]](#footnote-22) Not exceeding the soil water storage capacity creates

The soil water storage capacity can be determined from direct measurements and estimated based on the Natural Resources Conservation Service Web Soil Survey, which is accessible online at <https://websoilsurvey.sc.egov.usda.gov/>.

1. **Surface Discharge via Irrigation.** The Order requires that the maximum soil water capacity for the site between the discharge land surface and a depth of five feet below land surface is not exceeded. Soil water storage capacity is the total amount of water stored in the soil within the plant’s root zone. The soil water storage capacity can be used to determine the quantity of water to apply at a time and the time until the next discharge event. Applying more water to the soil than can be stored results in a loss of water to deep percolation and leaching of nutrients beyond the root zone. The duration of irrigation is affected by the infiltration rate and water storage capacity of the soil. The infiltration rate establishes how much irrigation can be applied per hour. The capacity sets the cumulative amount that can be applied.[[23]](#footnote-23) Not exceeding the soil water storage capacity creates

The soil water storage capacity can be determined from direct measurements and estimated based on the Natural Resources Conservation Service Web Soil Survey, which is accessible online at <https://websoilsurvey.sc.egov.usda.gov/>.

# PROVISIONS

1. **Installation notification requirement.** For new wineries, the Discharger must contact the Regional Water Board and County to notify of the installation of the wastewater treatment system within 72 hours of initiating the installation. This notification will allow the Regional Water Board and County an opportunity to inspect the installation of the system and verify that the system is being installed per the accepted design.

1. **Monitoring and Reporting Program.** The monitoring and reporting program is needed to ensure that the Discharger complies with the Order. Pursuant to the Order and Water Code section 13267, Dischargers must implement a Monitoring and Reporting Program (**Attachment A**). The Monitoring Program must be consistent with all components of the facility’s Notice of Intent to obtain coverage under the Order. The Monitoring Program requires regular visual inspections, effluent water quality sampling, reporting, and record-keeping, and groundwater monitoring. The burden, including costs, of this monitoring bears a reasonable relationship to the need for that information and the benefits to be obtained from the information. Additional information is provided below for some aspects of the Monitoring Program.

1. **Nitrogen Hazard Index.** The Nitrogen Hazard Index allows the Discharger to assess the potential level of harm its nitrogen discharge to land may cause on the receiving groundwater. The Order’s approach to nitrogen management requires a combination of wastewater treatment, discharge management, and, as appropriate, crop management. The Nitrogen Hazard Index is an online tool for assessing appropriate nitrogen management strategy for facilities that discharge by surface irrigation. All facilities that discharge by surface irrigation are required to calculate their Nitrogen Hazard Index value and submit the value and the supporting report generated by the website to Regional Water Board staff with the first annual report.
2. To determine the Nitrogen Hazard Index, access the Nitrogen Hazard Index Calculation Tool, which is a free online tool provided by the University of California’s California Institute for Water Resources. The Order requires the use of the Nitrogen Hazard Index as a component of the NOI Package for facilities that have discharges to the land surface irrigation. The tool is available at: http://ciwr.ucanr.edu/Tools/Nitrogen\_Hazard\_Index/.
3. **Groundwater Monitoring**. The Order requires groundwater sampling under the following three conditions:
4. Sampling of existing groundwater wells, potable water supply or agricultural production wells located onsite. Short-term groundwater well sampling is required for wineries that have wells onsite in order to assess whether the current management and treatment measures and design criteria are protective of groundwater quality. Rather than requiring all Dischargers to install monitor wells, site-specific ground water quality will inform whether subsequent monitoring or additional wells are necessary.
5. Facilities discharging greater than 10,000 gallons per day of process wastewater, as averaged over a calendar month, that land apply treated process wastewater for the purpose of reuse or discharge, in areas of nitrate-impacted groundwater for the purpose of assessing compliance with conditions of the Order and whether the discharge is contributing to the impacted groundwater.
6. If the pond infiltration rate assessment conducted on existing unlined ponds results in an infiltration rate greater than 1 x 10-6 centimeter/second, the pond can be lined or amended or groundwater monitoring can be conducted.
7. **Fixed Dissolved Solids and Sodium.** Monitoring of fixed dissolved solids and sodium provides additional information by which the Regional Water Board can more effectively manage and regulate salinity.There are not groundwater quality objectives for electrical conductivity, fixed dissolved solids, or sodium, which are parameters that are related to salinity. The Order requires Dischargers to monitor their discharges for electrical conductivity, fixed dissolved solids, sodium, and chloride to provide data to aid in understanding correlations between the parameters and site-specific and collective basin-wide salinity loadings to the groundwater basins. Moving forward, the collected data will inform the Regional Water Board’s development of salinity‑related numeric water quality targets and to support the protection of the groundwater beneficial uses. The monitoring of sodium and chloride will also provide data for Dischargers to evaluate the effectiveness of salinity reduction measures implemented at their wineries.
8. **Sodium Adsorption Ratio (SAR)**. The Order has a numeric action level for various combinations of SAR and electrical conductivity. Irrigation water has two properties, salinity and sodicity, that can have concurrent impacts on the soil. Excess sodium can cause the soil to become less stable and reduce its ability to assimilate nitrogen. The amount of sodium and soluble salts in the effluent affects the rate of water infiltration into the soil. Salinity of the water in the root zone can be expressed as electrical conductivity. As electrical conductivity increases, the potential impacts of SAR on soil infiltration decrease.

In addition to requiring monitoring for fixed dissolved solids, sodium, and chloride, the Order also requires the Discharger or the water quality analysis laboratory to calculate their sodium adsorption ratio. The sodium adsorption ratio, in conjunction with the electrical conductivity, is a Numeric Action Level. If the Numeric Action Level is exceeded, the facility is required to submit a Sodicity Management Assessment Report.

The Sodium Adsorption Ratio (SAR) is a weighted ratio of sodium to other cations in solution, primarily calcium and magnesium. Equation 1 is used to calculate the SAR:

Equation 1.

The concentrations are expressed in the unit of milliequivalents per liter (mEq/L). The milliequivalent unit incorporates both the ion concentration and the charge on the ions.

Soil permeability problems increase when SAR approaches 10. SAR values of 3 to 9 pose a severely hazardous risk of reducing infiltration when the electrical conductivity is less than 3,000 to 5,000 microSiemens per centimeter (µS/cm) or 0.3 to 0.5 deciSiemens per meter (dS/m).[[24]](#footnote-24) Table 3-6 of the Basin Plan contains a SAR water quality objective limit of 9.0 for groundwater with an agricultural supply beneficial use. To minimize the risk of the land application of winery wastewater causing soil structure destabilization, **Table 9** contains combinations of effluent electrical conductivity and sodium adsorption ratio values that will result in the permit requirement to prepare a Sodicity Management Plan.

The data generated through the monitoring will be used to inform whether a limitation will be included in subsequent versions of the Order and to require winery management modifications to reduce salinity levels and the impacts to the receiving environment.

# CALIFORNIA ENVIRONMENTAL QUALITY ACT

1. **Regional Water Board is the CEQA Lead Agency.** The Regional Water Board is the lead agency for purposes of complying with the California Environmental Quality Act (CEQA), Public Resources Code sections 21100-21177. As lead agency under the CEQA, the Regional Water Board provided notice of intent to adopt a mitigated negative declaration (SCH No. #) for the Order on June #, 2017 (CCR, Title 14, § 15072).

The documents and other materials, which constitute the record, are located at 1515 Clay Street, Suite 1400, Oakland, CA 94612, and online at <http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/on_site_wastewater_treatment_systems.shtml>.

# ANTIDEGRADATION POLICY

1. Compliance with the Antidegradation Policy is also supported by the following aspects that are supported through the Order:
2. Soil provides natural wastewater treatment.The Order sets parameters which protect the natural function of the soil to treat the wastewater before it reaches the groundwater.
3. Groundwater protected from nitrate by microbial and plant activity and effluent limitations.Soil microorganisms and vegetation transform forms of nitrogen present in wastewater. The Order provides nitrate effluent limitations and requires that wastewater is applied intermittently to land to create aerobic conditions and anaerobic conditions that support denitrification, which changes nitrate to nitrogen gas. Nitrogen gas does not pose a threat to human or environmental health.
4. Hydraulic loading rates are protective.By requiring that wastewater be applied to land at reasonable hydraulic and agronomic loading rates, the Order protects underlying groundwater. Appropriate hydraulic loading rates of the wastewater to land are necessary to ensure that the soil is not continually saturated and that the soil conditions are conducive to providing additional treatment of the winery wastewater. To confirm that the wastewater is applied at rates appropriate for the soil conditions, the Order requires that the Discharger conduct a discharge area Soil Assessment and Wastewater Management Plan, which includes hydraulic loading rate calculations.
5. Soil depth-to-groundwater requirements are protective.Based on peer-reviewed scientific studies,[[25]](#footnote-25) three feet of aerated soil will provide sufficient treatment of septic tank effluent through bacteria breakdown and sufficient distance for the filtration needed for the treatment of effluent BOD at levels greater than the limits in the Order. The Order requires that new subsurface dispersal system be sited, designed, and operated to provide at least five feet of vertical depth of suitable unsaturated soil between the bottom of the dispersal system and the elevation of any restrictive limiting condition, such as bedrock or groundwater, encountered beneath the dispersal system.
6. The Order contains wastewater limitations and specifications that support the conditions needed within the soil to provide additional treatment prior to reaching groundwater. Such limitations include the following:
7. pH effluent limitation range of 6.0 to 9.0 standard units;
8. BOD limitations for activated sludge and membrane biological reactor wastewater treatment systems of a monthly average of 30 mg/L and a seven‑day average of 45 mg/L;
9. BOD loading rate limitation of 100 pounds per acre per day;
10. Nitrate limit of 12.5 mg/L for subsurface and surface discharges that do not have actively managed vegetation in the discharge area. Nitrate limit of 20 mg/L for discharges that have actively managed vegetation in the discharge area;
11. Site-specific hydraulic, organic, nitrogen, and salt loading rates of a land application treatment system shall be considered in the wastewater treatment system design to ensure proper operation; and
12. Resting periods for the land following wastewater loading to provide for decomposition of waste materials and refreshing of the soil system before the next dose of wastewater is applied.
13. The Order contains prohibitions that constrain discharges to prevent groundwater quality degradation. Examples include the following:
    * 1. Prohibition of the discharge to saturated soil because saturated soil conditions hinder the soil treatment processes.
      2. Prohibition of the discharge of untreated, partially treated, and inadequately treated wastewater;
      3. Prohibition of the continuous application of wastewater to land and the requirement for alternating between resting and discharging periods; and
14. Prohibition of the creation of a pollution, contamination, or nuisance.
15. The Order contains water quality-based effluent limitations for the key constituents of concern, nitrate and chloride. The Order contains additional technology-based effluent limitations for BOD and other constituents. The effect of these effluent limitations will be to ensure that existing groundwater quality and beneficial uses are maintained and protected.
    1. Region-wide water quality-based effluent limitations for nitrate and chloride are based on water quality objectives from the Basin Plan.
    2. The Order requires additional location-specific water quality-based effluent limitations for impacted groundwater basins. A nitrate mass loading effluent limitation is set for facilities discharging to nitrate-impacted groundwater basins. The Order may be amended at a later date to include chloride mass loading effluent limitations for groundwater basins that are impacted by chloride.
16. The Order contains discharge specifications that ensure that wastes are treated and managed in a manner that minimizes and prevents groundwater quality degradation. Examples include the following:
17. Wastewater systems must be constructed and operated in accordance with approved system design plans, and operation and maintenance procedures;
18. The site-specific hydraulic, organic, nitrogen, and salt loading rates of a land application treatment system shall be considered in the design phase to ensure proper operation; and,
19. New and expanding facilities shall base the hydraulic loading rate on the saturated vertical hydraulic conductivity test results for the site and on soil morphology.
20. The Order contains provisions that allow for a continuing evaluation of the effects on groundwater of individual discharges covered by the Order. These provisions include required studies and required monitoring and reporting.
21. Studies required by the Order include the following:
    * 1. Nitrate – all facilities that discharge via irrigation are required to determine and report their Nitrogen Groundwater Pollution Hazard Index, which is an estimation of the probability that nitrate will degrade groundwater. The Nitrogen Groundwater Pollution Hazard Index ranks the relative significance of effects from crop, soil, and the irrigation system and presents management practices that minimize groundwater degradation.
      2. Facilities discharging to nitrate-impacted groundwater basins are required to conduct a Nitrogen Assessment Plan, which requires nitrogen budget calculations and an assessment of management practices to minimize the nitrate loading from the facility to the groundwater.
      3. Salinity – the Order requires that wineries identify sources of salinity and implement practices to minimize the saline discharges.
22. Monitoring and Reporting required by each facility covered under the Order is commensurate with the facility’s tier. All facilities are required to monitor their effluent. Additional groundwater monitoring is required of facilities that discharge to an area with nitrate-impacted groundwater.
23. The Order is part of an initiative to comprehensively ensure that degradation due to winery wastewater discharges does not result in water quality less than that prescribed in state and regional policies and will not unreasonably affect present and beneficial uses. The information gathered by the Regional Water Board while the Order is in effect will allow the Regional Water Board to effectively understand, manage, and mitigate the localized and potential cumulative impacts of the discharges on groundwater resources.
24. Regional Water Board implementation of the requirements of the Order further ensures the protection of groundwater quality via the Order. These implementation activities include inspections, report review, and enforcement.

1. Grape and Wine Research and Development Corporation. 2011. Winery Wastewater Management & Recycling Operational Guidelines. http://research.wineaustralia.com/wp-content/uploads/2012/11/Operational-Guidelines.pdf [↑](#footnote-ref-1)
2. U.S. Environmental Protection Agency. (March 9, 2012). Technology Services Vocabulary Catalog. Accessible online at http://bit.ly/2hOChAG. [↑](#footnote-ref-2)
3. Sources: Data from Buelow, M. S. (2015). *Characterization of Winery Wastewater for Reuse in California*. American Society for Enology and Viticulture, 66(3), pp. 302-310; Central Coast Regional Water Quality Control Board. (2008). General Waste Discharge Requirements for Discharges of Winery Waste Order No. R3-2008-0018; Napa Sanitation District & Oakley Water Strategies. (2009). *Winery Waste Management* - Technical Memorandum; and Crites, R., Tchobanoglous, G. 1998. Small and Decentralized Wastewater Management Systems. Table 4-13. [↑](#footnote-ref-3)
4. Water quality data collected during September through December. [↑](#footnote-ref-4)
5. Water quality data collected during January through August. [↑](#footnote-ref-5)
6. Source: Qasim, S. (1999). *Wastewater Treatment Plants Planning, Design, and Operation* (Second ed.). Lancaster, Pennsylvania: Technomic Publishing Company, Inc. [↑](#footnote-ref-6)
7. The sodium concentration in domestic wastewater is heavily influenced by the composition of the drinking water supply. The concentration of sodium in domestic wastewater is generally the sum of the concentration of sodium in the source water and an average value between 40 and 70 mg/L. Source: Tchobanoglous, G., & Burton, F. (1991). Metcalf and Eddy Wastewater Engineering Treatment, Disposal, and Reuse (3 ed.). McGraw-Hill. [↑](#footnote-ref-7)
8. Source: United States Geological Society Water Science School. 2016. https://water.usgs.gov/edu/ph.html. [↑](#footnote-ref-8)
9. U.S. EPA. 2006. Process Design Manual Land Treatment of Municipal Wastewater Effluents. EPA/625/R-06/016. [↑](#footnote-ref-9)
10. Source: Frate, Carol. Nitrogen Transformations in Soil. University of California Cooperative Extension, Tulare County. Accessible online at http://cdrf.org/wp-content/uploads/2012/01/11.7\_Nitrogen\_Transformations-final.pdf. [↑](#footnote-ref-10)
11. Source: U.S. EPA. 1977. Pollution Abatement in the Fruit and Vegetable Industry. Wastewater Treatment. EPA-625/3-77-007. [↑](#footnote-ref-11)
12. Source: U.S. EPA. 2006. Process Design Manual Land Treatment of Municipal Wastewater Effluent. EPA/625/R-06/016. [↑](#footnote-ref-12)
13. Source: Kennedy/Jenks Consultants. 2004. Land Application of Winery Stillage and Non-Stillage Process Water: Study Results and Proposed Guidelines. Chapter 5. [↑](#footnote-ref-13)
14. Source: U.S. EPA NPDES Permit Writers’ Manual Chapter 5: Technology-Based Effluent Limitations. (September 2010). Accessible online at https://www.epa.gov/sites/production/files/2015-09/documents/pwm\_chapt\_05.pdf [↑](#footnote-ref-14)
15. Source: San Francisco Bay Regional Water Quality Control Board Criteria for Wastewater Treatment/Storage Ponds. July 1991. [↑](#footnote-ref-15)
16. The water quality objectives for groundwater are included in the Basin Plan section 3.4 and Tables 3-5 and 3-6, which is accessible online at <http://www.waterboards.ca.gov/sanfranciscobay/basin_planning.shtml>. [↑](#footnote-ref-16)
17. Source: Masclaux-Daubresse, C., Daniel-Vedele, F., Dechorgnat, J., Chardon, F., Gaufichon, L., & Suzuki, A. (2010). Nitrogen uptake, assimilation and remobilization in plants: challenges for sustainable and productive agriculture. Annals of Botany, 117 (3), 1141-1157. [↑](#footnote-ref-17)
18. California State Water Resources Control Board. 1976. Nitrification and Denitrification of Municipal Wastewater Effluents Disposed to Land. Publication No. 58. Agreement 3-2-59 with University of California at Davis. [↑](#footnote-ref-18)
19. The July 2015 Nutrient Management Plan for the Livermore Valley Groundwater Basin can be accessed at <http://www.zone7water.com/images/pdf_docs/groundwater/nmp-2015_final.pdf>. [↑](#footnote-ref-19)
20. The most current version of the Nutrient Management Plan is accessible on the Zone 7 Water Agency website under the Groundwater section of the Reports and Planning Documents located at http://www.zone7water.com/index.php/reports-a-planning-documents. [↑](#footnote-ref-20)
21. Source: <http://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/san_joaquin/r5-2012-0103.pdf> [↑](#footnote-ref-21)
22. 2007 Manual of Good Practice for Land Application of Food Processing/Rinse Water, which is accessible at http://clfp.com/documents/Manualofgoodpractice/CLFP%20Manual\_COMPLETE\_FINAL\_3-14-07%20(2).pdf. [↑](#footnote-ref-22)
23. 2007 Manual of Good Practice for Land Application of Food Processing/Rinse Water, which is accessible at http://clfp.com/documents/Manualofgoodpractice/CLFP%20Manual\_COMPLETE\_FINAL\_3-14-07%20(2).pdf. [↑](#footnote-ref-23)
24. Source: Buelow, M. S. (2015). Characterization of Winery Wastewater for Reuse in California. *American Society for Enology and Viticulture, 66*(3), pp. 302-310. [↑](#footnote-ref-24)
25. Source: Magdoff, F.R., Keeny, D.R., Bouma, J., Ziebell, W.A. 1974. Columns representing mound type disposal systems for septic tank effluent: II. Nutrient transformations and bacterial populations. Journal of Environmental Quality. 3(3). [↑](#footnote-ref-25)