Public Comment Letters Received During the 2014 Triennial Review
of the Central Coastal Basin Plan

No.	Commenting Organization	Representative
L1	General Public	Dr. Edo McGowan
L2	General Public	Dr. John Ackerman
L3	General Public	Willy Cuhna
L4	City of Santa Cruz Water Department	Chris Berry
L5	General Public	Dr. Edo McGowan
L6	General Public	Dr. Edo McGowan
L7	City of Lompoc	Patrick Wiemiller
L8	Greenspace Cambria Land Trust	Mary Webb
L9	City of Santa Maria Utilities Department	Richard G. Sweet
L10	Grower Shipper Association of Santa Barbara and San Luis Obispo Counties	Claire Wineman, Gail Delihant
L11	Santa Clara Valley Water District	Joan Maher

From:	Edo McGowan
To:	Thomas, Michael@Waterboards; Harris, Ken@Waterboards; Saiz, Steve@Waterboards; HillaryWith Das; JohnAckerman; james.joyce@sen.ca.gov
Subject:	Comments relating to: Up-date every three years of water quality requirements
Date:	Saturday, August 09, 2014 11:35:38 AM

To: CC RWQCB

Fm: Dr Edo McGowan

Re: Comments and questions relating to Triennial Review

Please direct this to the appropriate area within your agency as a comment and request.

You seek community input on the following: ***The Central Coast Water Board is accepting input and comments on the 2014 Triennial Review of the Water Quality Control Plan for the Central Coastal Basin (Basin Plan) from July 30, 2014 to September 15, 2014***.

Per the below copied section of the CWA, I wish to comment and at the same time, in order to accomplish that end, seek answers that will allow my further inquiry into this topic, hence exercising my right to fully and effectively comment-----comment as your Board suggests people do.

We know that we are loosing our antibiotics to resistance, hence a potential loss of an effective defenses against increasingly serious pathogens; I don't believe this situation is in dispute.We also know that antibiotic resistant pathogens and their genes are generated and subsequently released by sewer plants due to current sewer plant designs and operation. We also know that these pathogens and their genes are discharged by these same sewer treatment works into the environment in an uncontrolled way, hence constituting a potentially serious public

health risk. Notwithstanding this situation, this issue of resistance as generated by sewage processing, has not been a topic receiving much consideration by the state and regional boards. This, however, has not necessarily been an absent topic in my discussions with your Board and the State Board. Nonetheless, it seems to have been a topic that at best, has received low priority.

It is now time to shift gears and bring the topic of resistance forward and thus the opportunity to advance this subject within the newly to be developed Plan and hence its standards. We note in that State shall adopt criteria based on biological monitoring or assessment methods consistent with information published pursuant to section 304(s)(8). "Nothing in this section shall be construed to limit or delay the use of effluent limitations or other permit conditions ***based on or involving biological monitoring or assessment methods*** or previously adopted numerical criteria."

We have brought to your Board data documenting the fact that antibiotic resistant pathogens and their antibiotic resistant genes are commonly found in in large numbers within effluents and in the finished and disinfected recycled water meeting existing standards. We have also presented evidence, ample evidence, to alert your Board that the state's standardized tests for water quality are failing to alert the regulatory community and therefore the citizens of health risks associated with this water. We have provided documentation that within delivery systems, when comparing the water content of standard indicator bacteria and pathogens, that water quality tests at point of release as contrasted to point of use,show a large jump at the POU in both standard indicators as well as serious multi-drug resistant pathogens. (see: http://www.ncbi.nlm.nih.gov/pubmed/23755046)

While this water, as just released at the treatment works, may pass state standards, it often fails at the point of use (POU). Thus findings of the standard test indicating high bacterial counts, by it self at the POU would dictate that the final delivered water is no longer fit for its intended use. This situation has been reported to the Board for several years without apparent action. There seems to be regulatory reluctance to test at the POU. We, viewing the regulatory agencies from the outside do not fully understand this, but such reluctance, if it exists, certainly exposes the population to an unnecessary level of resistance and thus may adversely impact the general level of public health.

These results indicating a major jump in bacterial numbers at the POU show that something is going on within the pipe as the water is moving down toward ultimate use. We feel it is

resuscitation of bacteria that were within the dormant state noted as viable but non-culturable, something that the standard test could not see. Thus, the current standards are unreliable. This clearly needs serious discussion during the Triennial Review. Will it be accorded adequate discussion?

Based on Sec. 303(c)(2)(B) and presumably your intended and underlying efforts in the ***Triennial Review of the Water Quality Control Plan*** you now need to set up a program for the actual assessment and testing methods for the waters using a sufficiency of lab tests to look at resistant organisms and their genes. The paper by Fahrenfeld N[1], Ma Y, O'Brien M, Pruden A, noted above, gives the lab protocols for accomplishing this. Is there any reason why the Board or your Agency can not run such tests? If you are prohibited from doing so for some reason, please explain in detail such reason. Perhaps if the Legislature understands this and recognizes it as an impediment for correctly protecting public health, we will at least accomplished something.

These qPCR tests are in common usage by the scientific community. When used to analyze recycled water, the results have demonstrated that we have serious problems, yet the regulatory community seems to be having trouble in implementing such tests.

Now some questions, not just idle questions but questions to which answers are needed to allow for a competent and meaningful appraisal of the current system, hence meaningful comments related to your request for the ***Triennial Review of the Water Quality Control Plan*** : 1) what prohibits the RWQCB from testing for resistant pathogens and their genes? 2) Now seems to be an opportunity to initiate, at least some serious discussion on the Board's apparent and seemingly longstanding inability to effectively move forward in this quest, 3) Based on the section below, i.e, Sec. 303(c)(2)(B), would you, as a Board and Agency please tell me why you might not be able to effectively and actively start a serious open discussion on antibiotic resistance and the release of resistant organisms and their genes into the environment as discharged by current systems, yet not seen by currently used antiquated standards. 4) is it not your function to to come up with suggestions for inclusion of programs to protect public health? 5) Knowing that the scientific community has clearly documented the presence of and abundance of uncontrolled pathogens and resistant organisms in the byproducts of sewage treatment, do you not have a legal duty to warn?

I need an open discussion with your staff to allow for meaningful comments as requested for the ***Triennial Review of the Water Quality Control Plan***

Per the below copied portion of the Clean Water Act,

[Sec. 303(c)(2)(A) designated by PL 100-4]

(c)(2)(B) Whenever a State reviews water quality standards pursuant to paragraph (1) of this subsection, or revises or adopts new standards pursuant to this paragraph, such State shall adopt criteria for all toxic pollutants listed pursuant to section 307(a)(l) of this Act for which criteria have been published under section 304(a), the discharge or presence of which in the affected waters could reasonable be expected to interfere with those designated uses adopted by the State, as necessary to support such

designated uses. Such criteria shall be specific numerical criteria for such toxic pollutants. Where such numerical criteria are not available, whenever a State reviews water quality standards pursuant to paragraph (1), or revises or adopts new standards pursuant to this paragraph, such State shall adopt criteria based on biological monitoring or assessment methods consistent with information published pursuant to section 304(s)(8). Nothing in this section shall be construed to limit or delay the use of effluent limitations or other permit conditions based on or involving biological monitoring or assessment methods or previously adopted numerical criteria.

From:	Thomas, Michael@Waterboards
To:	Hammer, Phillip@Waterboards; McCann, Lisa@Waterboards; Saiz, Steve@Waterboards
Subject:	Fwd: Comment re: 2014 Triennial Review of the Water Quality Control Plan for the Central Coastal Basin.
Date:	Sunday, August 10, 2014 4:23:58 PM

Sent from my iPhone

Begin forwarded message:

> **From:** john ackerman <johnmackerman@gmail.com>
> **Date:** August 10, 2014, 3:27:17 PM PDT
> **To:** <mthomas@waterboards.ca.gov>
> **Cc:** john ackerman <johnmackerman@gmail.com>
> **Subject: Fwd: Comment re: 2014 Triennial Review of the Water Quality Control Plan for the Central Coastal Basin.**

> Begin forwarded message:

> > **From:** john ackerman <johnmackerman@gmail.com>
> > **Subject: Comment re: 2014 Triennial Review of the Water Quality Control Plan for the Central Coastal Basin.**
> > **Date:** August 10, 2014 at 3:19:24 PM PDT
> > **To:** CC RWQCB
> > **Cc:** Edo McGowan <edo_mcgowan@hotmail.com>
>
> > August 10, 2014
> >
> > To whom it may concern:
> >
> > I am totally supportive of all of the recommendations that Edo McGowan, Ph.D. (in Hydrology) wrote to you on August 9, 2014 at 11:35 A.M.
> > Please respond to me with a written statement.
> > Please direct this to the appropriate area within your agency as a comment and request.
> >
> > Respectfully,
> > John M. Ackerman, M.D.
> > Lt. Cmdr. (1968-1970)
> > U.S.P.H.S. (Indian Health Service)
> > Entire State of Alaska
> > Retired

From: Denker, Sharon@Waterboards on behalf of WB-RB3-centralcoast
To: Saiz, Steve@Waterboards
Subject: FW: Comments for Triennial Review
Date: Tuesday, September 02, 2014 8:53:05 AM

From: Willy Cunha [mailto:wcunha@sunviewvineyards.com]
Sent: Friday, August 29, 2014 12:20 PM
To: WB-RB3-centralcoast
Subject: Comments for Triennial Review

I am an Organic Grower in the Shandon area. I would love it if the reporting process for surface water and groundwater were more closely integrated for us farmers.
I understand why we use an outside group to do the surface water testing and reporting. But the process that we go through to interact with you guys is like dealing with two separate agencies.
It needs to be simple and direct. Easy to comply with. It is excellent to collect this information. Can you make it simpler?

Along those same lines it would b excellent if the sister agencies of Cal EPA would work more closely together. To keep things simple, streamlined and efficient as we all work together to protect our environment. I think that was the main idea behind the formation of Cal EPA. Air Quality and Water Quality are highly interrelated and the efforts we make as a State to protect them should be highly interrelated.

Your basin management activities, goals and plans should deal with the whole watershed, not just the basins at the bottom. It is a very interrelated system.

If the current drought continues the water quality results that you are currently collecting from our basins should in a few years should show significant degradation of water quality. This information should be used to help define sustainable levels of groundwater within defined portions of basins. More effort should be lent to delineating what are the constituents of our ground water deep in these basins. Use this information to determine why water quality is declining. If it is due to farmers or cities introducing salts or negative chemicals to the system, those should be curtailed. If it is due to water extractions of cleaner water from higher elevations of the subterranean water resource efforts and resources should be turned in that direction. Don't blindly spend your limited time and budgets on activities less beneficial to the water resource.

From: Denker, Sharon@Waterboards on behalf of WB-RB3-centralcoast
To: Saiz, Steve@Waterboards
Subject: FW: Triennial Review
Date: Wednesday, September 03, 2014 2:18:20 PM

From: Chris Berry [mailto:cberry@cityofsantacruz.com]
Sent: Wednesday, September 03, 2014 2:11 PM
To: WB-RB3-centralcoast
Cc: John Ricker (John.Ricker@santacruzcounty.us); Jen Michelsen (JMichelsen@slvwd.com); Akin Babatola; Terrill Tompkins; Bean, Zeke@City of Santa Cruz; Jeremy Farr; Chris Berry; Saiz, Steve@Waterboards
Subject: Triennial Review

Dear Central Coast Water Board staff,

Thank you for the opportunity to participate in the Region 3 Basin Plan review. As you may be aware, the City of Santa Cruz Water Department provides domestic drinking water to over 90,000 people in the Santa Cruz area. We are primarily a surface water purveyor who operates in TMDL waterbodies where ESA-listed species occur and where the City has no jurisdiction over land use. Therefore we are uniquely interested in and affected by the current review, update and implementation of the Basin Plan. In that context, please consider the following comments and suggestions (several of which we have also made during previous reviews) as you proceed with your work:

Issue 6: The turbidity objective is obviously problematic as written in Jackson turbidity units. Also, the concept to develop objectives specifically for fisheries purposes seems well-intentioned, but why would one choose any particular beneficial use as warranting a special objective? Why not choose other beneficial uses like MUN for similar focus?

Issue 7: Development of a riparian policy has been on the Board's list of goals for quite some time. While riparian corridors have continued to be impacted by a litany of impacts since this was first proposed, it is not clear how the current progress summary (which wraps riparian protection in with several other issues) will specifically protect riparian corridors. We strongly advocate for stronger protection of riparian corridors and hope that the Board will exercise whatever authority it has on that matter to achieve such protections.

Issue 10: Please consider designation of the POW beneficial use for Newell Creek. As water systems tackle carbon footprint reductions, small hydroelectric projects are increasingly common. The City is currently considering a small inline hydroelectric generator for the fisheries bypass release from Loch Lomond and a beneficial use designation supporting this would be very helpful. Please also remove the SHELL beneficial use designation for Loch Lomond Reservoir. While there have never been shellfish in Loch Lomond, the current drought-related drawdown has given us ample opportunity to look for shellfish and they simply are not present in this water body. Finally, with ongoing water supply planning that includes alternative such as desalination and increased attention on marine conservation in general, it seems appropriate to begin consideration of developing beneficial uses for critical marine areas in the region. On this note, MUN should be listed as a future anticipated beneficial use of coastal waters in the region (as it is already being planned for or has occurred previously in the case of Santa Barbara) and water quality objectives relevant to such a designation should also be initiated.

Issue 11: We generally support greater enforcement authority for waste discharge

violations. However, frequently overland discharge is the only way to drain drinking water system infrastructure (e.g., dead end main flushing as required by California Department of Public Health), and - if conducted with proper BMPs, such as dechlorination, sediment and erosion control - can be done without harm to beneficial uses. Therefore, prohibition of discharges to land should be carefully considered so that beneficial uses are protected without engaging in "mission drift" or otherwise extending the Board's authority inappropriately and so creating conflict with other regulatory and statutory requirements, and without jeopardizing public health and safety by virtue of limiting water system maintenance unnecessarily.

Thanks for your consideration. If you have any questions on these comments, please do not hesitate to contact me.

Chris Berry
Watershed Compliance Manager
City of Santa Cruz Water Department
715 Graham Hill Rd., Bldg A
Santa Cruz, CA 95060
O (831) 420-5483/F (831) 420 6220/C (831) 251 6875

From: Edo McGowan
To: Saiz, Steve@Waterboards
Subject: Addendum to comments on
Date: Friday, September 05, 2014 5:06:48 PM

Re: Comments for consideration during the 2014 Triennial Review of the Water Quality Control Plan for the Central Coastal Basin

To Mr Steve Saiz CCRWQCB

Fm Dr Edo McGowan

Dt: 9-5-14

Previous comments sent to the state board and other regional boards are also applicable here because they bring in background that this topic of antibiotic resistance has been noted several times in the past. These materials are thus incorporated by reference:

http://www.waterboards.ca.gov/water_issues/programs/land_disposal/comments052714/docs/edo_mcgowan.pdf

http://www.waterboards.ca.gov/water_issues/programs/water_recycling_policy/docs/comments100912/edo_mcgowan.pdf

3.199.216.6/larwqcb_new/permits/docs/9259_R4-2010-0074_WDR_amd.pdf

To: State Water Resources Control Board
Fm: Dr Edo McGowan 9/16/2007

Re: Comments related to--

Back ground:
-http://www.swrcb.ca.gov/comments/docs/water_recycling_policy_notice.pdf
Recycled water is a major source of water supply in California and a major component in California's plan for meeting the state's growing water demand. The California Water Plan estimates that recycled water usage can increase from half a million acre-feet per year in 2003 to two million acre-feet per year in 2030.
NOTICE IS HEREBY GIVEN that the State Water Resources Control Board (State Water Board) will hold a public workshop to receive public comments on a proposed statewide Water Recycling Policy as part of a State Water Board meeting to be held on October 2, 2007 in Los Angeles.

http://www.waterboards.ca.gov/comments/docs/water_recycling_policy.pdf
Recycled water irrigation projects and groundwater recharge reuse projects provide benefits to the people of the state. These benefits include extending the state's limited water supply to provide water to its growing population, reducing diversions of surface water, and reducing use of groundwater supply. **These benefits outweigh the costs associated with lowering of water quality,** as mitigated through best practicable treatment or control, that would be caused by a recycled water irrigation project, provided that the lowering does not cause a violation of a water quality objective.
The California Code of Regulations, Title 22, Division 4, Chapter 3, Recycling Criteria, specify treatment processes for ensuring proper disinfection of recycled water. They also specify requirements for limiting public contact with recycled water to protect public health.

Dr. McGowan's Comments to the Control Board:

The document and its underpinnings are so weak on pathogens, transfer of antimicrobial resistance, lateral transfer of genetic information to soil and aquatic microbes and environmental niches, all potentially impacting public health as to be blatantly dangerous. Because of the potential impact on public health, an EIR warrants preparation under CEQA to fully discuss the human and environmental health implications and alternatives. The

reference resolutions noted within the document are so old with respect to issues and impacts on public health, that they are useless. There are provisions within the resolution (resolved 7 (b) relating to Title 22, Resolve 10 requiring CDPH to have developed MCL, but nothing on pathogens, antibiotic resistant genetic material, antibiotic resistance and the build up of antibiotics such as macrolides that can maintain vancomycin resistance. Thus for constituents that CDPH has not established MCLs, the regional boards may establish such---but where is the expertise to do so?

Therefore let us take some examples for illustrative purposes----------

Let us first discuss Erythromycin, which is a bioaccumulating macrolide that has been shown to maintain or cause cross resistance with vancomycin. Hence, since this can bioaccumulate in soils, and where there are soil microbes, these can develop resistance to both of these antibiotics. There are soil microbes everywhere in soils. Thus one may well see the build up of resistance or similar cellular and molecular machinery established that can supply cross resistance. Additionally, the entrained antibiotic resistant genetic material as discussed by Pruden et al is found in Title 22 water and the pathogens entrained in this water, as discussed by Rose et al, (WERF #00-PUM-2T)will be delivered with the Title 22 water. Thus, we have, under each micro-emitter of a drip system a small biological factory for producing antibiotic resistant pathogens. I have had this Title 22 water run in the lab and it contained multi-drug resistant bacteria. In viewing the Mueller-Hinton plated two days later, we noticed secondary growth within formerly clear areas. This may have represented bacteria in the viable but non-culturable (VBNC) state that resuscitated. These also were resistant. Title 22 does not, as far as I can ascertain, look for either resistance or VBNC. Rose in her paper as published by WERF comments on the fact that the indicators used in ascertaining health risks from recycled water have long been known to be non-reflective of public health risks.

The state's public health agencies appear to have little or no information on these phenomena. I asked the various agencies that are presumed to have some control over public health who amongst them was dealing with antibiotic resistance in water. Each, in response assured me that, now that they understood the situation [many had not even thought about it], it was not within their jurisdiction, but if I would just call this number, that agency over there would be the one that could help me. I received the same or similar reply, went full circle and never found any state agency that was dealing with this issue. The U.S EPA has just started to look at this, but only as relates to sewage sludge (biosolids). EPA does have standards for sewage solids but has not entered the arena of reclaimed/recycled water; that is an area left to the states. The U.S. EPA has not done a human health risk assessment on pathogens contained within biosolids, and none on reclaimed/recycled water. In discussing this with both U.S. EPA and CDC&P, both admit that there had been no coordinated or focused effort in looking at antibiotic resistance in sewage, hence its risks to man. I am on a newly established U.S. EPA/WERF scientific panel that has been developed to look at antibiotic resistance within biosolids. Some of that work will, of course, translate to reclaimed/recycled water questions, but as yet even the RFP for these studies in the area of biosolids are still in the developmental state. Thus, it seems that to assume that somehow all is well within Title 22 is a major jump and is in fact a fiction as relates to public health. Thus at a minimum, the resolution's actions fall to CEQA and warrant an EIR to explore the issues of public health.

In large irrigation systems such as public parks, we have large pop-up sprinklers that are designed to produce a spray pattern that will water the entire lawn's area. As a second example then, let us assume a family at a picnic on the grass of the public park irrigated with Title 22 water. Did not little Susie, just drop her lollypop on the grass, and then pick it up to suck on it again? Or little Jim, skid across the grass attempting to catch a ball and open his forearm with a skid-rash? Thus the skin's protective barrier is broken.

Now we have the opportunity for entry of antibiotic resistant microbes found within Title 22. In the case of little Susie, she may not get sick, but what is the chance that her gut bacteria will pick up that genetic information, multiply it out. Now three weeks later she is crying and you can't calm her down, her eardrum is infected, and she has a bladder infection, not necessarily related to the lollipop, but from something entirely unrelated. But the pathogens just happened to have met with and exchanged genetic information with her own internal flora that now contain the genetic information from what was on the lollipop. Also one must consider transfer of genetic information from these organisms to more robust organisms as highlighted by Sjolund et al. (2005) [1] indicating that resistance in the normal flora, which may last up to four-years, might contribute to increased resistance in higher-grade pathogens through interspecies transfer.

These bacteria that were on the lollipop were from the Title 22 water. They were able to colonize her gut bacteria through ingestion. Once ingested, the genetic information was transferred to normal flora, and subsequently to the pathogenic bacteria, making later treatment with particular antibiotics ineffective. Little Susie is now in the ICU on vancomycin and that drug is tearing up her vascular system and they had to discontinue it and attempt to find another drug. She is on a respirator, things don't look good.

Sjolund et al go on to note that since populations of the normal biota are large, this affords the chance for multiple and different resistant variants to develop. This thus enhances the risk for spread to populations of pathogens. Furthermore, there is crossed resistance. For example, vancomycin resistance may be maintained by using macrolides.

So, just how fast can a lethal level of antibiotic resistance develop? It does not take long as the example below will illustrate. Schentag, et al. (2003), followed surgical patients with the subsequent results. Pre-op nasal cultures

found Staphylococcus aureus 100% antibiotic susceptible. Pre-op prophylactic antibiotics were administered. Following surgery, cephalosporin was administered. Ninety percent of the patients went home at post-op day 2 without infectious complications. Nasal bacteria counts on these patients had dropped from 10/5 to 10/3, but were now a mix of sensitive, borderline, and resistant Staphylococcus sp. By comparison, prior to surgery, all of the patients' Staphylococcus samples had been susceptible to antibiotics. For the patients remaining in the hospital and who were switched on post-op day 5 to a second generation cephalosporin (ceftazidine), showed bacterial counts up 1000-fold when assayed on post-op day 7 and most of these were methicillin resistant Staphylococcus aureus (MRSA). These patients were switched to a 2-week course of vancomycin. Cultures from those remaining in the hospital on day 21, revealed vancomycin resistant enterococcus (VRE) and candida. Vancomycin resistant enterococci infections can produce mortality rates of between 42 and 81%.

Note in the above, that on entry to the hospital that none of these patients harbored resistant bacteria in their nasal cavities. But what would be the result if there had been inadvertent acquisition of resistance from environmental contamination such as through Title 22 water? Gerba and Rusin conducted research on the passage from finger to mouth of pathogens found on typical household objects. But we are not at home, but on a sunny day in the park, innocently having a picnic, on grass irrigated with Title 22 water that carries antibiotic resistant bacteria and other pathogens.

Cottage Hospital in Santa Barbara is a teaching hospital and I occasionally attend grand rounds and other functions to maintain my continuing medical education requirements. Cottage has been, since about 2003, giving vancomycin as a pre-op prophylactic for many surgical procedures. Vancomycin is not a benign drug. But, now because of the levels of background and community acquired antibiotic resistance, it would be unconscionable not to consider this drug. It was once held in reserve as the drug of last resort. Now from hospitals and nursing homes across California, it is used to quell resistant bacteria. As a pre-op prophylactic, it is also found in the human waste which is going to the sewer, then back into the reclaimed water along with resistant pathogens and their genetic material, and back onto the lawns of parks----a revolving door. Sewer plants have a very hard time with pharmaceuticals, but that connection to Title 22 seems to be seldom discussed.

Because resistance can be and is transferred to the flora of the human gut (skin and mucosal flora as well) the infective dose used to estimate public health impacts is confounded. This then brings into question the current paradigm on infection and its dose response to a certain load of a particular pathogen, i.e., ID and LD 50s. Lateral transfer of mobile genetic elements conferring resistance is not considered in this old paradigm. With the prodigious capacity for the gut bacteria to multiply, once the lateral transfer has taken place, very small original numbers---well below the old paradigms can be multiplied into impressive numbers. Since viruses and phages are also involved, their capacity to multiply, which dwarfs that of bacteria, must also be included. Thus there is a need for a new paradigm; unfortunately, the regulatory community seems not to recognize this. When one considers the multiplication within sewer plants and also within their byproducts, disbursement into the environment, the transfer to background organisms, hence to man and his animals, then the remultiplication within commensals of the gut, the emerging picture is worrisome.

Further, there are opportunities and interrelationships between microbes that can degrade antibiotics, eg. antibiotic resistant bacteria, and those that can degrade heavy metals and pharmaceuticals brought in by the Title 22 water as well as well as pesticides and fertilizer chemicals that are already found in soils of the park. In many cases, the involved cellular machinery is the same or similar, i.e., a duality (see for example papers by Schlüter).

Third example--------Your favorite uncle, Uncle Albert who was the youngest of the brothers, was also at the above picnic. He is about 48, has diabetes, a toe has been removed and he has a non-healing open ulcer on the bottom of the same foot. He is a devil-may-care fellow who still thinks he is 26, bullet-proof, and thus does not watch his blood sugar. A week after taking his shoes off and playing ball in the park with the family, he is in the clinic because his foot is infected. He is given a course of gorilla-cillin and it does no good, but in the interim his foot and lower leg are all red and swollen. It is difficult to walk and now he is taking a day off work. He really does not appreciate his situation because he can't feel too much due to diabetic neuropathy in his lower limbs, so he just soldiers on. Thus in a few days leg is much worse, but because of neuropathy he just does not feel things. The gorella-cillin is not working but Albert doesn't know that. His wife and kids tell him to go to the doctor and finally he decides to do just that. His swollen leg is starting to turn a dusky color.

On examination, he is immediately put into the hospital and put on IV antibiotics while lab tests are run to determine the sensitivity of the antibiotics. His foot is badly damaged already but again, Albert really can't feel the pain. Try as they might, because of his poor circulation, the antibiotic can not reach the infection; the infection turns to gangrene and the foot must come off.

Let's now move five years out and revisit Albert. He is now 53, depressed and when he attends picnics he laments the fact that he can't run and play catch. His depression over his state has him on antidepressants. He already had erectile dysfunction, but now because of the anti depressants he is not really interested. His wife 15 years his junior still has a normally functioning libido and marital discord is showing up.
Albert's other leg is starting to break down due to the added stress.

Move out 3 more years. Albert has just come back from the hospital, for treatment of an ulcer that developed on the stump of the other leg which was removed. He is just like a lot of diabetics that lose a leg. They will lose the

other in about 5 years from the added stress. His numerous bouts with infection, the diabetes, his impacted immune system, and the numerous experiences with antibiotics find that his system is easily colonized with antibiotic resistant bacteria. He is relegated to a wheel chair, on heavy meds for depression and has not worked full-time for two years. He lives in a small subsidized housing system. His wife left him and he sees the children on alternate weekends. He is now seeing a cardiologist because his cardiovascular tree is coming apart. In losing his legs he also lost the calf pumps. The calf pumps, contraction of the calf and foot muscles, move the blood back to the heart through a series of check valves in the veins and thus pre-load the heart for normal circulation to occur. Thus Albert's heart is not preloaded and this causes deterioration of the entire cardiovascular tree.

Do you think the Water Quality Board staff will come to visit him in his room at the dingy public assistance rooming-house and cheer him up or lay flowers on Susie's grave?

Pathogens in reclaimed Water
Reclaimed water rules

[1] Emerging Infectious Diseases (Vol. 11, # 9, Sept 2005 @ p. 1389 et seq)

From: Edo McGowan
To: Saiz, Steve@Waterboards; Bernados, Brian@Waterboards; Olson, Anne@Waterboards; JohnAckerman
Subject: FW: APUA Newsletter Vol 32 No 2
Date: Friday, September 05, 2014 5:48:15 PM
Attachments: APUA Newsletter Vol 32 No 2.pdf

For those of you attached to the regional water boards, there are some articles in this newsletter that would be of use in gaining a broader idea of the risks associated with wastewater systems and hence the use of recycled water. Note that the products from wastewater have the potential for adverse impacts accruing to their usage, hence impacts that a regulatory agency needs to seriously consider.

To Steve Saiz,---Steve, this newsletter should become part of my overall comment on the 2014 Triennial Update.

To Brian Bernados, this news letter should be considered as submitted background information on the move to use recycled water for aquifer recharge.

From: Katherine.Broecker@tufts.edu

Subject: APUA Newsletter Vol 32 No 2
Date: Fri, 5 Sep 2014 20:39:22 +0000

Dear Edo,

Thank you again for all of your contributions and dedication on your manuscript. Your prompt responses and attention to detail made it so easy to get this ready for publication and it is much appreciated.

I have attached the final version of the August APUA Newsletter Volume 32 No. 2 in its entirety. The newsletter is also posted on our website (http://www.tufts.edu/med/apua/news/newsletter_60_2110964016.pdf)http://www.tufts.edu/med/apua/news/newsletter_60_2110964016.pdf should you wish to forward onto friends, family, and colleagues.

We enjoyed our close collaboration and hope you are pleased with the final result. Please do not hesitate to reach out to us, should you need anything in the future.

Best,

Katie Broecker
Global Public Health Project Coordinator
Alliance for the Prudent Use of Antibiotics
www.apua.org

August 2014
Volume 32, No. 2

APUA® NEWSLETTER

PUBLISHED CONTINUOUSLY SINCE 1983 BY THE ALLIANCE FOR THE PRUDENT USE OF ANTIBIOTICS

Tracking Antibiotic Resistance Genes in the Environment

FEATURE ARTICLES

3 Introduction to this issue
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Introduction to this issue

by Bonnie Marshall and Katherine Broecker (APUA staff)

With the current spotlight focused nervously on the Ebola virus outbreak, the whole matter of vector transmission in the environment has advanced to the forefront of attention. In our ever more closely entwined global society, the issue of environmental vectors and transport can no longer be ignored. The relatively recent formation of the "One Health Initiative" (http://onehealthinitiative.com) as a more holistic approach for addressing health and disease issues in our tightly knit global community, has highlighted the need for attention to the intricacies of animal, human, insect, water and soil interconnectedness and the vectors that overtly or subtly interface with pathogens and non-pathogens in these environments.

This issue of the APUA Newsletter explores the concept of resistance genes as emerging contaminants or pollutants in our environment and examines a small sampling of the environmental niches that are impacted by antibiotics, The total tonnage of antibiotics applied in humans and animal husbandry is disputed, but up to 95% of the antibiotics consumed are excreted in an unaltered state. This antibiotic "spillage" from excretion and discarded drugs ends up in the environment – rivers, streams, farmlands and even waters processed and reclaimed through water treatment facilities.[1]

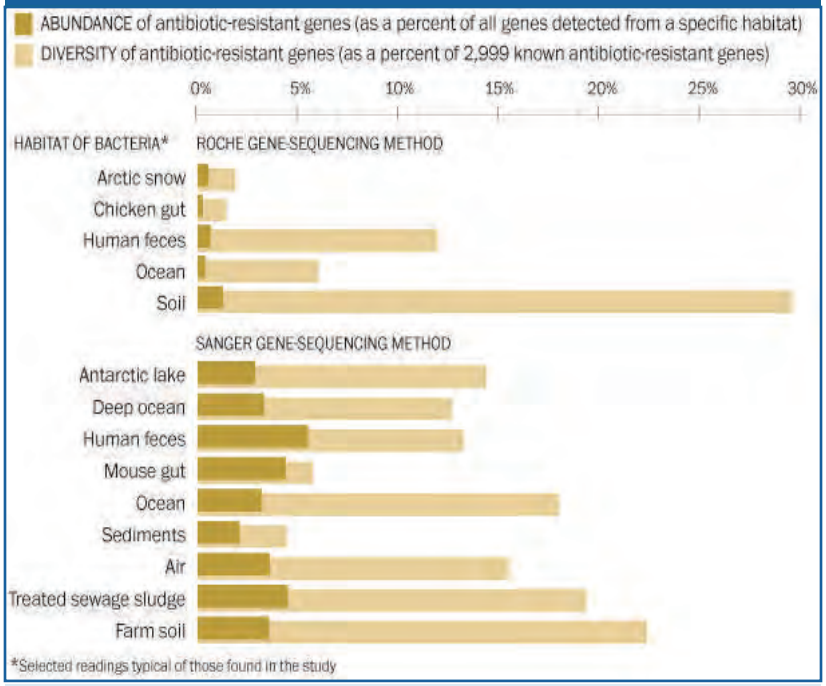
The increasing reports of antibiotics in our environment indicate wide dispersion through our ecosystem via multiple and complex pathways, many of which are largely unexplored in terms of resistance gene transmission. As "societal" drugs, antibiotics have profound ramifications—far beyond the boundaries of the original consumer. Persisting at levels well below the original therapeutic doses, these contaminants are capable of inducing, selecting and generating antibiotic resistance genes (ARGs) that have now also been identified in a wide variety of environmental niches (Fig. 1). This propagation of ARGs in the environment makes them unique among contaminants. Through low-level selection pressure and the process of horizontal gene transfer, ARGs may be multiplied through pathogens and non-pathogens alike, including distantly related species. Moreover, they may persist with, or without, a viable host. ARGs are known to coalesce into movable "cassettes" of resistance genes (integrons) and even "superintegrons," which reportedly contain over 100 cassettes. The co-existence of these linked genes indicates the potential for cross-resistance, i.e., the ability to resist multiple antibiotics when confronted with only a single drug. [2]

Wastewater processing breeds resistance genes

This Newsletter issue focuses on some of the often overlooked elements of the environment that play varying, but potentially significant roles in the dissemination of ARGs. Water is an element that interfaces all our environmental niches. Recent efforts in water conservation have forced the issue of water reclamation, accompanied by an upsurge in interest in how these processes affect the spread of pathogens and antibiotic resistance.

The article by McGowan takes a closer look at the structure, age and function of our wastewater treatment plants (WWTPs) and examines their shortcomings in dealing with the problem of propagating and spreading resistance genes. WWTPs are interfaces between multiple different environments (domestic, industrial, healthcare) and have become a reservoir for the convergence of pathogens, opportunistic pathogens and environmental bacteria. Even the most high-tech plants may be

Figure 1. Ubiquity of antibiotic resistance genes in natural habitats



Source: Clark P. 2014. Antibiotic Resistance found everywhere. Washington Post. Original data from: Nesme J, Cecillon S, Delmont TO, *et al*. 2014. Large-scale metagenomic -based study of antibiotic resistance in the environment. Current Biol. 24(10):1096-1100.

fertile breeding grounds for antibiotic-resistant superbugs, and some multi-resistant strains reportedly can resist as many as 7 or 8 antibiotics.[3] Of interest in this regard is the recent collaborative study between Rice University (Texas, US) and Nankai and Tianjin Universities (China) which garnered the Grand Prize in University Research for their work on the proliferation of NDM-1 positive superbugs in Chinese activated sludge treatment plants. Four to five-fold more highly resistant NDM-1 positive strains were exiting the wastewater treatment plant than entered it, and the resistance genes remained transferable to other benign bacteria.[4]

Of recent concern are the outputs of WWTPs—the sludge and treated wastewater (multi-stage treated, plus UV and bleach), the latter of which is circulated through so-called "purple pipes" and subsequently dispensed for irrigation of golf courses, grounds of city schools, sports fields and municipal parks. Biosolids (dry sewage) application is a common practice that disperses unknown amounts of both antibiotics and resistance genes. While this practice has been banned in Switzerland, the Netherlands and parts of Canada, in the US alone, millions of tons of biosolids are generated and about one -half is processed for use as fertilizer.

The effects of individual wastewater treatment processes are largely unknown and study is needed on both the fate of the antimicrobials and the resistant bacteria themselves. Antibiotics may be reduced as much as 85 %, (e.g., norfloxacin and ciprofloxacin), remain unchanged (e.g., enrofloxacin), or actually increase in these processes. (e.g., nalidixic acid).[5] Although seemingly eliminated from effluent, antibiotics are actually adsorbed to sludge, rather than undergoing biodegradation, and can persist in sludge for long periods. Because ARGs are now so widely dispersed in the environment and sometimes display high background levels, it can be challenging to determine what constitutes elevated levels of greater concern. While evidence points to a proliferation of resistance genes within the WWTP transport pipes themselves, the implications of finding resistance genes at sludge application sites are as yet unknown. The lack of sufficient data prevents an assessment of quantitative health risks at present.[6]

Establishing causal links

While an abundance of ARGs in the greater environment is not disputed, the greater challenge has been demonstrating the causal links between antibiotic use in one environment and disease emergence in another – particularly with regard to the substantial use of antibiotic growth-promoters in animals. Nonetheless, with recent rapid advances in the newer molecular technologies (i.e., sequence-based metagenomics), microbial hosts from different communities can be compared and the links between these environments are becoming more evident.[7]

In a recent issue of the APUA Newsletter (volume 25 issue 2), the significance of extended-spectrum beta-lactamase (ESBL)-producing bacteria was discussed in depth. Here, the article by Hachler and Stephan demonstrates how tracking of ESBL genes can be an ideal model for examining the many environments that interface with humans. Their studies of humans, wildlife, pets, farm animals, food and water illustrate the scope of spread of ESBL genes and highlight in particular the role of WWTP in disseminating and concentrating ESBL types that are shared with humans.

A third area addressed in this *Newsletter* is the less well-recognized role of insects, which harbor considerable potential for dispersing bacterial pathogens and facilitating the spread of resistance genes to and from pathogens in our environment. The article by Ghosh and Zurek looks more closely at these vectors, examining the exposure of insects to antibiotics used in food-animal husbandry and the habitats of excreted manure that provide ideal breeding grounds for these insects. Not surprisingly these authors show evidence for the sharing of multidrug-resistant clonal lineages between insects and the manure of commercial swine operations. Their tracking then extends to the environs of restaurants, restaurant food, and wastewater treatment facilities, following in particular, *Enterococcus spp*.

As highlighted in the recent WHO report, there is a crisis in antibiotic resistance that demands urgent action for this complex problem. In addition to the dire need for new antimicrobials, a reduction in antibiotic overuse is mandated. Actions to mitigate contamination through environmental pathways are also warranted, but these are not yet addressed by WHO.

Noting that formal risk assessments are necessary—but will only postpone the crucial action needed—Pruden *et al* in their recent critical review, outline multiple options that can be implemented immediately, but often at minimal cost. They identify simple strategies, such as nutrient management, runoff control, and infrastructure upgrades that work synergistically with current policies.[6] Clearly new capture technologies are needed. One such novel removal method would engineer the native bacterial efflux pump (Acr-B) by coupling it with a solar -driven proton motive force (Delta rhodopsin) in a membrane-bound vesicle. In the presence of direct sunlight, the vesicle system can selectively capture twice the volume of antibiotics

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Transfer of extended-spectrum β -lactamase (ESBL)-producers at the human-food chain-environment-wildlife interface in Switzerland

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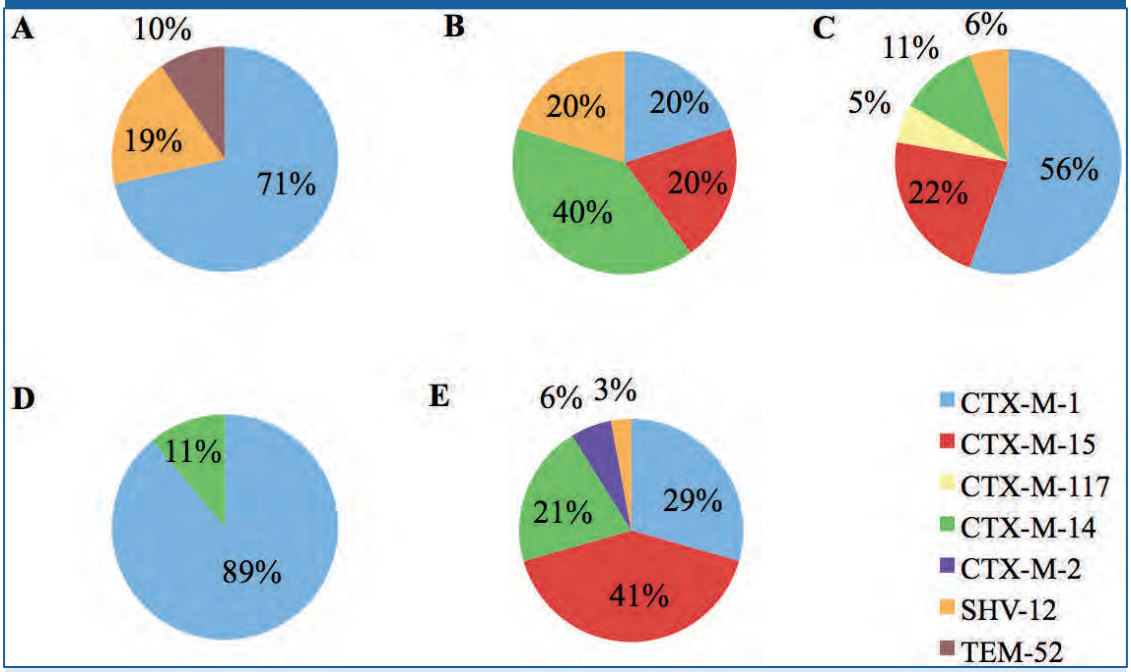
Extended-spectrum β-lactamases (ESBL) are the resistance determinants most appropriate to serve as a model to show the dissemination of antibiotic resistance from the human to the non-human environment. This, for a number of reasons: (i) β-lactams are the earliest antibiotics, and are in clinical use since the 1940s, (ii) because of their perfect selective toxicity, they are the most popular antibiotics being administered in nearly two thirds of all human antimicrobial treatments worldwide, (iii) a vast number of chemical derivatives of β-lactams, including five generations of cephalosporins have been developed (iv) thus, enormous selective pressure has been exerted by β-lactams, prompting bacteria to adapt through evolutionary diversification and fine tuning of resistance factors, and (v) extensive research on β-lactamases over decades has facilitated the development of tools for rapid detection, as well as easy and precise molecular characterization.

The first β-lactamase was discovered in 1940,[1] almost simultaneously with the introduction of the first penicillin into clinical practice. The first plasmid-mediated and horizontally transferable β-lactamase in *Escherichia coli* - TEM-1 - was described in 1962 and hydrolyzed penicillins and first-generation cephalosporins (1G-Ceph) soon followed by SHV-1 with a similar substrate spectrum. During the 1970s and early 1980s, 2nd and 3rd-generation cephalosporins (2G-Ceph and 3G-Ceph) came into market, followed by the 4G-Cephs in the 1990s. These new formulations were to become indispensable for clinicians, and were accordingly over-used. Consequently, bacteria became exposed to heavy selection pressure and reacted by optimising their β-lactamase structures. Starting from the broad-spectrum β-lactamases TEM-1 and SHV-1, two whole families, TEM- and SHV-ESBLs, arose through microevolutionary processes that led to few amino acid substitutions, thus extending the substrate

Figure 1. Prevalence in Switzerland of *bla*$_{ESBL}$ genes in *Enterobacteriaceae* of farm-animal or healthy-human origin.



A: chickens; B: sheep, C: cattle; D: pigs; E: healthy humans. (Graphics taken from Ref. 7 with written permission from the original publisher).

spectra to also include 2G-, 3G- and 4G-Cephs and monobactams. The first such ESBL, SHV-2, was described in Germany in 1982,[2] followed by TEM-3 in 1987.[3] Not only did these two ESBL families grow to encompass further types, but at least two more families conferring an ESBL phenotype were discovered, the most important being the cefotaximases of the CTX-M type. Bush *et al.* provided a classification system,[4] and Jacoby and Bush set up an internet platform for all authors reporting new β-lactamases (http://www.lahey.org/Studies/). This platform - when accessed in August 2014 - had 219 TEM-, 188 SHV-, and 159 CTX-M β-lactamases on display: truly a formidable evolutionary record by the bacterial pathogens within just three decades.

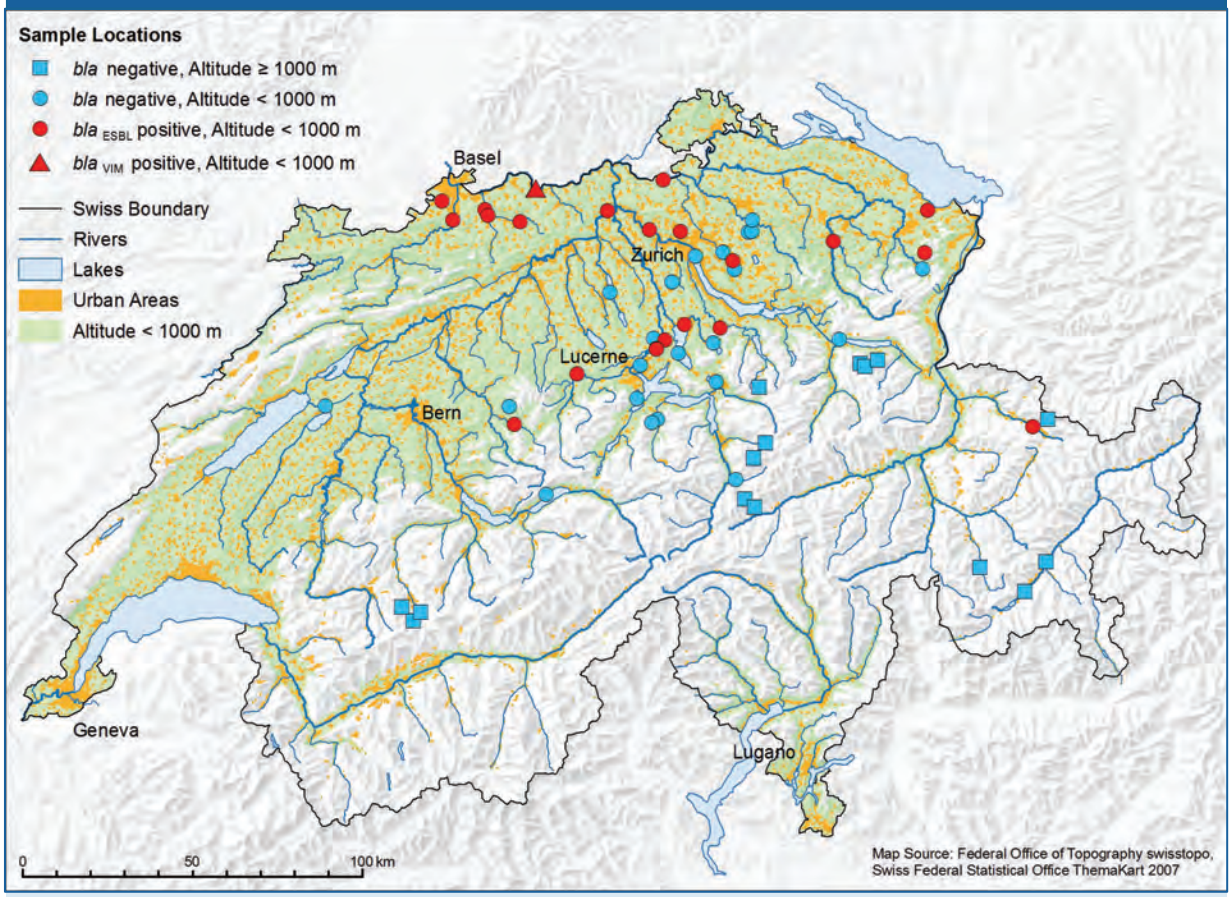
Bacterial isolates producing ESBLs also underwent a remarkable development, and, with time, became an issue of much concern. Although ESBL-producers were at first sporadic, opportunistic pathogens—mainly *E.coli* isolated from long-term hospitalized patients—they were soon found responsible for nosocomial outbreaks. Moreover, ESBL-encoding plasmids were soon transferred horizontally into many other species of *Enterobacteriaceae*, including obligate pathogens such as *Salmonella* sp., and even non-fermenters, including *Pseudomonas aeruginosa*. By the end of the century, ESBL-producers had disseminated around the world, and, interestingly, CTX-M group enzymes had replaced TEM- and SHV types as the dominating ESBL family for as yet unknown reasons. By around 2005, ESBL-producers made up an ever-increasing proportion of isolates from patients of private practitioners, heralding a shift from the hospital to the general public. Thus, with some delay, this paralleled a similar tendency of the methicillin-resistant *Staphylococcus aureus* (MRSA) from hospital- towards community-acquired MRSA. This tendency, together with a illustrative flow chart showing the putative pathways of dissemination of ESBL-producers into the environment has been outlined in an excellent recent review.[5]

Switzerland is a country with highly developed industrial and food technological standards, as well as a sophisticated medical system. By installing nationwide infectious disease experts and hospital hygienists etc., it imposes strict prescription guidelines for the prudent use of antibiotics in human and veterinary clinical practice as well as in agriculture. Consequently, we decided to search for producers of ESBLs along the food chain, in patients from primary care, in healthy humans, in wild animals, and in the environment. The aim was to (i) collect sets of strains from the mentioned origins, (ii) characterize all strains in much detail using molecular methods, and (iii) compare the sets in order to gain insights into possible routes of dissemination.

ESBL-producers are most prominent among *Enterobacteriaceae*, and are by far most frequent in *E. coli*. Considering our knowledge gained from foreign studies on the shift of prevalence of such organisms from hospitals to the general public, food was primarily suspected as a vehicle, and in particular meat and animal products, because of the well-known therapeutic application of antimicrobials in animal husbandry. Consequently, faecal carriage of ESBL-producers in various farm animals and corresponding food products such as meat and milk were assayed. Faecal swabbing of cattle, pigs, sheep, and chickens at slaughter yielded ESBL-positive isolates in 13.7%, 15.3%, 8.6%, and 63.4% of samples, respectively. In contrast, no ESBL-producers were found in minced beef or pork from retailers, and neither were any of 100 bulk raw milk samples contaminated, although one sample (withheld from market because of mastitis) grew a producer of CTX-M-14 ESBL.[6-7] However, 78% of poultry samples from retailers yielded *E. coli* expressing CTX-M-1,[8] and 15% of cutting boards from a hospital kitchen grew ESBL-producers after processing of poultry meat. Again, CTX-M-1 was predominant.[9] Concurrent studies on humans in Switzerland revealed that 5.8% of healthy subjects[10] and 5.2% of primary care patients[11] carried ESBL-producers in their stool. Sequencing of the bla_{ESBL} genes from the strain sets of these studies provided an astonishing multiplicity of expressed ESBLs (Fig. 1), and even a novel type, CTX-M-117.[12] However, it became obvious that CTX-M-1 was predominant in food animals and poultry meat, while CTX-M-15 (42%) was most frequent in humans (Fig. 1). Interestingly, 8/107 (7.5%) isolates from cats and dogs with urinary tract infections also expressed CTX-M-15.[13] Considering these frequencies and the Swiss consumer habits, animal food products, particularly poultry, offer a plausible explanation for the 29% of CTX-M-1 producers found among the isolates from human ESBL carriers. However, the main proportion—the 42% of human carriers of CTX-M-15 producers—could not be explained by these studies.

Prompted by the relatively high ESBL prevalences encountered within the realm of humans and farm animals, the scope of the investigation was extended to cover wild animals and the environment. Among a total of 235 hunted ibex, chamois, red deer, and roe deer, a single roe deer was identified as a carrier of *E. coli* expressing CTX-M-1. It had been shot in a rural area

Figure 2. Map of Switzerland showing surface waters, urban areas, and altitude discrimination along with sample locations and ESBL/carbapenemase status.



Graphics taken from Ref. 17 Zurfluh K, Hächler H, Nüesch-Inderbinen MT, *et al*. 2013 with written permission from the original publisher.

of the central lowlands of Switzerland, where nocturnal grazing on a cow paddock could not be excluded.[14] Among 298 street pigeons from the City of Zürich, one carried a producer of CTX-M-15. Of 30 great cormorants one each was a carrier of *E. coli* expressing CTX-M-15 or CTX-M-27, respectively.[15] Sampling 139 fish (8 species) caught in two Swiss lakes (Lake Zürich and Lake Thun) we identified 26 (18.7%) as ESBL carriers. Some even carried multiple strains, yielding a total of 32 ESBL-producers and one producer of plasmid-mediated AmpC β-lactamase. Interestingly, the most frequent ESBL type was CTX-M-15 (13/32 [40.6%]).[16]

Eventually, a systematic investigation into surface waters covering the German part of Switzerland was performed, whereby 40 rivers and 18 lakes from urban and rural areas, including low and high altitudes, were surveyed by means of filtering 500mL per sample for examination. The results are depicted in Fig. 2. Alarmingly, 21 of the 58 samples from the water bodies (36.2%) yielded a total of 74 *Enterobacteriaceae* producing ESBLs.[17] A variety of ESBL types were found. However, as found in healthy humans, CTX-M-15 was the dominating type (62%). Moreover, ESBL-producers were clearly confined to the urban areas, while samples from altitudes above 1000m remained negative even though sampling had been executed during the alpine summer farming season (Fig. 2, red circles and blue squares). Very worrisome was the detection of a *Klebsiella pneumoniae* strain expressing VIM carbapenemase (Fig. 2, red triangle).[17-18] VIM belongs to a relatively recently discovered family of metallo β-lactamases that, unlike the ESBLs, compromises the last remaining effective treatment option among the β-lactam antibiotics—the carbapenems.

In conclusion, ESBL-producers are extremely widely disseminated in humans, in food animals and pets, in various wild animals, and even in the urban low altitude surface waters in Switzerland. Careful determination of ESBL types has yielded convincing evidence that outlines four major findings: (i) food animals, particularly poultry, are an important reservoir of *E. coli* producing CTX-M-1 ESBL and may be

responsible for a part of the ESBL-producing *E. coli* that colonize humans; (ii) although the reservoir of CTX-M-15-producers has not so far been discovered, CTX-M-15 is the most frequently found ESBL (41%) among the 5.8% of healthy humans excreting ESBL-producers; (iii) humans and pets largely share the same ESBL type, CTX-M-15; and (iv) surface waters and humans share the most frequent ESBL type, again CTX-M-15. The latter finding strongly suggests that CTX-M-15-producers may be disseminated by human sewage via waste water treatment plants (WWTP) into the environment. This view is convincingly supported by a very recent French study showing that ESBL-producing *E. coli* are less efficiently eliminated by WWTPs than are susceptible *E. coli* of the normal flora, and are thus relatively enriched.[19]

Finally, owing to the fact that ESBLs are almost exclusively encoded on conjugative plasmids, they are currently so evenly disseminated over a plethora of different clones of *Enterobacteriaceae* that any endeavour to trace particularly promiscuous clones—e.g., by genetic typing of chromosomal backgrounds with pulsed field gel electrophoresis—must fail (e.g., Figure 1 in Ref. 6). In order to generate even more precise data on the routes of dissemination than is shown in this review, there will therefore be no way around laborious genome sequencing of whole series of the involved conjugative plasmids, as has been attempted in a recent pilot study.[20]

Acknowledgements

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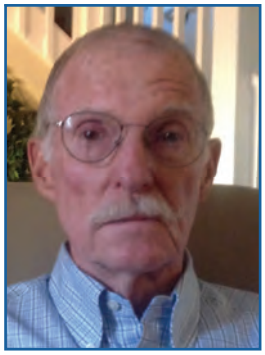
Antibiotic resistance genes in wastewater treatment and reclamation: hazards and challenges



Edo McGowan, PhD (retired/Emeritus): Dr. McGowan has over 40 years' experience in the development and direction of local, regional, and international programs and policy relating to health aspects of water quality, vector control, the analyses and disposal of hazardous materials, and the use of water as a vehicle for bioterrorism.

The undisputed current reality is that we are losing our antimicrobials to resistance, hence, a potential loss of an effective defense against increasingly serious pathogens.[1] This is not news. Nonetheless, I'd like to broaden the context of this discussion beyond addressing prudent use of antimicrobials and consider controllable "things" that are generating resistant bacteria and why those "things" are ignored.

We have seen the basis of antibiotic-resistant infections expand from narrowly confined classic sites, such as hospital ICUs, to the community at large. Through the ease of modern transport, this community disbursement has broadened to all corners of the globe. Because this expansion has been a relatively recent event, questions of community sources remain essentially unanswered and largely under investigated. What do we find in the community at large that might be a reservoir for resistant pathogens? Are these pathogens circulating back into hospitals and again into the community? How might we demonstrate such? If we could identify a common causative factor, would that factor be controllable? Would there be the political will to control? What kinds of technologies, policies and expenditures would be needed?

In fact, there is such a source embedded in our communities. It is directly connected to hospitals, is currently inadequately controlled (but potentially controllable), and generally ignored at the industry and regulatory levels. This source is wastewater—but wastewater viewed within a broader context than is typically considered.[2-11]

Wastewater is derived from potable water that has been utilized and subsequently discharged to sewers. It generally undergoes some type of processing in a wastewater treatment plant (WWTP) and is then released back into the environment—usually into a river or lake where that water will again be used for supplying drinking water and irrigation water for food crops (Fig. 1).[10, 12-17, 19, 22-26]

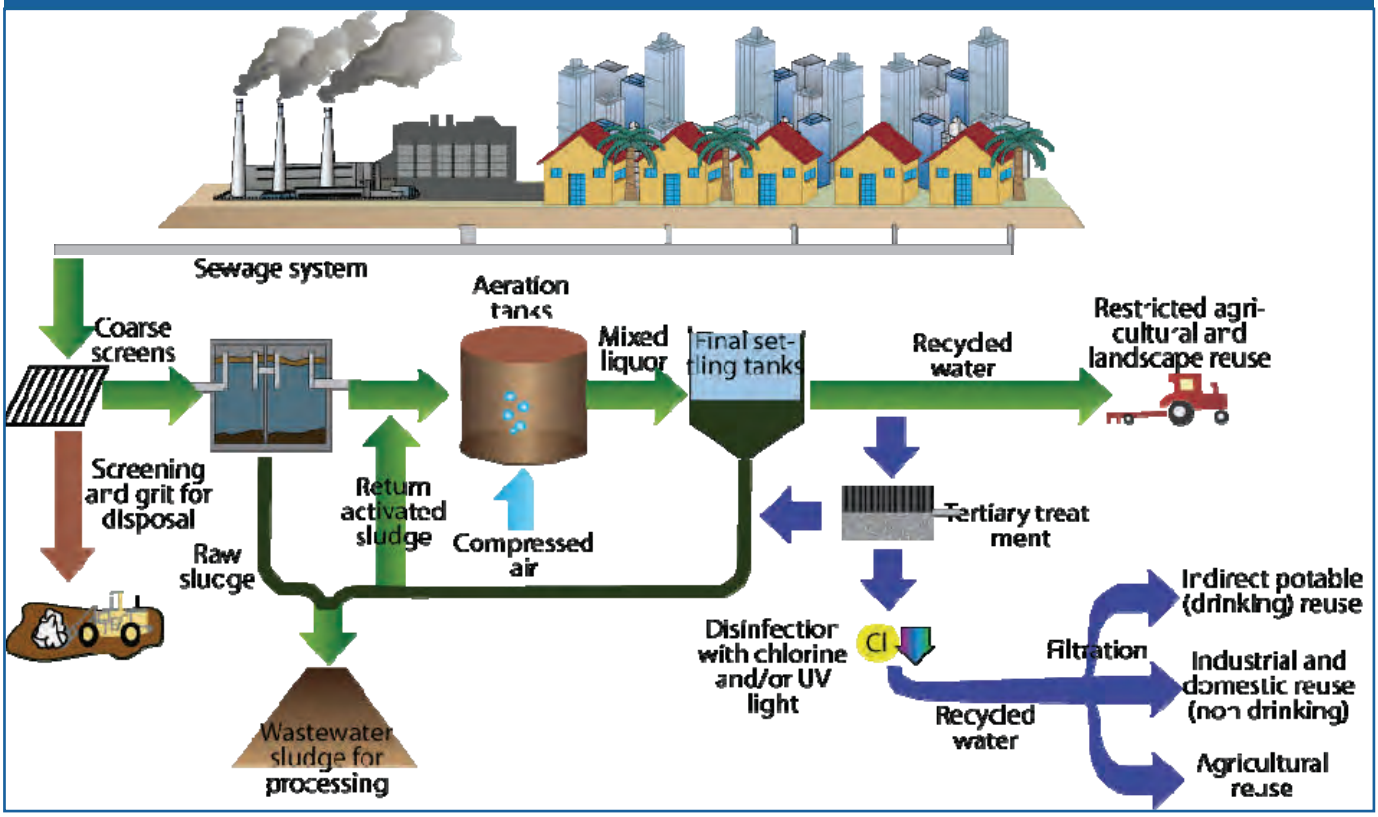
Propagation of antimicrobial resistance

The close juxtaposition of sub therapeutic levels of discarded and excreted antimicrobials, together with microbes in a WWTP, fosters gene exchange, thereby enhancing resistance. Several major studies have demonstrated this.[6, 10-11, 14, 16-18,27] In one study,[27] the authors followed fecal coliforms, tracing the movement and frequencies of resistant bacteria through a WWTP at various locations along the treatment process, i.e., the inlet, primary sedimentation tank, activated sludge digestion tank, final settling tank, outlet and return activated sludge drain. Both resistant and susceptible bacteria were tracked and examined for the presence of drug resistance plasmids. From 900 individual isolates tested for resistance to tetracycline, kanamycin, chloramphen-icol, streptomycin, ampicillin, nalidixic acid, rifampicin, and sulfisoxazole, more than half contained plasmids encoding multi-drug resistance.[27] While this was interesting, another finding raised even greater concern. The further along that the wastewater progressed through the treatment process, the greater the tendency was to encounter strains that had developed multi-resistance and simultaneously carried transferable drug-resistance plasmids. Thus, the development of drug resistance and the transfer of multi-drug resistance are enhanced in WWTPs.[27] Similar findings were reported as early as the 1950s and documented for decades—but without an effective (or long-term) response from industry or the regulatory community. In an era of seemingly abundant functional antibiotics, this may have been viewed as a non-issue. But today is an altogether different scenario.

Dispersal of resistance genes into the environment

Current academic studies on some of the nation's most sophisticated sewer plants document that they are discharging resistant microbes and antibiotic resistant genes (ARGs)[28] in

Figure 1. Conceptualized modern wastewater treatment plant (WWTP)



The above diagram conceptualizes the many processes that may be involved in the treatment of sewage and wastewater derived from a diverse set of community services (domestic, industrial, health care, etc.). The resulting products are 1) sludge, which may be applied to agricultural farmlands; and 2) recycled water products, both potable and non-potable. The latter is increasingly utilized for irrigation of farmlands as well as municipal parks and recreation fields. Antibiotics escape capture by the current non-specific activated carbon filtration methodology, due to their relative low abundance. While reverse osmosis will accomplish this goal, it is still relatively costly.

Source: "Tropical Connections: South Florida's marine environment" (pg. 101) http://ian.umces.edu/imagelibrary/displayimage-lastup-0-7574.html

impressive amounts directly into US rivers and lakes, from which other cities subsequently draw drinking water.[13] However, because of current antiquated standards and non-action by regulators, this is perfectly legal. Researchers are also documenting the passage of ARG's into drinking water supplies.[29, 30] These resistant organisms are also present in reclaimed (recycled) sewer water which is already legally allowed to be used on vegetables consumed raw and to recharge ground water basins used for drinking water.[31]

Chlorine and ultra-violet light are the two main forms of disinfection used by the water industry. The emergence of organisms resistant to chlorine used in water treatment have now been reported.[32, 33] Chang, et al, (2007) noted that exposure of *Staphylococcus aureus* to chlorine causes shifts in the genes that enhance virulence factors.[33] Resistance genes and genes involved with virulence are essentially unaffected by both chlorine and UV when used at the levels found in water treatment.[13, 35, 36] Additionally, the filters typically used by industry do not stop through-put of these genes.

Some of these same authors have also examined the reclaimed (recycled) water which is used ubiquitously for irrigation of municipal parks and school playing fields.[37] These studies are again finding impressive numbers of ARGs and pathogens in the delivered, presumably disinfected and finished reclaimed water.[38-40]

Resistant bacteria can transfer their ARGs to the intestinal microbes of humans and animals. That information may persist for years — contributing to increased resistance in higher grade pathogens through interspecies transfer.[41]

Outdated and failing systems

Although water processing is regulated, controls of

such systems (WWTPs and drinking water plants) are based on engineering and operational standards/concepts that predate the antibiotic era. Wastewater treatment plants (in the U.S. and globally) were never designed to fully eliminate pathogens[42] and their resistance genes. Additionally, the standards under which these plants operate (e.g., water quality standards of the US, as well as those of the World Health Organization [WHO]), do not effectively consider the realities of numerous pathogens as well as resistance nor the complexities caused by modern industrial waste discharged to sewers. Overwhelmed and unequal to the task, our current wastewater treatment plants are failing.

Regulatory shortcomings

Typically, the water industry has been in control of this failing process. The challenge has outstripped the cumulative control capacity of those in charge, including the regulatory community. Such loss of control encompasses the generation of antimicrobial resistance and other critical contaminants that are presumably removed in the waste water treatment process.[5, 10-25] In addition, other constituents of concern interact with both sewage and its byproducts with little effective oversight or investigation by the regulatory community.[28]

The subject of wastewater plant-generated resistance was extensively studied and confirmed in the late 1970s by the US EPA, through a series of studies at its Wastewater Research Division, Municipal Environmental Research Laboratory in Cincinnati. That series of studies noted that "Several researchers have pointed out that wastewater, treated or untreated, is the primary contributor of bacteria to the aquatic ecosystem." Citing data sources that reach back into the 1950's, the report from this study continues: "Waters contaminated by bacteria capable of transferring drug resistance are of great concern since there is the potential for transfer of antibiotic resistance to a pathogenic species."[13]

Unfortunately, rather than build upon these studies to propose new plant designs, the report and any data from the study were subsequently removed from the entirety of the US EPA data base. It was as if the topic never came up. Once deleted from circulation, the subject seems to have been promptly forgotten. In fact, the Agency and its upper management seemed reluctant to even open any discussion of the topic. Freedom of Information Act requests for such information were met with non-action. The topic seemed to be taboo. Fortunately, a 1982 peer-reviewed journal article preserved the essence of the study.[13] Absent that journal article, the topic would have disappeared and with it, discussion of the issue. This journal article had been published following an extensive internal US EPA review by a scientific panel that vetted the information for accuracy (hence, for external release). The whole of the study was based originally on the author's doctoral dissertation.

The question that must be asked is, why did US EPA remove the report and all evidence of the study? That question is especially germane today because the Obama Administration is discussing large expenditures to correct deferred maintenance in US infrastructure. If we, as taxpayers, are expected to refurbish infrastructure, we should be assured that the best interests of the nation are being considered and that the best designs are presented so that generation of resistant organisms and their discharge into the environment will be finally terminated. Repouring concrete into the same old systems and forms may not only waste money, but also exacerbate the current issues regarding discharge of resistant organisms and contaminants of emerging concern.

Antiquated diagnostics

The typical water quality test used by industry is the Most Probable Number (MPN), using coliforms as the indicator. That test is known to have serious flaws. [19, 40, 42] The point within the system where these tests are conducted also plays a critical part in how that water is viewed. Typically, industry and regulators choose to test bacteria at the point of release (POR) from the processing plant, but almost never at the point of use (POU), which can be miles down the pipe. Investigators who test at both the POR and POU are finding demonstrably higher indicator bacteria (coliform counts) at the POU (Fig. 2).[43] Susceptibility testing (by Kirby-Bauer disk diffusion) at both the POR and POU typically finds multi-drug resistant bacteria. However, industry does not employ this test. Using the state standard MPN test at the POR often finds low (or non-detectable) counts, and again, this is only for coliforms. Retesting at the POU will often detect coliform counts that are completely off the chart. Thus, something is evolving as the water travels down the pipes.[43] We hypothesized that it is resuscitation of the indicator bacteria from a viable but non-culturable (VBNC) state, or the sloughing of biofilms, or both.[43] Also, these high counts at POU were not a simple momentary blip in the system, but rather found to be a constant state. Using the state standard tests, (i.e., MPN on coliforms) a positive reaction would ***not*** be expected from bacteria in the VBNC state. It is thus easy to obtain a false negative.[19] The regulatory community is aware of this—but seems disinclined to correct it.

Addressing shortfalls

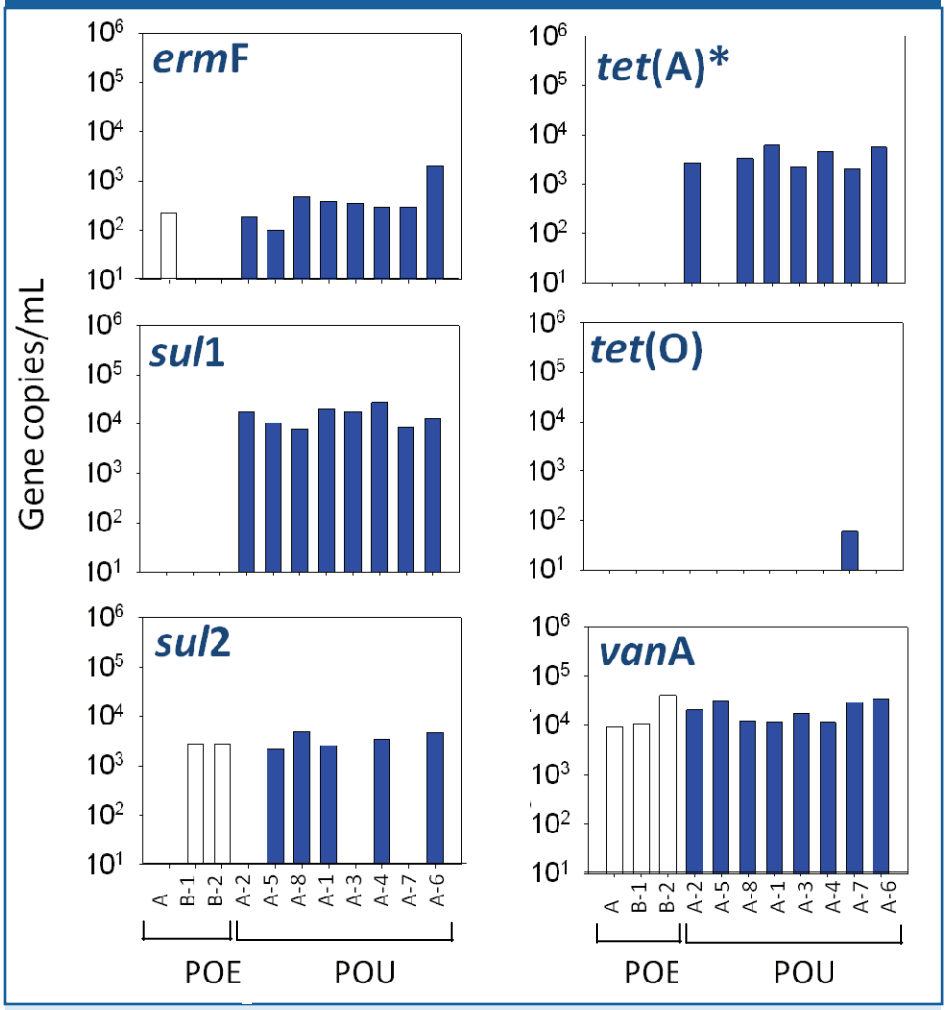
In summary, obtaining an effective grip on the increasing levels of multi-drug resistant pathogens and their antibiotic resistance genes will involve far more than a mere call for prudent use from within medicine. A coordinated, multi-disciplinary approach will be needed. To give the reader some perspective regarding the bureaucratic challenges, the following is offered:

At the 2006 Environmental Law Conference in Yosemite an interesting insight exposed how the effects of dysfunctional regulators can impact Public Health. The topic was presented vis-a-vis analyses of "non-action". One paper addressed the inadequacies of WWTPs in the removal of pharmaceuticals. Current WWTP designs accelerate the shift from solids into solutions and this is why we now have pharmaceuticals in our drinking water. Other contaminants—such as carcinogens, mutagens, endocrine disrupters, and fire retardants, etc., pass through without being effectively removed or filtered out.[44, 45] Consequently, recharge of aquifers with reclaimed water carries serious risks.

Of particular interest at the Environmental Law Conference was the analysis of the Safe Drinking Water Act (SDWA) by one of the conference US/EPA drinking water toxicologists. Keep in mind that he was discussing drinking water, which must now include the "toilet to tap" conversion of reclaimed sewage into drinking water that is being proposed across the nation. The toxicologist concluded with the following: “Bottom line on almost all of the ‘emerging’ contaminants that have attracted attention: It will be a long time, if ever, before they are regulated under the SDWA.” But, industry is bound by what is in statute, regulation, and standards. Under existing law and standards, industry cannot just move to correct many of these issues. We are on the horns of a dilemma. It would be illegal to do so. Nonetheless, should we allow them to fall back on the adage—“but we meet state standards"?

The treatment and discharge of wastewater, under existing standards, creates the perfect storm for the production and dispersal of resistant pathogens back into the commons. Discharged sewage effluent is, however, a ubiquitous but currently legal carrier for spreading multi-drug resistant pathogens. Getting a grip on the increasing levels of multi-drug resistant pathogens (MDRP) and their antibiotic resistance genes (ARGs) will involve far more than a response from within medicine for prudent usage. Needed will be a coordinated multidisciplinary

Figure 2. Recovery of selected antibiotic resistance genes from treated wastewater transit pipes



The above graphs highlight the importance of considering the bacterial activity that transpires as treated water flows through WWTP pipes from point of exit (POE, clear bars) to the point of use (POU, solid bars). The presence of *vanA* (detectable throughout) is noteworthy because vancomycin is a drug of last resort for MRSA, a common community infection.

POE samples represent 2 WWTPs (A, B) that emit water to a co-mingled distribution system.
WWTP A: 1 site tested; **WWTP B**: 2 sites tested; POU= 8 different sites tested randomly.
*Shows significant differences in ARG concentrations between POE and POU samples ($p<0.001$).

Source: Adapted from Fahrenfeld et al. Ref 43.

approach that in-stitches issues arising from political economy and acknowledges the fact that there is widespread clientele capture by industry of its regulatory community. To understand this, and hence gain the necessary control, will include incorporating several non-medical disciplines from various other sciences. This interdisciplinary interaction will also require broadly based generalists to act as coordinators and interpreters for discussions amongst and between the various and generally disparate and highly technical disciplines.[46] The end result then needs to be distilled into carefully crafted transparent policies, new standards, and development of clearly directed law. This may heighten emphasis and focus on the changing areas of public health and public health law generally that seem to have been neglected or sacrificed to the political calculus.

The author and staff greatly appreciate the valuable assistance of Amy Pruden, PhD.

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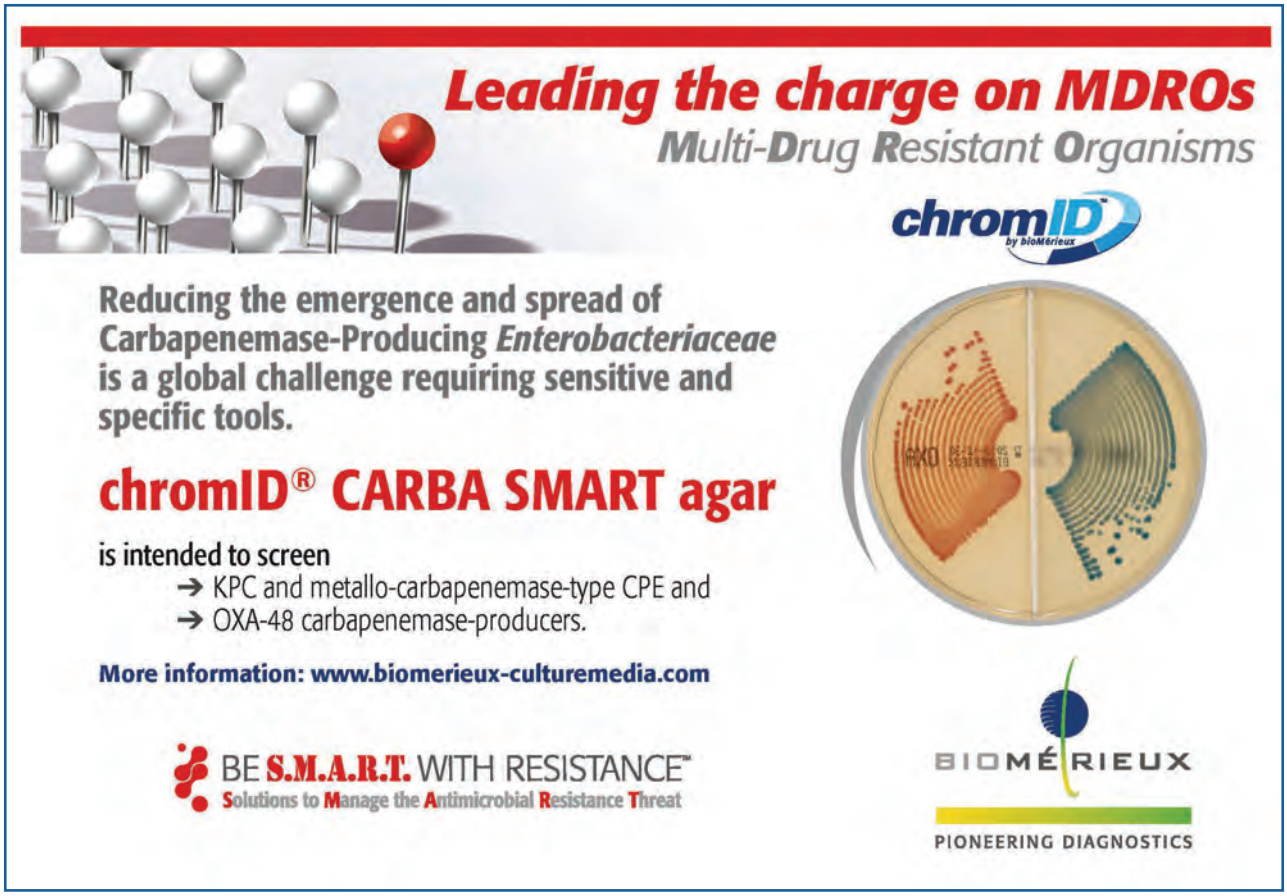

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Do insects spread antibiotic resistance traits from waste to fork?

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Insects are a numerous and diverse group found in many environments; however, their potential to play a role in the ecology of antibiotic resistance traits has not been well recognized.[1] With continuing urban expansion into agriculturally zoned areas, the concern in the public health community about insect pests, such as flies and cockroaches associated with animal productions and waste treatment facilities, has increased because of the capacity of these insects to spread zoonotic food-borne pathogens. Flies and roaches have a great potential to disseminate fecal bacteria because of their developmental habitat, unrestricted movement, mode of feeding, strong attraction to human food, and synanthropic nature.[2,3]

Bacteria proliferate and share antibiotic resistance genes in the insect gut

Bacterial proliferation and transfer during insect feeding has been demonstrated previously in house flies for *Escherichia coli*.[4,5] We used a GFP-labeled *Enterococcus faecalis* OG1RF:pMV158 to track the fate of this bacterium in the digestive tract of house flies and to assess the vector potential of this insect for *E. faecalis*.[6] Analysis of viable fluorescing cells within various gut components over several time points revealed the highest bacterial count in the midgut in the first few hours (1-4h) after feeding, followed by a subsequent gradual decline; while the CFU peaked in the fly foregut (crop) after 48h and remained high until the end (96h) of the experiment. This suggested that *E. faecalis* was digested in the midgut, but proliferated in the crop.[6] Bacterial proliferation in the house fly crop and digestion in the midgut have also been reported for *Aeromonas hydrophila* and *Pseudomonas aeruginosa*.[7,8] This is important because the content of the crop, including associated bacteria, is typically released on a food source by house fly regurgitation during feeding.[2,9] Furthermore, we also directly assessed the ability of house flies to contaminate ready-to-eat food with enterococci under laboratory conditions.[10] Within 30 minutes, exposure of as few as five flies collected from a cattle feedlot resulted in an average of ~10^3 enterococcal CFU/g of crop deposit on the food (beef patty from a hamburger).[10] These studies further support the notion that house flies can act not only as a mechanical, but also as a bioenhanced vector for bacteria, and have great potential to contaminate substrates by microbes during feeding and by defecation.

In addition, the potential for horizontal transfer of genes coding for toxins and antibiotic resistance among bacteria within the digestive tract of house flies was also evaluated. Petridis et al.[11] observed relatively frequent (10^{-3} to 10^{-2} transconjugants per donor) transfer of genes for chloramphenicol resistance and the Shiga toxin among strains of *E. coli* in both the midgut and crop of house flies 1h post-feeding. Our study showed that the tetracycline resistance gene (*tetM*) on a pheromone-responsive plasmid pCF10 was frequently (10^{-5} to 10^{1} transconjugants/donor) transferred between *E. faecalis* strains in the house fly mouthparts and digestive tract within 24h after exposure.[12] The implications of these studies are significant to public and animal health as they point to the ability of bacteria to actively share toxins and antibiotic resistance genes within the house fly gut beyond what is consumed initially by the fly and beyond simple bacterial proliferation.

Insects on animal farms carry antibiotic-resistant bacteria

Extensive use of antibiotics, especially as growth promoters, in the animal industry has resulted in great pressure for evolution and selection of antibiotic-resistant bacteria in the food-animal environment.[13,14] Many antibiotics used as growth promoters are poorly absorbed in the animal digestive tract and are therefore released to the environment in animal feces.[15,16,17] At the same time, organic waste in and around animal productions provides an excellent habitat for the development of insects such as house flies and stable flies. In addition, some animal facilities (e.g. confined swine productions) provide a new and ideal habitat for insects that are typically considered urban

pests, particularly German cockroaches.[18] As a consequence, the likelihood that the livestock insect pests acquire and carry bacteria with antibiotic resistance traits is high.[1]

The first report on the potential of flies to acquire antibiotic-resistant *E. coli* from food animals (swine and cattle) was published in 1990 by Marshall et al.[19] The Australian bush fly was reported as a carrier of multi-drug resistant *Salmonella* sp. and *Shigella* sp. on a cattle farm and in urban areas in Australia.[20] Literak et al.[21] found that house flies from two swine operations in the Czech Republic carried *E. coli* with the same antibiotic resistance patterns and genotypic profiles as those from swine manure. The same group isolated *E. coli* with identical antibiotic resistance phenotypes and genetic backgrounds from both flies and manure on a dairy farm.[22] Usui et al.[23] sampled flies (house flies and false stable flies) and cattle feces from a cattle farm in Japan and found 14.3% (13/91) of house flies, 10.3% (7/68) of false stable flies and 7.5% (7/93) of cattle feces were positive for a third-generation cephalosporin-resistant strain of *E. coli* that contained transferrable plasmids encoding the $bla_{\text{CTX-M-15}}$ gene. Pulsed-field gel electrophoresis (PFGE)-based genotypic analysis indicated that the flies carried the same *E. coli* clones that were detected in cattle feces. Extended-spectrum beta-lactamase (ESBL)-producing *E. coli* were also isolated from house flies and blowflies from two poultry farms in the Netherlands, and the genetic background of these isolates was identical to that of ESBL-producing *E. coli* isolates from the chicken manure.[24] In a study from poultry farms in the U.S., house flies collected at and near confined chicken operations carried antibiotic-resistant enterococci that matched genotypically and phenotypically those from poultry litter.[25] Our research team compared enterococci from house flies, German cockroaches, and pig feces from two commercial swine operations in Kansas and North Carolina.[26] Enterococci were detected in the majority (>89%) of all samples and multi-drug (mainly tetracycline and erythromycin) resistant enterococci were common from all three sources. Genotypic PFGE analysis of selected *E. faecalis* and *E. faecium* isolates demonstrated that cockroaches and house flies shared the same enterococcal clones that were detected in the swine manure, indicating that insects acquired enterococci from swine manure.[26] The above studies demonstrate that insects on farms commonly carry the same clonal lineages of multidrug-resistant bacteria that are found in animal feces.

Table 1. Antibiotic resistance profiles of *Enterococcus faecalis* from sludge and house flies (HF) onsite and nearby (offsite) of a WWTF.

Resistance profile	Sludge (n=88/24) *	HF onsite (n=120/44) *	HF offsite (n=98/31) *
	no. of resistant isolates (%)	no. of resistant isolates (%)	no. of resistant isolates (%)
TET	6 (6.8)	11 (9.2)	7 (7.1)
ERY	3 (3.4)	2 (1.6)	
GM			5 (5.1)
D	1 (1.1)		
TET, D	11 (12.5)	11 (9.2)	6 (6.1)
TET, S	2 (2.3)	2 (1.6)	
TET, ERY		5 (4.2)	
TET, D, GM	14 (15.9)	15 (12.5)	1 (1.0)
TET, D, ERY	6 (6.8)	6 (5.0)	4 (4.1)
TET, ERY, S	3 (3.4)		2 (2.0)
TET, ERY, NIT		1 (0.8)	
TET, D, S	1 (1.1)		1 (1.0)
D, ERY, GM	1 (1.1)		
TET, D, ERY, GM	8 (9.1)	6 (5.0)	
TET, D, ERY, S	2 (2.3)	1 (0.8)	
TET, ERY, S, GM		2 (1.6)	
TET, D, S, GM		1 (0.8)	
TET, D, GM, NIT		1 (0.8)	
TET, D, ERY, S, GM	22 (25.0)	24 (20.0)	1 (1.0)
Pan-susceptible	8 (9.1)	32 (26.7)	71 (72.5)

TET-tetracycline, D-doxycyline, ERY-erythromycin, S-streptomycin, GM-gentamicin, NIT- nitrofuratoin.
* number of *E. faecalis*/number of samples

Antibiotic-resistant bacteria in insects from restaurants, apartments, and wastewater treatment facilities

Previous studies using fly traps and multi-locus DNA fingerprinting reported random dispersal (up to 125 km) of house flies from poultry and cattle farms.[27,28] We screened the digestive tract of house flies collected at five fast-food restaurants and found that antibiotic-resistant enterococci were common.[29] *Enterococcus faecalis* was found as the most abundant species (88.2%)—harboring resistance to tetracycline (66.3% of isolates), erythromycin (23.8%), streptomycin (11.6%), ciprofloxacin (9.9%), and kanamycin (8.3%). Our subsequent study showed that ready-to-eat food from the same restaurants was commonly contaminated with antibiotic-resistant enterococci.[30] Overall concentration of enterococci throughout the year averaged ~10^3 CFU/g, with greater prevalence during the summer than the winter. The higher prevalence of enterococcal contamination among food samples in summer correlated with house fly activity. These studies implied that food served in restaurants is commonly contaminated with antibiotic-resistant enterococci and that house flies may play a role in this contamination.

Most recently, we assessed the prevalence of enterococci in house flies collected from four municipal wastewater treatment facilities (WWTF) as these sites are another potential source of antibiotic-resistant strains. Interestingly, the highest prevalence of multidrug-resistant enterococci was detected from a WWTF (sludge and associated house flies) that processed the waste from a nearby sausage factory, pointing again to animal agriculture as a source of these bacteria (Table 1).[31] Genotypic analysis (PFGE) revealed the same clones of *E. faecalis* present in the waste and in the house fly digestive tract. Doud *et al.*[31] also collected house flies from the residential environment (restaurant, apartment complex, mobile homes) close (0.7-2.0km) to one of the WWTF and found similar antibiotic resistance profiles in *E. faecalis* and *E. faecium*, although in lower prevalence, and with no clonal matches to enterococci isolated directly from the WWTF environment (Table 1).

We propose that integrated pest management should be incorporated into pre- and post-harvest food safety programs to minimize spread of antibiotic-resistant bacterial strains. In addition, the insect link between agricultural and urban environments presents another reason for implementation of prudent use of antibiotics in the food-animal industry.

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Recommended Reading

Antimicrobial Resistance Monitoring and Research Program

In response to the increasing antimicrobial resistance, the US Department of Defense founded the Antimicrobial Resistance Monitoring and Research (ARMoR) Program to aid in infection prevention and control. This network of epidemiologists, bioinformaticists, microbiology researchers, policy makers, hospital-based infection preventionists, and healthcare providers collaborate to collect relevant AMR data, conduct centralized molecular characterization, and use AMR characterization feedback to implement appropriate infection prevention and control measures and influence policy. Since it's initiation in 2009, the government-funded ARMoR program has collected and archived >20,000 isolates for further support of outbreak investigations. In an effort to update the US taxpayers and the stakeholders, this paper provides an overview of the program, its policy development and collection methods, program costs and communications, and challenges and mitigations of future outcomes.

Upcoming Events

September 5-9, 2014: Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC 2014), Washington, DC, USA

September 10-12, 2014: TEDMED2014: Unlocking Imagination: CDDEP Director Ramanan Laxminarayan has been scheduled to speak at this year's TEDMED conference (Session 4), where he will discuss an unusual, yet practical, approach to conserving antibiotics. Washington DC and San Francisco, CA, USA

September 23, 2014: Accelerating the engineering of life for human health applications, Cambridge, MA, USA

September 24, 2014: Roundtable on Improving knowledge and understanding of antimicrobial resistance (BSAC), London, England

September 27-30, 2014: 5th ASM Conference on Beneficial Microbes, Washington DC, USA

October 8-12, 2014: Infectious Diseases Society of America (IDSA), the HIV Medicine Association (HIVMA), and the Pediatric Infectious Diseases Society (PIDS)'s ID Week 2014, Philadelphia, PA, USA

October 14-16, 2014: The Cuban Society for Microbiology and Parasitology hosts the 8th Cuban Congress on Microbiology and Parasitology/5th National Congress on Tropical Medicine/3rd International Symposium on HIV/AIDS Infection in Cuba, Havana, Cuba

October 22-24, 2014: ESCMID hosts Conference on Reviving Old Antibiotics, Vienna, Austria.

October 27-29, 2014: Re-entering Anti-Bacterial Drug Development Summit, Boston, MA, USA

October 31-November 3, 2014: 5th International Meeting on Emerging Diseases and Surveillance (IMED 2014), Vienna, Austria.

November 12-14, 2014: National Institute for Animal Agriculture (NIAA) Antibiotics Symposium, Atlanta, GA, USA

November 26-29, 2014: 15th Asia Pacific Congress of Clinical Microbiology and Infection (APCCMI), Kuala Lumpur

December 9, 2014: Roundtable on Safeguarding the effectiveness of existing antimicrobial treatments for serious infections (BSAC), London, England

See more events

Tracking Antibiotic Resistance Genes in the Environment : news

Sewage treatment contributes to antibiotic resistance

Elizabeth Wellington of the University of Warwick and her research team have demonstrated that sewage treatment plants spread antibiotic resistance. Wastewater treatment plants have become reservoirs where human, farm, and industrial wastes mix and antibiotic resistance bacteria evolve more quickly than they would in isolation. Sewage plants have become hotspots of antimicrobial resistance and bacterial gene sharing. As a result, gut bacteria in the environment have become resistant to some of the most clinically-effective antibiotics, such as third-generation cephalosporins. The plasmid gene *bla*CTX-M-15, which allows bacteria to adapt to their environment and develop resistance, has been found in UK rivers used for irrigation, swimming, and drinking. Wellington advocates stricter regulations and higher levels of sewage treatment in order to "halt the rise in antibiotic resistance in the environment".

Antibiotics found in Minnesota groundwater

A recent study of groundwater contaminants (2009 – mid 2012) by the US Geological Survey and the Minnesota Pollution Control Agency has found measureable levels of antibiotics—most commonly, sulfamethoxazole (in >10% of samples), azithromycin and lincomycin (an animal antibiotic). Previously identified in surface waters, these and other consumer and industrial contaminants are thought to have leached into the ground water from landfills, septic systems, and sewage treatment plants. While none were found in excess of drinking water quality standards, the report does raise awareness for the 75% of Minnesota residents who drink groundwater.

Mixed results in FDA's annual antibiotic resistance survey

The US FDA released its National Antimicrobial Resistance Monitoring System (NARMS) 2011 Executive Report in mid-August, showing increasing and decreasing trends in antimicrobial resistance. This report summarizes data from the FDA, the CDC, and the USDA which tracks antibiotic resistance in foodborne bacteria. Samples of *Salmonella, Campylobacter, E. coli,* and *Enterococcus* were collected from humans, food animals, and retail meat sources to determine if these bacteria showed resistance to multiple human antibiotics. NARMS, established in 1996, monitors antimicrobial resistance in foodborne bacteria and assists the FDA in making evidence-based decisions regarding effective antimicrobials for use in animals.

Key findings from the 2011 Executive Report include:

- In people, the five-drug resistance pattern "ACSSuT" (resistance to ampicillin, chloramphenicol, streptomycin, sulfonamide, and tetracycline) in *Salmonella* has declined to 19.5% in 2011 from its peak in 1997 at 35.1%.
- Multi-drug resistance in *Salmonella* from humans, slaughtered chickens and slaughtered swine was the lowest since 1996. However, multi-drug resistance in *Salmonella* from retail poultry meats generally increased.
- Erythromycin resistance in *Campylobacter jejuni (C. jejuni)* has remained at less than 4% in isolates obtained from humans, retail chicken and slaughtered chicken since testing began. The antibiotic erythromycin is the drug of choice for treating *Campylobacter* infections, more than 90% of which are caused by *C. jejuni.*
- *Campylobacter* resistance to the fluoroquinolone ciprofloxacin has increased slightly in isolates from humans since 2005. Ciprofloxacin is not approved for use in poultry, and the FDA withdrew approval for the use of enrofloxacin in poultry in 2005. Ciprofloxacin and enrofloxacin are both in the same class of drugs (fluoroquinolone).

Resistance to third-generation cephalosporins, another important drug class for the treatment of *Salmonella* infections, rose among isolates from retail ground turkey between 2008 and 2011 and among certain *Salmonella* serotypes in cattle between 2009 and 2011. In April 2012, FDA prohibited certain uses of cephalosporin drugs in cattle, swine, chickens, and turkeys. NARMS will continue to monitor these trends over time.

APUA Headquarters in Action

APUA names MedImmune a new corporate sponsor

APUA signed a contract with **MedImmune** for a $25,000 corporate sponsorship to run through August 2015. MedImmune will support APUA's presence at ICAAC this September. MedImmune shares APUA's goals of promoting innovative antibiotic development and ensuring prudent antibiotic use as both a patient safety and cost containment strategy.

APUA to host *Resistance* documentary showing

On September 25, APUA will host a showing and panel discussion of the documentary Resistance. The showing is free and open to the public and will take place at the Coolidge Corner theatre in Brookline, MA from 7-9pm. The 72-minute documentary explores the bacteria that give rise to antibiotic resistance infections through microscopic footage and personal stories. The Uji film traces the mass production of antibiotics through the rise of the superbugs in the 21st century. Following the film, APUA Vice President Tom O'Brien, filmmaker Michael Graziano, and a Cubist pharmaceuticals representative will answer audience questions about antibiotic resistance.

APUA hosts Boston summit on point-of-care biomarkers

In May, APUA hosted an international meeting of key opinion leaders concerning the utility of biomarkers to guide antibiotic therapy and reduce antibiotic overuse. The 12 key opinion leaders had relevant health care expertise from Europe and diverse US geographic locations, including two US CDC leaders in antibiotic stewardship and *Get Smart About Antibiotics*. Also in attendance were staff from APUA and Alere Inc. APUA planned and coordinated the summit meeting with the help of an unrestricted educational grant from Alere, Inc.

The Boston-based May 21 summit meeting, titled *Improving antimicrobial stewardship in outpatients: Potential for CRP and other biomarkers*, explored how biomarkers such as C-Reactive Protein (CRP) can be used at the point-of-care (POC) from finger-stick blood samples, thereby providing additional information to guide the physician in antibiotic decision-making and reducing diagnostic uncertainty in community healthcare settings. This practice is now common in some northern European countries, which are well known for prudent antibiotic use and low levels of resistance. A rapid, point-of-care CRP test is not currently approved in the US, and there are multiple barriers to its implementation, including physician and patient uptake, cost issues and federal approval.

A consensus evolved among attendees that US-based studies to evaluate and clarify the utility and outcomes of CRP are needed in order to augment the dearth of sometimes conflicting data—most of which are based in Europe at present. A summary manuscript of the meeting outcomes, submitted to a primary health care journal in July, is under review, pending publication.

International Chapter Updates & Reports

APUA-Russia Chapter Activities

Submitted by: Dr. Roman Kozlov, APUA-Russia chapter leader

APUA Russia was established in 1997 in affiliation with the Interregional Association for Clinical Microbiology and Antimicrobial Chemotherapy (IACMAC). IACMAC members (over 1,500 in Russia) frequently participate in national and international conferences and symposiums organized jointly by IACMAC with APUA.

IACMAC activities includes several annual meetings (one international congress in Moscow and two international conferences in different parts of Russia), antibiotic resistance monitoring, educational workshops and meetings with online and offline schooling of bacteriologists, clinicians and clinical pharmacologists and publishing activities (official international -peer-review quarterly publication "Clinical Microbiology and Antimicrobial Chemotherapy", practical guidelines on anti-infective chemotherapy etc.)

Specifically, there are three annual meetings scheduled for 2014 in Siberian region (Krasnoyarsk), Moscow and Far-east region (Vladivostok), two of which have been held:

Prof. Roman S. Kozlov, Director of the Institute of Antimicrobial Chemotherapy (IAC) of Smolensk State Medical Academy, President of the Interregional Association for Clinical Microbiology & Antimicrobial Chemotherapy (IACMAC), Smolensk, Russia

- IV Siberian conference on antimicrobial therapy, Krasnoyarsk, 3-4 April 2014: 1579 participants from 19 regions of Russia
- XVI International IACMAC Congress on antimicrobial therapy, Moscow, 21-23 May 2014: 1328 participants from 64 regions of Russia and 17 countries
- Vladivostok, regional conference, Far East region - will be on October 16-17.

Prof. Marina M. Petrova, Prof. Roman S. Kozlov, & Prof. Tatsuo Yamamoto at the IV Siberian conference on antimicrobial therapy

APUA-Mexico coordinates AMIMC workshops

Submitted by: Dr. Miguel Angel Peredo, APUA-Mexico chapter leader

The 39th Annual Congress of Infectious Diseases and Clinical Microbiology Mexican Association (AMIMC) was held on May 28-31 in Acapulco, Mexico. This Congress is the main scientific forum on infectious diseases in Mexico. As very high rates of resistance have been observed in bacteria that cause common healthcare-associated and community-acquired infections, the APUA-Mexico chapter and the AMIMC coordinated the workshop of rational antibiotic use to discuss the treatment of the following therapeutic guidelines: urinary tract infections, gastrointestinal infections, upper and lower respiratory infections and multi-resistant bacterial infections. The workshop was held to exchange and improve best practices and discussion about solutions, such as improved data collection and surveillance, eliminating the overuse of antimicrobials and reducing the use of critically important antibiotics.

Chapter leader, Dr. Miguel A. Peredo, and APUA-Mexico continue their educational activities with medical students and physicians through lectures and workshops to promote the prudent use of antibiotics.

APUA-Nepal: Government approves Antibiotic Treatment Guidelines

Submitted by: Dr. Kumud K. Kafle, APUA-Nepal chapter leader

APUA-Nepal has recruited experts from different disciplines for the drafting of new Antibiotic Treatment Guidelines. Following review and approval by program managers and experts from the Ministry of Health and Populations (MOHP) of Nepal, the Guidelines have been adopted and implemented. The new treatment Guidelines were developed for common infective health problems related to general medicine, surgery, pediatrics, obstetrics and gynecology, sexually transmitted diseases, ophthalmology, ear, nose/oropharynx and dental infections. Guideline topics cover the relative safety of antimicrobial agents in pregnancy, lactation and breast feeding, antibiotic prophylaxis in surgery, topical antibiotics, antimicrobial combinations and also a section on requirements for considering antibiotic prescriptions. The new Guidelines have classified antimicrobials into non-restricted prescriptives, nonrestricted prescriptives for TB and leprosy, restricted prescriptives (prescribed by a medical officer or higher qualification) and those highly restricted for prescription by faculty, a specialist or consultant only.

Recommended Resource

Antibacterial Drug Development: Challenges, Recent Developments, and Future Considerations

The Nature Publishing Group recently released a commentary by Nambiar *et al*. regarding the challenges of antibiotic development. The authors discuss appropriate clinical trial designs in order to continually generate effective therapies to sustain patient needs. The authors critique the use of non-inferiority trials during antibiotic development and recognize the FDA-drafted guidance for streamlined pathways to expedite antibacterial production. While the GAIN Act has made significant progress, Nambiar *et al.* advocate further research and policy developments to make the new therapies available.

Introduction continued from p. 4

from surface waters as the standard activated carbon filter methodology.[8]

These and other innovative approaches, coupled with improved tracking methodologies and multidisciplinary interventions will help answer persisting critical questions and improve the quality of our environmental resources.

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Policy Updates

German livestock producers required to report antibiotic usage

Under a new German regulation, livestock farmers are now required to report every 6 months on what antibiotics they have administered to which animals in order to survey and track antibiotic usage and resistance. The amendment to the German Drug Act will help minimize the use of antibiotics in food animal production. If a livestock farm's antibiotic usage index is greater than the federal average, then producers and veterinarians must identify the causes and take steps to reduce use. If livestock producers fail to report, they may be fined or farm operations may be suspended. In 2008, a federal German antibiotics resistance strategy required drug makers and wholesalers to report how many antibiotics were distributed to veterinarians. This regulation has contributed to a 170-ton reduction in sales from 2012 to 2013. Similarly, The Netherlands are preparing a benchmarking system to curb antibiotic use on poultry farms. Already the Dutch have reduced antibiotic use by 40-50%, but are aiming for a 70% reduction in antibiotic usage across all sectors by 2015.

FDA reverses ruling on animal antibiotic use

At the end of July, the US Court of Appeals ruled that the US FDA is not required to hold hearings concerning the safety of sub-therapeutic antibiotic use in food animals. The Natural Resources Defense Council, the Center for Science in the Public Interest, Food Animal Concerns Trust, Public Citizen, and the Union of Concerned Scientists argued that the FDA is required to hold hearings to withdraw approval for the use of penicillin and tetracyclines in animal feed. The 1970s report and recent research shows that the low-dose routine use of antibiotics in food animals contributes to the development of resistant bacteria. The 2013 CDC Report on antibiotic resistance states, "Because of the link between antibiotic use in food-producing animals and the occurrence of antibiotic-resistant infections in humans, antibiotics should be used in food-producing animals only under veterinary oversight and only to manage and treat infectious diseases, not to promote growth." Not requiring hearings means that the FDA does not have to consider banning the routine feeding of low-dose antibiotics to healthy animals as growth promotion.

Pew Charitable Trusts proposes new pathway for drug development

The rise in drug resistance and the dry antibiotic pipeline are contributing to the post-antibiotic era and the rise of superbugs in the 21st century. The healthcare community is searching for innovative new drugs for patients whose treatment options are nonexistent. Last January, Pew hosted a conference to explore drug development for limited populations and proposed to bring urgently needed medicines by reducing economic and regulatory barriers to antibiotic innovation. The government regulators, infectious disease physicians, public health specialists, pharmacists, pharmaceutical representatives, and payers in attendance concluded that proper management and data-driven use of the limited-population antibiotics would be important for the success of this new development pathway.

Getting serious about antibiotic development and stewardship

Kathleen Young, APUA Program Consultant and Katherine Broecker, APUA Staff

"Care follows the dollar" is an established health policy maxim, meaning that money is a powerful motivator of health care provider behavior. Pharmaceutical development is one of the country's more successful enterprises whose profits derive from aggressive marketing deemed necessary to gain adequate return on investments. The antibiotic development business faces unique challenges however, in that aggressive marketing over time can result in antibiotic overuse and antibiotic resistance, leading to the premature loss of the drug's effectiveness. To slow the emergence of antibiotic resistance, public health authorities are instituting tighter antibiotic stewardship and infection control requirements which, if successful, could constrain antibiotic sales even further.

Faced with limited sales projections and ROI for antibiotics, many pharmaceutical companies have abandoned the antibiotic development business in favor of the more lucrative drugs for chronic conditions. To address this dilemma, APUA recently signed on with several initiatives to explore radical solutions such as that proposed by APUA President, Dr. Stuart Levy in his 2002 publication of *The Antibiotic Paradox*. "Antibiotics are uniquely societal drugs …" he stated, "By establishing a special regulatory category, we can improve how they are used, marketed, and developed through incentives to industry." While that proposal seemed unorthodox at the time, similar untraditional economic models are now being seriously explored to address the rising rates of untreatable resistant infections.

APUA is participating in several pioneering programs to promote innovative business models aimed at reconciling the seemingly incompatible goals of antibiotic development and stewardship. As a consortium member in the original proposal, APUA is now serving as a member of the antibiotic stewardship study section of The EU DRIVE-AB project (Driving Re-Investment in R&D and Responsible Antibiotic Use) recently funded by the EU Innovative Medicines Initiative (IMI)—a three-year project which aims to develop innovative public/private collaborations to promote development of novel antibiotics while ensuring rational antibiotic use and enhancing competitiveness of the EU biopharmaceutical sector. Having joined in the consortium on the original proposal, APUA will now serve on the stewardship study section.

The Chatham House Working Group on Antibiotic De-linkage is another promising initiative which was recently established by the UK-based international think-tank. It engages representatives from academia, industry, NGOs and government to develop breakthrough solutions to major global policy issues. APUA will contribute as a reviewer to this study group, which is exploring alternative economic models to ensure antibiotic company profits, while eliminating perverse incentives to maximizing antibiotic sales or use. The group will statistically evaluate feasibility of various incentives to simultaneously spur antibiotic development and conservation. The final report will serve as a framework for the DRIVE-AB project and include recommendations regarding payment models; geographic scope; financing credits; IP ownership and marketing utilization incentives. Professor Kevin Outterson, of Boston University School of Law, who has published extensively on the topic of de-linkage, is coordinating the working group. Their report is due out in the fall of 2014.

As APUA's representative on these projects, I look forward to contributing APUA's antibiotic stewardship expertise and an understanding of the public health and industry interests I gained as an FDA Anti-infective Drug Development Advisory Committee member. Development of novel antibiotics is urgently needed to treat resistant infections now. At the same time, stronger incentives for antibiotic stewardship are essential in order to extend their lifespan and ensure a sustainable supply of these lifesaving agents for all.

US developments to drive antibiotic stewardship and development

The Infectious Diseases Society of America (IDSA) and pharmaceutical executives criticize the US regulatory disincentives as a major barrier to US antibiotic development.

The aforementioned European regulatory environment, in contrast, implements strategies to fund antibiotic development and address drug resistance as a public health priority.

In July 2012, President Obama signed the FDA's Generating Antibiotics Incentives Now (GAIN) Act to incentivize the research and development of novel antibiotics. Due to the dry antibiotic pipeline, antibiotic-resistant infections are a severe public health risk—according to the CDC antibiotic resistant infections cause over 2 million illnesses and 23,000 deaths in the US, costing over $20 billion annually. Incorporated into the FDA's Safety and Innovation Act, the GAIN Act created a pathogen-focused antibacterial drug development pathway and identifies antibiotics for priority review. The Act also removes some financial developmental barriers to expedite antibiotic production, provided the compounds fulfill minimum efficacy data. To review the progress of GAIN to date, read here.

Following the President's Council of Advisors on Science and Technology (PCAST) this summer, IDSA wrote white papers exploring the PCAST recommendations to incentivize federal action regarding the increasing antibiotic resistance and dry antibiotic pipeline. IDSA encourages PCAST to: consider Europe's successful antimicrobial surveillance and tracking system; stimulate antibiotic R&D with collaborative work through public-private-partnerships; and increase federal funding. The White House responded by releasing the *2016 Budget for Combating Antibiotic Resistant Bacteria Resource Priorities*. The budget proposal allocates funds to minimize the development of resistant bacteria, to strengthen national one-health surveillance, to develop rapid diagnostic technology, to accelerate and develop new antibiotics, therapeutics, and vaccines, and to improve international collaboration.

APUA has joined the new U.S. Stakeholder Forum on Antimicrobial Resistance (S-FAR), convened by IDSA, to help coordinate efforts to inform and advise the U.S. government on matters relating to antibiotic resistance (AR). S-FAR already includes 60+ organizational partners. Members will also occasionally be notified of opportunities to engage in AR advocacy, such as sign-on letters, legislative activities, and public events. S-FAR went live on September 4 and has opened resources to the general public.

Funding Opportunity

ASMCUE® Leadership Grant for International Educators

The Leadership Grant for International Educators enables a select group of microbiology, biology, and health science undergraduate educators from resource-limited countries to attend the ASM Conference for Undergraduate Educators (ASMCUE) and a pre-conference workshop in order to provide these future leaders with the resources to develop and pilot innovative pedagogy and learning modules that engage students and lead to enduring understandings in microbiology, biology, and health science.

Program Description: The goals of this program are to provide educational leaders from resource-limited countries with training in the latest developments in microbiology education in order to improve microbiology and STEM education in their home country and to build capacity for disseminating change within their local and national STEM educational communities.

Application Deadline: October 1, 2014

Funding: ASM will provide up to **$3,000 US dollars** towards round trip economy airfare to the US & ground transportation to the conference. Complimentary registration and conference housing is provided to recipients.

Recommended Resource

URTI Stewardship Guidelines

The Global Respiratory Infection Partnership (GRIP) has prepared a continuing professional development module to meet the needs of patients with upper respiratory tract infections (URTIs). After completing this module, physicians should:

- Understand antibiotic resistance as a result of antibiotic overuse and/or misuse
- Acknowledge the importance of communicating with patients on appropriate antibiotic use in URTIs
- Recognize the importance of meeting patients' symptomatic treatment needs in URTIs
- Be aware of when antibiotic use is appropriate for patients with sore throat
- Have a knowledge of the 1,2,3 approach to sore throat management

News and Publications of Note

MASSPIRG's campaign to stop the abuse of antibiotics in factory farms

MASSPIRG, a Massachusetts consumer advocacy group and coalition of Boston medical professionals released a white paper on August 5 asking the Obama administration to immediately restrict the use of antibiotics on factory farms. Campaign associate, Amirah Mitchell urged, "The medicine chest may be empty soon. We need to end the abuse of antibiotics on factory farms right now to preserve their ability to treat infections." More than 70 percent of antibiotics used in human medicine are sold for use in food animals to promote weight gain. This use fuels the creation of resistant bacteria that can spread from farms via food, animal to human contact, and animal waste that enters the environment. Last December, the U.S. FDA issued guidelines for antibiotic use on farms. Critics argue that the guidelines were voluntary and narrow in scope, and are unlikely to lead to significant reductions in antibiotic misuse on farms. In July, it was ruled in a 2-1 decision that the FDA is not required to hold hearings concerning the safety of feeding antibiotics to food animals at subtherapeutic levels.

CDC: Antibiotic resistance could be 'next pandemic'

At a recent National Press Club luncheon, CDC director Dr. Tom Frieden addressed the growing threat of antibiotic-resistant bacteria. Over-prescribing of broad-spectrum antibiotics in hospitals has caused bacteria to mutate and develop drug resistance with the potential to "kill anyone in the country, undermine modern medicine, to devastate our economy, and to make our health care system less stable". He cited the highly resistant CRE (carbapenemase-resistant *Enterobacteriaceae*) as the most problematic of these infectious agents. The cost of antibiotic resistance amounts to $20 billion and 23,000 US deaths per year. Frieden lists improved detection, control, prevention, and innovation as the four keys to stopping antibiotic resistance. There is a need for national surveillance and tracking of prescribed antibiotics, infection control, implementation of antibiotic stewardship programs, and new incentives to develop antibiotics and diagnostics.

Global antibiotic consumption on the rise

A recent Princeton University study published in The Lancet Infectious Disease concluded that antibiotic use has risen by 36% from 2000-2010. The BRICS countries (Brazil, Russia, India, China, and South Africa) account for 75% of the increase in global antibiotic use. Researchers Van Boeckel and colleagues examined the IMS Health MIDAS database for retail and hospital pharmacy antibiotic sales data in 71 countries in order to examine global trends in antibiotic consumption. Cephalosporins, broad-spectrum penicillins, and fluoroquinolones account for half of the increased antibiotic consumption, in addition to significant increases in carbapenems and polymixins—two last-resort antibiotic classes. Peak antibiotic use correlated with the end of the winter and monsoon seasons, which in the US corresponds with flu season. The authors recommend educational programs to improve prescriber habits and to reduce antibiotic distribution to patients with viral respiratory tract infections.

Five-fold increase in CRE superbug infections prompts warning of epidemic

Community hospitals in the southeastern US are urged to prepare for the oncoming carbapenem-resistant *Enterobacteriaceae* (CRE) epidemic. As classified by the WHO, CRE are "one of the three greatest threats to human health" as they are a class of highly antibiotic-resistant bacteria that cause lung, blood, and urinary tract infections. Over a 5-year study period, CRE infections increased five-fold. Researchers speculate that increased and overuse of broad-spectrum antibiotics, poor infection control, staff shortages, and financial constraints are reasons for the increased infection rate.

Antibiotic resistance prompts reinvestigation of phage therapy

With the looming threat of a post-antibiotic era, Western researchers and governments have revitalized the study of bacteriophages for treating infections. Phage therapy uses viruses to kill bacteria and is commonly used in Russia, Georgia, and Poland today. The US National Institutes of Allergy and Infectious Disease (USAID) has listed phage therapy among its plans to combat antibiotic resistance, and Swiss researcher

Gregory Resch has developed plans for the first multi-center clinical trial of phage therapy for human infections (the Phagoburn study). In contrast to broad-spectrum antibiotics, phages kill one species or strain of bacteria. Resch and the Phagoburn researchers hope that phage therapy will be regulated similarly to the seasonal influenza vaccine—continually updated as new bacterial strains emerge. With the EU contributing $5.2 million to the Phagoburn study, Resch and his team will recruit burn victims infected with *E. coli* or *Pseudomonas aeruginosa* and treat them with a variety of phage cocktails. While phage therapy is not expected to replace antibiotics, it can provide alternative treatment options for those patients in whom drug treatments have failed.

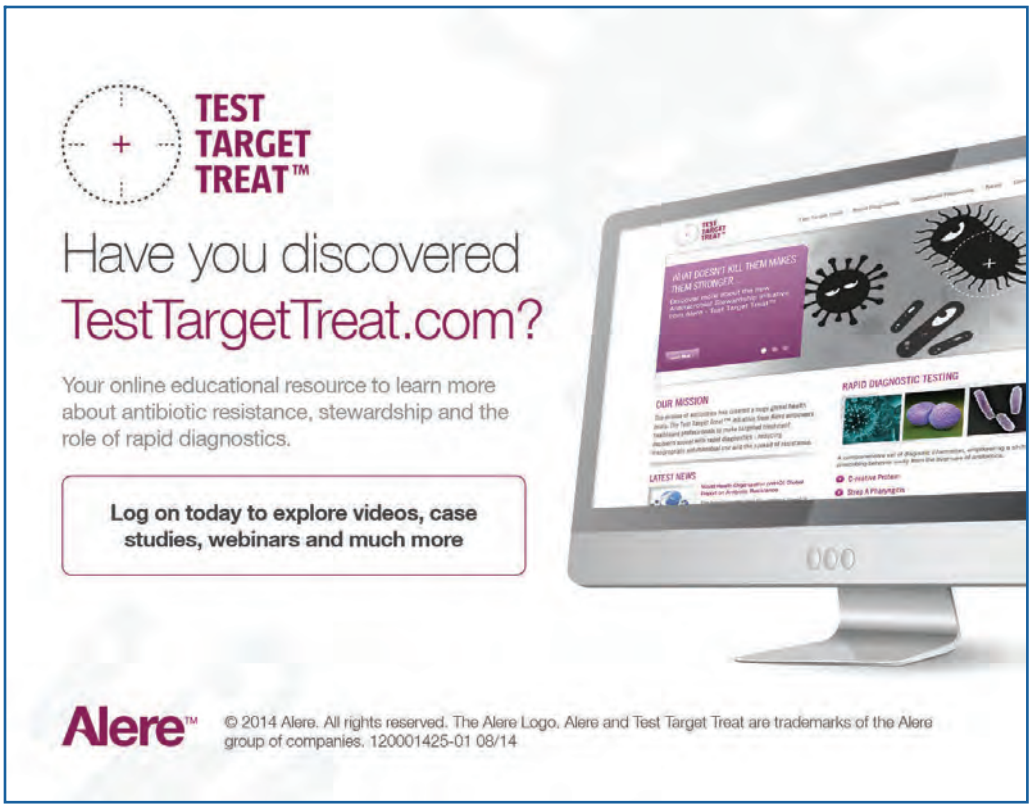
Asymptomatic bacteriuria: resisting the urge to treat

Infectious disease physicians are aware that "asymptomatic bacteriuria" patients do not require antibiotics. However, many physicians feel the urge to prescribe antibiotics when diagnostics reveal bacteria in the urine. Up to 80% of asymptomatic bacteriuria patients receive antibiotics despite the IDSA's 2005 guidelines, which recommend treatment only for pregnant women or those with a genitourinary procedure with anticipated bleeding. Professor Leis and his University of Toronto colleagues published a pilot study in *Clinical Infectious Disease* which required physicians to call the microbiology lab to get test results. Of the 415 subjects, 2% were diagnosed with asymptomatic bacteriuria; antibiotic prescribing rates declined from 48% to 12% when physicians had to call the lab for the test results. (Leis JA, Rebick GW, Daneman N, et al. Reducing antimicrobial therapy for asymptomatic bacteriuria among noncatheterized inpatients: a proof-of-concept study. Clin Infect Dis. 2014;58:980-983.)

***Note**: The American Geriatrics Society (AGS) supports the Choosing Wisely Campaign, an initiative of the ABIM Foundation. It has published two lists (2014, 2013) of five things that healthcare providers and patients should question to reduce overuse of tests and procedures, and support physician efforts to help patients make smart and effective care choices. The Choosing Wisely Campaign engages healthcare organizations, professionals, individuals, and family caregivers in discussions regarding the safety and appropriateness of medical tests, medications, and procedures.*

New route identifies drugs to fight bacterial infections

Daniel M. Czyz and colleagues have identified a novel approach for treating infections caused by the intracellular bacterial pathogens Coxiella burnetii, Legionella pneumophila, Brucella abortus, and Rickettsia conorii. By screening a library of FDA-approved compounds, they found numerous non-antibiotic candidates that that had limited toxicity to the infected host cell, but simultaneously, effectively inhibited intracellular bacterial growth by targeting 3 probable host cell functions: (i) G protein-coupled receptors, (ii) intracellular calcium signals, and (iii) membrane cholesterol distribution. The findings suggest that drugs that disrupt intracellular pathogen growth pathways can act as therapeutic candidates to decrease the emergence of drug resistance.



"Preserving the Power of Antibiotics"®

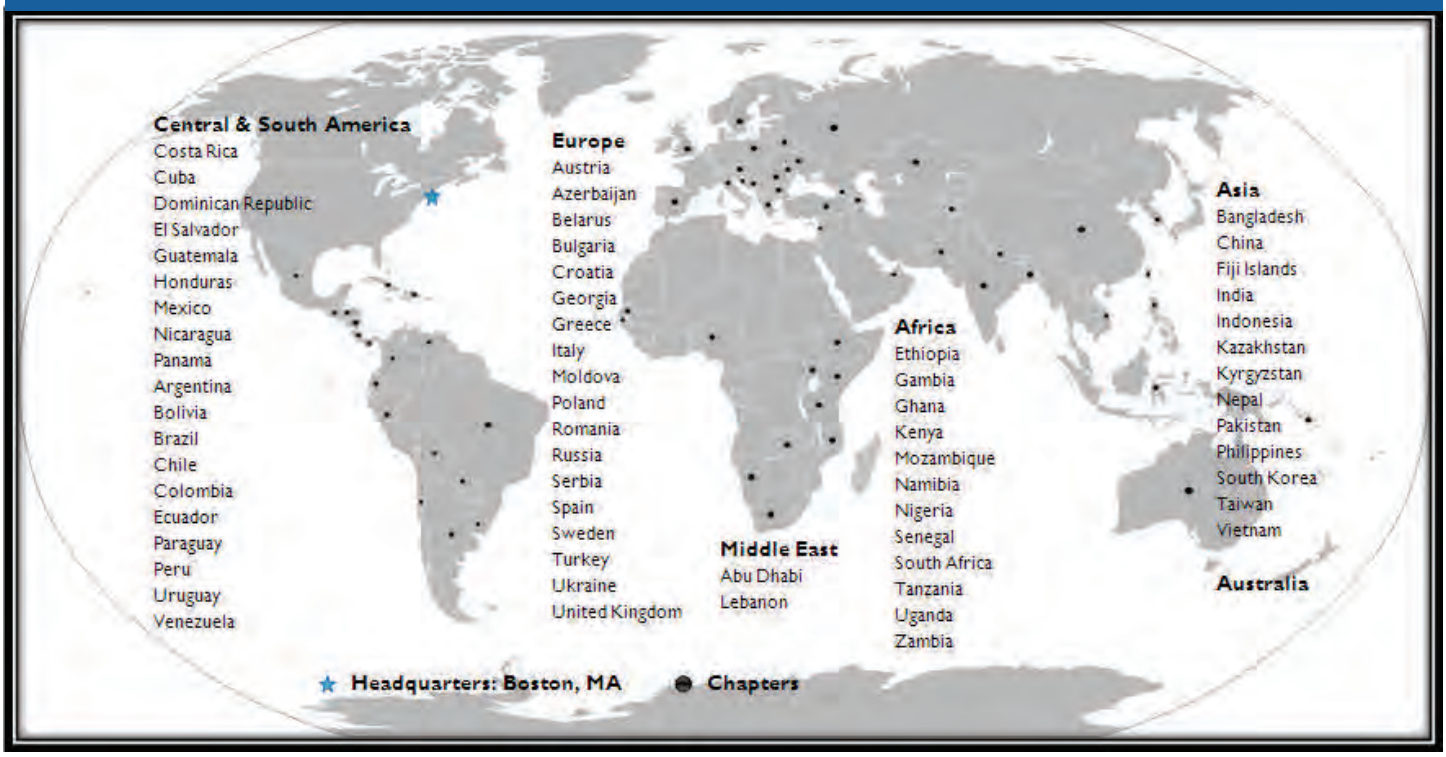
About us

Antibiotics are humanity's key defense against disease-causing microbes. The growing prevalence of antibiotic resistance threatens a future where these drugs can no longer cure infections and killer epidemics run rampant. The Alliance for the Prudent Use of Antibiotics (APUA) has been the leading global non-governmental organization fighting to preserve the effectiveness of antimicrobial drugs since 1981. With affiliated chapters in more than 65 countries, including 33 in the developing world, we conduct research, education and advocacy programs to control antibiotic resistance and ensure access to effective antibiotics for current and future generations.

Our global network of infectious disease experts supports country-based activities to control and monitor antibiotic resistance tailored to local needs and customs. The APUA network facilitates the exchange of objective, up-to-date scientific and clinical information among scientists, health care providers, consumers and policy makers worldwide.

The APUA Newsletter has been published continuously three times per year since 1983.
Tel: 617-636-0966 • Email: apua@tufts.edu • Web: www.apua.org

APUA global chapter network of local resources & expertise



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www.apua.org

CITY OF
LOMPOC

September 11, 2014

Mr. Steven Saiz
Central Coast Regional Water Quality Control Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401

RE: Triennial Review – Central Coast Region Basin Plan Comments

Dear Mr. Steven Saiz:

The City of Lompoc thanks you for the opportunity to review and comment on the Basin Plan through the Triennial Review process. The following comments reflect the opinions and concerns of the City of Lompoc.

General Comments:
It has been approximately 20 years since the Basin Plan was written and it is no longer accurate in many areas. A full and considered revision is desirable, to bring the Plan up to date, recognize current conditions, verify the accuracy of beneficial uses, and provide scientifically based, current objectives for surface and groundwater.

Background On The Santa Ynez Hydrologic Unit
While the Santa Ynez Hydrologic Unit functioned with natural watershed processes in the distant past, construction of Gibraltar Reservoir in 1920, Juncal Dam and Jamison Lake in 1930 and Bradbury Dam in 1953, on the Santa Ynez River, altered its natural surface flow and sediment deposition regime.

The Santa Ynez River watershed is approximately 896 square miles acres in size. The majority of the watershed is held in federal hands by the U.S. Forest Service (Los Padres National Forest), Vandenberg Air Force Base, and the United States Penitentiary combined. The majority of the remainder is held in rural and agricultural lands. Combined, the three small cities located along the river, Solvang (2.43 square miles and a population of 5,245), Buellton (1.6 square miles and a population of 4,828) and Lompoc (11.6 square miles and a population of 42,438), comprise only .017% of the watershed's area.

CITY HALL, 100 CIVIC CENTER PLAZA, P.O. BOX 8001, LOMPOC, CA 93438-8001
PHONE (805) 736-1261 FAX: (805) 736-5347

Now, in drought conditions, no surface water in the Santa Ynez River has flowed beyond the H Street Bridge during the past two years, with the exception of a trickle that lasted one day during the winter of 2013/2014. Cachuma Reservoir is now at less than 40% of its capacity. The Basin Plan does not address the reservoirs found on the Santa Ynez River, that combined with a natural drought cycle, have eliminated virtually all surface flow in the river. The City of Lompoc's municipal drinking water source is the groundwater aquifer in the Lompoc Plain.

Lompoc sits over the forebay of the Lompoc Plain and receives a significant amount of groundwater from the underflow of the Santa Ynez River, which in part is supported by State Water Rights Board Order 89-18.

Chapter 2. II. BENEFICIAL USE DEFINITIONS, and Table 2:1 Identified Uses of Inland Surface Waters.

1. <u>Santa Ynez River Downstream Of Bradbury Dam</u>

Currently identified Beneficial Uses for the Santa Ynez River surface flows include: Municipal, Agricultural, PROC, IND, Groundwater Recharge, Recreation 1, Recreation 2, Wild, Cold, Warm, Migratory, Spawning, Rare, Fresh, Comm. We believe the following listed Beneficial Uses should not be applied to the Santa Ynez River.

MUN - The Santa Ynez River's (SYR) surface waters are not now, and have not been, used as a Municipal and Domestic Supply of water (verified with Lompoc, Solvang and Buellton). In addition, the SYR as a surface water source is not sufficient to supply an average sustained yield of 200 gallons per day, as there is rarely any flow. When the river does flow, its Total Dissolved Solids (TDS) are anticipated to far exceed 3000 mg/l (5000 uS/cm electrical conductivity), set as a standard by State Board Resolution No. 88-63, "Sources of Drinking Water Policy". This Policy finds surface waters exceeding these standards not suitable for municipal or domestic water supply.

AGR-The Santa Ynez River is and has not been used as a source of surface agricultural irrigation water, as it does not provide regular flow and in many years has no flow.

PROC – The Santa Ynez River does not flow with any frequency and regularity and is not, and has not, been used as a source of industrial process water.

Adverse Impact of Beneficial Use Designation as a Municipal, Agricultural or Industrial Process waters.

It is important to accurately and properly reflect the uses of the Santa Ynez River below Bradbury Dam, as well as its primary status as an almost year-round dry riverbed, except for short periods in high rainfall years. This is particularly true when considering the upcoming development of TMDLs for the Santa Ynez River. The erroneous identification of municipal, agricultural and industrial process water as beneficial uses of the Santa Ynez is expected to result in the development of water quality standards inappropriate to the actual uses of the occasional flows in this river. The cost associated with unnecessarily ensuring all discharges to this waterbody meet related water quality standards for these listed beneficial uses will greatly outweigh the benefit of such improvements, for a river that has not and cannot support these beneficial uses.

2. Graves Wetland

Currently identified Beneficial Uses for the Graves Wetland include: Recreation 1, Recreation 2, Warm, Spawning, Comm.

The Graves Wetland is mis-identified in the Basin Plan and is locally known as the Bailey Wetland. The wetland is a remnant turn in the river that was cut off and continues as a low spot. It is not connected to any waterway and does not have water in it. There is no inflow or outflow to other water bodies, and as a result of development of the property on which it is located, the depression no longer retains water. A hydrology report prepared prior to the development of the subject properties found the wetland was being supplied with water through irrigation from what was at the time, agricultural uses. Without this agricultural contribution of water, the wetland has dried up and the vegetation mix is changing. The wetland was not determined by the U.S. Army Corps of Engineers to meet the criteria for a jurisdictional wetland.

The Beneficial Uses identified in the Basin Plan are not applicable to this area. Recreation 1 & 2, commercial fishing, and warm water values are not present, as there is no water. Spawning values are not present, as there is no water and the area is not hydrologically connected to any other waterbody or waterway. The historic wetland area has been fenced off from public access.

VI.B.10. SANTA YNEZ RIVER HYDROLOGIC UNIT (3rd Paragraph)

Please revise this paragraph to read: "The City of Lompoc operates a tertiary treatment facility (design average dry weather flow 5.5 mgd; permitted flow 5.0 mgd.) and discharges treated effluent to San Miguelito Creek. The City also provides service to Vandenberg Village Community Services District and sewered areas of Vandenberg Air Force Base. The recommended plan for Lompoc is to control mineral concentrations in the effluent by enforcing strict limits on discharges to the sewer system and to continue to implement a pretreatment program. Implementation of this plan is the responsibility of the City of Lompoc. Vandenberg Air Force Base and Vandenberg Village Community Services District retain ownership and direct responsibility for wastewater collection and transport systems up to the point of discharge into the wastewater treatment plant owned and operated by the City of Lompoc."

VI.E. STORM WATER MANAGEMENT

The section entitled "VI.E – Storm Water Management" needs to be updated to reflect the one acre minimum size applicability of the current Construction General Permit and the applicability of NPDES Phase II permit requirements to municipalities / urbanized area with populations under 100,000 or densities of over 1,000 per acre.

In addition, the following sentence should be revised. It currently reads: "The specific types of facilities that need coverage is dependent upon the facility's Standard Industrial Classification Code." To read: "A facility's need for coverage is dependent upon that facility's Standard Industrial Classification Code."

This section also references the Construction General Permit adopted in 1992, stating "The statewide permits expire five years after adoption. At that time, Regional Boards will most likely adopt Region specific General Permits." Since this did not happen in 1997/1998, this section

should be revised to discuss the current Construction General Permit. The statement that no sampling is required under the Construction General Permit is no longer true.

VIII.B. URBAN RUNOFF MANAGEMENT

Section VIII.B. Urban Runoff Management would benefit from revision in light of the Statewide and Regional changes in Phase I and II Municipal Storm Water Regulation.

CHAPTER 5. V.H.9. SEAWATER INTRUSION

In light of the prolonged western drought and increased groundwater pumping, consider adding the following language to the V.H.9. Sea Water Intrusion section: "The potential for, and effects of, sea water intrusion into ground water basins should be considered when actions that could affect groundwater quality and quantity, such as increases in pumping of groundwater, are considered. Sea Water intrusion into groundwater basins should be limited and discouraged to the MEP, and by the same token, activities that reduce sea water intrusion should be recognized and encouraged for that benefit.

Thank you again for the opportunity to comment through the Basin Plan Triennial Review process.

Sincerely,

Patrick Wiemiller, City Administrator
City of Lompoc

c: Lompoc City Council
Teresa Gallavan, Economic Development Director/Assistant City Administrator
Larry Bean, Utility Director

From:	Mary
To:	Saiz, Steve@Waterboards; WB-RB3-centralcoast
Cc:	Harris, Ken@Waterboards; Anderson, Tamara; Hamilton, Mary@Waterboards; Monica S. Hunter; Moody, Mitchell@Waterboards; Vasquez, Victor@Waterboards
Subject:	Basin Plan Triennial Review - Cambria Area
Date:	Sunday, September 14, 2014 10:07:07 AM
Attachments:	Water Board Triennial comments.pdf Desalination standards 81914.pdf WAter Basin review plan 81914.pdf

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September 25-26, 2014 Meetings

Please include these comments and letters in your upcoming meetings relating to lowering of monitoring wells for Cambria, desalination, water quality, discharges, and basin plan review. Specific policy suggestions are listed in attached comments from NGO's to the State Board on desalination, but their recommendations in regards to the Regional Water Boards should be seriously considered for incorporation as soon as possible. We are very concerned about Cambria's public works project that seems too have little oversight due to emergency permitting.

Thank You,
Mary Webb VP
Greenspace-the Cambria Land Trust

September 15, 2014

Steven Saiz
Central Coast Water Board Office
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401

ssaiz@waterboards.ca.gov
centralcoast@waterboards.ca.gov

RE: Basin Plan Triennial Review:

Good morning Steven,

It was nice meeting you and thank you for the informative presentation on the Basin Plan Triennial Review last August. I understand there is opportunity to comment on the Triennial review of the Basin Plan for the North Coast region.

We suggest the board incorporate more detailed language on desalination into these plans as offered by the CA Coastkeepers Alliance and the CA Coastal Protection network as attached. Our organization and others are very concerned about the impacts of desalination /reverse osmosis plants being introduced on the California coast.

From reading documents and letters submitted to the State Water Resources Control Board on the subject of desalination it is my understanding that broad discretion is given to the Regional Water Boards on a case by case basis in adopting language for permits for desalination and discharge of wastes. Given the drive for desalination in California, it is critical that the Regional Board develop high standards to minimize the effects of brine discharges and their constituents, prohibit open ocean intakes, prohibit outfalls in Marine Protected Areas and make sure desalination is the last choice - not the first choice for an alternative water supply, as is the case in Cambria.

As you know, Cambria Community Services District is building a reverse osmosis/desal project on San Simeon Creek under 'emergency permits' due to drought this year. This 20 year old public works project without permits, has already broken ground without the benefit of normal levels of scrutiny usually provided by San Luis Obispo County or other agencies.

Serious analysis must be made of this rushed project before more construction is allowed to happen on San Simeon Creek and VanGordon Creek. The level of grading that is being done can seriously impact creek areas with sedimentation when it rains, and the threatened species that live there will be affected. San Simeon Creek is considered CORE 1 habitat for these species.

All levels of Land and Marine protection afforded to both **San Simeon and Santa Rosa Creeks** should be noted in the Triennial Plan. The restrictions afforded by the following protections should be clearly detailed in the plan and include but may not be limited to:

- Monterey Bay National Marine Sanctuary
- CA Sea Otter Refuge
- Cambria State Marine Park - no Commercial Take in the State Marine Park
- CA State Parks Natural Preserve - highest level of protection in the State Park System

The Central Coast Water Board Vision for Healthy Watersheds includes
- Preventing and Correcting degradation of aquatic habitat
- Preventing degradation of Hydrologic Processes
- Preventing/Reversing Seawater Intrusion
- Preventing Further Degradation of Groundwater Basin from Salts

The Cambria Community Services District's proposed 'emergency reverse osmosis" project on San Simeon Creek seems to be at odds with your above stated visions and goals. The project:

- induces SeaWater Intrusion into a well that is considered "h*igh quality drinking water.*"
- degrades the groundwater basin by pouring human effluent onto a pond within 100 feet of a steelhead creek.
- does not treat the Cambria effluent at the source - the WasteWater Treatment Plant.
- proposes the release of chemically treated reverse osmosis waste/water into Van Gordon and/or San Simeon Creeks (project is still undesigned).
- creates a waste/brine pond containing chemicals and other agents near sensitive habitat
- is inconsistent with stated riparian buffer zone goals for sensitive habitat
- may propose ocean outfalls into highly protected areas due to brine reservoir limitations.
- has caused increased levels of pumping from Santa Rosa Creek resulting in the request to lower the WBE Monitoring Well from 3 feet to 2 feet.

The entire Cambria CSD project would have benefitted greatly from serious oversight and review. We are awaiting a TMDL Study that is being created by Howard Kolb on San Simeon Creek due to the high nitrate levels at that location. How will that study affect this project? Public comment and input from experts from the agencies has been limited and response to July 22 comments has not been published. Public hearings with agencies other than the Cambria District would have answered many questions.

Instead the normal CEQA process has been abandoned, the financing has been rushed, and many in the community are outraged at this 'emergency' permitting. Others just want water at any cost unfortunately, and have been given no other choice.

In order to provide guidance to all agencies who are making policy decisions regarding desalination, Greenspace is attaching two letters from organizations that commented on the Water Basin Review Plan and State Water Resources Control Board's July 2014 draft Desalination Amendment in links shown below:

The Expert Panel I: Impacts and Effects of Brine Discharges
http://www.swrcb.ca.gov/water_issues/programs/ocean/desalination/docs/dpr.pdf

Salinity Toxicity Study
http://www.swrcb.ca.gov/water_issues/programs/ocean/desalination/docs/saltoxfr08012.pdf

Expert Panel II: Intake Impacts and Mitigation
http://www.swrcb.ca.gov/water_issues/programs/ocean/desalination/docs/erp_intake052512.pdf

Expert Panel III: Intake Impacts and Mitigation
http://www.swrcb.ca.gov/water_issues/programs/ocean/desalination/docs/erp_final.pdf

The attached letters were submitted August 19, 2014 from the California Coastkeeper Alliance, which includes the Center for Biological Diversity, Surfrider, the Desal Response Group, Residents for Responsible Desalination, the Planning and Conservation League, Heal the Bay and many others who have worked extensively on this issue. We are forever grateful to their tireless efforts and extensive research in this area.

Please include these specific recommendations in the attached documents in all decisions on desalination, and to help guide updates to any policies and plans being considered, especially for the North Coast Region of Central California. State and local policies for desalination have yet to catch up to the lobbying for this expensive and energy intensive technology. The time to act to protect our coastal creeks is running out in Cambria.

Sincerely,

Mary Webb VP
Greenspace-the Cambria Land Trust

cc: Cambria District, RWQCB, CA Coastal Staff, CA Dept. Fish & Wildlife, NMFS, US Fish & Wildlife, Center for Biological Diversity, PCL, R4RD, Surfrider and others.
Attachments:

CA Coastkeeper Alliance Water Basin Review Plan
CA Coastkeeper Alliance Desalination Amendment

Public Comment
Desalination Amendments
Deadline: 8/19/14 by 12:00 noon

RECEIVED
8-19-14
SWRCB Clerk

CALIFORNIA COASTKEEPER ALLIANCE

SURFRIDER FOUNDATION

NRDC
THE EARTH'S BEST DEFENSE

Heal the Bay

CALIFORNIA COASTKEEPER ALLIANCE

August 19, 2014

Chair Felicia Marcus and Board Members
c/o Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814

Sent via electronic mail to: commentletters@waterboards.ca.gov

RE: Comment Letter ï Desalination Amendment

On behalf of California Coastkeeper Alliance, which represents 12 California Waterkeeper groups spanning the coast from the Oregon border to San Diego, Surfrider Foundation, Natural Resources Defense Council, and Heal the Bay, we appreciate the opportunity to provide comments on the State Water Resources Control Boardôs (ñState Boardò) July 2014 draft Amendment to the Water Quality Control Plan For Oceans Waters of California Addressing Desalination Facility Intakes, Brine Discharges, and the Incorporation of Other Non-Substantive Changes (ñDesal Amendmentò).

Our organizations have spent decades working with state and federal agencies to develop regulations to implement the federal Clean Water Act (CWA) and minimize the intake and mortality of marine life from open ocean intakes and antiquated ñonce-through coolingò technology for coastal power plants.[1] Regulations adopted in 2010, and the associated environmental analyses, by the State Board documented the significant impact to marine ecosystems from these intake structures, and required power plants on our coast and in estuaries to employ ñbest technology availableò (BTA) to reduce the entrainment and impingement of marine life.[2] Seawater desalination proponents are now seeking to continue using the very same intakes regulated and intended to be phased-out under the Once-Through Cooling (OTC) Policy, thus undermining the Policyôs objective of minimizing marine life mortality from entrainment and impingement.

Currently proposed desalination facilities will have a detrimental impact on the chemical, physical, and biological integrity of Californiaôs waters. Today, Californiaôs desalination facilities have a combined design capacity of approximately 6.1 MGD.[3] That capacity would be dwarfed by the 15 seawater desalination plants currently proposed along the California coast, with a combined design capacity of 250 to 370 MGDð a 60-fold increase over todayôs current capacity.[4]

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[1] *See* STATE WATER RES. CONTROL BD., Website: ñOnce Through Cooling Water Policyò *available at* http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/policy.shtml

[2] STATE WATER RES. CONTROL BD., WATER QUALITY CONTROL POLICY ON THE USE OF COASTAL AND ESTUARINE WATERS FOR POWER PLANT COOLING, Resolution No. 2010-0020, http://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2010/rs2010_0020.pdf; 2014 Amendments http://www.swrcb.ca.gov/water_issues/programs/ocean/cwa316/docs/otc_2014.pdf

[3] STATE WATER RES. CONTROL BD., Draft Substitute Environmental Document: Amendment to the Water Quality Control Plan for Ocean Waters of California: Addressing Desalination Facility Intakes, Brine Discharges, and the Incorporation of Nonsubstantive Changes, pg. 13 (July 2014), *available at* http://www.waterboards.ca.gov/water_issues/programs/ocean/desalination/docs/draft_desal_sed_070314.pdf.

[4] Cooley, H. and K. Donnelly. 2012. Proposed Seawater Desalination Facilities in California, Pacific Institute.

Our organizations have comprehensively reviewed Californiaôs water supply options and have determined ocean desalination should be pursued with caution and only after conservation, stormwater capture, water use efficiency, and wastewater recycling has all been fully implemented. As discussed in Section 22 below, these preferred alternatives are not only less expensive; they have additional benefits of preventing pollution, contributing to habitat restoration, and reducing energy usage. While we understand local water supply agencies have the authority and discretion whether to develop seawater desalination facilities in their portfolio, it is the State Boardôs charge to ensure those facilities meet the mandates of State and Federal law.

If and when seawater desalination is appropriate, projects should be appropriately scaled to meet demonstrated water supply needs. Then, project permits should require the best available site and design to accommodate the best available technology to minimize the intake and mortality of marine life; minimize the brine dischargeôs adverse impacts to the marine environment; and avoid conflict with ecosystem-based management activities, especially ongoing implementation of the Marine Life Protection Act, and climate change and disaster preparedness.

Given the expected push for desalination in the near futureð and the likely availability of environmentally preferable alternativesð it is critical that the State Board develop statewide standards to minimize the intake and mortality of all forms of marine life. However, substantial changes need to be made to the Amendment in order to achieve the intent of the CWA and Porter-Cologne Act, uphold the OTC Policy, and protect and restore Californiaôs marine ecosystems. As described in detail below, we request the State Board make the following revisions to the Desal Amendment and the accompanying Substitute Environmental Document (SED):

1) Include guidance on how regional boards shall combine all 13142.5(b) elements;
2) Be explicit that the ñbest availableò standard is required for each 13142.5(b) element;
3) Determine subsurface infiltration galleries are the best available technology;
4) Remove cost from the best available technology feasibility criteria;
5) Define when subsurface intakes are ñnot feasibleò;
6) Be explicit that open-ocean intakes with fine mesh screens are not the best available technology;
7) Include design capacity into the best available design analysis;
8) Reconsider the currently proposed best available design criteria;
9) Ensure the best available site accommodates the best available technology;
10) Minimize impacts to Marine Protected Areas and other Special Protected Areas;
11) Exempt expanded facilities from the best available site analysis;
12) Prohibit after-the-fact restoration as in-lieu mitigation for the best available technology;
13) Revise the mitigation fee calculation;
14) Spend fees on the best available mitigation to minimize the intake and mortality of marine life;
15) Determine spray-brine diffusers are the best available discharge technology;
16) Conduct proper toxicity monitoring;
17) Hold alternative technologies to the ñbest availableò standard;
18) Prohibit flow augmentation for brine dilution;
19) Monitor for harmful algae blooms;
20) Narrowly define the emergency exemption;
21) Ensure co-located desalination facilities meet the standards under CWA Ä316(b);
22) Consider cheaper, less energy intensive water supply options.

1. REQUIRE A PROPER 13142.5(B) ANALYSIS AND PROVIDE GUIDANCE ON HOW TO COMBINE ALL 13142.5(B) ELEMENTS TO BEST MINIMIZE THE INTAKE AND MORTALITY OF MARINE LIFE.

A. Provide clear guidance on conducting a 13142.5(b) analysis.

Generally speaking, we agree with the intent of the Amendment to enforce each element under Water Code Ä13142.5(b). We agree with the approach of identifying the ñbest siteò, ñbest designò and ñbest technologyò available for ñminimizing the intake and mortality of all forms of marine life.ò These three

elements should be fully enforced before turning to mitigation. And mitigation, to the extent it includes after-the-fact restoration, is still required to be ñbest.ò

It is also a reasonable interpretation of the language to include an analysis of all the three primary elements in combination to ensure that, collectively those elements of a facility meet the standard of ñbestò and ñminimizationò of the intake and mortality of all forms of marine life. However, it would undermine the letter and intent of the law if a combination of the elements resulted in less than one element could achieve. For example, choosing a site or design that would effectively preclude the use of the best technology is not a combination that collectively minimizes the intake and mortality of all forms of marine life. The site and design may be the ñbestò for some other purpose, but clearly not for the purpose of the law.

Therefore, the Amendment needs clear definitions and explanations for how the combination of terms are considered, to ensure the process results in full realization of collectively minimizing the intake and mortality of all forms of marine life ï rather than leaving ambiguity that would allow a lesser standard.

Best is not ñsomeò advantage, and minimize is not ñsomeò reduction ï it is the optimum possible. Further, the intent of the Amendment should not be to minimize the intake of ñsomeò species at ñsomeò life stage ï instead, it should be to minimize the intake and mortality of ñallò forms of marine life.[5] Consequently, technologies like open-ocean screens as part of a collection of technologies must be shown to be superior at minimizing the intake of all forms of marine life ï inclusive of all species of all sizes and life stages. To the extent restoration is part of mitigation, it must ensure replacement of all species lost to the intake ï not just replacement of the weight of what is lost (it is not a replacement of general biomass, it is replacement of biomass of ñall forms of marine lifeò lost to intake and mortality).

We request the State Board incorporate the following definitions into Appendix 1:

ñBestò most advantageous, suitable, or desirable: áthe best way.
ñMinimizeò to reduce to the smallest possible amount or degree.
ñAll forms of marine lifeò all individual species in all different life stages.

B. *The State Board needs to provide clear guidance on how a regional board shall combine all of the 13142.5(b) elements.*

The amendment should clarify the intent of combining the site location, facility design, and technology elements: *ñ[t]he combination of elements shall collectively be the best combination to minimize the intake and mortality of all forms of marine life.ò* Adopting a ñtech neutralò and ñsite specificò approach to best technology, as suggested by project proponents (See Appendix 1), would undermine the clear intent to minimize intake and mortality of all forms of marine life through a combination of the elements. As we have seen in the past, this approach allows a ñsiteò selection that has little to no advantages for minimizing intake and mortality, and results in ñsite specificò technologies that are not the ñbest.ò The State Board should be careful not to adopt a policy that does not follow the intent of the Water Code language and does not ensure the best minimization of the intake and mortality of marine life ï whether it is through each individual element or the combination of elements.

In *Surfrider Foundation v. California Regional Water Quality Control Board, San Diego Region (ñCarlsbadò* decision)[6], the court allowed broad discretion to the Regional Board in its adoption of the Carlsbad permit ï finding that a narrow selection of alternative sites with little or no connection to minimizing intake and mortality was acceptable. The court allowed the same discretion in finding that the design of the facility to produce 50 MGD was allowable ï again with little or no connection to the ultimate goal of minimizing the intake and mortality of all forms of marine life. Then, given the selection

[5] California Water Code Ä13142.5(b).
[6] *Surfrider Foundation v. California Regional Water Quality Control Board*, San Diego Region, Super. Ct. No. 37-2010-90436-CU-WM-OTL (2010).

of the site, the discussion of best technology feasible at that site was dramatically constrained if not eliminated. Because the design of the facility did not include alternatives that would make the site compatible with the best technology, the entire purpose of combining site, design and technology to minimize the intake and mortality of all forms of marine life unraveled and the clearly preferable combination was precluded. How the combination was reviewed resulted in far less than the ñbestò that would be possible with a different process of combining the elements. The process for combining the separate elements clearly did not collectively minimize the intake and mortality of marine life. While the court allowed broad discretion to the Regional Board in combining the elements, the process effectively precluded a combination of elements that were compatible and collectively minimized the intake and mortality of marine life.[7]

As discussed below, the *Carlsbad* decision serves as a practical example of how ambiguity in the Ocean Plan can result in undermining its intent. It is not sufficient to simply state that the Water Code envisions a combination of the elements, it is imperative to describe the process for considering the combination in a way that ensures a collective minimization of the intake and mortality of all forms of marine life. Further, comments by industry representatives including newly fabricated terminology like ñsite specificò best technology, and taking a ñtech neutralò approach are clear evidence of recommended modifications to the Amendment that will result in less than ñthe bestò elements or combination of elements, and consequently less than ñminimizingò (reducing to the smallest possible amount or degree) the intake and mortality of marine life by combining the separate but interconnected elements.

The Amendment should be modified to clarify that combining the elements does not undermine the intent of best reduction of intake and mortality possible. Without clarifying language and instructions for combining the elements, the Amendment will not result in full enforcement of the intent. As written, the Amendment does little to assert the authority and duty of the State Board to ensure the regional boards enforce the law in a way that is consistent. In practice, the Amendment would still allow similar discretion to the regional boards as they have today, and effectively codify the process that allowed a co-located facility in Carlsbad as the future model for stand-alone facilities statewide.

Given the Amendmentôs clear directive to combine all 13142.5(b) elements, we request the State Board *include a ñcombination sectionò to provide regional board guidance on the proper way of combining all 13142.5(b) elements*.

To ensure the Amendment properly combines the 13142.5(b) elements, we request the following revisions to Chapter III.L.2.a.(2):

> *The regional water board shall conduct a Water Code section 13142.5(b) analysis of all new and expanded desalination facilities.* A Water Code section 13142.5(b) analysis may include future expansions at the facility. The regional water board shall first analyze separately as independent considerations a range of feasible alternatives for the best site, the best design, the best technology, and the best mitigation measures to minimize intake and mortality of marine life. Then, the regional water board shall consider all four factors collectively, and the combination of elements shall collectively be the best combination to minimize the intake and mortality of all forms of marine life ~~include the best combination of alternatives that in combination minimize intake and mortality of marine life~~. The best combination of alternatives may not always include the best alternative under each individual factor because some alternatives may be mutually exclusive, redundant, or infeasible in combination.*

[7] *See id*.

2. THE STATE BOARD NEEDS TO BE EXPLICIT THAT THE ñBEST AVAILABLEò STANDARD IS REQUIRED.

A. The ñCarlsbad decisionò does not restrict the State Boardôs authority to interpret 13142.5(b).

The ñ*Carlsbad* decisionò is factually distinguishable from the Amendment, and does not limit the discretion of the State Board to ensure enforcement of the law. First, it is abundantly clear that the court was analyzing the permit for ñtemporaryò operation of the facility while the co-located power plant was discharging heated wastewater for use as ñsource waterò for the desalination facility. Consequently, the factual basis for the decision is not the same as the facts applicable for a stand-alone facility; nor to the adoption of statewide rules for new and expanded facilities.

The benefit of using the discharge wastewater from the power plant in Carlsbad has all but evaporated ï we predict that source water will cease nearly simultaneously with completion of construction of the facility. And the technology proposed for co-location and co-operation is irrelevant for a stand-alone facility. For example, surely the State Board will not consider ñscrubbing bubblesò as a technology for minimizing intake and mortality for a new stand-alone facility. And similarly, the best site, design, technology and mitigation required for the co-located project is not the best for a stand-alone facility.

While we agree that the courtôs interpretation of the law provides important guidance for this Amendment, it does not limit the State Boardôs discretion to interpret the law and establish regulations for enforcement of the law. ñAgency deferenceò afforded to the Regional Boardôs issuance of the temporary permit does not limit the State Boardôs discretion to establish statewide standards for stand-alone facilities.

Further, courts have found that when an agency ñreverses directionò in their regulatory standards, they must include a reasoned analysis for the change. The Amendment already does that in several ways, and those changes are supported by a reasoned analysis. For example, the Amendment clarifies that ñbest available mitigationò, or ñafter the fact restorationò, is not weighted the same as ñbest available site, design and technologyò when combining the elements of section 13142.5(b). After-the-fact restoration is only allowed for the remainder of what marine life is lost to the intake after the best available site, design and technology has been implemented ï it is not a co-equal element in the combination of elements. While we disagree that ñmitigationò includes ñafter the fact restorationò, we agree that the rule should exhaust every alternative for minimizing the intake and mortality in the first place before attempting to ñreplaceò the species lost. Therefore, the Amendment has already distinguished *Carlsbad*, and done so within the State Boardôs discretion, by articulating a reasoned analysis for the change. And we support the reasoned analysis ï it is effectively impossible to restore or construct habitat that ensures replacement of all forms of marine life lost to the intake. Similarly, the Amendment changes direction in the interpretation of the term ñfeasibleò in the statute. While we disagree with the Amendmentôs treatment of determining what is and is not ñfeasibleò, we agree that changing direction by not relying on the CEQA definition is within the State Boardôs retained discretion, given a reasoned analysis for the change.

In conclusion, the State Boardôs discretion in adopting the Amendment is not strictly constrained by *Carlsbad*. And it is now apparent that the decision, if it were to constrain the development of this Amendment, would not result in full enforcement of both the letter and intent of the law.

B. What is ñBest Available?ò

Through past regulatory decisions and judicial review, the definition of ñbest availableò has evolved to mean not only what is available today. The term has been interpreted to incorporate a ñtechnology forcingò policy to ensure that future innovations be adopted as they become ñavailable.ò Therefore, when applying a ñbest availableò standard to ñsiteò, ñdesignò and ñmitigationò (elements other than ñtechnologyò) the term might logically be interpreted as enforcing an ñinnovation forcingò policy.

As State Board staff discussed at the August 9, 2014 Board Workshop, this interpretation is in conflict with limits in the Water Code in that section 13142.5(b) only applies to ñnew or expanded facilities.ò We agree that there is an apparent, yet likely unintended, contradiction in the Water Code language. The Amendment must include a reconciliation of the contradiction within the discretion of the State Boardôs authority to interpret the law. And within that discretion, we think it is appropriate to distinguish that the contradiction is centered on interpreting ñavailableò to establish an ñinnovation forcingò policy in the Amendment. That is, if it is impractical to compel future changes as innovation evolves, it does not preclude imposing the ñbestò or the ñbest availableò at the time a facility is first permitted ï in fact, it compels more scrutiny to ensure that ñless than bestò is not enshrined in a proposed facility site, design or technology once it is considered ñexisting.ò

An exception to the requirements above arises when facilities have been constructed and are operational. The principle that ñavailableò includes an ñinnovation forcing policyò is, from a practical perspective, unenforceable for changing ñsitesò once a facility is constructed and operating. Arguably, this may affect the selection of a technology that is ñavailableò in the future at an existing facilityôs site. That is, the standard interpretation of ñavailableò (which embodies a policy to adapt as innovations provide better alternatives} will not be practical for better ñsitesò once a facility is built and operating. However, that does not preclude requiring ñbetterò technologies at an existing site as innovative alternatives are developed ï even if a future ñbestò is impractical at the existing site. In other words, enforcing the ñinnovation forcing policyò for technologies developed in the future is not completely eliminated after a site is chosen and a facility is constructed ï it merely limits what is ñavailableò at the site.

We agree with the State Board that the literal interpretation of the language creates a conflict between the policy to compel innovation and the limited enforceability on ñnew and existing facilities.ò The conflict is, from a practical perspective, primarily a limit on changing the site as innovative new technologies and designs become available. However, the conflict between an innovation forcing policy and the limited authority to regulate new or expanded facilities is largely, if not completely avoidable by ensuring the absolute best in the first place. In fact, it is hard to imagine how a project proponent would be compelled to modify a facility that was designed and sited to be compatible with sub-surface intakes in the first place.

Further, it does not preclude requiring the best available technology at the time future project proposals are considered for a permit. It should *be clear that if alternatives to a SIG ï that are better or equivalent at minimizing intake and mortality of marine life, but more ñavailableò ï are developed in the future, the identification of what is ñbestò may change for new or expanded facilities*.

C. The concept of Best Available needs to be distributed throughout each of the elements under 13142.5(b).

As noted above, we agree that the separate elements of section 13142.5(b) need to be considered individually and in combination. Nonetheless, each element ï site, design, and technology - needs numerical or qualitative standards to ensure the ñbest availableò mandate is enforced, and the combination needs guidance to ensure that all the elements collectively result in the ñbest availableò scenario to achieve the intent of minimizing the intake and mortality of marine life.

The analysis starts with the ñbest available technology.ò It is undisputed that sub-surface wells eliminate the intake and mortality by a measurable degree. Subsurface infiltration galleries (SIG) effectively minimize intake and mortality of marine life to the same degree. The difference in minimizing marine life mortality between a subsurface well and a SIG is the potential mortality associated with construction and maintenance of a SIG. An open-ocean intake, whether screened or not, is not equal to a sub-surface intake and should not be considered ñbest available technology.ò

Next, the ñbest designò is one that is compatible with the best available technologyð a sub-surface intake. A SIG can be constructed in modules or different configurations to safely supply much larger volumes of

ñsource waterò than a well. The ñsiteò of a facility is ñbestò if it is compatible with the availability of a sub-surface intake. The currently considers other ancillary issues for what may be the ñbest siteò for a facility ï for example consolidating industrial facilities, avoiding special terrestrial habitats and species, co-locating with a sewage treatment plant for dilution water ï but achieving the legislative intent of minimizing the intake and mortality of all forms of marine life mandates that the best site available is the site that is compatible with the best technology available.

Finally, the ñbest available mitigationò should also be considered within the context of the intent to minimize the intake and mortality of ñall forms of marine life.ò ñAll forms of marine lifeò lost to the intake from a seawater desalination facility using an open intake with screens will likely include a diversity of species and life-stages that inhabit every marine habitat ï from deep and shallow rocky reef, to deep and shallow sandy areas, to the water column itself. To the extent the entrainment and impingement of organisms includes those that inhabit estuarine or other inland waters, the scope of ñreplacement habitatò is virtually all habitat. This is why minimizing the intake and mortality of all forms of marine life in the first place must be enforced to the fullest extent ï replacement of all these species is extremely difficult to ensure.

To ensure each 13142.5(b) element is the ñbest availableò, we offer the following revisions to the Amendment:

> *Chapter III.L.2.b.: The Regional Board shall require the best available site. Site is the general onshore and offshore location of a new or expanded facility. There may be multiple potential facility design configurations within any given site.*
>
> *Chapter III.L.2.c.: The Regional Board shall require the best available design. Design is the layout, form, and function of a facility, including the configuration and type of infrastructure, including intake and outfall structures.*
>
> *Chapter III.L.2.d.: The regional Board shall require the best available technology. Technology is the type of equipment, materials,* and methods that are used to construct and operate the design components of the desalination facility.**
>
> *Chapter III.L.2.e.: The Regional Board shall require the best available mitigation. Mitigation for the purposes of this section is the replacement of marine life or habitat that is lost due to the construction and operation of a desalination facility* after minimizing marine life mortality through the best available site, best available design, and best available technology measures.*

3. SUBSURFACE INTAKES ARE THE BEST AVAILABLE TECHNOLOGY.

A. The State Board needs to be explicit that subsurface galleries are the best available technology.

Subsurface intakes are not only the ñpreferred alternativeò for minimizing the intake and mortality of marine life ï but the best available technology for minimizing the intake and mortality of all forms of marine life. The Amendment implements Section 13142.5(b) by stating that when the regional board conducts a 13142.5(b) analysis, the board shall first analyze ñé the best technologyé to minimize intake and morality of marine life.ò This is where the terms ñbest available technologyò end. Instead, Chapter III.L.2.d., states that the regional board ñshall apply the following considerations in determining whether a proposed technology best minimizes intake and mortality of marine life.ò The SED also falls short of establishing subsurface intakes as the best available technology. Instead, SED Section 8.3.5., the State Board recommends Option 3, which would ñestablish subsurface intakes as the *preferred technology* for seawater intakes.ò

The State Board needs to be explicit that subsurface intakes are the best available technology for minimizing the intake and mortality of marine life. As the Board admits ñ[s]ubsurface intakes draw water from below the ground or seafloor using the sediment as a natural filter, *resulting in null impingement and entrainment* at the intake.ò[8] The Board goes on to state that a subsurface intakeôs elimination of impingement and entrainment ñgives subsurface intakes a *significant environmental advantage* over surface water intakesé ò[9] It is evident that the State Board believes subsurface intakes to be the superior technology for minimizing intake and mortality of marine life, yet fails to designate subsurface intakes as the best available technology in the Amendment.

The science community agrees with the State Board that subsurface intakes are a superior technology for minimizing the intake and mortality of marine life. Studies come to the same conclusion that subsurface intakes *eliminate* impingement and entrainment.[10] Similarly, subsurface intakes provide a natural barrier to suspended sediments, algal toxins, pathogens, dissolved or suspended organic compounds, harmful algal blooms, kelp, sea jellies, debris, or oil or chemical spills, and adult and juvenile marine organisms.[11]

The international community finds subsurface intakes to be the superior technology ï beyond the benefit of nearly eliminating the intake and mortality of all forms of marine life. A 2013 survey led by international experts summarized important findings arguing strongly in favor of subsurface intakes:

> ñThe use of subsurface intake systems for seawater reverse osmosis (SWRO) desalination plants significantly improves raw water quality, reduces chemical usage and environmental impacts, decreases the carbon footprint, and reduces cost of treated water to consumers. Recent investigations of the improvement in water quality made by subsurface intakes show lowering of the silt density index by 75 to 90%, removal of nearly all algae, removal of over 90% of bacteria, reduction in the concentrations of [total and dissolved organic carbon], and virtual elimination of biopolymers and polysaccharides that cause organic biofouling of membranes. Economic analyses show that overall SWRO operating costs can be reduced by 5 to 30% by using subsurface intake systems. Although capital costs can be slightly to significantly higher compared to open-ocean intake system costs, a preliminary life-cycle cost analysis shows significant cost saving over operating periods of 10 to 30 years.ò[12]

There is no question that subsurface intakes are the best available technology. As such, the State Board should *be explicit that subsurface intakes ï and specifically, subsurface infiltration galleries (as discussed below) ï are the best available technology*.

B. There is a difference between subsurface wells and infiltration galleries.

Not all subsurface intakes are created equally. Subsurface wells and subsurface infiltration galleries are often grouped together under the umbrella of subsurface intakes. And while subsurface intakes collectively have the same operational benefits of eliminating impingement and entrainment, different types of subsurface intakes may have different construction and maintenance impacts resulting in the potential for marine life mortality or temporary displacement.

Subsurface wells (vertical beach wells, slant wells, and horizontal directionally drilled (HDD) wells) should be considered the ultimate technology for minimizing marine life mortality because there is no marine life mortality ï both operational and during construction. Vertical beach wells consist of a series

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[8] Supra note 3 at 58.
[9] Supra note 3 at 54.
[10] Missimer, T.M., N. Ghaffour, A.H.A. Dehwah, R. Rachman, R.G. Malvia and G. Amy. 2013. Subsurface intakes for seawater reverse osmosis facilities: Capacity, limitation, water quality improvement, and economics. Desalination. Vol. 322: 37 ï 51.
[11] Supra note 3 at 54.
[12] Thomas M. Missimer et al., *Subsurface intakes for seawater reverse osmosis facilities: Capacity limitation, water quality improvement, and economics,* 322 Desalination 37 (2013).

of shallow wells near the shoreline that use beach sand or other geologic deposits to filter water.[13] Vertical wells are also a proven feasible technology for large-scale desalination facilities internationally. The Sur plant, in the country of Oman, is one of the largest desalination plants in the world with a pumping capacity of up to 21.2 MGD. The Sur plant is an example of a facility that uses subsurface intakes to successfully provide large volumes of water for desalination.[14]

HDD wells are a combination of vertical wells before moving horizontal underneath the seafloor. HDD well technology is used extensively by the oil exploration industry and has been used in desalination plants.[15] The 34 MGD San Pedro del Pinatar (Cartagena) plant in Spain, has been operational for several years, and is the largest desalination plant using HDD technology.[16]

Slant wells are drilled at an angle such that the wellhead and related infrastructure may be onshore, while the well extends below ocean sediments and draws seawater through the seabed. With this technology, the wellhead can be located some distance from the beach to minimize ñloss of shoreline habitat, recreation access, and aesthetic valueò.[17] While this is a new and growing technology, the potential for slant wells is increasing and evidence of the advancement of slant wells and the minimization of the intake and mortality of all forms of marine life is already proven by the ñDana Point Pilot Projectò under operation by the Municipal Water District of Orange County.

Subsurface wells have no construction impacts to marine life. All well construction begins at the beach, and then either goes directly down, goes down and then horizontally under the seafloor, or goes offshore at an angle. But regardless of what type of subsurface well is used the benefits of subsurface wells are the same ï no marine life mortality during both construction and operation ï making subsurface wells the ultimate technology for minimizing marine life mortality.

Subsurface infiltration galleries are different ï they have construction and maintenance impacts possibly leading to marine life mortality. Infiltration galleries are typically constructed by removing soil or rock, placing a screen or network of screens within the excavated area, and then backfilling the area with a porous media to form an artificial filter around the screens. Infiltration galleries are usually located within the intertidal zone of the beach or in the seabed, thus leading to potential construction impacts on marine life. While galleries have the same operational impacts of subsurface wells ï zero marine life mortality ï galleries do have some construction and maintenance impacts making that technology the secondary alternative technology for minimizing marine life mortality.

Subsurface infiltration galleries offer flexibility to desalination proponents. Since galleries are designed to replace the natural substrate, they are considered to be ñhighly feasible.ò[18] The only drawback to galleries is they cannot be located in areas of ñsignificant concentrations of mud and sediment, commonly associated with locations near the mouth of a river or streamò without planning for maintenance to ensure the galleries do not clog up and lose performance. [19] Galleries have proven feasible at the Fukuoka desalination plant in Japan.[20] The gallery has an intake flow of 27 MGD and has been operational since 2006.[21] Since the facility has become operational, the gallery system has not required cleaning, and the

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[13] Pacific Institute, Key Issues in Seawater Desalination in California: Marine Impacts, pg. 9 (2013).
[14] David, B., J. Pinot and M. Morrillon. 2009. Beach Wells for Large-Scale Reverse Osmosis Plants: The Sur Case Study. IDA World Congress at Atlantis, The Palm. Dubai, UAE. (7-12 Nov. 2009), available at http://www.cacoastkeeper.org/document/beach-wells-for-large-scale-reverse-osmosis-plants.pdf.
[15] Supra note 13, at 10.
[16] *Id*.
[17] Mackey, E.D., N. Pozos, J. Wendle, T. Seacord, H. Hunt, and D.L. Mayer. (2011). *Assessing Seawater Intake Systems for Desalination Plants*. Denver, Colorado: Water Research Foundation.
[18] Supra note 10.
[19] *Id*.
[20] Supra note 13, at 10.
[21] Pankratz, T. (2008). ñGlobal Overview of Seawater Desalination Intake Issues.ò Presented at the Desalination Intake Solutions Workshop, October 16-17, Alden Research Laboratory, Holden, Massachusetts.

filter membranes have required only minimal maintenance.[22] The City of Long Beach, California has also been operating a pilot seabed infiltration gallery for several years. And several other systems around the world are in design, have been proposed for development, or are in operation. Interestingly, the Long Beach pilot gallery is located near the mouths of the Los Angeles River and San Gabriel River, and behind a long breakwater eliminating wave action. Despite the fact this location violates all the industry recommendations for where to construct a gallery to ensure performance and avoid maintenance, the pilot gallery appears to be operating without problem.

The State Board should *consider galleries and wells as two separate technologies with different performance standards*.

C. The feasibility of subsurface intakes should not preclude the State Board from determining that subsurface intakes are the best available technology for setting a performance standard.

Absolute feasibility should not preclude the State Board from making a determination that subsurface intakes are the best available technology. When determining that wet-cycle cooling towers were the best technology available for minimizing marine life mortality under the OTC Policy, the State Board did not find that wet-cooling technology were feasible everywhere. During the development of the OTC Policy, the State Board hired Tetra Tech Consultants to evaluate the technical and logistical feasibility of retrofitting 15 of the Stateôs coastal OTC facilities with wet cooling systems.[23] The report developed conceptual retrofit designs based on each facilityôs design parameters and evaluated feasibility in terms of logistics (e.g., available space, interference with other critical systems or nearby infrastructure), operations (e.g., energy penalty), local use restrictions (e.g., noise or building codes) and aesthetic or environmental restrictions (e.g., conflicts with conservation plans, impacts to threatened and endangered species). The Tetra Tech report found that wet cooling was technically and logistically feasible at 12 of the 15 facilities.[24] Although wet-cooling towers were not believed to be feasible for all facilities, the State Board adopted that technology as the best technology available ï setting a standard for OTC facilities to meet through either the Track 1 or Track 2 approach.

Setting the best available technology for desalination facilities is analogous to setting BTA under the OTC Policy. Subsurface wells may offer limited feasibility due to geological conditions; however, infiltration galleries are designed to work in most geological conditions. Beach galleries specifically have design potential for large scale facilities, and have been demonstrated to be able handle large volumes of water.[25] Therefore, beach galleries are analogous to wet-cycle cooling towers, they may not work in 100 percent of the locations, but they are feasible in the majority of sites along the California coast.

Like the OTC Policy, the State Board should *determine subsurface intakes to be the best available technology despite the possibility of infeasibility at some locations*.

D. Subsurface infiltration galleries should be the best available technology.

While subsurface wells are the ultimate technology for minimizing marine life mortality, subsurface galleries should be considered the best available technology for determining the performance standard. Notably, the OTC Policy did ñnot require a facility to adopt closed-cycle cooling [dry cooling towers] in order to comply, but instead contains a two track approach that acknowledges the ability of different technology options to achieve reductions that are *substantially similar* to closed-cycle wet cooling [wet cooling towers].ò[26] The State Board did not set a OTC Policy performance standard of dry cooling towers

[22] Supra note 10.
[23] STATE WATER RES. CONTROL BD., Final Substitute Environmental Document: Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling, pg. 162 (May 2010), *available at* http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/docs/final_sed_otc.pdf.
[24] *Id.*
[25] Supra note 3, at 55.
[26] Supra note 23, at 10.

because that technology was shown not to be feasible at many ñexistingò power plants ï and hence not readily ñavailableò for existing facilities. Dry cooling is analogous to subsurface wells because both result in a performance standard of zero marine life mortality but may not be feasible everywhere.

Alternatively, wet cooling towers is analogous to SIGs because both would result in minimal marine life mortality, but both establish a performance standard to be met by different technologies that achieve reductions that are *substantially similar*, or ñfunctionally equivalentò to the ultimate technology. Moreover, galleries are similar to wet cooling towers because both technologies are feasible in most locations.

The same conclusions made in the OTC Policy should be drawn here for the Desalination Policy. First, the State Board should *be explicit that SIGs are the best available technology* for minimizing intake and mortality of all forms of marine life, and for their nearly universal ñavailabilityò compared to sub-surface wells. Further, the ñperformance standardò for a SIG is similar to a ñwet cooling towerò in that the SIG can be assumed to have some mortality associated with the construction and maintenance ï a minimally less protective performance standard than the absolute best (dry cooling towers in the case of power plants ï and subsurface wells in the case of seawater desalination).

To ensure that the best available technology is being implemented to reduce the intake and mortality of marine life, we offer the following revisions to the draft Amendment Section L.2.d:

> *The regional Board shall require the best available technology. Technology is the type of equipment, materials,* and methods that are used to construct and operate the design components of the desalination facility.* The regional water board shall apply the following considerations in determining whether a proposed technology best minimizes intake and mortality of marine life:*
>
> *(1) Considerations for Intake Technology:*
>
> *(a) The best available intake technology for minimizing the intake and mortality of all forms of marine life is subsurface infiltration galleries. Subject to Section L.2.a.(2), the regional water board shall require subsurface* intakes, either subsurface wells or galleries, unless it determines that subsurface* intakes are ñnot feasibleò based upon an analysis of the criteria listed below, in consultation with State Water Board staff.*

4. COST SHOULD NOT BE A FACTOR IN DETERMINING FEASIBILITY.

A. Performing a cost-analysis under a feasibility determination is illegal.

When determining the feasibility of the best available technology, cost should not be a factor. In *Entergy Corp. v. Riverkeeper, Inc.* (*Riverkeeper II*),[27] the Supreme Court found that Ä316(b) authorizes the U.S. EPA to compare costs that are reasonably borne by the industry in determining the best technology available for minimizing environmental impact at cooling water structures. Importantly, however, U.S. EPA is not required to consider costs in conducting this analysis.[28] *Riverkeeper II* court held that the use of the term ñBest Technology Availableò prevents the use of inferior technologies, or what the court referred to as ñsecond best.ò[29]

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[27] *Entergy Corp. v. Riverkeeper, Inc.*,[27] 129 S.Ct. 1498 (2009) (ñ*Riverkeeper II*ò).
[28] *Id.*
[29] *Id.* at 108. Congress's use of the superlative ñbestò in the statute cannot be read to mean that a facility that achieves the lower end of the ranges, but could do better, has complied with the law. The statutory directive requiring facilities to adopt the *best* technology cannot be construed to permit a facility to take measures that produce second-best results, especially given the technology-forcing imperative behind the Act. *Natural Res. Def. Council v. U.S. Envtl. Prot. Agency*, 822 F.2d 104, 123 (D.C. Cir. 1987). Insofar as U.S. EPA establishes performance standards instead of requiring facilities to adopt particular technologies,

The *Riverkeeper II* decision held that ñthe EPA's determination of BTA, cost-benefit analysis is not consistent with the requirement of Ä 316(b) that cooling water intake structures ñreflect the best technology available for minimizing adverse environmental impact.ò[30] Most importantly, the court determined that ñthe statutory language requires that the EPA's selection of BTA be driven by technology, not cost.ò[31] ñThe Agency is therefore precluded from undertaking such cost-benefit analysis because the BTA standard represents Congress's conclusion that the costs imposed on industry in adopting the best cooling water intake structure technology available (i.e., the best-performing technology that can be reasonably borne by the industry) are worth the benefits in reducing adverse environmental impacts.ò[32] Therefore, the State Board cannot use a cost-benefit analysis to determine the BTA under 316(b). That is already adopted in the OTC Policy, and as discussed below, we believe the same conclusion should be upheld for desalination facilities under 13142.5(b). In brief, there is no legislative intent to include a cost-benefit analysis in the Clean Water Act section 316(b), nor is there any such intent evident in the Porter-Cologne Act Ä13142.5(b). They are similar and must be enforced similarly.

The State Board cannot authorize a site-specific determination of whether BTA is feasible using a cost-benefit analysis. In the Amendment, the State Board allows a cost-benefit analysis to determine whether subsurface intakes are infeasible. However, the *Riverkeeper* decision was clear that ñ[j]ust as the Agency cannot determine BTA on the basis of cost-benefit analysis; *it cannot authorize site-specific determinations of BTA based on cost-benefit analysis*.ò[33]

Riverkeeper II is explicitð an individual projectôs analysis of whether BTA is feasible cannot be based on a cost-benefit analysis. Therefore, we request the State Board <u>*remove any cost-benefit analysis in the best available technology ñfeasibility criteria.ò*</u>

B. Californiaôs common law interpretation of statutes requires cost to not be a factor in determining feasibility of the best available technology.

California case law on an agencyôs statutory interpretation also suggests that the State Board should not allow cost to be a factor when determining feasibility for the desalination policy. When determining whether the State Board properly interpreted Ä13142.5(b) a court will "`take into account matters such as context, the object in view, the evils to be remedied, the history of the times and of legislation upon the same subject, public policy, and contemporaneous construction.'"[34] The State Board developed the OTC Policy with the intent to eliminate the unnecessary mortality of marine life from seawater intake; the same ñevils to be remediedò are also present in the need for a desalination policy. Without a strong desalination policy that remedies the evils of marine life mortality, the OTC Policy is undermined. "`Consistent administrative construction of a statute over many years, particularly when it originated with those charged with putting the statutory machinery into effect, is entitled to great weight....'"[35]

The State Boardôs adoption of the OTC Policy set a precedent to not consider cost for the feasibility of minimizing the mortality of marine life. OTC facilities are currently expending great financial resources to implement and comply with the OTC Policy. This shows the OTC Policy was not the harbinger of economic collapse predicted by power plant operators. But maybe more importantly, if desalination facilities are allowed to continue withdrawing seawater in a way that replaces, if not exceeds, the intake and mortality of retired once-through-cooling ï the entire investment will be offset and wasted.

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it must require facilities to choose the technology that permits them to achieve as much reduction of adverse environmental impacts as is technologically possible. *Riverkeeper II*, 475 F.3d at 108.

[30] *Id*.

[31] *Id*.

[32] *Id*.

[33] *Id*.

[34] *Cossack* v. *City of Los Angeles* (1974) 11 Cal.3d 726, 733 [114 Cal. Rptr. 460, 523 P.2d 266], quoting *Alford* v. *Pierno* (1972) 27 Cal. App.3d 682, 688 [104 Cal. Rptr. 110]; *United Business Com.* v. *City of San Diego, supra,* at p. 170.

[35] (*Gay Law Students Assn.* v. *Pacific Tel. & Tel. Co.* (1979) 24 Cal.3d 458, 491 [156 Cal. Rptr. 14, 595 P.2d 592], quoting *DiGiorgio Fruit Corp.* v. *Dept. of Employment* (1961) 56 Cal.2d 54, 61-62 [13 Cal. Rptr. 663, 362 P.2d 487].)

Finally, a court gives deference to the precedent of not allowing cost to be a factor in determining feasibility. ñLawmakers are presumed to be aware of long-standing administrative practice and, thus, the reenactment of a provision, or the failure to substantially modify a provision, is a strong indication the administrative practice was consistent with underlying legislative intent.ò[36] The California Legislature has not enacted any legislation that would require the State Board to use cost as a factor for determining feasibility under the OTC Policy, thus providing a strong legislative indication that cost should not be a factor, and the State Board should continue interpreting Ä13142.5(b) to not require cost to be a factor for feasibility under the desalination policy.

C. The Supreme Courtôs interpretation of federal statutes strictly limiting the inclusion of a cost analysis should be considered.

The Supreme Court interprets statutes narrowly when determining whether a cost-benefit analysis is necessary. A statutory canon provides that, unless a cost-benefit analysis is clearly authorized by a legislative body, agencies may not use it.[37] Instead, regulatory statutes should be read to require avoidance of environmental and other harm to the extent possible or feasible.[38]

Legislative bodies do not hide elephants in mouseholes. In *Whitman v. American Trucking Associations, Inc.*,[39] the Supreme Court held that section 109 of the Clean Air Act (ñCAAò) precluded consideration of the costs of implementation in setting National Ambient Air Quality Standards (ñNAAQSò). Justice Scalia concluded that the consideration of cost to be authorized ñin vague terms or ancillary provisionsò is inappropriateð Congress ñdoes not, one might say, hide elephants in mouseholes.ò[40] The burden was on industry to ñshow a [clear] textual commitment of authority to the EPA to consider costs in setting NAAQS,ò and industry failed to carry that burden.[41] In the absence of clear authority, the U.S. EPA is not only not compelled to consider costs; it has no authority to do so.[42] *American Textile* held that when a legislative body intends for an agency to use cost-benefit analysis it makes that clear in the statute.

D. The State Boardôs about-face change in existing policy to not consider cost when determining feasibility of best available technology is illegal.

Given *Riverkeeper IIôs* holding that a cost-benefit analysis is illegal, the State Board decided to not allow cost to be a factor in the OTC Policyôs feasibility analysis. The State Board justified its position because it is ñnot appropriate to equate the substantial mortality of marine life associated with OTC to monetary costs of compliance.ò The only monetary value associated with impacts to marine life is based on commercial values of fish, which is completely inadequate to characterize the ecological effects of OTC.ò[43] As discussed above, similarities between the OTC Policy and the proposed Amendment justify applying this same reasoning to not allow cost to be a factor when determining feasibility.

If the Amendment allows cost to be considered in determining the feasibility of subsurface intakes, then it will be considered an illegal about-face change in existing policy. The State Board is given deference when interpreting the California Water Code, but the Board is bound the rule that an agencyôs statutory interpretation cannot be ñarbitrary, capricious, or entirely lacking in evidentiary support, or contrary to

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[36] *DeYoung v. City of San Diego* (1983) 147 Cal. App. 3d. 11; *quoting Horn* v. *Swoap* (1974) 41 Cal. App.3d 375, 382 [116 Cal. Rptr. 113]; 58 Cal.Jur.3d, Statutes, Ä111, pp. 496-497.)

[37] Jonathan Cannon, The Sounds of Silence: Cost-Benefit Canons in *Entergy v. Riverkeeper*, Inc., pg. 433 (2008), *available at* http://www.law.harvard.edu/students/orgs/elr/vol34_2/425-460.pdf.

[38] *See* William N. Eskridge, Jr. & Lauren E. Baer, *The Continuum of Deference: Supreme Court Treatment of Agency Statutory Interpretations from* Chevron *to* Hamdan, 96 GEO. L.J. 1083, 1201ï 02 (2008).

[39] *Whitman v. American Trucking Associations, Inc.*, 531 U.S. 457 (2001).

[40] *Id*. at 468.

[41] *Id.* at 468ï 71.

[42] *Id*.

[43] OTC Policy Final Response to Comments, pg. 66, *available at* http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/docs/cwa316may2010/sed_final_g.pdf.

required legal procedures.ò[44] Courts apply an even higher standard to the required justification for changes such as the Amendment in question, where an agency revokes its previous rule or makes an about-face change in an existing policy. The level of deference afforded an administrative agencyôs rulemaking decision is defined in *Chevron v. Natural Resources Defense Council*, 467 U.S. 837 (1984) (ñ*Chevron*ò). *Chevron* requires that when the State Board is implementing the Clean Water Act pursuant to its delegated authority, it must first ensure that its implementation decisions are not contrary to the clear language of the law. To the extent there is any ambiguity in the statute, the agency must interpret the law in a way that is not arbitrary and capricious or otherwise abuses the discretion afforded agencies by the Legislature:

> [I]f the statute is silent or ambiguous with respect to the specific issue, the question for the court is whether the agency's answer is based on a permissible construction of the statute.[45]
>
> [I]f, however, the court determines Congress has not directly addressed the precise question at issue, the court does not simply impose its own construction on the statute, as would be necessary in the absence of an administrative interpretation. Rather, if the statute is silent or ambiguous with respect to the specific issue, the question for the court is whether the agency's answer is based on a permissible construction of the statute. Id. If Congress has explicitly left a gap for the agency to fill, there is an express delegation of authority to the agency to elucidate a specific provision of the statute by regulation. Such legislative regulations are given controlling weight unless they are arbitrary, capricious, or manifestly contrary to the statute.ò[46]

The State Board has already decided that cost should not be a factor in determining the feasibility of the best available technology. The State Board decided in its OTC Policy that it ñdoes not believe cost-benefit is appropriate at the programmatic level.ò[47] *Motor Vehicles Manufacturers Association v. State Farm*[48]explains that the State Board cannot reverse its decision that cost is not appropriate to determine feasibility. In State Farm, the Supreme Court held that:

> ñrevocation constitutes a reversal of the agency's former views as to the proper course. A settled course of behavior embodies the agency's informed judgment that, by pursuing that course, it will carry out the policies committed to it by Congress. There is, then, at least a presumption that those policies will be carried out best if the settled rule is adhered to." Accordingly, an agency changing its course by rescinding a rule is obligated to supply a reasoned analysis for the change beyond that which may be required when an agency does not act in the first instance.ò[49]

The State Board has decided that cost should not be a factor in determining feasibility of the best technology available. Reversing that course of action without a reasoned analysis will violate the ñarbitrary and capriciousò standard.

The State Board should remove ñcostò, including ñlifetime costò, from the feasibility analysis for determining best available technology. The same reasoning applied in the OTC Policy is applicable here ï that being the cost of compliance is easy to calculate, while the benefits of compliance are un-

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[44] *Stauffer Chemical Co. v. Air Resources Control Board*, 128 Cal.App.3d 789, 796 (1982); *see also City of Arcadia v. State Water Resources Control Board* 135 Cal.App.4th 1392, 1409 (2006) (applying writ of mandate standard under Cal. Civil Code Ä1085); *see also* 5 U.S.C. Ä706(2)(A); *see also Se. Alaska Conservation Council v. Army Corps of Engôrs (SEACC)*, 486 F.3d 638, 643 (9th Cir. 2007).
[45] *Id.* at 843.
[46] *Id.* at 843-844.
[47] Supra note 13, at 63.
[48] *Motor Vehicles Manufacturers Association v. State Farm*, 463 U.S. 29 (1983).
[49] *State Farm*, 463 U.S. at 41-42 (emphasis added).

calculable. Californiaôs statutory interpretation of Water Code Section 13142.5(b) demands that cost be removed from the feasibility determination. The Supreme Courtôs statutory interpretation of similar federal statutes further explains why cost should not be a factor. And if the State Board reverses its decision to consider cost as a factor, it would be considered an arbitrary and capricious interpretation of the law.

In order to uphold the OTC Policy and comply with the law, we request the State Board *remove cost from the feasibility analysis for the best available intake technology*.

5. THE FEASIBILITY DETERMINATION FOR SUBSURFACE INTAKES SHOULD BE NARROWLY DEFINED.

A. The OTC Policy should guide the development of the Desalination Policy.

The OTC policy should be used as guidance for the desalination policy because: (1) Section 13142.5(b) in the Water Code does not distinguish between withdrawals for cooling water and any other industrial withdrawal of seawater; (2) the impacts are comparable; (3) ensuring consistent treatment of similar environmental impacts is good policy; and (4) the desalination policy has the potential to undermine ecosystem protections gained by the OTC policy and other efforts to protect marine life, including the Marine Life Protection Act.

Impacts from OTC and desalination facilities are both immense and comparable, and both the OTC Policy and the Desal Policy should set similar standards to prevent undermining one another. For over thirty years, power plants in California have used open seawater intakes for OTC.[50] Several state agencies, including the California Energy Commission, State Lands Commission, Ocean Protection Council and State Board, have recognized that intake systems for once-through cooling have caused significant damage to Californiaôs marine ecosystems.[51] The ecological losses from open seawater intakes used for once-through cooling are estimated in the millions of dollars, and there are additional market losses of commercially and recreationally important species.[52] The concentration of open ocean intakes in a given area can also factor into the magnitude of environmental destruction. The cumulative impact of multiple open seawater intakes in bays could increase environmental damage when they are located in highly biologically productive regions that serve as nurseries for marine life.[53] It is particularly important that cumulative impact evaluations address all seawater intakes (OTC and desalination) in the zone where impacts may be actualized and incorporate research on the performance of Track 2 technologies for OTC alternatives. Finally, it is not uncommon for existing intakes to impact prey species that are not targeted by fisheries nor easily ñmonetizedò, but nonetheless serve a critical ecological function in the rebuilding and sustainable populations of our fisheries.

Currently, the proposed Track 2 of the desalination policy would allow open ocean intakes ï the very same type of intakes addressed by the OTC policy (and in the cases where the desalination plants are co-located with the OTC power plants, it could be literally the very same pipe), and section L.2.d.1.c seems to imply that screens are an equivalent technology for minimizing the intake and mortality of marine life ï including a provision that requires and equivalency test for screens rather than an equivalency test for sub-surface intakes.

The entrainment and impingement impacts of withdrawing large volumes of water is the same whether the seawater is ultimately used to cool a power plant or as source water for a desalination plant.[54] The

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[50] *See* CAL. STATE WATER RES. CONTROL BD., SCOPING DOCUMENT: WATER QUALITY CONTROL POLICY ON THE USE COASTAL AND ESTUARINE WATERS FOR POWER PLANT COOLING 78 (2008) [hereinafter 2008 SCOPING DOCUMENT].

[51] *See generally* CAL. OCEAN PROT. COUNCIL, RESOLUTION REGARDING THE USE OF ONCE-THROUGH COOLING TECHNOLOGIES IN COASTAL WATERS (April 20, 2006); FINAL SED, *supra* note 4, at 1.

[52] CAL. ENERGY COMMôN, ISSUES AND ENVIRONMENTAL IMPACTS ASSOCIATED WITH ONCE-THROUGH COOLING AT CALIFORNIAôS COASTAL POWER PLANTS: STAFF REPORT 31 (CEC-700-2005-013) (2005).

[53] *See id.* at 30-31.

[54] *See*, HEATHER COOLEY, PETER H. GLEICK & GARY WOLFF, DESALINATION, WITH A GRAIN OF SALT, A CALIFORNIA PERSPECTIVE

State Board already considered the efficacy of screened intakes in the OTC Policy and found that they were sub-par ï and they are still sub-par regardless of the mesh size.

Further, the average volume of water withdrawn per day at once-through-cooled power plants is comparable to the anticipated volume of the proposed large-scale desalination plants in California.[55] Therefore, given entrainment and impingement impacts are potentially comparable ï and possibly even greater ï than OTC and would be regulated under the same California Water Code provision, *the legal interpretations of section CWA Ä316(b) should be used to instruct how the State Board regulates desalination*.[56]

B. The Once-Through Cooling Policy and Clean Water Act Ä316(b) should be used to guide the State Boardôs definition of ñinfeasible.ò

Given the California Water Code does not define ñfeasibleò, the State Board should use the OTC Policy and CWA Section 316(b) as guidance. California Water Code Ä13142.5(b) mandates desalination facilities use ñthe best available site, design, technology, and mitigation measures *feasible*é to minimize the intake and mortality of all forms of marine life.ò The Water Code does not define ñfeasible,ò and case law does not provide appropriate guidance. Likewise, the Clean Water Act does not provide a definition of ñfeasibleò in relevant contexts, but the U.S. EPA has provided guidance as discussed below. Given the lack of a statutory definition of ñfeasible,ò the State Board has the administrative discretion to define ñfeasibleò by referring to an appropriate analog. The statutory provision most directly analogous and appropriate for reference is Clean Water Act (CWA) Ä316(b), because it addresses the same harmful open seawater intakes that certain project proponents propose to use for their coastal desalination facilities, and if a ñnew or expandedò power plant were proposed, the Porter-Cologne Act would be enforceable and therefore not only analogous, but rather exactly the same. The Once-Through Cooling Policy (OTC Policy) and associated 316(b) Guidance should be used to craft an appropriate definition of ñnot feasibleò in the desalination policy.

California courts have stated that where a state and federal statutory scheme have the same ñobjectives and relevant wordingò, as they do here, California courts look to federal precedent for guidance.[57] The OTC Policy is based on federal CWA Ä316(b), which has similar requirements as State Water Code Ä 13142.5(b), which applies to seawater withdrawals for ñcooling waterò and desalination facilitiesô ñsource waterò. For the OTC Policy the State Board developed a two-track approach, with Track 1 setting the best technology available standard, while Track 2 provided an alternative ï but substantially the same ï compliance track that could be pursued when an existing facility demonstrates to the State Water Boardôs satisfaction that Track 1 is ñnot feasible.ò The Desalination Amendment proposes a similar structure for the best available intake technology section. Section L.2.d.1.a. states that the ñregional water board shall require subsurface intakes unless it determines that subsurface intakes are infeasibleé ò Like the OTC Policy, this sets-up a two-track approach for coming into compliance with the best available technology portion of Water Code Section 13142.5(b). Given the similar statutory language of CWA Ä316(b) and Water Code Ä13142.5(b), the similar two-track approach in both policies, and critical nature of the term ñnot feasible,ò the State Board should use the OTC Policy and CWA Ä316(b) as guidance for the desalination policyôs definition of ñnot feasible.ò

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1 (2006), *available at* www.pacinst.org/reports/ desalination/desalination_report.pdf.

[55] *See id*. at 31, tbl.4 (listing the capacity of proposed desalination plants); FINAL SED, *supra* note 12, at 33, tbl.2 (listing the average flow rate of water withdrawn from existing power plants).

[56] *See*, ANGELA HAREN KELLEY, *A Call For Consistency: Desalination, Open Ocean Intakes & the California Water Code*, 4 GOLDEN GATE U. ENVTL. L. J. 277 (2011). *Available at:* http://digitalcommons.law.ggu.edu/cgi/viewcontent.cgi?article=1062&context=gguelj

[57] *See, e.g., Reno v. Baird* (1998) 18 Cal. 4th 640, 64 7 (reasoning that where "the objectives and relevant wording" of a state statute are similar to a federal statute, "California courts often look to federal decisions interpreting these statutes for assistance in interpret[ation]"); *see also Guz v. Bechtel Nat 'I. Inc.* (2000) 24 Cal. 4th 317, 354; *Cal. State Univ. v. Superior Court* (2001) 90 Cal.App.4th 810, 823.

In order to adequately protect our marine ecosystems from entrainment and impingement impacts and to ensure that any gains made through the OTC Policy and the MLPA are not undermined, the State Water Board should *use the 316(b) judicial guidance as guidance for the desalination policy ï as the State has already done in the OTC Policy*.

C. CEQAôs definition of ñfeasibleò is not an appropriate definition for a State Board Policy aimed to minimize the mortality of marine life.

The California Environmental Quality Act (CEQA) and the Porter-Cologne Act have vastly different purposes. CEQA is primarily designed to identify and disclose to decision-makers and the public the significant environmental impacts of a proposed project prior to its consideration and approval. An EIR is "ócthe heart of CEQA"' and the "environmental ócalarm bellô whose purpose it is to alert the public and its responsible officials to environmental changes before they have reached ecological points of no return."[58] It is intended, further, "ócto demonstrate to an apprehensive citizenry that the agency has, in fact, analyzed and considered the ecological implications of its action."'[59] "Because the EIR must be certified or rejected by public officials, it is a document of accountability."[60]

CEQA is an information-forcing law that keeps the public informed and agencies accountable. Porter-Cologneôs purpose is to regulate the ñwater resources of the stateò and ensure ñthe quality of all the waters of the state shall be protected for use and enjoyment by the people of the state.ò[61] Porter-Cologne expects sources of pollution, like desalination facilities, to ñbe regulated to attain the highest water quality which is reasonable.ò[62] CEQA and Porter-Cologne are not analogous statutes; their definitions are not analogous. Therefore, the State Board should not interpret ñfeasibleò by using CEQAôs definition. Rather, statutory interpretation, case law, and responsible public policy suggests the State Board *use the Clean Water Act, EPA and judicial guidance on 316(b), and the State Boardôs analogous OTC Policy to define ñfeasibleò for the desalination policy*.

It is critical to articulate the reasons for defining ñnot feasibleò consistent with the OTC Policy definition and not the CEQA definition as any deviation from the CEQA definition will be a change in course from what the State previously argued in *Surfrider Foundation v California Regional Water Quality Control Board*[63].

D. In-plant dilution should not be a factor in determining the feasibility of subsurface intakes.

ñAugmented flowò for ñin-plant dilutionò is the intake of additional seawater for the purpose of in-plant dilution during the discharge of a desalination facilityôs brine waste. The Policy mistakenly includes in-plant dilution under the definition of augmentation flow, but they are two separate terms. ñIn-plant dilutionò is the commingling of another source of water, typically treated wastewater, to dilute brine as it is discharged into the ocean. The distinction between ñflow augmentationò (ñadditional intake volumeò) and other sources of water for in-plant dilution is, ñflow augmentationò dilution water was pulled out of the ocean for the purpose of diluting brine, while other waters for in-plant dilution were already put to another use before being used for dilution, and these wastewaters do not add to the intake and mortality of all forms of marine life. This difference is critical because ñaugmented intakeò (or ñadditional intake volumeò) severely increases the intake and mortality of marine life, causing a net negative benefit to marine life, while wastewater used for ñin-plant dilutionò results in no marine life mortality and results in a net benefit given its ability to dilute brine to natural levels.

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[58] *Laurel Heights Improvement Assn.* v. *Regents of the University of California* (1988) 47 Cal.3d 376, 392 [253 Cal. Rptr. 426, 764 P.2d 278].)
[59] *Id.*
[60] *Id.*
[61] *See* Cal. Water Code ÄÄ13000 *et seq.*
[62] *See* Cal. Water Code ÄÄ13000 *et seq.*
[63] Supra note 6.

It is already known that seawater intakes can be devastating to marine life, with the exception of sub-surface intakes. Taking additional seawater through surface intakes to dilute brine can result in a three-fold increase in the amount of marine life mortality. Take the Carlsbad facility as an example since they are currently permitted to conduct augmented flow for in-plant dilution. Carlsbad is a 50 MGD facility requiring about 105 MGDs of source water, but its NPDES permit allows for a 304 MGD seawater withdrawal due to in-plant dilution. The San Diego Regional Board set a dilution ratio for Carlsbad at 15.5:1, resulting in 199 MGDs [64] of additional seawater intake flow just to dilute the brine. Once Carlsbad becomes a stand-alone facility, if similar additional intake volumes were necessary to meet the dilution ratio in the draft, it would result in triple the amount of marine life mortality. And screens may provide some reduction in entrainment, but likely very little ï and certainly not a reduced intake and mortality of ñall forms of marine life.ò

Allowing additional intake volumes simply for in-plant dilution is illegal. Interpreting Ä13142.5(b) to allow flow augmentation for brine dilution is not wise policy and would lead to ñmischief and absurdity.ò A court determining whether flow augmentation is permitted under Ä13142.5(b) would first ñascertain the intent of the Legislature so as to effectuate the purpose of the law."[65] The Legislatureôs intent is clear ð it wants the best available technology to minimize the intake and mortality of all forms of marine life. In-plant dilution does not minimize the mortality of marine life if it requires increasing the intake volume; it exacerbates impingement and entrainment to dilute brine. A court also needs to interpret Ä13142.5(b) to give ña reasonable and common sense interpretation consistent with the apparent purpose and intention of the lawmakers, practical rather than technical in nature, which upon application will result in wise policy rather than mischief or absurdity.ò[66] Statutes should be interpreted to produce reasonable results and words should be interpreted to "promote rather than defeat" the law's purpose and policy.[67] Allowing a project proponent to increase its intake of seawater ï impinging and entraining marine life in the process ï to dilute brine is not a common sense approach to minimizing mortality; and allowing this dilution alternative to be a factor for determining feasibility would lead to mischief and create an absurd policy position.

The State Board has already acknowledged that increased flow volumes for dilution of the discharge is illegal. The State Boardôs 2010 Triennial Review stated that ñwith regard to intake impacts, the Ocean Plan does not authorize flow augmentation for dilution purposes.ò[68] The State Board goes on to explain that the Triennial Review ñidentified plans for a limitation on in-plant dilution of brine prior to discharge.ò[69] As the State Board admits ñdiluting brine prior to discharge by taking in additional source water from a surface intake may reduce discharge mortality; however, there would be increased intake mortality that might offset any benefit of diluting the brine prior to discharge.ò[70] It is clear from the expert reports that the potential increased mortality through screened intakes will be far greater than any potential entrainment mortality from diluting brine with properly designed diffusers. And compared to comingling with wastewater for in-plant dilution, the additional intake and mortality would **not** be offsetting any intake and mortality. Therefore, augmented intake (additional intake flow volume) for the purpose of in-plant dilution should be explicitly prohibited in the Desalination Policy to prevent backsliding from the Ocean Planôs current prohibition.

Subsurface intakes for additional flow volume may be considered in determining practices for rapid dilution, so long as the additional volume from the subsurface intake is not a factor in determining

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[64] Regional Water Quality Control Board, San Diego, Carlsbad Desalination NPDES Permit, pg. 6.
[65] *Select Base Materials* v. *Board of Equal.* (1959) 51 Cal.2d 640, 645 [335 P.2d 672]; *California Teachers Assn.* v. *San Diego Community College Dist., supra*, 28 Cal.3d 692, 698; *Moyer* v. *Workmen's Comp. Appeals Bd.* (1973) 10 Cal.3d 222, 230 [110 Cal. Rptr. 144, 514 P.2d 1224].
[66] *United Business Com.* v. *City of San Diego* (1979) 91 Cal. App.3d 156, 170 [154 Cal. Rptr. 263]; *City of Costa Mesa* v. *McKenzie* (1973) 30 Cal. App.3d 763, 770 [106 Cal. Rptr. 569].
[67] *Granberry* v. *Islay Investments* (1984) 161 Cal. App.3d 382, 388 [207 Cal. Rptr. 652].
[68] State Water Resources Control Board, Triennial review, pg. 6 (2010).
[69] Supra note 23, at 22.
[70] *Id*. at 83.

whether subsurface intakes are ñnot feasible.ò For example, if a plant is designed to produce a volume of product water that is feasible using subsurface intakes, but not feasible if the additional ñdilution waterò is added to the plant design ï the facility should be mandated to utilize best available technology for the ñsource waterò and alternative discharge technologies and practices to ensure rapid dilution of the brine discharge. To consider sub-seafloor intakes ñnot feasibleò due to the volume of water necessary to properly dilute the brine discharge, above what is necessary for ñproduct waterò, would amount to a violation of the Water Codeôs mandate to ñsite and designò the intake to minimize the intake and mortality of all forms of marine life.

ñAugmented intake volumeò for ñin-plant dilutionò from open or screened surface intakes should be prohibited. This additional volume of intake water volume exacerbates the marine life mortality ï in contradiction of Ä13142.5(b)ôs clear read to minimize the intake and mortality of all forms of marine life. Further, as shown in the report provided to the State Board by the expert panel on brine discharges, there are alternative technologies and practices that provide rapid dilution of brine discharges without the need for ñaugmented intakesò and the additional marine life mortality from this proposed practice. Therefore, *increased intake volume for ñin-plant dilutionò should be expressly prohibited, and expressly prohibited as a consideration in determining whether subsurface intakes are feasible.*

E. Co-location with a wastewater treatment facility should not be used to demonstrate infeasibility.

As with nearly all of the criteria in L.2.d.1.a.1, whether a facility is sited next to a wastewater treatment facility should have no bearing on whether subsurface intakes are a feasible means of minimizing the intake and mortality of marine life. However, the State Board states in Section L.2.d.1.a.i. that a factor to be considered in the analysis of whether meeting the preferred alternative of sub-surface intakes is feasible is ñco-location with sources of dilution water.ò How does co-location with sources of dilution water the best available technology any more or less feasible? The State Board explains that:

> ñSiting a desalination facility in close proximity to a wastewater dilution source can prevent a facility from discharging toxic concentrations of brine into ocean waters and reduce the cost of constructing conveyance pipes to transport the brine to the wastewater facility or vice versa.ò[71]

We agree with this statement, but it has nothing to do with whether the best available technology to ñminimize the intake and mortality of all forms of marine lifeò is feasible. First and foremost, it is critical that the best available technology be implemented to reduce marine life mortality. The ability to co-mingle treated wastewater with brine discharge should not take precedent over requiring the best available technology to minimize intake and mortality. Regardless, a facilityôs proximity to a wastewater treatment facility has no bearing on whether the best available technology is feasible to achieve the purpose of section 13142.5(b). Therefore, we request the State Board *remove from consideration ñco-location with sources of dilution waterò as a factor to be considered in whether subsurface intakes are feasible*.

As explained further in sub-section 6 below, any other criteria unrelated to the directive to ñminimize the intake and mortality of all forms of marine lifeò is equally irrelevant for determining whether an alternative can feasibly attain that goal. And as discussed below, cost should not be a factor in determining ñnot feasible.ò *It is critical for clarity and consistent enforcement that the Amendment include a definition of ñnot feasible.ò*

F. The Desalination Policy needs a feasibility definition, not a list of criteria project proponents can use to explain why they cannot achieve the best available technology standard.

The proposed Desalination Policy does not contain a definition of ñinfeasibleò, but rather a laundry list of criteria to be evaluated by regional boards. Section L.2.1.a. states that subsurface intakes are required

[71] *Id*. at 64.

unless the regional board ñdetermines that subsurface intakes are infeasible based upon an analysis of the criteria listed belowé ò Subsection (i) then goes on to list numerous factors a project proponent can use to exempt themselves from their legal responsibilities to install the best available technology, including:

(1) Hydrologic and oceanographic conditions;
(2) Presence of sensitive habitats and species;
(3) Energy use;
(4) Impact on aquifers, local water supply, and existing users;
(5) Desalinated water conveyance, existing infrastructure, co-locations with sources of dilution water;
(6) Design constraints;
(7) Project life cycle cost; and
(8) Other site specific and facility factors.

These eight factors are not only vague and open-ended, allowing project proponents to excuse themselves from the best available technology standard, but they do not provide an actual definition of feasible under Water Code Section 13142.5(b). Blackôs Law Dictionary defines feasible as ñcapable of being accomplished.ò[72] Other than criteria number one ï hydrologic and oceanographic conditions ï how do any of the other criteria determine whether subsurface intakes are feasible? All of the other criteria may or may not be appropriate to determine the best available design, or the best available site -- but criteria two through seven do nothing to determine whether the best available ñtechnologyò is feasible for minimizing the intake and mortality of marine life. Each of these elements should be removed from Section L.2.d.1.a.i., and replaced with a proper definition of ñnot feasibleò consistent with the definition in the OTC Policy.

The law requires the State Board to ensure use of the best available technology feasible for minimizing the intake and mortality of all forms of marine life. The law does not condition a determination of the best available technology on whether or not it meets the project proponentsô business goals. Instead of providing a list of criteria for project proponents to use to excuse themselves from complying with the law, the State Board should look at the OTC Policyôs definition of ñnot feasible.ò

First, the State Board defined the term ñavailableò in regards to ñbest technology available.ò The State Board determined that ñthe technology must be ñavailableò in the sense that it is *technically* and *logistically* feasible at *most facilities* subject to the proposed Policyé ò[73] From that definition of ñavailableò the State Board created a definition of ñnot feasibleò:

> ñCannot be accomplished because of space constraints or the inability to obtain necessary permits due to public safety considerations, unacceptable environmental impacts, local ordinances, regulations, etc. Cost is not a factor to be considered when determining feasibility under Track 1.ò[74]

For the reasons discussed above, the State Board should use the OTC Policyôs definition of ñnot feasibleò as a starting place for a similar definition in the Desalination Policy. In order to provide an accurate definition of ñinfeasibleò, we suggest the following revisions to Chapter III.L.2.d.(1).a.i.:

> *The regional water board shall use the following definition of ñnot feasibleò ~~consider the following criteria~~ in determining feasibility of subsurface* intakes: Cannot be constructed or operated given geotechnical data, hydrogeology, benthic topography, or oceanographic conditions. Cannot be accomplished because of the inability to obtain necessary permits due to unacceptable environmental impacts, local ordinances, State or*

[72] Blackôs Law Dictionary, available at http://thelawdictionary.org/feasible/.
[73] Supra note 23, at 67.
[74] Supra note 2, at 19.

local regulations, etc. Cost is not a factor to be considered when determining feasibility. Flow Augmentation for brine dilution is not a factor to be considered when determining feasibility. ~~*, presence of sensitive habitats,* presence of sensitive species, energy use; impact on freshwater aquifers, local water supply, and existing water users; desalinated* water conveyance, existing infrastructure, co-location with sources of dilution water, design constraints (engineering, constructability), and project life cycle cost. Project life cycle cost shall be determined by evaluating the total cost of planning, design, land acquisition, construction, operations, maintenance, mitigation, equipment replacement and disposal over the lifetime of the facility, in addition to the cost of decommissioning the facility. In addition, the regional water board may evaluate other site- and facility-specific factors.*~~

Furthermore, we suggest the following addition to Chapter III.L.2.d.(1)(a):

iii. If subsurface wells or galleries are determined to be ñnot feasible,ò then the regional board shall allow an alternative technology, or suite of technologies and other measures other than after-the-fact restoration, which achieves a minimization of the intake and mortality of all forms of marine life that is equivalent to the performance of subsurface infiltration galleries.

6. SCREENS ARE NOT THE BEST AVAILABLE TECHNOLOGY AND WILL UNDERMINE THE OTC POLICY.

A. General Considerations

As noted throughout these comments, the draft raises concerns about screened surface intakes. The draft Amendment section on ñTechnologyò, section L.2.d., is vague and needs to clarify that screens of any slot size are not the best technology for minimizing the intake and mortality of all forms of marine life. The draft should identify Seafloor Infiltration Galleries (SIG) as the best technology available, and use that determination to establish a reasonable ñperformance standard.ò

Further, section L.2.d. should remove any language that implies screens are the standard for an ñequivalency test.ò An equivalency test, as used in the OTC Policy and the *Riverkeeper* case law, is to ensure that any alternative to the ñbest technologyò meets a reasonable range of performance based on the performance of the ñbest technology.ò The State Water Board considered the efficacy of screened intakes for minimizing the intake and mortality of marine life during the OTC Policy creation and found them inferior. In fact, the OTC Policy only allowed the use of screens if, in combination with other measures, they could meet the performance standards established by the ñbest available technology.ò Since the adoption of the OTC Policy, there has not been any new technological advances or scientific studies to suggest that intake screens are best available technology. If anything, recent studies have only confirmed that the efficacy of screened surface intakes is still questionable and likely less than what was assumed when the OTC Policy was adopted.[75]

This amendment to the Ocean Plan for desalination needs to be consistent in the consideration of screen efficacy as the adopted approach in the OTC Policy.

B. Fine Mesh Screens Are Not Best Technology Available.

As the State Board previously concluded in the OTC Policy that establishing statewide standards for best technology available" to minimize intake and mortality from seawater intakes not only ensures enforcement of the California State Water Code, but that it is also the best way to ensure uniform application of the law by the Regional Boards and statewide protection of marine ecosystems. While it is

[75] *See* discussion of scientific studies CAL. STATE WATER RES. CONTROL BD.,, DRAFT STAFF REPORT INCLUDING THE DRAFT SUBSTITUTE ENVIRONMENTAL DOCUMENTATION AMENDMENT TO THE WATER QUALITY CONTROL PLAN FOR OCEAN WATERS OF CALIFORNIA ADDRESSING DESALINATION FACILITY INTAKES, BRINE DISCHARGES, AND THE INCORPORATION OF OTHER NON-SUBSTANTIVE CHANGES, 52 (2014) [hereinafter ñSEDò] *available at:* http://www.swrcb.ca.gov/water_issues/programs/ocean/desalination/docs/draft_desal_sed_070314.pdf (accessed August 13, 2014).

appropriate for Regional Boards to review individual desalination permit applications, the State Board should provide a clear a set of standards for the Regional Boards in order to ensure statewide consistently. As discussed above in Section E, the draft Desal Policy does not establish BTA and instead leaves interpretation as to what constitutes BTA up to individual Regional Boards. This type of piecemeal approach could certainly lead to vastly different types of technology used as well as inconsistent levels of protection of marine life.

Perhaps the most obvious example is the potential for the Desal Policy to allow surface intakes with fine-mesh screens. Despite the fact that the Substitute Environmental Document (ñSEDò) concludes ñ[s]ubsurface intakes are more protective of marine life than surface water intakesò[76] the draft Desal Policy fails to designate subsurface intakes as BTA and instead leaves open the possibility of a new desalination plant receiving permits to use surface intakes with screens of a yet-to-be determined slot size.

Fine mesh screens have not been proven to be a reliably effective method of reducing entrainment and impingement and should not be considered best technology available for minimizing intake and mortality of all forms of marine life. While wedgewire screens may potentially reduce impingement mortality and entrainment loss of juvenile and adult fish to a certain degree, itôs important to recognize that ñintake-related mortality will be site and species-specific.ò[77] Further, as the SED noted in a report cited by the US EPA[78], the efficacy of minimizing impingement mortality is conditional: ñ0.05 mm screens have been used on traveling screen and single entry, double exit screens. These systems are successful if the facilities apply a safe return of impinged organisms.ò There is nothing in the draft Amendment speaking to, much less requiring the safe return of impinged organisms and the data collected in recent screen studies is evidence that impingement is occurring and may be a function of both mesh size and/or intake velocity. The State Board should *include an analysis in the SED describing the relationship between mesh size and intake velocity to the efficacy of minimizing the intake and mortality of all forms of marine life ï whether through entrainment and/or impingement mortality***.**

The efficacy of screening technology remains uncertain and thus should not be considered BTA. As the SED notes ñ(s)ome studies on screen efficacy are contradictory. The majority of studies that examine the efficacy of wedgewire screens only looked at impacts on ichthyoplankton; yet there are many other organisms that are abundant in the water.ò[79] Californiaôs marine ecosystems are complex and support incredibly diverse species that are ñextremely valuable from an ecosystem standpoint as well as being a key contributor to Californiaôs economy.ò[80] Allowing new desalination plants to build or continue the use of surface intakes with fine mesh screens is not the best way to achieve the directive of the Water Code to protect all forms of marine life.

In setting BTA for ocean open intakes for OTC Policy, the State Board had the particular challenge of evaluating technology for plants that already existed. And even in that case, fine mesh screens were not determined to be BTA. Here, the State Board has the opportunity to set BTA for desalination plants that have not yet been built. As described in Section E above, subsurface intakes have not been scientifically proven to protect against both entrainment and impingement, and thus subsurface technology should be determined to be BTA.

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[76] CAL. STATE WATER RES. CONTROL BD.,, DRAFT STAFF REPORT INCLUDING THE DRAFT SUBSTITUTE ENVIRONMENTAL DOCUMENTATION AMENDMENT TO THE WATER QUALITY CONTROL PLAN FOR OCEAN WATERS OF CALIFORNIA ADDRESSING DESALINATION FACILITY INTAKES, BRINE DISCHARGES, AND THE INCORPORATION OF OTHER NON-SUBSTANTIVE CHANGES, 52 (2014) [hereinafter ñSEDò] *available at:* http://www.swrcb.ca.gov/water_issues/programs/ocean/desalination/docs/draft_desal_sed_070314.pdf (accessed August 13, 2014).

[77] *Id* at 52.

[78] See Desal amendment Staff Report at p 49, ñRecent Developments in Techniques to Protect Aquatic Organisms at the Intakes of Steam-Electric Power Plants.ò

[79] Supra note 3, at 52.

[80] *Id*. at 36.

C. If Fine Mesh Screens Are Used, Screen Size Should be .5 mm or Smaller (if they are shown not to exacerbate impingement mortality).

The Amendment currently has a placeholder for the recommended screen size and the State Water Board is seeking input on whether the screen size should be designated as .5mm, .75mm, or 1.0mm.[81] Although the State Water Board is seeking comment on screen size, itôs own conclusions in the SED seem to give the answer. The SED states: ñSection 13142.5(b) requires that the Ocean Plan consider all forms of marine life, regardless of size. Subsurface intakes are more protective of marine life than surface water intakes. However, when subsurface intakes are proven to be infeasible, small slot-sized screens will protect larger juvenile and adult organisms (particularly fishes) from entrainment.ò[82] But that is not the end of the question. There may still be impingement of organisms that result in mortality, and the impingement rate may be dependent on slot size and intake velocity. Therefore, we think that the reduction in entrainment may not equate to a reduction in mortality.

While studies have concluded that ñeffectiveness of both fine-mesh screens and wedgewire screens in reducing entrainment is a function of the screen slot sizeò and that ñ(e)ntrainment decreases as the screen slot size decreases and the size of the fish increasesò[83] the size of the fish is not the only factor. The effectiveness of a given screen in preventing entrainment is largely dependent on the species, and specifically on their head capsule dimensions.[84] Different species have different morphology that play an important role in whether a given screen size will protect against entrainment. For example, fish such as anchovies and flatfish that are laterally compressed have higher entrainment rates than fish such as sculpines and rockfishes of the same length because anchovies and flatfish have smaller head capsule dimensions.[85] Thus the State Water Board should be cautious when presented with arguments that larger screen sizes have proven effective in preventing entrainment of a certain species and should remember the Water Code charge to reduce intake and mortality ñall forms of marine life.ò

The velocity control is also an important factor to consider when evaluating whether mesh and wedgewire screens are effective at reducing impingement. We are concerned that the draft Amendment sets intake velocity at 0.5 foot per second for screened surface intakes. That is an intake velocity set by EPA to minimize the impingement of marine life that have developed swimming capability. Tests have shown that most fish can swim away from that velocity and avoid impingement on the screen. However, that isnôt the case for developing organisms who are exposed to entrainment; ñ(m)ost larval and juvenile organisms are not developed enough to swim and avoid entrainment and may be susceptible to entrainment through even small slot sized intake screensò[86] Because of this reduced mobility, we are concerned that the proposed 0.5 foot per second intake velocity limit will not protect larval and juvenile marine life from impingement. Because of this reduced mobility, we are concerned that the proposed 0.5 foot per second intake velocity limit will not protect larval and juvenile marine life from impingement. Further, the efficacy of ñcylindricalò screen housings is in large part a function of the difference between ñapproach velocityò and ñintake velocity.ò That is, if the approach velocity is significantly greater than the intake velocity, the organisms may be swept of the screen housing. But it would seem extremely rare

[81] *See* Draft Desal Policy Section I.2. (d)(1)(c)ii.

[82] *Id*. at 52.

[83] *Id*. at 50 *quoting* ELECTRICAL POWER RESEARCH INSTITUTUE, FIELD EVALUATION OF WEDGEWIRE SCREESN FOR PORTECTING EARLY LIFE STAGES OF FISH AT COOLING WATER INTAKES, REPORT NO.1010112 (2005); TENERA ENVIRONMENTAL, EVALUATION OF FINE-MESH INTAKE SCREEN SYSTEM FOR THE DIABLO CANYON POWER PLANT, PREPARED FOR BETCHEL POWER CORPORATION JUOTC PROJECT (2013); Weisberg, S.B. et al. *Reductions in Ichthyoplankton Entrainment with Fin-Mesh, Medge-Wire Screens*, 7 NORTH AMERICAN JOURNAL OF FISHERIES MANAGEMENT, 386-393 (Issue 3).

[84] EVALUATION OF FINE-MESH INTAKE SCREEN SYSTEM FOR THE DIABLO CANYON POWER PLANT, PREPARED FOR BETCHEL POWER CORPORATION JUOTC PROJECT (2013).

[85] *Id*.

[86] CAL. STATE WATER RES. CONTROL BD., DRAFT STAFF REPORT INCLUDING THE DRAFT SUBSTITUTE ENVIRONMENTAL DOCUMENTATION AMENDMENT TO THE WATER QUALITY CONTROL PLAN FOR OCEAN WATERS OF CALIFORNIA ADDRESSING DESALINATION FACILITY INTAKES, BRINE DISCHARGES, AND THE INCORPORATION OF OTHER NON-SUBSTANTIVE CHANGES, 36 (2014) [hereinafter ñSEDò] *available at:* http://www.swrcb.ca.gov/water_issues/programs/ocean/desalination/docs/draft_desal_sed_070314.pdf (accessed August 13, 2014).

to find a circumstance in the ocean where the approach velocity would be faster than the intake velocity.

Californiaõs diverse marine species and habitats support complex ecosystems with high diversity. ñThese biologically diverse species are extremely valuable from an ecosystem standpoint as well as being a key contributor to Californiaõs economy.ò[87] *If the State Board decides to allow screened surface intakes, then a slot screen size of .5 mm or smaller should be required after a showing that they can be designed to safely return impinged organisms.*

7. DESIGN CAPACITY NEEDS TO BE THE BEST AVAILABLE DESIGN.

A. Design capacity is a critical consideration for minimizing the intake and mortality of marine life.

It is critical that the State Board include design capacity as a factor to be considered under the best available design analysis. The State Board must interpret every factor in Ä13142.5(b) and harmonize each factor. Statutory interpretation dictates that ñ[s]ignificance should be attributed to every word, phrase, sentence and part of an act in pursuance of the legislative purpose, as ótheõ various parts of a statutory enactment must be harmonized by considering the particular clause or section in the context of the statutory framework as a whole.õ"[88] Again, Section 13142.5(b) requires the best available design be used to minimize the intake and mortality of marine life ð designing a facility with a production design capacity to accommodate subsurface intakes is the best available design.

In interpreting Ä316(b), the U.S. EPA has determined that the technology, design, location, and capacity, must be assessed in conjunction with the other factors. The State Board agrees with the U.S. EPAõs statutory interpretation, and finds the same reading is appropriate under Section 13142.5(b).[89] Chapter III.L.2.a.(2). states that ñthe regional water board shall consider all four factors collectively, and include the *best combination* of alternatives that in combination minimize intake and mortality of marine life.ò

To understand how each of the four factors should best be combined, the State Board should look to the U.S. EPA for guidance. The U.S. EPA General Counsel has provided guidance to the State Board on using design capacity to minimize the intake and mortality of marine life:

> ñSince the magnitude of entrainment damage is frequently a function of the amount of water withdrawn, the only way that massive entrainment damage can be minimized in many circumstances is by *restricting the volume of water withdrawn*...ò[90]

The EPA has determined that restricting the volume of water withdrawn by a facility is one appropriate way to meet the BTA standard of CWA Ä316(b).[91] The State Board should make the same determination and incorporate design capacity as the best available design.

The technical feasibility of subsurface intakes and infiltration galleries has already been demonstrated internationallyï including in nations with standards similar to the Clean Water Actõs BAT standard.[92] As the State Board has already concluded: ñ[b]each galleries specifically have design potential for *large*

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[87] Supra note 3, at 36.
[88] *Moyer* v. *Workmen's Comp. Appeals Bd., supra,* 10 Cal.3d 222, 230.
[89] See Draft Policy, Chapter III.L.2.a.(2). ñThen the regional water board shall consider all four factors collectively, and include the best combination of alternatives that in combination minimize intake and mortality of marine life.ò
[90] Accord Decision of the General Counsel No. 63, at p. 381, n. 10; In re Public Service Company of New Hampshire, 10 ERC at 1262 (Decision of Administrator of EPA). See also Supplement to Background Paper No. 3 (September 3, 1996), p. A-3; Background Paper No. 3(April 4, 1994), p. 2-3; EPA 1976 Development Document, p. 153.
[91] *See* also In re Public Service Company of New Hampshire, 10 ERC at 1264 (Decision of Administrator of EPA); EPA 1976 Development Document, p. 178; EPA Draft CWA Ä316(b) Guidance (May 1, 1977), p. 13 (ñReducing cooling water flow is generally an effective means for minimizing potential entrainment impact . . . [and i]n fact, . . . may be the only feasible means . . .where potentially involved organisms are in relatively large concentration and uniformly distributed in the water columnò).
[92] *See* David Boris, Beach Wells for Large-Scale Reverse Osmosis Plants: The Sur Case Study, IDA World Congress (2009).

scale facilities, and have been demonstrated to be able handle large volumes of water.ò[93] With infiltration galleries demonstrated to be technically feasible, the State Board should require flow restrictions to a facilityôs design capacity to achieve BAT. In fact, designing a facility to produce a certain amount of freshwater, and consequently withdrawing a certain amount of seawater, may be the only ñdesignò consideration with any relevance to the goal of minimizing the intake and mortality of all forms of marine life.

Statutes relating to the same subject matter should be read together in a manner that harmonizes them whenever possible.[94] Therefore, the State Board should *include design capacity as the best available design for minimizing the intake and mortality of marine life*.

B. The Best Available Design accommodates the Best Available Technology.

The best design capacity should be defined as the maximum amount of produced water achieved using the best available technology at the best available site ï because that will best minimize the intake and mortality of marine life. Statutory interpretation requires the State Board to interpret and harmonize every factor in Ä13142.5(b).

Zero design capacity is not the best available design. There is an argument to be made that if design capacity was included under the best available design analysis, then the best available design would be a zero MGD desalination facility. We agree this would be an absurd result, but disagree that the best available design is a zero design capacity. Instead, the best available design is that which is compatible with a feasible output from subsurface intakes -- thus establishing a design performance standard of zero marine life mortality but not zero production. As noted before, ñminimizeò does not necessarily mean reduce to zero ï bu reducing to zero, or close to it, is certainly ñminimizing.ò This standard can be met by implementing the best available technology, which would not result in a zero MGD capacity facility. As illustrated in facilities elsewhere, subsurface intakes can supply relatively large desalination facilities. And recent discussions over the feasibility of a SIG for the proposed Huntington-Poseidon facility have concluded that a ñFukuoka-styleò SIG can be replicated in modules to produce more source water than a single SIG.

As discussed above, subsurface wells and subsurface infiltration galleries have both been demonstrated to be feasible technologies for ñlarge scaleò desalination facilities. To ensure the best available design does not achieve absurd results, we request the State Board *define design capacity as the maximum amount of capacity achieved using the best available intake technology at the best available site for that technology*.

C. Regulating the design capacity of a facility does not impose limits on local water supplies.

Requiring project proponents to consider design capacity as the best available design does not limit local jurisdictions in their selection water supplies. Water supply agencies are granted the authority to develop water projects ï but not water projects that violate State or federal law. For example, a water agency could not argue that enforcement of the Endangered Species Act, if it interfered with a water development project in any way, would constitute an intrusion on their sole authority[95]. The only difference here is that the Porter-Cologne Act, as codified in the Water Code section 13142.5(b), specifically mandates the regulation of seawater withdrawals for these facilities. The Ocean Plan amendment is simply enforcing State law, and to the extent it may require modification of a water development project, it is not an intrusion on a water agencies sole authority. As drafted, and even with our requested edits, the water agency still has the opportunity to develop a seawater desalination facility and is only constrained by the mandates of State law ï if they are constrained at all.

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[93] Supra note 3, at 55.
[94] *Dyna-Med, Inc.* v. *Fair Employment & Housing Com.* (1987) 43 Cal.3d 1379, 1386-1387 [241 Cal. Rptr. 67, 743 P.2d 1323].
[95] See eg; ñBay Delta Conservation Planò

Further, as discussed in the introduction to this comment letter, California has ample alternative water supplies to be implemented before desalination is necessary. Furthermore, a plain reading of Section 13142.5(b) finds the Legislature did not intend water supply concerns to be considered when conducting the ñbest availableò analysis. And finally, a desalination facilityôs ability to take seawater is not a right, but rather a privilege that the public provides. The public trust doctrine provides that tidelands, the beds of navigable waterways and other natural resources are held in trust for the public by the state.[96] The state holds these rights in trust for the public. Thus, design capacity restrictions relating to public trust rights of seawater cannot conflict with a local governmentôs authority over water supplies, because the project proponent never had the right to use the property for non-public trust uses.[97]

While placing design capacity restrictions on the intake of seawater does not conflict with any local authority, we understand the State Boardôs concern. To alleviate concern, we suggest the State Board be clear that reduced design capacity be limited to public trust seawater influent. The State Board should *be explicit that the design capacity for the intake of seawater shall be reduced to accommodate the best available technology, but project proponents can increase its overall capacity from other source water, such as comingling treated wastewater with the seawater intake*.

As such, we recommend the following revisions to Chapter III.L.2.c.:

> *The Regional Board shall require the best available design. Design is the size, layout, form, and function of a facility, including the production capacity, and the configuration and type of infrastructure, including intake and outfall structures. ~~The regional water board shall require that the owner or operator perform the following in determining whether a proposed facility design best minimizes intake and mortality of marine life:~~*

8. THE STATE BOARD SHOULD RECONSIDER THE CURRENTLY PROPOSED DESIGN CRITERIA TO ENSURE THE BEST AVAILABLE DESIGN IS ACHIEVED.

A. The owner or operator of the desalination facility should not be responsible for determining the best available design.

The proposed ñbest available designò analysis is severely lacking any real consideration of the best available design for minimizing the intake and mortality of marine life. Section L.2.c. states that the ñregional water board shall require that the owner or operator perform the following in determining whether a proposed facility design best minimizes intake and mortality of marine life.ò First, the draft Amendment should clarify that the information provided by project permit applicants to the Regional Boards is to be carefully scrutinized. The draft needs clear direction, and elimination of any ambiguity or implication that a project proponentôs own analysis of alternative designs is not afforded undue weight. We have seen in the past that allowing the project proponent to narrowly define the purpose of the project and, then design their facility to best accommodate their own self-defined limited purpose, leads to permits that do not meet the requirements under 13142.5(b).

We request the State Board *require regional boards to determine the best available design for a proposed project, in consideration of the specific purpose to design a facility that is compatible with the best available technology at the best available site to collectively minimize the intake and mortality of all forms of marine life.* Any other project goal or project design to meet that goal, would not meet the mandates of Water Code section 13142.5(b).

B. Design Factor (1) is a site consideration already analyzed under the ñbest available siteò determination.

[96] *Illinois Central Railroad Co. v. Illinois*, 146 U.S. 387, 452-4 (1892).
[97] *See National Audubon Society v. Superior Court*, 33 Cal. 3d 419, 440 (1983).

Avoiding sensitive habitats and sensitive species is a site considerationð not a design consideration. Section L.2.c.1. requires the owner or operator at each potential site to ñanalyze the potential design configurations of the intake, discharge, and other facility infrastructure to avoid impacts to sensitive habitats and sensitive species.ò That sounds a lot like consideration (2) of the site analysis: ñ[a]nalyze the feasibility of placing intake, discharge, and other facility infrastructure in a location that avoid[s] impacts to sensitive habitats and sensitive species.ò We agree that the best available site analysis should avoid impacts to sensitive habitats and sensitive areas, but repeating the same consideration under the design analysis is inappropriate and does not meet the legal requirements of best available design. There is only one ñdesignò criteria we can think of that would improve the goals of the law beyond what a proper site and technology would achieve ï design the production capacity to ensure compatibility with the best site and technology.

We request the State Board <u>*remove Factor (1) from the best available design analysis*</u> since it is already ï and most appropriately ï addressed in the best available site analysis.

C. Design Factor (2) is a technology consideration already analyzed under the ñbest available technologyò determination.

Section L.2.d preamble clarifies that: ñTechnology is the type of equipment, materials and methods that are used to construct and operate the óDesignô components é .ò Analyzing intakes in order to minimize the Area Production Foregone is already a consideration under the best available technology consideration. Section L.2.d.1.a. already requires sub-surface intakes if feasible, and sub-surface intakes are already accepted as the best technology in minimizing the intake and mortality of marine life (measured by APF). Alternatively, section L.2.d.1.c.ii.states that in ñorder to reduce entrainment, all surface water intakes must be screened with a [0.5 mm/0.75mm/1.0mmm] or smaller slot size screen when the desalination facility is withdrawing seawater.ò Additionally, subsection (d) states that in ñorder to minimize impingement, through-screen velocity at the surface water intake shall not exceed .15 meters per second.ò All of these provisions combined minimize the Area Production Foregone ï and no further analysis is needed to minimize the intake and mortality of marine life. Repeating these two technology considerations under best available design Factor (2) does nothing additional to minimize the intake and mortality of marine life.

There is only one ñdesignò criteria we can think of that would improve the goals of the law beyond what a proper site and technology would achieve ï design the production capacity to ensure compatibility with the best site and technology.

We request the State Board <u>*remove Factor (2) from the best available design analysis*</u> since it is already ï and most appropriately ï addressed in the best available technology analysis.

D. Design Factors (3 ï 5) are the same consideration repeated and re-worded.

The best available design Factors (3 ï 5), are essentially the same considerations repeated. These factors require:

> ñ(3) Design the outfall so that the brine mixing zone* does not encompass or otherwise adversely affect existing sensitive habitat.*
>
> (4) Design the outfall so that discharges do not result in dense, negatively-buoyant plumes that result in adverse effects due to elevated salinity* or anoxic conditions occurring outside the brine mixing zone.* An owner or operator must demonstrate that the outfall meets this requirement through plume modeling and/or field studies. Modeling and field studies shall be approved by the regional water board in consultation with State Water Board staff.

(5) Design outfall structures to minimize the suspension of benthic sediments.ò

As discussed below, we donôt believe any of these factors are appropriate to analyze the best available ñdesignò to minimize intake and marine life mortality ï they are not clearly related to the intake and mortality of marine life, but rather to the discharge of brine. Nonetheless, if Factors 3-5 are considered ñdesignò considerations, each of these elements are essentially the same consideration and should be incorporated into only one factor. ñBrine mixing zone[s]ò, ñnegatively-buoyant plumesò, and ñsuspension of benthic sedimentsò are all essentially the same consideration ï design the outfall to minimize the impacts of the associated brine plume. There is no need to be repetitive and expand this one consideration into three separate factors. But more to the point, these three considerations are already covered by the performance standards for brine diffusers. This subsection merely identifies the benefits of the performance standards in terms of best intake, which is both confusing and unnecessary.

It is evident that the State Board struggled to develop appropriate design criteria to determine the best available design to minimize intake and mortality of marine life. We request that the State Board, at a minimum, *analyze Factors (3 ï 5) as only one factor*.

E. Design Factors (3 ï 5) have nothing to do with minimizing the intake and mortality of marine life.

Designing an outfall to prevent toxic brine plumes is a laudable goal, but it has nothing to do with Section 13142.5(b)ôs requirement of minimizing the intake and mortality of marine life. The best available design factors (3 ï 5) all require the outfall to not have a negative discharge plume. While a discharge plume has adverse impacts on marine life, minimizing those impacts is not the same as ñminimizing the intake and mortality of marine life.ò

We request the State Board *move Factors (3 ï 5) to Section L.2.d.2.* and incorporate into the considerations for brine discharge technology if the current language in that sub-section needs any additional clarification.

9. THE BEST AVAILABLE SITE SHOULD ACCOMMODATE THE BEST AVAILABLE TECHNOLOGY.

We think the analysis of the best available site necessarily starts with the ñbest available technology.ò It is undisputed that sub-surface wells eliminate the intake and mortality of all forms of marine life to any measurable degree. While the law doesnôt mandate complete elimination of intake and mortality, a technology that would achieve that degree of minimization is clearly the ñbest.ò Nonetheless, a Subsurface Infiltration Gallery (SIG) effectively minimizes intake and mortality of marine life to the same degree. The difference in minimizing marine life mortality between a subsurface well and a SIG is the potential mortality associated with construction and maintenance of a SIG.

However, as articulated in the Riverkeeper cases, a range of performance is allowable and justifiable to define ñbestò because measuring the efficacy of a technology will show different results at different times ï therefore measuring the efficacy of different technologies is allowed if it is within that range of performance bounded by the margin of error. The court established that ñrangeò for a performance standard to be effectively equitable as 10% -- and the OTC Policy adopted that range.

The operation of either wells or a SIG is assumed to minimize intake and mortality 100%. But the mortality from construction and maintenance of a SIG is difficult to calculate because monitoring and measuring the impact is nearly impossible. So, the efficacy is equitable within a margin of measuring and monitoring error. And because a SIG is ñavailableò without the hydro-geological constraints of siting wells, it is arguably the ñbest availableò and should be used to set the performance standard. Finally, surface intakes, whether screened or not, are not equitable to sub-surface intakes and are not to be considered ñbest available technology.ò However, as noted in the OTC Policyôs analysis, where sub-surface intakes are proven to be ñnot feasibleò, screened intakes may be part of a suite of alternatives that, in combination, may achieve an equitable minimization of the intake and mortality of marine life as that

of a SIG. However, the choice of the defined ñbest available technologyò allows permitting the facility without any monitoring requirements and conditions that the intake technology may have to be changed if the alternative technology(s) fails to meet the performance standards.

To be consistent with the Ocean Plan amendment directive that the elements of section 13142.5(b) be considered individually and in combination, the best technology needs to be considered in combination with the best available site. And if that combination is to collectively achieve the goal of minimizing the intake and mortality of all marine life, these elements need to be compatible ï they must work together to achieve the goal. *The performance standard for the ñbest available technologyò established in the Ocean Plan should be the determining factor in defining ñbest available site.ò*

The Ocean Plan draft should that the ñsiteò of a facility is ñbestò if it is compatible with the installation of a sub-surface intake. The ñbest sitesò for the use of wells is limited by the availability of seawater aquifers and arguably not the ñbest availableò under one interpretation of that phrase. However, the ñbest sitesò for the use of a SIG are much more ñavailable.ò A SIG can be sited in areas where there is enough open sandy-bottom habitat to accommodate the size of a gallery or multiple galleries. And while some places are preferable for reducing potential maintenance and repairs, areas where a SIG can be constructed are readily available statewide, and any SIG (regardless of maintenance and repairs) is equitable for minimizing the intake and mortality of all forms of marine life. Reducing maintenance and repairs are considerations for optimal sites for reasons other than minimizing the intake and mortality of all forms of marine life. What is optimally ñfeasibleò is what is the best for minimizing the intake and mortality of all forms of marine life, and any unavoidable maintenance and repairs does not render a site infeasible. In fact, surface intakes for power plants require regular maintenance and repairs, including an occasional shut-down of the facility altogether. Yet these surface intakes are clearly feasible ï although itôs also clear they are not the ñbest.ò

There are arguably other considerations for what may be the ñbest siteò for a facility ï for example consolidating industrial facilities, avoiding special terrestrial habitats and species, co-locating with a sewage treatment plant for dilution water, etc. But for achieving the section 13142.5(b) legislative intent of minimizing the intake and mortality of all forms of marine life, the best site available is a site that is compatible with the best technology available. The State Board should *clearly articulate a baseline for minimization of the mortality of all forms of marine life lost to an open intake, and a reasonable performance standard established as a range between 100 and 90 percent reduction of intake and mortality from the baseline*. Further, the guidance should *clarify that the ñbest siteò is determined by the siteôs compatibility with technologies that achieve the performance standard*.

An important issue missing in the draft feasibility analysis of alternative sites, that has come up repeatedly in past permit applications, is the scope of the area considered reasonable for alternative sites. To date, the geographic scope of the alternative site analysis has been determined by a project proponentôs self-defined and narrow ñproject purpose.ò And consequently, the proposal has never looked far for alternative sites that may be compatible with a SIG or well.

As part of the feasibility analysis, the draft amendment should add a sub-section to clarify the geographic scope of alternative sites available to ensure consistency in Regional Board decisions and to ensure full enforcement of section 13142.5(b).

We recommend the geographic scope of alternative sites be bounded by practical constraints to moving the water from the production site to the point of demand. And for further clarification, this practical boundary does not imply that the actual water molecule needs to travel through distribution infrastructure from the point of production to the point of consumption ï rather it is simply possible, or even common, to ñtransferò water across jurisdictions.

From experience, we know this is an important issue when defining the feasibility of different sites to ensure the ñbest.ò We recommend that a section devoted to this consideration, with recommended

language to codify the rule, and that the State Board consider the language and invite public comment before adopting it into the Ocean Plan amendment.

10. THE BEST AVAILABLE SITE SHOULD MINIMIZE IMPACTS TO MARINE PROTECTED AREAS AND OTHER SPECIAL PROTECTED AREAS.

In 2012, California finalized the nationôs first science-based network of Marine Protected Areas (MPAs). Stretching from Oregon to the US/Mexico border, this network of 124 protected areas was created to safeguard the productivity and diversity of marine life and habitats for future generations.

To achieve significant ecological benefits, the Marine Life Protection Act Science Advisory Team (SAT) provided guidelines for MPA design, which included criteria for size, space, habitat representation and replication. Additionally, the scientific guidelines included a recommendation to avoid locating MPAs within areas of poor or threatened water quality, such as power plant intakes and discharges and municipal or industrial outfalls.

The water quality siting guidance was developed in recognition that degraded water quality has the potential to threaten marine life and impede the recovery of ecosystems in areas set aside for protection. To ensure the long-term success of Californiaôs MPA network, it is critical that desalination facilities be sited appropriately.

Desalination plants with infrastructure sited in or near MPAs would likely result in significant impacts from intakes and brine discharge to resources, similar to impacts from power plant intake and discharge sites. Furthermore, desalination plants sited in proximity to MPAs may reduce larval connectivity between protected areas through entrainment and impingement, thereby compromising the effectiveness of the broader network.

Given the potential impacts of desalination projects on protected areas, we fully support the unambiguous directive in Chapter III.L.2.b.6. of the draft Amendment that intake and discharge structures for desalination facilities will not be located within MPAs or State Water Quality Protected Areas (SWQPAs). We also support the statement that discharges should be sited at a sufficient distance as to have no impacts on MPAs or SWQPAs; however, the criteria for avoiding impacts from discharges is currently limited to salinity. While salinity and brine dilution levels are a top concern, impacts of chemicals used in the desalination process also need to be evaluated. The State Board should *establish additional criteria - such as thresholds for chemicals like coagulants and anti-foulants - that will be used to determine that discharges are having no impact on protected areas.*

We also appreciate and support the statement that, to the extent feasible, intakes shall be sited to maximize the distance from MPAs and SWQPAs. However, consistent with CEQA requirements and other state laws such as the Coastal Act,[98] potential impacts on important ecological features, such as a kelp bed, canyon head or other productivity hot spot, should be analyzed and addressed even if they occur outside of a protected area. We recommend the State Board *revise section L.2.b.6 of the desalination policy to include the statement that ñIntakes should be sited to minimize impacts to important ecological features in addition to maximizing their distance from MPA and SWQPA boundaries.ò*

Additionally, the Board will need to reconcile the language in the recently approved Ocean Plan amendment that creates a new designation to protect water quality within MPAs (State Water Quality Protection Areas ï General Protection, SWQPA-GP) with the language in the desalination amendment. The SWQPA-GP amendment states that ñ[n]o new surface water seawater intakes shall be established within a State Water Quality Protection Areað General Protectionò and goes on to state that this ñdoes

[98] Section 30230 of the California Coastal Act requires that special protection be given to areas and species of special biological or economic significance and that uses of the marine environment be carried out in a manner that will sustain the biological productivity of coastal waters and maintain healthy populations of all species of marine organisms.

not apply to sub-seafloor intakes where studies are prepared showing there is no predictable entrainment or impingement of marine life.ò This language is inconsistent with section L.2.b.6 of the proposed desalination amendment, which prohibits *any* intake structures within MPAs and SWQPAs. The approach in the draft desalination amendment is preferable, given that a facility with a subsurface intake would still have discharges with adverse effects that should not occur in a SWQPA or MPA.

To ensure benefits from MPAs are realized and SWQPA designations are fulfilling their purpose of protecting water quality within these refuges, we recommend the State Board *adjust section E.5.d.2 of the SWQPA amendment to match the related provision in section L.2.b.6 of proposed desalination amendment, prohibiting all intake structures within MPAs and SWQPAs*.

11. EXEMPT EXPANDED FACILITIES FROM THE SITE ANALYSIS UNDER 13142.5(B).

It is prudent public policy to allow already constructed facilities, and those that are deemed ñexpanded facilitiesò under the Policy, be exempt from the Section L.2.b. analysis. The State Board is proposing that ñChapter III.L.2 (Water Code Ä13142.5(b) Determinations for New and Expanded Facilities: *Site*, Design, Technology, and Mitigation Measures) applies to new and *expanded* desalination facilities withdrawing seawater.ò Furthermore, the State Board defines an ñexpanded facilityò as an ñexisting facilityò which either increases the amount of seawater intake or changes its design.

We agree that the State Board has the authority to require expanded but existing facilities to evaluate the best available site post-construction. Water Code Section 13142.5(b) is clear that expanded facilities need to achieve the best available site, design, technology, and mitigation measures feasible. There is no clear intent by the Legislature that expanded but existing facilities be exempt from any of these factors to minimize the intake and mortality of marine life.

The California Legislature likely modeled Section 13142.5(b) after the federal Clean Water Act section 316(b). Like Section 13142.5(b), CWA Section 316(b) does not exempt expanded ï or even existing ï facilities from the required best available site determination. The U.S. EPA considers ñsiteò as one of the most important factors in minimizing adverse impacts from ocean withdrawals, because ñmany adverse impacts can be avoided simply by not siting the intake in areas of sensitive or important natural resources.ò[99] But section 13142.5(b), as interpreted in the draft Amendment, combines site, design and technology to collectively minimize the intake and mortality of all forms of marine life an goes beyond just avoiding sensitive habitat areas ï as it should. So the Amendment provides an excellent opportunity to require the best available site, because the policy will be adopted before the majority of facilities are built. The U.S. EPA agrees that selecting a site where the best available technology may be used ñis likely to be easier for a new facility than an existing facility.ò[100] Yet even for an existing facility, EPA believes alternatives sites ñmust be consideredé because it may be possible in some cases to reduce impacts by replacing an existing [facility] with a new one at a new location.ò[101]

While we maintain that the State Board has the authority to require expanded facilities to choose the best available site, we do not believe it is appropriate at this time to require expanded facilities to comply with the best available site analysis under Chapter L.2.b. Facilities already constructed, but considered an expanded facility, should invest limited resources on implementing the best available design, technology, and mitigation measures to minimize marine life mortality at the existing site.

The State Board should determine that it is impracticable for expanded facilities be required to move to another location. In order to get around the legal requirement that expanded facilities must use the best

[99] ñPlant siting and the location of the intake structure with respect to the environment can be the most important consideration relevant to applying the best technology available for cooling water intake structures. Care in the location of the intake can significantly minimize adverse environmental impacts.ò EPA 1976 Development Document, p. 178.
[100] EPA Guidance 7-23. See EPA 1976 Development Document, p. 169.
[101] EPA Guidance 7-23. See EPA 1976 Development Document, p. 169.

available site, we suggest the State Board limit the site analysis for existing and expanded facilities to the property where the facility has already been built. The State Board can limit this analysis by stating a very specific and narrow rule that the ñbest available site for expanded facilities is the site already selectedò, and find that requiring a constructed facility to move to another location is ñinfeasible.ò

The State Board should not require expanded facilities to move locations, but an expanded facility should be required to site its intake, discharge, and other facility infrastructure at the pre-selected site to minimize intake and mortality of marine life and avoid impacts to sensitive habitats and sensitive species.

12. AFTER-THE-FACT RESTORATION IS NOT MITIGATION.

Allowing mitigation to restore marine life mortality after-the-fact is counter to the California Water Code. The Amendment Section III.L.2.e. states that the best available mitigation is ñthe replacement of marine life or habitat that is lost due to the construction and operation of a desalination facility after minimizing marine life mortality through site, design, and technology measures.ò We agree that the best available mitigation should be implemented after minimizing marine life mortality through site, design, and technology measures. However, attempting replacing marine life that is lost due the activity of a desalination facility is not an appropriate way to minimize mortality. . Indeed, federal courts have concluded that after the fact restoration cannot be used ñin-lieuò of the best technology available.

A. The Riverkeeper I decision finds after the fact restoration illegal.

As the State Board is well aware, the Clean Water Act prohibits the use of ñrestorativeò or ñcorrectiveò measures (that is, ñafter the factò mitigation measures) to meet the section 316(b) best available technology requirement. The Second Circuit has definitively affirmed that the technology requirement of section 316(b) cannot be satisfied with ñafter-the-factò mitigation. As the court explained in the first *Riverkeeper* case:

> Reclaiming abandoned mines to reduce acid mine drainage into the waterbody, removing barriers to fish migration, and creating buffers to reduce destructive runoff from agricultural lands, . . . however beneficial to the environment, have nothing to do with the location, the design, the construction, or the capacity of cooling water intake structures, because they are unrelated to the structures themselves. Restoration measures correct for the adverse environmental impacts of impingement and entrainment; they do not minimize those impacts in the first place.[102]

Beyond the plain language of the statute, the Second Circuit cited supporting legislative history, prior agency interpretation of section 316(b), and EPAôs own statements concerning the significant complexity and difficulty of ñplanning, implementation, and evaluation of restoration measures for populations of aquatic organisms and ecosystems as a whole.ò[103] For all of these reasons, the court rejected EPAôs argument that restoration measures are a permissible consideration in determining best available technology.

In *Riverkeeper II*, the court strongly reaffirmed that allowing compliance with section 316(b) through environmental restoration measures constitutes an impermissible construction of the statute.[104] The court explained that ñrestoration measures substitute after the-fact compensation for adverse environmental impacts that have already occurred for the minimization of those impacts in the first instance.ò[105] As such, they are ñóplainly inconsistentô with the statuteôs textò and ñcontradict the unambiguous language of

[102] *Riverkeeper I*, 358 F.3d at 189.
[103] *Id*. at 190 (quoting 66 Fed. Reg. 65,285, 65,314).
[104] 475 F.3d at 109-10.
[105] *Id*. at 110 (citing Riverkeeper I, 358 F.3d at 189).

section 316(b).ò[106] In short, restoration is not ñtechnologyò under section 316(b) and, therefore, cannot take the place of alternative cooling technologies to satisfy that statuteôs best available technology requirement.

B. California courts will look to the interpretation of 316(b) to interpret Section 13142.5(b).

In interpreting similar language in section 13142.5(b) of the Porter-Cologne Act, modeled after and partially implementing section 316(b), state courts will look to this federal interpretation,[107] as the State Board wisely did in crafting its OTC Policy. Although section CWA 316(b) does not apply to the intake systems for desalination facilities, section 13142.5(b) of the Porter-Cologne Act is not limited to power plants and it applies equally to industrial installations utilizing seawater. It is illogical for the State Board to interpret section 13142.5(b) not to allow after-the-fact mitigation for power plants while the Desal Policy allows the use of after-the-fact mitigation for other facilities using seawater. Indeed, as it currently stands, existing power plants must come into compliance with the OTC Policy by phasing out their open-ocean intake, while a brand new desalination facility operating under the same statutory provision would be allowed to use mitigation in lieu of satisfying best available site, design and technology requirements. That outcome not only undermines the new OTC Policy, but renders Californiaôs marine resource policies incomprehensible.

A plain reading of section 13142.5(b), like that of CWA 316(b), precludes interpreting the term ñmitigationò as synonymous with, or inclusive of, restorative measures. The language in the Porter-Cologne Act provides that all four elements ï site, design, technology and mitigation -- whether read holistically or individually ï must ñé minimize the intake and mortality of all forms of marine life.ò As explained by the *Riverkeeper* court, and instructive to interpreting 13142.5(b), ñrestoration measures substitute after-the-fact compensation for adverse environmental impacts that have already occurred for the minimization of those impacts in the first instance.ò[108] In like fashion, restorative measures, by definition, do nothing to ñmitigateò the intake and mortality of all marine life in the first instance. The mere use of the term ñmitigationò is not sufficient to justify an interpretation of section 13142.5(b) that is inconsistent with the OTC Policy serving the same purpose.

The Amendment must establish clear and unambiguous direction to regional boards to only consider restorative measures after fully enforcing the individual and collective ñbestò available site design and technology to minimize the intake and mortality of all forms of marine life. And even then, the calculation and planning of restorative measures must be shown to achieve the performance standards of subsurface intakes.

After the fact restoration is not allowed under the law. The State Board should revise the Desalination Policy to *ensure restoration is not used in-lieu of the best available site, design, and technology for minimizing intake and mortality of marine life*.

13. THE MITIGATION FEE CALCULATION SHOULD BE CORRECTED.

A. The ETM/APF model contains too many scientific assumptions.

Any discussion of the use of ETM/APF for calculating the area of habitat construction/restoration, and even more so for any discussion of a ñmitigation feeò based on APF, needs some qualifying assumptions and statements included in the Ocean Plan. Most importantly, it should be made clear that replacement of all forms of marine life is an inherently difficult, if not an impossible task. Experts have created models like ETM/APF to estimate the damage and convert the loss into an area that may create or improve the productivity of marine habitats to replace all the species and life stages of those species. But the experts

[106] *Id.*
[107] *See*, e.g., Reno v. Baird, 18 Cal. 4th 640, 647 (1998).
[108] 475 F.3d at 110 (citing Riverkeeper I, 358 F.3d at 189).

admit that this model is a ñbest effortò and not an exact science. The marine environment and ecological systems are too complex and too poorly understood to have complete confidence that habitat restoration or creation will have the desired effect of replacing all forms of marine life lost to a facility. This has been recognized in the science community, the regulatory community and the judicial system.

This is the reason it is sound public policy to ensure minimization of the intake and mortality of all forms of marine life in the first place. To the extent minimization achieves or approaches 100% performance, and elimination of the risk to healthy marine ecosystems and the myriad species that support that system is achieved, the task of trying to replace those organisms and maintain ecosystem function is unnecessary.

The Amendment should establish clear enforceable standards to ensure the intake and mortality of marine life is minimized through implementation of the best available site, design and technology before turning to inherently difficult and admittedly imperfect attempts to recreate complex marine ecosystems.

B. The ETM/APF model should be qualified.

As noted in the scientific literature, elsewhere in these comments and the Expert Panel workshops, ETM/APF is not an exact method for quantifying the area and types of habitats necessary to effectively replace all forms of marine life lost to the intake of a facility. Nonetheless, we agree it is a superior method for measuring ecological impacts from the loss of the myriad species and life-stages of marine life affected, as compared to an ñAdult Equivalency Lostò or ñFecundity Hindcastingò model.

Consequently, any attempt to ñmonetizeò a replacement value based on APF must first ensure that the APF calculation is qualified, and the risk of under-compensation (or less than full replacement value) is minimized. The draft Desal Policy takes the first step in ensuring ñfull replacement valueò by mandating a 90 percent confidence level in the APF calculation. *The confidence level should be increased to 99 percent, and the acreage calculation should include a greater than 1:1 ratio to ensure against unpredictable and/or unquantifiable circumstances reducing the projected productivity of the restoration project.*

But even then, any attempt to convert a restoration project to a fee paid to a ñmitigation bankò only compounds the risk factor and results in less confidence in achieving the goal to ñminimize the intake and mortality of all forms of marine life.ò We are not aware of any ñmitigation banksò in the marine environment. And aside from designating and enforcing more area in marine reserves, we are not sure how a marine habitat mitigation bank would include all habitats necessary for replacing all forms of marine life lost to the facility intake. And mitigation banks established to restore or create coastal wetlands are clearly only attempts to increase productivity for a sub-set of the speciesô populations suffering intake and mortality at the facility. And again, this ñnot in-kindò habitat creation/restoration problem is compounded when the calculation ñaveragesò all the APFs for different habitats affected.

Further, the examples shown by the Expert Panel for how to calculate a ñmitigation feeò included many assumptions that need clarification. For example, the presentation included several past restoration project costs from past efforts at mitigating the impact of cooling water intakes. It did not appear to capture the cost of land acquisition, project planning, and other costs that a full mitigation fee must include. And it seemed to include a past project that, in combination with wetlands creation/restoration, created artificial rocky reef. This is an example of the difficulty, if not impossibility, of replacing ñall forms of marine life ï creating shallow rocky reef on areas of sandy bottom compounds the loss of species that inhabit sandy habitat or forage in sandy habitat.

We are reluctant to suggest methods for improving the confidence that a restoration project or a mitigation fee calculation will result in full replacement value beyond the recommendation to require a 99% confidence level and something greater than a 1:1 acreage ratio. However, we recommend a clarification in the draft, like that concerning a later determination of the best slot size for intake screens, that the staff will review comments on the subject before finalizing the Amendment ï and we would add

that both these details in the Amendment will be coordinated efforts of several agencies with relevant expertise and include full public notice and comment opportunities.

The best solution is avoidance of the problem in the first place. A very strict adherence to a combination of ñbest available site, design and technologyò standards will all but eliminate the need for ñafter-the-factò restoration. Further**,** *the complexities of marine ecosystems and the ñbenefitò of maintaining healthy ecosystems should form the basis of a ñreasoned analysisò to prohibit ñcostò as an element of defining ñnot feasible.ò*

C. Project proponents are asking for a lower confidence level.

Project proponents are requesting limits that would exacerbate the risk of under-compensation rather than recommendations for how to better ensure success of any ñafter the factò restorative measures. Project proponents recommend lowering the ñconfidence leveló in the draft Ocean Plan amendment from 90% to 50% based on past decisions using a 50/50 chance of success. They are arguing, in effect, that if past decisions have failed to incorporate measures to ensure success, the amendment should not correct those errors. We disagree. Amendments to the Ocean Plan to enforce the law are the right time to set statewide standards for resolving any past errors and ensure those errors are not repeated.

The SED articulates why a higher confidence level is used in other regulatory schemes, and why it is necessary in this context. The limits of our understanding of marine ecosystems demands a precautionary approach and assurances that the restoration is scaled properly and performs properly over time.

Finally, at the August 6th Workshop[109] we have heard requests for ñcreditò in the restoration scaling method to account for higher productivity habitat created or restored to compensate for less productive habitat. A careful read of the ETM/APF assumptions, combined with a careful read of section 13142.5(b) shows why that request must be denied.

The ETM model estimates the source water body for a sample of species in the entrainment studies, and the APF calculation includes several habitat types to represent the species in the sample. Those separate individual APFs are then combined to calculate a cumulative APF. But importantly, the assumption in the model is that the ñcumulative APFò, and the restoration project scaled on that calculation, will be proportional to the different species and habitats in the ETM calculation.

And the language and intent of section 13142.5(b) is clear, but often overlooked. The relevant language states the intent to minimize the intake and mortality of ñall forms of marine life.ò This is not simply a mandate to minimize the intake and mortality of marine life in general ï it is a mandate to minimize the intake and mortality of each and every form of marine life.

Taken collectively and within the context of ñecosystem-basedò management[110], the assumptions in the APF model must be realized to ensure compliance with the intent of section 13142.5(b). There is no ñcreditò allowable for restoring or creating a single habitat type based on some productivity comparison. Just the opposite, *the calculation must include a ñmultiplierò to ensure that, if the creation/restoration project replaces habitats that are not proportional to the species lost to the intake, the indirect benefits are reasonably ñdiscountedò ï not credited. It should be clarified in the draft amendment that the purpose of any habitat restoration/creation project is to fully replace ñall forms of marine life.ò If that goal is to be measured in biomass, it must be species-specific biomass measured in proportion to the species lost. It is not ñgeneral biomassò that may or may not have some indirect benefit to the species*

[109] West Basin Water Districtôs public comments at the August 6th Board Workshop.
[110] This is a recognized principle in habitat creation/restoration efforts. For example, wetlands restoration are not simply the creation or restoration of areas permanently or intermittently covered in water. While those areas in and of themselves represent different habitat types, and resident species ï full restoration often requires additional ñuplandò habitat to ensure ecosystem functions and full productivity.

lost.

As noted above, we are reluctant to recommend a formula for ensuring that habitats in a restoration project are proportional to the lost productivity of myriad species lost to the intake of proposed facilities. Once again, the complexities and limits to accurately measure the impacts, and the inherent risk of under-compensation and disproportional compensation, argue for a very strict policy to minimize the intake and mortality of ñall forms of marine lifeò in the first place. And once again, if the performance of sub-surface infiltration galleries is the enforceable standard for ñbest available technologyò then the residual intake and mortality is all but eliminated, and reliance on imperfect models and restoration projects is minimized.

14. MITIGATION FEES NEED TO BE SPENT PROPERLY TO MINIMIZE THE INTAKE AND MORTALITY OF MARINE LIFE.

We support the requirement to fully mitigate for all marine life mortality associated with a desalination facility, and to do at least three years of baseline monitoring to estimate that mortality. However, compensating for killing a wide variety of larvae and other sea life by restoring specific habitats is an embryonic, inexact and unproven science. The challenges of converting estimates of a sample of the sea life harmed by a project into an area of production foregone, then restoring sufficient habitat to replace the lost production for the full range of affected species underscore several key points in this policy.

First, it is critically important to minimize mortality in the first place by making the best choices about siting, design and technology respectively, due to the impossibility of guaranteeing successful replacement of larval production (See Section E above). Even a well-designed mitigation plan cannot be counted on to restore the exact species, the quantities of those species, and the ecological *functions* that surface intake structures harm. For that reason, we reiterate that subsurface intake technology should be required as best available technology and not left to best professional judgment on the combination of best site, design and technology.

Second, for impacts that cannot be avoided despite the use of best siting, design and technology, respectively, mitigation measures should be designed to replace an acre of production foregone with a significantly greater area of replacement production. In section III.L.2.e.(3)(b)iii, we urge the board to strive to achieve replacement value at least equivalent to the impact of the facility by calling for a ratio greater than 1:1 (area of production replaced to area of production lost) in this policy.

As noted in the Staff Report, wetlands mitigation policies often require a ratio significantly greater than 1:1 to take into account the uncertainty and difficulty of replicating natural systems with their full array of ecosystem functions and benefits. The California Coastal Commission, for example, has in the past used a ratio of 4:1 for wetlands mitigation.[111] A similar rationale applies in this case, where the track record of previous success is even more limited than that of wetlands mitigation.

We recommend a ratio of 3:1 or higher to take into account the potential for less than 100 percent success and the significant uncertainty about how best to accomplish successful mitigation projects involving larval production. Such a ratio can also help account for the fact that desalination intakes and discharges may have adverse impacts on the food web or other ecosystem functions that arenôt fully captured in measurements of larval mortality.

Next, we support including a broad list of potential mitigation projects as identified in section III.L.2.e.(3)(b)i, along with clear performance standards and measurement requirements. Having a broad list may help provide the flexibility needed to increase the prospects for a proportional and successful mix of restoration projects to fully replace ñall forms of marine lifeò lost to the intake. *The State Board should*

[111] California Coastal Commission. 2013, Local Coastal Program Update Guide:. Environmentally Sensitive Habitats, Part 1, Section 4, p. 10.

also include a preference for mitigation projects in the geographic vicinity of the proposed project, to help match replacement production as closely as possible to marine life losses. However, some caution is necessary to ensure that the productivity of the restoration project is not within a ñsource water bodyò which may increase entrainment and reduce the replacement value of the restoration project.

We recognize the challenges of developing successful mitigation projects and the resulting need for flexibility in their location. *We suggest balancing proximity value with geographic flexibility by adding, perhaps as a new Section III.L.2.e.(3)-(b)iv, a statement like: ñPreference shall be given to projects in the geographic vicinity of the desalination facility.ò* Such a preference would likely also have the advantage of better replicating the species mix impacted by the facility. *In section III.L.2.e.(4), Mitigation Option 2, the State Board should add ñor projectsò after ñongoing implementation of a mitigation projectéò in line 4 of that paragraph. We make this suggestion because a combination of projects may well be needed to fully mitigate impacts in certain cases.*

Additionally, we appreciate the emphasis on completing actual mitigation projects with measurable benefits as described in Chapter III.L.2.e.(3) or, as described in Chapter III.L.2.e.(4), providing funding for available mitigation programs. The health of ocean ecosystems is the endpoint that matters with respect to mitigation. Mitigation efforts should therefore focus on full replacement of all forms of marine life that are harmed. Money can facilitate that restoration but is no substitute for it.

In Section III.L.2.e.(3)(b)i, we suggest the following changes: ñMitigation shall be accomplished through expansion, restoration or creation of one or more of the following: kelp beds, estuaries, coastal wetlands, natural reefs, MPAs, State Water Quality Protection Areas, or other projects approved by the regional water board that will mitigate for intake and mortality of marine life associated with the facility.ò

In Section III.L.2.e.(4)(b)m suggest adding clause in caps: ñThe amount of the fee shall be based on the cost of the mitigation project, or if the project is designed IN WHOLE OR IN PART to mitigate cumulative impacts from multiple desalination facilities or other development projectséò

Lastly, Chapter III.L.2.e.(5) authorizes agencies to conduct audits and inspections of any mitigation projects, but provides no guidance as to what steps those agencies can take to address problems or inadequacies they may find. We urge the State Board to *add steps, including, at a minimum, actions to correct flaws in the project pursuant to the adaptive management portion of the mitigation plan, use of the audit findings to inform periodic reviews of waste discharge requirements and NPDES permits, authority to open a permit at any time to ensure compliance, as provided in the OTC Policy, and other actions as needed.*

15. SPRAY-BRINE DIFFUSERS SHOULD BE DETERMINED THE BEST AVAILABLE DISCHARGE TECHNOLOGY.

A. Requiring treated wastewater for dilution will conflict with Californiaôs recycled water goals.

Requiring treated wastewater for dilution will conflict with Californiaôs recycled water goals. The goal of reaching 2 million acre feet of recycled wastewater will be best met if every water purveyor statewide is able to contribute.[112] So, it is a concern if wastewater discharge volumes are permanently allocated to brine dilution for a seawater desalination facility ï effectively undermining the ability of any given region to fully contribute to reaching the Stateôs goal to advance the use of recycled wastewater.

For example, CalAm is currently considering whether to mix the brine from their proposed Monterey desalination facility with a wastewater discharge, or to install diffusers. That choice is dependent on the availability of the wastewater for recycling. While it is unclear whether the recycling facility will be

[112] State Water Resources Control Board, Recycled Water Policy (2013), available at http://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2013/rs2013_0003_a.pdf.

available before the deadline to operate the desal facility (based on the Carmel River CDO deadline), should CalAm apply for a permitted comingling with wastewater in their NPDES permit, this desalination Ocean Plan should ensure against ñenshrinementò of the commingled discharge ï effectively eliminating the recycling option in the future. The permanent elimination of wastewater for recycling through a permitted comingling with brine would directly undermine the intent of the Recycled Water Policy to advance recycled wastewater. The State Board should *apply these principles statewide for any potential future local opportunity to expand wastewater recycling capacity*.

Industry is arguing that this provision is beyond the State Boardôs authority because: ñWater supply agencies are responsible for development of water supply and reliability projects, not the SWRCB or its Regional Boards[113].ò This argument mis-states the authority of the State Water Board. The draft Amendment is simply enforcing the Clean Water Act and Porter-Cologne Act in regards to the discharge. In that sense, it does not necessarily place a limit on the water agenciesô discretion to develop seawater desalination as a part of a portfolio. It simply ensures that the brine discharge does not violate the law. Further, the State Board has already exercised its authority in this field. While it is not asserted in the Amendment, this provision would ensure that the adopted State Board policy to develop recycled wastewater is consistent with the provisions of the Desalination Amendment. To our knowledge, water supply agencies did not have any objections to the State Boardôs policy on recycled water ï which arguably had just as much connection with the choices made by local water agencies as this Ocean Plan amendment would have.

B. Spray brine diffusers are the best available technology for discharging brine.

The Brine Expert Panel did not cite any studies disproving that spray brine diffusers would cause the mortality of marine life ï the calamity caused from trying to disprove a negative statement. Nonetheless, other experts concluded that it would likely be a small impact[114]. There is no empirical data to support the hypothesis of intake and mortality in spray brine diffusers. And judging by the comments of several project proponents at the August 6th Workshop, either there is a divergence of opinion on the hypothesis, or the intake and mortality is extremely site specific. For example, Poseidon-Carlsbad has implied that the intake and mortality in the brine plume would exceed that of a modified intake system ï although they have no studies to support that claim. On the other hand, MWDOC, CalDesal and Poseidon-Huntington seem to imply that any minimal mortality in the spray brine diffuser plume would be so small so that a minor adjustment to the restoration project should more than compensate for the harm (implying it is immeasurable). Industry should not be allowed to modify the Amendment in hopes that ñsite-specificò determinations undermine the goal of consistent statewide enforcement of the law, and simultaneously undermines the intent of the Clean Water Act to comply the ñbest technology availableò for the control of polluted discharges.

Until there is some empirical evidence, or at a minimum laboratory tests, showing the degree of mortality in a spray brine plume, properly designed and sited diffusers should be considered the best available technology for brine dilution.

Alternatively, or in any case, if the principle behind the preference for co-mingling wastewater with the brine is an effort to take a precautionary approach and avoid any potential harm from mortality in the diffuser, that precautionary principle should be equally applied in every issue where there is a lack of scientific evidence to disprove a hypothesis (eg. the hypothesis that fine-mesh screens create increased impingement mortality).

As such, we recommend the following revisions to Chapter III.L.2.d.2.(b):

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[113] *See* Attachment: Municipal Water District of Orange County (MWDOC) [in consultation with other water agencies, Cal Desal and Poseidon], ñInformation Itemò, August 4, 2014, bullet 6.
[114] See Joint Intake Panel and Discharge Panel presentation, desal workshop in Sacto, date???

Multiport diffusers are the ~~next~~ best available method for disposing of brine* ~~when the brine* cannot be diluted by wastewater and when there are no live organisms in the discharge~~. Multiport diffusers* shall be engineered to maximize dilution, minimize the size of the brine mixing zone,* minimize the suspension of benthic sediments, and minimize marine life mortality.*

16. TOXICITY MONITORING MUST BE DONE PROPERLY.

A. We support the current requirements for toxicity monitoring.

In addition to the entrainment and impingement impacts from the intakes, desalination facilities pose a serious threat to marine ecosystems from concentrated brine discharge. Concentrated brine discharge can cause both acute and chronic toxicity to the ecosystems.[115] In particular, brine discharges ñcan pose significant risks to sensitive habitats.ò[116] For example, brine discharges have been associated with ñreduced growth, reduced biomass, and the disappearance of seagrasses.ò[117] In addition to toxicity associated with elevated salinity, brine plumes can form a physical barrier preventing adequate mixing of dissolved brine resulting in anoxia or hypoxia in benthic organisms.[118]Exposure to brine and other potentially toxic constituents in desalination effluent can cause serious impacts on bottom-dwelling organisms including: osmotic stress or shock, endocrine disruption, compromised immune function, acute or chronic toxicity, and even death in extreme conditions.[119] While mobile organisms may swim away from the discharge, stationary organisms cannot move away and thus might experience more serious effects.[120] Due to the serious nature of the potential toxicity of brine discharges, we support the draft Desal Policyôs requirement for a establishing a minimum of baseline monitoring for 36 months prior to commencing brine discharge and conducting a Whole Effluent Toxicity (WET) test.

B. The State Board is using the proper species for the WET test.

The draft Desal Policy requirement that WET test be conducted for germination and growth for giant kelp (*Macrocystis pvrifera*), development of red abalone (*haliotis refescens*), development and fertilization for purple urchin (*Strongleocentrotus purpuratus*), development and fertilization for sand dollar (*Dendraster excentricus*), and larval growth rate for Topsmelt (*Athernipos affnis*)[121] is scientifically sound and appropriate.

In 2012, scientists at U.C. Davis Department of Environmental Toxicology conducted hyper-salinity studies using U.S. EPA west coast methods on a number of species including bay mussels, purple sea urchins, sand dollars, and red abalone, giant kelp, and Topsmelt.[122] These studies, known as the Granite Canyon studiesò form the basis for the recommended WET test studies in the SED. The State Water Board staff reduced the list of species to reduce costs and focused the species list on those that are most affected by salinity, while still representing a variety of taxa.[123] This is a reasonable while still scientifically sound approach.

While the species list in the recommended WET test may not always be found at every proposed desalination site, it is still appropriate to conduct the WET test for all of these species as they are

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[115] Roberts *et al.* Impacts of desalination of plant discharges on the marine environment: A critical review of published studies, 117-5138 Water Research 44 (2010).
[116] Supra note 3, at 36.
[117] *Id*. at 37.
[118] *Id*. at 82 quoting Hodges et al. Impingement and Entrainment: Biological Efficacy of Intake Alternatives Presented at the Desalination Intake Solutions Workshop 16-17 October 2008, Alden Research Laboratory, Holden, MA; Roberts supra note 114.
[119] Supra note 3, at 82.
[120] *Id*.
[121] Draft Desalination Policy at I.3.c.(1)(b)
[122] Phillips et al., Hyper-Saline Toxicity Thresholds for Nine California Ocean Plan Toxicity Test Protocols, Final Report, University of California Davis, Department of Toxicology at Grand Canyon
[123] Supra note 3, at 107.

representative of other similar species that may occur along our coast.[124] For example, abalone are in the Phylum Mollusca, which is a diverse tax that includes snails, shellfish, squid, octopus, nautilus and nudibrachs. Some desalination proponents have suggested running toxicity test on species at the location of the proposed discharge site to establish facility-specific receiving water limit. However that process would be cost, labor, and time intensive because an owner would have to first establish which species are the most sensitive to salinity changes and then would have to establish and validate U.S. EPA test protocols for the most sensitive species. Again the established indicator species listed in the SED were selected due to their sensitivity to toxicity and are appropriate as a minimum species to use for tests. Although we do not support substituting species for those established in the SED, we do support supplementing the established WET test with additional location-specific species as appropriate.

Additionally, some desalination proponents have suggested running toxicity studies on species caught directly in the proposed discharge environment. This approach is also not scientifically advised as wild-caught species will have different levels of physical fitness, which can result in inconsistencies in the results. As the SED notes ñthere is a high probability toxicity studies on wild caught species will result in inconclusive results.ò[125] We support the Staff recommendation of conducting toxicity studies on laboratory or farm raised species that have established U.S. EPA approved test protocols because it will increase the accuracy of the results.

17. ALTERNATIVE TECHNOLOGIES NEED TO BE HELD TO THE ñBEST AVAILABLEò STANDARD.

A. Alternative intake technologies need to substantially meet the performance standard of the best available intake technology ï subsurface infiltration galleries.

The CWA, and thus Californiaôs granted authority to enforce the Water Code as long as the Stateôs laws and regulations are as protective or more protective than those in the federal law, allows alternative technologies to be implemented if they are proven to be as effective as the ñbest available technology.ò The Porter-Cologne Act is used to implement Californiaôs duties under the CWA, and the ñmost salient characteristic of the [CWA], articulated time and again by its architects and embedded in the statutory language, is that it is technology-forcing.ò[126] Meaning, as new technologies are developed, and permits are renewed, permittees are required through an iterative process to continue implementing the ñbest availableò technologies.

The technology-forcing nature of the CWA and the California Water Code also allows permittees to be innovative at meeting their compliance options. The innovative concept behind the CWA takes a three-step approach. First, a permitting authority is required to determine the best available technology for minimizing impacts to a waterway. Second, the permitting authority determines the appropriate performance standard that is met by the best available technology. Third, the permitting authority allows permittees to meet the performance standard ï not only through the option of implementing best available technology ï but through other technologies demonstrated to meet the performance standard set by the best available technology. We support this innovative approach to CWA and Water Code compliance, and agree that the State Board should provide an opportunity and requirement for innovation in the Amendment.

The OTC Policy allowed for innovation in meeting its compliance standard. The approach taken in the OTC Policy found that ñdry cooling towersò were the best technology for minimizing the adverse impacts, but used ñwet cooling towersò as the basis for the performance standards. The reasoned analysis concluded that the performance of wet towers was ñequivalentò to dry towers (93 percent reduction), and that a marginally lower performance standard was justified to allow more universal availability. The OTC Policy clearly stated that either wet cooling towers or dry cooling towers would be allowed because dry

[124] *Id.*
[125] *Id.* at 108.
[126] *Natural Resource Def. Council v. Envtl. Prot. Agency*, 822 F.2d 104, 123 (D.C. Cir. 1987).

towers exceeded the performance standard. Finally, the OTC Policy allowed alternative approaches where wet cooling towers were shown to be ñnot feasible.ò Arguably, the ñ90% reduction of a 93% reductionò allowed a ñless than bestò performance standard. Nonetheless, the State Board found this standard ñfunctionally equivalentò to the ñbestò.

While we support the State Boardôs decision to allow innovative alternate technologies, those technologies must meet the performance standard set by the best available technology. The State Board followed the Second Circuitôs ruling by requiring alternative technologies in the OTC Policy to meet the performance standard set by the best available technology ï within a range of performance based on the agencyôs reasoned analysis.

Unlike the OTC Policy, the draft Amendment does not require alternative technologies meet the best available technology performance standard. In fact, the draft does not include a clearly stated performance standard ï nor an explanation how it is derived from the effectiveness the ñbest technology.ò Instead, the State Board is allowing alternative intake technologies ñso long as the alternative method provides equivalent protectioné as is provided by a [0.5 mm/0.75 mm/1.0 mm] slot size screen.ò Wedge-wire screens are not the proper performance standard by which alternative technologies should demonstrate compliance. As discussed above, and stressed in the *Riverkeeper II* decision, alternative technologies can be used to comply with the ñbest availableò standard, but those technologies must demonstrate equivalent protection as the best available technology.

As discussed above, subsurface infiltration galleries should be determined as the best available intake technology for minimizing the intake and mortality of marine life. As expressed in *Riverkeeper II*, and followed by the State Board in the OTC Policy, the State Board should *only allow alternative technologies, or a suite of measures, that meet the performance standard of subsurface infiltration galleries*.

To ensure the Desalination Policy properly allows for innovative intake technologies, we offer the following revisions to Chapter L.2.d.1.c.iii.:

> *An owner or operator may use an alternative method of preventing entrainment so long as the alternative method provides equivalent protection of eggs, larvae, and juvenile organisms as is provided by subsurface infiltration galleries ~~a [0.5 mm (0.02 in)/ 0.75 (0.03 in)/ 1.0 mm (0.04 in)] slot size screen [see note above]~~. The owner or operator must demonstrate the effectiveness of the alternative method to the regional water board. The owner or operator must conduct a pilot study to demonstrate the effectiveness of the alternative method, and use an Empirical Transport Model* (ETM)/ Area of Production Forgone* (APF) approach* to estimate entrainment at the pilot study location.*

B. *Alternative discharge technologies need to substantially meet the performance standard of the ñpreferred technologyò ï dilution with wastewater.*

Alternative discharge technologies must demonstrate equivalent protections as dilution with wastewater. As discussed above, we support the ability of permittees to use innovative alternative technologies to comply with the Policy, but alternative technologies must meet the best available technology performance standard.

Under Chapter L.2.d.2.a.,ñpreferred technology for minimizing intake and mortality of marine life resulting from brine disposal is to commingle brine with wastewater.ò This ñpreferred technologyò sets the performance standard as explained in Riverkeeper II and followed by the State Board in the OTC Policy. However, the draft Desal Amendment does not state that alternative technologies needs to meet the numeric water quality standard and numeric ZID limit as a performance standard. Chapter L.2.d.2.d. states that ñ[b]rine disposal technologies other than wastewater dilution and multiport diffusers, such as flow augmentation, may be used if an owner or operator can demonstrate to the regional water board that

the technology provides a comparable level of protection.ò That ñcomparable level of protectionò is the performance standard, and the Amendment would be clearer if it used that terminology in the relevant areas.

If the State Board intends alternative discharge technologies to be comparable to either wastewater dilution or multiport diffusers, then the State Board needs to be explicit that both technologies have the same performance standard. *If the State Board does not find both technologies to have equivalent performance standards, then the State Board needs to be explicit that alternative discharge technologies must demonstrate equivalent protections as dilution with wastewater*.

To ensure the draft Desal Policy properly allows for innovative discharge technologies, we offer the following revisions to Chapter L.2.d.2.d.:

> *Brine disposal technologies other than wastewater dilution and multiport diffusers, such as flow augmentation, may be used if an owner or operator can demonstrate to the regional water board that the technology provides a comparable level of protection as dilution with wastewater*.

C. *Zero discharge desalination technologies need to be given special consideration as an alternative brine disposal technology.*

Zero discharge desalination (ZDD) should be explicitly allowed as an alternative discharge technology, and should be exempt from empirical studies demonstrating equivalent protections as dilution with wastewater. ZDD is a discharge technology specific for desalination facilities that separates salts into salable products. The ZDD concept utilizes the energy-saving feature of electrodialysis to remove salts from the brine reject and concentrate them about threefold before evaporation.[127] Although ZDD systems have higher capital cost than traditional desalination facilities that discharge into the ocean, the ZDD technology could potentially reduce the cost of seawater desalination when all the costs and benefits are considered.[128] ZDD also has the potential to reduce the regulatory burdens and costs associated with discharging brine directly into the ocean.

As the name suggests, ZDD results in zero discharge of brine from desalination facilities. This technology is the ultimate ñbest technologyò for discharging of brine. However, we understand the State Boardôs concerns that this technology ï while innovative ï is not necessarily ñavailableò in the context of a regulatory scheme. Despite ZDD not being ñavailableò, it is exactly the type of innovative technology this Policy should be cultivating.

As we understand the Policy, ZDD would be approved as an alternative design technology because a project proponent can easily demonstrate equivalent protection as dilution with wastewater. However, Chapter III.L.2.d.(2)(d) requires empirical studies or modeling to demonstrate comparable levels of protection. While we support the requirement for empirical studies to demonstrate discharge compliance, we believe it is unwarranted for ZDD technology given the obvious benefits of zero discharge to the marine environment.

Given ZDDôs performance standard of zero brine discharge, we recommend the State Board *incentive ZDD technology, and remove the discharge demonstration requirements under Chapter III.L.2.d(2)(d) for ZDD projects*.

18. FLOW AUGMENTATION FOR BRINE DILUTION IS ILLEGAL.

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[127] Davis, H. (2006). Zero Discharge Seawater Desalination: Integrating the Production of Freshwater, Salt, Magnesium, and Bromine. Columbia, SC: University of Southern California Research Foundation. http://www.usbr.gov/research/AWT/reportpdfs/report111.pdf.

[128] *Id.*

A. Allowing flow augmentation as an alternative discharge technology is illegal and bad public policy.

As discussed above, flow augmentation (increased intake volume), is illegal and should not be an allowable technology or practice for discharging brine. As the State Board admits, withdrawing ñadditional seawater through surface intakes for the purpose of diluting brine effluent to meet water quality standards (referred to as ñflow augmentationò) can significantly increase entrainment and impingement.ò Moreover, even if a technology can reduce entrainment through ñlow turbulence intakesò ñ[a]dditional mortality may occur through brine exposure in the mixing process and through predation in conveyance pipes.ò[129]

Experts in the field of brine discharges have found flow augmentation leads to significant increases in marine life mortality. Studies have demonstrated that 100 percent of entrained organisms die,[130] and that entrainment impacts on individual populations and the ecosystem can be significant.[131] Withdrawing additional source water with traditional pumps to dilute brine would result in significantly increased marine life mortality compared to discharging through multiport diffusers.[132]

Only one project proponent believes flow augmentation using low-turbulence screw pumps (e.g. Archimedes screws pumps, screw centrifugal pumps, or axial flow pumps) can significantly reduce marine life mortality by lowering turbulence and through-pump mortality at the point of intake.[133] That singular project proponent and expert consultants, have failed to prove the claim ï even though multiport diffusers are available in numerous places and tests could have been conducted years ago, And Alden Labs apparently told State Board staff the tests of alternative low-turbulence pumps could be performed in their test laboratories.

Proponents of flow augmentation have argued that flow augmentation can overall result in less marine life mortality compared to multiport diffusers even though the mechanisms to do so have not been clearly demonstrated.[134] To date, there are no empirical data that have estimated egg, larvae and small juvenile mortality at the low-turbulence pumps, even though such studies are technically feasible.[135]

Besides no data demonstrating that low-turbulence screw pumps are capable of minimizing entrainment, flow augmentation does not prevent marine life mortality at the mixing zone. The State Board acknowledges that ñ[o]rganisms entrained in the flow augmented dilution water may experience turbulence and shearing stress, osmotic stress or shock, or thermal stress as brine and dilution water are mixed prior to discharge.ò[136]

Flow augmentation results in a net loss of marine life mortality, and no data exists to prove that low-turbulence screw pumps reduce entrainment. There is nothing to suggest that flow augmentation can demonstrate equivalent protections as that of dilution with wastewater. Despite no evidence to justify flow augmentation as an alternative discharge technology, the State Board is allowing a project proponent to invest in low-turbulence screw pumps and operate them for up to three years before demonstrating equivalent protections as dilution with wastewater.

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[129] *Id*. at 46.
[130] Pankratz, T. 2004. An overview of Seawater Intake Facilities for Seawater Desalination, The Future of Desalination in Texas. CH2M Hill, Inc. Vol 2: Biennial Report on Water Desalination, Texas Water Development Board.
[131] Raimondi, P. 2011. Variation in Entrainment Impact Based on Different Measures of Acceptable Uncertainty. Prepared for California Energy Commission, Public Interest Energy Research Program.
[132] Supra note 3, at 88.
[133] *Id*.
[134] *Id*.
[135] *Id*.
[136] *Id*.

This is bad public policy, and allows regional boards to kick the proverbial compliance can down the road. Regulatory flexibility is important, but perverting regulations to ñaccommodateò every project is inappropriate. At some point, California needs to stand up for its marine environment ï and the laws intended to protect it ï by requiring facilities to meet their legal requirements. Allowing three years to build and then try to demonstrate compliance with their own corporate studies is unjustifiable. How will regional boards have the resources or expertise to know whether the empirical studies were done correctly? The proponent of low-turbulence pumps has already submitted questionable studies disputed by industry experts. Does anyone believe Water Boards will require a facility to shut down a water supply facility once it is in the local portfolio, rip-out their low-turbulence pumps, and install the proper discharge technologies once they fail to meet the performance standard? Itôs untenable and unworkable from a practical perspective.

In order to prevent flow augmentation from undermining the best available intake and discharge technologies, we request the State Board *explicitly prohibit flow augmentation under Chapter III.L.2.d.2. by deleting all of Chapter III.L.2.d.2.(e).*

B. Proponents of flow augmentation failing to demonstrate equivalent protections as the preferred discharge technology should not be given additional opportunities to re-design their system .

Project proponents that install low-turbulence intakes and fail to meet the required intake and discharge performance standards should not be allowed to continue operations. Instead, the State board allows project proponents that are not meeting the required performance standards ñre-design the flow augmentation system to minimize intake and mortality of marine life to a level that is comparable with wastewater dilution or multiport diffusersé ò As discussed above, it is already inappropriate to allow a project proponent to operate for three years with flow augmentation technology that is assumed to increase marine life mortality rather than minimizing it. Allowing proponents to continue using flow augmentation after failing to demonstrate compliance just perpetuates the impacts to marine life. How many opportunities does a project proponent get at re-designing their in-plant dilution technology? How many years after a re-design does the proponent get to prove the new design is in compliance? In fact, given the opportunities to collect empirical data on the mortality of marine life entrained in a diffuser plume, and the availability of laboratories to test low-turbulence pumps for efficacy reducing mortality ï project proponents should be mandated to prove their hypothesis prior to issuance of a permit.

In order to minimize the damage of allowing flow augmentation as an alternative discharge technology, we request the State Water Board *delete the option for project proponents to re-design their low-turbulence intakes after failing to demonstrate such technology meets the required performance standards*. We offer the following revisions to Chapter L.2.d.2.d.iii.:

> *If the empirical study shows that flow augmentation* is less protective of marine life than a facility using wastewater dilution or multiport diffusers,* then the facility must ~~either (1)~~ cease using flow augmentation* technology and install and use wastewater dilution or multiport diffusers* to discharge brine waste~~, or (2) re-design the flow augmentation system to minimize intake and mortality of marine life to a level that is comparable with wastewater dilution or multiport diffusers, subject to regional water board approval~~.*

19. THE STATE BOARD NEEDS TO MONITOR FOR HARMFUL ALGAE BLOOMS TO PROTECT PUBLIC HEALTH AND THE ENVIRONMENT.

1. Scientists are unsure whether reverse osmosis technologies remove all toxins from harmful algae blooms.

The science is unclear whether impacts from harmful algae blooms (HABs), commonly referred to as ñred tides,ò may occur due to desalination operations. HABs are a concern for desalination plants due to the high biomass of microalgae present in ocean waters and a variety of substances that some of these

algae produce. These compounds range from noxious substances to powerful neurotoxins that constitute significant public health risks if they are not effectively and completely removed by the RO membranes.[137] Algal blooms can cause significant operational issues that result in increased chemical consumption, increased membrane fouling rates, and in extreme cases, a plant to be taken off-line.[138] Early algal bloom detection by desalination facilities is essential so that operational adjustments can be made to ensure that production capacity remains unaffected.[139] Although numerous issues involving the desalination process are now being examined,[140] very limited information exists on the risks that algal blooms pose to seawater desalination facilities.[141]

The science community is unaware of any ñpublished reports on the effectiveness of reverse osmosis for removing dissolved algal toxins from seawater.ò[142] Some of these toxin molecules (e.g. domoic acid) are near the size of molecules rejected by reverse osmosis membranes, but experimental studies are required to validate the effective of this process on toxin removal.[143]

Until more studies are conducted on the effectiveness of reverse osmosis to remove HAB toxins, the State Board should *take a precautionary approach to siting desalination facilities near HABs*.

2. *Discharges of harmful algae bloom toxins back into the marine environment amplify the impacts.*

A desalination facilityôs pretreatment process may exacerbate HAB impacts. The science community has discovered that the desalinationsô ñpretreatment process might disrupt cells and create significantly higher concentrations of dissolved organic substances, including toxins, than were originally present in the source water.ò[144] Therefore, it is important that the desalination community carefully characterize these potential contaminants and their removal to improve treatment approaches in seawater desalination.[145]

In addition, more information will be needed to understand the potential impact of discharged brine and pretreatment backwash water resulting from the reverse osmosis desalination process on the ecology of coastal ecosystems. Reports conclude that if HAB toxins are in the intake water, then pretreatment coagulant would ñconcentrate toxic algae and their associated toxins.ò[146] Similarly, the ñdischarge of brine resulting from the reverse osmosis process would contain elevated concentrations of dissolved algal toxins relative to unfiltered seawater.ò[147] Given the potential for brine discharges to elevate the impacts from HABs, it is critical that the State Board *address HABs in the Amendment*.

3. *Monitoring is needed to ensure harmful algae blooms are not discharged with the brine.*

As detailed above, it is essential that a desalination facility incorporate a means of rapid algal bloom detection so that, when necessary, proper process changes can be made to maintain the production capacity. Sensors for detecting an eminent algal bloom can be located at the desalination facility to inform personnel regarding changes in water quality that are directly observed on the source water.[148] When constructing a new intake pipeline, the selection of its location (e.g. depth and distance from shore) can be greatly enhanced through the use of offshore monitoring devices and efforts to take into account the presence of any local accumulations of algal biomass due to currents, water mass

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[137] Caron et al., Harmful Algae and Their Potential Impacts on Desalination Operations Off Southern California, pg. 1 (2009), available at https://dornsife.usc.edu/assets/sites/378/docs/Caron_pdfs/2009_Caron_etal_WR_Proofs.pdf.
[138] *Id*.
[139] *Id*.
[140] Separation Processes Inc., 2005; Gaid and Treal, 2007; Pankratz, 2008, 2009.
[141] Supra note 137, at 1.
[142] *Id*.
[143] *Id*.
[144] *Id*.
[145] *Id*.
[146] *Id*.
[147] *Id*.
[148] *Id*.

convergences/divergences or internal waves, and also subsurface maxima in algal abundance.[149] Toxic blooms in the vicinity of desalination plants are rare or often unrecognized events, and plant operators are generally unaware of the threat that algal toxins pose. As a result, no measurements of marine algal toxins before and after treatment have been made at any full-scale desalination plant during an actual HAB.

HABs on the U.S. west coast exhibit significant generalities but the details of bloom dynamics differ with geographic location, depth and season. The high degree of variability associated with these events makes constant monitoring of HABs in intake water for desalination a vital issue.[150]

It is also important to consider the benefits of subsurface intakes in regards to HABs. Subsurface intakes provide a natural barrier to suspended sediments, algal toxins, pathogens, dissolved or suspended organic compounds, harmful algal blooms, kelp, sea jellies, debris, or oil or chemical spills, and adult and juvenile marine organisms.[151]

The State Board should *require all projects that are not using subsurface intakes to be required to conduct ocean monitoring for HABs, and be required to shut-down all intake operations when a HAB is present*.

4. The State Board should include drinking water permitting as part of the Policy.

With the California Drinking Water Program not part of the State Water Board, it should consider drinking water permits during the Adoption of the Amendment. Previously, the California Department of Public Health (DPH) had permitting responsibilities under the Safe Drinking Water Act. DPH had the authority to review desalination facilities operations and include specific performance standards for construction and operation of a facility, evaluation of the integrity of equipment used at the facility, determining the required response by the facility operator to various problems, and other requirements.[152]

During the initial drinking water permit review of the Carlsbad facility in 2006, the project proponent stated that toxins associated with potential red tide/algal bloom episode(s) in the waters around the plant intake *should* not pass through the various treatment processes. The public health office concluded that as ñindustry-wide understanding of the Harmful Algal Bloom (HAB) phenomenon, and related biotoxin toxicity issue, in drinking water progresses, *both the monitoring and operations* of permitted desalination facilities may require alteration.ò[153] DPH went on to find that in the event that the Department makes a determination that biotoxins should be regulated, then Carlsbad would be ñrequired to change their operations and monitoring plans to include, but not be limited to establishing: monitoring ranges, recording and reporting infrastructure, and shut down set points.ò[154]

Since 2006, the science community has become increasingly concerned about the effectiveness of reverse osmosis operations to filter all HAB toxins. As discussed above, the pretreatment process may elevate toxin levels in the source water, and scientists are unsure whether HAB toxins are completely removed. Moreover, the internationally community is now confronted with HAB incidents. In 2013, a desalination facility in Oman was ñshut down due to the uncertainty that the drinking water would remain safe during the red tide.ò[155]

Given the growing concerns regarding HABs and desalination operations, we believe *Californiaôs*

[149] *Id*.
[150] Caron, 407.
[151] Supra note 3, at 54.
[152] Desal Handbook, 53.
[153] Carlsbad termporary drinking water permit.
[154] *Id*.
[155] Website: http://www.desalination.com/wdr/49/10/red-tide-shuts-down-swro.

Drinking Water Program should reassess whether desalination facilities should be required to monitor their source and product water to ensure HAB toxins are completely removed from the drinking water supply.
As such, we request the following revisions to Chapter III.L.2.c.:

> *The owner or operator of a desalination facility* must submit a Monitoring and Reporting Plan to the regional water board for approval. The Monitoring and Reporting Plan shall include monitoring of effluent and receiving water characteristics, monitoring for harmful algae blooms influent and final product water, and impacts to marine life. The Monitoring and Reporting Plan shall, at a minimum, include monitoring for benthic community health, aquatic life toxicity, and receiving water characteristics consistent with Appendix III of this Plan and for compliance with the receiving water limitation in chapter III .L.3. A project proponent implementing the best available technology of subsurface intakes shall not be required to monitoring for harmful algae blooms*.

20. THE EMERGENCY EXEMPTION NEEDS TO BE PROPERLY DEFINED.

Chapter III.L.1.(a). of the draft Amendment defines exceptions where the Amendment would not apply. The exception includes an Executive Director waiver of the rule for ñfacilities that are operated to serve as a critical short-term water supply during a state of emergency as declared by the Governor.ò We do not oppose reasonable exceptions to the rule for emergency situations. We agree that, in a state of emergency declared by the Governor, these portable units should be available for temporary emergency relief. In fact, the draft exception to the rule should be expanded to ensure disaster relief for emergencies in California declared by Federal authorities, and to indicate that several portable units may be needed in an area to ensure public safety during disasters.

The second exception for ñoperationò of facilities to serve as a short-term water supply is not clearly defined and may create an ñexception that swallows the rule.ò For example, permanent facilities are required to use the ñbest designò to minimize the intake and mortality of marine life. To date, permanent facilities have been proposed for inclusion in a permanent water supply portfolio. It is not clear how a facility that is designed and operated as a permanent component of a water supply portfolio could change that ñoperationò to ñserve as a critical short-term water supply.ò If it is designed to produce a determined volume of water, and that production capacity is relied on in non-emergency times, it is unclear how it can be ñoperatedò differently during an emergency to produce a ñshort-term water supplyò beyond what the facility normally produces. Therefore, the ñexecutive director waiverò for operation of facilities to serve a short-term supply of water should be deleted ï existing facilities can only produce what they are designed to produce regardless of whether the product water is used continuously or only during an emergency. Alternatively, if the draft is anticipating some use of existing facility we have not considered, *the ñwaiver provisionò should be clarified so that it is not applicable to projects proposed for permanent non-emergency use that just happen to apply for a permit during times of emergency ï or any other application that undermines the intent of the rule*.

21. CO-LOCATION WITH AN OTC FACILITY DEMANDS 316(B) STANDARDS APPLY.

The State Board should apply both Water Code Section 13142.5(b) and the CWA Section 316(b) to all desalination plants that are using a seawater intake that uses at least 25 percent of the influent for coolant. As currently written under Chapter III.L.2.a.(2) that the ñregional water board shall conduct a Water Code section 13142.5(b) analysis for all new and expanded desalination facilities. But the Amendment makes no mention of CWA Section 316(b) applying to desalination facilities. CWA section 316(b) requires that the location, design, construction, and capacity *of cooling intake structures* reflect the best technology available for minimizing adverse environmental impact. Section 316(b) does not distinguish between new, expanded, or existing facilities, but does not explicitly state that desalination facilities are covered. Unlike Section 13142.5(b) which is explicit what type of facilities are covered (ie cooling and industrial facilities), 316(b) limits its coverage to any facilities that use ñcooling intake structures.ò Meaning, a

desalination facility would be covered by CWA 316(b) if the facility is co-located with an OTC facility and is using their cooling intake structure.

Currently, numerous proposed facilities are sited adjacent to OTC facilities with the hope that the facility can utilize the existing OTC intake structure. These facilities should theoretically be required to meet both Section 13142.5(b) and 316(b). However, the U.S. EPA developed regulations that define 316(b) rule to apply only to facilities that withdraw at least two million gallons per day of cooling water and use 25 purposes or more of the water withdrawn exclusively for cooling purposes. Therefore, a desalination facility that is co-located with an OTC facility, and uses its intake structure which withdraws at least two MGDs 25 percent of which goes to cooling purposes would be required to comply with 316(b).

The draft Amendment contains no provision requiring desalination facilities to comply with CWA Section 316(b). However, the State Board notes that Section 316(b) ñindirectly applies to desalination facilities co-located with power plants and other industrial cooling water intakes insofar as a cooling water intake structure, used to withdraw water for use by both facilities, must meet the requirements of the federal statute and applicable regulations.ò[156] The State Board goes on to note that ña desalination facility that collects source water through an existing, operational cooling water intake associated with a power plant, or certain other types of industrial facilities, may be required to comply with technology-based standards for minimizing impingement and entrainment impacts.ò[157]

To ensure desalination facilities are properly regulated under 316(b), the State Board should *add a provision requiring new, expanded and existing facilities that are co-located with an OTC facility and meet the U.S. EPA regulations shall comply with both the OTC Policy and this Amendment*.

22. ALTERNATIVE WATER SUPPLIES SHOULD BE DEVELOPED BEFORE DESALINATION.

A. California has feasible water supply alternatives that provide multiple benefits to Californians.

A recent survey of public perceptions of water use showed that respondents underestimate water use by a factor of 2 on average, with large underestimates for high water-use activities.[158] Compared with other countries that use desalination, Californiaôs urban water consumption ranks the highest at 201 gallons per capita per day (GPCD), compared with Australiaôs urban water use of 80ï 130 GPCD in the early 2000ôs, Israelôs 84 GPCD, and Spainôs 76 GPCD.[159] The California Urban Water Conservation Council (CUWCC) documented that the state could save more than 27.5 billion gallons of water per year.[160] Similarly, the Pacific Institute calculated that California could reduce current in-state demand for water by six-to-eight million acre-feet per year (between 1.9 and 2.6 trillion gallons), equivalent to roughly 20 percent of statewide use, through existing, cost-effective technologies and practices.[161]

Stormwater runoff is a drastically underutilized potential resource in California. For example, a one-inch storm in Los Angeles County can result in 10 billion gallons of runoff flowing through the areaôs storm drain systems and being discharged into the ocean.[162] At the same time, stormwater runoff is also the

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[156] Supra note 3, at 28.
[157] *Id*.
[158] Shahzeen Attari et al. *Perceptions of Water Use, Proceedings of the National Academy of Sciences (2014)* doi: 10.1073/pnas.1316402111.
[159] PUBLIC POLICY INSTITUTE OF CALIFORNIA, WATER AND THE CALIFORNIA ECONOMY, 7 (2012), *available at* http://www.ppic.org/content/pubs/report/R_512EHR.pdf. Australiaôs urban water use has declined further in recent years due to prolonged drought in the 2000s. *Id.*
[160] HEATHER COOLEY ET AL., CALIFORNIAôS NEXT MILLION ACRE-FEET: SAVING WATER, ENERGY, AND MONEY 6-7 (2010) *available at* http://www.pacinst.org/reports/next_million_acre_feet/next_million_acre_feet.pdf.
[161] HEATHER COOLEY, JULIET CHRISTIAN-SMITH, PETER GLEICK, MICHAEL COHEN, MATTHE HEBERGER, CALIFORINAôS NEXT MILLION ACRE-FEET: SAVING WATER, ENERGY, AND MONEY 6-7 (2010) *available at* http://www.pacinst.org/reports/next_million_acre_feet/next_million_acre_feet.pdf
[162] NRDC DROUGHT RECOMMENDATIONS TO THE STATE WATER RESOURCES CONTROL BOARD 17 (Feb. 26, 2014), http://docs.nrdc.org/water/files/wat_14022701a.pdf

leading source of surface water pollution in California, carrying bacteria, metals, and other pollutants to our waterways, resulting in harm to the environment and economic loss potentially into the hundreds of millions of dollars every year from public health impacts alone.[163]

Low impact development (LID), is a land planning and engineering design approach that emphasizes rainwater harvesting, including through infiltration of water into the ground as well as capture in rain barrels or cisterns for later use onsite at new and redeveloped residential and commercial properties in the urbanized areas.[164] Improved stormwater management both enables cities, states, and individuals to increase access to safe and reliable sources of water while reducing the amount of energy consumed and global warming pollution generated by supplying the water.

Increased recycling of waste water is another important water supply option that is less impactful than sweater desalination. Between Santa Barbara and San Diego, sewage treatment facilities discharge between 1.5 to 3 billion gallons of freshwater a day. According to state estimates, development of water recycling projects can readily achieve an estimated 1.4 million to 1.7 million acre-feet by the year 2030, of which 0.9 million to 1.4 million acre-feet (62 to 82 percent) would be recycled from discharges that would otherwise be lost to the ocean, saline bays, or brackish bodies of water.[165] In Orange County, the Sanitation District built a world-renowned water reuse facility which generates enough purified water to serve 500,000 people.[166] According to the Report Card for Americaôs Infrastructure, this facility is between 35 and 75% less expensive than saltwater desalination and will consume half the energy.[167] By prohibiting ocean discharges from wastewater treatment plants by 2030, the State Board could dramatically accelerate the adoption of water recycling and significantly improve the drought resistance of urban communities.[168] This would significantly increase available water supply for both agricultural and urban water users, at costs that are comparable to imported water and alternative supplies. This policy change would have at least two added benefits: it would improve coastal water quality by reducing ocean discharges, particularly of wastewater that is only treated to secondary levels; and it could potentially reduce greenhouse gas emissions, because recycled water consumes less electricity than many alternative water supply sources, including water imported from the Bay-Delta to Southern California and ocean or brackish water desalination. It is also recommended that the state develop a General Permit that would allow for the onsite use of greywater under specific conditions.

B. Alternative water supply options are less expensive than desalination.

Water produced by seawater desalination is very expensive with an average price per acre foot 4 to 8 times higher than water from other sources. Estimates for plants proposed in California range from $1,900 to more than $3,000 per acre-foot.[169] A 50 MGD plant, such as the one under construction in Carlsbad is projected to have a price between $2042 - $2290 per acre foot.[170] By comparison, the Department of Water Resources data cited in the 2009 California Water Plan Update found that:

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[163] *Id.*

[164] NOAH GARRISON ET AL., A CLEAR BLUE FUTURE: HOW GREENING CALIFORNIA CITIES CAN ADDRESS WATER RESOURCES AND CLIMATE CHALLENGES IN THE 21ST CENTURY, NRDC Technical Report 4 (2009), *available at* http://www.nrdc.org/water/lid/files/lid.pdf

[165] CAL. DEPôT OF WATER RES. CALIFORNIA WATER PLAN: UPDATE 2009 11-10 (2009), *available at* http://www.waterplan.water.ca.gov/docs/cwpu2009/0310final/v2c11_recycmuniwtr_cwp2009.pdf.

[166] Groundwater Replenishment System, Website: Question and Answer page, *available at* http://www.gwrsystem.com/about-gwrs/questions-a-answers.html

[167] American Society of Civil Engineers, Report Card for Americaôs Infrastructure, *available at* http://www.infrastructurereportcard.org/case-study/groundwater-replenishment-system.

[168] NRDC DROUGHT RECOMMENDATIONS TO THE STATE WATER RESOURCES CONTROL BOARD 18-19 (Feb. 26, 2014), http://docs.nrdc.org/water/files/wat_14022701a.pdf

[169] *See* HEATHER COOLEY ET AL., PAC. INST., EXECUTIVE SUMMARY KEY ISSUES FOR DESALINATION IN CALIFORNIA: COST AND FINANCING 5 (2012), *available at* http://www.pacinst.org/reports/desalination_2013/financing_exec_sum.pdf

[170] *See* HEATHER COOLEY AND NEWSHA AJAMI, PAC. INST., KEY ISSUES FOR DESALINATION IN CALIFORNIA: COST AND FINANCING 12 (2012), *available at* http://www.pacinst.org/reports/desalination_2013/financing_final_report.pdf

- The ñestimated range of capital and operational costs of water recycling range from $300 to $1300 per acre-footò depending on local conditions.[171]
- The cost to realize an acre-foot of water savings through efficiency measures ranges from $223 to $522 per acre-foot.[172]
- The agricultural efficiency improvements that result in water savings of between 120,000 to 563,000 acre-feet per year can be achieved at a cost ranging from $35-$900 per acre-foot.[173]

While the cost of seawater desalination has declined over the past 20 years, the cost remains very high and there are unlikely to be major breakthroughs in the near- to mid-term that make it cost-competitive with the less expensive, and less impactful, alternatives.

C. Alternative water supplies options are less energy intensiveð do not perpetuate climate changeð compared to desalination.

A 2011 life-cycle energy assessment of Californiaôs alternative water supplies commissioned by the California Energy Commission found that, while a desalination system can have a wide array of impacts depending on the water source: ñIn all cases, the energy use is higher than alternative water supply.ò[174] Energy accounts for 36% of the cost to run a reverse osmosis seawater desalination plant.[175] The seawater desalination plant under construction in Carlsbad will require 47 percent more energy than water delivered to San Diego from the State Water Project Transfers ï currently the highest energy demand in the regionôs water supply portfolio.[176] The Los Angeles Economic Development Corporation found ocean desalination to indirectly create more greenhouse gases than any other water source.[177] The Inland Empire Utilities Agency has similarly reported that ocean desalination would use *over ten times more energy* than water recycling in its service area.[178]

Californiaôs current water management system is already extremely energy-intensive: ñwater-related energy use consumes 19 percent of the stateôs electricity, 30 percent of its natural gas, and 88 billion gallons of diesel fuel every year.ò[179] In its 2008 Climate Change Scoping Plan document, the California Air Resources Board noted that one way for the state to achieve GHG emissions reductions is to replace existing water supply and treatment processes with more energy efficient alternatives.[180] Because

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[171] CAL. DEPôT OF WATER RES. CALIFORNIA WATER PLAN: UPDATE 2009 11-10 (2009), *available at* http://www.waterplan.water.ca.gov/docs/cwpu2009/0310final/v2c11_recycmuniwtr_cwp2009.pdf.
[172] CAL. DEPôT OF WATER RES. CALIFORNIA WATER PLAN: UPDATE 2009 3-25 (2009), *available at* http://www.waterplan.water.ca.gov/docs/cwpu2009/0310final/v2c03_urbwtruse_cwp2009.pdf
[173] CAL. DEPôT OF WATER RES. CALIFORNIA WATER PLAN: UPDATE 2009 2-13 (2009) http://www.waterplan.water.ca.gov/docs/cwpu2009/0310final/v2c02_agwtruse_cwp2009.pdf
[174] Arpad Horvath et al. LIFE-CYCLE ENERGY ASSESSMENT OF ALTERNATIVE WATER SUPPLY SYSTEMS IN CALIFORNIA, CAL. ENERGY COMMôN, 4 (2011) *available at* http://www.energy.ca.gov/2013publications/CEC-500-2013-037/CEC-500-2013-037.pdf; *see also* BARRY NELSON, ET AL., NATURAL RES. DEF. COUNCIL, IN HOT WATER: WATER MANAGEMENT STRATEGIES TO WEATHER THE EFFECTS OF GLOBAL WARMING 19, 35 (2007), *available at* http://www.nrdc.org/globalwarming/hotwater/contents.asp.
[175] *See* HEATHER COOLEY AND NEWSHA AJAMI, PAC. INST., KEY ISSUES FOR DESALINATION IN CALIFORNIA: COST AND FINANCING 10 (2012), *available at* http://www.pacinst.org/reports/desalination_2013/financing_final_report.pdf
[176] Bill Powers, Memorandum for Surfrider Foundation, ñAssessment of Energy Intensity and CO_2 Emissions Associated with Water Supply Options for San Diego County,ò (Oct. 12, 2007).
[177] LAEDC, ñWhere Will We Get the Water? Assessing Southern Californiaôs Future Water Strategies,ò 2 (Aug. 14, 2008) (LAEDC Report); *available at* http://www.laedc.org/sclc/documents/Water_SoCalWaterStrategies.pdf
[178] MARTHA DAVIS, INLAND EMPIRE UTILITIES AGENCY, PRESENTATION TO THE STATE WATER RESOURCES CONTROL BOARD (March 2009), *available at:* http://www.swrcb.ca.gov/water_issues/programs/climate/docs/ieua_030409.pdf. *See also* CAL. ENERGY COMMôN, LIFE-CYCLE ENERGY ASSESSMENT OF ALTERNATIVE WATER SUPPLY SYSTEMS IN CALIFORNIA, (CEC-500-2005-101) *available at* http://www.energy.ca.gov/research/environmental/project_summaries/PS_500-02-004_HORVATH.PDF (evaluating the global warming potential of desalination versus recycling and import of water).
[179] CAL. ENERGY COMMôN, CALIFORNIAôS WATER-ENERGY RELATIONSHIP 1 CAL. ENERGY COMMôN (2005), *available at* http://www.energy.ca.gov/2005publications/CEC-100-2005-007/CEC-100-2005-007-CMF.PDF.
[180] *See* CAL. AIR RES. BD., CLIMATE CHANGE SCOPING PLAN APPENDICES, VOLUME I C-134 (2008), *available at* http://www.arb.ca.gov/cc/scopingplan/document/appendices_volume1.pdf

seawater desalination is so energy intensive, extensive development of this technology could lead to ñgreater dependence on fossil fuels, an increase in greenhouse gas emissions, and a worsening of climate change.ò[181]

To effectively minimize the impacts of climate change and reduce GHG emissions, the state should prioritize water supply and treatment alternatives that are energy efficient.

D. California should not encourage desalination because of the drought.

California should learn from Australiaôs mistakes. Severe drought from the mid-1990s until 2012 prompted Australia to construct six large-scale seawater desalination plants at a cost of $10 billion to provide an alternative source of drinking water.[182] At the same time, water policy reforms and improved efficiency measures were implemented through the countryôs National Water Initiative.[183] The plants took years to build, and by the time they were operational, the drought had eased and cheaper alternatives, made possible by the National Water Initiative, made the water from the desalination plants impractical.[184]

Today, four of the six Australian plants stand idle, illustrating the danger of demand risk, which ñis the risk that water demand will be insufficient to justify continued operation of the desalination plant due to the availability of less expensive water supply and demand management alternatives.ò[185] Because many of the seawater desalination projects proposed in California are privately financed:

> ñproject developers may build large plants in an effort to capture economies of scale and reduce the unit cost of water. This can, however, lead to oversized projects that ultimately increase demand risk and threaten the long-term viability of a project.ò[186]

The plant in Sydney cost $2 billion to build, yet in 2012 it was shut down while taxpayers were left to pay $16 million per month for the cost of building the plant and its pipeline.[187] Melbourne also reacted to the drought and built the $3.6 billion Wonthaggi desalination plant, which came online in 2012.[188] Similar to the Sydney plant, Wonthaggi is now idle. Nevertheless, water consumers are continuing to pay $670 million annually for Wonthaggiôs construction through water bill surcharges, and that is without one drop of water being drawn from the plant.[189] If California reacts to the drought in the same manner as Australia, we may also find ourselves in a regrettable position ï with taxpayers footing the bill for years to come.

E. The State Board should consider the real-world implementation of the Amendment before it is adopted.

Over the past decade, our organizations have engaged in numerous industry conferences, academic and policy research efforts, and regulatory permitting processes for several California desalination proposals. That experience has given us a deep understanding of the need for the State Board to articulate not only the intent of the Desalination Amendment, but the specific language needed to ensure that the intent is

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[181] COOLEY ET AL. PAC. INST, DESALINATION, WITH A GRAIN OF SALT, A CALIFORNIA PERSPECTIVE 7 (2006), *available at* http://www.pacinst.org/reports/desalination/desalination_report.pdf
[182] Elizabeth Harball, ñAussies warn Calif. that it canôt ómagically replubô its way out of drought,ò E&E Publishing, Inc. (March 19, 2014).
[183] *Id.*
[184] *Id.*
[185] KEY ISSUES FOR DESALINATION IN CALIFORNIA: COST AND FINANCING at 7.
[186] *Id.*
[187] Liz Foschia, ñSydney desalination plant to be switched off,ò ABC News (June 26, 2012), *available at* http://www.abc.net.au/news/2012-06-26/sydney-desalination-plant-to-switch-off/4092482.
[188] Murray Griffin, ñDrought Prompts Australia to Turn to Desalination Despite Cost,ò Bloomberg (March 6, 2013), *available at* http://www.bloomberg.com/news/2013-03-06/drought-prompts-australia-to-turn-to-desalination-despite-cost.html.
[189] *Id.*

realized. Several past decisions by regional boards have clearly shown how the words and phrases of Water Code section 13142.5(b) can be interpreted and manipulated to undermine the goal of siting, designing and constructing seawater desalination facilities to minimize the intake and mortality of all forms of marine life. However, there are examples that exhibit the ñgood actorsò ability to meet the intent of the law, and also ensure a quicker path to permits from several agencies, including regional boards.

The simplified question is whether a project proponent seeking a permit from a Regional Board has done everything possible to reduce the intake and mortality of marine life of all forms and life stages, through a combination of the best site available, the best design available, and the best technology available to achieve that minimization of harm. Obviously, if the project combined these elements in a way that eliminated the intake and mortality of all forms of marine life, or got as close as possible to elimination, that would clearly be the best possible combination. But if the project proposal does not get as close as possible to eliminating the harm, the question then becomes whether there is a better site, better design or better technology available. Pre-determining any one of these elements without ensuring compatibility with the other elements can result in the other elements being considered ñinfeasibleò ï and consequently result in a ñless than the bestò desalination project that does not minimize environmental impacts. For example, when an applicant requests adoption of a ñsite-specificò best technology standard[190], they are clearly not combining the ñbest siteò with the ñbest technologyò to collectively minimize the intake and mortality of all forms of marine life. We know from experience that this is ñcodeò for picking a site for some other reason than minimizing the intake and mortality of all forms of marine life, and then arguing that the best technology is not feasible at the site. Further, some proposals show an unnecessarily high reliance on ñafter-the-fact restorationò over full minimization[191], and then argue against full replacement through after-the-fact restoration[192]. This is clearly undermining the intent of the law and the policy, but is arguably allowed under the currently proposed Amendment as written.

Fortunately there are also examples of project proposals that do combine the elements ï site, design, and technology ï in a way that collectively minimizes the intake and mortality of all forms of marine life. Permitting of the Sand City project, and planning for the CalAm project in Monterey has, in effect, started with the identification of sub-surface intakes as the best technology, and then identified several sites that may be compatible with that technology. Further, in the CalAm proposal, the design is still contingent on whether recycled wastewater can provide a portion of the demand, either now or in the future. We recommend the State Board follow this approach and advance a Desal Policy that requires site location, facility design, and technology to be collectively combined to minimize the intake and mortality of all forms of marine life: each of the elements has to be the best available, and the combination has to emphasize that the separate elements must be compatible and collectively minimize the intake and mortality of marine life. While we agree with the Municipal Water District of Orange County (MWDOC) and Poseidon that ñminimizeò harm does not necessarily mean ñeliminateò harm ï it is important to clarify that eliminating harm is clearly the best minimization. And as the *Riverkeeper* court clearly articulated, if the best possible minimization is 100 percent, and there is an acceptable variance of 10 percent, then 90 percent is the performance standard ï not 89 percent.

Therefore, we request the State Board *consider previous desalination permitting, and provide clear guidance and less discretion to Regional Boards to ensure consistent enforcement statewide*. *The final Amendment must include additional clarification language to ensure the elements of section 13142.5(b) minimize the intake and mortality of all forms of marine life both individually and through a combination that ensures compatibility and collective minimization.*

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[190] *See* Attachment 1, Municipal Water District of Orange County (MWDOC) [in consultation with other water agencies, Cal Desal and Poseidon], ñInformation Itemò, August 4, 2014, bullet 3.
[191] *Id* at bullet 3 and bullet 5.
[192] *Id* at bullet 10.

The undersigned groups want to see a Desalination Policy adopted that requires seawater desalination facilities to be built in a manner that protects fish and marine life, and to be located in sites that minimize harm to the coast and ocean. We look forward to working with you to ensure sufficient clean water for California.

Sincerely,

Sean Bothwell
Staff Attorney
California Coastkeeper Alliance

Joe Geever
Consultant
Surfrider Foundation

Sarah Sikich
Science & Policy Director, Coastal Resources
Heal the Bay

Karen Garrison
Co-Director, Oceans Program
Natural Resources Defense Council

Attachment 1

Item No. 4

INFORMATION ITEM
August 4, 2014

TO: **Planning & Operations Committee**
(Directors Osborne, Barbre, Hinman)

FROM: Robert Hunter
General Manager

Staff Contact: Karl Seckel/Richard Bell

SUBJECT: **Draft Amendment to the Water Quality Control Plan for Ocean Waters of California - Desalination Facility Intakes and Brine Discharges**

COMMITTEE RECOMMENDATION

Staff recommends the Committee receives and files the report.

SUMMARY

The SWRCB has been developing its Ocean Desalination and Brine Disposal Policy and Amendment to the Water Quality Control Plan for Ocean Waters of California ("Ocean Plan") over the past three years. On July 3, 2014 SWRCB staff released their Draft Staff Report, Draft Substitute Environmental Documentation report, and proposed Draft Amendment to the Ocean Plan. A public workshop and public hearing are scheduled for August 6 and 19 in Sacramento. Richard Bell will be attending.

Staff has been working with CalDesal, several coastal agencies developing ocean desalination projects, and with Poseidon Resources. The proposed regulations provide some flexibility, are well written and clear, but require improvement in several areas to make the regulations more workable and to clean up areas where oversights or inconsistencies exist, and where interpretation could lead to unintended constraints. Following are our main comments where the regulations need to be revised.

Budgeted (Y/N): n/a	Budgeted amount:	Core X	Choice __
Action item amount:	Line item:		
Fiscal Impact (explain if unbudgeted):			

1. **The term "Feasible" is not defined in the water code or proposed regulations; the SWRCB staff indicates this would allow greater flexibility in use of the term; we disagree.**

   It is our opinion, that a reasonable definition of feasible is warranted. It should be noted that in the recent Court of Appeals Decision in *Surfrider Foundation v. Cal. Regional Water Quality Control Board* upheld the use of the definition of "feasible" under CEQA. Under CEQA, "feasible" means "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social and technological factors". The Coastal Act relies on the same definition. For consistency, the SWRCB should consider this same definition.

2. **Need for Ocean Desalination and consistency with regional planning documents.**

   Page 4. 2.b.(1) – This section (under determination of the best site available), brings into the Ocean Plan the determination whether the proposed ocean desalination facility is needed and whether the proposed project is consistent with an integrated regional water management plan or an urban water management plan and County or City general plans regarding growth.

   This determination is beyond the scope of the statutory requirement under Section 13142.5 and is not part of the determination of the best available site. We don't see a need for this in the Ocean Plan. Water supply agencies are responsible for determining the need for local resource developments, not the SWRCB or RWQCB's. Local resource development plans, including ocean desalination, are typically included in their water supply agency plans. In the event that the SWRCB will not remove this provision, the provision should be expanded to also include water agency Water Master Plans, Water Resource Plans, and Water Reliability Plans.

3. **Regional Boards shall require subsurface intakes unless it determines that subsurface intakes are infeasible. This provision could be onerous, depending on the definition of feasibility.**

   The intake option should be a site specific, project-by-project determination. One size does not fit all. This standard could result in excessive costs and delays in permitting projects. It is the responsibility of the Project Proponent to make a determination of the best project intake system, based on cost, capacity, and other factors. This requirement could create an unreasonable burden and potentially increased costs to water agencies and to the public.

   The reason and justification given for this approach is that subsurface intakes do not cause impingement and entrainment impacts and thus would fully achieve the statutory requirement to minimize the intake and mortality of marine organisms. However, the statutory requirement **<u>does not require zero impact</u>**, but requires that

impacts be minimized. Subsurface intakes may impact coastal environments during construction and maintenance activities. The water agency should determine the best intake method for each project considering all factors.

In the case of the Doheny Ocean Desalination Project, we have found that a subsurface slant well intake is feasible, provides adequate capacity for local agencies, causes no impact to marine organisms, can provide seawater intrusion control benefit, is less costly than an open intake system, coastal impacts can be mitigated to a less than significant level, and that the project can participate in assistance in restoration of the seasonal coastal lagoon and efforts to help in the recovery of southern steelhead trout.

4. **Brine Discharges shall be sited to "maximize their distance from Marine Life Reserves" and salinity shall not exceed natural background levels in MLR's.**

   Page 4. 2.b.(6) – This section requires that brine discharges shall be sited **to maximize** their distance from an Marine Protected Area (MPA) or a State Water Quality Protection Area (SWQPA) such that there are **no impacts** to these areas and that the salinity does not exceed the natural background salinity. "Maximizing" the distance from an MPA or SWQPA is limitless, sets no feasible boundary, is a subjective consideration, and could lead to excessive costs to public agencies without any added protective benefit to marine organisms. Determination of a reasonable or sufficient distance to be protective of the MPA and SWQPA should be determined by the Regional Board with dispersion modeling information provided by the project proponent and taking into consideration that a 2 part per thousand parts (ppt) standard is fully protective for the most sensitive marine organisms. Determining a natural background salinity could be impossible from a compliance standpoint due to the impacts of the brine discharge and natural salinity variations. Siting the discharge edge of the Brine Mixing Zone (BMZ) at a reasonable distance from the MPA or SWQPA would achieve the protective objective of this section.

5. **Subsurface Intakes can be determined to be infeasible by the Regional Board.**

   Section 2d(1)(a)(i): The Regional Board can determine that subsurface intakes are infeasible based on their analysis of specified criteria, including "presence of sensitive habitats, presence of sensitive species, energy use, impact to freshwater aquifers, local water supply, and existing water users..." This section should allow for mitigation of impacts and not be solely used by the Regional Board to determine that a subsurface intake is infeasible due to a finding of the **presence** of any of these criteria.

6. **Potential for recycling could prohibit co-disposal of brine with municipal wastewater.**

   Section 2d(2)(a) states that the preferred technology for minimizing mortality of marine life resulting from brine disposal is to "…commingle brine with

wastewater…**unless the wastewater is of suitable quality and quantity to support domestic or irrigation uses**". This clause in effect could be used to prohibit co-disposal of brine with municipal wastewater if the Regional Board determines that the wastewater could potentially be used in the future for recycling.

The Regional Board would likely condition the permit to require the agency to use an alternate method for brine disposal should a recycling project(s) reduces the amount of wastewater below levels necessary for dilution of the brine. This clause should be deleted or revised. Water supply agencies are responsible for development of water supply and reliability projects, not the SWRCB or its Regional Boards.

7. Intake Marine Life Mortality Report and 3 year Entrainment Study is onerous.

Page 37 Section 2e(1)(a): Entrainment Study requires at least a 36 consecutive month period of ocean sampling. This would delay the Poseidon Project from two to three years in order to comply with this requirement as only one year was used in procuring their existing NPDES permit, which is up for renewal in a couple of years. This requirement should be reduced to 1 year of ocean sampling for the permit application and allow additional post-permit issuance sampling to refine the predicted entrainment impact and mitigation determinations.

8. Requirement for mitigating entrainment impacts in the Brine Mixing Zone (BMZ).

Existing wastewater agencies are not required to mitigate for the very small entrainment losses that might occur from wastewater disposal within the zone of initial dilution. The SWRCB Expert Panel indicated that the mortality from shearing losses is likely quite small from high pressure jets. The monitoring costs would far exceed the value and cost of any mitigation and this can be better handled as a small adjustment to the mitigation acreage.

9. Definition of BMZ prohibits acute toxicity in the BMZ which is non-attainable and would inadvertently prohibit brine disposal.

As defined, it is impossible to prevent acute toxicity in the Brine Mixing Zone (BMZ) due to brine disposal. When brine firsts enters the ocean from the diffuser it is acutely toxic prior to being adequately diluted. A reasonable zone within the BMZ should be exempt from the acute toxicity rule. One approach is to make this definition consistent with current municipal wastewater discharge acute toxicity requirements in the Zone of Initial Dilution which prohibits acute toxicity beyond 10% of the distance from the edge of the discharge structure to the edge of the chronic brine mixing zone, if this is an adequate distance. Otherwise, this provision would in effect prohibit brine disposal. This is obviously not the intent of the SWRCB and this provision needs to be revised to make disposal through multi-port high pressure jets workable.

10. Mitigation requirements as proposed are excessive.

The mitigation for entrained organisms using the Area Production Foregone method as proposed would require meeting a 90 percent confidence level where prior mitigation requirements have required a 50 percent confidence level. Based on data shown in the appendix, the 90 percent confidence level would increase the required land area for mitigation by a factor of 4 fold or higher. In addition, using the two mesh sizes, the standard 335 micron size and a new requirement for a finer 200 micron mesh, would result in a greater number of entrained larvae and eggs, increasing the required mitigation level. Coastal wetland areas are limited and increasing the area requirement by a factor of 4 or more is unreasonable, especially if the approach is to use individual species. Use of mean species would be more representative of the total effect and would be a more reasonable approach if the benefits to be derived by the higher confidence levels and smaller mesh size are significant. If not, the amendment should rely on the prior standardized approach.

Public Comment
Desalination Amendments
Deadline: 8/19/14 by 12:00 noon

California Coastkeeper Alliance

Surfrider Foundation

NRDC
The Earth's Best Defense

Heal the Bay

California Coastal Protection Network

Desal Response Group

Southern California Watershed Alliance

Coastal Environmental Rights Foundation

Planning and Conservation League

EHL

Center for Biological Diversity
Because life is good.

Pacific Coast Federation of Fishermen's Associations
PCFFA
Stewards of the Fisheries

Wholly H2O

7th Generation Advisors

R4RD
Residents for Responsible Desalination

west marin c

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8-19-14
SWRCB Clerk

CALIFORNIA COASTKEEPER® ALLIANCE

August 19, 2014

Chair Felicia Marcus and Board Members
c/o Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814

Sent via electronic mail to: commentletters@waterboards.ca.gov

RE: Comment Letter ï Desalination Amendment

On behalf of the undersigned organizations, we appreciate the opportunity to provide comments on the State Water Resources Control Boardôs (ñState Boardò) July 2014 draft Desalination Amendment (ñAmendmentò).

Desalination permits should require the best available site and design to accommodate the best available technology in order to: minimize the intake and mortality of marine life; minimize the brine dischargeôs adverse impacts to the marine environment; and avoid conflict with ecosystem-based management activities, especially ongoing implementation of the Marine Life Protection Act, and climate change and disaster preparedness. It is critical that the State Board develop statewide standards for desalination that minimize the intake and mortality of all forms of marine life and maintain ecosystem functions. Substantial changes need to be made to the Amendment in order to achieve the intent of the Clean Water Act (CWA) and Porter-Cologne Act, uphold the OTC Policy, and protect and restore Californiaôs marine ecosystems.

The State Board should be explicit that the ñbest availableò standard is required for each 13142.5(b) factor and include guidance on how regional boards shall combine all factors. Generally speaking, we agree with the Amendmentôs intent of identifying the ñbest siteò, ñbest designò and ñbest technologyò available for ñminimizing the intake and mortality of all forms of marine life.ò These three elements should be fully enforced before turning to mitigation. And mitigation, to the extent it includes after-the-fact restoration, is still required to be ñbest.ò It is also a reasonable interpretation of the language to include an analysis of all the three primary elements in combination to ensure that, collectively, those elements of a facility meet the standard of ñbestò and ñminimizationò of the intake and mortality of all forms of marine life.

The State Board should make a finding that subsurface infiltration galleries are the best available technology. Subsurface infiltration galleries offer flexibility to desalination proponents, and are considered ñhighly feasibleò because they are designed to replace the natural substrate with an engineered substrate that allows for high design capacity. The State Board should consider galleries and wells as two separate technologies with different performance standards. While galleries and wells have the same operational impacts, they have different construction impacts ï thus each has different performance standards for minimizing marine life mortality. Finding galleries to be the best available technology provides the State and Regional Boards flexibility, while achieving the legal requirements under 13142.5(b).

Screens are not the best available technology. In its OTC Policy, the Water Board already considered the efficacy of screened intakes for minimizing the intake and mortality of marine life, and found them inferior. In fact, the OTC Policy only allowed the use of screens if, in combination with other measures, they could meet the performance standards established by the ñbest available technology.ò Nothing has changed since adoption of the OTC Policy. If anything, recent studies have only confirmed that the efficacy of screened surface intakes is still questionable and likely less than what was assumed when the OTC Policy was adopted. The consideration of screen efficacy in the Amendment needs to be consistent with the adopted approach in the OTC Policy, and the State Board needs to be explicit that surface intakes with fine mesh screens are not the ñbest available technologyò ï far from it.

When determining the feasibility of the best available technology, cost should not be a factor. The federal courts have determined that ñ[j]ust as the Agency cannot determine BTA on the basis of cost-benefit analysis; it cannot authorize site-specific determinations of BTA based on cost-benefit analysis.ò[1] There is no legislative intent to include a cost-benefit analysis in the Clean Water Act section 316(b), nor is any such intent evident in Porter-Cologne Act section 13142.5(b). They are similar and must be applied similarly. The State Board cannot authorize a site-specific determination of whether BTA is feasible using a cost-benefit analysis.

The State Board should properly define ñnot feasibleò under the best available technology analysis. Given the California Water Code does not define ñfeasibleò, the State Board should use the OTC Policy and CWA Section 316(b) as guidance. The proposed Amendment does not contain a definition of ñnot feasibleò, but rather a laundry list of criteria to be evaluated by regional boards. These eight factors are not only vague and open-ended, allowing project proponents to excuse themselves from the best available technology standard, but they do not provide an actual definition. Blackôs Law Dictionary defines feasible as ñcapable of being accomplished.ò[2] Therefore, we believe the definition of ñnot feasibleò in the Amendment should be: ñCannot be constructed or operated given geotechnical data, hydrogeology, benthic topography, or oceanographic conditions. Cannot be accomplished because of the inability to obtain necessary permits due to unacceptable environmental impacts, local ordinances, State or local regulations, etc. Cost is not a factor to be considered when determining feasibility. Flow Augmentation for brine dilution is not a factor to be considered when determining feasibility.ò

The State Board should determine design capacity to be the ñbest available design.ò It is critical that the State Board include design capacity as a factor to be considered under the best available design analysis, because designing a facility with a production design capacity to accommodate subsurface intakes is the best available design. We request the State Board define design capacity as the maximum amount of capacity achieved using the best available intake technology at the best available site for that technology.

The State Board should revise the best available site analysis to accommodate the best available technology and minimize impacts to Marine Protected Areas and other important ecological areas. Desalination plants with infrastructure sited in or near MPAs would likely result in significant impacts from intakes and brine discharge to marine life and ecosystem functions, similar to impacts from power plant intake and discharge sites. Desalination plants sited in proximity to MPAs may reduce larval connectivity between protected areas through entrainment and impingement, thereby compromising the effectiveness of the broader network of MPAs. We therefore fully support the clear directive in section L.2.b.6 of the draft policy that intake and discharge structures for desalination facilities shall not be located within MPAs or State Water Quality Protected Areas (SWQPAs). We also support the statement that discharges should be sited at a sufficient distance as to have no impacts on MPAs or SWQPAs. It is equally critical, as stated above, that the best available site accommodate the best available technology, and that siting, design and technology each fully minimize the intake and mortality of marine life --

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[1] *Riverkeeper, Inc. et al. v. U.S. Environmental Protection Agency*, Nos. 04-6692 et al. (2d Cir. Jan. 25, 2007).

[2] Blackôs Law Dictionary, available at http://thelawdictionary.org/feasible/.

especially potential impacts to MPAs and other ecologically important sites.

The State Board should prohibit after-the-fact restoration as in-lieu mitigation for the best available technology; it should revise the mitigation fee calculation; and ensure mitigation fees are spent to minimize the intake and mortality of marine life. We agree that the best available mitigation should be implemented after minimizing marine life mortality through site, design, and technology measures. However, replacing marine life that is lost due to the activity of a desalination facility as a substitute for best available technology is illegal. Federal courts have concluded that after-the-fact restoration cannot be used ñin-lieuò of the best technology available. Moreover, the mitigation fee calculation must include a ñmultiplierò to ensure that, if the restoration project replaces habitats that are not proportional to the species lost to the intake, the indirect benefits are reasonably ñdiscountedò ï that is, not credited. It should be clarified in the Amendment that the purpose of any habitat restoration project is to fully replace ñall forms of marine life.ò We support including a broad list of potential mitigation projects as identified in section III.L.2.e.(3)(b)i, along with clear performance standards and measurement requirements. Having a broad list may help provide the flexibility needed to increase the prospects for a proportional and successful mix of restoration projects to fully replace ñall forms of marine lifeò lost to the intake. The State Board should also include a preference for mitigation projects in the geographic vicinity of the proposed project, to help match replacement production as closely as possible to marine life losses.

The State Board should determine that spray-brine diffusers are the best available discharge technology; and prohibit flow augmentation for brine dilution. The Brine Expert Panel could not cite any studies disproving that spray brine diffusers would cause the mortality of marine life. Until there is some empirical evidence, or at a minimum laboratory tests, showing the degree of mortality in a spray brine plume, properly designed and sited diffusers should be considered the best available technology for brine dilution. Flow augmentation (increased intake volume) is illegal and should not be an allowable technology or practice for discharging brine. As the State Board admits, withdrawing ñadditional seawater through surface intakes for the purpose of diluting brine effluent to meet water quality standards (referred to as ñflow augmentationò) can significantly increase entrainment and impingement.ò Moreover, even if a technology can reduce entrainment through ñlow turbulence intakesò ñ[a]dditional mortality may occur through brine exposure in the mixing process and through predation in conveyance pipes.ò Spray-brine diffusers are the best available discharge technology and flow augmentation to dilute brine is illegal.

***

The undersigned groups want a desalination policy that requires seawater desalination facilities to be built in a manner that protects fish and marine life, and to be located in sites that minimize harm to the coast and ocean. We look forward to working with you to ensure sufficient clean water for California.

Sincerely,

Sean Bothwell
Staff Attorney
California Coastkeeper Alliance

Joe Geever
Consultant
Surfrider Foundation

Sarah Sikich
Science & Policy Director, Coastal Resources
Heal the Bay

Karen Garrison
Co-Director, Oceans Program
Natural Resources Defense Council

Debbie Cook
Former Mayor
City of Huntington Beach

Zeke Grader
Executive Director
PCFFA

Susan Jordan
Executive Director

Emily Jeffers
Staff Attorney

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Livia Borak
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Coastal Environmental Rights Foundation

Rebecca Crebbin-Coates
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Amy Trainer
Executive Director
Environmental Action Committee of West Marin

Conner Everts
Executive Director
Southern California Watershed Alliance
Co-Chair, Desal Response Group

Center for Biological Diversity

Dan Silver
Executive Director
Endangered Habitats League

Elizabeth Doherty
Executive Director
Wholly H20

Merle Moshiri
President
Residents for Responsible Desalination

Leslie Tamminen
Director
7th Generation Advisors

Santa Maria
All-America City

CITY OF SANTA MARIA
UTILITIES DEPARTMENT
Business Services • Regulatory Compliance
Solid Waste Services • Water Resources

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September 12, 2014

Kenneth A. Harris, Jr.
Executive Officer
Central Coast Regional Water Quality Control Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401

SUBJECT: TRIENNIAL REVIEW

Dear Mr. Harris:

The City of Santa Maria ("Santa Maria" or "City") appreciates this opportunity to comment on the Regional Board's 2014 Triennial Review of the Basin Plan, including the supporting "Brief Issue Descriptions" document. As the Regional Board is aware, Santa Maria is developing an Integrated Plan that is intended to comprehensively address all of the City's water quality requirements. Santa Maria believes that the Triennial Review process offers an excellent opportunity to augment the Basin Plan to continue support for such a watershed-based, integrated approach to water quality. The City's comments are written from this perspective.

Comments

Santa Maria has the following comments on the Triennial Review, including the "Brief Issue Descriptions":

1. Issue 1: Vision Framework

In general, the City does not oppose including a linkage between the Basis Plan and the Regional Board's Vision for Healthy Watersheds. The Vision Framework's focus on a watershed approach aligns well with the City's Integrated Plan efforts. However, the linkage between the Basin Plan and the Vision Framework should be made in a way that allows for flexibility; simple incorporation of the Vision Framework may drive determinations that are too rigid and may inhibit creative approaches in the future. A better approach may be to prioritize the Watershed and Integrated Water Resource Protection concept reflected in Issue 2. Out of all the issues identified in the "Brief Issue Descriptions," Issue 2 best reflects the City's goals.

2. Issue 2: Watershed and Integrated Water Resource Protection

The City strongly supports the concept of adding language to the Basin Plan to provide "authority and implementation to address all factors and activities in an integrated fashion and with incentives for multi-benefit activities." Adding such language would support the type of integrated planning approach that the City intends to pursue. Rather than focusing on the Regional Board's authority to "address all relevant factors and activities that affect waters," however, the Basin Plan Amendment should support a process in which dischargers develop and propose for Regional Board approval integrated approaches that result in multi-benefits. The Basin Plan Amendment could include incentives that the Regional Board might provide to those dischargers that pursue such an approach. A Basin Plan Amendment that merely addresses the Regional Board's authority to impose such an approach is not supported. It will not result in the type of collaboration and flexibility needed to successfully pursue an integrated approach to water quality that achieves the multi-benefits contemplated.

3. Issue 3: Groundwater Recharge Area Protection

The City supports the idea of continuing to protect groundwater recharge efforts and areas that are well-suited for groundwater recharge. However, the City believes that this concept is best implemented through the Watershed and Integrated Water Resource Protection idea reflected in Issue 2. The City therefore supports the removal of this issue from the 2014 Triennial Review.

4. Issue 6: Aquatic Life Protection; Issue 8: Biostimulating Substances Objective Revision

The City does not support prioritizing the adoption of additional numeric water quality objectives. Narrative objections remain appropriate and conversion of narrative objectives to numeric ones will not facilitate better water quality outcomes. Rather than focusing on adding numeric requirements, the Triennial Review should prioritize an integrated and watershed-based approach to achieving existing objectives. For this reason, the City does not support prioritizing Issue 6 and supports the removal of Issue 8.

5. Issue 7: Aquatic Habitat Protection/Riparian Buffer Zone Protections

The City supports efforts to protect aquatic habitat and riparian buffer zones. The City agrees, however, that such protection is best addressed within the Watershed and Integrated Water Resource Protection concept reflected in Issue 2. The City therefore supports removal of this issue from the 2014 Triennial Review.

6. Issue 10: Designation of Beneficial Uses

Santa Maria has repeatedly asked the Regional Board to reassess its approach to the Blosser, Bradley and Main Street channels. Such channels are more properly viewed as being part of the manmade drainage system and should be regulated consistent with

Section 402(p)(3)(B) of the Clean Water Act. While the City continues to believe that a different approach to these channels is warranted, the City does not support prioritizing the type of Basin Plan Amendment contemplated in Issue 10. The proposed approach reflected in Issue 10 would only further inhibit the Watershed and Integrated Water Resource Protection concept reflected in Issue 2. The City suggests deletion of Issue 10 from the Triennial Review as proposed and encourages an emphasis on Issue 2, as revised in the City's comments above.

7. Public Process

As a fellow public agency, the City is keenly aware of the challenges faced by staff in preparing documents for public review. Santa Maria also understands that this comment process is but one of the public participation opportunities related to the Triennial Review. Santa Maria knows that the Regional Board will continue to provide meaningful opportunities for public input. The City notes, however, that due to the timing of the release of the "Brief Issue Descriptions", as well as holidays and the CASQA conference, the 45 day review period really only afforded the public with approximately 24 business days to meaningfully prepare comments. The Regional Board may wish to take this into account during future public comment opportunities.

Conclusion

The City thanks the Regional Board for this opportunity to comment on the 2014 Triennial Review. Santa Maria encourages the Regional Board to focus its limited resources on the Watershed and Integrated Water Resource Protection concepts reflected in Issue 2, as modified in the City's comment above.

Sincerely,

RICHARD G. SWEET, P.E.
Director of Utilities

September 15, 2014

To: centralcoast@waterboards.ca.gov

Re: Basin Plan Triennial Review

Dear Central Coast Regional Water Board Staff:

Thank you for the opportunity to review and comment on priority issues for the 2014 Basin Plan Triennial Review. As expressed in the public meeting, **we believe that the progress made since the 2009 Triennial Review has been understated** and did not include the TMDLs that have been adopted since 2009.

We further appreciate the opportunity to comment on the priority issues for the 2014 Triennial Review.

There are several proposed Basin Plan issues that would aggressively and unilaterally expand the role of the Water Board if ultimately approved. We ask that you remove these priorities such that the role of the Central Coast Water Board can be thoughtfully considered during a thorough vetting process assessing the roles of other local, state, and federal policy and enforcement mechanisms.

More specifically, we urge you to remove the following as contemplated activities:

- **We urge you to remove the "Tributary Rule" from Issue 10: Designation of Beneficial Uses (page 21).** This issue is currently being thoroughly vetted by multiple stakeholders at the federal level. We ask that the Water Board defer this issue until it can be resolved at the federal level.
- **We urge you to remove Issue 2: Watershed and Integrated Water Resource Protection (page 10)** as currently written. **We have grave concerns with the ambiguous and broad authority suggested** by**:** "…staff proposes to amend the Basin Plan to develop the authority to adequately address all relevant factors and activities that affect waters" (page 11). There are numerous other activities at the local, state, and federal levels that are continually moving towards better water resource management. These include collaborative, local Integrated Regional Water Management Plans (IRWMP) that emphasize implementation activities. Other examples of efforts already underway include the transfer of the Drinking Water Program from DPH to the Water Board and pending groundwater management legislation. As written, Issue 2 could undermine multi-agency collaborative efforts that consider and improve integrated water resources and instead create conflicts that would not result in the mutual goal of improving water quantity and quality where needed.
- **We ask that you remove Issue 6: Aquatic Life Protection** until the State Board completes the activities referenced on page 16.

We support Staff's recommendation to remove Issues 3, 5, 7, 8, and 9. We also ask that currently approved TMDLs be revised as appropriate following the State's findings on Issues 8 and 9.

Sincerely,

Claire Wineman
President

Gail Delihant
Director, California Government Affairs

5750 Almaden Expressway, San Jose, CA 95118-3614 | (408) 265-2600 | www.valleywater.org

Santa Clara Valley Water District

September 15, 2014

Mr. Steven Saiz centralcoast@waterboards.ca.gov
California Regional Water Quality Control Board
Central Coast Region
895 Aerovista Place, Suite 101
San Luis Obispo, California 93401-7906

Subject: Comment Letter – Triennial Review of the Water Quality Control Plan for the Central Coast Basin (Basin Plan)

Dear Mr. Saiz:

Santa Clara Valley Water District (District) staff has reviewed the August 2014 Brief Issue Descriptions for the Triennial Review of the Water Quality Control Plan for the Central Coast Basin (Basin Plan). The District appreciates this opportunity and respectfully submits the following comments.

Issue 2 - Watershed and Integrated Water Resource Protection

Central Coast Water Board (Water Board) staff recommends prioritizing this issue. The Basin Plan would be amended to develop the authority to adequately address all relevant factors and activities that affect waters. Amendments will likely focus on achieving preservation and restoration of watershed processes through implementation of integrated water resource management planning.

The District supports an integrated approach to protecting surface water and groundwater quality, but is concerned with the potential scope of related Basin Plan amendments. There are many approaches to this complex issue, ranging from voluntary cooperative efforts to regulatory limits or prohibitions. To be most effective, the approach to improving water quality through integrated water resources management should be developed in coordination with local water resources, groundwater management, and land use planning agencies.

Issue 3 - Groundwater Recharge Area Protection

Water Board staff recommends removing this issue; instead, it will be addressed through Watershed and Integrated Water Resource Protection (Issue 2). The District supports this approach, subject to the comments on Issue 2 above.

Issue 4 - Revision of Water Quality Objectives for Specific Water Bodies

Water Board staff's discussion cites deficiencies in the numeric objectives for salts in surface water (Table 3-7) and groundwater (Table 3-8), but does not provide information on where or how the objectives are deficient. Water Board staff recommends that historical data be used to develop objectives to reflect statistically viable baseline conditions where possible, and that minimum and maximum objectives be developed for all basins.

The District concurs that numeric objectives should be reviewed and revised as necessary, and recommends this be done in coordination with groundwater management and other water resources agencies. These objectives should be influenced by several factors, including current technical guidelines, available historic data, enforcement feasibility, and beneficial uses. The Basin Plan should clearly document the source and intended use of these objectives. For example, the Basin Plan median groundwater objectives for TDS, chloride sodium, and nitrogen are below existing median concentrations for the Llagas Subbasin, and it is not clear how these objectives were developed.

The need for minimum, median, and maximum objectives for groundwater is unclear and there is no discussion of the rationale or potential use of multiple objectives. The District is concerned about the use of a single objective for surface water; the variability of surface water quality over both time and location suggests that the objective may be better suited to be set as a range (minimum – maximum) or by reach. In any case, the basis for the objectives and their intended use should be clearly described in the Basin Plan.

Issue 5 - Groundwater Basin Configurations Update

Water Board staff recommends this issue be removed from the priority list. Staff completed work on this issue since the previous review, and will submit an amendment in 2015 if the issue remains a priority. It is included in the Comprehensive Basin Plan Editorial Revisions (Issue 12).

The Basin Plan sets objectives and goals for the management of basins, and cannot be effectively implemented unless the basins are defined. To ensure consistency, the District recommends that the Basin Plan use the groundwater basins and subbasin boundaries and names as defined in the 2003 Department of Water Resources Bulletin 118 and future updates.

Issue 6 - Aquatic Life Protection

Water Board staff recommends maintaining this issue as a priority. The water quality objective units for turbidity are proposed to be changed from Jackson Turbidity Units (JTUs) to Nephlometric Turbidity Units (NTUs).

The District supports the recommendation to maintain this issue as a priority and change the turbidity units to NTUs. The District recommends that the water quality objectives for protecting aquatic life be defined on a stream by stream basis and be tied to specific aquatic life forms and life stages. Consideration should also be given to specific reaches within the watersheds (i.e., headwaters vs estuary).

Issue 7 - Aquatic Habitat Protection/Riparian Buffer Zone Protections

Water Board staff suggests that the Lahontan Basin Plan be used as a model. The Lahontan Plan includes avoiding, minimizing, or mitigating impacts to waters by setting minimum wetland/riparian mitigation ratios. The District does not support the application of minimum mitigation ratios; projects should be evaluated based on the overall benefits and impacts, which depend on site specific conditions. Our experience is that formulaic approaches lead to increased project costs and project delays; these impacts delay the benefits to the wetland/riparian areas which the project is trying to achieve.

Issue 8 - Biostimulatory Substances Objective Revision

Water Board staff recommends that this issue be removed as a priority as the State Water Resources Control Board is addressing this issue through their statewide nutrient policy. The District believes that biostimulatory substances are significant water quality issues, and that each substance needs to be evaluated for dose responses for both acute and chronic exposure as well as for synergistic effects (both positive and negative). The District recommends that the Water Board develop a prioritization process for addressing biostimulatory substances as the number of compounds and complexity of the issues will require more than three years to address. The prioritization process can be used to develop Basin Plan priorities in subsequent triennial reviews. Additionally, we believe the Water Board's Basin Plan should include language to incorporate standards when they become available. This type of language should be amended to the Basin Plan. The District recommends that this issue be maintained as a priority.

Issue 9 - Bacteria Objectives for *E. coli* and *Enterococcus*

Water Board staff recommends that this issue be removed as a priority as the State Water Resources Control Board is addressing this issue. The District recommends maintaining this issue as a priority. Pathogen indicator sampling should include water quality objectives for both E. Coli and Enterococcus, which is consistent with USEPA recommendations.

Issue 10 - Designation of Beneficial Uses

Water Board staff recommends this issue be maintained as a priority. Issues to be addressed include making changes to beneficial use designations based on prior public comment, possibly instituting a tributary rule, and adding the beneficial use designation of groundwater recharge to all surface waters overlying groundwater basins.

The District is concerned about the incorporation of a tributary rule; surface water quality and beneficial uses vary over time and location. Many beneficial uses that are applicable to the main stem streams do not apply to the tributaries and some of these beneficial uses are conflicting. The District recommends that other approaches, including a reach-by-reach designation, be considered. The Basin Plan should list and identify all tributaries. The District supports the beneficial use designation of groundwater recharge for surface water overlying the recharge areas of the groundwater basins.

Issue 12 - Comprehensive Basin Plan Editorial Revisions

Water Board staff recommends amending the Basin Plan to revise and eliminate outdated paragraphs, tables, figures, references to outdated policies, and appendices.

The District has the following additional editorial comments:

- The District concurs with the suggestion to "Add list of TMDLs approved through non - BP amendment processes" and suggests that all tributaries be listed and identified for waters listed in all TMDLs.

- Page 1-4: The average annual precipitation per capita and population should be updated to reflect the 2010 census.

- Table 2-3: San Benito County is referenced in several places as Benito; this table should be revised to correct this.

- Change all references for the California Department of Public Health to the State Water Resources Control Board Division of Drinking Water.

- Section VI.B.2. Pajaro River Hydrologic Unit (Page IV-15,16): The discussion states: "The recommended plan for the Gilroy-Morgan Hill wastewater treatment facilities is to continue geohydrological assessments to determine impacts of continued effluent disposal by percolation at the Gilroy site." The District recommends that this discussion be updated.

  The section on San Martin discusses the occurrence of nitrate in groundwater and recommends calculating the loading rate from different sources. The District recommends updating this discussion using nitrate results from the District's domestic well testing and groundwater monitoring programs and the draft Llagas Subbasin Salt and Nutrient Management Plan, which includes regional loading calculations.

- Agricultural and Irrigation Water Quality Objectives: The District recommends revising Tables 3-3 (Guidelines for Interpretation of Quality of Water for Irrigation) and 3-4 (Water Quality Objectives for Agricultural Water Use) to better describe the objectives and their intended use. For example, Table 3-3 contains numeric objectives related to "increasing problems" or "severe" problems, but the first footnote says the guidelines are "flexible and should be modified when warranted…" The objectives in both tables should also be re-evaluated considering more recent studies, and adjusted as necessary.

- The existing Basin Plan in the Agricultural and Waste Water Management section (page IV-48) states: "Pesticide use and limits on fertilizer applications are not specifically considered; these materials are covered by appropriate water quality objectives." The District believes that application of pesticides and fertilizers should be specifically addressed in the Basin Plan. The plan should also reference and incorporate key language from the *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Land, Order No. R3-2012-0011*, dated March 15, 2012.

- Section VI.E. Storm Water Management (Page IV-26): This section focuses on the pollution control and control of storm water runoff. The District supports these efforts. Over the past several years there has been an increasing effort to capture and use storm water runoff, including within the State Water Resources Control Board's Recycled Water Policy. The District recommends updating this discussion to include the State policy and address the balance between storm water runoff capture and use and groundwater pollution prevention.

- Section VI.I. Underground Storage Tank Program (Page IV-34): The District recommends that this section be updated to include a discussion of the State's low threat closure policy.

- Section VIII.D. Individual, Alternative, And Community Disposal Systems (Page IV-59): The District recommends that this discussion be updated to be consistent with the State's on-site waste treatment system policy and Santa Clara County's 2013 ordinance.

Thank you for your consideration of these comments.

Sincerely,

Joan Maher

Joan Maher
Deputy Operating Officer
Water Supply Division

cc: G. Hall, L. Porcella, S. Dharasker, L. Lee, B. Ahmadi, V. De La Piedra, G. Cook