

Central Valley Regional Water Quality Control Board

MEETING SUMMARY FOOD SAFETY EXPERT PANEL – PUBLIC MEETING 14 November 2019 10:00 a.m. to 1:00 p.m.

Attendees

The table below provides a list of Panel members who attended the meeting.

Panel Member	Title & Affiliation
Dr. Barbara Petersen	Principal Scientist, Chemical Regulation and Food Safety- Exponent Incorporated
Dr. Seth Shonkoff	Executive Director- PSE Healthy Energy, Affiliate- Lawrence Berkeley National Lab, Visiting Scholar- University of California, Berkeley
Dr. David Mazzer	Chief, Food and Drug Branch- California Department of Public Health
Dr. Kenneth Kloc (remotely)	Staff Toxicologist- Office of Environmental Health Hazard Assessment (OEHHA)
Dr. Bruce Macler	Staff Toxicologist- United States Environmental Protection Agency (EPA)
Dr. Stephen Beam	Branch Chief- California Department of Food and Agriculture (CDFA)

Panel members Gabriele Ludwig, Mark Jones and Andrew Gordus were unable to attend. The table below provides a list of affiliated parties who attended the meeting.

Affiliated Parties	Title & Affiliation
Dr. Karl Longley	Chair of the Board- Central Valley Regional Water Quality Control Board (Central Valley Water Board or Board)
Dr. William Stringfellow	Science/Technical Advisor- University of the Pacific, LBNL
Mr. Clay Rodgers	Assistant Executive Officer- Central Valley Water Board
Mr. W. Dale Harvey	Supervising Engineer- Central Valley Water Board
Ms. Rebecca Asami	Engineering-Geologist- Central Valley Water Board
Mr. Josh Mahoney	Water Resource Control Engineer- Central Valley Water Board
Mr. Ralph Saucedo	Associate Government Program Analyst- Central Valley Water Board
Dr. Robert Scofield	Principal Toxicologist- GSI Environmental, Inc. (GSI)
Dr. Bernard Beckerman	Senior ESG- GSI

Introductions and Agenda Review

On 14 November 2019, the Central Valley Water Board held a public meeting of the Food Safety Expert Panel (also referred to as “Panel”). The meeting was to discuss issues associated with the application of oilfield produced wastewater (produced water) on crops grown for human consumption. A summary of the meeting follows. This summary is not a dictation of the meeting’s presentations, documents, or comments.

The meeting was webcast so that members of the public and Panel could participate remotely. Comments and questions could be emailed to Central Valley Water Board staff a waterboardfoodsafety@waterboards.ca.gov. A video can be found on the Central Valley Water Board’s web page.

Clay Rodgers began the meeting stating that this is a working meeting of the Food Safety Expert Panel. Mr. Rodgers stated that all materials posted on the web page must be compliant with the American with Disabilities Act (ADA), which has prevented Central Valley Water Board staff from posting some materials prior to meeting. It has also affected some materials already on the web page. Items will be reposted as they are made ADA compliant. Members of the public may contact the Central Valley Water Board staff for copies. The White Paper should be presented at the April Board meeting. Agenda items for the meeting follow:

- Introduction
- August Meeting Summary and Review
- Task One Update
- Task Two Update
- Task Three Update
- White Paper
- Public Comment
- Action Items
- Adjourn

Materials List

The following items will be posted on the Central Valley Water Board’s web page. Hard copies were made available to Panel members and affiliated parties during the meeting.

- Meeting Agenda
- August 2019 – Draft Meeting Summary
- Draft White Paper (November 2019 Version)

August 2019 Panel Meeting Review

The Panel held a public working meeting on 29 August 2019. The summary, which is in draft status, will be sent to the Panel for review, then finalized and made available to the

public. A video of the August meeting is available on the Food Safety web page (opens a link to You Tube).

Presentation on The MOU Tasks - GSI Environmental, Inc.

Dr. Bernard Beckerman of GSI Environmental, Inc. (GSI) gave the Panel a presentation on GSI's work on the tasks completed under the Memorandum of Understanding between the Central Valley Water Board and the Food Safety related dischargers (MOU). Tasks to be completed under the MOU are as follows:

- Identify chemicals of interest from the list of additives that are potentially present in produced water.
- Complete a literature review on the chemicals of interest.
- Conduct an evaluation of the analytical results from sampling crops irrigated with produced water in the Central Valley.

Task 1: Identifying Chemicals of Interest:

- Evaluate a list of 400 chemicals and naturally occurring constituents
- Identify those that are a concern
- Identify the radionuclides
- Identify those that are basically non-hazardous/ not chronically toxic or easily biodegradable
- Identify those that do not have enough relevant data to decide
- Identify those that need further evaluation
- Develop ad hoc toxicity values when able
- Calculate toxicity based on consumption

This task is nearly complete. Results of this Task have been presented at other meetings of the Food Safety Expert Panel. GSI has a working draft report on the findings of Task One. This report has been shared with the Panel for review. Once a draft has been made final, the report will be made ADA compliant and shared with the public on the Food Safety web page.

Panel Discussion

Ken Kloc: What are the five radionuclides?

Bernie Beckerman: Uranium, Radium 226, Radium 228, Xenon, and Argon. Some are naturally occurring. Some are used as tracers. For example, xenon and argon produce beta radiation and that makes them unique and easy to identify in the natural environment.

Task Two: Literature Review

- As proposed in the scope of work, GSI will develop a systematized means of reviewing literature on the chemicals of interest.
- Conduct a literature review focused on the chemicals of interest, specifically in the context of produced water in an agricultural system.
- Focus on data from 2000 to present.
- Potential types of publications: peer review literature, government publications, scientific letters, and industry reports.
- GSI will add sections regarding ambient levels of chemicals of concern, other sources of chemicals, breakdown products, plant uptake, fate and transport, and knowledge gaps.
- Literature review will include a section on knowledge gaps.
- The initial research is complete.

Panel Discussion:

Barbara Petersen: Explain how you will classify compounds.

Bernie Beckerman: For instance, some of the PAHs are planar. They'll stick together and behave in the environment kind of like plates, one on top of each other and then they'll stick to organic matter. We have a good idea of the kind of mechanisms which may attenuate the ability of those to locate or be available to different kinds of plants. Whereas things like metals, given a standard environment in which a plant is grown, is likely to move within the soil and then be taken up.

Barbara Petersen: How did you come up with the groups?

Bernie Beckerman: They will be classified according to natural groups (e.g. planer compounds) and will be grouped according to some expected interaction with the environment. Some will be metals which will move within the water especially if the water is acidic, and that'll be a separate class of chemical. We have a larger number of chemicals that behave in potentially mixed ways.

Barbara Petersen: When I try and categorize things like this the categories don't work out.

Bernie Beckerman: In some cases, they're not solid categories but do give us a spectrum of how we might expect these compounds to interact with their environment, starting with water and moving all the way to the soil.

Seth Shonkoff: You're planning to have a discussion on breakdown products. How are you going to do this? By going by chemical by chemical? Or are you going to have a few specific examples as cases? This is a very big topic which cannot necessarily be solved in a chemical by chemical approach.

Bernie Beckerman: You're right. The work has shown us that the environments are very specific to how the chemical breaks down. We have a good idea that some of them may not entirely mineralize under bacterial degradation. For the most part we don't have enough information to determine what those break downs products are or how they may break down if at all.

William Stringfellow: This is a big issue. There are some scientific studies being done and other approaches sampling whole water for things like toxicity. I am working with them to cover all the bases. We would take suggestions for things that we need to look at. Now would be a good time to put forward any ideas if you have them.

Seth Shonkoff: I will offer myself if you want to talk about some of holistic approaches to identify toxicity or non-targeted sampling approaches to identify toxicity.

Task Three: Sampling of Food Crops

Crops have already been sampled and analyzed by the laboratories. GSI is reviewing the results and preparing a report. GSI reported the following:

- The crops have been tested for 113 analytes
- Thus far, the results have shown that most analytes are non-detect in all crops. Most constituents detected have been inorganics
- 30 constituents have been detected in both treated and control samples.
- Metals detected were strontium, copper, barium, zinc, nickel, antimony, cadmium, arsenic, cobalt, chromium, molybdenum, lead, vanadium, and selenium
- Organic constituents detected include: acetone, phenol, 1,4 dioxane, 2-chloroethyl vinyl ether, benzo (a) pyrene, 2-butanone, methyl tert-butyl ether (MTBE), 2 hexanone, methylene chloride, bis(2-ethylhexyl)phthalate, dibenzo(a, h)anthracene, sec-butylbenzene, acrolein, ethyl acetate, p-isopropyl toluene, methanol

GSI conducted a Fisher's Exact Test (statistical analysis), comparing the analytical results of treated to control samples. Prior to adjusting for multiple testing, strontium and phenol appeared to be statistically different.

- Ultimately, the Fisher's Exact Test did not find that there was a difference between treated and control samples
- Panel members concluded that an analysis based on reference dose of detected analytes is not necessary, because in most cases the doses would need to be very large
- GSI has conducted work to determine if there are any hazards associated with consuming these crops when considering exposure
- GSI will look at water quality data to determine what role, if any, water quality plays

- GSI's report on Task Three is in draft form and will be made available to the Panel, then public when finalized
- GSI is working to QA/QC some of the analytical data

Panel Discussion

Barbara Petersen: I noticed that some of your lower P-test values show you have lower levels in the treated vs the controls sometimes. I don't know if you indicate that in the chart. But that'd be helpful to the reviewer. I don't see any treated samples that are higher considering the number of detects or farther away from the reporting limit. If you had a take home message about the treated water what would it be?

Bernie Beckerman: The take home message from here is that it does not appear that there's any difference between the conventionally irrigated crops and those crops that are irrigated with produced water. They seem to have similar levels of detects. It is hard to make statements about statistical differences due to having a very small sample size in lot of the cases. Using an order of magnitude test that we might expect some source of water to be the culprit in determining the levels that we're observing. We might expect to see at least a two to ten-time difference in the levels that we're observing but that doesn't seem to be the case. They are all within 20 percent or less of what might be expected.

Barbara Petersen: I was thinking same, because these aren't from oranges off the same tree. I'm surprised we aren't seeing more differences.

Bernie Beckerman: The take home is that there is no significant difference between the treated and control samples that you could directly attribute to produced water. But there have been some unexpected chemicals reported (more often in controls). These could be attributed to crops ripening, laboratory solvents, or ambient chemicals in the environment. Our ongoing work is focused on identifying if there are any threats from consuming these crops. We will estimate consumption patterns, and compare them to a criteria dose, and then look at water data to see if any of the differences are from water quality.

Barbara Petersen: Do you subtract the values you see in the control water in order to get some level of impact from the treated water? If so, how do you treat that calculation considering limits of detection?

Bernie Beckerman: No, the samples numbers are small and it's hard to say that the differences we see are attributable to one variable or other. Potentially introducing an uncontrolled bias into the estimate if we try and subtract one from the other. We don't have any evidence that that's the case.

Barbara Petersen: That's the question we are being asked.

Bernie Beckerman: It was our understanding is that the question is, "Is there a difference?" and the answer is "No." Especially given what we're able to do with the

data. Trying to subtract one from the other, is difficult given that there are other factors that may be involved in why we're seeing any differences. I mean if the differences were on the order of five times and ten times, I think it would be within reason to subtract one from the other and say this is the part that is from produced water but they are very close, and we don't have enough information on farming practices or other water sources. There are several factors that seem to be enough to represent these very small differences we see, and we don't have a way to get rid of that difference, or any confounding effects when making estimates of what are attributable to one versus the other.

Stephen Beam: The ongoing work that you describe here related to estimating a reference dose considering consumption and comparing to quantity of food required to reach a criteria dose. Is that for chemicals identified as chemicals of interest in the literature review? What I'm hearing is you don't have enough information to make a distinction between the treated and the control. So, if you pool all the data and get an aggregate number, you're basically evaluating something that doesn't really get us to a decision point. It might be of interest but it's not really the question we're after. Can you clarify what you mean by this ongoing work and the reference dose information?

Bernie Beckerman: Only for those things which we've actually detected. We plan to use reference dose-based risks based off of the Task One work. We will use that work like a library or database of values. We can't evaluate things we haven't detected. We will use the same values and literature to consider the food crop and the consumption rates and potential effects that it may have in a body. We aren't evaluating all of the compounds, because they haven't all been detected. So far, we have detected 30.

Stephen Beam: If we don't see a difference between treated and control. Then you're combining the data to come up with this reference dose. It may not tell us what's safer or not safe. I'm just wondering what that's good for.

Rob Scofield: It appears that there is no difference between treated and controls, and if there is a difference it is hard to see. We want to show that the level that is there is safe. In some of these cases it's hard to come up with a mean difference between treated and control samples. When we look closely at the average concentration, we realize we've got so many non-detects it's hard to come up with valid mean estimates. The next step is to start with certain concentrations of metals known in a crop and the next step is to consider how much of that crop you will have to eat. To get a mean or max level this shows that you can't eat enough almonds to get to the reference dose for strontium for example. We know that's getting to the safety question, we have no difference between the controls and treated. We're trying to show that there is really no difference and the level is safe. Maybe there is no need to do the reference dose step.

Barbara Petersen: What if the guidance comes that you should buy your produce from water grown without treated water? I can see this coming and potentially going into the organic standard. You're not changing the person's intake but you're adding something here which the data don't drive us to do. I think we just need to be careful. I understand

the problem of subtracting the controls, though that's the obvious thing to be done. I understand because it gets you in a problem from the statistical end.

Robert Scofield: We are trying to see if it matters if there is a little bit more of a chemical in treated crops. We don't see any real difference between the crop types, but I can understand when you look through those tables in detail, you may see small differences. We wanted to put the whole thing in perspective. If that difference is real, there is enough to get a consumer to that reference dose.

Barbara Petersen: I think your Fisher's test says we're far away from anything being different here. I don't see anything that suggests that we need to get more samples or do more analysis.

Robert Scofield: That is our conclusion as well, Bernie pointed out that often the P- Value was less than 0.05. But in some cases, the control was higher. But even when the treated is higher, you're just not going to eat enough of this crop to have a concern for health.

Clay Rodgers: The task of the Panel and the task of GSI is to determine whether there's any actual difference associated with the use of produced water. This isn't an overall risk assessment of sources of foods grown. It appears the food crops are within the natural variation. We don't see a difference between the treated, which is irrigated with produced water, and the control which is not. The operative question is "Are there issues associated with using produced water for irrigation, over and beyond issues that are related to using other sources of water?" I agree that the additional work considering reference doses may not be within the scope of work. I'll ask the Panel- Is there a problem with using produced water? It may be nice to have more samples of certain crops, but sometimes there just isn't enough of a crop in Kern County (e.g. apples).

Bruce Macler: I concur with the three of you. We were looking to see if there was a difference in the crops based on the different sources of irrigation water. We are not seeing anything. I don't think we need to go further in terms of estimating how many pistachios you'd need to eat for risk. That's not the question for the Panel.

Ken Kloc: I generally agree with the discussion but one of the things I would like to see in terms of the statistical calculations is the use of a Fisher's Test which has more statistical power. It would be Fisher's Exact Test with a Mid-P Correction.

Dave Mazzer: I agree with what the Panel members are saying and Clay as well. Our task was to identify differences between the control and treated. I think we have gone far on the pathway and have good information to inform us on recommendations for the White Paper. It might be interesting to look at reference dose. But I'm not sure how informative that ultimately is. Food amounts might be interesting as a talking point, but there's really is no risk. I would also recommend we don't add that into the ongoing work.

Robert Scofield: We've done the preliminary calculations for most of these. When you find that you must eat 20 or 30 kilos a day, you know it's a lot. There are some where

it's good to go back and look at this difference. For those where there is a difference and treated is a little higher this could be helpful. But even with those you must eat really large quantities.

Seth Shonkoff: I agree, using this criteria and approach, it's clear that there are no significant differences between treated and control samples. I think that question has been answered. The only thing that I would add is a discussion of limitations. We have talked about identification of parent and daughter compounds. Testing for only parent compounds is a limitation worth noting. Parent compounds may break down into daughter compounds, and that may be why we have so many non-detects. There is a complexity of testing food versus water. The science and lab capabilities of testing fruits is challenging. I think given limitations there is no significant difference between treated and control crops. I think it is important to note that this is not all produced water. This is produced water from a certain set of fields, which have certain unique characteristics. Extrapolation beyond this to all fields in California and the United States and the globe is something that would be an overreach.

Clay Rodgers: Part of this project is staff will create drafts the White Paper. The Water Boards aren't paying Panel members for time, we greatly appreciate the effort, and will ask for Panel recommendations. No study answers every question. If there are some unanswered questions, certainly we want the Panel's recommendations on what additional work could be done. Also, we want recommendations on conditions. Does this work apply to other oilfields or is it applicable to other issues? I just want to reiterate this will be an important component of the White Paper. The input of the Panel will be added to our summary of the drafts, conclusions, and recommendations. The general question was, "Is there an issue associated with using produced water over other sources of irrigation water?" That was the operative question that Regional Board itself was most interested in and whether there were unintended consequences associated with our permitting of this activity.

Dave Mazzer: Dr. Shonkoff brought up an interesting point. This is produced water from an area and how does that apply when you're looking at other projects? How does the role of waste discharge requirements limit the use? Consider what's discharged so that it's somewhat equivalent across projects and there's some consistency in what produced water used?

Clay Rodgers: The economics drive what water is going to be used in Kern County. At this point in time it's not economic to take high mineral content produced water and run it through reverse osmosis. I don't know what the case will be in the future. Depending on climate changes or the Sustainable Groundwater Management Act, we may see changes in what is economic in Kern County. I would anticipate as water becomes more valuable, we may at some point see an increase in the types of water that are contemplated for irrigation. As far as the chemical additives, we could examine them, but it may not be a whole lot different than other types of produced water. The metals appear to be one of the primary concerns, not the organic compounds. Dr. Vengosh from Duke is looking at metals. Dr. Banuelos is an expert on plant uptake, and his

concerns were associated with inorganics. It's not the organic compounds because we think many of them will break down. It's unlikely they would migrate into the soils and work through the plant into the edible fruits and nuts. If the water looked similar after treatment would we expect a difference in our assessment or in what would be taken up the plants? Or is there some additional work that you would want to recommend in the White Paper? We want some guidance from the Panel. Dr. Karl Longley Chairman of the Central Valley Water Board is here and may add to the meeting.

William Stringfellow: Is everyone in agreement that we don't need to do the criteria dose analysis? We don't need to go forward with that work and that we should focus our energies in looking at the breakdown products?

Barbara Petersen: We were saying to mention the limitations with breakdown products. I'm not sure we were going to wait on our decision for more data.

William Stringfellow: We have been discussing the breakdown product issue. We are looking at the literature and whole sample biological based analysis, such as toxicity assays. There is no way you can know every breakdown compound product.

Seth Shonkoff: Looking at breakdown products is an enormous amount of work. I think the more efficient way is to review what's been done on some of these bioanalytical approaches and consider what's been recommended. For example, a recent Science Advisory panel report convened by the State Waterboard on monitoring strategies for constituents of emerging concern and recycled water. Putting forth the benefits and challenges of those approaches would be helpful and time efficient.

Bernie Beckerman: I can refocus a section of the literature review on breakdown products.

Barbara Petersen: When you talk about milligrams per kilogram in the crop and then talk about intakes it's helpful to use parts per million parts per billion and milligrams per kilogram in parentheses. It's something if you look at WHO to keep the reader focused on concentration is intake or exposure. This causes the least amount of confusion. Be sure to reference the US FDA Total Diet Study, because there are about 50 total diet studies in the world.

Public Comment

Bill Allayaud (Environmental Working Group): You have 347 additives, of which 180 have published toxicity levels, 65 of those became chemicals of interest. What about the 347 minus the 180 that don't have published toxicity levels? Are these unaccounted for? Can they end up in food?

Bernie Beckerman: There are 347 additives and 90 naturally occurring constituents (with some overlap). In the first step we had 107 that had published toxicity values then we were able to do a read across. Then developed ad hoc surrogate toxicity values. A number of these chemicals did not have published data available, but we could develop

a similar value to compare them to. The chemicals with published toxicity values. That gave us a total of 180 chemicals. Then screening out the ones with most acute toxicity (less than 0.5 milligrams per kilo per day) and those that were poorly biodegradable or not inherently biodegradable or inorganic, gave us a priority list to review further in the literature review. That is what we were tasked with identifying those chemicals of interest. There are several other chemicals that are not on the priority list and did not have toxicity data, we don't know much about them. We want to find out what happens to them in the environment. Those that have incomplete information to make an assessment. We have five radionuclides which are not going to degrade in the environment and likely to persist. We don't know about those levels in California or irrigation water and the uptake in plants. This is where the literature review is focused. Step two are looking for chemicals that are food additives, pharmaceutical goods. We are not concerned with their toxicity. We identified 69 other chemicals which didn't appear to have chronic toxic effects related to chronic oral exposure. For example, if you eat in Silica dust it's not considered a problem, but you can't breathe it. If we know some of these are not toxic due to route of exposure or animal data suggesting, there's no chronic effects. This how they have all been screened out. That leaves the chronic toxic profile, so we understand whether they're going to degrade in the environment or in water. From there we developed that list of chemicals which were our priority because we understand the toxicity but there's a few chemicals which are still being reviewed.

Bill Allayaud: I think Dr. Shonkoff said we must be aware that we're looking at this from a specific neck of the woods in Kern County. The produced water in this area may differ from another part of the county or another part of the world. I guess to the layperson they're saying that it's not water from the state water project or federal water project, it is from oil companies. They're using a bunch of chemicals that we don't know about so are they checking for the ones that are not standard in surface or groundwater? If there is something coming from Chevron, Hathaway, or CRC that's different than what we would expect from the state water project or groundwater, make sure we look for it.

Bernie Beckerman: We can only evaluate what we have methods to evaluate. We don't have a very good understanding of breakdown products. We can at least holistically evaluate them using a toxicological profile or whole invitro assays. Look at the whole of the water as opposed to just these specific constituents.

Clay Rodgers: Nobody's using produced water without having waste discharge requirements. Those orders and future orders require complete disclosure of all chemicals being used. We have issued orders to manufacturers to disclose even trade secret information. We have been able to negotiate trade secrets by not getting the exact recipe but by getting all the components, so we know all the components being added. That will be done for future projects. If new chemicals or compounds pop up, I will look to the Board and consider having some work done on that compound. This will be answered in the White Paper in the recommendations section. If it's going to be

used, we're going to want to know something about it. I don't think we'll be in a situation where we don't know about something used.

William Stringfellow: The issue of new additives could be managed or addressed in the White Paper. Maybe there could be some kind of protocol, so that there is a process when a new chemical is added. In the North Sea's OSPAR, there are things you can use, but for new additives you must go through an evaluation process. A logical outcome may be a consideration of that kind of approach.

Justin Bass (via email): Does GSI know the full list of chemicals used by the oil companies during maintenance, well stimulation, drilling, and extraction?

Bernie Beckerman: It's our understanding that we were provided with are the ones are used throughout the process, and represent maintenance, drilling, and extraction.

Clay Rodgers: We have a complete list. Also, there are no hydraulic fracturing activities occurring in the fields where produced water is being recycled for irrigation. In well stimulation, those chemicals are reported under Senate Bill 4. All those chemicals must be reported to Frac Focus or another database. Areas where produced water is sourced for irrigation is generally porous and not fracked.

Justin Bass: What are the knowledge gaps?

Bernie Beckerman: We are going to identify those within the context of the chemical lists. We are evaluating the uses of water to determine whether or not the crops or the use of produced water to irrigate crops poses a health hazard. That is the basic scheme of how we're evaluating potential knowledge gaps.

Justin Bass: Does GSI know where the oil companies get their water?

Bernie Beckerman: All the irrigation water data is available on the Water Board's website and that represent the locations from where that irrigation water is being provided.

Clay Rodgers: We do not know all the sources of the waters that are used by the oil companies. That question is more for Division of Oil Gas Geothermal Resources. We don't know the source of all the water but have extensive testing of the water that's used for irrigation. We have a reporting of the chemicals that are being added which are included in the analyses. But we do not know the sources of the water. I think a significant amount of water is recycled in enhanced oil recovery efforts.

Justin Bass: Did GSI pick the test fruit and where are you getting control samples?

Clay Rodgers: The fruit samples were picked third party hired by Cawelo Water District and observed by Regional Board Staff who went out in the fields when the fruits being collected. Samples were transferred to our staff then shipped to the analytical laboratories. Water Board representatives were present and took field notes. Control samples came from fields known to have not been irrigated with produced water but have otherwise similar conditions. This was done to try and minimize the variability.

Dale Harvey: There was one round of early citrus sampling where water board staff went out with Dr. Stringfellow and some folks from University of Pacific. We conducted that round of sampling and transportation to the lab.

Justin Bass: Did you eat the apples, carrots, and the other food crops you test for?

Bernie Beckerman: I eat produce from California and am unaware of the irrigation water used. No one ate any of them during the sampling. They were just placed in jars and shipped off to the laboratory.

Clay Rodgers: It is not appropriate to eat products we are sampling. I too eat nuts and vegetables grown in California. This effort has not caused me to look at the labels.

David Ansolabehere (Cawelo Water District): Most times when either myself or my staff was out observing the crop sampling, we sampled the fruit. The farmers will bring fruit in right from fields to our office. We have eaten crops grown in our district for the last 25 years.

Justin Bass: Did GSI do the lab work?

Bernie Beckerman: Weck Laboratories did the analytic work in the City of Industry. The other was APPL Labs in Clovis, California.

Clay Rodgers: Agricultural Priority Pollutants Laboratory currently in Clovis, California.

Justin Bass: You mentioned chromium, did you detect chromium VI? In which crop did you detect chromium?

Bernie Beckerman: There is no indication of which valence of chromium it was. Total chromium was in treated and control samples of carrots and at trace levels.

Justin Bass: You said methylene chloride. In which food crops was methylene chloride detected and from whom did you get the food crop?

Bernie Beckerman: Methylene chloride was detected in carrots in control and treated samples and in control pistachios.

Justin Bass: You said MTBE. In which food crop did you detect MTBE and from whom did you get the food crop?

Bernie Beckerman: MTBE was detected in samples of pistachios in both treated and controls.

Will Stringfellow: Considering methylene chloride, there's no report of it in oilfields and not it's used on agricultural fields. It is commonly used in laboratories during extraction. It's a few hits of methylene chloride here and there. In my experience if results are not recurring, we look at it with a little skepticism. I'm personally skeptical there's any MTBE, it's a very small molecule and can be confused with other molecules.

Justin Bass: Who pays the bills for GSI and does GSI have any affiliation with oil companies?

Clay Rodgers: The Memorandum of Understanding (MOU) between the water users and Central Valley Water Board states that the operators that are using the water for irrigation are paying GSI bills. They report to Central Valley Water Board and to me as the manager of this project. Cawelo Water District and the other irrigation districts have no control over the technical aspects of the job. There are no technical conversations between GSI and the water users without going through me. Payments of invoices and other administrative issues go through Cawelo are approved by Mr. Ansolabehere. The technical issues are overseen by the Water Board.

Justin Bass: This question is for Mr. Rodgers. Does the Central Valley Water Board have rainwater recapture? Do the farms in Kern County have underground aquifers that they can use to capture rainwater? Maybe we don't need to expand oilfield wastewater farming in California. Maybe we can focus on sustainable farms and expand rainwater recapture. Maybe we can give that water to farmers instead.

Clay Rodgers: There are significant strides being made to recharge groundwater with excess surface water. Those activities have increased significantly during times where we have high flow, including within Kern County. Cawelo Water District itself and the North Kern Water District have significant recharge basins. The appropriateness of using water sources for oil activities or giving that water to the farmers is beyond the jurisdiction of Central Valley Water Board. I can't offer an opinion. This is a very political issue, that is outside the intent of this effort.

Update on the White Paper- Central Valley Water Board Staff

The purpose of the White Paper is to present the results and the findings of the Food Safety Project. A draft of the White Paper was made available to Panel members and the Lyris list. The Draft White Paper summarizes the tasks and reports in progress. The public may send a request to the Food Safety Project email for a PDF copy.

The most recent version is dated, 12 November 2019. Significant additions and updates were made to sections including treatment of produced water, oil field additives, quality of produced water, and the summary for the Task One Report. Staff want to discuss some of the comments with the Panel members and get additional feedback regarding those questions.

The first question for the Panel from Waterboard staff is. Should the description of "essentially non-toxic" be changed to "low concern for toxic effects?"

Dale Harvey: This question was brought up by Dr. Kloc. If the Panel could consider it or if you had any significant comments, please share. Staff can work up another draft of the White Paper based on what the general consensus is.

Joshua Mahoney: We will look out for written comments. Please submit them via email.

The second comment is should chemicals designated as “inherently biodegradable” be retained on the chemicals of interest list? According to Will Stringfellow’s memo (attached to the Task One report), it cannot be assumed that ‘inherently biodegradable’ chemicals will rapidly biodegrade in all environments or conditions. Study of the fate and transport of these chemicals might be a reasonable next step. Should the chemicals of interest list include inherently biodegradable chemicals? Right now, the chemicals of interest list will focus on poorly biodegradable chemicals. It does not consider readily and inherently biodegradable.

Will Stringfellow: There is standardize testing. Readily biodegradable and inherently biodegradable means that the compound biodegrades in some conditions. We included inherently biodegradable because we are trying to prioritize. We are focusing on what we know the least about. Typically, compounds fail the ready biodegradability test, which is a very specific test that is well known. It is well known that not all compounds that break down in soils will break down in that test. Part of the triage to focus energies and look at compounds that had passed these standard tests and are considered low probability of persisting in agricultural soils. These other ones had either not been tested or had failed the ready biodegradability tests and were more worthy of including on the high priority list. I think the Panel should decide what we need to look at. The things that are inherently biodegradable are likely to biodegrade aerobic agricultural soils. They are not going to persist very long in the environment.

Ken Kloc: I made the comment. Even though the compounds may biodegrade in aerobic soils. The question would be what the rate of decomposition is. Is it quick enough such that a plant wouldn’t have a chance to engage in a lot of uptake prior to biodegradation? That was my concern.

Will Stringfellow: There is guidance from the US EPA on how to interpret these tests with certain kinds of assumptions about decay rates. I looked at some literature. It could be included in the literature review. There are guidelines in the EPA Activated Sludge Modeling. There is guidance that shows you could assume a certain rate of decay if it passed a ready or inherent biodegradability test. We can pursue that and work on it.

The third comment concerned daughter products: The assumption that parent compounds will stay those compounds is a significant reach. Compounds tend to interact with other compounds, degrade to daughter products, and otherwise transform. As such, while chemical disclosure is critical to the development of risk-relevant science, it is inadequate to build a reliable monitoring program to manage those potential risks. A discussion of daughter products should be a part of the literature review, and we will see what kinds of information are available to reference. Is there any additional feedback or comments on this topic?

Seth Shonkoff: I submitted this comment. It's relevant and transparent to communicate that while disclosure of chemicals is an essential pillar of being able to assess this activity, it's not the only pillar. Discussion of gaps and what those other pillars might be is appropriate.

Joshua Mahoney: Excluding the comments that were talked about in this presentation most of the comments that we received from the Panel were incorporated into the most recent version of the White Paper (12 November 2019 version).

Draft White Paper

- On 12 November 2019, a draft of the White Paper was distributed through the Lyris list and will be available on the web.
- Central Valley Water Board staff will reach out to Dr. Gary Banuelos to review the White Paper.

The following are currently being worked on for the next version of the White Paper:

- Task Two Summary
- Task Three Summary
- Discussion of Data Gaps
- Recommendations by the Panel

Panel Discussion

Dave Mazzera: Can you remind us again of the timelines for the White Paper?

Josh Mahoney: As we get Task Reports, we will incorporate them into the White Paper.

Clay Rodgers: My intent is to have a Draft White Paper to the Panel by the end of the calendar year. We will provide about 30 days for the Panel to comment on it. Water Board staff will incorporate your comments, then put a draft out for the public review. Then it can be presented to our Board. That would complete this process. A discussion of the White Paper with the Board should occur in April in Bakersfield. This is an oilfield issue and we want to present this in the area where the operators are active. It will happen June latest.

Barbara Petersen: I would encourage us to get it done by April, mainly because crops start being grown and throw decisions out there in the middle of the crop year.

Clay Rodgers: This should be completed in April. But I want to make sure we get this right. The White Paper needs to meet the standard that is acceptable to the Panel and the Board.

Dale Harvey: We will be looking for Panel comment in a couple weeks.

General Public Comment

Bill Allayaud: Soil sampling still seems to be a missing link. The logical thing would be to take profiles across several properties and sample down six inches to several feet. Especially where this water has been used for over two decades. I don't know why this has not been done. Maybe the Duke Study will get it done soon. I would have gone right for the soil, then the citrus, pistachios, almonds, and then the root crops. I'd want to see if anything is a concern with farmworkers or the dust people breath that in. when Dr. Banuelos was here, I asked him about growing food in that soil. He said he would not grow tubers or root crops in that soil. I know he is not a member of the Panel, but I would like to see that addressed in the White Paper. So far samples are showing equableness in terms of the various contaminants and constituents. US EPA is looking at the produced water in the United States including for irrigation. I want to say I appreciate the work of the Panel. This is important work you're doing. We look forward to the eventual White Paper and conclusions.

Action Items

- Send the presentations out through the Food Safety Lyris list.
- Send White Paper comments out to Panel, get recommendations, and see if you concur with Water Board staff's approach to handling those comments.
- Reach out to Dr. Banuelos about getting comments regarding the White Paper.
- Board staff will complete a draft summary of the November 2019 Food Safety public meeting and make it available to the public.
- GSI Report: If a member of the public wants a copy, they may email Board staff, or the Food Safety Project email.
- Board staff to set the next Food Safety Public meeting.
- Board staff to continue to work on the White Paper and collaborate with the Panel.
- Board staff with comments on the Draft White Paper via email.

Closing

Clay Rodgers: That brings us to the end of the meeting. We have not set the date for the next meeting yet, but it will probably be around mid-February. I want to thank everybody for their participation.

Clay Rodgers thanked the Panel and the meeting was adjourned.