

Homework #2 for CV-Salts Executive Committee
Written Responses Due at Noon (pdt) on Tuesday, May 3rd

Submitted by San Joaquin River Group Authority

- 1) If Agriculture (AGR) is ubiquitous throughout the Central Valley, should we begin with an initial presumption (rebuttable on a site-specific basis) that all surface and ground waters in the region will likely be used for this purpose and should be designated to protect this beneficial use? If not, what factors should be considered to not assign an AGR use to a water body?**

We should begin and end with this assumption. Throughout the Central Valley, all water supplies whether surface or ground waters are used for irrigation of crops, gardens, pastures, you-name-it. Where irrigation is not practiced, the water supplies are often used for animal drinking water and this is part of agricultural uses. How the water supply is used is determined by the quality of the water and this is part of a later question.

- 2) Where a water body is designated AGR, is it appropriate to assume that water quality must be capable of ~~for~~ growing any sort of crop or supporting any type of livestock?**

No. The quality of water used for production agriculture (irrigation and animal production) is an economic question. In most cases the farming practices and cropping patterns are adjusted to the quality of water available. This is not to imply that water quality can be allowed to deteriorate to the detriment of a farming practice but it also can not be expected that a salt or nitrogen sensitive crop can be grown with a water supply that is known to be of poor quality.

- 3) Where crop yields are known to decline in proportion to salinity concentrations, at what threshold (% reduction) is the AGR use "impaired?" "Precluded?"**

There is no straightforward answer to this. The 100% "yield potential" threshold is determined by looking at research information on leaching and water quality. Almost all of this information was developed by Maas and Hoffman when they were at the U.S. Salinity Laboratory. Maas and Hoffman used a best fit equation to predict yield potential and the loss in potential as salinity increases. Most evaluations would use the 100% yield potential but in reality actual yield may be less due to fertilization, weather, soil factors, pest control and other factors. It is impossible to take all these into

account. Most large irrigation project planning efforts use a 90% “yield potential” for economic and feasibility analyses. Most environmental protection efforts and standards setting processes use a 100% “yield potential” as they are not interested in the economic return.

4) If water quality is inadequate to support maximum expected yield for a given crop but is adequate to assure maximum expected yield for another crop, is the AGR use impaired?

There is a need to repeat part of the answer given for Question #2. No. The quality of water used for production agriculture (irrigation and animal production) is an economic question. In most cases the farming practices and cropping patterns are adjusted to the quality of water available. This is not to imply that water quality can be allowed to deteriorate to the detriment of a farming practice but it also can not be expected that a salt sensitive crop can be grown with a water supply that is known to be of poor quality. The evaluation that would be needed is whether the cropping pattern has changed as a result of deteriorated water quality. If the answer to this question is yes, then possibly impairment has occurred. This would not be the case however if the groundwater basin was known to have an unavoidable decline in quality due to rising salinity, then an impairment would not have occurred.

5) If water quality is inadequate to support maximum expected yield using efficient irrigation practices, but maximum expected crop yield can be maintained by increasing the amount of irrigation water applied, is this an acceptable (albeit less desirable) approach for protecting the beneficial use?

This is not protecting beneficial use or less desirable. This is utilizing a management practice (higher leaching fraction) to allow beneficial use to occur. The decision to utilize more water to allow a higher level of beneficial use (greater economic return) is within the decision mechanism of the individual grower. There is no regulation that states a quantity of water available for a particular crop or cropping practice. This will be dictated by water availability, crop pricing and water pricing.

6) At what levels would nitrate concentrations no longer be suitable for an AGR use?

Crop Production: As with salinity, there is a range of crop tolerances to nitrate or nitrogen. The decision to use a particular quality of water for irrigated crop production is an economic question. In most cases the farming practices and cropping patterns are adjusted to the quality of water available. This is not to imply that water quality can be allowed to deteriorate to the detriment of a farming practice but it also can not be expected that a nitrogen sensitive crop can be grown with a water supply that is known

to be of poor quality. The level of nitrate that would impact crop production would need to be evaluated based on the cropping pattern and the production practices used. For example, if you have a groundwater with a known high nitrate level, you would be cautious in how that water supply is used. If you were growing grapes, you would want to avoid the use of the groundwater early and mid-way through the season as you would get excessive vegetative growth and delayed maturity of the grapes. During the fall, or after the grapes are harvested, you would want to utilize the groundwater to ensure that the grape vines had an adequate nitrogen level in the spring of the next season. Another example is that you would want to avoid higher nitrate waters to irrigate winter grains (wheat, barley, oats) in the spring as it will cause a flush of growth that may cause the crop to “lodge” or fall over thus making harvest losses greater. Again these are all management practices that allow the use of various water nitrate levels during the cropping season.

As a general rule, for irrigated agriculture it is always assumed that if $\text{NO}_3^- \text{N}$ (nitrate reported in terms of elemental nitrogen) is below 5 mg/L that very few, if any problems with its use will develop. On the other extreme, concentrations above 30 mg/L are likely to cause continuous problems and could be classified as impaired for irrigation use.

Animal Drinking Water: Like irrigated agriculture, there is a range of concentrations that may cause impacts. You need to consider several factors in evaluating nitrate concentrations and using this water for animal drinking water. Most guidelines for $\text{NO}_3^- \text{N}$ (nitrate reported in terms of elemental nitrogen) are over 40 years old and show that concentrations less than 100 mg/L are probably safe. This however needs to be evaluated based on the time of year (amount of water consumed daily), age and condition of the animal (lactating, pregnant, young or weak may be more susceptible), feed composition and animal species. For example, the impact of nitrate may be amplified when the forage used is also irrigated with the same water supply. Another example found in the Central Valley is pregnant dairy cows are known to abort their calves if the nitrate levels in the drinking water are high.

7) At what levels would salinity concentrations (EC or TDS) no longer be suitable for an AGR use?

There is no published limit. It depends upon the cropping pattern and the economics of production. For all practical purposes however it is probably close to 5,000 dS/m. Above this, it becomes impractical to leach the salts to a level where even the most salt tolerant crops will be grown. Theoretically you could utilize water above this level but you reach a limit on how much water the soil can infiltrate and therefore it becomes the limiting factor and thus it is impractical to grow that crop. On a more regional level, if you have water above an EC of 3,000 dS/m on most Central Valley soils, it will be very difficult to conduct economic production levels.

8) What, if any, subcategories of the AGR use might be useful to improve water resource management and water quality regulation in the Central Valley?

The answer to this question would require an analysis conducted similar to the one performed by Glenn Hoffman for the South Delta (Hoffman Report). This type of analysis would give you the threshold limits that are likely to allow full production with various qualities of water. This type of analysis however would be very costly and take several decades to perform. In the absence of such an analysis, one could assume that there would be unrestricted use of water for irrigation if the salinity is less than 700 dS/m. This could be considered full AGR use. On the other extreme, any water supply known to be in excess of 3,000 dS/m would be severely restricted in its use for irrigated agriculture. This could be considered a severely limited or restricted level of AGR use and in most cases would only provide incidental AGR use. What is in between these numbers (the bulk of the ground water in the Central Valley) would have varying levels of limitations depending upon the farming practices and farm economics. This could be considered a limited level of AGR use but not one that would be severely restricted by water quality. Animal drinking water would for most practical purposes, follow the same ranges however incidental use of water above 3,000 dS/m would be more widespread in range lands and use of this type of water may be for longer periods.

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- 1) If Agriculture (AGR) is ubiquitous throughout the Central Valley, should we begin with an initial presumption (rebuttable on a site-specific basis) that all surface and groundwaters in the region will likely be used for this purpose and should be designated to protect this beneficial use? If not, what factors should be considered to not assign an AGR use to a waterbody?

I think this is a reasonable and efficient approach. Since ag land draws irrigation water from both surface and groundwater it is integrative. In reality most land uses have adapted over time to the prevailing blend of imported and local water quality – the AGR designation should recognize this.

- 2) Where a waterbody is designated AGR, is it appropriate to assume that water quality must be capable for growing any sort of crop or supporting any type of livestock?

No – as mentioned above – site conditions dictate the size and quality of the groundwater resource which is typically blended with surface supply with which to grow a crop. Farmers have adapted to these conditions and will typically grow the most high value crop they can cognizant of prevailing conditions.

- 3) Where crop yields are known to decline in proportion to salinity concentrations, at what threshold (% reduction) is the AGR use "impaired?" "Precluded?"

Will vary – but should be within a range where the costs of production exceed the return to crop yield. This will vary between crops and may not be a linear response. Difficult to come up with a single value.

- 4) If water quality is inadequate to support maximum expected yield for a given crop but is adequate to assure maximum expected yield for another crop, is the AGR use impaired?

Only if there is a substantial history of cultivation of that crop. Remember that crop yields can also respond to specific ions such as boron – it is difficult to discern which yield reducing factors are in play. What about GM crop varieties? Especially those crops bred for salt tolerance. Perhaps set the threshold for the most widely grown crop in the region.

- 5) If water quality is inadequate to support maximum expected yield using efficient irrigation practices, but maximum expected crop yield can be maintained by increasing

the amount of irrigation water applied, is this an acceptable (albeit less desirable) approach for protecting the beneficial use?

Higher crop yields are not protected by simply applying more water. It is more critical to relieve plant stress locally – this is more effectively done with drip irrigation – especially subsurface drip. Response to improved irrigation technologies is well established. These technologies are also highly efficient.

- 7) At what levels would nitrate concentrations no longer be suitable for an AGR use?

When nitrate becomes the dominant anion in water supply or when excessive leaching of nitrate endangers rural groundwater sources. Crops can tolerate high levels of nitrate.

- 8) At what levels would salinity concentrations (EC or TDS) no longer be suitable for an AGR use?

Typically above 1250 ppm for direct application and 2500 ppm as a blended supply (Westlands Water District farmers Fall, 1998).

- 9) What, if any, subcategories of the AGR use might be useful to improve water resource management and water quality regulation in the Central Valley?

*Could be combined with (a) irrigation technologies (drip, furrow, sprinkler)
(b) salt tolerant and salt sensitive crop designations*

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Written Responses Due at Noon (pdt) on Tuesday, May 3rd

Reclamation Responses

- 1) If Agriculture (AGR) is ubiquitous throughout the Central Valley, should we begin with an initial presumption (rebuttable on a site-specific basis) that all surface and groundwaters in the region will likely be used for this purpose and should be designated to protect this beneficial use? If not, what factors should be considered to not assign an AGR use to a waterbody?

Not sure. But I think there could be an assessment of whether conditions exist for potential AGR (soil type, slopes, climate, precip/water availability) – then could have an existing and potential AGR (are there areas that have not been exploited, or would we be moving into marginal quality areas with new ag?) I also think there could be salinity-tolerance level AGR designations in theory. Currently, do severely impaired lands or retired lands retain the AGR designation or are they listed as potential AGR until it becomes economically feasible to reclaim the land for agricultural use?

- 2) Where a waterbody is designated AGR, is it appropriate to assume that water quality must be capable for growing any sort of crop or supporting any type of livestock?

No, I think we have developed a water system based on certain assumptions and our designations should take that into account in setting site-specific objectives. Also there must be some recognition of precipitation expectations, drought recurrence, and supply reliability – very explicitly state the conditions under which AGR can occur and when it could expect to achieve less than 100% yield.

- 3) Where crop yields are known to decline in proportion to salinity concentrations, at what threshold (% reduction) is the AGR use "impaired?" "Precluded?"

I don't know. Is this an economics question depending on the crop? Are there other reasons for growing the crop which makes economics (and thus yield) a secondary consideration?

The other way to go with this is based on the hydrology variation I described in 2 – so hypothetically, say 40% of the time is wet and you get 100% protection, but when we slide into drier and then prolonged dry conditions there could be some acceptable or already agreed-to expectation of yield reduction. This is tied back to "reasonable" protection. Developing the context of what is "reasonable" protection under what conditions while balancing "reasonable" protection of other uses of the water.

- 4) If water quality is inadequate to support maximum expected yield for a given crop but is adequate to assure maximum expected yield for another crop, is the AGR use impaired?

That is one way to describe it. Or we could set up sub-categories recognizing the suitability of the existing water quality to existing crops and relieve the state of expectations that more vulnerable crops have to be protected as potential uses – but I would do this in the context of evaluating trade-offs with other beneficial uses or with the water supply reliability versus water quality trade-off (i.e. wouldn't mind a little salt if I could just get some water to keep my trees alive or don't expect to grow beans in the second year of a drought scenarios). I think the AGR use has to be a little more dynamic, since AGR has some degree of adaptability that other beneficial uses don't have. Perhaps looking at the methodology used for the annual agricultural allocation forecast which takes into consideration factors such as water supply availability and meteorological conditions could be tied to a category of crops that can be grown without or with minimal impact.

- 5) If water quality is inadequate to support maximum expected yield using efficient irrigation practices, but maximum expected crop yield can be maintained by increasing the amount of irrigation water applied, is this an acceptable (albeit less desirable) approach for protecting the beneficial use?

Depends on your water supply availability, where the return flow is going, and what your other beneficial uses that you are balancing. But I can see this being an acceptable (and even currently practiced) approach.

- 7) At what levels would nitrate concentrations no longer be suitable for an AGR use?

I don't know.

- 8) At what levels would salinity concentrations (EC or TDS) no longer be suitable for an AGR use?

There are tables in the Hoffman report and in the Ayers and Westcot report as to salt sensitivity. I think the San Joaquin Drainage Authority could give you a reasonable number, but it depends on whether you are assuming the salt will build up in the groundwater below the crop or whether it will be removed. (I suppose our San Luis Drainage Feature Reevaluation analysis may also have some information, but I didn't have access to that in time to inform this assignment).

- 9) What, if any, subcategories of the AGR use might be useful to improve water resource management and water quality regulation in the Central Valley?

I think categories that take into consideration the factors I've described above would be incredibly helpful towards improving water (and other) resource management.

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Central Valley Water Board Responses.

Clarification: *Note that in the Sacramento/San Joaquin Basin Plan, AGR encompasses both Irrigation Supply and Stock Watering beneficial uses and a specific water body may not always have the same designation for both (e.g. the Sutter Bypass and North Fork of the American River are both designated for “existing” irrigation supply but not designated for stock watering). In contrast, the Tulare Basin Plan does not distinguish between the two and only designates the combined AGR.*

- 1) If Agriculture (AGR) is ubiquitous throughout the Central Valley, should we begin with an initial presumption (rebuttable on a site-specific basis) that all surface and groundwaters in the region will likely be used for this purpose and should be designated to protect this beneficial use? If not, what factors should be considered to not assign an AGR use to a waterbody?

Yes. As an example,, “stock watering, or support of vegetation for range grazing,” would apply to most, if not all, remote, northern Sacramento Valley mountain streams that are currently not designated ARG.

Rebuttal should be based on general criteria developed and approved by the Board through the Basin Planning process. Note that both the Sacramento/San Joaquin and Tulare Lake Basin Plans, include language that provides criteria to make exceptions and/or allow limitations to the beneficial use designations “. . . parallel to Resolution No. 88-63 exception criteria . . . ” (page II-3 in both documents). For AGR the criteria are as follows:

1. *There is pollution, either by natural processes or by human activity (unrelated to a specific pollution incident), that cannot reasonably be treated for agricultural use using either Best Management Practices or best economically achievable treatment practices, or*
2. *The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day, or*
3. *The aquifer is regulated as a geothermal energy producing source or has been exempted administratively pursuant to 40 CFR, Section 146.4 for the purpose of underground injection of fluids associated with the production of hydrocarbon or geothermal energy, provided that these fluids do not constitute a hazardous waste under 40 CFR Section 261.3.*

Other factors that should be considered are discussed in more detail later.

- 2) Where a waterbody is designated AGR, is it appropriate to assume that water quality must be capable for growing any sort of crop or supporting any type of livestock?

No. Imported water of better quality has allowed cropping changes in areas that historically supported more salt tolerant species. A review of soil types, climate and natural water supply should be conducted as part of a process for determining a reasonable suite of crops that should be protected as part of irrigation supply use in a given sub-area. Livestock may be a separate beneficial use consideration.

- 3) Where crop yields are known to decline in proportion to salinity concentrations, at what threshold (% reduction) is the AGR use "impaired?" "Precluded?"

This question appears to be more related to economic viability and the concept of "tipping potential" brought up during the MUN discussion by the agricultural industry. This question may also relate to the concept of what is an "acceptable" reduction in yield during drought conditions.

- 4) If water quality is inadequate to support maximum expected yield for a given crop but is adequate to assure maximum expected yield for another crop, is the AGR use impaired?

Assuming that appropriate AGR uses were designated for sub-basins (as alluded to in question #2 above), AND a threshold (objective) is adopted to protect that use (e.g. water quality at a specific yield reduction), the impairment determination will be based on the salinity impact on the most salt sensitive crop that fits that particular AGR use definition. Anti-degradation also applies and we as an agency are required to insure discharges don't increase concentrations above background levels "unless it is in the best interest of the people". So while "impairment" may be linked to the federal 303d policy and specific water quality objectives for surface water, we are still bound by additional California policy to protect both surface and groundwater from degradation. An exception may be needed during drought conditions.

- 5) If water quality is inadequate to support maximum expected yield using efficient irrigation practices, but maximum expected crop yield can be maintained by increasing the amount of irrigation water applied, is this an acceptable (albeit less desirable) approach for protecting the beneficial use?

This appears to be more of an implementation/policy issue than a beneficial use issue. If appropriate AGR beneficial uses and objectives are adopted per question #2 above, but the grower determines they can grow a more salt sensitive crop by more aggressive leaching--as long as the beneficial uses of downstream surface water bodies and resident groundwater are not impacted—it becomes their economic decision balanced with available water supply that is under discussion rather than protecting the beneficial use.

- 6) At what levels would nitrate concentrations no longer be suitable for an AGR use?

Staff would need to defer to the ag industry and technical experts to support any findings.

- 7) At what levels would salinity concentrations (EC or TDS) no longer be suitable for an AGR use?

Again, the answer would depend on specific sub-basin conditions, sensitivity of various crops, and timing of use. Would need input from ag industry and technical experts.

- 8) What, if any, subcategories of the AGR use might be useful to improve water resource management and water quality regulation in the Central Valley?

Sub-categories of uses will not be effective without also attaching appropriate water quality objectives to that sub-category—otherwise, site specific challenges can continue to be anticipated. Categories should be explored that are regionally based (e.g. based on crops that could be grown for the soil/climate/natural salinity levels that might be limiting). There may also be benefit in designating some water bodies within farms or districts for “AGR reuse” to allow the flexibility to move poor quality drainage around for blending and reuse or “AGR recycle” to allow recycled water to irrigate crops that are not in the human food chain.

For the mountainous areas of the Sacramento Valley, a subcategory of AGR specific to “range grazing” could be a step towards improved water resource management and water quality. If established with water quality objectives specific to the sub-category, it could help to address some of the concerns with non-point source issues associated with grazing impacts on federal, state and private lands.

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No. Uses should never be designated by the stroke of a pen. The factors to designate or not designate should be clearly delineated then decisions made based on those factors and the science available. The level of science needed to designate should be equivalent to that required to de-designate.

The need for subcategories of uses should also be determined up front, to the extent practicable.

Some factors that might be considered when designated/not designating/or severely limiting an AGR use include:

1. Reliability of the water source (i.e. seasonal waterbody where water is not available during the irrigation season).
2. Salinity or other water quality constituent that may limit or prohibit use (e.g. Boron).

- 2) Where a waterbody is designated AGR, is it appropriate to assume that water quality must be capable for growing any sort of crop or supporting any type of livestock? (Emphasis mine – both in question and response)

No, this is not consistent with the water code that requires reasonable protection of beneficial uses and for the water quality criteria to consider various factors:

“The Legislature further finds and declares that activities and factors which may affect the quality of the waters of the state shall be regulated to attain the highest water quality which is **reasonable**, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible.” (CWC §13000)

“Water quality objectives” means the limits or levels of water quality constituents or characteristics which are established for the **reasonable** protection of beneficial uses of water or the prevention of nuisance within a specific area.” (CWC§ 1350(h))

“Each regional board shall establish such water quality objectives in water quality control plans as in its judgment will ensure the reasonable protection of beneficial uses and the prevention of nuisance; however, it is recognized that it may be possible for the quality of water to be changed to some degree without unreasonably affecting beneficial uses. Factors to be considered by a regional board in establishing water quality objectives shall include, but not necessarily be limited to, all of the following:

- (a) Past, present, and probable future beneficial uses of water
- (b) Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto.
- (c) Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area.
- (d) Economic considerations.
- (e) The need for developing housing within the region.
- (f) The need to develop and use recycled water.” (CWC §13242)

There are many factors that go into determining if a crop or livestock is viable in a certain area, including soil type, climate, water supply, water quality, and other factors. These must be considered. Those crops or livestock that are not viable should not be considered.

All factors for viability should be considered before determining the appropriate water quality to support the use. Factors in CWC §13242 must be used as a basis in establishing the water quality necessary for the reasonable protection of that use.

It is also important to note that there may be several sources of water that could support a specific AGR use: groundwater, local surface supplies, imported surface and/or groundwater, recycled water, etc. One water source may make that crop viable, where another may not. Great care should be taken not to assign an objective to a waterbody to protect an AGR use that, would another source of the water not be available, would not be viable.

- 3) Where crop yields are known to decline in proportion to salinity concentrations, at what threshold (% reduction) is the AGR use "impaired?" "Precluded?"

Unknown. However, in most cases, there are multiple factors (climate, soil, rainfall, etc.). These factors work together to create declining yields. It may be important to balance all or describe conditions of other assumptions (i.e. normal rainfall, etc.), before answering the above question or determining what is appropriate.

- 4) If water quality is inadequate to support maximum expected yield for a given crop but is adequate to assure maximum expected yield for another crop, is the AGR use impaired?

No. See responses above.

- 5) If water quality is inadequate to support maximum expected yield using efficient irrigation practices, but maximum expected crop yield can be maintained by increasing the amount of irrigation water applied, is this an acceptable (albeit less desirable) approach for protecting the beneficial use?

Not answering the question but asking one: Is this truly a water quality issue, or is it choice of crops, soil, other factors or a combination thereof?

- 7) At what levels would nitrate concentrations no longer be suitable for an AGR use?

Unknown. This is likely a crop-specific answer. However, it should be recognized that nutrients are essential for plant growth and are commonly added through fertilization. Recycled water can provide many nutrients and offset fertilizer use, which has water, energy and other environmental benefits.

- 8) At what levels would salinity concentrations (EC or TDS) no longer be suitable for an AGR use?

This is crop specific.

- 9) What, if any, subcategories of the AGR use might be useful to improve water resource management and water quality regulation in the Central Valley?

As mentioned above, it may be important to differentiate what the water sources to each of the crops are, as objectives are applied to the waterbody. It does not make sense to apply an objective for a crop to a local waterbody (such as Salt Creek) when crops are grown using imported water from the Sierra watershed, or applying that same objective to groundwater where there is high mineralization or natural hardness.

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Yes. However criteria similar to those listed in Resolution 88-63 would arguably make sense. I would think the case could be made that to the extent MUN and AGR designation and de-designation criteria are similar, the better.

- 2) Where a waterbody is designated AGR, is it appropriate to assume that water quality must be capable for growing any sort of crop or supporting any type of livestock?

No. See below response(s) for some particulars.

- 3) Where crop yields are known to decline in proportion to salinity concentrations, at what threshold (% reduction) is the AGR use "impaired?" "Precluded?"
- 4) If water quality is inadequate to support maximum expected yield for a given crop but is adequate to assure maximum expected yield for another crop, is the AGR use impaired?
- 5) If water quality is inadequate to support maximum expected yield using efficient irrigation practices, but maximum expected crop yield can be maintained by increasing the amount of irrigation water applied, is this an acceptable (albeit less desirable) approach for protecting the beneficial use?

This answer applies to Questions 3, 4, and 5:

Given the variety of plants and animals that can be farmed for profit and the different tolerances they have for different constituents, each with their own concentration ranges, which depend on many local variables, it is likely to be a recipe to study, and then micromanage (deemed) acceptable uses, practices and profit margins..... *to the point of inaction.*

Perhaps a general goal of protecting say, at least 80% of the product value, where possible, could guide salt management plans. And, as alluded to in the answer to Question 1, some consideration should be given to unifying the MUN and AGR protection criteria to the extent possible if the opportunity presents itself...for example

choosing a WQO of around 900-1000 (ec) that would serve to protect both AGR and MUN on a fairly broad basis may be desirable.

In the end, each salt management unit will have to pick a WQO number, or range, to manage each constituent to, and then let the users sort out crop types, irrigation practices, etc. to their best benefit given the options available to them. It is likely CV_SALTS may find it necessary to provide policy guidance on appropriate WQO levels the various management units may set in order to manage salt on the unified Region 5 level. Those who provide exports from the Region may also wish to weigh in on such policy decisions, but just like any other particular local user, they may not be able to have all of their conceivable uses remain completely uncompromised, all of the time.

- 7) At what levels would nitrate concentrations no longer be suitable for an AGR use?

For livestock.... presumably some level would trigger methemoglobinemia concerns similar to human infants...I don't know what the number is though. For certain crops (ie sugar beets)..... I understand there are certain times in the growth cycle nitrate is a problem....and I think that number may be even less than 10 mg/l as N.

So, again, it may require making a policy decision that a certain "broadly protective" concentration level will be the WQO that SNMPs must manage to for nitrate.

[Note: There is a possibility the Aquatic life criteria for things like spawning fish may set an even lower level for some surface waters, and their tributaries, than would otherwise apply to protect MUN and/or AGR]

- 8) At what levels would salinity concentrations (EC or TDS) no longer be suitable for an AGR use?

Please refer to the answer to Question 3, 4, and 5 as a preface...then I would suggest this number could go quite high...perhaps to levels cited in Resolution 88-63, for instance.

- 9) What, if any, subcategories of the AGR use might be useful to improve water resource management and water quality regulation in the Central Valley?

I'm not sure this wouldn't lead to the micromanagement trap discussed above...I think it may be a much better management approach to pick a WQO that is broadly applicable, and then let the multitude of users decide how to categorize the options available to them for maximum benefit.

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Submission from AG Producers and Processors

- 1) If Agriculture (AGR) is ubiquitous throughout the Central Valley, should we begin with an initial presumption (rebuttable on a site-specific basis) that all surface and groundwaters in the region will likely be used for this purpose and should be designated to protect this beneficial use? If not, what factors should be considered to not assign an AGR use to a waterbody?

The AGR designation may not be appropriate in some localized areas where land uses preclude agricultural uses. However, it is likely that within the Central Valley region, most surface and groundwaters currently support, or are capable of supporting some level of AGR beneficial use. The primary concern with the AGR beneficial use is, what are the appropriate water quality objectives for salinity to support the localized AGR beneficial uses, not necessarily the AGR beneficial use designation itself.

- 2) Where a waterbody is designated AGR, is it appropriate to assume that water quality must be capable for growing any sort of crop or supporting any type of livestock?

No, water quality objectives should be consistent with reasonably, feasible commercial agricultural uses in the site vicinity, based on a variety of factors, including but not limited to: soil type, rainfall, climate, etc.

- 3) Where crop yields are known to decline in proportion to salinity concentrations, at what threshold (% reduction) is the AGR use "impaired?" "Precluded?"

While the Regional Board should not condone water quality degradation, there are a myriad of factors that contribute to crop yields, and it may be difficult to directly correlate a yield reduction with water quality alone. Further, the Regional Board is required to reasonably protect beneficial uses, thus indicating that requiring water quality objectives to be set at the most stringent level in order to protect 100% of crop yield may not be appropriate.

- 4) If water quality is inadequate to support maximum expected yield for a given crop but is adequate to assure maximum expected yield for another crop, is the AGR use impaired?

Again, causes of yield decreases are manifold. Impairment may need to be assessed relative to crops grown, management methods employed, and actual yields on other properties in the immediate vicinity.

Further, impairment of the AGR beneficial use should be determined after identifying appropriate and relevant water quality objectives. If the appropriate water quality objectives for the area of interest are exceeded, then the AGR beneficial use is impaired. Determination of appropriate water quality objectives should be considered on a localized, watershed, or sub-regional basis – not Valley wide. To determine the appropriate water quality objective, consideration should be given to the pre-dominant crops in the area and others that are reasonably, feasible on a commercial basis. The AGR beneficial use should not be defined to protect “back-yard gardens” that include exotic crops for the area of interest.

- 5) If water quality is inadequate to support maximum expected yield using efficient irrigation practices, but maximum expected crop yield can be maintained by increasing the amount of irrigation water applied, is this an acceptable (albeit less desirable) approach for protecting the beneficial use?

Uncertain as to the question being asked, and the principle proposed.

- 6) At what levels would nitrate concentrations no longer be suitable for an AGR use?

Nitrogen loading is generally not associated with crop toxicity. Growers should consider the concentration of nitrate in the water supply in determining the crops needs for fertilizers.

- 7) At what levels would salinity concentrations (EC or TDS) no longer be suitable for an AGR use?

As mentioned previously, the effect of salinity on crops varies by crop species and other site factors. Salinity water quality objectives should vary based on the pre-dominant crop types, and other reasonably, feasible commercial crops that may be grown in the area. Also, salinity of TDS/EC needs to consider individual ions such as sodium, chloride, and boron, as well as crop type.

- 8) What, if any, subcategories of the AGR use might be useful to improve water resource management and water quality regulation in the Central Valley?

Subcategories could potentially be defined for specific geographic conditions, e.g. agricultural land immediately adjacent to stream. Specific Basin Plans could set different limits for AGR water quality. Or, the Basin Plans could include a process for establishing site-specific water quality objectives for protecting the agricultural beneficial use in that area.