

A Water Quality Field Guide for Nurseries

Darren L. Haver

SOUTHERN CALIFORNIA EDITION



Includes Guidelines for Southern California Edison Properties



University of California
Agriculture and Natural Resources

Best Management Practices

A Water Quality Field Guide for Nurseries

SOUTHERN CALIFORNIA EDITION

Cooperative Extension, Orange County
Agriculture & Natural Resources
University of California

Best Management Practices - A Water Quality Field Guide for Nurseries was developed as a joint project between the University of California Cooperative Extension Orange County, Orange County Coastkeeper, Orange County Farm Bureau, and Southern California Edison. Our goal was to create a simple water quality field guide for small to medium-sized nurseries operating in urban environments. This field guide provides nursery growers as well as land owners, operators, employees, and stormwater municipal personnel with a straightforward list of Best Management Practices (BMPs) to reduce pollutants from entering urban storm drains, creeks, bays, and the ocean.

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Photographs included herein are for the express purpose of demonstrating proper BMPs. Photographs depicting improper practices were staged and no implication should be made that a nursery is not in compliance with regulations. $\ensuremath{\mathbb{O}}$ 2007 by the Regents of the University of California

Division of Agriculture and Natural Resources

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Special Notice to Nurseries with Southern California Edison (SCE) License Agreements

Implementation of any of the BMPs listed in this handbook <u>requires</u> prior written approval by Southern California Edison. BMPs listed in this handbook are provided as guidelines for nursery operators. Follow Southern California Edison's guidelines for BMP approval described on pages 30 and 31 of this handbook.

Table of Contents

Introduction		6 - 7
Water Quality Regulations	 	6
Impacts on Nursery Industry	 	7
Sample Nursery Layout		8 - 9
Best Management Practices		10 - 23
Composting Area	 	10
Fertilizer Storage	 	11
Restroom and Trash Facilities	 	12
Maintenance Areas	 	13
Non-Production Landscape Areas		
Parking Lots & Loading Docks		
Pesticide Storage		
Potting Area		
Production Areas		
Roads		
Soil Storage & Mixing Areas		
Water Collection & Storage		
Water Treatment	 	23
Water Quality Related References		24 – 25
Water Quality Related Web Sites		
Regulations	 	25
Agencies Involved in Water Quality Issues	 	25
Glossary		26 - 27
Glossary	 	26
Acronyms		
BMP Recordkeeping		28 - 29
SCE BMP Approval Guidelines		30 - 31
SCL DITE APPIOVAL GAIAGITIES		20 - 31

Introduction

Water Quality Regulations

Federal, state, and local government, in response to concerned citizens, have mandated that nurseries eliminate or reduce wastewater discharges from their operations, especially if they exceed established water quality criteria. The authority of agencies to regulate discharges is contained in federal and state water quality laws, and local codes.

<u>Clean Water Act of 1972</u> - The Clean Water Act (CWA) of 1972, administered federally by the United States Environmental Protection Agency (USEPA), developed two programs to address water quality: the National Pollutant Discharge Elimination System (NPDES) and the Total Maximum Daily Load (TMDL).

<u>NPDES Program</u> - The federal NPDES program requires point source dischargers to mitigate their effluent to meet specific water quality standards based upon the best available control technologies. A point source is defined as any 'discernable, confined, and discrete conveyance' and generally includes water treatment facilities, industrial factories, and urban storm conveyance systems. Agriculture has historically been exempt from the NPDES permit program.

In California, the federal NPDES program is implemented by the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCB). The SWRCB and each of the nine RWQCBs within the state are given the task of enforcing the Clean Water Act as well as state water quality laws and regulations.

California's Porter-Cologne Act, enacted prior to the 1972 Clean Water Act, requires each RWQCB to establish basin plans containing policies, beneficial uses, water quality objectives, and implementation plans. Under the Porter-Cologne Act, RWQCBs can issue Waste Discharge Requirement (WDR) permits to individuals discharging into state waters to ensure that water quality objectives are not violated. If it is determined that a nursery's discharges are resulting in the impairment of a water body, the Regional Water Quality Control Board may issue a cease and desist order and require a WDR permit for further discharges to occur. The WDR sets water quality requirements that must be met by all discharges that occur during the period of time that the permit is issued to an individual. Several RWQCBs have issued WDRs to nurseries in areas of the state adjacent to sensitive waterbodies or when concerned local citizen or environmental groups expressed concern over the discharge of surface runoff from a facility.

On a regional basis, the RWQCB may also issue an agricultural waiver. Waivers require that all facilities must meet minimum established requirements in order to continue discharging wastewater; these requirements always require implementation of Best Management Practices (BMPs) and may also require individuals establish individual or group monitoring programs. Nurseries located in highly urbanized areas may also be regulated under the Municipal Storm Water Permitting Program or MS4 permit.

<u>TMDL Program</u> – Total Maximum Daily Loads are defined as the quantitative amount of a pollutant a water body can tolerate on a daily basis, while meeting established water quality standards. Each state is required by Section 303(d) of the CWA to identify "impaired" waterbodies and establish maximum loading limits, a TMDL, for each pollutant causing the impairment. The process requires that all point and nonpoint sources

be identified and assigned a pollutant allocation that shall not be exceeded in order to protect the beneficial uses of the designated water body. Beneficial uses include wildlife habitat, recreation, drinking water source, agriculture, and shellfish harvesting. The 303(d) list of impaired waterbodies contains information on which beneficial uses are impaired and by what pollutants. The list is updated every two years and is available for viewing on the SWRCB or RWQCB websites. (Refer to section on Water Quality Related References.)

<u>Groundwater</u> – California's Pesticide Contamination Prevention Act (PCPA) of 1985 required the California Department of Food and Agriculture to establish numerical values for specific characteristics of pesticides in order to provide information on those pesticides that potentially could contaminate groundwater. Numerical values are established for the following characteristics: water solubility, soil adsorption coefficient (K_{oc}), hydrolysis half-life, soil metabolism under anaerobic and aerobic conditions, and field dissipation of pesticides. Knowledge of these pesticide properties prior to the use of a pesticide enables the user to minimize or eliminate the risk of the pesticide impacting surface and ground waters. The University of California Riverside has developed an interactive pesticide manager web site to assist the user in determining if the pesticide being utilized, taking into account site specific conditions, has the potential to enter surface or ground waters. (http://www.pw.ucr.edu)

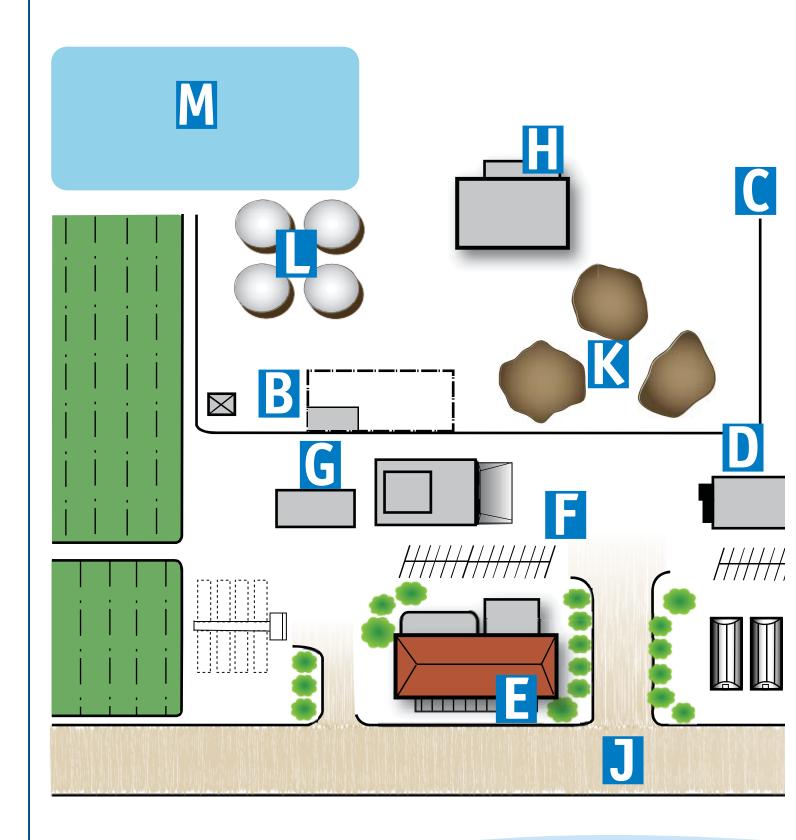
Impacts on Nursery Industry

It is imperative that growers are fully aware of the impact, if any, of their operation on the beneficial uses of local waterbodies. The following steps should be taken by existing and planned nursery operations:

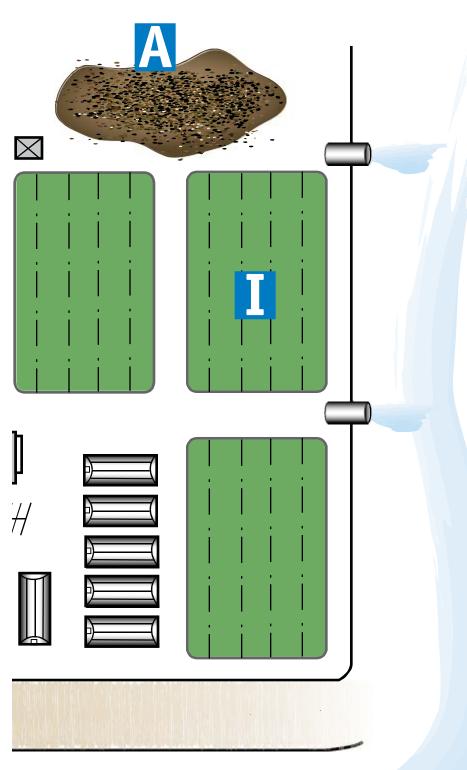
- □ Determine which RWQCB governs where your operation exists.
- □ Inventory streams, lakes, estuaries, or other water bodies that may be impacted by discharges from your operation.
- Obtain a copy of the appropriate RWQCB Basin Plan to determine the local water quality objectives.
- □ Be an active stakeholder in the development of TMDLs for water bodies that your facility impacts.
- Be aware that if you discharge, a WDR may be requested by RWQCB.
- Be prepared to work closely with the RWQCB, local water agencies, and other regulatory agencies on developing appropriate controls for discharges from your facility.
- □ Determine the need for permits prior to installing structural BMPs, such as retention basins, sediment traps, etc.
- □ Monitor flow and basic nutrient concentrations in discharges regardless if you operating under a WDR. Protect yourself against inaccurate data.
- □ Know the basic properties of the pesticides utilized at your operation and how they could potentially impact local waters.

In order for the nursery industry to act in accordance with the numerous water quality regulations, it is imperative that more efficient fertilization, irrigation and pest management programs are developed and implemented by growers.

Sample Nursery Layout



←Creek Draining to Ocean



- A Composting Area
- **B** Fertilizer Storage
- C Restroom and Trash Facilities
- D Maintenance Areas
- E Non-Production Landscape Areas
- F Parking Lots & Loading Docks
- **G** Pesticide Storage
- **H** Potting Area
- I Production Areas
- **J** Roads
- K Soil Storage & Mixing Areas
- Water Collection & Storage
- M Water Treatment



Composting Area

·Nutrients ·Pathogens ·Pesticides ·Sediment ·Trash Potential Pollutants:



- Isolate composting area from water conveyance systems, lakes, and overland storm flow.
- Provide adequate buffering around composting piles utilizing vegetation, berms, or wattles.
- Properly secure a tarp over compost piles to protect soil and debris from mobilization during storm events.



Example of a compost pile covered with tarps to protect from storm events.



Example of a straw wattle placed around the perimeter of a compost pile to minimize movement of soil and associated pollutants during storm events.





Compost pile is located near perimeter of nursery and lacks any form of protection from storm events.



Dispose of used soil and decaying plant material in appropriate trash containers.

Fertilizer Storage



Potential Pollutants: Nutrients Trash



- Store bags or non-waterproof containers on pallet(s) covered with plastic tarps or inside a storage area to protect from rain.
- Fertilizer tanks should have a secondary containment system made with an impermeable concrete, metal or synthetic material.
- Place empty containers or bags in a trash can with a <u>lid</u>.
- Open bags should be sealed and stored in a location to prevent accidental spillage.
- Mix and load fertilizers on an impermeable surface, such as concrete or tarp, to permit complete and easy clean up of spills.
- Clean up any spillage immediately as well as repair any torn bags.



Example of a proper covered fertilizer storage area.



 $\label{thm:example} \textbf{Example of secondary containment around fertilizer tanks.}$





Example of improperly stored fertilizer bags - unsealed and not placed in a covered storage area or up on a pallet and covered.





Restroom and Trash Facilities

·Nutrients ·Pathogens ·Trash Potential Pollutants:



- Portable restrooms should be maintained on a regular schedule to avoid leaks or spills from contaminating surrounding areas.
- Trash should be placed in containers at all times. Utilize lids at all times to prevent trash from being carried into storm drains by wind and storm events.



Example of a well-maintained portable restroom located in the container growing area.



Example of a trash container placed in the container growing area, properly secured, and covered with a lid.





Garbage containers left uncovered are potential sources of pollutants that can be carried into storm drains by wind and storm events.

Maintenance Areas



Potential Pollutants: •Automobile/Equipment Fluids •Nutrients •Pathogens •Pesticides •Sediment •Trash



- Provide secondary containment for fuel areas.
- Place fueling area on a relatively flat impervious surface (2-4%).
- Use a berm around fueling area to prevent run-on, especially from storms.
- Store and dispose of all hazardous waste and oil as required by law.
- Surround larger maintenance area with landscape, vegetative buffers, or gravel.
- Equipment and equipment parts should be stored under a tarp or a covered storage area to keep stormwater from washing chemicals, such as oil, off-site into nearby storm drains.



Example of a secondary containment area for containing fuel spills.



Example of proper storage of chemicals or waste containers in secondary containment areas.







Example of improper storage of unused equipment and parts.





Non-Production Landscape Areas

Potential Pollutants: •Automobile/Equipment Fluids •Nutrients •Pathogens

·Pesticides Sediment Trash



- Utilize these landscape areas as buffers throughout the nursery to collect stormwater or irrigation water.
- Minimize the use of pesticides and nutrients in these areas except when necessary to maintain plant health.
- Protect hillsides from erosion using plastic, wattles, or vegetation for stabilization.
- Reduce off-site sediment movement utilizing sandbags, straw, or coir fiber rolls around perimeter fences & near entrances.



Example of non-production area planted with vegetation to stablize hillside.



Protect the perimeter of nursery from erosion using wattles.





Non-production areas where vegetation, fabrics, or gravel have not been utilized, resulting in signifcant erosion.



Parking Lots & Loading Docks



Potential Pollutants: ·Automobile/Equipment Fluids ·Sediment ·Trash



- Cover parking lot with a layer of gravel to allow infiltration.
- Utilize decomposed granite with a binder or gravel to provide a stable parking surface while still allowing infiltration.
- If impervious surfaces are used such as concrete or asphalt, utilize vegetative filters, gravel sumps or wattles around perimeter to filter pollutants.
- Use plastic grids or approved substitute to stabilize gravel in critical areas such as driveway entrances.
- Utilize shaker or corrugated steel plate in driveway entrances to keep gravel and soil from tracking on to streets.



Example of a loading dock protected with a thick layer of 3/4" or larger gravel.



Example of plastic grids used to hold gravel applied to driveway entrance.





Driveway entrance slopes to street and lacks adequate erosion stabilization such as additional gravel, a corrugated steel plate, or plastic grids.



Pesticide Storage

Potential Pollutants: Pesticides Trash



- Follow all state laws regarding storage of pesticides.
- Store empty pesticide containers in trash can with a lid until transported to an approved disposal site. (Contact local Agriculture Commissioner's Office for a list of sites.)
- Storage, handling and disposal of pesticides (including mixing, loading, and cleaning practices) should not occur in the vicinity of a well, waterbody or storm drain.
- Install a secondary system to contain any spills or leaks.
- Clean up any spills immediately using proper spill kit and dispose of material as required by law.
- Store pesticide application equipment in enclosed or covered location.



Example of a properly designed and maintained pesticide storage area.



Example of a container used to store pesticide application equipment reducing the chance of pesticide residues from being washed off during storm events.





Example of improper storage and disposal of empty pesticide containers.



Potting Area





- Potting areas should be covered to minimize movement of loose soil from canning equipment.
- Spilled potting soil should be cleaned up regularly to prevent its movement in rain and irrigation water, especially if fertilizers and pesticides are incorporated.
- Utilize a graveled area for watering new transplants where runoff can be contained and allowed to infiltrate.



Example of a permanent structure covering a potting area reducing the exposure of loose soil from storm events.



Example of a temporary structure erected over a potting area.





Example of a potting area lacking any type of soil stabilization resulting in significant erosion during storm events.



Production Areas



- Perform regular tests of distribution uniformity on irrigation delivery systems and make corrections if necessary.
- Minimize or eliminate the use of fertilizer injection if overhead sprinklers are utilized to irrigate. Shift to using controlled-release and slow-release fertilizers.
- Place plants on gravel, geotextile, or weed cloth to allow infiltration and minimize erosion even inside greenhouse structures.
- If recycling water, minimize contact of runoff with bare surfaces utilizing concrete to line runoff trenches.
- Slope production areas 2-4% to prevent ponding and to allow runoff to flow into vegetative buffers or gravel sumps for filtering.



Example of drip irrigation in a 5-gallon container.



Example of weed cloth covering the inside floor of a hoop house to minimize weed growth and erosion.







Examples of poor irrigation practices leading to excessive runoff carrying pesticides, nutrients, and sediment.



Production Areas (cont'd)



Potential Pollutants: •Nutrients •Pathogens •Pesticides •Sediment •Trash



- Implement an integrated pest management (IPM) program which includes monitoring for pests, establishing tolerance thresholds, and developing treatment protocols utilizing least toxic strategies first.
- Apply pesticides directly to the target minimizing drift and overspray, especially in areas irrigated with overhead sprinklers.
- Clean up spills of soil, especially those containing incorporated pesticides.
- Apply the minimal amount of irrigation to maintain optimum plant growth and health.
- Consolidate containers and turn off irrigation in areas not in production (requires individual on/off valves at each sprinkler head).



Example of irrigation utilizing drip tape.



Example of production area covered with gravel to prevent erosion and sediment movement.





Irrigation and storm events mobilize soil and associated chemicals spilled in production areas.





Roads

Potential Pollutants: •Automobile/Equipment Fluids •Nutrients •Pathogens

·Pesticides ·Sediment ·Trash



- Maintain a layer of gravel on roads near critical locations such as next to drainage areas, creeks, paved roads, and parking lots.
- Apply polyacrylamides (PAM) prior to storm events to reduce erosion and sediment movement.
- Utilize decomposed granite with a binder to stabilize roads in critical locations.
- Minimize or eliminate irrigation runoff from roads, especially if gravel is not used.
- When decomposed granite or gravel is not utilized, direct runoff into vegetated areas to catch sediment.
- If erosion is significant, install trap in road to collect sediment.



Example of road and exposed access area covered with gravel.



Example of sediment trap installed in road to trap sediment.





Example of unprotected road surfaces.



Soil Storage & Mixing Areas



Potential Pollutants: Nutrients Pathogens Pesticides Sediment Trash



- Locate soil storage and mixing as far away from water conveyance systems as possible.
- Protect soil from rain and wind by storing under covered structures or securely fastened tarps prior to inclement weather.
- Utilize soil incorporated with fertilizers and pesticides immediately; do not store for extended periods.
- Surround soil storage areas with straw/rice/coir wattles or some type of berm.



Example of soil pile covered with tarp to protect from wind and rain.



Example of a type of berm (sandbags) around soil piles.





Soil piles lacking any protection from storm events.





Water Collection & Storage



- Reduce sediment build-up in storage tanks or reservoirs by minimizing runoff over exposed surfaces.
- Minimize wear and tear on pumping equipment by controlling sediment movement at its source.
- Utilize recycled water for irrigating nonproduction landscaped areas.
- Fertilizer rates should be altered taking into account the nutrient content of the collected water.
- Line reservoirs with an impervious material, such as a professional pond liner.
- Maintain reservoirs properly to prevent algae buildup and eliminate mosquito populations. Seek professional assistance prior to installation.
- Fence in reservoirs and provide safety equipment to prevent accidental drownings.



Example of a series of water storage tanks.



Example of a concrete water collection basin built wide enough to accommodate equipment to remove sediment.





Water collection and storage are not allowed on SCE property due to structural engineering requirments.

Water Treatment





• Obtain professional assistance when designing, installing, or maintaining a water treatment system.

Types of treatment systems include:

- heat
- microfiltration
- ultraviolet
- ozone
- chlorination
- Thoroughly understand the advantages and disadvantages of each type of treatment prior to selecting a system.

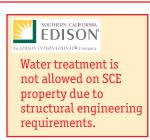


Example of an ultraviolet(UV) treatment system.



Example of an ozone treatment system.





Water Quality Related References

Water Quality Related Web Sites

Best Management Practices

California Stormwater Quality Association Handbooks http://www.cabmphandbooks.com/

UCCE San Diego Agricultural Water Quality Program Grower Resources http://cesandiego.ucdavis.edu/Clean%5FWater/Grower_Resources.htm

UC Cooperative Extension -The Farm Water Quality Plan: Farm Water Planning Series (Pub. # 9002) http://anrcatalog.ucdavis.edu/InOrder/Shop/ItemDetails.asp?ItemNo=9002

California Department of Transportation Stormwater Manuals and Handbooks http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm

County of Orange – OC Watersheds Documents http://www.ocwatersheds.com/StormWater/documents_bmp_intro.asp

University of California, Riverside – PesticideWise http://www.pw.ucr.edu

Laws, Regulations, and Ordinances

County of San Diego - Project Clean Water http://www.projectcleanwater.org/html/programs.html

County of San Diego – Land Use and Environment Group/Agriculture/Weights and Measures http://www.sdcounty.ca.gov/awm/ag_water.html

County of Orange – OC Watersheds

http://www.ocwatersheds.com/StormWater/swp_documents_intro.asp

County of Riverside – Flood Control and Water Conservation District – Storm Water Program http://www.floodcontrol.co.riverside.ca.us/stormwater/

County of Los Angeles – Department of Public Works http://ladpw.org/WMD/npdes/

County of Ventura – Stormwater Quality Management Program http://www.vcstormwater.org/regulations.html

Regulations

Federal

Clean Water Act (National Pollutant Discharge Elimination System, Total Maximum Daily Load)
Coastal Zone Act Reauthorization Amendments of 1990

State

Porter-Cologne Water Quality Act Nonpoint Source Program Plan – required under Clean Water Act

Regional

Agricultural Waivers Basin Plan, WDRs

Total Maximum Daily Loads – required under Clean Water Act for polluted waters listed on California's 303(d) list.

Agencies Involved in Water Quality Issues

Federal

US Environmental Protection Agency (USEPA)
U.S. Fish and Wildlife Service (USFW)
Army Corps of Engineers (ACOE)
National Oceanic and Atmospheric Administration (NOAA)

State

State Water Resources Control Board (SWRCB) California Department of Fish and Game (CDFG) California Department of Pesticide Regulation (CDPR) California Coastal Commission (CCC)

Regional

Regional Water Quality Control Board (RWQCB - 9 regions in state)

Local

County (various departments including stormwater and planning) City (various departments including stormwater and planning)

^{*} Construction of structural BMPs to alter flow into or in natural waterways requires permitting from one or more agencies listed above.

Glossary

Berm

A curb, ledge, wall or mound used to prevent the spread of contaminants.

Best Management Practice (BMP) or Management Practice (MP)

A practice or combination of practices that are the most effective and practicable (including technological, economical, and institutional considerations) means of controlling point or nonpoint source pollutants at levels compatible with environmental quality goals.

Binder

A binder is a material used to bind together two or more other materials in mixtures.

Geotextile

A woven fabric capable of passing water but able to hold back soil.

Integrated Pest Management (IPM)

The use of different techniques in combination to control pests, with an emphasis on methods that are least injurious to the environment and most specific to the particular pest.

Municipal Storm Water Permitting Program

NPDES program to regulate discharges from municipal separate storm sewer systems (MS4s).

Nutrients

Chemicals that are needed by plants and animals for growth (eg, nitrogen, phosphorus). In water resources, if other physical and chemical conditions are optimal, excessive amounts of nutrients can lead to degradation of water quality by promoting excessive growth, accumulation, and subsequent decay of plants, especially algae. Some nutrients can be toxic to animals at high concentrations.

Pathogens

A pathogen is a bacterium, virus or parasite that causes or is capable of causing disease. Pathogens may contaminate water and cause waterborne disease.

Pervious

Pervious materials permit water to enter the ground by virtue of their porous nature or by large spaces in the material.

Pesticides

Chemical substances used to control pests. Pesticides often have unintended toxic effects on living organisms in soil and water.

Polyacrylamides (PAM)

Chemical soil stabilizer that when applied according to recommendations reduces the quantity of suspended sediments in surface water runoff by flocculation (gathering together small particles to form larger particles).

Sediments

Soil, sand, and minerals washed from land into water, usually after rain. They pile up in reservoirs, rivers and harbors, destroying fish and wildlife habitat, and clouding the water so that sunlight cannot reach aquatic plants.

Total Maximum Daily Load (TMDL)

A Total Maximum Daily Load describes the amount of a pollutant that a waterway can receive without violating water quality standards. 2) The TMDL process provides a flexible assessment and planning framework for identifying load reductions or other actions needed to attain water quality standards (ie, water quality goals to protect aquatic life, drinking water, and other water uses).

Acronyms

BMP - Best Management Practices

CWA - Clean Water Act

MS4 - Municipal Separate Storm Sewer System

NPDES - National Pollutant Discharge Elimination System

PCPA - Pesticide Contamination Prevention Act

QAPP - Quality Assurance Project Plan

RWQCB - Regional Water Quality Control Boards

SWRCB - State Water Resources Control Board

TMDL - Total Maximum Daily Load

USEPA - United States Environmental Protection Agency

WDR - Waste Discharge Requirement

For a listing of agency acronyms see page 25

BMP Recordkeeping

Λ	BMP NAME	Installation Date	MAINTENANCE FREQUENCY
A -			
Composting Area			
<u>ш</u>			
೨			
	BMP Name	Installation Date	MAINTENANCE FREQUENCY
B			
ge			
Fertilizer Storage			
М. ——			
	BMP Name	INSTALLATION DATE	MAINTENANCE FREQUENCY
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Restroom & Trash Facilities			
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Maintenance Areas			
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Non-Production Areas			
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G -	BMP NAME	INSTALLATION DATE	MAINTENANCE FREQUENCY
Pesticide Storage			
Potting Area	BMP NAME	INSTALLATION DATE	MAINTENANCE FREQUENCY
Production Areas	BMP NAME	INSTALLATION DATE	MAINTENANCE FREQUENCY
Roads	BMP NAME	INSTALLATION DATE	MAINTENANCE FREQUENCY
Soil Storage & Mixing Area	BMP NAME	INSTALLATION DATE	MAINTENANCE FREQUENCY
Water Collection & Storage	BMP NAME	INSTALLATION DATE	MAINTENANCE FREQUENCY
Water Wate Treatment Wate	BMP NAME	INSTALLATION DATE	MAINTENANCE FREQUENCY

SCE BMP Approval Guidelines



The following criteria are provided to aid in the submission of a BMP list for SCE consideration and approval prior to implementation by the licensee. Submission of a BMP list for approval should be done well in advance of the next wet weather season (October - March).

Select BMPs from handbook (excluding any BMPs not allowed on SCE property).
Submit 5 copies of existing SCE approved plot plan with proposed location(s) and dimensions of each BMP.
Verify any clearance requirements from SCE facilities for proposed BMPs. Location of BMPs should not impede access to SCE towers, poles, or conductors.
A template submission letter (opposite page) is provided for your convenience and should accompany your plot plan.
Send complete package to your appropriate Southern California Edison Right of Way Agent.

Southern Ca Corporate R 14799 Chest Westminster	nut St.
Subject:	Request for Approval to Construct BMPs
	Account No
	Property No
	Site Location:
location of p from Souther Please provi understand	r Southern California Edison's review and approval is a plot plan depicting the proposed BMPs that are being considered for the area which we currently license ern California Edison. de your written approval if you concur with these proposed improvements. We that we will not move forward without prior written approval from Southern dison. We can be reached at ()
Sincerely,	
Nursery Lice	ensee

Date

The Best Management Practices - A Water Quality Field Guide for Nurseries aids nursery growers in identifying potential pollutants and selecting practices to reduce or eliminate their impact on water quality. The design of the field guide allows the grower to document the date a practice is initiated, its maintenance requirements, and if the practice is successful.



The following individuals provided assistance with design, layout, and content of the handbook.



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