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Submitted electronically

Ms. Angela Schroeter
Regional Water Quality Control Board
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SUBJECT: Comments on Draft Order No. R3-2011-0006, Conditional Waiver of Waste Discharge Requirements for Discharges From Irrigated Lands

Dear Ms. Schroeter:

Our firm represents the California Strawberry Commission (CSC) in the Central Coast Regional Water Quality Control Board's (Central Coast Water Board) matter for adoption of new regulations pertaining to discharges from irrigated lands. On behalf of the CSC, we have reviewed Draft Order No. R3-2011-0006, Conditional Waiver of Waste Discharge Requirements (Draft Waiver), the Draft Monitoring and Reporting Program for Order No. R3-2011-0006 (Draft MRP), and all other associated materials.

Based on our review of the Draft Waiver, we must express grave concern with many of the findings and provisions. In general, we find the Draft Waiver similar in nature to the Preliminary Draft Order issued in early 2010, as it continues to propose prescriptive requirements that are unreasonable and unlawful. Our detailed comments on the many provisions of concern are detailed below.

As a preliminary matter, the CSC was a signatory on and continues to support the *Draft Central Coast Agriculture's Alternative Proposal for the Regulation of Discharges from Irrigated Lands* (Agricultural Alternative) submitted on December 3, 2010. The CSC believes the Agricultural Alternative represents a viable and appropriate approach for addressing water quality issues and impairments in the Central Coast. Specifically, the Agricultural Alternative as applied to strawberry growers and others would create an agricultural Coalition with specific duties and functions that would help to assist agricultural operations in the Central Coast address the many complex water quality problems that exist. Through the Coalition, grower operations and associated farm plans would be subject to

multiple audits, and where warranted, additional assistance would be provided directly to growers to improve agricultural operations.

In contrast, the Draft Waiver consists primarily of an expensive, draconian, paperwork exercise that relies almost exclusively on the submittal of paper reports and monitoring information in an attempt to improve water quality. While this approach may allow the Central Coast Water Board to bring multiple enforcement actions for paper violations and alleged violations of water quality objectives, it fails to provide any real or direct assistance to growers to help them change and modify operations for the protection of water quality. Without this essential link, growers may be unfairly penalized for violating water quality objectives.

Although the CSC supports the Agricultural Alternative as proposed and believes it is superior to the Draft Waiver, CSC is not opposed to revisions to the Agricultural Alternative if the Central Coast Water Board finds it necessary for it to be a viable alternative. For example, CSC understands that the Central Coast Water Board may be more amenable to the Agricultural Alternative if it contained more specific milestones related to water quality improvement. Further, CSC understands that it may be necessary to expand application of the Coalition requirements to those that may cause a threat to water quality due to the use of certain pesticides such as diazinon and chlorpyrifos, or even to expand the Coalition requirements universally to all operations subject to the Draft Waiver. CSC does not speak or comment for other agricultural organizations on this issue, but CSC would not oppose such revisions.

With respect to the Draft Waiver, Draft MRP, and other associated documents as proposed, the CSC submits the following comments.

I. Draft Waiver Includes a Number of Inappropriate and Unsupported Findings¹

In California, the Central Coast Water Board must support its decisions with specific findings based on evidence in the record. In particular, the Central Coast Water Board must “set forth findings to bridge the analytical gap between the raw evidence and the ultimate decision or order.” (*Topanga Assn. for a Scenic Community v. County of Los Angeles* (1974) 11 Cal.3d 506, 515 (*Topanga*); see also *In Re Petition of the City and County of San Francisco, et al.* (Sept. 21, 1995) SWRCB Order No. WQ 95-4, at pp. 10, 13.) Further, the findings must be supported by evidence in the record. (*Topanga* at pp. 514-515.) In other words, findings must be based on specific evidence and may not be a statement based on rhetoric.

¹ Findings 29 through 31 regarding compliance with the California Environmental Quality Act (CEQA) are addressed in detail by the California Farm Bureau Federation (CFBF). CSC hereby incorporates by reference CFBF’s comments on Findings 29-31 and the Draft Subsequent Environmental Impact Report. Finding 32 incorporates the findings from Attachment A, which are addressed separately in section III below.

Here, the Draft Waiver uses significant rhetoric to portray agriculture as the evil polluter that has caused undue harm to fish and public drinking water supplies throughout the Central Coast. While the CSC admits that agriculture may be contributing to some water quality impairments in the Central Coast, CSC declines to believe that it has caused the wide-spread harm portrayed by the Draft Waiver. Further, careful review of data and information apparently relied on by Central Coast Water Board staff to find this wide-spread harm shows that at least some data and information may be inappropriately manipulated and fail to represent the premise for which they are proposed. Due to the short timeframe available to review the extensive Draft Waiver and its related documents, the CSC was unable to critically review all data and information. However, if the manipulation of one data set (e.g., groundwater nitrate data) is indicative of the Central Coast Water Board staff's practices for reviewing data and making findings, then other findings based on supposed "available data and information" may also be questionable and may not be supported by evidence in the record.

A. Finding That Irrigated Agriculture Is the Primary Source of Nitrate Pollution in Drinking Water Wells Is Not Supported by Available Data and Information

Finding 6 of the Draft Waiver states in part that, "[n]itrate pollution of drinking water supplies is a critical problem throughout the Central Coast Region. Studies indicate that fertilizer from irrigated agriculture is the largest primary source of nitrate pollution in drinking water wells and that significant loading of nitrate continues as a result of agricultural fertilizer practices. Researchers estimate that tens of millions of pounds of nitrate leach into groundwater in the Salinas Valley alone each year. Studies indicate that irrigated agriculture contributes approximately 78 percent of the nitrate loading to groundwater in agricultural areas." This finding is largely responsible for many of the groundwater and nitrate related requirements proposed in the Draft Waiver. (See, e.g., Provisions 80 through 91, at pp. 22-27.) However, critical review of available data and information question the finding and the evidence from which it is supposedly derived.

A report prepared by Robert Dolezal, *Anomalies in Data Supporting Proposed Regulations Offered by the Central Coast Regional Water Quality Control Board: A Critical Analysis – November-December 2010* (Dolezal 2010), provides significant information that questions the statements made in Finding 6. (Dolezal 2010, Attachment 1, submitted on CD that was sent via Federal Express to the Central Coast Water Board on December 30, 2010.) For example, Dolezal 2010 summarizes results from several U.S. Geological Survey reports to show that in fact there is not widespread nitrate groundwater contamination in the Central Coast. (Dolezal 2010 at pp. 4-5.) Dolezal 2010 also provides evidence that disputes the statement that tens of millions of pounds of nitrate leach into groundwater in the Salinas Valley. (See Dolezal 2010 at pp. 5-6.)

Of even greater concern is a presentation of data in Mr. Matthew Keeling's powerpoint to the Central Coast Water Board at its April 8, 2010, workshop and as presented to the Sustainable Agriculture Expo by Central Coast Water Board staff member, Ms. Lisa McCann. To the extent Finding 6 is based on data presented in Mr. Keeling and Ms. McCann's presentations, the finding is not supported by substantial evidence in the record. Specifically, Dolezal 2010 found that when Ms. McCann's graphics of public supply wells were compared to data from the Geo Tracker GAMA database, Ms. McCann's graphics greatly under-depicted the actual number of wells in the area. For example, for the Castroville area, Ms. McCann's graphics showed a total of six wells in the area; however, the GAMA database reveals that there are actually one hundred twenty-two wells in nine different clusters. For the King City area, Ms. McCann's graphics depict an estimated thirteen wells of which seven supposedly have exceedences above the drinking water standard. (Dolezal 2010 at pp. 9-11.) In comparison, the GeoTracker GAMA records show one hundred nine wells of all types comprising twenty clusters. Fifty-two of the wells are drinking water wells. According to the GAMA database wells, two clusters of drinking water wells for a total of eight individual wells showed historic exceedences of the drinking water standard. Of these eight wells, two no longer had exceedences and all but one was located in a cluster in downtown King City. (Dolezal 2010 at pp. 10-11.)

Overall, the evidence provided in Dolezal 2010 clearly indicates that statements proposed in Finding 6 are overstated and not supported by evidence in the record. Thus, Finding 6 fails to support the proposed Draft Waiver provisions that are intended to "rectify" agriculture's impacts to groundwater. Without supporting substantial evidence, many of the nitrate and groundwater requirements are inappropriate.

B. Finding That Compliance Based on Mere Possibility of Discharge Inappropriate

Finding 21 states that landowners and operators of irrigated lands who obtain a pesticide use permit *may* have a discharge of waste that could affect surface or groundwater, and therefore *must* submit a completed Notice of Intent (NOI) to comply with the Draft Waiver. Inherent in this finding is an improper presumption that simply because a landowner has obtained a pesticide use permit, that the landowner may have a discharge of waste. The Draft Waiver provides no information or evidence to support this finding. Conversely, pesticide use permits are issued for various pesticide applications, including use permits for pesticides and herbicides that are not typically considered to be present in irrigation return flows or migrate to groundwater. Thus, the presence of a pesticide use permit itself does not constitute evidence of a potential discharge of waste.

The Central Coast Water Board has the authority to regulate "discharges of waste" from irrigated agriculture operations. (Wat. Code, § 13260.) However, the Central Coast Water Board does not have unfettered regulatory authority to regulate irrigated agriculture just because a pesticide use permit exists. Accordingly, this finding should be eliminated or

amended to reflect that the Central Coast Water Board's authority does not extend to irrigation practices that do not result in a "discharge of waste."

II. Draft Waiver Includes a Number of Inappropriate Substantive Provisions

The Draft Waiver contains a number of substantive provisions that are of concern to the CSC. Collectively, the provisions set forth an impossible program that would prohibit any discharge that may exceed water quality standards on the day of adoption—regardless of the inferences made to time schedules and the need to implement best management practices (BMPs). Further, as a practical matter, the Draft Waiver includes a number of specific provisions that are unrealistic for agriculture in the Central Coast. Our specific comments on the provisions are provided here in the order as they appear in the Draft Waiver.

A. Provision 1 Inappropriately References Water Code Section 13263

This provision lists the relevant statutory authority under which dischargers must comply with the terms and conditions of the Draft Waiver, including Water Code sections 13263, 13267, and 13269. However, one of the listed code sections, Water Code section 13263, is not applicable to the Draft Waiver and should not be included. Water Code section 13263 addresses the Central Coast Water Board's ability to prescribe requirements as to the nature of any proposed discharge, existing discharge, or material change in an existing discharge, and places certain restrictions on that authority. (Wat. Code, § 13263(a).) However, the Draft Waiver is not a waste discharge requirement or change to an existing waste discharge requirement, but rather a conditional waiver of waste discharge requirements. (See Wat. Code, § 13269.) As the Subsequent Environmental Impact Report (SEIR) acknowledges, discharge authorization can be in the form of waste discharge requirements *or* a conditional waiver of waste discharge requirements. (SEIR, p. 2, § 2.2.) The reference to and inclusion of Water Code section 13263 in this provision is inappropriate and should be eliminated.

B. Provision 3 Creates an Unspecified Prohibition

This provision states that dischargers must not discharge any waste not specifically regulated by the Draft Waiver. However, there is no designation or reference as to what types of waste are specifically regulated by the Draft Waiver, or what types of waste are not included in the Draft Waiver. Such a provision provides no clarity or guidance to dischargers. Thus, this language is far too broad and requires some clarification.

C. Provision 8 Inappropriately Places Landowners In a Regulatory Role

This provision would require landowners to police lessees to ensure that they are complying with the terms of the Draft Waiver. Such a provision is improper for several reasons. First, determining compliance with the Draft Waiver is a Central Coast Water Board function—not a landowner function. While the Central Coast Water Board may arguably

have the authority to hold both landowners and operators jointly responsible for compliance with the Draft Waiver, the Central Coast Water Board has no authority to require landowners to “police” operators and determine if they are compliant with the terms of the Draft Waiver.

Second, as proposed, this provision puts landowners in jeopardy of being responsible for multiple violations for one act of wrongdoing. Under this provision, a landowner could theoretically be liable for a violation of the Draft Waiver individually, and also be liable for the very same violation by not “ensuring” that the operator was compliant. Accordingly, this provision should be deleted.

D. Provisions 9-16 Create an Inappropriate Tiering System

Central to the Draft Waiver and its requirements is the tiered system proposed in Provisions 9-16. The proposed tiered system attempts to equate threat to water quality based on pesticides used, type of crop grown, size of the operation, and physical location as compared to surface waterbodies listed as impaired on the state’s 303(d) list. It fails to recognize or take into account that the implementation of certain BMPs and/or certain cultural practices by various commodities may be more effective in protecting water quality than the mere presence of the physical parameters identified in the Draft Waiver.

Further, the tiered approach sets forth a paperwork exercise that is burdensome on growers and less effective in improving water quality regulation as compared to the Coalition approach proposed in the Agricultural Alternative. The Coalition approach would work directly with growers to help to design and implement BMPs that are protective of water quality. Further, the audit system built into the Coalition approach provides for substantially more accountability than the tiered approach proposed in the Draft Waiver.

Also as proposed, the establishment of tiers is somewhat illusory. Specifically, Provision 14 would allow the Executive Officer (EO) of the Central Coast Water Board to elevate Tier 1 or Tier 2 dischargers to a higher tier, if the EO finds the discharger poses a higher threat. However, there are no objective criteria listed to determine when a discharger is to be elevated from one tier to another, and there are no listed identifying factors the EO is to consider when making this determination. Thus, there is nothing in the Draft Waiver that would provide an agricultural operator and/or landowner with any guidance as to what might trigger their elevation to a higher tier, nor are there any procedural or due process elements included that would allow an agricultural landowner or operator to challenge the EO’s decision before the Central Coast Water Board. All that is required under the proposed provision is that the discharger, in the opinion of the EO, poses a “higher threat.” This term is not defined and is subject entirely to the EO’s discretion. The decision to elevate a discharger to a higher tier can have serious ramifications for a discharger, yet it is essentially at the whim of the EO.

Water Code section 13223(a) provides the Central Coast Water Board with the authority to delegate its powers to the EO with the exception of, among others, the promulgation of any regulation and the issuance, modification, or revocation of any water quality control plan, water quality objective, or waste discharge requirement. The amount of discretion given to the EO under this provision, and in numerous other provisions within the Draft Waiver, seemingly delegates to the EO the authority to revise requirements in the Draft Waiver. Although revisions to conditional waivers adopted pursuant to Water Code section 13269 are not specifically enumerated in Water Code section 13223(a), revisions to waivers are akin to revisions in waste discharge requirements. Specifically, changing the status of a discharger from a lower tier to a higher tier fundamentally alters the burdens and regulatory requirements placed on that discharger—much like a revision to waste discharge requirements. Considering the potential changing regulatory burden and fundamental due process concerns, such an action should not be delegated to the EO. Thus, if the Central Coast Water Board decides to maintain the tiered system, this provision must be removed, or, at the very least, be revised to include specific criteria that would trigger a change in tier categorization for the agricultural operator and/or landowner.

E. Proposed Discharge Prohibitions Create Immediate Non-Compliance

Nearly all of the discharge prohibitions listed in Part B, Provisions 17-28, are inappropriate and problematic for agricultural landowners and operators. As a general matter, these discharge prohibitions would become effective on the day of adoption and would effectively prohibit the discharge of any waste that has the reasonable potential to cause or contribute to a violation of a water quality standard regardless of the time schedules contained in Provisions 98-101. Thus, the supposed findings and provisions that suggest the Draft Waiver includes moderate time schedules are negated by the proposed discharge prohibitions.

In general, the inclusion of discharge prohibitions exceeds the authority of the Central Coast Water Board under relevant provisions in the Porter-Cologne Water Quality Control Act (Wat. Code, § 13000 et seq.) (Porter-Cologne). Specifically, Water Code section 13243 states that, “[a] regional board, in a water quality control plan or in waste discharge requirements, may specify certain conditions or areas where the discharge of waste, or certain types of waste, will not be permitted.” However, Porter-Cologne does not authorize a regional board to prohibit discharges as part of a conditional waiver issued pursuant to Water Code section 13269. As noted above, the statutory provisions governing the issuance of conditional waivers are separate and distinct from those governing waste discharge requirements, and should not control the content of the Draft Waiver. More fundamentally, these discharge prohibitions undercut the primary purpose for the adoption of a waiver. Discharge requirements, and waivers from discharge requirements, are intended to ensure that discharges of waste are controlled to protect water quality considering the beneficial uses of waters of the state, and water quality objectives reasonably required for the purpose of protecting beneficial uses. (See Wat. Code, §§ 13263, 13269.) The prohibitions contained in Part B are in fact blanket prohibitions on any discharge that might violate water quality

standards, containing no discussion of beneficial uses or reasonableness, and entirely inappropriate in the context of a conditional waiver of waste discharge requirements.

Further, this section proposes blanket prohibitions on any discharge specified, without reference to or consideration of time schedules included in the Draft Waiver. For example, Provision 100 states that within four years of adoption of the Draft Waiver, certain dischargers must demonstrate that they are not causing or contributing to exceedances of water quality standards for nutrients and salts. However, Provision 17 would prohibit the discharge of any waste that causes or has reasonable potential to cause, or contribute to an exceedance of water quality standards, including nutrients and salts, on the day of adoption. These are two contradictory provisions, one prescribing immediate prohibition and one allowing four years for compliance. The immediate waste discharge prohibitions in Part B essentially overwrite any of the time schedules allowed in the Draft Waiver. Such an approach is inconsistent with statements made by Central Coast Water Board members at the May 12, 2010, workshop in San Luis Obispo, as well as the July 8, 2010, workshop in Watsonville. (See May 12, 2010, Workshop, Audio #12 [“timelines . . . need to be reasonable”]; see also July 8, 2010, Workshop, Audio #8 [“there is a misconception that we intend to have everything clean in the next two to four years . . . I want to respond to that . . . we are not going to see everything cleaned up in four or five years. We hope to see a trend develop where we are on the path to getting where that goal needs to be”].) Accordingly, the discharge prohibitions need to be deleted from the Draft Waiver. In the alternative, the prohibitions need to at least be revised to incorporate reasonable time schedules.

There are also specific concerns regarding several of the individual discharge prohibitions. For example, the discharge prohibition in Provision 19 is incredibly overbroad. It states that the discharge of any waste not specifically regulated by the Draft Waiver is prohibited. There is no designation or reference to what specific waste is not designated in the Draft Waiver, or what types of discharge of waste might be included under this provision. The Draft Waiver cannot purport to prohibit discharge of all waste of any type, without reference to or respect for the relevant time schedules, conditions, and restrictions, both within the Draft Waiver and external to the Draft Waiver. This language, much like the language in Hereby Ordered Provision 3, is far too broad and requires some clarification by the Central Coast Water Board.

Several of these prohibitions are unlawful because they are unrelated to the discharge of waste, and hence are outside the Central Coast Water Board’s authority to regulate. For example, Provisions 22 and 23 prohibit the legal application of fertilizer, fumigants, and pesticides if such application results in a discharge of waste to groundwater. Central Coast Water Board authority does not extend to regulating the application of commercial fertilizers or pesticides to crops, as those acts in themselves are not a discharge of waste.

With respect to fertilizers, there currently exists no state regulation of their use by agricultural operations. The California Department of Food and Agriculture has limited authority over labeling, and conducts extensive research and educational programs. (See, e.g., Food & Agr. Code, § 14501 et seq.) However, in the future, should the California legislature determine that regulation of such use is necessary, then it is on the legislature to act accordingly. It is improper and unlawful for the Central Coast Water Board to create this authority for itself as part of the Draft Waiver.

With respect to pesticides, their use and registration is regulated exclusively by the California Department of Pesticide Regulation (DPR). (See Food & Agr. Code, § 11501.1 [“This division and Division 7 (commencing with Section 12501) are of statewide concern and occupy the whole field of regulation regarding the registration, sale, transportation, or use of pesticides to the exclusion of all local regulation.”].) Conversely, the Central Coast Water Board’s authority is limited to matters that pertain to water quality, and does not include the authority to direct growers with regard to their pesticide applications or to direct the means to comply with a DPR permit. (See Wat. Code, § 13225; see also *id.*, § 13360 [“No . . . order of a regional board . . . shall specify the . . . particular manner in which compliance may be had with that requirement, order, or decree, and the person so ordered shall be permitted to comply with the order in any lawful manner.”].)

As another example, Provision 25 prohibits the presence of bare soil vulnerable to erosion. Allowing the presence of “bare soil” as identified under this prohibition is not a discharge of waste and prevention of such a condition is incredibly impractical and infeasible for an owner or operator of irrigated agricultural land. Provision 26 prohibits the discharge of agricultural rubbish, refuse, and other solid wastes at any place where they may contact or may eventually be discharged to surface waters. While CSC understands the need to control rubbish and refuse and prevent littering from occurring, as proposed the prohibition is impractical.

Further, Provision 21 would prohibit the discharge of waste to groundwater that has the MUN beneficial use designation if the discharge would cause or contribute to an exceedance of U.S. EPA or California Department of Public Health (DPH) drinking water standards, whichever is more stringent. This prohibition is problematic for several reasons. First, the prohibition would apply to drinking water standards that are not properly adopted water quality objectives. Specifically, the Water Quality Control Plan for the Central Coast (Basin Plan) incorporates drinking water standards from title 22 (i.e., standards from DPH)—not from U.S. EPA. (Basin Plan at p. III-2.) Further, the Basin Plan only includes certain sub-sets of state drinking water standards (e.g., primary MCLs for organic and inorganic constituents)—and not all drinking water standards (e.g., secondary MCLs). (Basin Plan at pp. III-5 - III-7.) Thus, the reference to drinking water standards generically is overbroad and fails to acknowledge that not all standards are properly adopted water quality objectives contained or incorporated in the Basin Plan.

Second, the Central Coast Water Board has no authority to incorporate U.S. EPA drinking water standards as pseudo water quality objectives through its adoption of the Draft Waiver. As discussed further in section III.H below, water quality objectives must be adopted into the Basin Plan pursuant to Water Code sections 13241 through 13245. U.S. EPA's drinking water standards have not been adopted into the Basin Plan pursuant to these requirements. Thus, any reference to U.S. EPA's standards is inappropriate and must be removed.

Collectively, the provisions in Part B prohibit all discharge of waste at any location immediately, without due regard to beneficial uses, particular constituents, the Basin Plan, or reasonable time schedules for compliance. Many of these prohibitions are beyond the scope of authority for the Central Coast Water Board and prohibit acts that are not discharges of waste. The entirety of the discharge prohibitions section is contrary to statute and Central Coast Water Board member direction to staff, and must therefore be removed.

F. Part C Includes Improper General Conditions

Part C includes a number of general conditions that would apply to dischargers in all three tiers. However, several of the general conditions are improper conditional waiver requirements and should be removed. Further, some of the conditions either undermine time schedule provisions, and/or are undermined by the discharge prohibitions as discussed above. Specific comments on certain general conditions are provided here.

1. Provision 30 Creates an Immediate Discharge Prohibition and Undercuts Time Schedules

As proposed, Provision 30 states, “[d]ischargers must not cause or contribute to exceedances of water quality standards . . . [and] . . . may have to implement best management practices, treatment or control measures, or change farming practices to achieve compliance with this Order.” (Draft Waiver at p. 13.) Much like the Part B Discharge Prohibitions, this provision would require immediate compliance with all water quality standards, without due regard for time schedules or other considerations. It also assumes that BMPs exist and if utilized will ensure compliance with water quality standards. However, as repeatedly indicated by agricultural specialists and researchers that is not necessarily the case. For example, in testimony provided by Dr. Timothy K. Hartz, Extension Specialist and Agronomist with the University of California, to the Central Coast Water Board at its July 8, 2010, workshop, he stated that, “[t]here are practical limitations on agriculture that will make control of nitrate losses especially concentration based control down to 10 ppm, very difficult or impossible to reach.” (Central Coast Water Board Workshop to Discuss Preliminary Draft Staff Report Recommendations for an Updated Agricultural Order, Public Comments and Alternative (July 8, 2010) (July 2010 Workshop), Audio 4, at 40:30.) Dr. Hartz also testified that, “[c]ertain conservation measures discussed to remove discharge from fields such as vegetative ditches and filter strips may have good effectiveness for certain pollutants, but for nitrates they have very limited effectiveness.” (July 2010 Workshop, Audio 4, at 38:30.)

Similarly, Mr. Michael Kahn, an Irrigation Water Resource Advisor for the University of California Cooperative Extension, testified that, “UC researchers and advisors like myself participate in evaluation and development of practices that can improve farm water quality. However, although we are developing effective practices, these practices can’t be used in every situation.” (Transcript of part of July 2010 Workshop at p. 9:8-15.)

Considering the uncertainty associated with meeting water quality standards even with the implementation of BMPs, provisions such as this must be deleted from the Draft Waiver as they create an impossibility of compliance for agricultural operations in the Central Coast.

2. Provision 31 Fails to Account for Assimilative Capacity in Groundwater

This provision states that dischargers must ensure that agricultural discharges percolating into groundwater must be of such quality at the point where they enter the ground to assure the protection of all actual or designated beneficial uses of groundwater. (Draft Waiver at p. 12.) This provision fails to account for potential assimilative capacity of groundwater and treatment (i.e., de-nitrification) that may occur in the soil profile.

Although this provision requires irrigation water to be of a quality that complies with groundwater quality objectives at the time it enters the ground, as a practical matter, this means that the water must be of such quality at the time of application. This requirement in effect regulates the quality of water at the moment it is used rather than at the moment it becomes a discharge of waste. Such a requirement is unreasonable and inconsistent with Porter-Cologne because the use of water for irrigation purposes is not considered a discharge of waste that can be regulated in this manner. The legislative history of Porter-Cologne indicates, “[t]he discharge of waste does not take place while water is still being used to irrigate crops in the fields.” (Report of the Assembly Committee on Water concerning Assem. Bill 413 (Assembly Report) at p. 3.) In addition, the State Water Resources Control Board’s (State Board) regulations governing the appropriation of water rights specifically provide that, “[n]o permittee shall be required to file a report of waste discharge pursuant to Section 13260 of the Water Code for percolation to the groundwater of water resulting from the irrigation of crops.” (Cal. Code Regs., tit. 23, § 783.) It is apparent that the Legislature and the State Board do not consider the percolation of irrigation water to groundwater a discharge of waste. As such, the Central Coast Water Board’s effort to require irrigation waste to be of sufficient quality to protect beneficial uses at the moment it enters the ground exceeds its authority.

Furthermore, this requirement that water be of sufficient quality at application does not account for the treatment in the soil profile that occurs after application, nor does it account for the assimilative capacity of groundwater. There is considerable treatment that may occur as water makes its way through the soil profile, and in many areas it can be reasonably expected that there will be significant dilution and attenuation of constituents after application. (See Dolezal 2010 at pp. 5-6; see also section I, *post.*) Because the lands covered

by the Draft Waiver are so varied in soil composition, the assimilative capacities of those lands also vary, and a requirement that all discharges be of sufficient quality to protect beneficial uses at the point where they “enter the ground” is inappropriate.

3. Provision 39 Is an Improper General Application of Authority to Enter Discharger Property

This provision states that pursuant to Water Code section 13267(c), representatives of the Central Coast Water Board may enter a discharger’s property, inspect and photograph certain locations and activities, have access to records, and perform sampling or monitoring activities. It is inappropriate to apply this provision generally to all dischargers as opposed to individual dischargers in instances where there is a known and demonstrated need to enter the landowner’s property and undertake these activities. Water Code section 13267(c) states that, “[i]n conducting an investigation pursuant to subdivision (a), . . . The inspection shall be made with the consent of the owner or possessor of the facilities or, if the consent is withheld, with a warrant duly issued pursuant to the procedure set forth in [Code of Civil Procedure section 1822.50].” The Draft Waiver fails to acknowledge that an individual showing would be required whenever the Central Coast Water Board seeks to act under this provision. Central Coast Water Board authority to enter onto the property of a discharger is an individualized determination and is improper as a provision of general applicability.

Under California Code of Civil Procedure section 1822.51, the Central Coast Water Board or its representatives would only be allowed to enter a discharger’s property upon a showing of cause, which is an individualized determination depending on the facts and circumstances surrounding the individual discharger. In stark contrast, the language of this provision is general and contains no such restriction or limitation on the action of the Central Coast Water Board. Such a general provision implies that the Central Coast Water Board has the authority to enter onto the property of a discharger without providing a demonstration of cause in the individual instance, and assumes that a representative of the Central Coast Water Board may undertake these investigations without any individual justification or suspicion of wrongdoing. Accordingly, this provision should be deleted, or at least amended to reflect that the Central Coast Water Board would be unable to enter the property of a discharger and undertake an investigation under Water Code section 13267(c) without an equivalent individual showing.

4. Provision 40 Exceeds Water Code Section 13267’s Authority and Includes an Improper Reference to Section 13304

This provision states that the EO may require dischargers to locate and conduct sampling of private domestic wells “in or near agricultural areas with high nitrate in groundwater” and submit technical reports evaluating the sampling results. (Draft Waiver at p. 14.) As noted in greater detail in comments to Provision 59 below, Water Code section 13267 governs the submission of technical reports and requires that the Central Coast Water Board provide justification and evidence for the request on an individualized basis.

(Wat. Code, § 13267(b)(1).) In order for such requests to be upheld, the Central Coast Water Board has the responsibility of explaining to the discharger the need for the information and identifying substantial factual evidence that supports requiring the reports. Further, the burden, including costs, of obtaining the report must bear a reasonable relationship to the need. This provision implies that no such showing on the part of the Central Coast Water Board is required before the EO can request such reports. In addition, the term “near” agricultural areas with high nitrate is undefined and gives too much discretion to the EO in broadly authorizing requests for such technical reports. Specific criteria identifying which dischargers are subject to this requirement are required, as is an acknowledgment that the EO does not have the authority to request such reports without the individualized showing required under Water Code section 13267.

With respect references to Water Code section 13304, such references are inappropriate and misplaced in the Draft Waiver. Under Water Code section 13304, the Central Coast Water Board may, in an action unrelated to the Draft Waiver, require a discharger to, “clean up the waste or abate the effects of the waste, or, in the case of threatened pollution or nuisance, take other necessary remedial action, including, but not limited to, overseeing cleanup and abatement efforts.” As part of a cleanup and abatement order issued pursuant to this authority, the State Board or a regional board may require the provision of, or payment for, uninterrupted replacement water service, which may include wellhead treatment, to each affected public water supplier or private well owner. (Wat. Code, § 13304(a).) However, Water Code section 13304 is an individualized remedy and determination, and only applies to a person who has discharged waste in violation of a waste discharge requirement or other order, or who creates or threatens to create a condition of pollution or nuisance with their discharge. (Wat. Code, § 13304(a).) By referencing Water Code section 13304 in the Draft Waiver, this provision wrongfully implies that the Central Coast Water Board can arbitrarily require dischargers to provide replacement water merely by violating a provision of the Draft Waiver. Simply stating that all dischargers may be required to undertake these activities, without also requiring that the Central Coast Water Board provide some demonstration that the requirement is related to an action of the discharger as described above, is entirely inappropriate. Thus, reference to Water Code section 13304 should be deleted from the Draft Waiver.

G. Monitoring and Technical Report Requirements Exceed Central Coast Water Board’s Authority

Parts D and E include a number of provisions that would require monitoring and submittal of technical reports from irrigated agricultural operations on the Central Coast. Most of the proposed provisions are inappropriate as they exceed the Central Coast Water Board’s authority to require such information and/or require the submission of confidential, proprietary information. In general, the Central Coast Water Board’s authority to require monitoring and technical reports is not without constraints. Under section 13267 of the Water Code, the legal authority to require such information, the Central Coast Water Board has the

burden of explaining to the discharger the need for the information and for identifying substantial factual evidence that supports requiring the reports, i.e., demonstrates a nexus between the requested information and the Central Coast Water Board's statutory authority to investigate water quality. Mere assertions that such a nexus exists are insufficient to support requests pursuant to Water Code section 13267. Most of the monitoring and technical report requirements in Parts D and E, as well as the specific monitoring requirements in the Draft MRP, fail in whole or part to meet the Central Coast Water Board's statutory burden. Further, many of the monitoring and technical report requirements include practical constraints that make compliance difficult if not impossible for many dischargers. Our specific comments on the monitoring and technical report provisions identified in the Draft Waiver are provided here. Where the Draft Waiver provisions identify requirements contained in the Draft MRP, the comments here apply to parallel provisions in the Draft MRP as well and are not repeated later in these comments.

1. Provision 44 Improperly Requires Public Disclosure of Confidential Information

This provision states that dischargers must sample private groundwater wells in agricultural areas, and identify areas of the greatest risk for waste discharge and other concerns in compliance with the Draft MRP. As proposed, this requirement is overly broad. Further, it would require the monitoring results to be submitted to the Central Coast Water Board as a public document. We have concerns with this requirement for several reasons. First, sampling information from private domestic wells and agricultural supply wells may be useful for management purposes; however, such information is not appropriate for determining compliance with Draft Waiver. Thus, the CSC recommends that monitoring results from domestic wells and agricultural supply wells be maintained in confidential, on-farm water quality management plan. (See Agricultural Alternative at p. 12.)

Second, it is not necessary to require the frequency and number of samples as proposed in the Draft MRP. Groundwater data is unlikely to change rapidly and thus annual monitoring of one primary well is sufficient information for improving the Farm Water Quality Management Plan (Farm Plan). It is not necessary to require samples from multiple wells on a quarterly basis to obtain information regarding nitrate and salinity levels in domestic or agricultural supply wells.

2. Provision 48 Improperly Requires Individual Discharge Monitoring

This provision would require Tier 3 dischargers to conduct individual discharge monitoring in compliance with the Draft MRP. This is an unnecessary requirement that exceeds the Central Coast Water Board's authority under Water Code section 13267. Section 13267 requires that the Central Coast Water Board's request for technical information be reasonable as compared to the burden of compiling the information, including the cost.

Further, the request for such information must be supported by evidence as to why the information is necessary.

In this case, the Draft Waiver and Draft MRP collectively fail to identify why such information is necessary from “Tier 3” dischargers, and fail to identify evidence in the record that supports such a requirement for all Tier 3 dischargers. In particular, the proposed criteria for categorizing dischargers into Tier 3 are generic in nature and are not necessarily related to an individual operation’s actual threat to water quality. Thus, the Draft Waiver assumes that operations meeting Tier 3 criteria are a threat to surface water quality to such an extent that individual discharge monitoring is required. However, there is no specific evidence that links the proposed criteria to actual water quality threats and therefore there is no evidence to support the requirement for individual discharge monitoring.

3. Provision 50(d) Is Impractical

This provision states that in the event of any change to operations or ranch/farm information, dischargers must submit an updated NOI to reflect the change. (Draft Waiver at pp. 16-17.) The term “any change” is not defined or adequately explained as part of this provision or the Draft Waiver. This provision fails to account for the fact that farming is an iterative and dynamic process. Changing circumstances require changes in operations on a frequent basis, far more often than farmers would be capable of submitting, and the Central Coast Water Board would be capable of reviewing, updated NOIs. It is infeasible and impracticable for every individual farmer or rancher to submit an updated NOI whenever there is “any change” in operations. This requirement should be limited to changes that meet certain criteria or thresholds that need to be specifically identified in the Draft Waiver.

4. Provision 51 Delegates Excessive Authority to the EO

As with a number of other provisions within the Draft Waiver, this provision would delegate too much discretion to the EO after adoption of the Draft Waiver. Specifically, this provision would require dischargers to include specified information requested in the NOI, including but not limited to those listed in the provision. The inclusion of this phrase “including but not limited to” in this context is entirely inappropriate. This provision implies that the EO has the authority to request more information at his or her discretion without criteria or justification for the request. The information to be submitted could change on a regular basis, subject to the whims of the EO and without any consistent guidance for agricultural operations. This results in a situation of perpetual uncertainty for those operating under the Draft Waiver, and delegates excessive authority to the EO. Under this provision, the EO seemingly has the authority to demand any amount of additional information, without justifying such a request as reasonably related to the burden on the discharger as required under Water Code section 13267, and without undertaking any formal notice and hearing procedures as would be required if the new requirement were an addition or amendment to the existing regulatory requirements. These unknown and unidentified future additions to the

NOI, left wholly to the discretion of the EO, represent potentially significant burdens on dischargers without procedural limitations or accountability on the part of the EO.

5. Provision 59 Violates Statutory Requirements

This provision states that all dischargers *must* submit technical reports that the EO *may* request to determine compliance with the Draft Waiver, as authorized by Water Code section 13267. (Draft Waiver at p. 18.) However, this provision, like many others, is not consistent with the identified code section, and gives excessive authority and discretion to the EO. The Central Coast Water Board's ability to require reports pursuant to Water Code section 13267 is not without constraint, and in order for such a request to be upheld, the Central Coast Water Board has the burden of explaining to the discharger the need for the information and identifying substantial factual evidence that supports requiring the reports. Specifically, Water Code section 13267 authorizes the Central Coast Water Board to require reports from those who discharge waste, but requires that the Central Coast Water Board "provide the person with a written explanation with regard to the need for the reports" and "identify the evidence that supports requiring that person to provide the reports." (Wat. Code, § 13267(b)(1).) Provision 59 contains no such requirement and states that *all* dischargers must submit these technical reports upon request, essentially at the unfettered discretion of the EO. It does not require that there be a written explanation regarding the need for the reports provided to the discharger, or that there be evidence to support such a request, both mandatory statutory requirements. A mere assertion that such evidence exists in the broadest sense, without more, is insufficient to support a Water Code section 13267 request.

In addition, this provision seemingly eliminates the statutory requirement that the Central Coast Water Board demonstrate that the burden on the discharger in submitting these reports, including costs, bears a reasonable relationship to the need for such reports. Specifically, Water Code section 13267 states that when the Central Coast Water Board requests a discharger to furnish a technical or monitoring report, ". . . the burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports." (Wat. Code, § 13267(b)(1).) In many instances, the burden on the individual discharger operating under the Draft Waiver will not bear a reasonable relationship to the need for report being requested, yet under the language of this provision, the EO has the authority to request such reports nonetheless. The onus is on the Central Coast Water Board to demonstrate that this reasonable relationship between burden and benefit exists for each report requested. The Draft Waiver cannot automatically satisfy this burden for every discharger and create the authority for the Central Coast Water Board to act in each individual instance. As such, this provision vests far too much authority in the EO and is contrary to the sections of Porter-Cologne from which the Central Coast Water Board claims the authority to act.

H. Certain Pollutant Specific Conditions Applicable to All Dischargers Are Unreasonable, Inconsistent With Other Provisions, and Create Double Jeopardy

1. Provision 61 Undermines Time Schedules

This provision states that dischargers must not cause or contribute to exceedances of pesticide and toxicity water quality standards, but does not include timeframes for compliance or incorporate reasonable time schedules. Again, as with the discharge prohibition provisions and others, this immediate requirement defeats the purpose of reasonable time schedules. As identified in comments pertaining to Part B (Prohibition of Discharges), such a broad and immediate requirement puts agricultural operations in immediate jeopardy of noncompliance, and is both inconsistent with the other time schedule provisions in the Draft Waiver and infeasible for discharger compliance.

Further, and as identified in comments pertaining to Provision 30, and others, the implementation of BMPs does not provide certainty with respect to being able to comply with water quality standards. As indicated by many professionals, although certain BMPs can be effective in controlling some parameters, they are not effective in controlling all parameters. Clearly, the control of non-point source pollution is an iterative process that requires time and adaptation to protect water quality. Creating a scenario of immediate non-compliance will only jeopardize the viability of agriculture in the Central Coast. As with other similar provisions, this provision must be deleted from the Draft Waiver.

2. Provision 62 Creates Double Jeopardy for Same Violation

This provision states that dischargers must comply with any DPR adopted or approved surface water protection requirement. (Draft Waiver at p. 19.) Clearly, where DPR has adopted regulations that are applicable to agricultural operations in the Central Coast, such agricultural operations must comply. However, this statement of fact is inappropriate as a provision of the Draft Waiver. As noted in comments regarding Provisions 22 and 23, pesticide use in California is regulated exclusively by DPR and the Central Coast Water Board's authority does not include the ability to direct growers with regard to pesticide applications or to direct the means to comply with a DPR permit. In addition, this provision improperly creates a situation of double jeopardy for the discharger. The Double Jeopardy Clause prohibits successive punishment for the same offense. (*United States v. Gartner* (1996) 93 F.3d 633, 634 [citing *Dept. of Revenue of Montana v. Kurth Ranch* (1994) 511 U.S. 767; *United States v. Halper* (1989) 490 U.S. 435, 451].) A discharger cannot be subject to both DPR action and Central Coast Water Board action concurrently, creating a situation where dischargers are punished twice by two different agencies for the exact same act. If a discharger fails to comply with a DPR regulation, then that person should be subject to DPR enforcement exclusively and not also be subject to a concurrent enforcement by the Central Coast Water Board for violation of the Draft Waiver. Thus, this provision should be deleted as it is unnecessary and creates double jeopardy.

3. Provision 63 Undermines Time Schedules

This provision states that discharges must not cause or contribute to exceedances of nutrient and salt water quality standards, but does not provide a reasonable timeframe for compliance, or reference the relevant time schedules in other sections of the Draft Waiver. Again, much as with the discharge prohibition sections, this immediate requirement that dischargers comply defeats the purposes of time schedules. For example, Provision 100 states that within *four years* of adoption of the Draft Waiver, certain dischargers must demonstrate that they are not causing or contributing to exceedances of water quality standards for nutrients and salts. These are two contradictory provisions, one prescribing immediate compliance and one allowing four years for compliance.

4. Provision 64 Creates Double Jeopardy for Same Violation

Like with Provision 62, this provision requires dischargers that apply fertilizers, pesticides, or other chemicals to comply with applicable DPR requirements or local ordinances. As noted above, pesticides are regulated by DPR under the Food and Agriculture Code, and the Central Coast Water Board's authority does not include the ability to direct growers with regard to its pesticide applications or to direct the means to comply with a DPR permit. Also, similar to Provision 62, this provision creates a situation of double jeopardy. If the discharger fails to comply with a DPR regulation or local ordinance, then that discharger should be subject to DPR or local agency enforcement process, not a Central Coast Water Board action for failure to comply under the Draft Waiver. A discharger cannot be subject to both DPR/local action and Central Coast Water Board action concurrently for the same act.

5. Provision 65 Defeats Purpose of Time Schedules

This provision states that dischargers must not cause or contribute to excursions or exceedances of sediment, turbidity, or temperature water quality standards. This provision, as with numerous others including the discharge prohibitions in Part B, defeats the time schedules outlined in Part I, Provisions 97-101.

6. Provision 66 Is Irrelevant in Light of Discharge Prohibition

This provision states that dischargers must minimize the presence of bare soil vulnerable to erosion and soil runoff to surface waters to meet turbidity and sediment water quality standards. However, the more restrictive discharge prohibitions in Part B make this provision irrelevant. Specifically, Provision 25 entirely prohibits the presence of bare soil vulnerable to erosion such that it results in a discharge of waste. These are two contradictory provisions that make the Draft Waiver internally inconsistent and fail to provide appropriate guidance to dischargers.

7. Provision 67 Constitutes a Taking and Exceeds Regulatory Authority

This provision, and Provisions 92-94, collectively require certain dischargers to implement a Water Quality Buffer Plan, which includes the dedication of portions of agricultural lands to uses prescribed by the Central Coast Water Board. Individually and collectively these requirements are governmental regulations that deprive agricultural landowners near streams of the economic benefit of their private property. The state and federal Constitutions guarantee real property owners just compensation when their land is taken for public use. (*Allegretti & Co. v. County of Imperial* (2006) 138 Cal.App.4th 1261, 1269.) Regulatory takings, though not direct appropriation or physical invasion of private property, are compensable under the Fifth Amendment. (*Lingle v. Chevron U.S.A. Inc.* (2005) 544 U.S. 528, 537.) Courts examining regulatory takings challenges generally analyze three factors to determine whether a taking has been effected, including the economic impact of the regulation on the claimant, the extent to which the regulation has interfered with distinct investment-backed expectations, and the character of the governmental action. (*Penn Central Transp. Co. v. City of New York* (1978) 438 U.S. 104.) The requirements in the Draft Waiver relating to aquatic habitat protection and the establishment of water quality buffer zones would likely be considered a regulatory taking.

The economic impact of the proposed buffer zone approach on agricultural landowners is potentially significant given that productive farmland will be forced out of production as a result of these buffer zones. In addition, this requirement that a landowner or operator essentially dedicate portions of productive agricultural land to the Central Coast Water Board unreasonably impairs the value or use of the property. The land covered by these buffer zones is most likely designated for and dedicated to the production of agriculture, a use which would be completely eliminated by these regulatory requirements. Such a buffer zone also severely interferes with the investment-backed expectations of the landowners who operate under the assumption that these dedicated buffer zones would be put to productive agricultural use. By depriving landowners of all economically beneficial use of land designated as a riparian buffer zone, the proposed regulation will severely interfere with the investment-backed expectations of landowners. Finally, while the proposed regulation may not constitute a typical physical invasion or appropriation of land, the proposed regulation would effectively appropriate these riparian buffer zones to the Central Coast Water Board for a public use. Even if no such appropriation is found, the severity of the economic impact and the devastation of the investment-backed expectations of the landowners are sufficient to demonstrate a regulatory taking.

8. Provision 67(a) Would Improperly Supersede Streambed Alteration Requirements

Subpart (a) of this provision states that dischargers must maintain a number of riparian functions, including streambank stabilization and erosion control. By including this

provision, the Central Coast Water Board is attempting to take control of decisions that are rightfully administered by the California Department of Fish and Game (DFG). Fish and Game Code section 1600 et seq. provide DFG with the authority for reviewing and approving proposed activities that may substantially divert or obstruct the natural flow of, or substantially change or use any material from, the bed, channel, or bank of any river, stream, or lake. (Fish & G. Code, § 1602.) Here, the Central Coast Water Board is attempting to interfere with DFG's authority by prohibiting any such activities altogether. The Central Coast Water Board has neither the authority nor the expertise to prohibit and regulate such activities. Moreover, relevant portions of the Fish and Game Code may only be administered and enforced through DFG. (Fish & G. Code, § 702.) DFG staff have the necessary expertise to determine precisely what activities in streams may be detrimental to aquatic life, leading to better results than blanket prohibition by the Central Coast Water Board under the Draft Waiver. Thus, reference here is unnecessary and should be deleted.

9. Provisions 67(a)-(c) Unlawfully Dictate Manner of Compliance

Water Code section 13360 states that the Central Coast Water Board may not specify the manner of compliance with orders of the Central Coast Water Board, but rather that the discharger may comply with the order in any lawful manner. As applied to the Draft Waiver, the Central Coast Water Board may adopt waiver conditions that identify what must be done, however, the Central Coast Water Board cannot prescribe the methods used to accomplish that objective. The Draft Waiver, specifically provisions dealing with the riparian buffer zones, dictates that landowners must undertake specified activities including streambank stabilization and erosion control, stream shading and temperature control, and maintaining vegetative cover in specified areas. All of these requirements clearly dictate the manner of compliance with the Draft Waiver to protect aquatic habitat. As such, these requirements exceed the Central Coast Water Board's authority under the Water Code.

10. Provision 73h May Require Individual Monitoring by All Dischargers

This provision states that Farm Plans must demonstrate that discharges do not cause or contribute to exceedances of water quality standards by including, "methods and results to evaluate progress and effectiveness of water quality management practices . . ." (Draft Waiver at p. 21.) The only certain method for meeting this requirement is to conduct on-farm, edge of field monitoring. Thus, this provision implies that individual farm monitoring would be required of all dischargers—not just those in Tier 3. The CSC is not opposed to the implementation of *voluntary*, on-farm SMART Sampling. (See Agricultural Alternative at pp. 9-10.) However, the CSC does oppose any mandate that would require individual, on-farm monitoring. Such a mandate is inappropriate for the reasons specified in section G.2 above.

11. Provision 74 Requires Too Frequent Updates

This provision requires dischargers to update their Farm Plans at least annually. As a practical matter, a mandatory annual update of individual Farm Plans is far too frequent and exceedingly burdensome on landowners and operators.

12. Provision 76 Requires Onerous Education Requirements

The requirement that dischargers complete 15 hours of farm water quality education within 18 months of adoption of the Draft Waiver is burdensome. This is a significant amount of educational hours that would need to be completed in a relatively short period of time.

In contrast, the previous conditional waiver required dischargers to complete 15 hours of education in a 3-year period. The CSC supports the need for continuing education. However, the CSC believes that 5 hours for growers that were subject to the 2004 Conditional Waiver is sufficient. Conversely, 15 hours for new growers may be appropriate.

I. Additional Conditions for Tier 2 and Tier 3 Dischargers Are Unreasonable

Parts G and H propose significant requirements that would apply to Tier 2 and Tier 3 dischargers. Of particular concern are the requirements associated with the Nitrate Hazard Index Rating, certification and submittal of elements of an Irrigation and Nutrient Management Plan (INMP), and application of nitrogen balance ratios. In general, the approach proposed in the Draft Waiver looks to individual farming operations and operation specific parameters to determine if there is a risk of nitrate loading to the groundwater. (Draft Waiver at pp. 22-24.) However, this approach is contrary to the Hazard Index Concept developed by the University of California Center (UC Center) for Water Resources, which was apparently relied on in part by the Central Coast Water Board staff to create its "Nitrate Loading Risk Factor." (See Draft Waiver, Table 22, at p. 33.) The primary purpose of establishing a hazard index is to reduce nitrogen contamination potential to groundwater by identifying the fields with the highest intrinsic vulnerability. (See Hazard Index Concept, Attachment 2, at p. 2.) Unfortunately, the Draft Waiver departs from this well-reasoned and scientific approach and instead focuses only on types of crops and individual operational practices. The Draft Waiver does not consider or incorporate any of the hazard index concepts that are related to intrinsic groundwater vulnerability. By ignoring this fundamental element, the Central Coast Water Board has created an arbitrary risk factor determination and associated requirements that may or may not be related to groundwater quality. Accordingly, the nitrate-associated requirements are not supported by evidence in the record, and inappropriately apply a University of California management guidance concept known as the hazard index.

1. Nitrate Loading Risk Factor Determinations Are Arbitrary

Specifically, Provisions 80-85 require calculation of a nitrate loading risk factor for each ranch/farm included in the operation. (Draft Waiver at pp. 22-23.) Based on the calculated score, agricultural operations may be subject to additional reporting and management plan requirements. (Draft Waiver at pp. 23-24.) However, the nitrate loading risk factor determinations are improper for several reasons. First, the purpose of the nitrate Hazard Index Concept developed by the UC Center for Water Resources is “[t]o provide information for farmers to voluntarily target resources for management practices that will yield the greatest level of reduced nitrogen contamination potential for groundwater by identifying the fields of highest intrinsic vulnerability.” (See Hazard Index Concept, Attachment 2, at p. 2.) It was not developed as, nor is it intended to be, a regulatory tool. Further, its use as a regulatory tool is improper and unlawful for it has not been adopted into the Basin Plan pursuant to relevant Water and Government Code statutory provisions. (See Wat. Code, §§ 13240, 13242, 13244, 13245; see also Gov. Code, § 11353(b).)

Second, the nitrate loading risk factor criteria proposed in the Draft Waiver are not consistent with the nitrate Hazard Index Concept developed by the UC Center. For example, Provision 80 and Table 2 identify three criteria for determining nitrate loading risks. (Draft Waiver at pp. 22, 33.) The three factors include crop type, irrigation system type, and irrigation water nitrate concentration. Missing from the Central Coast Water Board’s proposed criteria is a criterion related to soil type. As indicated in documents prepared by the UC Center, soil type is a key element in determining nitrate loading risks and vulnerability to groundwater. (See Hazard Index Concept, Attachment 2, at pp. 2-3 [“Soils classified as 1 are those that have textural or profile characteristics that inhibit the flow of water and create an environment conducive to denitrification. Both denitrification and restrictive water flow decrease migration of nitrate to groundwater. Conversely those soils classified as 3 are most sensitive to groundwater degradation by nitrate because of the high water infiltration rates, high transmission rates through their profile, and low denitrification potential.”].)

Further, in supporting evidence for the Hazard Index Concept, the UC Center identifies soil and sediment texture as a key factor in the hazard index. The UC Center specifically found that NO₃ concentrations were not significantly correlated to the estimated amount of nitrogen fertilizer, and concentrations, therefore, “were most likely affected by factors such as soil and sediment texture.” (Supporting Evidence for the Nitrate Groundwater Pollution Hazard Index Concept, Attachment 3, at p. 2.) In the same document, the UC Center also notes as follows:

Letey et al. (977) reported the results of an extensive investigation of agricultural tile drain effluents in California. The annual total mass of the NO₃ collected in tile drainage water was inversely correlated to the highest percent of clay in the soil above the tile depth. This is consistent with the hypothesis that clay layers in the soil reduce the hazard index by restricting the rate of

water flow and/or causing denitrification. Other studies in California have shown that textural changes in profiles can have significant effects on NO₃ loss below the root zone (Lund et al. 1974, Pratt et al. 1972). (Supporting Evidence for the Nitrate Groundwater Pollution Hazard Index Concept, Attachment 3, at p. 2.)

Considering the UC Center's evidence with respect to soil characteristics and effects on NO₃ concentrations, a nitrate loading risk factor determination that ignores soil types and characteristics is seriously flawed. Also, the UC Center does not include irrigation water concentration in its hazard index concept. Instead, it consists of an overlay and index using soils, crops and irrigation systems. Accordingly, the Central Coast Water Board's inclusion of irrigation water nitrate concentration is inconsistent with the UC Center's hazard index concept and is not supported by evidence in the record.

Next, the Draft Waiver proposes to categorize risk based on arbitrary scores of 10, 10-15, and more than 15. (Draft Waiver at p. 23.) The scores and their associated characterizations are not supported by evidence in the record and are arbitrary. As far as we can tell, the Central Coast Water Board "made up" the proposed scores and categories, as no references are provided to support the calculations or the proposed characterizations. (See, e.g., Table 2, at p. 33.) However, contrary to the Draft Waiver's characterizations, the UC Center finds that a hazard index (that considers soil type) between 1 and 20 is of minor concern, while an index number greater than 20 should receive careful attention. (Interpretation of Nitrate Groundwater Pollution Hazard Index Number, Attachment 4, at p. 1; see also Draft Waiver, Attachment A at p. 44, definition of Nitrate Hazard Index.)

Considering the lack of supporting evidence for the Central Coast Water Board's nitrate loading risk approach, and significant evidence to the contrary, Provisions 80-85 and Provisions 86-91, which are triggered by the results of the nitrate loading risk calculation, must be deleted from the Draft Waiver.

2. Annual Reporting of INMP Elements Improper

The CSC does not oppose requirements for irrigation and nutrient management plans per se. In fact, the Agricultural Alternative includes similar requirements to be part of the Farm Plan. (See Agricultural Alternative at pp. 8-9.) Essential elements of irrigation and nutrient management plans identified in the Agricultural Alternative are similar to those identified in Provisions 87-88, and are intended to achieve the same purpose, which is to ensure proper irrigation and nutrient management to protect water quality. (*Ibid.*) However, unlike the Agricultural Alternative, the Draft Waiver would make certain elements of the irrigation and nutrient management plans public by requiring annual reporting. (See Draft Waiver at p. 25.) The CSC opposes any mandate that would make any part of the Farm Plan, including irrigation and nutrient management plans, a public document. Such information is proprietary and not appropriate for release in the public domain. As proposed in the Agricultural Alternative, the irrigation and nutrient plans must be developed, and must be

made available to Central Coast Water Board staff at the agricultural operation's place of business if requested. By allowing such review, Central Coast Water Board staff has the opportunity review and critique the information without transforming proprietary information into public records. Thus, it is not necessary to require annual reporting of certain elements.

3. Certification of INMPs Impractical and An Unnecessary Expense

Provision 87 would require the INMP to be certified by a Professional Soil Scientist, Professional Agronomist, or Certified Crop Advisor. While many growers consult and work with such professionals, it is not necessary for an INMP to be certified in order to be an effective management tool. Many growers have in-depth practical experience as well as formalized training in irrigation and nutrient management techniques and are able to develop effective INMPs without professional assistance. Also, the requirement creates a new costly burden that many growers may not be able to afford.

Alternatively, the CSC and other organizations can develop and offer educational training courses that will assist growers in developing effective INMPs. This assistance can be offered in conjunction with providing educational opportunities to growers to meet the educational mandates in Provisions 75 and 76. Assuming *arguendo*, of course, that the INMPs, or similar Farm Plan elements, remain confidential, proprietary documents.

4. Nitrogen Balance Ratios Fail to Account for Actual Groundwater Vulnerability and Crop Needs

Provision 90 would require Tier 3 dischargers to achieve certain nitrogen balance ratios without considering if groundwater beneath the fields in question is intrinsically vulnerable, and fails to consider practical implications. Provision 90 also attempts to oversimplify crop nutrient needs as compared to the amount of nutrients (i.e., nitrogen) applied. For example, while a nitrogen balance ratio of 1.2 may sound appropriate, in reality it is not always possible or practical. (See Dynamics of Nitrogen Availability and Uptake, Attachment 5, at p. 1 ["The temporal supply of plant available N must match the temporal N demand by the crop to achieve the goal of 'provide adequate, but not excessive levels of soil nitrogen throughout the growing season.' Achieving this goal may not always be possible or practical, but one should strive to do so to the extent possible."].)

As indicated above, the largest threat to groundwater is more closely related to intrinsic vulnerability associated with physical factors versus actual agricultural operations. Thus, strict requirements for nitrogen balance ratios that fail to consider actual groundwater vulnerability are arbitrary and capricious. Further, the Draft Waiver and its record fail to include any findings or supporting evidence that indicate the ratios proposed are appropriate for rotational and annual crops. The CSC is currently conducting research to collect information necessary for determining nutrient sufficiency needs for strawberry production and there is currently no agreement on the levels necessary for successful production of

strawberries across all varieties, production systems and locations. Without a more complete research basis for establishing such findings, the requirements are arbitrary and unlawful.

Further, basing nitrogen management on a strict requirement on the amount of nitrogen applied per crop fails to take into account the many factors that influence the potential for nitrogen leaching, such as soil type, timing of application, method of application, etc. It is undoubtedly more important to apply nitrogen at the correct time for the crop and in the correct manner than to focus a grower's efforts on the total amount applied. For this reason, the development and implementation of BMPs to minimize nitrogen leaching, which may include N ratio guidelines, would provide better management of nitrogen leaching than strict N ratios that fail to consider a number of other factors.

J. Time Schedule Provisions Are Unreasonable and Impractical

The time schedules and milestones identified in Provisions 97-101, and in the time schedule attachment, are aggressive and unreasonable. As indicated previously, significant research and study is needed to determine the effectiveness of BMPs, and the ability of certain BMPs to ensure compliance with water quality standards. There are no existing BMPs that can guarantee 100% compliance with water quality standards, 100% of the time, without greatly impacting the productivity of Central Coast agricultural operations. Also, the time schedules require only Tier 3 dischargers to demonstrate compliance with water quality standards while growers in other tiers are not held to the same standards. Such a requirement is arbitrary for it places all responsibility for water quality compliance on Tier 3 and fails to consider impacts by operators in other tiers. Furthermore, given the blanket discharge prohibitions contained elsewhere in the Draft Waiver, the time schedules are seemingly irrelevant.

III. Attachment A Includes Inappropriate Findings and Incorporates Improper Water Quality Objectives

A. Finding A1 Is Contrary to Other Permit Provisions

These provisions include in part, the Discharge Prohibitions in Part B, Provisions 17-28. Other provisions that conflict with this finding, and which indicate dischargers will be in immediate jeopardy of noncompliance regardless of the time schedule order, include Provision 63 (nutrients and salts) and Provision 31 (all discharges). The other discharge prohibitions and other provisions throughout the Draft Waiver render this finding—that the Central Coast Water Board is providing reasonable schedules for dischargers to reach full compliance—completely untrue. As discussed in detail above, the Draft Waiver includes many provisions that result in immediate compliance and undermine any intent that the Central Coast Water Board may have to allow time schedules.

B. Finding A11 Improperly States That Porter-Cologne Grants Water Rights Authority

This finding states that Porter-Cologne grants authority to the State Board with respect to water rights and water quality regulations and policy, and gives regional boards the authority to regulate discharges and adopt water quality regulations and policy. As a clarification, Porter-Cologne does not grant water rights authority to the State Board. (See Wat. Code, § 13000 et seq.) Porter-Cologne governs water quality and gives the State Board and regional boards certain authority with respect to water quality. The State Board's water rights authority is found in other provisions of the Water Code—not Porter-Cologne. This finding should be amended accordingly.

C. Finding A13 Overstates Authority Pursuant to Water Code Section 13267

This finding highlights that Water Code section 13267(b)(1) authorizes the Central Coast Water Board to require dischargers to submit technical reports, and that the Draft Waiver itself provides evidence that discharges of waste from irrigated lands pollutes waters of the state, thereby requiring persons subject to the Draft Waiver to prepare and submit technical reports without any additional showing from the Central Coast Water Board. This is entirely inappropriate for a variety of reasons. The Central Coast Water Board cannot grant itself the authority to circumvent legally required findings in individual cases by inserting a provision that purports to be a blanket justification for requesting technical reports. Generic findings do not satisfy the individualized requirements of the statute. As noted in the discussion of Provision 59, above, there must be some justification for these technical report requests, and the Central Coast Water Board's ability to require reports pursuant to this part are not without constraints. An assessment that there is some evidence demonstrating that discharges from some irrigated lands have degraded or polluted waters of the state is insufficient to allow the Central Coast Water Board or EO to require all dischargers to irrigated lands to prepare and submit technical reports at their discretion. The Draft Waiver cannot automatically satisfy this burden and create the authority for the Central Coast Water Board in each individual instance.

In addition, Finding A13 suggests that the Central Coast Water Board is exempting itself from requirements under the Water Code and circumventing section 13267. Water Code section 13267 authorizes the Central Coast Water Board to require reports from those who discharge waste, but requires that the Central Coast Water Board “provide the person with a written explanation with regard to the need for the reports” and “identify the evidence that supports requiring that person to provide the reports.” Unless the Central Coast Water Board undertakes these activities in individual instances, it has not satisfied its burden. In contrast, this finding would subject all operations to various reporting requirements without providing a written explanation or supporting evidence. This is inappropriate and unsupportable under Porter-Cologne.

In many cases, the burden of preparing the individual discharge characterization and conducting individual discharge monitoring will not bear a reasonable relationship between the Central Coast Water Board's need for information as compared to the benefits to be obtained, as required under Porter-Cologne. (See Wat. Code, § 13267(b)(1).) The collective costs for all of the monitoring requirements contained in the Draft Waiver are likely to be extensive, and the Central Coast Water Board will obtain a great deal of information that does not directly convey relevant information regarding water quality in waters of the state. As such, the burden on the discharger in producing such information will not bear a reasonable relationship to the benefit derived from the receipt of such information, and the requests will be unsupportable under Porter-Cologne.

D. Findings A44-A45 [Groundwater Pumping Provisions] Are Outside the Central Coast Water Board's Authority

Both of these findings are irrelevant because they are unrelated to the discharge of waste, and hence outside the Central Coast Water Board's authority to regulate them. Finding A44 states that groundwater pollution due to salts is a significant problem in the region and agricultural activities are a significant cause of the pollution due to, among other things, seawater intrusion caused by "excessive" agricultural pumping and agricultural pumping/recycling of groundwater that concentrates salts in the aquifer. Agricultural pumping activities as a potential cause of salt pollution are not the subject of the Draft Waiver and addressing these issues is beyond the scope of the Central Coast Water Board's authority. Agricultural pumping is not a discharge of waste, and the Central Coast Water Board does not have the authority to determine whether dischargers are engaging in "excessive" agricultural pumping. Finding A45 states that agricultural pumping of groundwater contributes to saltwater intrusion in certain basins. However, groundwater pumping or the right to put groundwater to beneficial use is not the subject of the Draft Waiver, and thus, it is inappropriate for the Central Coast Water Board to be commenting on these matters.

E. Finding A59 Improperly References an Un-Adopted Water Quality Objective

This finding states that the drinking water standard is not intended to protect aquatic life and that Central Coast Water Board staff estimate that 1 mg/L nitrate is necessary to protect aquatic life beneficial uses. However, the use of this 1 mg/L nitrate standard is not a proper water quality standard and is not an objective adopted in the Basin Plan. (See section II.H, *post.*)

F. Finding A61 Improperly References an Un-Adopted Water Quality Objective

This finding states that more than 60 percent of all sites in the region have average nitrate concentrations that exceed the drinking water standard and limits necessary to protect aquatic life. However, the Central Coast Water Board seemingly refers to the same pseudo

water quality objective referenced in Finding A59, which is not a legally adopted objective. As noted in comments regarding Table 1A, indicator values in the Draft Waiver are not legitimate water quality objectives established through the basin planning process. Thus, reference to “limits necessary to protect aquatic life” must be deleted.

G. Findings A66-A67 Unlawfully Equate Detections to Water Quality Objective Violations

These findings state that based on monitoring data, multiple pesticides and herbicides have been detected in Central Coast waterbodies and that this is a violation of the Basin Plan general objective for pesticides. This provision improperly assumes that “detection” is the equivalent of or means there is necessarily an impact to a beneficial use. A mere “detection” does not equal impairment to a beneficial use or violation of a water quality objective. In discussing the objectives for pesticides, the Central Coast Basin Plan states, “No individual pesticide or combination of pesticides shall reach concentrations *that adversely affect beneficial uses*. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life” (Basin Plan, chapter II, p. III-4.) These findings make collectively the inappropriate leap that merely because the identified pesticides and herbicides have been detected that they are therefore adversely affecting beneficial uses in that waterbody. There is no support for this conclusion, and no additional analysis or evidence to suggest this is the case. Thus, the findings should be deleted.

H. Table 1A Unlawfully Includes Indicators of Narrative Objectives

The inclusion of “Indicators of Narrative Objectives” in this table represents an attempt by the Central Coast Water Board to establish de facto water quality objectives without going through the appropriate procedures. Water quality objectives are defined to mean, “the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water” (Wat. Code, § 13050(h).) Porter-Cologne requires each regional board to establish water quality objectives in Basin Plans, and to adopt the Basin Plans through a public hearing process. (Wat. Code, §§ 13241, 13244.) More importantly, when adopting water quality objectives, regional boards must comply with Water Code sections 13241 and 13242. Section 13241 requires consideration of a number of factors including economics and feasibility of meeting the objective. (Wat. Code, § 13241(c), (d).) Section 13242 requires regional boards to adopt a program of implementation that is designed to meet the water quality objective.

Table 1A identifies many “Indicators of Narrative Objectives.” For example, the Biostimulatory Substances objective includes an indicator of 1 mg/L of nitrate to protect aquatic life beneficial uses from biostimulation. (Attachment A, p. 33.) The source for this indicator is a technical paper prepared by Central Coast Water Board staff. This indicator has never been proposed or adopted as a water quality objective and is not listed as such in the Basin Plan. Thus, it has not been found to be necessary to reasonably protect the aquatic life beneficial use. Further, without going through the formal adoption process, it is impossible to

know the economic impacts associated with meeting this objective, and whether it can reasonably be achieved. The Central Coast Water Board cannot ignore its legal responsibility to adopt water quality objectives pursuant to Porter-Cologne simply by claiming they are “Indicators of Narrative Objectives.” Unless and until the Central Coast Water Board adopts these pseudo water quality objectives pursuant to the law, these “indicator” values identified are unlawful and must be removed from Table 1A. Only actual water quality objectives adopted legally into the Basin Plan should be included in the tables, and all others must be deleted, as they represent unlawfully adopted water quality objectives.

I. Certain Definitions Are Overly Broad

1. Definition of Discharge Waste Is Overly Broad

The proposed definition for “Discharge of Waste From Irrigated Lands” is overly broad and inappropriate. (Attachment A at p. 11.) Under the Draft Waiver, a discharge of waste includes irrigation return flows, tailwater, drainage water, and stormwater runoff, to name a few. However, as noted above in comments to Provision 31, the discharge of waste likely does not take place while water is still being used to irrigate crops in the field, and the State Board does not consider the percolation of irrigation water to groundwater a discharge of waste. The definition for a “discharge of waste” should be limited to those particular actions that result in actual discharge of waste to the waters of the state.

2. Definition of Operation Is Not Consistent With Proposed Requirements

The proposed definition of an operation would mean a, “[a] distinct farming business, organized as a sole proprietorship, partnership, corporation, and/or cooperative.” (Draft Waiver at p. 45.) In other words, an operation is the collective business and would not be limited to contiguous agricultural parcels in one area. By defining operation in this manner, the characterization of operations into tiers becomes extremely problematic. Specifically, key criteria associated with tier characterization is if the “operation’s” total acreage is greater than 1000 acres, and if an “operation” is located within 1000 feet of a list surface waterbody. (Draft Waiver at pp. 10-11.)

Under the proposed definition, an “operation” would be ineligible for Tier 1 if a grower’s total business acreage exceeded 1000 acres even if the acreage is spread-out throughout the Central Coast, includes various crops, and the various crops have a different threat to water quality. Further, as used in relationship to location within 1000 feet of impaired surface waters, the term operation implies that it is one contiguous agricultural parcel. However, as defined, this is not the case. As a practical matter, many agricultural operations on the Central Coast include multiple properties (either owned or leased) that may or may not be within 1000 feet of an impaired surface waterbody. As proposed here, if a grower had one property out of twenty that was within 1000 feet of an impaired surface

waterbody, then all properties under that operation would automatically be in Tier 2 even if the collective operation was less than 1000 acres, and did not use chlorpyrifos or diazinon.

Considering the proposed application of the term “operation” in determining tier characterizations, the term must be carefully defined and be parcel specific, or at least specific to contiguous parcels farmed by one business entity. Otherwise, the tier determinations are arbitrary and unrelated to threat to water quality.

IV. Cost Considerations in Appendix F Understate the Potential Implications to Agriculture

As a preliminary matter, the Draft Technical Memorandum: Cost Considerations Concerning Conditional Waiver of Waste Discharge Requirements for Discharges From Irrigated Lands (Draft Technical Memorandum: Cost Considerations) mischaracterizes the Central Coast Water Board’s obligations under Water Code section 13141. (See Draft Technical Memorandum: Cost Considerations at p. 4.) The Draft Technical Memorandum: Cost Considerations implies that regional boards are only required to estimate costs for agricultural quality control programs when a basin plan is being amended. However, the legislative history of this statute suggests otherwise.

When Water Code section 13141 was amended to include requirements related to agricultural water quality control programs, it was clear that these requirements would be met before implementation of any such program, including the type and nature of programs identified in the Draft Waiver. More specifically, the State Water Board stated in its Enrolled Bill Report to the Governor’s office that, “[t]his bill will not prevent implementation and enforcement of agricultural water quality control programs. It will require, however, that the State and Regional Boards consider, and include in the basin plans, an economic study of an agricultural water quality control program in terms of total cost estimate and potential sources of financing *before* implementing such a program.” (See Enrolled Bill Report to SB 904 from State Water Resources Control Board at p. 1, emphasis added.) The purpose of this provision, and the State Water Board’s reason for encouraging signature of the legislation, was further expressed as follows:

This bill is consistent with existing SWRCB policy regarding regulation of agricultural wastewater discharges.

Agriculture is presently the largest user of the State’s freshwater resources. The Board recognizes that in many instances discharges of agricultural wastewaters create water quality problems. However, the Board also recognizes that there are inadequate institutional, financial, and technological means at this time for the development and management of a comprehensive and effective agricultural water quality control program. While, in specific instances, agricultural discharges can and should be dealt with under existing law, long-term water quality problems, such as nonpoint source control and

salinity control programs, represent more difficult problems and the costs associated with implementation of these programs can be enormous. *Therefore, it is the Board' policy that any agricultural water quality control program must be carefully examined and formulated before it is implemented, and the costs and sources of financing would be a material consideration before any decision is made.* (Enrolled Bill Report to SB 904 from State Water Resources Control Board at p. 2, emphasis added.)

In light of the requirements expressed in Water Code section 13141, and the clear intent with respect to application of these requirements, the Draft Waiver Staff Report must reflect the Central Coast Water Board's obligation to pursue a Basin Plan amendment accordingly prior to adoption of the program described in the Draft Waiver. Further, as indicated above, the Central Coast Water Board must materially consider the costs associated with the program prior to adoption.

In general, the Draft Technical Memorandum: Cost Considerations appears to greatly under-estimate the costs associated with the Draft Waiver and its economic impact to the region. For example, it attempts to limit application of certain requirements for cost considerations in a manner that is inconsistent with actual Draft Waiver requirements. More specifically, to calculate an estimated cost for Aquatic Habitat Protection using buffers, the Central Coast Water Board staff only estimates costs for operations that were larger than 1000 acres *and* adjacent to an impaired waterbody. (Draft Technical Memorandum: Cost Considerations at p. 27.) However, the water quality buffer plan requirements would apply to Tier 3 dischargers with operations adjacent to impaired waterbodies regardless of their size. (See Draft Waiver at p. 27.) Accordingly, the staff's analysis in Table 8 grossly under-estimates these costs by limiting their applicability only to operations that exceed 1000 acres.

The Draft Technical Memorandum: Cost Considerations also fails to include any real information on the potential impacts to the regional economy. Although it includes a section allegedly dedicated to this issue, the information referenced does not achieve that purpose. Specifically, Draft Technical Memorandum: Cost Considerations attempts to review the economics of strawberry production as an indicator of how Central Coast agriculture will adjust to the economic impact of the Draft Waiver. Unfortunately, this assessment is incomplete, includes outdated reports, and draws false conclusions.

First, the Draft Technical Memorandum: Cost Considerations fails to actually quantify the costs associated with the Draft Waiver. For example, there are no commercial ready production practices in the world that can immediately comply with some of the prohibitions included in the Draft Waiver. Thus, in those cases, the cost is not some incremental regulatory cost, but in fact impacts the ability to remain in farming.

Second, the Draft Technical Memorandum: Cost Considerations selects various excerpts from outdated reports and draws erroneous conclusions. For example, the Draft Technical Memorandum: Cost Considerations quotes a 2005 research study as follows:

“demand at every price is increasing, because of income and population growth effects . . . at a rate estimated at 2.3% annually. [This] effect dominates, suggesting that farmers will not face losses at all but simply a slowing of the rate of increase in the gains that they would have expected in the absence of a cost increase.” (Draft Technical Memorandum: Cost Considerations at p. 40.) The Draft Technical Memorandum: Cost Considerations then acknowledges, “[t]he current conditions of stagnating income growth are different from 2005 when this research was completed.” (*Ibid.*) To say that current economic conditions are “different” than in 2005 is an understatement. To further suggest that the study is still relevant and that demand will simply outweigh costs fails to recognize that consumer demand is associated with retail price. The price that retailers (i.e., grocery stores) pay to farmers will always be highly competitive. In fact, in a global economy, other countries such as Mexico are also able to supply strawberries during some of the same time periods as the Central Coast. Thus, retailers will turn to the lower price supply if available versus paying Central Coast producers more.

Although the Draft Technical Memorandum: Cost Considerations recognizes the effects of globalization as a legitimate factor, it references an outdated study to dismiss its impact. More specifically, the Draft Technical Memorandum: Cost Considerations quotes the report, “. . . capacity to produce for export in Mexico would have to grow dramatically at a rate without historical precedent for imports to make a serious dent in the U.S. market” (Draft Technical Memorandum: Cost Considerations at p. 40.) It adds, “[i]n the last 10 years, Mexican strawberry exports to the U.S. have quadrupled. If they quadruple again in the next 10 years and if the U.S. market does not grow at all . . . Mexican imports would then be 24% of U.S. consumption.” (*Ibid.*) A review of U.S. Department of Commerce, Bureau of Census import data indicates that in fact strawberry imports from Mexico for the past five years (2004-2009) have nearly doubled (\$96 million in 2004 compared to \$180 million in 2009). Thus, had current data available from the U.S. Department of Commerce, Bureau of the Census, been reviewed, then the Draft Technical Memorandum: Cost Considerations would have found that the scenario that the study stated was “without historical precedent” is in fact the scenario that is currently taking place.

Finally, Draft Technical Memorandum: Cost Considerations references USDA Economic Research Service outlook reports on the impacts of weather. The reports referenced highlight how weather can have a significant impact on the supply and pricing of strawberries. It then states, “[t]he strawberry example illustrates the relative influence of multiple factors in determining the ultimate economic viability of farming enterprises, and places in context the incremental cost of production attributable to environmental compliance.” Unfortunately, the Draft Technical Memorandum: Cost Considerations misses entirely what happens in reality. A deeper review of the USDA outlook reports reveals that retailers shift the source of their supply to the lowest price available. As a result, regulatory costs have an even greater impact.

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For example, the Draft Technical Memorandum: Cost Considerations reviews a 2004 report prepared in conjunction with Monterey County's General Plan but fails to include any other information or analysis that attempts to quantify the potential regional economic impacts associated with implementation of the Draft Waiver.

Considering the significant deficiencies in the Draft Technical Memorandum: Cost Considerations, Central Coast Water Board members will not be able to materially consider the cost implications of this program without further information. To help fill this void, the CSC encourages Central Coast Water Board consideration of an in-depth study report that has been commissioned by the Grower-Shipper Association of Central California. We understand that this in-depth report will be available and transmitted to the Central Coast Water Board in early February.

In conclusion, the Draft Waiver and its associated documents present a draconian regulatory scheme that will not improve water quality but will dramatically increase costs and subject growers to unnecessary enforcement actions. Overall, the Draft Waiver includes many findings and requirements that are not supported by the evidence in the record, requires immediate compliance, and fails to include reasonable time schedules. Due to the Draft Waiver's many failings, and the superior approach proposed in the Agricultural Alternative, CSC encourages the Central Coast Water Board reject the Draft Waiver in its entirety and adopt the Agricultural Alternative and its Coalition approach.

Very truly yours,



Theresa "Tess" A. Dunham

Attachments

cc: Rick Tomlinson, California Strawberry Commission
TAD:cr



THE HAZARD INDEX CONCEPT

A supporting document for the UC Center for Water Resources (<http://www.waterresources.ucr.edu>) Nitrate Groundwater Pollution Hazard Index

The United States Congress appropriated funds to the US Geological Survey (USGS) to begin the National-Water Quality Assessment (NWQA) Program in 1991. As part of the NWQA Program the USGS works with other federal, state and local agencies to understand the spatial extent of water quality, how water quality changes with time and how human activities and natural factors affect water quality across the nation. The USGS published a report (USGS 1999) entitled, "The Quality of Our Nation's Waters" with specific reference to nutrients and pesticides. For the purposes of our report, we will only address nitrogen issues.

Some of the highest levels of nitrogen were reported to occur in streams and groundwater in agricultural areas. However, concentrations were found to vary considerably from season to season as well as among watersheds. A graphical plot of nitrogen inputs to agricultural land versus median nitrate concentrations in underlying shallow groundwater produced a complete scatter of points (USGS 1999, p 47). The range of nitrate concentrations was the same for all levels of nitrogen input. Differences in natural features and land management practices make some areas more vulnerable to contamination than other areas. Recognition of differences in vulnerability to contamination can help target the appropriate level of protection and monitoring to major aquifers at greatest risk. The most extensive control strategies should be considered in the more vulnerable settings.

Nolan (2001) used multi variant logistic regression models based on more than 900 sampled wells to predict the probability of exceeding 4 mg/L of nitrate in ground water in the United States. The model consisted of 6 variables: nitrogen fertilizer loading, percent crop land-pasture, natural log of population density, percent well-drained soils, depth to seasonally high water table, and presence or absence of a fracture zone within an aquifer. Although valuable at the large landscape scale, the results are not useful on a farm level scale where management decisions are made which could affect ground water degradation from nitrogen. Nevertheless, the concept of establishing vulnerability to groundwater contamination is valid and even more appropriate on a farm scale.

Estimates of groundwater vulnerability can be separated into intrinsic vulnerability and specific vulnerability (National Research Council, 1993). Intrinsic vulnerability is related to factors of which the farmer has no control such as the hydrologic properties of the soil and hydrogeologic factors



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such as proximity of an aquifer to land surface, etc. Although the farmer can choose the crop to grow, the choice is usually made on economic factors. Once a crop is chosen, each crop has an intrinsic vulnerability for groundwater contamination from nitrates. Likewise, irrigation systems may be selected, but each irrigation system has an intrinsic vulnerability. Specific vulnerability is a function of management factors such as quantity, rate, timing, and methods of nitrogen and water application and other agricultural management practices. Therefore, the farmer has some level of control over the specific vulnerability with little or no control over the intrinsic vulnerability.

The National Academy of Science Water Science and Technology Board appointed a committee on Techniques for Assessing Groundwater Vulnerability. The committee defined groundwater vulnerability as: “The tendency or likelihood for contaminants to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer.” They pointed out that this definition of groundwater vulnerability is flawed, as is any other, by a fundamental principle that they stated as the First Law of Groundwater Vulnerability: “All groundwater is vulnerable.” They also proposed a Second Law of Groundwater Vulnerability: “Uncertainty is inherent in all vulnerability assessments.”

The committee suggested a vulnerability assessment process. The first step is to identify the purpose of the assessment. The next step is to select a suitable approach for conducting the assessment. They listed three methods of assessment: 1) overlay and index methods, 2) methods using process-based simulation models, and, 3) statistical methods. The report elaborated on each of these methods. We will follow the proposed steps by stating the purpose and then describing the assessment method.

PURPOSE: To provide information for farmers to voluntarily target resources for management practices that will yield the greatest level of reduced nitrogen contamination potential for groundwater by identifying the fields of highest intrinsic vulnerability.

ASSESSMENT METHOD: We used the overlay and index method. Although process-based simulation models were not specifically used, the basic physical and chemical factors that are incorporated into these models were used in deriving an index number. The overlay consists of soil maps, crop and irrigation system distributions. The soils, crops and irrigation systems were each indexed by an approach described below.

This approach is consistent with the recommendations of a Nutrient Technical Advisory Committee (TAC) appointed by the California State Water Resources Control Board. The TAC was assigned to propose a nutrient management approach in California that would meet the varied interests of those who have a stake in the quality of California’s waters. The TAC proposed that farmers complete a hazard index for each field on their farm based on the soil, crop and irrigation systems. The TAC proposed that the soil be assigned a hazard value of 1, 2 or 3. Soils classified as 1 are those that have textural or profile characteristics that inhibit the flow of water and create an environment conducive to denitrification. Both denitrification and restrictive water flow decrease the migration of nitrate to groundwater. Conversely those soils classified as 3 are most sensitive to groundwater degradation by nitrate because of the high water infiltration rates, high transmission rates through their profile, and



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low denitrification potential. In our case, we expanded the hazard values to 1 through 5, but used the same criteria as proposed by TAC for assigning higher or lower hazard values.

The TAC proposed that crops be classified into three hazard indices based on their degree of potential for nitrate leaching. They suggested that those with the highest potential for nitrate leaching, which would have a hazard index of 3, are those with the following characteristics: (1) The nitrogen uptake in the crop is a small fraction of the total nitrogen applied to the crop; (2) the crop requires high nitrogen input and frequent irrigation to ensure rapid vegetative growth; (3) the value of the crop is such that there is a tendency to add excess nitrogen to ensure no nitrogen deficiencies; (4) the crop is not adversely affected when more than adequate amounts of nitrogen are applied; and (5) the crop has a shallow root system where a small amount of water movement could carry nitrate below the root system. Crops with the opposite characteristics of those listed would have a low potential for nitrate leaching and have a hazard index of 1. Crops with intermediate characteristics would be classified with a hazard index of 2.

The criteria that we used in assigning a hazard index for crops were consistent with those suggested by TAC, but differed in detail. We also expanded the crop hazard index to 1 through 4. The factors considered in establishing a hazard index for field crops and vegetables were as follows: 1) rooting depth, 2) ratio of N in the crop tops to the recommended N application, 3) fraction of the crop top N that is removed from the field in the marketed product, 4) the magnitude of the peak N uptake rate, and 5) whether the crop is harvested at a time when N uptake rate is high. A slightly modified set of criteria was used for tree and vine crops. The rooting depth is quite great in all cases and none is harvested at the time of peak N uptake rate. Therefore, these criteria were eliminated and replaced by the magnitude of leaf N deposit for trees and vines.

The crops with a shallower rooting depth have a higher potential for N leaching than deep-rooted crops. Crops that take up a high percentage of the recommended N application provide for a lower hazard for N leaching than those which take up a low percentage, thus leaving much N in the soil. Furthermore, removal of much of the N in the crop tops with the harvested product creates a lower hazard than when the crop residues containing much N are left on the field. Crops that have a very high peak N uptake rate over a short period are considered to be more hazardous than those with low peak N uptake rate because they require large quantities of mineral N to be available for that time period.

A matrix was constructed for each crop and the criteria used to establish the hazard index. The hazard index number that was chosen for each crop was based on an overall consideration of all the criteria. For example, lettuce has a hazard index of 4 because it is shallow rooted, is harvested at the time of peak uptake rate, and much of the N in the tops remains in the field. Conversely, alfalfa has a hazard index of 1 because it is deep rooted and nitrogen fertilizer application is not required. The matrix, as well as the hazard index number, will be reported for each crop.

The TAC recommended that the irrigation system be classified into a hazard index of 0 through 3. The "0" hazard index is a micro-irrigation system accompanied by fertigation. Small amounts of



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water and nutrients can be frequently applied in quantities to match the crop need. A micro irrigation system without fertigation is assigned a hazard index of 1. Sprinklers used throughout the irrigation season or for pre-irrigation for crop establishment is assigned a hazard index of 2. Entire surface irrigation systems such as furrow are assigned a hazard index of 3. We used the same criteria for indexing irrigation systems except that our range was 1 through 4 rather than 0 through 3.

In our case, the overlay and index method consists of having an overlay of the soil, crop and irrigation system maps and multiplying the hazard index numbers for each. The intrinsic hazard index number can range from 1 through 80. The TAC suggested adding the index numbers. Adding the numbers would provide a much smaller range between 3 and 13, which would consequently make it more difficult to distinguish the relative hazards among combinations of soils, crops, and irrigation systems.

Although the TAC proposed that farmers complete a hazard index for each field, the proposal has never been implemented. A major impediment to the implementation is that soils and crops have not been assigned hazard rating values. We have developed tables of hazard rating numbers for the major irrigated soils and crops in Arizona, California, and Nevada that can be used by farmers to assess the relative hazard for groundwater degradation by nitrate for each of their fields.

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SUPPORTING EVIDENCE FOR THE NITRATE GROUNDWATER POLLUTION HAZARD INDEX CONCEPT

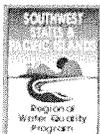
**A supporting document for the
UC Center for Water Resources (<http://www.waterresources.ucr.edu>)
Nitrate Groundwater Pollution Hazard Index**

The USGS measured the occurrence of nitrate in ground water beneath three agricultural land-use settings in the Eastern San Joaquin Valley of California during the period 1993-1995 (Burow et al. 1998). Water samples were collected from 60 domestic wells in land-use settings of (1) vineyards, (2) almond trees, and (3) a crop grouping of corn, alfalfa, and vegetables.

The vineyards and almonds were located on similar coarse-grained, upper and middle parts of the alluvial fans with rather rapid water transmission properties and low potential for denitrification. The three-crop setting was on the lower part of the fan consisting of relatively fine-grained sediments that would have lower water transmission properties and a denitrification potential. We would rate the soil hazard index higher on the vineyard and almond lands than the three-crop lands. We give the vineyards a lower hazard index than the almonds because of the much lower N application to vineyards. The three-crop system includes alfalfa with the lowest hazard index and vegetables with the highest hazard index so the cumulative effect is unknown and is expected to be intermediate.

The NO_3 concentrations in the wells were highest in the almond area, intermediate in the three-crop area, and lowest in the vineyard area. We have emphasized that NO_3 concentration is not necessarily a reliable indicator of management, but in this case it is an appropriate criterion for some comparisons. The concentrations of chloride and NO_3 were correlated in the almond and vineyard settings indicating very little denitrification and that is consistent with the soil properties. We assume that the irrigation of the two crops provided similar leaching fractions. Therefore, the higher concentration would be associated with the higher N application to almonds than for the vineyards. Furthermore, with similar amounts of deep percolation, the higher concentration would also mean higher N mass flow.

The soils for the three-crop system were expected to have lower hydraulic conductivity and also possible denitrification. The electrical conductivity (EC) and chloride concentration of the water



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were higher in the three-crop area than for the other two orchard crops, suggesting a lower leaching fraction consistent with the soil properties. Also, the NO_3 and chloride concentrations were not correlated in the three-crop system, which indicates denitrification. The dissolved oxygen was also lower in the three-crop system than the others. Because of the diversity of crops in the three-crop system, it is not possible to draw other conclusions.

The USGS measured the NO_3 concentrations in ground water samples collected from 3 domestic wells in 1995 (Burow et al. 1998). The results were related to various physical and chemical factors in an attempt to understand the processes that control the occurrence and concentrations of nitrates. The results were also compared with results of the analyses of samples collected in 1986-87.

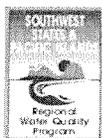
One major finding, which is consistent with numerous other studies, is that the NO_3 concentrations were not significantly correlated with the estimated amount of nitrogen fertilizer applied within a 0.25- and a 0.5-mile radial distance from the sampled well. The concentrations, therefore, were most likely affected by factors such as soil and sediment texture.

Nitrate concentration generally decreased with increasing depth below the water table. The deeper waters are older waters, which reflect lower historical application rates of nitrogen fertilizers.

The investigators did not find a relationship between NO_3 concentrations and soil permeability, hardpan percent, and clay percent. The lack of correlation may be explained by counterbalancing effects of these soil properties on NO_3 concentrations. Low soil permeability, hardpans, and clay would restrict the rate of water flow contributing to a low leaching fraction, which could lead to higher NO_3 concentrations. Additionally, these soil properties are conducive to higher denitrification, which would reduce the NO_3 concentrations. Since there was no significant correlation between the soil properties and NO_3 concentration, neither mechanism predominated. Both mechanisms, however, contribute to lower NO_3 mass movement, but this was not measured.

Nitrate concentrations were positively correlated to dissolved oxygen concentrations. This result provides evidence that denitrification was a factor affecting the NO_3 concentrations. Nitrate concentrations were also positively correlated to specific conductance, which is related to salt concentration. This result provides evidence that increased concentration associated with lower leaching fractions was a factor affecting NO_3 concentrations. This conclusion is further supported by the finding that the nitrate and specific conductance was more strongly correlated when the chemically reduced environmental samples were removed from the data set used in the statistical analyses.

Letey et al. (1977) reported the results of an extensive investigation of agricultural tile drain effluents in California. The annual total mass of the NO_3 collected in tile drainage water was inversely correlated to the highest percent of clay in the soil above the tile depth. This is consistent with the hypothesis that clay layers in the soil reduce the hazard index by restricting the rate of water flow and/or causing denitrification. Other studies in California have shown that textural changes in profiles can have significant effects on NO_3 loss below the root zone (Lund et al. 1974, Pratt et al. 1972).



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INTERPRETATION OF NITRATE GROUNDWATER POLLUTION HAZARD INDEX NUMBER

**A supporting document for the
UC Center for Water Resources (<http://www.waterresources.ucr.edu>)
Nitrate Groundwater Pollution Hazard Index**

The hazard index number can range from 1 through 80 with the hazard increasing with increasing hazard index number. The first and second laws of groundwater vulnerability (National Research Council, 1993) are important to consider in application of the hazard index. The first law states “all groundwater is vulnerable” which recognizes that some groundwater degradation can occur even with a hazard index of 1. The second law states “uncertainty is inherent in all vulnerability assessments.” Therefore, the following suggestions on interpreting the hazard index number are not absolute and are intended as general guidelines. We invoke the wisdom of Aristotle who stated “It is the mark of an instructed mind to rest satisfied with the degree of precision which the nature of the subject permits, and not to seek an exactness where only an approximation of the truth is possible.”

We propose that a hazard index of 1 through 20 is of minor concern. The farmer must still implement sound management practices but extraordinary procedures are not required. An index number greater than 20 should receive careful attention. The first step is to determine whether the soil, crop, irrigation system, or a combination of them contributed to the larger index number. This evaluation will help the farmer focus on the segment of his management system that requires the greatest attention.

The factors listed in the matrix should be considered in addition to the hazard index number for a crop. For example, if a shallow root system was a factor in raising the hazard index for a given crop, careful attention should be given to irrigation to minimize the water that would percolate below the root zone. If a crop hazard index was high because of a high residual mineral and/or organic N after crop harvest, the use of a cover crop to capture the N and prevent leaching would be advisable.

Assume that the high hazard index number was caused by both a high soil and irrigation system hazard index, careful attention must be given to the irrigation management. If irrigation is by furrows, decreasing the length of the furrow, increasing the flow rate as high as possible without stimulating erosion and decreasing the duration of irrigation to decrease the total amount of infiltration.



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The main message is that the hazard index number per se is of little value unless it is less than 20, which is an indicator that no special management is necessary. If the number is greater than 20, comparing a number of 40 to 60 is not useful. Identifying the factors that lead to the number is important because they identify the management factors, for that specific field, that would reduce the potential for N leaching. Management guidelines for specific hazard factors are presented in other parts of this report.

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DYNAMICS OF NITROGEN AVAILABILITY AND UPTAKE

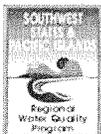
A supporting document for the UC Center for Water Resources (<http://www.waterresources.ucr.edu>) Nitrate Groundwater Pollution Hazard Index

Doerge et al. (1991) concluded that "The most effective management strategy will be one that recognizes the pattern of nitrogen demand by the crop and the nitrogen release characteristics of all important nitrogen sources to provide adequate, but not excessive levels of soil nitrogen throughout the growing season." Implementation of this strategy requires knowledge of the temporal N demand by the crop and the release characteristics of all important nitrogen sources. The nitrogen sources include: initial soluble mineral N content in the soil; the amount and mineralization rate of soil and applied organic matter; amount and timing of applied readily available N fertilizers; amount, time of application, and rate of release of slow release fertilizers; and N in the irrigation water.

The temporal supply of plant available N must match the temporal N demand by the crop to achieve the goal of "provide adequate, but not excessive levels of soil nitrogen throughout the growing season." Achieving this goal may not always be possible or practical, but one should strive to do so to the extent possible. The complete evaluation of a management strategy also requires understanding N losses by leaching, denitrification, and volatilization as well as plant demand and N supply sources. The expectation is that N losses by these mechanisms will be minimal if the available N at any given time is "not excessive."

Cumulative annual crop N uptake typically follows a sigmoid relation where the uptake curve initially increases gradually followed by a rapid increase and finally a plateau. When the vegetative part of the plant is marketed, the crop is usually harvested before the uptake curve plateaus. The slope of the uptake curve provides the daily rate of N uptake during the growth period.

The rate of N supply must be equal to the rate of uptake or some decrease in plant size will occur. But we will first analyze the case from a quantitative point of view. The effects of applying all the N requirement in a single application at the beginning of the crop season compared with multiple applications during the season is illustrated in figure 1. Clearly the impact of a large precipitation or irrigation event that causes leaching is greater from the large single application than the multiple split applications. One guiding principle, therefore, is that multiple applications, which more closely match the uptake, are better than a single application.



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Although evaluating N uptake and supply on a quantitative basis as illustrated in figure 1 is very useful, a comparison of the temporal rates of uptake and rate of supply is a more accurate assessment of whether the crop requirements for maximum growth is being met. Nitrogen moves by two mechanisms from the soil solution to the root surface where it can be taken up by the crop. Water flowing to the root to meet transpiration demand transports soluble N to the root surface. If the rate of N transport to root surface by flowing water exceeds the rate of N uptake, the N concentrates at the root surface and moves away from the root surface by diffusion in response to a concentration gradient. If the N uptake is more rapid than that transported by flowing water, the concentration at the root surface decreases, creating a concentration gradient causing diffusion toward the root. If the combined rate of transport by flowing water and diffusion is less than the potential N uptake rate, plant growth will be less than optimal.

Whether transport of N by flowing water is adequate to meet the plant requirement can be estimated using the following rationale. On a field basis, transpiration rate (TR) has units of $m^3/m^2/d$ and N uptake rate (NUR) has units of $kg/m^2/d$. Nitrogen uptake rate divided by transpiration rate has units of kg/m^3 , which are units of concentration. If the N concentration in the soil solution is equal to or higher than NUR/TR , adequate N is transported to the roots by flowing water. If the concentration is less than NUR/TR , water moving to the root will not supply adequate N, and the plant will be impacted unless diffusion is sufficiently rapid to provide the additional required N.

The quantitative analysis of N diffusion to a root system is very difficult, if not impossible, to accomplish. However, some generalizations are possible. Diffusion occurs through root surfaces; therefore, the total amount of N that can be made available to the plant by diffusion is related to the total area of root surface that actively take up N. A plant with a dense root system with many root hairs will be better supplied by diffusion than a plant with a sparse root system.

Information on the rate of N uptake as a function of time is valuable for programming N applications. These curves are presented for field corn and wheat in figure 2. The corn data are from Iowa State University of Science and Technology Cooperative Extension Services (STCES of Iowa State University, 1992) and the wheat data are from Doerge et al. (1991). The total N uptake was 294 kg/ha for corn and 258 kg/ha for wheat. Note that N uptake rate curve for corn is characterized by a much higher peak of shorter duration than wheat. Although the difference in total amount of N taken up between the two crops is not great (36 kg/ha), the N availability as a function of time is very different. Corn requires a very high supply for a relatively short time when compared to wheat.

The curves presented in figures 1 and 2 can be very misleading when one considers the N requirement at the early crop growth stage. Both figures would suggest that very little N is required during crop establishment. However, neither figure addresses the rate of N supply to the plant roots. The NUR/TR ratio identifies the soil solution concentration of N that is required for the transpiration stream to adequately transport N to root surfaces. Although the NUR is initially low (fig. 2), the TR is also small during the seedling stage. Uptake of N is required for the plant to enlarge and uptake must precede growth. Transpiration will increase as the plant becomes larger, but it is a responder to



plant size rather than a contributor. Therefore the NUR/TR ratio can be large and indicate the need of a large soil solution concentration of N in the root zone. Diffusion is not expected to be a major contributor of N supply to the roots because of the sparse root system during crop establishment. Therefore, even though the amount of N per land area may not need to be great during the seedling stage, that N must be concentrated in the zone where the plant roots exist.

One fact emerges when one considers the mechanism of N transport to plant roots. It is impossible to extract all the soluble mineral N from soil solution without suffering decreased plant growth. The consequence of this fact is that there will always be some soluble N that can be leached beyond the root zone when "excess" water is applied. The amount and concentration of N leached depends on the several dynamic and temporal factors discussed above.

Thus far, plant N uptake dynamics and mechanisms of transporting N in the soil solution to plant roots have been discussed. Consideration must now be given to the various sources of N supply and matching this information with plant uptake dynamics. The initial soluble mineral N content in the soil represents the amount in the soil that is available for plant uptake or leaching throughout the year. The N in the irrigation water is supplied at the time of irrigation and at the amounts that are related to the concentration of N in the water and the amount of water that is applied. Commercial mineral N fertilizers are available for leaching or plant uptake based on the amount and time of application. These sources can be quantified both by amount and time. In principle, these sources could be managed to match the time and amount of crop N uptake to the extent practicable.

Organic sources and slow release fertilizers require evaluation of the dynamics of the N becoming available for plant uptake or leaching. Organic materials must be mineralized before the N becomes available for plants. Different organic materials have a very high level of variability of mineralization rates, and precise quantitative information is generally not available for a given source. Nevertheless, very important general information is known about mineralization that is significant to the topic under consideration.

The rate of mineralization is highest when the organic material is first incorporated in the soil and tends to decrease exponentially with time after incorporation. The temporal rate of mineralization pattern does not match the temporal rate of plant N uptake. The plant uptake pattern approximates a bell shaped curve (fig. 2) whereas the rate of mineralization is a continuous downward sloping curve. Therefore, it is impossible to program organic material application so that the rate of available N supply coincides with the rate of N uptake. This is particularly true for crops that have a very high rate of N uptake over a relatively short period of time.

Pang and Letey (2000) used the ENVIRO-GRO model to simulate the consequences on plant growth and N leaching of applying two manures with different mineralization rates to corn and wheat that have different temporal N uptake rates. They concluded that crops with high uptake rates for a short time are not well adapted to be fertilized solely by organic matter. Doerge et al. (1991) suggest supplying only a portion of the nitrogen requirement of a crop in organic forms and utilize immediately available nitrogen materials to insure adequate nutrition during periods of peak nitrogen demand.



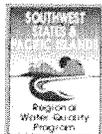
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Slow release commercial fertilizers behave somewhat like organic materials in that the rate of release is highest initially and decreases with time. The big difference is that the rate of release is much greater than the mineralization rate of most organic materials, and essentially all the N is released during the growth period of a crop. Slow release fertilizers have greater utility for crops that have fairly gradual uniform N uptake demand over the production period rather than for a crop with a very high peak demand.

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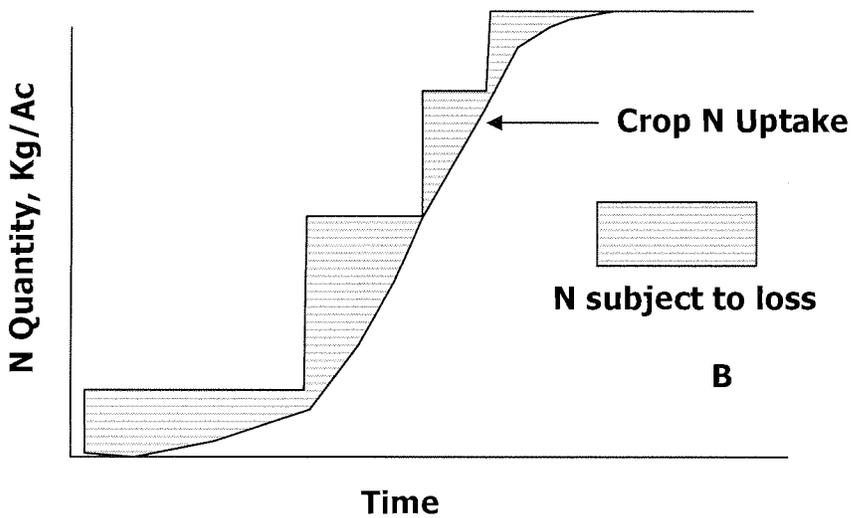
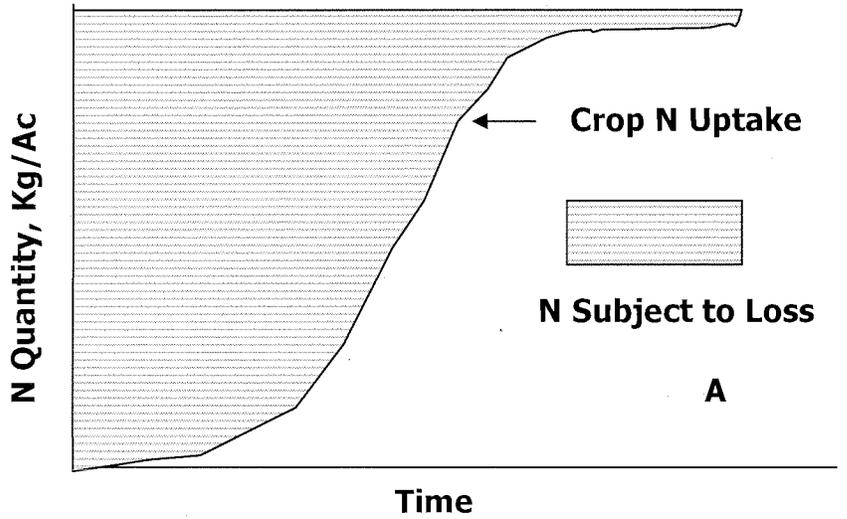


Figure 1. The quantity of N taken up by the crop or subject to loss from a single N application (A) or split N applications (B) (Adapted from Doerge et al., 1991).

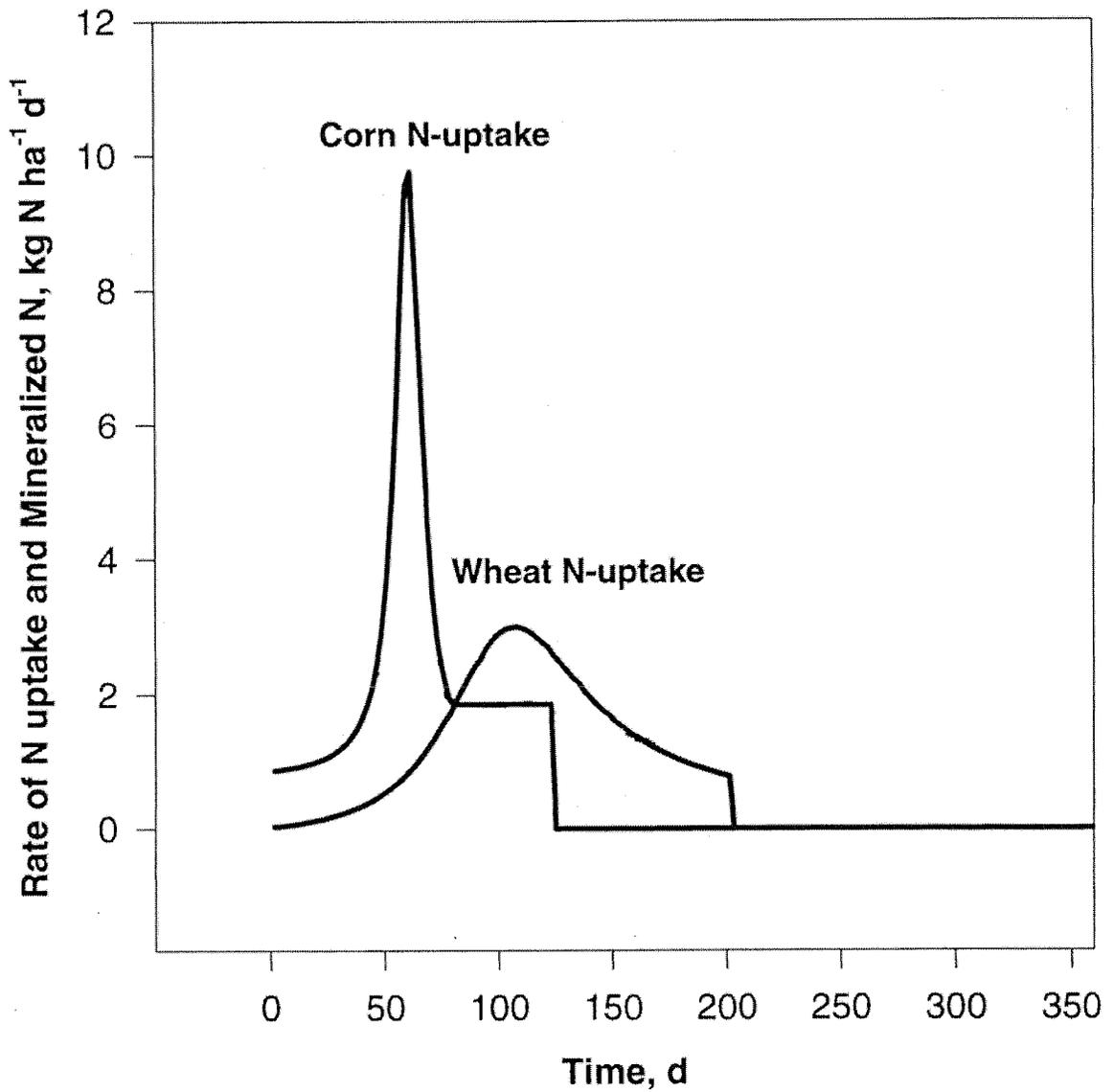


Figure 2. The rate of N uptake for corn and wheat as a function of plant growth over time.