

Emir Macari: I -- it was short, certainly at the panelists and speakers tables, we had very good discussion. I think that the discussion now extends into these last two panels. This panel is addressing risk and uncertainty, factors of safety, costs, benefits, and how all of these match with the implementation of the white paper. I would like to introduce the moderator for this next session is Dr. Ramzi Mahmood. He is Chair of the Department of Civil Engineering, at Sacramento State, California State University - Sacramento, Civil Engineer, Environmental Engineer. So, it's a great pleasure to have Ramzi with us, and he will be the moderator for this session. Ramzi.

Ramzi Mahmood: Thank you Emir. Welcome back. My challenge is to keep you awake after lunch. Luckily, I have talented panel with me that will do that. So, let me introduce the panel. First, we have Mr. Stein Buer who is Executive Director for SAFCA. Second, is Mr. Andy Harkness, who is Risk Assessment Team Lead, Army Corps of Engineers. Third, is Dr. Les Harder, who is Deputy Director, DWR. Fourth, Mr. Tracy Hendren, with Levy Safety Program Manager with Army Corps of Engineers. Fifth, is Mr. Scott Flint, with California Department of Fish and Game. And sixth, is Dr. Martin McCann who's President of Jack Benjamin and Associates, Inc. And last, but not least is Mr. Michael Hoover with United States Fish and Wildlife Service.

So, with that, the way we organized this is, we will give a chance of three minutes each to the panelists to give their opening remarks.

Stein Buer: Okay, thank you, thank you very much. Is this on? We're now shifting the discussion to the issue of policy formulation. And of course, we have a classic conundrum here, because policy makers are typically not subject matter experts. Certainly not broad subject matter experts with enough expertise to fully understand all the ramifications of the policies that they create, or we create. So, the question is, how do we best move forward? From what I've seen so far, what I've heard so far, we've heard a very

good elucidation of the Corps existing policy, which the Corps has indicated it wishes to move forward with enforcing.

The policy is rooted in history, but based on what? It's based on science that has been assembled over the years, but the last panel did a very, very good job of pointing out that the science is nuanced. That there are numerous pros and potential cons for having vegetation of various types on levees, depending on the substrate conditions, ecology, climate, and so on. So, how do we go forward from here? Very good question. In my own view, I haven't formulated a proposed policy position yet. In fact, I think it's important that we don't. I think that we should, first of all, continue this dialogue. Identify research that needs to be done in addition to this.

Bring together and continue a dialogue among people that have the expertise. And then, most importantly, encourage a spirited debate, unconstrained by professional and organizational policies. I think as we go forward, we should not be constrained by policies of the past. We should instead look at the science, dispassionately, not looking at our past approaches to this. I think there's enough information presented at this conference to warrant a fresh look at past policies and how we go forward. And if that is the main outcome of this session, I think all our time will have been well spent.

Andy Harkness:

Okay, I wanted to say a few words about risk assessments. It's a new effort within the Corps of Engineers. We've been working on levee risk assessment methodology for about a year and a half. The goal of the program is to protect public safety, reduce economic impacts, maximize cost effectiveness, develop reliable and accurate information and build information that supports communication of risk internally, within the Corps -- externally, to the public, the Congress OMB, and the media.

Dave Pezza gave just a brief introduction to what that is. Risk is probability of initiating event times, probability of failure times a

consequence. It could be life safety or economic loss. So, really risk is a common currency. It can be used to look at and compare one project against another. When we do risk assessment we look at, from a system perspective, we look at all the components comprising that system, and we ask several questions. What's the hazard? We have initiating events, it could be flood, earthquake -- what can go wrong? How likely is it to go wrong? And what are the consequences?

We're developing a series of software tools to support estimating probabilities of failure, and we take this and put it in an event tree format. Some of the outcomes we get from that, are what are the component risks? What's the loss of life contributing by failures of levees, walls? What's the impact of not being able to install a closure device? We're looking at pathways for risk reduction. How do you do that in an economical and strategic manner to maximize your investment? Buy down risk as fast as you can at the least cost. We're looking at developing import for interim risk reduction options. Things you can do quickly to save money and buy down risk, while you're exploring structural remediations.

We have a couple of levels of rigor. We have a screening process that we're beta testing right now. We're going to deploy that in 2008. Beyond that, we'll run all the projects through. It's like a sieve, where the -- looking for the worst projects first, and we'll those and do a more detailed risk assessment. Identify alternatives. Prioritize studies and investigations. And from that, we go to a site specific, where we really look in at the alternatives, develop them fully. I think a lot of the discussion that's going on over the last two days, fits into the framework of our process. We're understanding failure modes from -- related to vegetation. That's already in some of our tool kits. The new process works.

Les Harder:

Well, good afternoon. I have to say, this has been one of the most interesting and valuable symposiums I've been to in a long time. I think a lot of good ideas been out there, and different points of view exchanged and I think those of us with open minds are actually learning a lot, and hope to benefit from it.

I want to just reflect a little bit about risk, and priorities and so on. Also costs. First of all, I want to echo Stein's comments. I think the way to go from here, is a very collaborative approach. Trying to take measure of the actual risk and where the actual practical things [unintelligible]. We all want to keep Katrina from California. We all have the single foremost goal of [unintelligible]. And for that, we can collaborate. I think there's a lot of points of agreement we can actually come to. I think that, clearly, whether you're thinking about tree [unintelligible] or access to levees, or inspection for seepage, or flood fighting abilities, certainly most of the levee near the top, and on the back side or landside of the levees, should be kept relatively clear. I don't mean no vegetation but [unintelligible] thinned and [kerned], so that you can have access easy.

I don't think the state has any disagreement with that at all. I think the main issue is going to come down to what do we do on the water side? Particularly on the lower part of the levee and the channel bank, where there's extensive vegetation. And as we've discussed many times, this is critical habitat [unintelligible]. We will not be able to get rid of it. This is not replaceable, it is not [unintelligible]. So, what are we going to do? If we try and eliminate this, mitigation costs will be prohibitive [unintelligible]. And so, if we do try and do that, there has to be a compelling reason that really provides [unintelligible]. So, there is discussion, earlier yesterday and probably today about, "Well, maybe we need to do more science and some prototype testing and -- " I would offer that nature has done some of that for us.

We've seen the failures in New Orleans, as a result of Katrina. Overwhelmingly, they were results of foundation deficiencies [unintelligible]. This is one such failure. This is the London North, London Canal North failure, that's right here. The breach has been filled, and it was a failure as a result of a pervasive sand layer in an [unintelligible]. Foundation of the levee, and under seepage and erosion led to that failure. On the -- what we have as the smoking gun is this side of a near failure.

This almost failed -- this side. It's severely distressed. As a result of looking at it, what happened on it? The wall as a result of under seepage got pushed over, was ready to fail, it's opened up a gap that induced more seepage. And boils occurred at the toe, and tinkles appeared as material was being removed. This would have failed if the other side, and failure in London hadn't occurred first. The trees here were concluded not to have played a role. What [unintelligible] and I would offer this to you to consider, there are thousands of trees. These go on for miles. And except for the areas where there were foundation deficiencies, the levees performed [unintelligible].

You had lots of trees on both sides of the river, high water against the levees, and not just high winds, you had hurricane winds. Yet generally, these levees performed well when there wasn't a foundation deficiency. We have cases like this in California, where we have hundreds of miles of vegetated levees that have gone through many flood events over the last 50 years and we don't have any case histories of vegetation problems causing either serious distress or levee failure. There is a -- there must be a reason why after two weeks of searching frantically through all the literature that we only can find 18 referee journal articles relating to levee vegetation.

If we did the same search for under seepage in levees, or levee stability, we'd be finding thousands of records. So, I think Dave Pezza introduced

this concept yesterday, levee fragility curves, so in general, the way these things go is that you have a loading on the horizontal access, so higher flood stage, and then that increases the probability of failure. So, maybe even over talking failure mode in something like this is that you have a pretty low failure probability up to you get a stage close to over topping and then the probability of failure rapid [unintelligible].

You might have another mode of failure like under seepage that's different. Has a different shape, and would have different shapes for different areas. But what would be the failure associated with levee vegetation? That's going to be difficult to do because we don't have any [case histories of doing that]. We don't see very many. There's probably only a handful out there. And yet there's probably thousands of data points of [good science]. So, it's probably down here. So, we have limited funds. [We prioritize those funds.] What are we going to fix first? And we have to keep in mind, based on some of the science we've heard over the last day or so, that sometimes [it can be actually to our disadvantage to remove vegetation]. That's something we need to sort out in a collaborative way [and] [unintelligible].

[Unintelligible: voice or voices.]

Tracy Hendren:

Based on some of the things that I've heard this week -- we've heard a lot of good information, and there's going to be a good collaborative effort as we move forward on this. I would like to say something about Katrina. The reason the Corps has a levee safety program today is because of Katrina. Katrina shined a light on the need for a systematic approach for flood damage reduction projects that we have. And as Andy spoke about our risk assessments, that is one product that's coming out of that, as well as inventory and other things, where we find out where our problems really are. The one thing I want to say about systems, the risk assessments really look at things in terms of systems. We cannot just separate certain items, in some cases like vegetation and other things, from other times. If

you look at erosion characteristics, if you look at overtopping, seepage piping, some of the other issues, vegetation can play a role in all of those. In some cases it may be a small role, some cases it may be a large role. But we do need to take this into account as we look into these projects systematically.

Another thing I wanted to bring out is I've heard things about using risk assessments to buy down risk. That is [what we're going to do with] risk assessments. But we cannot waive minimum standards by using risk assessments. We have to maintain [our] minimum standards. I heard a lot of agreement from the research community here saying that there's some uncertainty on what has been presented. There are some conflicts. And we agree that we're going to have to move forward with more research as we go into the future and develop more policy.

There's a lot of common ground we have here as we move forward, and I think Les just made some mention of maybe it's a riverside slope where we have areas with more commonality. As we look through our policies and we look through California policies and things like that, I think there is a lot of common ground for us to move forward, and work in a collaborative effort as we go through this. One thing that Dave Pezza had mentioned is we must ensure public safety. That's something we've got to do, and we've got to ensure there's minimum standards. We've got to get the minimum standards right, and then we'll move in to the implementation process. So, that's where we're headed in the near future. All right, thanks.

Scott Flint:

Okay, I'd like to take a few minutes to speak to you from the Department of Fish & Games perspective and our position in participating in this process. First of all, I'll just start with the Department's mission. The purpose of this is to give you a little overview on where we're coming from and working on the collaborative process. The Department's mission is to protect, preserve, restore, enhance fish and wildlife resources and

their habitats on which they depend for their intrinsic ecological values and for use and enjoyment of the public. So, that's a large challenge. Fish and game is here with that in mind to meet the mission of the department. I hadn't realized that I'd committed that to memory, but I think I got pretty close, so if I missed a few words, you can correct me later.

A primary mode on doing this is by partnering with project applicants, public agencies, our sister agencies, state and federal and environmental stakeholders to ensure that projects achieve multiple benefits wherever possible. We also have some regulatory responsibilities under different codes and laws of the state. First and foremost, our public trust responsibilities under CEQA, California Environmental Quality Act, to consult on projects which may impact the environment, and ensure that significant impacts are mitigated. One direct regulatory authority department is under CESA -- California Endangered Species Act -- which we actually issue permits to projects that are going to have incidental take and other impacts to state-listed species. We also have another program that would apply to most flood projects and riverside projects.

That's the lake and stream alteration program under section 1600 of the fish and game code, which, again, allows the department to work cooperatively with project proponents on agreements to minimize impacts and offset impacts for projects that substantially alter bed, bank, or channel. Another sister agency that we work with closely and have some regulatory overlap with on water quality issues is the State Water Resources Control Board. One of their major charges is protection of beneficial uses and water quality in the state. Some of those beneficial uses are the same sorts of targets Fish & Game intends to protect or habitat targets, protection of species under Fish & Game's purview. Those being warm and cold water fresh water habitat, wildlife habitat, rare, threatened, endangered species, spawning and fish reproduction. So, those are some common goals we have with another agency, with the Water Board.

One of the latest developments on this overall regulatory framework are the passage of Proposition 1E and Proposition 84 by the voters last year. Provided public money and a mandate for public safety as a primary consideration in the development of flood protection and flood control projects. Prop 1E and 84 also mandate and elevate the priority of projects with multiple-objective approaches, which provide flood protection in combination with other public benefits, including habitat benefits and wildlife benefits. The department has been working cooperatively in the interagency flood collaborative group since before this issue has really started up just recently.

This has been up and running for a while. In its initial operation, it has provided streamlined permitting for many of the emergency repair projects funded by the state. That group has been operating as a collaborative of multi agencies, state and federal, and I think the challenge for that group is to continue to function and move on to deal with problematic approaches to these larger projects and early implementation of the bond-funded flood control projects. So, again, we can streamline permitting and ensure environmental protections remain in place. We also need to start looking towards a long-term, system-wide solution for the sustainability of the entire system.

What do we see at risk? I want to talk about other things at risk here, not risk assessment. Number one, public safety. The Department concurs public safety is the number one risk we need to deal with here. There's also a risk too much of the habitat that support's listed. [Of] special concern [are the sensitive species in the Central Valley of California], all the river-related species, including fish, birds, and other wildlife.

And, thirdly, those affect and are related to the quality of life issues such as aesthetics and recreation, part of which the Department has responsibility for that, being recreation, and those other qualities that

were brought up yesterday in discussion. Some of the cost benefits. We've talked about tree removals. How they can be \$10,000 to \$100,000 in any given jurisdiction, certainly multimillions statewide, for the system. The associated cost of levee rebuilding on top of that, after the tree removals. And one cost we haven't talked about yet, which is mandated both by the state's environmental laws and by proposition 84 and 1E, uh, is the environmental mitigations that go along with the impacts of that removal, and levee reconstruction. Costs for that will also be high. We haven't added that cost factor in here yet.

Given those potential costs, we need to weigh that against all the benefits of the program proposed in the white paper. And based on what I've heard here at this symposium in the last two days, those are still somewhat uncertain, so I think we need to continue to debate and examine those more closely. And we also need to remember that our funds are -- we have a unique opportunity to move forward with public funding under prop 84 and prop 1E, but it's not enough to retool the entire system, bring the system back to a natural state. We need to be opportunistic and prioritize our efforts with that funding, while keeping an overall vision of a sustainable system, to build a sustainable system into the future.

Martin McCann:

I don't have a horse in the race, so to speak. I'm not representing an agency or other stakeholder, so I've sort of taken the position of offering some risk management perspective, having been involved in a few recent levee risk studies -- New Orleans, here in California, and some other risk-related work. I wanted to highlight a couple of concepts, ideas, and observations from the work that I've been involved in, some of which echoes some of the prior speakers. From my bias but what I like to say correct perspective of looking at everything through risk-colored eyeglasses, we clearly need to understand the risk. And, to a large degree, I think, in principle, we do, with regard to levees, [at least where] the risks are coming from, what the failure modes are, and what is generally important, and so on. But every system is different. Once we've analyzed

the risks, we've got to ask the basic question, which has been referred to a couple of times.

Does the system provide the level of flood protection that we want? Are we meeting a flood protection goal, whatever that happens to be -- 100-year, 200-year, et cetera. And that, by the way, I suggested is quite undefined, given our current standards that we have in place. But with Katrina, with the [Delta] risk study here in California, I think the notion of what a flood protection risk goal is probably going to be redefined as we move along. Once we understand the risk and whether or not we've met the performance or protection goal that we're interested in, we need to maintain it. We don't want the goal to slowly slip away as things change. But then, ultimately, when everything's right, we have to manage the risk that's left. And this next slide sort of offers a bit of a cold perspective on things.

You can take the perspective that what we're doing with our current practices is we are designing for catastrophe. What I mean by that is in the risk analysis world where you're dealing with extremely large consequences, things like 100-year protection are unheard of. You don't design nuclear power plants that way, you don't design large dams that way, and neither should levees be designed that way, where there is a catastrophic potential. So, in effect, with all of the systems that we have out there, with large populations, large business interests, et cetera, at stake, we are designing those things to be overcome by flood. And that's when the system works well, meaning the levees stood up to the design event, but was eventually overtopped and everything gets flooded.

So, we're taking many chances in many places. It's just a matter of time and place, in terms of when these events occur. Drawing a term from a recent article in the New York Times magazine this past weekend, we're basically playing in nature's casino. We're not the holder of the cards or

playing with the house's money, if you will. They're playing with us. So, ultimately, the question is do we like the odds?

In managing this risk, as I said, the most important thing -- and it was referred to earlier -- safety is the most important thing. Are we providing a flood protection level, are we achieving the goal that we set out to? If we're not, then clearly there's work to be done. Whether vegetation comes into that picture or not is probably somewhat secondary, but nonetheless would be addressed. The other point that was made that we saw in Katrina is that we have to view the Levee not as individual reaches that the engineer does a stability count for, but rather as a system. Does the entire system perform as intended? And the goal ought to be applied to the system, not to individual reaches. Then again, in New Orleans, that was a very hard lesson that we learned without the benefit of [risk]. We realized at all levels the system failed.

If we do achieve the protection goal that we've set out, where does vegetation fit into the picture? Certainly -- and I'll make some comments in a moment about this -- in general, with regard to risk management, we want to spend our resources, our money, our time in places where we get the biggest bang for the buck, i.e., risk reduction, providing for safety. There's a lot of factors there, dollars, the time to do things, the liability that the owner has or the agency has in maintaining the levee and providing the flood protection. And we ultimately need to prioritize our actions on those things that are most important.

So, in terms of observations, if I look back at all of the risk studies that I've been involved in, those that I've looked at, uh, methodologies that I've been part of, the review process, I ask myself where did vegetation fit in all of that? And the answer is I can't recall that it ever did. It was never on the list of failure [modes]. I'm familiar with it for dams, I'm familiar with it for [turns for dams], but talking specifically about levees, as Les mentioned, the experience is lacking with regard to vegetation being a

problem, and the analytical experience, at least the contemplation of where vegetation is an important failure mode frankly wasn't on the radar. There were other, more dominant contributors. So, that observation suggests either we've ignored it or it's not significant and therefore setting aside, at least for the moment, was not unreasonable. Not to say that it is not a -- a player in the -- in the absolute scheme of things, but it doesn't seem to have risen to the top.

But as was mentioned, we do need tools, we need better tools and practices for assessing whether vegetation is important, and certainly there can be circumstances where it is, and then ultimately, which I think is the job here of this panel is to discuss and begin to focus on how we can develop risk-informed policies with regard to levee design, levee upgrade, levee improvement, and levee maintenance. Thank you.

Mike Hoover:

I guess I've been fighting the obvious. We don't have a dog or a pony in the race. We have lots of other species, though, I might add. [My people are on the Fish & Wildlife Service here in town.] And certainly our first concern is public safety, but we also have a concern about the potential for the ecosystem effects of implementation of the white paper. In an ecosystem that's already heavily impacted, we believe that there would be -- and other folks that we've dealt with believe there would be major ecosystem effects by implementing the white paper. Multiple federal, state, and local governments have worked very diligently in the past to restore as much of the ecosystem as possible along California's river corridor, examples of which certainly are CalFed, the Central Valley Project Improvement Act, Four Pumps, and most of those other actions that all or probably most of you are familiar with.

To date, in the last 10 to 15 years, at least \$1.6 billion have been spent on projects related to restoring the Central Valley ecosystem with a focus on riparian habitat and [anadromous] fish restoration and recovery. As an example of what we came from, typically we talk about 90 something

percent loss of wetland and riparian habitats within the valley. I need to run back a little bit and show you the Central Valley started with millions of acres of tule marsh habitat and riparian forest. The species evolved in this habitat, downstream emigrating chinook salmon and steelhead found that they were able to run out into the tule habitats and basically run along the more island and natural riverine riparian habitats that were adjacent to the river systems. Evolving into that and being placed into the more current habitat is part of the issue that we're facing now.

We're trying to maintain the species that exist in the central valley in a much more restricted habitat. This is the confluence of the American and the Sacramento River. And I was informed by some folks just before I showed this that this probably isn't a good example of the width of a project levee. Project levee's here in red. Typically they're more narrow than that. Species that we have concerns about relative to levee are giant garter snake, valley elderberry longhorn beetle, riparian brush rabbit, Swanson hawk -- it's a stated-listed species, but certainly we have concern. Those are the species we typically are concerned about on the outside of the levees. Delta smelt, valley elderberry longhorn beetle, again, on the inside. The chinook salmon and steelhead, anadromous fish species. Bank swallow and migratory songbirds. All of those we typically address under our authorities with other agencies in consultation under the Endangered Species Act in Fish & Wildlife. Coordination acts.

We're interested, of course, in migratory species under the migratory bird treaty act. Magninson Stevenson act, we work with National and Fisheries on that cooperatively. And the clean water act as well. Maybe a good example of some of the effects that we've seen in the past -- we do have quite a bit of anecdotal information -- and our agency -- this is a 2005 document, it's an IFIM [prehead Sim] study that was performed with the staff in our office looking at shaded, riverine, and aquatic habitat. Shaded, riverine, and aquatic habitat is a lot of what we're talking about impacting today. It's that riparian habitat that exists typically at the [toe] of a levee,

typically in a more natural setback levee system. As the river itself meanders -- it's right along the bank.

Excuse me. The service found shaded riverine aquatic habitat to be resource category 1, irreplaceable. I heard that mentioned earlier that that habitat is irreplaceable and unmitigatable. I agree. This finding under resource category 1 was specific to the Sacramento River Bank Protection Project at the time, but we continue to do research on it. As an example, we performed some studies -- like I said before, IFIM studies up in the northern part of the Sacramento River system and found that if you removed the shaded riverine aquatic habitat cover component, you remove 76 to 93 percent of the adequate habitat. I have access to that document, and I can provide it if you'd like to see it.

In closing -- I'm going to try to stick to my time [I think here] -- we recommend that you provide a variance or extension for a period long enough to allow determination of the best solution. I've heard that today. I've also heard that we work together to provide for public safety and environmental benefits in a more collaborative, cooperative, and creative manner. That's something we really need to focus on. The near term for that, we've been working on. We have a collaborative effort in process. We've been working for the last couple of years, in fact, and we've been very successful in directly and speedily addressing erosion problem areas in the system. As far as more long-term, we need to improve, correct, and restore central valley river and corridors, better aligning with the Corps past and potential -- shortly, I hope, anyway -- forthcoming comprehensive study on the Sacramento and San Joaquin River System.

Somebody asked earlier if there's ever been any GIS done in a major way; looking at riparian and aquatic habitats, I would argue the Corps already done that, six or seven years ago, with a study, and multiple other agencies have done the same thing. In addition, those sorts of studies have been ongoing, with the CalFed process, the Central Valley Project

Improvement Act process, and all ongoing at this point with the Bay Delta Conservation planning effort and the Delta Vision effort. So, there's an awful lot of studies going on to evaluate the effects of what we're talking about now. I do think collaboratively we need to proceed together to try to use that information and to generate more information, to come to a better process and a better solution for the problem we have at hand. I think somebody much more astute than I said it better than I possibly could. John [Meur] stated, when we try to pick out anything by itself, we find it hitched to everything else in the universe. Thank you.

Ramzi Mahmood: Thank you, gentlemen. Let's focus on the Sacramento area relative to risk. And I would like to address this question to Stein. With your experience, SAFCA's experience, please tell us about relative risk, and especially with other risk factors related to levee safety. And you may want to comment on mitigation measures and [costs].

Stein Buer: As I start to answer this, I, again, want to remind the audience, I don't consider myself an expert in the various failure modes. And it's a very difficult thing to quantify because when you say what is the greatest risk factor, you're mentally integrating over time and space. And levee failures are highly specific. They occur in specific locations due to defects of various kinds. And so I want to qualify my answer before I proceed. Looking at the Sacramento area -- let's look at the last big floods. In 1986, Sacramento was nearly inundated due to levee erosion along the lower American River. The erosive power of the river running at about 134,000 cubic feet per second cut through more than half of the levee section and almost caused a disaster of Katrina proportions.

In addition, we had through-levee seepage in the lower [Natomis] basin, on the southern portion of the Sacramento River side, which nearly resulted in a failure into the Natomis basin. It was a vigorous flood fight that prevented through-levee seepage from causing the back sides of the levees from washing away and causing failure. My understanding is that

failures upstream in '86 and '97 were primarily due to, as far as we can tell, problems in the foundations of the levees. And so it seems to me, based on what I would characterize as lay observations, that erosion, through-levee seepage, and under seepage are the biggest concerns that I'm aware of. As Les Harder indicated, I'm not aware of any failure associated specifically with vegetation, but that doesn't mean it is not a concern.

What I would like to do, though, is segue just a moment into responding to a statement that Tracy Hendren made, which is we have to maintain minimum standards. And when we say that, the assumption is we know what the ideal is, and any deviation from that is going away from and towards a minimum standard. The implication is that a levee with turf on it is the ideal, and any deviation from that is moving towards a minimum standard. The evidence that we have collectively heard so far suggests a far more complex picture, where there are potential liabilities and benefits. So, the question I would pose is are there ways to mitigate the potential liabilities such that the benefits of vegetation can be realized, both in terms of habitat, slope stability, erosion protection, and aesthetic and recreational values, while mitigating the challenges posed by wind throw and potential rotting roots and so on. I pose that as a question, and I think those questions need to be answered before we can even define what minimum standards are.

Tracy Hendren: Yeah. I'd like just one little chance to respond a little bit to what Stein's saying there. We do not exclude the use of vegetation on levees anywhere. If you go back to a lot of our polices, we say we have minimum standards, and the minimum standards are based on our engineering manuals for factors of safety for seepage, piping, stability, all the other things. Once you've met those standards and you maintain a root free zone in between that and whatever else you want to maintain on your levees, we allow that. As a matter of fact, our manuals actually encourage planting for our flood control projects.

Ramzi Mahmood: Okay, I have a question from the audience. This is from [Noah Hune, Still Water Science]. Compare the cost of land acquisition and development of the levee [setback with a woody riparian corridor] versus cost of the managed vegetation on the [levee face]. Is maintaining vegetation-free levees substantially cheaper than the managed riparian [shrub] community? [Does anybody want to answer?]

Les Harder: Well, the cost of a setback levee would be partially dependent on how far you set it back because part of the cost is how much land you have to pay for and acquire. Recently, we have some examples of setback levees in the Sacramento Valley, and they're on the order of \$10 to \$15 million a mile. Since we have 1,600 miles in the state/federal system in the Central Valley, you are talking about a budget beyond anything we can possibly do. And plus some of our areas are urbanized, where we have, you know, half-million, million-dollar homes up against the back of the levees. Trying to buy them out would be unimaginable. So, the simple answer would be that a bit of an effort to manage the vegetation without eliminating it, by some of the possible recommendations that we heard over the last day or so about trimming them, maybe managing what type of vegetation, making sure they don't get too high or taking out the most worrisome trees and so on would obviously be a much cheaper alternative by orders of magnitude.

Ramzi Mahmood: Anybody else want to comment?

Stein Buer: [Unintelligible] make one comment. Since SAFCA is currently considering setback options for the Natomis basin, two different kinds of setback levees -- one would be setback between 500 and 1,000 feet from the river, and the other concept is what we would call an adjacent setback levee, essentially building a levee section snuggled right up against the existing levee on the land side. The preliminary engineering estimates that we have done so far suggest that a setback levee would be much

more expensive than defending the existing levee system in place. The reason is that the foundation conditions which make it so much problematic to build a levee near the river persist further inland. The gravel and sand lies underneath the silt and clay on the surface, those are the weaknesses, which must be mitigated with deep [slurry] walls or seepage berms. It also turns out that you have to look at the hydraulic performance of the system.

If we set the levee back in North Natomis, we have to create artificial hydraulic roughness to prevent more water from shifting into that part of the system. We have to deal with impacts on the airport and the urban area and so on. And acquisitions of large swaths of land are difficult undertakings for public agencies to do. So, even in the portion of Sacramento where it's ostensibly still a rural agricultural area, it proves to be a very difficult and expensive proposition. On the other hand, the adjacent setback levee concept we're employing is in part in anticipation of the Corps new levee standards, which may, in some form, be enforced in the future. It would allow us to leave almost all the vegetation that's currently in place along the river and adjacent to the existing levee with a new geometric section adjacent to it on the land side. That proves to be likely about the same cost as defending the existing levee with a deep slurry wall.

Ramzi Mahmood: Okay. Second question from [Ken Lee, state OES, Office of Emergency Services]. Both state and federal agencies use cost/benefit analysis. Federal agencies use different models, i.e., FEMA and Army Corps. FEMA's module does not use economic and environmental benefits. How can these differences be resolved along with the recreational and other more difficult benefits or costs being included in the analysis? Any takers?

Andy Harkness: I guess you could take some of those benefits from recreation -- if you look at, from a risk perspective and the cost to buy down risk, you may be

able to make a stronger justification if you subtract those benefits from the cost in your derivation, usually, typically not done.

Les Harder:

Well, a couple thoughts. Even with the Corps's process, quite often you can make a flood control project join with an ecosystem restoration process and actually justify a joint objective project there where you couldn't do it just based on flood control. And so there are ways to incorporate other features into it. When the state's going forward to spend the bond funds, we have told people we will not necessarily be constrained by the federal formulas for benefit/cost ratios. And so we are going to be probably more flexible in our approaches and consider more than one way of calculating the benefits. But at the end of the day, I'm sure we would have our head handed to us to try and spend money on a project that was overall not feasible in at least some way.

Stein Buer:

I'd like to add a thought as well, which is that there're probably two major Achilles heels in our professional approach to levees. One is hydrology. As someone just recently said, nature's casino, and we really don't know how the cards are dealt, and we never really will get a good handle on that because the future is unknown. The second is putting a price on the value of habitat, the value of aesthetics, the value of our cultural heritage as reflected in our landscape. Those are very hard things to reduce to dollars, and I hope that we have the vision and involve our stakeholders to the point where we adequately consider the great value of those resources which we cannot put dollars on. I think they need to be considered as we go forward. I think they're critical to our future.

Tracy Hendron:

One other thing I would add in this is [when we're in meetings at OMB and other places], we're now hearing that we do need to include risk as part of our planning processes. Where, in the past, we have looked at other forms of justification, but we have been told to include risk, and that is one way that we can include some of these other projects, if we look at risk as we go down the road.

Scott Flint: Yeah, I think if we're going to approach this situation holistically, we need to tackle this. This is an issue we need to tackle. Certainly it's hard to often quantify resource values, but here we have some calculations of real costs, an investment that's been made in the system that we can basically use to evaluate what we might lose. And the figure thrown out by the service is \$1.6 billion. Mine weren't quite as big, but 20 million, at least, in the CalFed process, just in the last couple years. Probably reaching into the hundreds of millions investment on mitigating projects for the last 50 years or more.

And, again, investments by the Department of Fish & Game in habitat restoration projects for chinook salmon and other various species restorations for habitat improvements on the Sacramento River, probably in the high hundreds to low millions over the years. So, I think we have a way to get a handle on the economics here based on what we spent to attempt to receive and improve these systems to support these resources. These were, you know, public investments made with public decisions, capital investments, and improving the system. So, I think right there is some numbers we can use to factor in the equation without having a lot of trouble calculating individual resource value.

Ramzi Mahmood: [Let me follow] up with a question to Mike Hoover to Scott Flint. I know, Mike, you made comments on loss of habitat and so on in your presentation. At this point, if you want to add anything else to this area, especially if you want to talk about the water quality issue and potential mitigation. And also you may want to comment on type of consultation and administrative processes that will be needed [if the removal of woody vegetation is pursued] in California.

Scott Flint: I guess I can go first on that one. From the Department's perspective, I guess I'll start with the types of consultations or administrative actions that would be needed to pursue vegetation removal. One, CEQA

compliance within the state that hasn't been waived on these projects, so that's a process that takes anywhere from six months to two to five years, depending on the nature of the controversy surrounding your project, and it also can be an expensive process. From the standpoint of most of the -- almost all the projects that would remove vegetation from the levees would require 1,600 permits from the department, and again, those require mitigation or offsets for the impacts and minimization measures. That would be a huge permitting workload on the department.

That process -- we have some ways of streamlining that process and that process is not necessarily a long process in every case. So, time is less critical there, but most of them would require those and the necessary environmental mitigations to go along with securing those agreements. And one thing that we haven't talked much about in expediting permitting on the early emergency levee repair projects, which were primarily erosion control projects. A lot of the CESA issues were dealt with through avoidance by timing work windows with the work. As we move into projects that take multi years to construct and larger projects, working in the water and on the bank slopes throughout the year, we have a bigger CESA issue to deal with. So, CESA permitting will probably be something we need to deal with for the projects in the future. It has been less of an issue on emergency repair projects.

Again, for the Department to issue a permit, we must make a finding of full mitigation for that project. Full mitigation under CESA right now essentially means you're leaving the species no worse off than it is right now. You're not necessarily making it better, but you're certainly not making it worse. So, that would be the target we would look for, for any mitigations to offset those impacts. Obviously, since we're talking about impacting a system that is 95 percent gone already, our mitigation options are limited. As far as securing other sites or protecting sites, most of the areas are on levees, at least in the Sacramento area, and there aren't any

habitat sites. The values we would be trying to offset, replace, or protect are to be provided to riverine species, so you can't do that off the river.

So, unfortunately I think our mitigation options are severely limited except in those areas where we can work to put the system back to a little more natural state. And we've all heard about the numerous constraints with that, cost and opportunity-wise in the urban areas in particular. That would be the setback levee approach and letting the system return, at least in localized areas, to a more natural state. That doesn't fix the problem system-wide. So, I think our mitigating approach has to include some form of vegetation on, near, and/or around the levee that's managed in an acceptable manner, placed in an acceptable manner, and either meets minimum standards or minimum standards need to be closely examined to make sure they are the appropriate minimum standards.

Ramzi Mahmood: Mike?

Mike Hoover: I'm just going to add to what Scott said just a little bit. He had mentioned that it would be very difficult to mitigate for any impacts. I think it was mentioned yesterday by the Department of Water Resources, they thought there was about 800 miles of trees along the river systems that would be affected. Considering inboard/outboard, if it were even 400 miles of shaded river and aquatic-type habitat on the inboard side, you know, somebody asked how would you mitigate? I really don't think anybody could mitigate. I think that was implied throughout the day. You really can't mitigate for that. Impacts that might occur on the outboard side may be somewhat -- I still think that the best approach would be to do a more systematic-wide addressing of the problem and do more flood plane restoration major setback levee work.

As far as the federal process associated with the action that's rolling forward, you certainly need to do National Environmental Policy Act, NEPA, compliance, Endangered Species consultation, we assume section

seven, Fish & Wildlife Coordination Act consultation, which includes Clean Water Act, Migratory Bird Treaty Act, and other sorts of things that we typically address in that process as well. And we certainly would expect to be carried along in the process, participate in the process, and lead the process where appropriate to make sure that all avenues for my particular agency are addressed.

Ramzi Mahmood: Les Harder

Les Harder: Yes. I'd like to add a little bit of detail to the emergency repairs that we did over the last year. As most of you know, we took on the repair of 100 sites, pretty much in the Sacramento Valley, for the most part. Most of these were erosion sites, and most of the repairs consisted of trying to restore the eroded bank by placing rock in the water and then soil above the rock and then [armoring] that soil. So, we worked this out over the last year. We've worked carefully with our partners, the Corps of Engineers, and the Corps led roughly half the repairs and the Department of Water Resources did the other half. We worked with the permitting agencies because there's extensive vegetation on the waterside of many of these sites, and trees. And so while we -- one of the things we did is try and preserve all that vegetation, and we would do that by collaring each tree with timber blankets.

We would flag which trees we needed to take out for access. And we tried to minimize any trees we took out. But because we did have an impact, in order to get the permits and maintain and properly mitigate this, we had to add extra material, so that we'd have planting trenches, and we put in various willow bundles and various other plantings. We put soil on top of the rock to try and revegetate the slopes. We limited our construction hours. We sometimes delayed work because of presence of endangered species. While we probably don't have a firm accounting based on previous kinds of work, this type of activity, the environmental work, the processing, the permitting, the limitations on construction, the extra work

in construction typically adds up to 30 to 50 percent of the total cost. The total cost here for these 100 sites was \$340 million, so this was about \$100 to \$150 million probably. And that's keeping most of the vegetation there. Now, these 100 sites add up in length to maybe only 10 miles. We have hundreds of miles we're talking about now, where we would do much more extensive removal of vegetation. So, you can multiple the zeroes as much as I can.

Michael Hoover: Just a quick comment. The existing mitigation on the emergency sites is experimental and we'll be watching it as we go forward to see how their success is. But I want to emphasize that it's experimental, and we're certainly looking for a larger scale fix to the problem.

Ramzi Mahmood: Okay. The next one I would like the panel to address is the prioritization. Given that we know funding is limited -- I guess that's the story of my life -- Dean Macari, where is he? Yeah, right there in back. Earlier, he was talking to me about my budget, and it's [short]. So, anyway, [maintaining] agencies will look to set some priorities basically on what they need to do and what poses the highest threat? So, that's really what we want to talk about. And should we include vegetation removal and [unintelligible]. Do we have enough knowledge and science behind [us to develop] some risk criteria for vegetation removal? And is there some ranking? Meaning, you know, if we look at other risk factors, vegetation is one of them, as we mentioned. Piping [under seepage, overtopping, levee geometry], et cetera. So, [unintelligible].

Stein Buer: [I guess we're going right down the line] again here. Well, let me get straight to the answer. I do think vegetation should be on the list of issues to be prioritized, and I think, looking at it from a local perspective, SAFCA recently completed a proposed plan for providing 200-year [unintelligible] flood protection for Sacramento. And the underlying assumption there is that we attack the highest priority problems at every stage of the game, so every dollar we spend is always spent on the highest

priority action item. And that really boils down to highly specific analyses of essentially every foot of levee that we have, and not just levees, but we're also focused on the Fulsome Dam and the improvements that need to be made there.

And when you look at highly specifically, foot by foot, at erosion sites, which may occur specifically at a certain bend of the river or where [riffraff] ends, you might attack that site because that's where you might next see a major erosive event and a flood. If there's a large tree about to topple over or a dead tree, then the issue of decaying trunks, for example, or decaying roots, even though we may not be able to know until we dig the thing out, it's not unreasonable to say here is an issue that needs to be dealt with immediately.

So, what I'm arguing for and suggesting is that we use our best expertise, biological, hydraulic, engineering, and geotechnical, and look at the specific situation on the ground and make decisions accordingly. In essence, we nuance our prioritization based on what's real and on the ground. And I guess my fear would be that if we have a blanket policy, whether it relates to specifically exactly how vegetation should be managed or other things, it might distort the investment strategy, where you may end up spending a great deal of money to comply to policy when the actual risk factor may not reflect that.

So, I'm hoping that when we move forward with this debate, there will be room in that debate for a more nuanced discussion, of creating enough refinement, enough detail in any policy that's created to give us the freedom to make these investments in a carefully prioritized way that will, indeed, result in the most effective investment at every stage of the game.

Andy Harkness: I agree with what a lot of people have said, that we need a system-wide approach, risk assessment, looking at all the components of your levee

system. I think you need to really do that to understand where your risks lie. And it could be with vegetation. You may find that vegetation has adverse impacts to -- human factor type things, your ability to inspect, make observations [during flood fights, ability to flood fight]. The other thing you'll find from vegetation is it has beneficial aspects too, as far as providing armory on channel banks, those type of things. So, I think what you need to do is to really get to understand your system much better, identify the [remediation] schemes that fit the goals that you have.

There's a desire to keep vegetation. You need to develop [remediation] schemes around that. What we also need to be careful of is those remediation schemes, do they fit all of the loading conditions that you have? You know? Do you want a slurry wall that addresses seepage and piping? But, yet, you also need to consider seismic effects. Those are the kind of things that need to be done. You can prioritize, you can develop the cost estimates for these remediations. Look at how they buy down risk -- look for those opportunities where you get the most bang for your buck. That's really what it is about prioritizing the work effort.

Les Harder:

Well, I hope I'm not going to be too redundant with the previous speakers, but basically when we try to apply a level of safety to a system like a levee system, you know, we're not going to use one size fits all. We're not going to put a stability berm or foundation soft clay everywhere because soft clay doesn't exist everywhere along 40 miles of levee. We don't put a slurry wall in every section because we don't have under seepage everywhere. So, we ought to approach all the different factors based on what level of protection is needed, what are the deficiencies associated with each spot, and what are the appropriate measures? And those should be based on engineering calculations and related scientific information.

And alternatives should be weighed, just like for under seepage we use seepage berms someplaces, we use pressure relief wells other places, we use slurry walls in other places. So, should be our approaches be to

vegetation. And, you know, much has been said and referred to about minimum standards, but even minimum standards are evolved from engineering calculations, and they are based on state minimum standards for slopes, you know, 3:1 and so on. Have been based on what has traditionally worked, case history, studies, and slope stability calculations. So, even minimum standards should be based on analysis, engineering considerations, and other scientific data.

Tracy Hendron: I think we're all in agreement here. There's not much more I can add to that. The key is we do have to look at everything systematically, determine where our risks lie, and prioritize based on that, but we can't leave anything out. We have to look at everything that affects the system.

Scott Flint: I'm not stealing any ideas here, but I heard the last panel, before lunch, say -- I think it was [Dr. Berry] say we need a phased approach. We need a phased approach to this process, and I would agree with that. Inspections and evaluations are needed, but we also need a short-term resolution on what we're going to do with the conflict we have here between the white paper and the environmental impacts that we would incur if we were to implement that system-wide. The clock is ticking for folks who have already failed inspections and have one or two years under the current policy to come into compliance. Second of all, we don't have enough money or time to tackle the whole system. I think the bond funding is good for nine years or something if I remember, so we have a short window of opportunity to make some incremental benefits with the currently available public fund.

Secondly, when we do the assessments, inspections, and evaluations, we need to be looking at those areas and prioritizing areas for environmental benefits also, i.e., where we need to protect the most critical resources, where we have the ability to trade off, and where we have some opportunities to have some offsets or mitigations throughout the system. Even though we have a short window of opportunity, we need to quickly

get a picture of the entire system or what we want the system to be conceptually because the incremental improvement we make in the system now have to fit with the overall whole. So, I think that's a pretty tough challenge to meet that. So, let's get out of here and start working on it is what I have to say.

But, again, a phased approach -- over that time, we have some key research things I think we still need to look at and we should pursue those. I don't think we have an opportunity to fully debate the science here. We're going to have to make a policy decision and go forward. We have 18 papers. How much can we add in a couple years? We're going to have to take the best available information and move forward, weighing all the environmental benefits, plusses and minuses, and take advantage and make these incremental improvements with the system while looking towards the future.

Martin McCann:

To answer one of the parts of the question, I think to start out, and we've heard a little bit about it from the Corps's work, I think the engineering and science base is available to do the types of risk studies that we need. That's not to say, based on what I heard and general knowledge of where the Corps is at and others as well, that we are not in production mode yet, either in terms of the tools or the experience in applying the tools to what is no doubt an extremely large population of situations that we need to look at across the country. So, I think there's plenty available to do the job well, in a highly risk-informed way. But there's going to be a lot of work that needs to be done to get us into that production mode and to increase our knowledge base.

I think the one area, and we heard a little bit about it with regard to one of the earlier questions, where our tools, in particular our decision making or our decision information tools that will support decision making and eventual policy is trying to do a bit better job in terms of what the costs, and more importantly the benefits are, that levee systems [or restored]

habitat, et cetera, that will be going in. I think what we're going to find in some cases, and we've experienced this here recently in the Delta study, is that we often do things that do not directly improve our flood protection. But we've ponied something up to provide the flood protection and then added something as an add-on where we're, in effect, capitalizing, say, an improved environment. That benefit needs to be accounted for in the overall scheme of things.

And I think we need to do a bit better job of that, whether it's recreation, the environment, flood protection, and so on. I do think also, on a much higher level, which is far more problematic, that in looking at things in a more risk-informed, if not risk-based way, that we've got to look a bit more closely and make far harder decisions as to what level of flood protection we really need in those areas where we have a great deal at risk -- Sacramento, New Orleans, and other metropolitan areas certainly come to mind. I'm not sure where we're really addressing the main problem, but I think that's part of a larger flood management issue.

And I guess the last point I would make with regard to overall cost effectiveness, if our experience both analytic and empirical field experience is any indication that we have a reasonable understanding of what's going on, it would suggest that there is not, per se, a tunnel vision focus on vegetation, and a cost/benefit that needs to be looked at only in that regard. I think it's part of a much larger problem where vegetation has a role and it adds to both the plus and minus side of the ledger, and we ought to look at it that way in terms of the overall system, but not in some isolated manner.

Michael Hoover: I think the original question was whether or not we had a problem including vegetation as a prioritization within the levee risk assessment. And as I mentioned before, the service has been operating cooperatively and collaboratively with a group that's been ongoing, looking at just such things and considering vegetation in that process. I think because we are

concerned with public safety, we think that's reasonable, and I think I concur with what Mr. Flint said, that a phased approach is really the only way to do this. Looking at more of a systematic approach to things and prioritizing the environmental benefits as well, both plusses and minuses, to make sure we touch all the bases.

Ramzi Mahmood: Here's another question. This is to Andy and Tracy. Please clarify white paper's guidance restriction on vegetation on projected -- emphasis on projected -- levee slopes or riverbanks greater than 15 feet from the actual levee waterside [toe].

Male Voice: [Unintelligible.]

Ramzi Mahmood: Okay. It says please clarify white paper's guidance restriction on vegetation on projected levee slopes or riverbanks greater than 15 feet from the actual levee waterside [toe].

Tracy Hendron: [Unintelligible] see if I can address that. Based on some of our guidance and our policies, we do allow vegetation on overbuilt sections. That would, in turn -- you would have the minimum design section, then you would have your root free zones, and then you'd have your others. On top of that, you'd have the area where you could have trees. There have been comments that some of the diagrams from 301 and some of the other policies are not exactly clear. That's something that we're looking at right now, and we think there's room there that we can improve on those diagrams. And also there's room there for research where we can look at what would be allowable from that 15-foot zone out into the riverbanks. But as far as what is policy now is we do allow vegetation on overbuilt sections on the riverside of the levee. I don't know if that answers the question exactly or not.

Ramzi Mahmood: [Michael Rosenbauchen?]

Male Voice: Did that answer your question, Michael?

Male Voice: [Unintelligible.]

Michael Rosenbauchen?]: What I was interested in is for that portion of the riverbank or what's been described as the projected levee slope, that's below the real toe of the levee, there was some accounting that was done that said there's numerous trees or much vegetation, and that low level of the riverbank or down below the actual levee section, where vegetation was going to have to be removed. And so in my reading of the white paper, I thought we were only concerned with an area that was just 15 feet out from the waterside toe of the levee. And those areas that were at lower elevations on the riverbank or even on an area that may be considered the projected levee slope, we really did not restrict vegetation in those areas. So, I was wondering if you could clarify whether or not those areas on either the riverbank or not overbuilt sections. but just areas that were considered projected levee slopes that were beyond that 15 feet, does the Corps white paper indicate that the vegetation needs to be restricted in those areas.

Tracy Hendron: No. My understanding from all the policy and everything that I've looked at is we do not have restrictions once it reaches down into the water. There are notes -- or there's comments in the CFR and other places where we promote vegetation in those areas. Someone mentioned willows and other things. And there's also other statements about adding things for the safety of the structure. So, there are some slight discrepancies in some of the policies, but as far as everything that I've read, we allow vegetation of a downward slope into the extent below the waterline, if that's the area you're talking about. We don't have restrictions in that area.

Ramzi Mahmood: Okay, next question. Yesterday, the removal of [three on levees] in New Orleans was addressed. The physical and political environment in California is far different. The citizens in the Sacramento area just assessed themselves to pay for levee repairs. If the new Corps standards

are implemented, who will pay for the legal and environmental cost associated with the implementation? The local well is dry. [So, who wants to take it?]

Stein Buer: Well, since the local well is dry, I guess I can't answer that question.

Les Harder: Yeah, we've heard that before. I think implementing some of these things is going to be frightfully expensive, and I'm sure a lot of local agencies are going to be looking for the state to pick up some of the cost if we really have to do this. A lot of our bond funds are not oriented to paying for maintenance. They're oriented toward capital improvements. And there is a good chance that, legally, we cannot apply bond funds to cost share this. If that's so, we'll be looking to the federal government -- for more than one reason. Because, as we look at these 100-year-old trees, which were here when the Corps completed the project and handed it to us, there would be an implication of responsibility there. And actually that was mentioned in the white paper. So, . . . next?

Tracy Hendron: That's a tough one. I don't think we can really answer that question right now. You know, as Les mentioned, some of the vegetation may have been there, and normally we would say in something we turned over, the locals own it, it's their responsibility to deal with this. But in this situation, there may be some other things that we have to do with it that haven't been answered yet, and that's something we'll have to deal with in the future.

Stein Buer: Well, I would like to come back and give a little bit more complete answer about our local response to this. I made a little joke at the expensive my fellow agencies here, but in reality, our approach will be as it has been in the past, which is to work collaboratively for a solution. We recently passed an assessment here with the overwhelming support of our community, 82 percent, about a \$326 million assessment based on a specific plan for achieving 200-year level flood protection. We're also in

the process of seeking support for a development fee program, which would raise at least that much more money, to drive our level risk below 200 year, in other words to 300- or 400-year level flood protection over time. Among the elements which we hope to finance with that are erosion protection and tools for managing vegetation more intensively -- that is a higher level of maintenance than has been done in the past, consistent with urban standards.

So, I didn't say the well was dug, the questioner said the well was dry. In fact, it boils down to a matter of prioritizing what needs to be done. And where vegetation is a part of that picture, we'll need to address that. I think it's important, though, that as we move forward, recognize that retaining the confidence of our protected citizens is critically important. And so if we're going to shift our investment strategy dramatically, we need to have a very good reason for it, we need to be able to explain it to people, it needs to make common sense. It can't be simply we have a new policy or we have an old policy we're enforcing in a new way. There needs to be a very good explanation so we can bring people along. Because, ultimately, this is a partnership not just between our agencies, but between our agencies and the people we serve.

Ramzi Mahmood: Next question: should we differentiate between urban and rural levees in terms of characterization of risk associated with vegetation on levees? [Any takers?]

Stein Buer: Yes, but I was waiting to see if someone else wanted a shot first.

Male Voice: [Unintelligible.]

Stein Buer: [All right, go ahead.]

Les Harder: The question is should we have a different policy with regard, I guess, to vegetation control for rural areas versus urban areas. And the fact of the

matter is that urban areas need high levels of protection. Much of the central valley is commonly somewhere between 30- and 80- or up to 100-year level of protection. And nobody believes that's adequate for urban areas, particularly large urban areas in deep flood planes that could flood to depths like you saw in the Lower Ninth Ward or deeper. And so most people, of course, and this has probably been repeated several times, advocate between 200- and 500-year level of protection for urban areas. And I think Stein has voiced more than once the safe goal of at least 200-year and then higher levels after that. And the state certainly concurs with that for urban areas.

For rural areas, it would be difficult to justify the enormous cost that would be doing that. Here in the central valley, there will be -- there's roughly 1,600 miles of state/federal levees, about 350 miles are urban levees, 1,250 are rural. It will be difficult to get the rural levees up to even 100-year. And we already have that dichotomy. A lot of the urban areas are currently rated at 100, while the rural areas don't have that rating. So, we already have that difference. It will become more magnified with time, and you'll see more of a separation between rural and urban areas. And that's just in the normal kinds of things when we think of, like, overtopping and under seepage. So, it would make sense, without knowing how all these policies are going to work out, that if you're willing to have a higher risk with regard to overtopping, under seepage, or erosion for a rural area, and you accept that, that you might also accept that same higher-risk approach for rural areas with regard to vegetation. So, it seems to me that would be a consistent path.

Stein Buer:

And what Les has articulated is the state position is certainly consistent with SAFCA's view, which may appear to be self-serving, that urban areas, where lives and property are highly concentrated, would and should have a higher level of flood protection. This is consistent with the principle, I think, all the members of the panel here have articulated, which is put your resources where you get the biggest bang for the buck

and do that consistently. But I think we should also think about a comprehensive risk management strategy, and in fact, SAFCA has articulated one in which we suggest there should be a partnership between the urban and rural areas, recognizing that we do not have the resources to provide a high level of flood protection for the whole valley.

And if you do so, paradoxically, the level of flood protection for urban areas would likely decrease. So, the rural areas are implicitly paying a price for the urban protection, and we should recognize that with explicit risk management strategies and tools. For example, SAFCA has advocated for supporting flood insurance for the rural areas, because they will never have the federal and state subsidies which the urban areas are enjoying now and will enjoy in the future, that allows us to have lower flood insurance premiums. We should provide tools for improving rural levee maintenance. If you maintain a farm community, a farm economy, it's very difficult to support a high degree of levee maintenance.

And we should consider agricultural easements and other tools for preserving open space for withholding development in those areas. Those kinds of tools could allow us, in the long term, to protect the -- by analogy the wetlands of New Orleans. The loss of the open areas would be a grievous loss for our flood protection, and we should be not only conscious of the role those areas play in the event when our systems are overwhelmed, but also be prepared to equitably compensate those areas for the higher risk and the service they provide to their urban areas.

Martin McCann: [Unintelligible.] Yeah, I was just going to add, and Stein, I think, said it real well, I think one of the jobs we have ahead is establishing policy without worrying, just for discussion, the distinction between urban versus rural, but establishing standards for flood protection that's based upon what's at risk, whether it's levels of population, small town, large town, city, whether it's agricultural land or other areas, whether it's infrastructure of one type or another, that we ought to take a look at the

broad spectrum of what we have at risk and establish appropriate standards and policies for levees in those areas.

Another thing we might consider, and this gets difficult -- we've seen it with levees, we've seen it with dams -- invariably, there's going to be change, there's going to be development in a lot of areas, and one might also consider, within these policies, at least the potential for growth and the fact that a levee, which was in a relatively unpopulated area, may see development in the next 25 to 50 years, and that there ought to be a footprint of some sort that accommodates what's going to necessarily be an upgrade in the future to provide the flood protection that's warranted as things develop over time.

Ramzi Mahmood: We are almost out of time. Is there anyone who wants to make any concluding remarks before we close this session?

Stein Buer: I'd like to pick up on a comment that Scott made. We haven't really talked much about it in this forum yet. And that is implicit in the white paper is the proposed plan by the Corps to move forward, and for those agencies, levee sections that do not comply with whatever the new standards might be, there is the likely outcome that they will be put on inactive status under the PL-8499 program, and most likely, the levees will be decertified. And that, of course, has huge implications. That's a very, very big threat, not just a direct financial threat, but also one which will cause our citizens to question what we have been doing and why there's a sudden change. For example, here in Sacramento, in 2005, we certified the American River System. In 2007, we certified the pocket levees. In 1998, we certified the Natomis levees.

And the likely effect of an immediate implementation of the policy proposal laid out in the draft white paper would be very rapid decertification. In effect, I believe this would be perceived as a return to zero, go back to start for the citizens of this good community who have

trusted us to bring them to higher levels of safety and to bring their flood insurance premiums down accordingly. So, I feel like there's a bit of a sword hanging over my shoulder here, and I'm hoping that as part of the outcome of this symposium that [that there'll be consideration of pulling] the sword back just a little bit. Give us some time to talk, to think, to formulate a more nuanced policy and to not have that threat distort the investment strategy that we have all agreed needs to be based on a dispassionate assessment of the true risk caused by these various factors.

Ramzi Mahmood: Please join me to thank the panelists.

Emir Macari: Okay, great, well this has been a very enlightening panel. We have one more panel to go. We're going to take a 15-minute break. Before that, I'd like to announce two things. There is a conference scheduled for December 4 through the 6th, here in Sacramento, at Radisson Hotel, titled Integrating Riparian Habitat Conservation and Flood Management in California. So, I guess this would be a follow up to something like this. It is put together by the Riparian Habitat Joint Venture Group. Another thing, since we're talking about water resistance and impermeability, somebody lost the back of their watch. It says water resistant. I'm sure that it is not water resistant at this point. So, if you see your watch with the guts all over the place, we have it right here. Okay, 15 minutes, we'll be right back, we'll be wrapping up this session. Thank you very much. Thank you, panelists.