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Final Report to Kee Kitayama Research Foundation

"Best Management Practices for Compliance with 1987 Clean Water Act Regulations"

2002 – 2003

Dr. Karen L. Robb and Dr. Valerie J. Mellano
University of California Cooperative Extension
San Diego County

A main objective for this year's funding was to increase grower access to information on how to come into compliance with the 1987 Clean Water Act regulations. The following helped to accomplish that objective:

- Developed an Ag Water Quality Record Keeping guide for nurseries and greenhouses
- Conducted workshops and seminars on how to come into compliance
- Put resources on the web for growers for easy access to clean water information
- Used newsletters and trade journal articles to increase access to this information and to highlight CA growers as proactive stewards of the environment.

A copy of Ag Water Quality Record Keeping and an article written by Dr. Valerie J. Mellano accompanies this report.

2002 - 2003 Best Water Management Practices Workshop Summary

March 6, 2002 *"Environmental Quality Incentives Program (EQIP)"*

This workshop was held at Quail Botanical Gardens in Encinitas, CA, with 13 persons attending. The speaker was Jason Jackson of the Natural Resources Conservation Service (NRCS), which administers the EQIP program. EQIP is federal cost-share program, which offers financial and technical help to assist eligible farmers install or implement structural and management practices on eligible agricultural land. The application process was described in detail and applications were made available to fill out. Opportunity was also provided to discuss project ideas and answer questions. Two attendees submitted applications with one awarded funding. Attendees also requested this topic again be addressed in 2003. That meeting was scheduled for February 19, 2003.

April 30, 2002 "*Stormwater Regulations Update, Improving Irrigation Practices"*

This workshop was held at Quail Botanical Gardens in Encinitas, CA, with 35 persons attending. The speakers were Kathy Weldon, City of Encinitas, and David Shaw, University of California Cooperative Extension - San Diego County. Kathy Weldon discussed the Stormwater Program for the City of Encinitas and provided a Best Management Practices (BMPs) booklet for high priority commercial facilities, which includes greenhouses and nurseries. David Shaw discussed information on irrigation practices found effective in reducing runoff, which included uniformity, leaching, and runoff data.

May 21, 2002 "*Water Quality Record Keeping"*

This workshop was held at San Diego County Farm Bureau in Escondido, CA, with 22 persons attending. The speaker was Dr. Valerie Mellano of University of California Cooperative Extension - San Diego County. This presentation addressed the new stormwater regulation requirement for nurseries and greenhouses to demonstrate Best Management Practices through record keeping. A record keeping system developed by Dr. Mellano was presented and discussed and all attendees received a free binder copy. Requests for additional copies were also received after the meeting and a total of approximately 30 binders were distributed. A copy was also made available on the University of California Cooperative Extension website (http://cesandiego.ucdavis.edu). Feedback received from 8 meeting evaluation forms indicated that all found the meeting helpful in preparing for preparing for stormwater inspections and 7 evaluations indicated they would use the binder for their record keeping systems.

June 18, 2002 "*Understanding and Complying with Runoff Regulations - A primer for farmers, ranchers and nurserymen*"

This workshop was held at the California Center for the Arts, Escondido Conference Center in Escondido, CA, with 163 persons attending. The speakers were Eric Larson of San Diego County Farm Bureau, Dr. Valerie Mellano and Diane De Jong of University of California Cooperative Extension - San Diego County, Eric Becker of San Diego Regional Water Quality Control Board, Kathleen A. Thuner of San Diego County Department of Agriculture, and Jason Jackson of the Natural Resources Conservation Service. This workshop addressed the following topics: "Today's Regulatory Environment, What This Means to You, Doing a Self-Assessment, Regulatory Compliance, The Special Case for Greenhouses & Nurseries, Finding Your Solutions (guide to resources), and Success Stories." A discussion panel was also held to answer questions.

February 19, 2003 *"Environmental Quality Incentives Program (EQIP)"*

This workshop was held at the Farm Bureau in Escondido, CA, with 26 persons attending. The speaker was Jason Jackson of the Natural Resources Conservation Service (NRCS), which administers the EQIP program. EQIP is federal cost-share program, which offers financial and technical help to assist eligible farmers install or implement structural and management practices on eligible agricultural land. The application process was described in detail and applications were made available to fill out. Opportunity was also provided to discuss project ideas and answer questions.

Dissemination of Information through Web & Written Materials

The web information can be viewed at
http://cesandiego.ucdavis.edu/Clean_Water/

"Managing Runoff in Coastal Nurseries in San Diego County, " by Dr. Valerie J. Mellano, *NMPro - Winter 2003*

"State Water Board Seeks Statewide Input on Creation of Controls for Agricultural Runoff, " by Dr. Karen L. Robb, *CORF News - Spring 2002*

Other Activities

SAF conference tour in San Diego, February 25 2002, 126 participants

CORF Innovations and Technology Tour, October 30, 2002

Meeting with statewide UC Farm Advisors at South Coast Field Station to discuss water quality trainings, November 7, 2002

Ag Water Quality

Record Keeping

The following serves as a guideline to assist in compiling and organizing materials necessary to document efforts and practices that prevent runoff and nonpoint source pollution from agricultural properties. Much of the suggested types of information is likely already in your possession. This document is not comprehensive for all agricultural properties but serves as a tool to guide record keeping efforts.

Water quality record keeping is required for agricultural properties that must submit to storm water compliance inspections. Water quality record keeping is also strongly recommended for all agricultural properties to prepare for potential future regulations.

Funding for the development of this tool was provided by Kee Kitayama Research Foundation.

Table of Contents

Water Quality Records
Evaluation
May 21, 2002

Please circle the appropriate responses:

Was this meeting helpful to you in preparing for water runoff inspections?	Excellent	Good	Fair	No	NA
Did this meeting meet your expectations?	Excellent	Good	Fair	No	NA
Will you use this binder for your records	Yes		No		Maybe

Was anything left out of the binder which should have been included?

Do you have any suggestions for improving the binder materials?

Was any information you needed not covered in the presentation? If so, what?

What topics would you like covered in future presentations/workshops? Use the back of the sheet, if necessary.

Thank you!

Fax number 858-694-2849, attn: Valerie Mellano or Karen Robb

Site Map and Emergency Information:

1. The **maps** in this section will identify the location of various facilities and activities on your property. The site map can be a photocopy of the map that is required in the Hazardous Materials Business Plan required by the County of San Diego, **but should be modified to include the location of storm drains, wells, and any streams that run onto and/or through your property**. This map can be hand drawn, if necessary. In addition to the map of the immediate property, a general area/location map should be included on a separate page. It is now possible to download a map of the general area from the Internet that would be sufficient.

In case you do not have a Hazardous Materials Business Plan, we have included an example of a map, as well as a blank "Site Map" page for this notebook where you can draw your own.

2. This section also includes **emergency information**, or contact information in case of a spill that might affect water quality. Again, this information can be directly taken from the Hazardous Materials Business Plan, **but should be modified to include the names and phone numbers of your local water quality enforcement personnel.** These names and numbers will be different in every municipality and the county.

If it is easier to include the entire Hazardous Materials Business Plan, you can just insert a copy in this section of the notebook, as long as it has modifications to show storm drains, well, and streams, and the emergency phone numbers of local water quality personnel.

SAMPLE

THOMAS BROS. COORDINATES 1262-F4

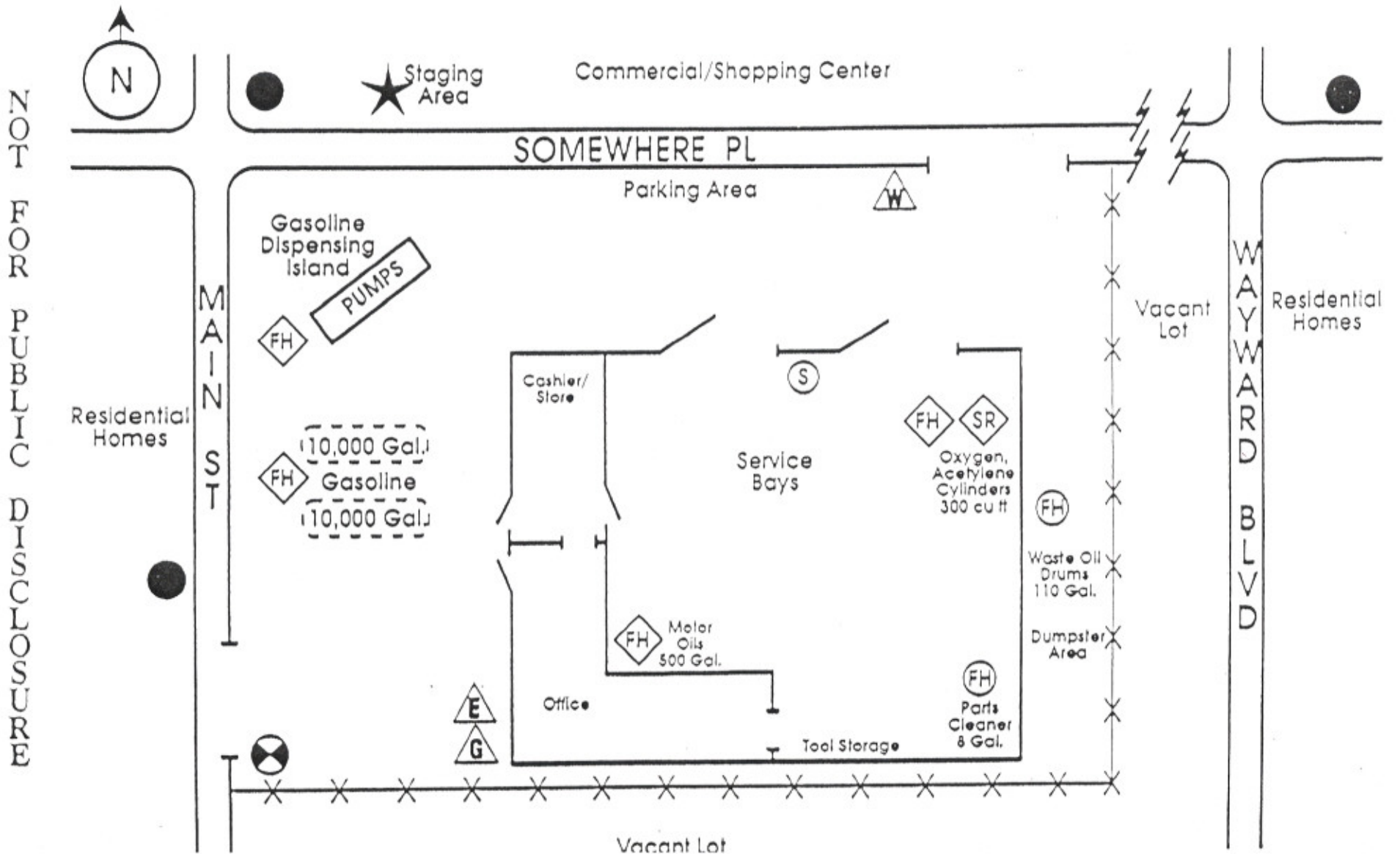
SITE MAP (Page 1 of 1)

H # 00000

OFFICE USE ONLY
REVIEWED BY _____
DATE _____

BUSINESS NAME Joe's Automotive Repair DATE 12-12-98

BUSINESS ADDRESS 1234 Somewhere Pl., Anywhere, CA ZIP CODE 99999



THOMAS BROS COORDINATES _____

SITE MAP (Page ___ of ___)

H # _____

BUSINESS NAME _____ DATE _____

BUSINESS ADDRESS _____ ZIP CODE _____

OFFICE USE ONLY
REVIEWED BY: _____
DATE: _____

N

NOT FOR PUBLIC DISCLOSURE

DATE ____/____/____
H _____
SIC Code: _____

Submit to H
Dunn and Bradstr
Number: _____

HAZARDOUS MATERIALS BUSINESS PLAN

II. EMERGENCY RESPONSE PLAN

1. Business Name _____

2. Business Site Address _____

3. Business Telephone _____ 24-Hour _____

4. Brief description of product manufactured and/or service provided _____

_____

5. Evacuation Procedures: _____

_____

_____

_____

_____

6. Notification Procedures:

In the event of a release or threatened release of a hazardous material the follow
agencies are to be notified:

		Phone #
A.	Local Emergency Response Agencies	911
	Hazardous Materials Management Division	338-2222 (911 after working hours
B.	State Office of Emergency Services	(800) 852-7550 (916) 427-4341

Name of person(s) responsible for completing notifications _____

_____

Describe notification procedures: _____

_____

7. Emergency Procedures: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

DATE ____/____/____ Submit

(OFFICE USE ONLY)
ESTAB NUMBER

H

HAZARDOUS MATERIALS BUSINESS PLAN

II. EMERGENCY RESPONSE PLAN

2

EMERGENCY COORDINATOR INFORMATION

PLEASE LIST THE NAME, TITLE/POSITION AND PHONE NUMBERS (OFFICE AND HOME/24-HR) OF THE EMERGENCY COORDINATOR AND ALTERNATES QUALIFIED AND AUTHORIZED TO ASSIST EMERGENCY RESPONSE PERSONNEL (FOR EXAMPLE, FIRE PERSONNEL) IN THE EVENT OF AN EMERGENCY.

ITEM (15) NAME OF EMERGENCY COORDINATOR (21)

TITLE (51) WORK PHONE (71) HOME/24-HR PHONE (78)

NUMBER (88) STREET (93) CITY (110)

ITEM (15) NAME OF ALTERNATE (21)

TITLE (51) WORK PHONE (71) HOME/24-HR PHONE (78)

NUMBER (88) STREET (93) CITY (110)

ITEM (15) NAME OF ALTERNATE (21)

TITLE (51) WORK PHONE (71) HOME/24-HR PHONE (78)

NUMBER (88) STREET (93) CITY (110)

Hazardous Materials:

1. List the hazardous materials on site, keeping in mind that you are itemizing those that would affect water quality in the event of a spill or other emergency, or through improper use. Again, if you already have a Hazardous Materials Business Plan, you can use the list required by that document. If you have included the entire Hazardous Materials Business Plan, reference that in this section of the notebook.

HAZARDOUS MATERIALS USED

MATERIAL	USE	LOCATION WHERE STORED	DISPOSAL METHOD	COMMENTS

HAZARDOUS MATERIALS USED

MATERIAL	USE	LOCATION WHERE STORED	DISPOSAL METHOD	COMMENTS

Sanitation and Waste Management:

1.Sanitary facilities such as "Porta Potties" or facilities utilizing septic tanks should be listed. The location of the facilities should be noted on the site map to the extent possible. Septic tanks that are improperly maintained and are not pumped on a regular schedule have been found to be the source of bacterial contamination of waterways on numerous occasions. Keeping good records of the maintenance of the sanitary facilities on your farm will alleviate the likelihood that you will be blamed for bacterial problems in the waterways.

2. Management of waste such as trash and even green waste should be noted in the records also. Locating trash facilities too close to streams, other waterways etc. can cause pollution problems and is discouraged. As with the above facilities, trash and other waste management facilities should be drawn on the site map, and records of the frequency of removal etc. should be available to the water quality inspectors. Once again, it is a good idea to include receipts, trash hauling agreements etc. as part of this record.

SANITATION AND WASTE MANAGEMENT

SANITARY FACILITIES

TYPE OF FACILITY	LOCATION	MAINTENANCE SCHEDULE	COMMENTS

SANITATION AND WASTE MANAGEMENT

WASTE MANAGEMENT

TYPE OF WASTE MATERIAL	LOCATION	MAINTENANCE/REMOVAL SCHEDULE	COMMENTS

SANITATION AND WASTE MANAGEMENT

SANITARY FACILITIES

TYPE OF FACILITY	LOCATION	MAINTENANCE SCHEDULE	COMMENTS

SANITATION AND WASTE MANAGEMENT

WASTE MANAGEMENT

TYPE OF WASTE MATERIAL	LOCATION	MAINTENANCE/REMOVAL SCHEDULE	COMMENTS

Pesticide Use:

1.If you file a monthly pesticide use report for the State of California, **a copy of the report can be included here.** If your reports are too numerous and are filed elsewhere on your premises refer to the location of those reports in this section.

For the purposes of the annual water quality inspections, pesticide use reports for the last twelve months should be available.

2. If you do not file a pesticide use report, and only use smaller household amounts of pesticides, note that on the chart we have included.

STATE OF CALIFORNIA

MONTHL[illegible]IARY PESTICIDE USE REPORT

PR-ENF-060 (RE\

DEPARTMENT OF PESTI[illegible] REGULATION
PESTICIDE E[illegible]ENT BRANCH

INSTRUCTIONS FOR COMPLETING THIS FORM ARE INDICATED BELOW AND ON THE REVERSE SIDE

OPERATOR (FIRM NAME)	ADDRESS	CITY	ZIP CODE	PHONE NUMBER

OPERATOR IDENTIFICATION/PERMIT NUMBER	LICENSE NUMBER	COUNTY (WHERE APPLIED)	COUNTY NUMBER	MONTH/YEAR OF USE	TOTAL NUMBER OF APPLICATIONS

1. ***Complete Columns A, B, C, and D for All Users***
2. ***Complete Column E by Using One of the Following Codes***

Code 10 - Structural Pest Control ..... includes any pest control work performed within or on buildings and other structures.
Code 30 - Landscape Maintenance Pest Control ..... includes any pest control work performed on landscape plantings around residences, or other buildings, golf courses, parks, cemetaries, etc.
Code 40 - Right-of-Way Pest Control ..... includes any pest control work performed along roadsides, power lines, median strips, ditch banks and similar sites.
Code 50 - Public Health Pest Control ..... includes any pest control work performed by or under contract with State or local public health or vector control agencies.
Code 80 - Vertebrate Pest Control ..... includes any vertebrate pest control work performed by public agencies or work under the supervision of the State or county agricultural commissioner.
Code 91 - Commodity Fumigation (Nonfood/Nonfeed)... includes fumigation of nonfood/nonfeed commodities such as; pallets, dunnage, furniture, burlap bags, etc.
Code 100 - Regulatory Pest Control ..... includes any pest control work performed by public employees or contractors in the control of regulated pests.

3. ***Complete Columns F and G, If Use Does not Fit one of the Above Codes***

A MANUFACTURER AND NAME OF PRODUCT APPLIED	B EPA/CALIFORNIA REGISTRATION NUMBER FROM LABEL INCLUDE ALPHA CODE	C TOTAL PRODUCT USED (Circle One Unit of Measure)	D NUMBER OF APPLICATIONS	E CODE	F COMMODITY OR SITE TREATED	G ACRES/UNITS TREATED
		LB OZ PT QT GA				
		LB OZ PT QT GA				
		LB OZ PT QT GA				
		LB OZ PT QT GA				
		LB OZ PT QT GA				
		LB OZ PT QT GA				
		LB OZ PT QT GA				
		LB OZ PT QT GA				
		LB OZ PT QT GA				
		LB OZ PT QT GA				

ORT PREPARED BY _____ _____ DATE _____

PESTICIDE USE

Pesticide Used and Manufacturer	EPA/California Product ID Number from Label	Total Amount of Product Used	Total Acreage/Units Treated	Commodity Treated

PESTICIDE USE

Pesticide Used and Manufacturer	EPA/California Product ID Number from Label	Total Amount of Product Used	Total Acreage/Units Treated	Commodity Treated

Fertilizer Use:

1. Fertilizer use is scrutinized because excess nutrients in the waterways/coastal areas can cause numerous water quality problems. Many water quality laws (in addition to storm water laws) monitor the nutrient loading levels of streams. Fertilizer use on your property should be recorded to alleviate questions about the source of nutrients in the waterways and to provide documentation of the levels and timing of fertilizer use.

2. Although local requirements may exist, there is currently no requirement in California to report fertilizer use. The following chart will allow you to track your fertilizer use. Receipts recording fertilizer purchases etc. can also be included to further document the quantities used. In addition to amounts of fertilizer used, the delivery method and timing are important and should also be recorded on the following chart.

FERTILIZER USE

Type of Fertilizer	Application/Delivery Method	Date/Frequency of Application	Crop(s) Fertilized	Comments

FERTILIZER USE

Type of Fertilizer	Application/Delivery Method	Date/Frequency of Application	Crop(s) Fertilized	Comments

Irrigation Practices and Runoff Management:

1. **Improper or inefficient irrigation practices** often lead to excess water running off farm property and into the storm drain system. Recording the irrigation practices used, including system maintenance and efficiency will provide the needed information both for the grower and the inspector.

2. In addition to the on-farm irrigation practices, **management of runoff water** from irrigation and non-irrigation activities should be documented. This includes sources such as vehicle and walkway wash water, roof runoff, etc. While it is legal for rainwater to leave your property and enter the storm drain system, a certain percentage of the initial rainfall must be retained on the property because it carries with it the greatest load of pollutants. Documentation of these activities will be very important when your growing operation is inspected for adherence water quality regulations.

The following charts allow you to record the status of your operation with respect to irrigation efficiency and management of runoff water. Section 8 of this notebook allows you to expand on the installation of irrigation or runoff management practices by itemizing best management practices in use on your farm.

IRRIGATION PRACTICES

Irrigation Method	Date Installed	Location Installed	Maintenance Frequency/Date	Comments

RUNOFF MANAGEMENT

Management Method Used	Date Installed	Location Installed	Maintenance Frequency/Date	Comments

IRRIGATION PRACTICES

Irrigation Method	Date Installed	Location Installed	Maintenance Frequency/Date	Comments

RUNOFF MANAGEMENT

Management Method Used	Date Installed	Location Installed	Maintenance Frequency/Date	Comments

Equipment Maintenance:

1. Maintenance of non-irrigation related equipment, particularly the types of equipment that can leak gas, oil or other products is an important aspect of protection of water quality. Leaks or spills can be very visible, and when washed down with water, a small amount of these petroleum products can impair a large amount of water. The following chart allows you to track your equipment maintenance and provide information that leaks and other problems are under control and are not likely to produce water quality problems.

EQUIPMENT MAINTENANCE

Type of Equipment	Maintenance Method	Maintenance Frequency/Date	Comments

EQUIPMENT MAINTENANCE

Type of Equipment	Maintenance Method	Maintenance Frequency/Date	Comments

The following is a list of Best Management Practices (BMP's) that have been recommended by our office for several years. It is not a comprehensive list! Many of the everyday practices you use may actually be considered BMP's, and should be documented here.

Irrigation Management / Runoff Management:

Water Quality Monitoring
Maximizing Irrigation Efficiency
Irrigation Scheduling
Growing Medium Selection
Use of Wetting Agents
Leaching Reduction
Collection/Reuse of Tailwater
Collection/Reuse of Runoff from Outdoor Production Areas
Filter Strips or Vegetative Filters
Constructed Wetlands
Lined Waterways
Field Erosion/Drainage Control
Road Management for Erosion Control
Water Conservation
Excess Water Removal
Other

Nutrient Management:

Choosing Appropriate Fertilizer Materials
Using Alternative Fertilizers
Composting
Determining Nutrient Availability in Recycled Irrigation Water
Monitoring pH and EC in Soil or Growing Media
Foliar Testing
Soil Testing
Use/Calibration of Fertilizer Injectors
Other

Pest Management

Adopting Good Management/Sanitary Practices
Utilizing a Pest Detection Program
Selecting pest-free planting materials
Utilizing Integrated Pest Management (IPM) Methods
Utilizing Improved Pesticide Application Techniques
Utilizing Surfactants
Other

Other Best Management Practices

BEST MANAGEMENT PRACTICES USED

BMP	LOCATION	INITIATION/ INSTALLATION DATE	REVIEW / MAINTENANCE DATE	COMMENTS

BEST MANAGEMENT PRACTICES USED

BMP	LOCATION	INITIATION/ INSTALLATION DATE	REVIEW / MAINTENANCE DATE	COMMENTS

BEST MANAGEMENT PRACTICES USED

BMP	LOCATION	INITIATION/ INSTALLATION DATE	REVIEW / MAINTENANCE DATE	COMMENTS

BEST MANAGEMENT PRACTICES USED

BMP	LOCATION	INITIATION/ INSTALLATION DATE	REVIEW / MAINTENANCE DATE	COMMENTS

BEST MANAGEMENT PRACTICES USED

BMP	LOCATION	INITIATION/ INSTALLATION DATE	REVIEW / MAINTENANCE DATE	COMMENTS

BEST MANAGEMENT PRACTICES USED

BMP	LOCATION	INITIATION/ INSTALLATION DATE	REVIEW / MAINTENANCE DATE	COMMENTS

BEST MANAGEMENT PRACTICES USED

BMP	LOCATION	INITIATION/ INSTALLATION DATE	REVIEW / MAINTENANCE DATE	COMMENTS

BEST MANAGEMENT PRACTICES USED

BMP	LOCATION	INITIATION/ INSTALLATION DATE	REVIEW / MAINTENANCE DATE	COMMENTS

BEST MANAGEMENT PRACTICES USED

BMP	LOCATION	INITIATION/ INSTALLATION DATE	REVIEW / MAINTENANCE DATE	COMMENTS

Educational Programs:

1. Over the years, our experience with our water quality programs have shown that the success of these activities is closely related to the involvement and knowledge of the employees, particularly those with irrigation responsibilities. Although the knowledge of the supervisors is also required, it is imperative that the employees be well trained, and the supervisors should make the training available.

2. This section documents educational programs conducted at your growing operation or at other locations and attended by personnel from your growing operation or yourself. Documentation of these activities will indicate a good faith effort in managing water quality. If you have meeting fliers or course descriptions, include them in this notebook.

EDUCATIONAL PROGRAMS

TITLE OF PROGRAM	DATE	ORGANIZATION PRESENTING PROGRAM	LOCATION	ATTENDED BY	COMMENTS

EDUCATIONAL PROGRAMS

TITLE OF PROGRAM	DATE	ORGANIZATION PRESENTING PROGRAM	LOCATION	ATTENDED BY	COMMENTS

Other Data and Information:

If you have other information that is pertinent to water quality records, please enter it in this section. Some examples include water quality testing data, if not included in the irrigation section, nutrient data, specific local considerations such as TMDL information etc.

Managing Runoff in Coastal Nurseries in San Diego County

Valerie J. Mellano, Ph.D.
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Environmental Issues Advisor
San Diego County
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The federal Clean Water Act requires municipalities to eliminate discharge of pollutants into the storm drain system to the maximum extent practicable. This discharge includes runoff from nurseries and other agricultural operations; agricultural runoff may contain applied chemicals and sediment in quantities that exceed state and federal water quality standards. For nurseries, this means no water other than storm runoff will be allowed to leave the property and enter the municipal storm drain system. In some cases, the "first flush" (ranging from .25 to.75 inches of rainfall) of a rainstorm must be captured on site. Water flowing into the storm drains passes directly to coastal or other water bodies without any form of treatment. In San Diego County and much of Southern California, commercial nurseries are often found in very close proximity to the coast.

Over the last several years, the County of San Diego, the Port District and each of the municipalities in the county (all considered "copermittees") have developed a "Municipal Stormwater Permit (2002)" that provides the legal specifications for enforcement of the runoff aspects of the Clean Water Act. Other counties in California and around the U.S. and locations have developed or are developing these types of permits. In the San Diego area, each of the "copermittees" has the opportunity to independently enforce the Stormwater Permit within its jurisdiction and to hold annual or more frequent inspections of nursery operations (and many other businesses as well) as they see fit. Although the inspection process is still fairly new, the fear is that this independent process will allow for inconsistencies in enforcement throughout the county. Some municipalities are opting to work with the County Department of Agriculture, Weights and Measures, and have them provide the personnel and methods for nursery inspections.

Water Quality Programs

We have worked with local coastal growers for several years to assist them in coming into voluntary compliance with the water quality laws prior to the development of the Stormwater Permit. The objectives of our program have included the following:

- Avoidance of unnecessary regulation and citation of growers by providing information and resources to familiarize them with the water quality requirements
- Provision of a non-regulatory liaison between growers and agencies to explore compliance options
- Assessment of the value of best management options utilized by growers to reduce runoff and contaminants
- Highlight the nursery industry as a model of compliance with the Clean Water Act regulations

These aspects of our program have been very useful in allowing the growers to comply with the Municipal Stormwater Permit 2002. In addition, because of these early efforts, the regulatory agencies have worked closely with us to gain information on reasonable growing practices, and we have also been able to tailor our current programs to reflect regulatory requirements.

We have used several outreach methods to provide information to producers. All outreach efforts are at no cost to the growers. These include:

- Confidential site assessments, allowing us to spot practices and equipment that would contribute to runoff problems
- Water quality testing for nitrates, phosphates, ammonia, EC and pH
- Monthly meetings/tours on topics relative to best management options
- Meetings and speaker presentations with regulators

Many growers have taken advantage of these resources. Some site assessments have continued as long-term programs to solve runoff issues. Although the issues seem huge, small changes can have a big impact on reduction of pollutants leaving the property in runoff water. Some of the implemented best management options include:

- Increased irrigation equipment efficiency and uniformity
- Replacement of irrigation systems
- Reduced leaching rates where appropriate
- Implementation of pulse irrigation
- Improved irrigation scheduling
- Improved irrigation system cleaning and maintenance
- Elimination of wash-down practices that create runoff
- Capture and re-use of runoff on-site
- Working with neighboring properties to re-use runoff

We have learned a number of things from working with the growers as well as the regulatory personnel on these projects:

- Free and confidential non-regulatory assistance is beneficial to encourage grower participation in these programs. Growers must be confident that the information regarding their operation is confidential and will not result in increased regulatory scrutiny.
- While nutrient management and runoff of nutrient-laden water is of concern, there is very little information about the nutrient requirements of many of the nursery crops grown in San Diego County. It is difficult or impossible to advise on fertilizer requirements in many cases.
- Irrigation equipment upgrades are the most common remedies to minimizing runoff. These include pressure regulators, emitters with check valves, timers/clocks and switching to a lower volume method of irrigation.
- Irrigation scheduling can alleviate much of the runoff. Use of instruments such as tensiometers or other moisture/climate sensors can aid in irrigation scheduling.

Additional Tools

As part of our program, we developed a "Self-Assessment" for growers. This is a questionnaire that gathers information about irrigation practices, fertilization practices and other factors associated with the runoff problem. This is a good starting point when a grower is beginning a water quality or storm water management program.

We also developed a water quality record keeping system that can be used by nursery operators for storm water or other water quality inspections. Much of the information required in a storm water inspection is also required for other regulatory agencies (such as Hazardous Materials Management Plans and Pesticide Use Reports). We developed a system that allows the grower to simply insert these other reports or materials into a loose-leaf notebook when this is appropriate. The record keeping system includes information on location of the growing operation, storm drains, streams or other water bodies the property, fertilizer use, waste management, irrigation management etc. It is also important to record the best management options that have already been implemented. The sections of the notebook correspond to the inspection categories and requirements.

Several years ago we published a booklet containing information on "Management Options for Nonpoint Source Pollution-Greenhouse and Container Crop Industries". This has been used extensively as a guidebook explaining growing practices that will alleviate water quality problems. The self-assessment, record keeping system, and the Management Options booklet are available online at http://cesandiego.ucdavis.edu.

Growers must continue to take a proactive approach towards implementing effective best management options appropriate for their growing operations to avoid a "one-size-fits-all" regulatory approach. This year our program will be

expanded to additional geographical areas in the county, and to growing operations in addition to the nursery industry.

Funding for these programs has been provided by the Kee Kitayama Research Foundation, California Association of Nurserymen, San Diego County Farm Bureau, Carlsbad Agricultural Improvement Fund, City of Encinitas and State Water Resources Control Board Prop 13 Program. Project cooperators include Karen L. Robb, Dave Shaw and Diane DeJong, UC Cooperative Extension, San Diego County.

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