WATER RESOURCES COMMITTEE
Council of the County of Maui

M I N U T E S

Council Chamber

October 31, 2018

CONVENE: **9:03 a.m.**

PRESENT: VOTING MEMBERS:
Councilmember Alika Atay, Chair
Councilmember Elle Cochran, Vice-Chair (in at 10:24 a.m.)
Councilmember Robert Carroll
Councilmember Stacy Crivello
Councilmember Kelly T. King

EXCUSED: Councilmember Yuki Lei K. Sugimura
Councilmember Mike White

STAFF: James Krueger, Legislative Analyst
Leslee Matthews, Legislative Analyst
Stacey Vinoray, Committee Secretary

Ella Alcon, Council Aide, Molokai Council Office (via telephone conference bridge)
Denise Fernandez, Council Aide, Lanai Council Office (via telephone conference bridge)
Dawn Lono, Council Aide, Hana Council Office (via telephone conference bridge)

ADMIN.: Jennifer Oana, Deputy Corporation Counsel, Department of the Corporation Counsel
Eva Blumenstein, Planning Program Manager, Department of Water Supply
Robert De Robles, Planner VI, Department of Water Supply (seated in gallery)

OTHERS: Dr. James Leary, Invasive Weed Specialist, University of Hawaii Manoa, College of Tropical Agriculture and Human Resources (CTAHR)

PRESS: *Akaku Maui Community Television, Inc.*

CHAIR ATAY: . . . *(gavel)* . . . Good morning, everyone. Time now, it's about three minutes after the hour of 9:00 a.m. here, today, on Wednesday, October 31, 2018. I wanna welcome everyone to this morning's Water Resources Committee meeting. I'd like to ask everyone to come to order and please at this time, silence all cell phones. I wanna

introduce the Committee Members here, myself, Alika Atay as Chairman of this Water Resources Committee. Vice-Chair Elle Cochran is in transit. We have Member Robert Carroll.

COUNCILMEMBER CARROLL: Good morning, Chair.

CHAIR ATAY: Good morning. Mike White is excused as well as Yuki Lei Sugimura, excused. Good morning, Member Kelly King.

COUNCILMEMBER KING: Good morning, Chair.

CHAIR ATAY: As well as Member Stacy Crivello.

COUNCILMEMBER CRIVELLO: Good morning, Chair.

CHAIR ATAY: Thank you for being here. I wanna recognize the Administrative Staff that's here from Administration, Department of Water Supply, Eva Blumenstein.

MS. BLUMENSTEIN: Good morning, Chair.

CHAIR ATAY: Representing Corp. Counsel, our Deputy Corporation Counsel member Jennifer Oana.

MS. OANA: Good morning, Chair.

CHAIR ATAY: Recognizing Committee Staff, Stacey Vinoray, Leslee, as well as James Krueger. And out in the neighboring centers, District Office Staff, Dawn Lono in Hana, Denise Fernandez on Lanai, Ella Alcon on Molokai. And behind the scenes my legislative and policy analyst Trinette Furtado and Brian Bardellini. This morning we have a resource person. I want to welcome Dr. James Leary, University of Hawaii at Manoa, College of Tropical, Agriculture, and Human Resources. Members, we have one item on today's agenda and the agenda item is WR-5, Watershed Management and Protection. If you've been paying attention, Members, my intent was to bring in all the various grantees that are currently receiving watershed management and protection grants from the County via the Department of Water Supply. And last year, we had something, like, 12 of the grantees all at once one day. They were trying to educated everyone in a matter of three minutes. What I opted this year was to give each of the grantees ample enough time to educate all of the Members here about their grants and the connection to the protection of our watershed, and also to address going forward what their needs are so that we can have a better grasp in regards to budget requirements. So, that's why we've been having a series of these meetings focused on WR-5, Watershed Management and Protection. At this time, I would like to begin by taking public testimony and for any individuals testifying in the Chamber, please, at this time, please sign up at the desk in the lobby, and if testifying from a remote site, please sign up with District Office Staff. Testimony will be limited to the item listed on the agenda today and pursuant to the Rules of the Council, each testifier will be allowed to testify for up to three minutes per item and when testifying, please state

your name and any organization you may be representing. I want to check in with District Offices. Hana Office, Dawn Lono, do you have anyone wishing to testify?

MS. LONO: Good morning, Chair. This is Dawn Lono at the Hana Office and there is no one waiting to testify.

CHAIR ATAY: Thank you. Reaching out to Lanai Office, Denise Fernandez, do you have anyone wishing to testify?

MS. FERNANDEZ: Good morning, Chair. This is Denise Fernandez on Lanai and there is no one waiting to testify.

CHAIR ATAY: Thank you. And reaching out to Molokai Office, Ella Alcon, do you have anyone wishing to testify?

MS. ALCON: Good morning, Chair. This is Ella Alcon on Molokai and there is no here waiting to testify.

. . . BEGIN PUBLIC TESTIMONY . . .

CHAIR ATAY: Thank you. I'd like to reach for Staff to call any testifiers in the Chamber.

MS. MATTHEWS: Good morning, Chair. There's no testifiers signed up to testify in the Chamber.

CHAIR ATAY: Okay. Seeing that there is no one else wishing to testify and if there are no objections, I will be closing public testimony.

COUNCILMEMBERS VOICED NO OBJECTION.

CHAIR ATAY: Thank you.

. . . END OF PUBLIC TESTIMONY . . .

WR-5 WATERSHED MANAGEMENT AND PROTECTION (CC 17-79)

CHAIR ATAY: Moving forward, our agenda item once again, WR-5, Watershed Management and Protection. This is what we have under County Communication 17-79. Members, today, we will be continuing our discussion of the matter of watershed management and protection, specifically the watershed partnership grants that the County supports. As I mentioned earlier, we last met on October 3, 2018, and at that meeting the Committee received presentations from Leeward Haleakala Watershed Restoration Partnership, as well as from East Maui Watershed Partnership and we also reviewed their work. And, Members, if you would like to reference those presentations in the future, they are also available for your review in Granicus. For today's meeting, we

have with us Dr. James Leary from CTAHR who will be giving a presentation on his research relating to identifying and controlling Miconia populations. The Chair's intention is to receive a presentation from Dr. Leary today and to schedule presentations for the remaining grantees for future Committee meetings. Without any ado, I'd like to proceed and allow Mister, Dr. Leary his presentation. Good morning.

. . . BEGIN PRESENTATION . . .

MR. LEARY: Good morning. Thank you, Chair. And thank you, Committee Members, for this honor to present today. Sorry, if I'm sitting down and standing up, I'm dealing with a leg injury, so if I appear to slouching and looking too comfortable, believe me, I'm intending to be paying attention and moving forward. So, let me start by standing up. First of all, again, thank you very much. I'm a new awardee of this grant program, and as already described I'm a research faculty member with the University of Hawaii. The academic home in Manoa in the Department of Natural Resource and Environmental Management, and my expertise is in invasive plant species management. So, a very practical applied science and I develop research and technology towards invasive species management, hence, a lot of my efforts focus on collaborations with the Maui Invasive Species Committee and also our watershed partnership. So, there's a really strong fit for my academic program working with their management programs. So, again, it's a really great opportunity for me to be more integrated with the watershed program, the grant program, and really become more integrated into the management aspects on Maui. I should mention, again, my academic home is on Oahu, but I am stationed on Maui. I've served in my position since 2009, so I've been on this island for 9 years and I was on Oahu 12 years prior to that. And so, I have up to 20 years of experience controlling weeds and experimenting control of weeds in many different ways, mechanical, physical, cultural, and chemical, in those 20-year period. And, believe me, coming from Michigan originally, when I came to Hawaii, I was originally fascinated by the idea of being able to grow food year round. I was fascinated by that tropical environment. Family's from here, and so I had that connection as well. But it took about two weeks to realize, like, oh my gosh, weeds grow year round too and pests grow year round too. The uniqueness of Hawaii and the uniqueness of the challenges are that you never have a break in managing your agricultural landscapes or your natural landscapes. So, that's, you know, the gist of my experience in Hawaii so far. So, today I'm going to share with you what I understand about Miconia management on Maui largely through association with the Maui Invasive Species Committee and collaboration, development of technologies that have improved our management, and then talk about and address the objectives in my grant proposal on how we can do a better job making decisions knowing that this is a growing problem, it's a dynamic problem, and we always have to be paying attention to the data that's being generated so that we have today's data telling us what we're gonna do tomorrow. So, the title of my presentation is identical to the title of the proposal that's funded for this year and it's the Bio-Economic Models Prioritizing Mauka Catchment Basins of the East Maui Watershed for Protection Against Miconia Invasion. So, besides myself, I'd also like to introduce partners who are helping me with this collaborative effort. We also have Dr. Kim Burnett and Dr. Chris Wada, who

are part of the University of Hawaii Economic Research Organization. So, they're research faculty who specialize in cost and benefits of protecting and conserving natural resources, and so they understand very well how to monetize management and the return on those investments, and so they're critical team members on this effort. And then Brooke Mahnken, who's with the Maui Invasive Species Committee, who is very skilled at managing data and collecting high-quality data from management efforts that the MISC conducts, so, and he, of course, he's their data analyst with Maui Invasive Species Committee. So, this is our team for integrating research and management for making better decisions. The mission and approach...can you guys hear me okay with this? The mission and approach of this project is, one, design cost effective management decisions to protect the mauka catchment basins in the East Maui Watershed against insipient incursions, almost identical to the title. This project will customize bioeconomic intervention models for optimal mitigation of Miconia encroaching in EMW's mauka catchment basin, so I'm...the acronym for East Maui Watershed will be EMW from here on out. Bioeconomic, if you break that into two parts it's biology and economy. And so, bioeconomic model uses the biology of the species, in this case the target species being Miconia, understanding the biology of Miconia and then understanding the economics of managing Miconia under the context that as an invasive species invading this natural resource, the watershed, what are the costs associated with controlling and outpacing its biology. This is a preemptive approach deploying state-of-the-art surgical "weed-ectomy" intervention system to efficiently maintain long-term health of Haleakala or East Maui Watershed. Kind of a spoiler alert, you know, what we're challenged with is terminology that of eradication, containment, and asset protection, and then all have, you know, they're all part of the paradigm of what, how are we going to manage Miconia in East Maui Watershed, and so it all comes down to what can we afford and what's gonna offer the best return on the investment. And I should say that my piece of this puzzle is only a fraction of the comprehensive management plan. I'm going to be focusing on different locations than, say, where ground operations will be occurring, so I'm a little ahead of myself but just kind of preempting that. Let's start with the biology of Miconia. What we understand from the literature, a lot of our best scientific literature comes out of Tahiti where it was introduced in 1938, was recognized as a problem in 1970, so you had that 30-year window when they finally realized, like, it was a nice plant when we brought it here but it's a big problem now. A lot of really good botany come out of there from Dr. Jean-Yves Meyer, he's very familiar with the Miconia problem in Hawaii as well and has published in Hawaii. And also, a lot of solid information from Australia where Miconia is also a problem in North Queensland, and so really good economist and management science coming out of Australia with a real aggressive effort to eradicate it from North Queensland. So, what we understand is, number one, I'm gonna use some terminology here, Miconia is autogamous species, meaning it's self-fertile. So, one plant, you know, most plants are what we would call dioecious, you have a female plant and you have a male plant and the male plant will pollinate the female to produce new fruit and seed. Miconia doesn't need that. That one plant is self-fertile. It can produce fruit without having a cohort to pollinate, so that's a risk factor as it relates to its invasive potential. That one plant isolated from others can still set seed and contaminate and impact the surrounding area. It is highly fecundus, meaning it

can produce lots of fruit in the millions. So, you have fruit that are six millimeters, they're very...they look like small blueberries as this picture shows here. That one fruit also contains 200 viable seed. They're the size of a grain of sand, they're really small, so you can imagine this one panicle of fruit has tens of thousands of live propagules just in that one and then, you know, a large mature Miconia can produce hundreds of those panicles. So, we're talking about a, you know, a reproductive or fecundity cycle that's in the millions and that's another invasive risk. It's edible. The fruit are edible. We understand very well that bird populations congregate around fruiting Miconia, will consume the fruit, and then move it to new locations and deposit seed into un-invaded locations, so birds are contributors to the spread of Miconia. So, we have a one plant, a self-fertile plant that produces lots of seed and is edible to bird populations that are prevalent within East Maui Watershed. And then finally, they have...so this contributes to what's called long dispersal range or long dispersal events, bird, the seeds can be deposited as far as the bird can carry it. And then also a persistent seed viability, it can last for a long time in the soil. Meyer in Tahiti and his studies where he would bury seed in the soil, he found that after 16 years of conducting this study, there were still viable seed, and this was like, okay, I'm done, like, you know, it's like 16 years. Who wants to manage an experiment for 16 years? He did it and it was still living and then it was terminated, so at least beyond 16 years we know Miconia seed can live. Okay so, this is the East Maui Watershed, which is in green. It's approximately 150,000 acres. As far as landscapes go, that's a very modest footprint. It's not a very large amount of area. It's significant, you know, relative to the size of Maui, obviously, but as far as watersheds go on the mainland and anywhere else, this is a really small piece of real estate. Well, this small piece of real estate extends from sea level to 10,000 feet, which is a novelty that we always have to acknowledge. It has a heavy influence on the climatic conditions of this location where you get orographic patterns of rainfall, it has the seventh wettest spot on the planet where one of these areas in here reaches up to 400 inches of precipitation. That's an amazing amount of water. It's critical habitat to over a hundred threatened and endangered species. We are the endangered species capital of the world. It has everything to do with our isolation where plants and animals have evolved without any kind of hybridization and have generated unique genetic types that what we call endemic species. While these endemic species are being impacted by exotic introductions that are depleting and impacting and modifying their critical habitat. East Maui Watershed is critical habitat to these species. This watershed, this 150,000 acres produces 60 billion gallons of water, fresh surface water a year. That's billion with a B and that is amazing. And, I mean, I'm tongue and cheek here but, you know, it's not inconceivable that there's gonna be a time in our life where water's gonna be more valuable than oil. I mean, I could be completely wrong, but I, personally, I'm off the record, I guess we're on the record anyways, but just imagine that resource. Fresh water at 60 billion gallons of water a day, we understand this as the County. I don't know...when I give this to the mainland though, it's an amazing response because it's so phenomenal. So, for us it's like we understand this and this is why the County is so protective of this resource and we should. It's really, really important. It's an amazing resource that has to be protected, managed responsibly. So, let's talk a little about the invasion history, what we know about when Miconia was introduced. According to records, it was probably introduced as early as 1970, early 1970s. It was

introduced as a botanical specimen, because it's a very attractive plant and it was collected for cultivation and show and distribution. And it was shared amongst neighbors, it was introduced into Hana and was shared and grown out, and this was 1970. In 1991, we had botanists from the Division of Forestry and Wildlife visit Tahiti and they were introduced to this scourge called Miconia and, like, wow, you guys got a real problem here, I'm not familiar with that in Hawaii until they got back and, like, we saw that plant in Tahiti, what's going on over here? This is obviously, someone did not send an e-mail out to inform them, but, so we're talking about time span of 1970 to 1991. And as I say that, I'm gonna go back because I realized what I didn't suggest here, what I didn't introduce you guys to is what we also understand about Miconia is it typically takes about four years for Miconia to reach maturity from germination. So, the immature, the juvenile phase is about four years before it reaches maturity and will set fruit. So, just remember that four-year mark as a benchmark or milestone for the lifecycle and life history of Miconia. So, when we talk about the introduction of Miconia in Maui in 1970 and then finally acknowledging the problem in 1990, we're talking about a 20-year period and we're talking about probably four or five generations of reproductive cohorts establishing and naturalizing a seed bank within its introduction, introduced area. This is what we would call a founder population. It was introduced and then it propagated, self-fertile, so it didn't need cohorts to pollinate, so it was able to reproduce quite readily. In that first effort in 1990, they had a grassroots effort of ground crews going through and they harvested 9,320 plants, it was documented as the first Miconia attempt at eradication in and around that introduction point and they're high fiving each other and then they kind of meander up the hill--I think this is Bob Hobdy maybe, he tells the story much better--and then sure enough right over the ledge, they found thousands more beyond what they just harvested, so that was the red flag. And that was really the start of, one, some cases it really ramped up our understanding and appreciation in concern for all invasive species in Hawaii, 'cause this is the first time where it was like, this is a problem that got away from us as soon as we recognized it. And so, this is where they developed a grassroots effort called the Melastome Action Committee that involved The Nature Conservancy, the State agencies, DOFAW and DLNR, the NARS and then also the National Park, the Haleakala National Park, so we had Federal, State, Local Community groups getting together to form the Melastome Action Committee.

COUNCILMEMBER KING: Chair, can I just ask a quick question?

MR. LEARY: Yes?

CHAIR ATAY: Member King?

COUNCILMEMBER KING: Thank you. I just...while we're on this slide, why was it introduced in 1970? I mean, I know, I was told like the apple snail was introduced 'cause someone though it would be good for escargot, but --

MR. LEARY: Right.

COUNCILMEMBER KING: --why was that introduced?

MR. LEARY: Yeah, I mean, I think the basic answer is, my sense of it is in 1970, the idea of a species being invasive was really not, wasn't part of the lexicon, it wasn't part of the general, it wasn't even really part of the science. There was a few scientists who understood very well exotic introductions and their impact. It really didn't gain traction until the '90s, so, I mean, that's where the history of Miconia is really in many ways the history of invasion biology in a lot of ways globally.

COUNCILMEMBER KING: So, do you think it was like an ornamental?

MR. LEARY: It was definitely an ornamental. It's an attractive plant otherwise. If it was a native species, we'd probably be celebrating it, but it is not and then we also understand, too, and I should say for full disclosure, our concerns beyond its fecundity and its ability to spread to new locations are concerns for its potential to modify the landscape and the functions and those functions that we've identified are watershed functions related to recharge and surface water and also critical habitat for invasive, native endangered species. I won't be able to go too much into that 'cause that's an expert, that's beyond my expertise, but I certainly have a strong appreciation for it. That's why we've decided that Miconia is a problem because of the risk factor associated with we see Miconia growing into monotypic or monotypic stands meaning that's all that grows and its, it can become quite devastating, so those are concerns that we have for Miconia. Okay. So, the Melastome Action Committee then eventually became the Maui Invasive Species Committee in, I believe in '95, I'm not certain on that, but anyways, they evolved into what is now the Maui Invasive Species Committee. It started with Miconia management and the Melastome Action Committee. And so, from 1991 to 2011, we have records, GPS records with timestamp and location information of close to a million plants controlled in that 20-year period. So, what we have on Maui is almost a complete history from when Miconia was introduced to pretty close to today, 2011. I came here in 2009, by the way, and so I was just getting involved and it was well established as a management program when I arrived here, and my interest came with observing a really high end, sophisticated operation of logistics and planning and scheduling and implementation. And you can see where Miconia is growing, where it is established along the coastline and up into the watershed, this is the extent of its spread into the East Maui Watershed. So, I came in, in 2009 and I started to work with them prior to that and into 2012 and this is where we introduced a new technology called herbicide ballistic technology with the concept of...so prior to prior...let me finish this and then I'll give some back story or premise to it. Herbicide ballistic technology is the technology of encapsulating a small amount of herbicide formulation into 68 caliber projectiles, otherwise, paintballs, and these projectiles, these herbicide projectiles have very low dose are able to be delivered from a pneumatic device paintball marker that can effectively and surgically treat individual plants. And so, from a qualitative standpoint, this allowed us to treat plants that were on cliff faces and within effective range of 10 to 20 meters. So, reasonable distance, high level of accuracy, and a very small dispensing of herbicide product directed directly at the plant, so again, I used the term weed-ectomy early on and this is what we would describe as weed-ectomy, being able to find individual plants and treat them individually. Prior to bringing HBT into the picture, they did a

lot of, they've been doing a lot of ground control, most, 90 percent of the points that you saw on the previous map were ground efforts in and around the introduction point. A lot of the further, the more isolated populations were controlled by helicopter with a long line applicator, a 100-foot hose with a spray system on the distal, and so which in its own right is a pretty interesting technology and very functional technology, but with helicopters with that system, they're not able to, they were not able to treat cliff face targets and the other one was if you have helicopter time, you had to make a decision of, are we gonna go and look for plants and record where they're at, or are we gonna put the long line on and treat plants that we have records of that we need to go treat, and so basically, they had to make these decisions on one versus the other. So with HBT what we immediately recognized is we can now treat plants that were otherwise unattainable with the current conventional methods that they were using and what we also determined was we were able to search and eliminate targets in the same amount of helicopter time, so we literally doubled the efficiency of helicopter flight time with the capabilities that HBT offered. So, you know, heading us off at the pass, where HBT really fits is in low density areas, the most remote locations of the watershed where you can search 100 acres of intact forest and find one Miconia plant. That is a highly successful operation. Where HBT fails as an extreme example that doesn't need to be proved is if I was to take this technology into the core infestation and in this room there's 200 plants surrounding me that would be a misuse of the technology. It would be very expensive and a gratuitous use of the herbicide product where it's designed for surgically eliminating these isolated, high-value targets. And when I say high value, we're talking about one plant in critical habitat or in a isolated area where there's no other plants around it and if we allow that plant to reach maturity it's going to reproduce and then impact the surrounding areas. That's what we would consider a high-value plant. And so, with the HBT it was now more justifiable to utilize flight time searching in these remote areas where we had a lack of information or expectation to not find anything, but if we found that one plant, that was a very, there was a, we got a good return on the investment.

COUNCILMEMBER KING: Chair?

CHAIR ATAY: Member King?

COUNCILMEMBER KING: Thank you. I just want to ask these questions while I think of them but...so when you...the technology, if you're going to shoot a plant like that, if you have a plant that's got seeds on it, does that kill all of the viability of the seeds as well or do you have to make sure you have a certain maturity before you use?

MR. LEARY: Yeah, that's a great question. And if I need to repeat it, but I think you're on microphone, but anyways the question is if you're treating a mature plant, will that kill the seed? Not with this herbicide, so no. That means you were late to the party. You'll eliminate that mature plant, but that gets recorded as mature and that tells us we should expect young new recruits coming up afterwards.

COUNCILMEMBER KING: Right. So, if you, do you take the plant away or...I mean 'cause if you just kill it and leave it there, then the seeds are still viable, right, so they're just gonna drop on the ground, you're gonna...

MR. LEARY: That is correct. There's nothing we can do about that other than we have knowledge that mature plant has probably impacted the watershed for the future. We'll talk about how we model that to interpret. And so, and to your point, the modus operandi, if you will, is never to allow an immature plant to reach maturity, which means that you need to kill every Miconia plant within four years. That's a...it's daunting.

COUNCILMEMBER KING: Right.

MR. LEARY: And that's the reality of Miconia management. It's not inconceivable and it's not impossible but with that knowledge we also know, like, you got to stay on top of it, because when you see that mature plant there's a, it's what we call future costs. So, every immature plant we kill or eliminate, we prevent that from reaching maturity that's what we call voided, avoiding future cost, and so this is what we'll talk about is the cost to control Miconia and the return on that investment is we avoided future cost with the number of progeny that would've been produced otherwise. So, that's a very good question and unfortunately, the answer is we don't have a herbicide that would go systemic and then kill off all the seed too. The only way of controlling, preventing that is controlling it before it reaches maturity. That is the only way that I am familiar with Miconia specifically and most plants for that matter.

CHAIR ATAY: Dr. Leary?

MR. LEARY: Yes, sir?

CHAIR ATAY: What's the name of the herbicide?

MR. LEARY: The herbicide is...so HBT-G4U200 is a registered product. The active ingredient in that product is triclopyr, and it's from the registered product of Garlon® 4 Ultra and I have the label as part of this talk. In fact, it might be the next one. Yeah, right here.

CHAIR ATAY: Okay. All right.

MR. LEARY: So, the product...to be able to utilize HBT, we had to develop protocol for demonstrating efficacy of a registered product. The registered product is Garlon® 4 Ultra. The novelty was encapsulating the G4U into the projectile, so that we could dispense it onto individual plants in these remote areas. We could...before that, we could legally apply it anyways, but this was a new, a novel system that had to go through scrutiny and vetting with the Department of Agriculture and the Environmental Protection Agency and this was probably about three or four years of experimentation and another two years of registration with those agencies. And so, in 2012, we got what's called a FIFRA 24(c) registration, which is a special local need

registration. It's a technology developed in Hawaii for Hawaii. We recognize the utility and the fit and work with the Hawaii Department of Agriculture to see this become registered and legal for use. So, we immediately identified that it was, it's best fit was in, was for in concert with conducting surveillance operations with helicopter. So, here we have a basic helicopter operation with pilot and applicator seated port side on a Hughes 500 aircraft and a navigator would be on the other side, and so 99 percent of the effort is spent looking for Miconia plants and the remaining 1 percent is spent treating those individual plants and that's the basic operation. I can't hide the fun factor, but I do want to make sure that it's well understood that it's a very serious operation and it's our intent to utilize this tool in a very discretionary manner. We really hang our hat on being very surgical in our approach, treating only the plants that need to be eliminated, and with the right amount of dose to administer an effective and lethal application. Some other points...no, moving forward. Surveillance is conducted in utility flights, meaning you don't have a floor. Tour copters have to fly 1,000 feet above ground, we're flying closer to 100 feet above ground so that we're within visual detection range of Miconia. The terrain is very extreme. I didn't premise it very well, but you should know that as risky, as difficult as it is to manage Miconia because of the biology, it's really the landscape of the East Maui Watershed that's just as difficult. Ninety-nine percent of the landscape of the East Maui Watershed is not accessible by ground. It requires the helicopter. We can only access where it was introduced originally in the area where they had a nursery established, but beyond that is very difficult to access, very slow, and very dangerous, and so the helicopter is indispensable in operations if we're going to comprehensively manage all of the Miconia in the most remote locations of the watershed. So, our operations are low and slow, we're flying at or above, at or below, 100 feet above ground and we're flying in about 5 to 10 knots. It's basically like riding in an elevator, very stable platform, and a really engaging process. We get about 80 or 90 minutes out of a fuel cycle and our, so our scan rate, and I'm getting a little technical here, but it's about ½ to 1 second per pixel, which is a ten by ten meter. This room is about one pixel size, but it's good for referencing as we start to analyze the data of how much effort it takes to look for Miconia in this room. We spend about a ½ to 1 second, again, think about 100 feet up and you're looking down and you're scanning the location, that's about how much time it takes, and in this case we'll demonstrate how time is money.

COUNCILMEMBER KING: What is the green section?

MR. LEARY: The green section, sorry, the green section is part of the East Maui Watershed.

COUNCILMEMBER KING: Oh.

MR. LEARY: Outside of that is not, so we have some operations falling below that. I'm sorry, do you guys mind if I pull my chair out? My one leg is starting to fall asleep.

CHAIR ATAY: Go ahead.

MR. LEARY: Thank you. Okay. So, in this example or in this presentation this is a GIS layer or geographical information systems. Using GPS we record our track lines.

Typically, every one to five seconds we're recording a point of where we searched and the yellow points indicating where we treated Miconia, so very accurate records of work accomplished. And again, the impressive part is GPS is, you know, really only came to, you know, be used in the 2000s but, gosh, man, they were using GPS back at the start. Our earliest recorded Miconia is 1991, so really impressive how they adapted the technology early on or adopted, sorry, and it's very, it's necessary in today's efforts to man, to analyze performance of our operations. So, you'll recall the previous map image of treatment of a hundred or a million plants or close to from '91 to 2011. HBT operations commencing in 2012 to today, that's a seven-year period and in that time, we've treated 25,956, those are the yellow points. And what you'll notice is how we've utilized HBT aerial operations focusing on the more remote areas of the East Maui Watershed, and more so today in the upper elevations. We're really striving for controlling these. So, some of these purple points, our older points, we've visited those areas and not found Miconia for instance, so but we're really trying to focus our limited resources looking for what we would call the highest value targets, the most remote areas of the landscape. It's also...anyways, that's the intent for how we deploy HBT in a very discretionary manner and very strategic manner. I guess, I should point out too just for reference that those blue lines there those are, that's the flume system, that's a map layer, and I want you to notice as we move further into the talk the flume system with, from Kano Falls to Hanawi, that runs the 1,300-foot contour, and that's gonna be a pretty important, let's call it the line in the sand, for now, but basically what we should acknowledge or recognize, I'm not a hydrologist, but below, but above that flume system those are the drainage basins, what I've referred to as the mauka drainage basins, that would be the source of water that's going to feed that flume system and would support Central Maui, whatever that is for agricultural enterprise or residential use. I'm not certain how the water's used, but if we were to access fresh water from East Maui, a lot of that would come from there otherwise from Waikamoi and others, so just making that reference. Below that flume system, obviously, unless water can grow legs and climb uphill, is probably not accessible that flume system. So, already we can prioritize the watershed based on the functionality and accessibility of those resources from, for our personal needs. So, we have over 157 operations conducted in that seven-year period upwards of in excessive of 500 hours of helicopter flight time have gone into HBT operations, and so this has allowed us to calibrate performance of the operation. These are scatter plots, these are points that are graphed out and you'll see it has an X and a Y axis. And on the X-axis for both graphs, you have targets per hectare. Hectare is a metric unit of area. And one hectare is about 2½ acres. And so, targets per hectare is basically target density from high, from low to high, from zero up to eight targets per hectare, which will be fairly high but consider the core infestation in Hana to be in the hundreds of targets per hectare, for instance. HBT operations are, have never exceeded ten targets per hectare, for instance. We're purposely and discreetly going for low-density areas, remote locations searching for individuals. Let's start with the graph on the left. We have seconds per hectare, which I would call search effort. The amount of flight time spent scanning a location as it relates to target density. What it shows is a strong linear fit and that linear fit has an equation of where it has the Y-intercept and the slope, if we remember our basic trig, and so that linear fit tells us quite a bit about our operations. One, it says is when we don't find any targets, we're spending on average

83 seconds of helicopter flight time searching one hectare, so that's based on our speed and how we calculate how far out we're seeing, 83 seconds on the average when we conduct operations. And there's some fluctuation based on the scatter of the points, but it's a pretty strong fit and...so I should've premised this, helicopter flight time is $1,200 an hour or 25 cents a second, no, 30 cents a second, so every second counts. Eighty-three seconds is equal to $24.90 a hectare. That's what we're...that's what it costs to search by helicopter in these very remote locations. Search effort as it relates to finding and not finding Miconia, in my book, is considered protection of that watershed. We can't say there's no Miconia in there unless you go and look for it. You can't cheat and say, well, we never looked but we don't think there's any out there. You have to dedicate the resources to prove it statistically. We search the area, we didn't find Miconia, what's next? You know, how much and how much did that cost? So, the cost of protection as it relates to searching and not finding is the lowest cost price point for Miconia protection of the watershed. That's what we strive for. We can fly all day and not find Miconia and it'll be a worthy investment, as an opinion. Yes, ma'am?

CHAIR ATAY: Member King?

COUNCILMEMBER KING: Thank you. This is really impressive. I think how you've been able to quantify this. The one thing that I think I didn't hear and I apologize if you've said it but is, can you talk about exactly what Miconia, how Miconia is a danger to the watershed? 'Cause, you know, you talked about how it's invasive and --

MR. LEARY: Yeah.

COUNCILMEMBER KING: --we all know it doesn't belong here. But exactly what does it do that causes harm to the watershed?

MR. LEARY: Sure. I think it's a good question and I have the same questions as you in some cases but let me at least try to articulate what I understand from the literature as we start to understand more about the impacts that Miconia has. So, it can grow into what we would call monocultures, where it will exclude all other vegetation types. I've seen it happen on the Big Island. It's most definitely, it's most extreme example was on in Tahiti where it was a solid wall of Miconia. And in the case of Tahiti, they wanted...the one case example was solid Miconia on a steep slope of Tahiti and resulting in a cataclysmic event where all the vegetation and top soil sluffed [*sic*] off and left this massive scar in that ecosystem and I'm not certain what the recovery was, but I've seen enough scars in West Maui and my assumption is slow to impossible recovery. It never comes back. If not, more Miconia comes back. So, it's very exclusive and aggressive as a vegetation community, so it's going to start to exclude and out compete native vegetations impacting critical habitat. I think that's the most reliable understanding that we have. As far as watershed function, we are wanting to learn more about its evapotranspiration rates. It grows faster than other vegetation, so it probably has a higher ET, which is translates into high ET is less water going, recharging the water table. So, if all you have is this high ET canopy, that's, that is affecting the recharge quality of the watershed. We also understand

because it has really large leaves that water that coalesces from the leaf and drops has a really strong kinetic potential that it creates erosion underneath the canopy. And so, you'll see often in really dense Miconia patches, exposed roots, and with subsoil included and so and that probably contributes to why other vegetation aren't able to survive. While so we know with Miconia very top heavy canopy and really shallow root systems, which probably contributes to the erosion potential. So, I think what we're, what we can find out and what we need to know more about is the erosion potential in the watershed, if what kind of scarring could result from monotypic stands of Miconia, which are starting to form on Maui, definitely has an impact on critical habitat. I'm uncomfortable with translating number of Miconia equals less gallons of water. I mean, that would be...it's not impossible, but, boy, that's a major investment to come up with a real answer. Anyone can make up numbers, I guess, but...

COUNCILMEMBER KING: No, I understand that. And I'm just trying to correlate some kind of a value, like ROI on, you know, the money that's being spent --

MR. LEARY: That's right.

COUNCILMEMBER KING: --and the amount of damage that we're preventing with that, so that we can, you know, maybe even justify higher levels of funding for this kind of work.

MR. LEARY: Right. Right. There's some uncertainty, but I think what we understand is it's going to increase erosion potential of the landscape. It's an unstable canopy relative to more diverse communities mixed with native vegetation, and it has a direct impact on critical habitat maintenance. So, those are the two areas of concern so far, but more work needs to be done. We should never stop studying the potential impacts of Miconia. So, we understand...but to your to...one final point in terms of ROI what we're...what I comfortable with talking about is if I eliminate one Miconia plant I'm going to demonstrate how we avoid having to control hundreds of new Miconia plants at the same price point. So, that's the translation so far but it's a work in progress. So, what we know with search efforts as target density increases without finding Miconia, we can cover that area, one hectare in 83 seconds. The slope, it says, 39.58 seconds per X, which means that every time we find a Miconia plant, it takes 40 seconds of helicopter time to engage the target, get within effective range, treat it, and then record that information. Well, that's real time and that's real money. And it's fairly...it's a pretty strong slope and so that slope has a factor on the cost per target, which by the way is $20.71. The cost of target is two things, flight time to engage the target and the amount of herbicide to treat that target. So, on our right we have on the Y-axis, grams asset equivalent per hectare. It's grams asset equivalent as the active ingredient, the amount of active ingredient treating the area covered. Again, we're treating individual plants but those individual plants are occupying space. So, as target density increase we have a much stronger linear fit and shows the Y-intercept of obviously if there's no targets in the area we're not using any herbicide. For every target that is found in an area, our slope says that we're administering 4.27 grams asset equivalent per hectare, which is equivalent to, so every projectile has 200 milligrams of triclopyr, so that's on average 22 projectiles per target. Target size

matters. Bigger plants require higher doses. Treatment is you're treating portions of the canopy. So, small ones that are within one meter, you can treat with one or two projectiles and that's a lethal dose. Something that is ten meters tall and has five or six branching points, that requires a higher dose. Most of the plants that we are treating are medium-size class, small to medium, and it takes about 22 projectiles. By design, I always get the question of, like, well, why don't you just increase the dose on the projectile and you can use less? Here's why, I want to try to have control over the treatment and when you start working with higher dosage, then you are, you're unable to distribute more uniformly on the target and you're applying more herbicide than necessary. You have better control over your dose when you're administering with sub-lethal doses. If you're starting off with a one shot one kill, well, you only got one shot to get it right. So, the potential for collateral injury and other factors come into play, so we've by design purposely reduced the amount, very sub-lethal amount where our lethal rates are approximately 22 projectiles depending on the size class. So, that's what we're working with as a technology. Moving forward, this is the same graph, but I put it on a different Y scale. So, here I go from 0 to 40 grams asset equivalent and then I double it to 70. I wanted to make...so in the label, it says we can use up to seven or six pounds of active ingredient per acre, which is equivalent to approximately 7,000 grams per hectare as a translation. The R use rates of HBT are on the don't exceed...sorry, I'm saying this backwards. That red dash at the top, that is equivalent to 1 percent of the allowable use rate. Our maximum use we've calculated so far is less than half of 1 percent. Most of them are in this bottom corner, typically we're treating one to two targets per hectare and/or less, and so our use rates are a tenth of...we're one thousandth percent less the, than the maximum allowable use rate and that's really by design. I can max out if I take some paintball guns into the core infestation and blast everything in sight. So, we can exceed the maximum rate, but by design what we're really trying to go after are those isolated individuals in remote locations, and so we can control our use rate based on how we strategize our approach to what we want to eliminate, in this case, going after high-value targets. It's cheating in a way, but that's, again, that's what we're trying to achieve. Okay, let's see if I can explain this. This is where it gets real fun. So, these are probability distribution functions. So, okay, let me start with this, so we have a million target points recorded and they each have spatial location. We know where they were located, and we know when they were treated. So, we have a space and time element to each one of those points. We know that we have 9,000 recorded mature points out of the million more immature points. So, we conducted in geographical information systems analysis what's called a near analysis. So, where for every immature point, we assign it to the closest mature point saying that that's the progeny of that mature point. That distance measurement was calculated and so of the million immature points assigned to those 9,000 points they were assigned a distance range and that distance range on this probability function, so on the left we have dispersal range. What we see on here is it's a really strong sharp peak which says that most of the immature points are probably falling off the tree and then recruiting around that maternal source. And in fact, 50 percent of them fall within 100 meters. Ninety-nine percent of all the immature points are within 600 meters. And then you have the remaining 1 percent of those plants from, recruiting out from 600 meters to 1,600 meters, that's 1 percent. It's not very many and if this is a dioecious plant

where you had pollination between male and female plants that would probably be inconsequential and not risky. But here's what we're dealing with, we're dealing with a self-fertile plant and all those plants near the mother source are gonna, will reach maturity just as well as the ones out there. This plant out at 1,600 meters is going to reach maturity and is, presents even more impact than the ones where you already have a bunch of Miconia anyways. This 1 percent is the ones we're really concerned about. Like I said, if this was a dioecious plant it wouldn't be a big deal because it probably wouldn't have another cohort to pollinate with, but these are the high risk, high-value targets that we're really trying to focus on and where we really get a good return on investment with HBT operations. They're in areas that are otherwise inaccessible anyways. Now, we also have a timestamp, and there's a time difference between when the mature plant was treated and when that assigned immature plant was treated and what we show is that, what do we say, 90 percent of recruitment after mature plant was eliminated occurs within ten years. So, here we have 90 percent of recruitment completed within ten years, so at the very least we have a very strong recruitment response in the first decade after you found a mature plant. When we find a mature plant, you said what do you do now? Now we know, well, there's gonna be some recruitment action going on and we got a decade window when 90 percent of them are going to realize themselves, we'll find them and eliminate them, so we're already committed to we want eliminate 90 percent of them it's gonna be ten years of work. At year 20, we've only achieved up to 99 percent of and it's ongoing because we only have data out to 20 years. So, but it gives us a really strong confidence of if we can at the, to the best of our ability be able to assign the time difference between when we found a recruit and when the nearest mature plant occurred that tells us, like, how far along are we in exhausting this seed bank. If we're finding recruits one year after we kill the mature plant, we got a long road to ho. If we're at year 20 or 25, we're starting to see those numbers, and so this really pays into where are we at on the management. This is still pretty new to us and so this is work in progress, but we now have a pretty good understanding of spatial impact on the landscape when a mature plant is setting new seed and dispersing propagules and how long you're gonna be obligated to management if you find that mature plant. So, if we find a mature plant today, we can assume, we can estimate early maturity producing say hundreds of propagules, 1,600 meters is equivalent to and maybe it is...here we go, 1,600 meters, so, you know, now we put it on a two-dimensional platform and as a map layer, 1,600 meters equal 841 hectares which is equal to 2,000 acres of real estate potentially impacted by 1 plant. We're talking about a 150,000-acre of watershed. So, I mean, you do the quick math and we literally would only need 20 mature Miconia plants evenly distributed to impact the entire watershed. It's crazy. But that's...based on our numbers, this is what we're realizing. Now impact is a relative term, but, you know, the best I can derive it is if there's Miconia occupying this space impact is occurring and that's how we see it. So, 99 percent of it is within 600 meters and 1 percent of them are between 600 and 1,600 meters. So, we calibrated the cost. The cost per target was $20.41 or, wait, it's $24.90 per hectare to search that area, to find or not find Miconia equal in measure in terms of level of protection, and $20.71 for every target we found, which is the cost of the herbicide at 30 cents per projectile and 40 seconds of flight time. So, for instance, if we get a dispersal kernel of a new mature plant that produces in our estimations we started with 320 propagules we can

establish densities from 0 where it cost 42 cents to search a pixel area, the size of this room, it would cost us 42 cents in helicopter time to say there's no Miconia in this area today. The highest densities are gonna be over $300 to control all the Miconia in this pixel area. So, it's a very strong linear fit that's based on those numbers I showed you previously. So, now the space and time elements that are displayed now have, are being monetized where we can create an economic layer of cost of operations, or variable cost of operations to get in a helicopter, go look for Miconia, and treat those Miconia. We have a pretty good...we at least have a good way at estimating the cost factors based on previous knowledge of where mature Miconia have been found, how many Miconia have been eliminated already, and how many we might expect in the future.

CHAIR ATAY: Dr. Leary?

MR. LEARY: Yes, sir?

CHAIR ATAY: Are you nearing the conclusion of your slideshow? It's been approaching an hour.

MR. LEARY: I am. Yes.

CHAIR ATAY: Okay. 'Cause I'd like to allow the Members opportunity to question.

MR. LEARY: Yes, sir. I can be done in five minutes.

CHAIR ATAY: Okay.

MR. LEARY: I think. I'll do the best I can. Okay. So, but point I want to make here, though, the really important point is so the most expensive pixels are going to be the ones with the highest density. We understand that, but 90 percent of your total cost...so, the cost to manage this entire area, which is 2,000 acres, just for one Miconia plant is $42,000. That's what we estimated. The flight time the cost to kill all 320 plants and the flight time dedicated to searching the entire 2,000 acres. So, $42,000, so for every immature plant eliminated before it reaches maturity the return on investment according to our estimations and our current calculations is $42,000 in return. Ninety percent of the cost...I'm sorry, 75 percent of the total cost is spent looking for those 1 percent. It's mostly helicopter time searching and not finding, but it has to be done. Again, like I said, you can't say, well, we didn't go out there, but we don't think there's anything out there. It's that one that you'll miss is what's gonna bite you in the end. So, remember this number for this exercise, $42,000 avoiding, cost avoided, and on the flip side if it reaches maturity, hello, you just made a $42,000 purchase for the next 25 years of managing these 2,000 acres. Moving on. Okay. So, what did we accomplish from 2012 to 2018? We've invested $800,000. A major portion of it contributed by the, this program but also the Hawaii Invasive Species Committee and the National Park Service, conducting 157 HBT operations as we stated we eliminated 25, 26,000 Miconia targets. Based on that spatial calculations, by eliminating those that many immature plants we have protected 17, over 17,000

hectares of watershed and I had triple checked this 'cause I can't believe it, but 25,000 targets, if we allowed all 25,000, 26,000 of those targets to reach maturity, add a compounding $40,000 for every one of those that's $1.1 billon of future cost to manage those progeny. That's a huge risk. That's within a five-year, six-year period. So, that's what we're talking about the risk factor allowing one immature plant to reach maturity. The cost associated with eliminating those future progeny is astronomical. So, that's what we've accomplished. We've saved you 1.1 billion. All right. Sounds nice. What did we not do? Well, with the same operations, we found and recorded 294 mature plants that are impacting 14,670 hectares. It's almost a perfect fit to what we protected. So, we're protecting...we protected this much and we created new impact doing this much because we found mature plants...we couldn't find them before they reached maturity. So, we've added impact based on our efforts. We've...there's a breach in the system. We added a minimum with the same calculations, 12.2 million in future management cost to go after all those new progeny that have been added to the seed bank. We were 98.9 percent effective. There was...the number of mature plants was less than 2 percent of all the plants treated in this area. So, what does that mean moving forward? Well, management to achieve containment, if we were to try to contain the entirety of the invasion within the East Maui Watershed here's what we found is of the impacted area the 15,000 hectares, only 12 percent of the area was actively searched with the 500 hours of helicopter flight time, meaning we're not doing enough reconnaissance, meaning we're not searching areas...there's a lot of area where we have no information on it. We just cannot fly enough to cover these areas. So, we've only achieved 12 percent coverage. Here's some other interesting points that we've identified. In reconnaissance, so for every year that we've recorded where we've gone in to new locations, over 50 percent of the mature plants are found in reconnaissance operations where it's the first time going in and being surprised by where did this plant come from and, oh, man, it's got fruit. That's what we're experiencing. Over half of the mature plants are in these operations and it speaks to the fact that we're not covering enough of the areas where there's new dispersal events occurring. The other one is where we're finding immature and mature plants, known target locations, what we call surveillance of known target locations search effort. What we're finding is in areas where we can search every 90 days this is where we're finding immature plants. Mature plants are found when we're decelerating and the interval between visits is extended to 180 days, which means that we need to double the effort to be able to achieve preventing maturity of immature plants according to these numbers. So, when I calculate the entire area though that 15,000 hectares, we need to add 826 hours of reconnaissance based on that scan rate, half second per pixel the size of this room. We need 826 hours of reconnaissance to establish 99 percent confidence that there are no Miconia in these locations and to be able to find where Miconia is fairly comprehensive and 672 hours of search in the next four years. Four years meaning like if new plants are going to reach maturity in the next four years, for instance. That's a fourfold acceleration from our current management operations. This is for complete comprehensive containment of the invasion, nothing to do with the eradicating the core infestation also by the way, but it is a significant commitment to really downsizing and reducing the impact of Miconia long-term. You know, based on our understanding on the cost of operations that's about 1.8 million in helicopter operations to achieve that goal in the next four years.

So, that's, you know, and you know what, if you assign me to, can you go back to those numbers and come back next month, I might come up with something different but we're in the ballpark. This is an evolving process but we're getting smarter about how we can monetize our operations and our understanding of the biology of the plant I think is really going to help us dictate. This is what we would have to strongly consider as a proposal if we were going to commit to a full comprehensive containment of the infestation. And I'm pretty much out of time, but I should've probably done this first but this is what I'm focusing on the proposal. What if we were to instead if we're working with limited resources, we're now talking about prioritizing our assets, which is we got to with the amount of resource we have where can we get the best return on our investment. Well, we do know what we should all be comfortable with is if we're limited resources if we spread ourselves out too thin you're not going to accomplish anything. It'll be a failure across the board. So, if you take those same resources and confine it to and prioritize where you want to protect the most, this is where I would consider this is one of several options but for the DWS what would, might be considered is the upper mauka drainage basins above the flume system between Kano Falls, Honomanu, and Hanawi. And this, for instance, is from 1,300 feet to 2,500, that's, there's some arbitrary estimations and we're also working on suitable habitat models to determine where Miconia actually would grow and that's in the works but I'm not able to present that today but next year we're gonna have numbers with that. This is the history of Miconia management and you can see within that priority area yellow points that are representing about 2 percent of all the Miconia plants we've treated so it's a lower density area. We don't know how many are out there now, but it would be comparable to what we've found in the past. I should mention that 31 of those, 6 percent of those, were mature, and this is between '98 and 2018. So, this is a 20-year period of these Miconia points recorded. Most of them in and around the flume system. I suspect that the flume may in fact actually contributed and continues the contribute to movement of Miconia and that's what we call a stochastic event. And so, it's not surprising that we'd see Miconia congregating around that flume system. Any upslope movement we're assuming to be from bird activity. Wrapping this up, search effort, we've only searched 200 hectares of this 29 or 3,000-hectare area. And so, using a comparable measure what I've estimated so far is to cover this entire area and to get a complete assessment that includes eliminating Miconia found it would take about 166 hours of recon, 20 hours of search effort over the next 4 years, at about $223,000 to cover this 3,000-hectare area. Review of concepts really fast, knowledge of phenology when it sets seed, and when it reaches maturity. Fecundity dispersal, the biology of Miconia and how it is...it can enhance our capacity to measure the impact on the landscape and project long-term strategies. The HBT platform encourages greater investment in surveillance with opportunities to eliminate incipient target populations in real-time. Now, I have to record it and be like, okay, we'll go back and get the long line, no let's do it now, man, we got it, we're in the aircraft. Miconia is beginning to saturate major portions of its suitable habitat. And so, I'm not here to present to you an eradication strategy today. That's...we don't have the budget for it and I wouldn't ask for it. With that in mind, protection of priority watershed assets, we need to go through that process. What are the priorities in the watershed, physically, spatially, so that we can start to look at the resources available now and in the future and get the best return on investment. Is it going to be a

comprehensive containment strategy? We can calculate that number or we can also calculate a number of a lesser amount protecting greater value areas. It's a moving target, and I am one opinion of tens. But protection of priority watershed assets appear to be the most cost-effective option, but they do have substantial trade-offs. When you divest in other areas, your chances of going back and recovering them become astronomically expensive. When you commit to no longer investing in certain areas, you may never get to go back to that. It may be cost prohibitive and, obviously, ecologically damaging. Partners that are involved in this, the Nelson Paint Company and Dow AgroSciences facilitating the development and the registration of the technology used. The ISCs are critical partners and here it's the Maui Invasive Species Committee. UHERO, the economic research organization of the University of Hawaii, having research economists on this team is invaluable. Being able to monetize what we do and what Miconia does is really important and I think will pay dividends to this grants program. National Parks Service as well, they actually invested heavily from 2000 to 2006 and then started to divest from then on. They're almost a non-player now, but they made major investments in the early 2000s and the reason that's important is you guys are it. The County of Maui and the State of Hawaii are the two major investors in controlling Miconia in the Maui, East Maui Watershed. That's not a good thing or a bad thing, it's just a thing. You guys are major investors in protecting this watershed and you need to know that the Federal government did at one point put a lot into it. How do we get them back in the game? I'm not certain of that. And also research, support for this research from the Forest Service, the Hawaii Invasive Species Council and from you guys which I really appreciate. So, with that, I went way overtime and you were warned. You shouldn't give me that amount of flexibility. But thank you all for your attention. I appreciate it.

. . . END PRESENTATION . . .

CHAIR ATAY: Thank you very much, Dr. Leary. Definitely thank you very much for the passion that you bring with the connection of science and the bioeconomics of this problem that we're dealing with, most importantly this invasive species that we are calling Miconia. Members, --

COUNCILMEMBER CARROLL: Chair?

CHAIR ATAY: --a lengthy presentation, do you guys want to...Member Carroll?

COUNCILMEMBER CARROLL: Thank you, Chair. Talking about looking to the future about what we have up there too, it really seems like a waste not expanding your mapping over there to cover other things that are coming up 'cause it can be done at the same time. Banana pokas, there's three different types of vines out there. If you go by ____ Park now, you will see whole sections where everything is gonna die, it's completely covered.

MR. LEARY: Yeah.

COUNCILMEMBER CARROLL: There's nothing that will survive. And it would seem like since you are doing that, it would be possible to go over there and identify the things that are really gonna give us problems in the future. And also, we're having a really big explosion of African tulips. If you go Hana Airport and then you go toward Hana you look on the right under the Maui Electric line, you'll see this solid African tulips, each one is about three feet apart. They're about maybe eight feet tall now. They choke out everything, just like Miconia. Nothing grows underneath. If we can start...and they've reached a critical mass already along Hana Highway and it's moving up and those are really hard to kill. They're harder to kill than Miconia.

MR. LEARY: Right.

COUNCILMEMBER CARROLL: So, if we could have some part of your program that would identify these species that we know are going to give us severe problems in the future. And at least even if you can't take care of them right now, at least you can map 'em out and we can get an idea of how severe it is. I would...I think that would be really appreciated.

MR. LEARY: I a hundred percent agree. On couple of fronts, we're not doing enough mapping of our watershed. It's...the technology available today that was not available, gosh, even five years ago, is amazing and underutilized, the technology available to...well, there's different ways to do it but looking at artificial intelligence and the computing power to be able to scan the landscape remotely whether it's by satellite or by helicopter and then using what would be called signature features, whether it's a spectral feature or a shape feature that identifies those individual species and then articulating where they're located. That is the future of landscape management with remote sensing is what it would be called. We made really great strides in particular with unmanned aerial systems, those are going to come into play. Those have limitations currently, technologically. They're limited by how far out they can get. They can't really get to our most remote areas. But I think your other point is at $1,200 an hour for a helicopter, it seems like we could figure out how to really maximize that investment and by adding...we can't generate enough data. We're data hogs about it and right now, we're only collecting data on Miconia. So, to your point, if we can become more comprehensive on the landscape level of calculating all of the species out there that are impacting. Yeah, we know it's not, that Miconia is not the only beast in the forest. There's to your point, African tulips, there's Kahili ginger is and other big problem, bamboo is all over the place, you name it. Strawberry guava is another big one. More of a problem on the west side but it's all over on East Maui. We got a lot of problems, and but I think also too, sorry, but this is where we kind of need to also decide mauka or makai of the flume system. What's more valuable? We need a process to evaluate the watershed based on the function and structure of it and the impacts that invasive species has on those landscapes.

COUNCILMEMBER CARROLL: Can I continue?

CHAIR ATAY: Member Carroll?

COUNCILMEMBER CARROLL: Is there any air coverage and occasionally going below the road where the main infestation is? Because they did that before and a couple of times the helicopter would go over and they found, I mean, almost literally forest here and there of mature plants.

MR. LEARY: Yes.

COUNCILMEMBER CARROLL: And going on the ground crew, they can't find them. I mean, it's just, it's almost impossible for them to really locate these really, really bad infestations. So are...

MR. LEARY: Right.

COUNCILMEMBER CARROLL: So, is that being done too?

MR. LEARY: So, yeah, it has and to your...and to address that, let me get my thoughts on this. So, to your point, you don't have to go too far off Hana Highway to encounter a situation where you can't send ground crews. There's some pretty sheer terrain you're confronted with in many examples. Limitations of helicopters largely involve residential areas, it's kapu to fly in and around houses, mostly noise signature. You're gonna get a call from the neighbor if you're doing that and so discretion is needed for utilizing helicopters in and around residential areas. Nahiku is a really challenging location because it's intermixed with property, residential properties, and so that's a limitation. So, anything below the highway is where you'll find a lot of the neighborhoods and residential locations. The other condition is based on what the numbers are telling me is we've had to retreat somewhat on, from, you know, I described comprehensive containment, which is a bigger approach to the problem, which gives you the better result but at a great expense versus asset protection in the case of flying in more remote locations. It's a give and take and the fact of the matter is if we were to focus on the lower areas that are already heavily impacted, we don't get a very good return on that investment.

COUNCILMEMBER CARROLL: What I was really getting at was not particularly spending time on the lower portion over there, more just identifying the areas for the ground crews --

MR. LEARY: Yes.

COUNCILMEMBER CARROLL: --to where they could go, and that you can go at a greater height and you don't have as much problem with the noise and everything else.

MR. LEARY: Oh, I see your point.

COUNCILMEMBER CARROLL: And that's...yeah, because the ground crews are a rock and a hard place, they can walk 100 yards away from a massive infestation and they're not gonna know about it.

MR. LEARY: That's right. Yeah.

COUNCILMEMBER CARROLL: And we've had that problem in lower Nahiku where they found one that was really, really established.

MR. LEARY: That's right. Yeah, they need better intelligence and mapping products for preparing their ground operations for sure. And I should state and I didn't say it very clearly, the role that ground operations have is equivalent or exceeds the role that aerial operations have. They really have to coincide with limiting overlap. You need them to match up. There's certain areas where ground crews are much more effective, especially the core infestation and along the highway, which is another important feature of the Miconia management plan as a comprehensive plan. So, yes, and so helicopters, yes, but what I would suggest is what we really should focus on or what I've encouraged the MISC and others is I think we really need to train our ground crews to become unmanned aerial pilots, learn how to fly quad copters and collect their own data and use that technology for reconnaissance work so that they can make better decisions in the field, and we can accomplish that through education and training. So, I think, you know, integrating UAS technologies into ground operations could really change the game with how they invest their efforts in the field so they limit searching and not finding and but having something right next to them and not realizing it.

COUNCILMEMBER CARROLL: Okay. I don't really want to take away from the containment 'cause the containment is so important what you're doing and keeping it from going more up.

MR. LEARY: Yeah.

COUNCILMEMBER CARROLL: But until we can, you're never going to succeed unless we can get the base population that's below the road down --

MR. LEARY: That's correct.

COUNCILMEMBER CARROLL: --or else it's gonna keep coming up.

MR. LEARY: That's correct. It's always going to keep moving. And I mentioned, you know, the opportunity cost. If all you're doing is managing these unique locations, it's at the expense of allowing everything else to continue to grow and expand and it's always going to be a problem.

COUNCILMEMBER CARROLL: Well, if nothing else I would hope you could expand your when you're looking for that we can add like the different invasive species that are damaging the watershed and could expand the mapping of that and get more of an idea of what needs to be done because we're never gonna be able to get funding unless we can identify it. Thank you, Chair.

CHAIR ATAY: Yeah, I think that's a good point, Member Carroll, and I think that's good for the Department to take note and when we push out the next grant RFPs to also include, be inclusive of all of these invasives. I want to recognize Member Elle Cochran here.

VICE-CHAIR COCHRAN: Yeah, good morning. Thank you, Chair.

CHAIR ATAY: Is that all, Member Carroll?

COUNCILMEMBER CARROLL: Yes.

CHAIR ATAY: Member King, you had questions?

COUNCILMEMBER KING: Yeah, thank you. And that was one of my questions was...one of my comments was gonna be we've heard...this is not the first time we've heard about this ballistic technology because we've had some other presentations so coordinating those so that the helicopter time can be used for more than one invasive species and that'd be a way to cover more ground to develop that data. One of the things that I wasn't clear on and I've seen Miconia, but the picture that you showed earlier was the seed, the pink?

MR. LEARY: Yes.

COUNCILMEMBER KING: Okay, so what is the fruit versus the seed, is that...

MR. LEARY: Oh.

COUNCILMEMBER KING: I haven't seen a picture of what the actual fruit is.

MR. LEARY: Let me pan back here.

COUNCILMEMBER KING: And one of the reasons why I ask that is because these are all seeds, correct?

MR. LEARY: These are all fruit.

COUNCILMEMBER KING: Oh, these are all fruit.

MR. LEARY: These are the fruit --

COUNCILMEMBER KING: Okay.

MR. LEARY: --and the seed are inside the fruit, if I had a laser pointer.

COUNCILMEMBER KING: Okay.

MR. LEARY: Each one of those fruit, again, they're only, that's like --

COUNCILMEMBER KING: Okay.

MR. LEARY: --true to size. They're about six millimeters. They're really tiny.

COUNCILMEMBER KING: Okay. So they're tiny. Okay. Yeah.

MR. LEARY: They have 200 seed in each of those fruit, so all of those...you're looking at hundreds of fruit which translates into--

COUNCILMEMBER KING: Right. Okay. So...

MR. LEARY: --hundreds of thousands.

COUNCILMEMBER KING: Yeah, so what, because what my question was gonna be is if you're going to eradicate it in the way they did it, I guess, manually when they first did this in 19...what was it? Nineteen --

MR. LEARY: Nineties.

COUNCILMEMBER KING: --ninety.

MR. LEARY: Yeah.

COUNCILMEMBER KING: How did they...what did they do? Did they burn them then? I mean, how do you get rid of that seed since it's so viable? Because I've, I was looking at gorse like 10-15 years ago and it has the same issue where you can't even walk ten feet if, you drop one seed you're gonna propagate all these plants. So --

MR. LEARY: Right.

COUNCILMEMBER KING: --the only way to deal with it was to burn it.

MR. LEARY: Yeah. They have...well, I just don't have a good economical solution to that. I mean, it, you know, theoretically, you know, obviously, if you could eliminate, again, the best approach is to eliminate immatures before reaching maturity.

COUNCILMEMBER KING: Right.

MR. LEARY: But you understand that and that's not what you're asking.

COUNCILMEMBER KING: But you're dealing with mature...you were talking about dealing with mature plants and you're --

MR. LEARY: Yes.

COUNCILMEMBER KING: --targeting mature plants so --

MR. LEARY: That's right.

COUNCILMEMBER KING: --and then all the seed drops and then you just have to keep mapping that area. But when they were doing it by hand, what were they doing? Were they pulling plants out and putting them in bags or burning them?

MR. LEARY: I think that's been attempted and that would, theoretically, be successful. Why I wouldn't recommend it, one, it probably wouldn't be very cost effective 'cause now you got a hauling issue. If you're in remote areas, you're hauling, you know, weight. And the other one is the risk factor of removing it from the site. The best we can do now is to keep it from growing in new areas. We know where it's growing and we don't have the best mechanisms in place yet to eliminate the seed. I mean, I could give some...I would give you unrealistic answers, I guess.

COUNCILMEMBER KING: Yeah, okay. So, then do we have any native Hawaiian plants that can out compete this or is that just never been found?

MR. LEARY: Possibly, but it has not been found --

COUNCILMEMBER KING: Okay.

MR. LEARY: --naturally.

COUNCILMEMBER KING: Okay. And my last question, Chair, is --

CHAIR ATAY: Yes.

COUNCILMEMBER KING: --this is not something that's actually being sold to people is it?

MR. LEARY: It's not.

COUNCILMEMBER KING: Because I looked at other presentations where the...I was actually at the Kona Airport not too long ago. I think I sent you, my colleague a picture of Himalayan ginger being sold, so some of these invasive plants that are actually being packaged and sold to tourists --

MR. LEARY: Right.

COUNCILMEMBER KING: --who take it off the island probably cause these problems somewhere else.

MR. LEARY: That's right. Well, Miconia is a noxious weed. It's listed as a noxious weed by the State of Hawaii, so that bans the sale of that species.

COUNCILMEMBER KING: Okay. So, Himalayan ginger is not then?

MR. LEARY: Apparently not.

COUNCILMEMBER KING: Okay.

CHAIR ATAY: Is that all?

COUNCILMEMBER KING: Yeah, that's all. Thank you. Thank you very much.

CHAIR ATAY: Okay. Member Cochran, question?

VICE-CHAIR COCHRAN: Good morning. Sorry, I missed...is there a handout or anything or no?

CHAIR ATAY: No.

VICE-CHAIR COCHRAN: Is this strictly...hi, Dr. James Leary.

MR. LEARY: Yes.

VICE-CHAIR COCHRAN: And then yours...we're focusing on Miconia --

MR. LEARY: That is correct.

VICE-CHAIR COCHRAN: --only?

MR. LEARY: Yes.

VICE-CHAIR COCHRAN: Okay. Yeah, that's a tough one to get a handle on, but I think as you say you know where it's at and I know the heart of where it actually started in Hana itself at that nursery and then it, to try and contain it has been the issue all these years but I know it's...so how far out from that epicenter has it now grown out? Do we have a gauge on that?

MR. LEARY: So, if you looked at the map and you can look at the map. This is a, this is the complete spatial assignment of all the treated plants. You see one in West Maui, that's a high-risk situation. That was actually planted. This is also...that was also 20 or 30 years ago. MISC is very aware of that planting and so they monitor that. It would never reach maturity but it was purposely planted in someone's yard similarly in Makawao and in Kaupo. Those were purposely introduced as ornamentals 20 or 30 years ago, so they're recorded, but they're not a part of the invasion per se but it's on our radar; otherwise, you got from Halehaku to Kipahulu, it's basically has wrapped all the way around from its original point of introduction. My guess is that it is saturating or reaching capacity of its entire suitable habitat. Once you get past Halehaku...I think temperature and moisture are major drivers of this suitability for habitat for Miconia. It likes it very wet and it needs warmer temperatures, so it's gonna be elevation-ally limited, which we're trying to determine but that could mean up to 3 or 4,000 feet above sea level. But we don't think it's gonna be much of an

issue going into say Kahului or Paia. But West Maui is a high-risk area, because it does have similar temperature and moisture regimes that we...that's, you know...anyways, that was 20 or 30 years ago, but gosh, you know, that's part of what they're trying to protect beyond East Maui Watershed, is really, can we keep it out of West Maui.

VICE-CHAIR COCHRAN: Yeah. Wait, real quickly, that one purple spot there in the, this side of West Maui. Is that...so, is it not eradicable? Is that a word, eradicable? Is it not...if you know this one spot, is there no way to just get rid of it?

MR. LEARY: Oh, no. It was gotten rid of.

VICE-CHAIR COCHRAN: 'Cause we've done it with coqui. Oh, it's gone?

MR. LEARY: These are plants that were --

VICE-CHAIR COCHRAN: Oh okay, okay.

MR. LEARY: --eliminated.

VICE-CHAIR COCHRAN: Oh, okay. Sorry, sir. Okay, very good.

MR. LEARY: Yeah. We have a million records of Miconia being eliminated, but we probably have 3 million more out there waiting to be killed.

VICE-CHAIR COCHRAN: Right. Okay.

MR. LEARY: My guess, too, is as I talked about earlier, the flume system of the East Maui Watershed likely being a major contributor to the speed of movement. It was introduced in 1970. They were finding plants over here in earlier '90s. If we just measured most of the dispersals by birds, if we were to calculate how far a bird moves the plant, which we were, we did, it would probably...the infestation would be more out to here. But it's reached out all the way to here and so...and you'll notice, too, that a lot of the plants are below the flume system what's possible, purely conjecture but what's possible to happen when you reach a, had a mature plant over here at the end of the flume, got picked up, and then as it makes its way down the flume and gets deposited in these different drainages and you...a lot of our Miconia are on steeper slopes in the drainage areas. So, that's like...that's one of the possibilities of how Miconia has moved through stochastic activities from human mediated events, someone wanted to plant it in their yard, the flume system as an engineering component to the watershed may have contributed to it. We're not calling anyone out. It's just a reality. And then, right now, most of it is being moved biologically by bird populations. And again, what we're trying to pay attention to is how far up will it move, probably somewhere in the 3,000, 4,000 feet. Below that it is choke Miconia. We got a lot of Miconia.

VICE-CHAIR COCHRAN: So, what is your main plan of attack here right now? What's your main way?

MR. LEARY: So, for my project, it's strongly coordinated with the Maui Invasive Species Committee. Comprehensively, I think what needs to be...what they want to achieve and what we need to achieve is keep it off the Hana Highway and keep it off the EMI roads and keep it away from the flume system so that we can protect West Maui.

CHAIR ATAY: Excuse me.

MR. LEARY: Yes, sir.

CHAIR ATAY: Excuse me, Dr. Leary. I think some of the Members need a bathroom break. We're at bare quorum right now, so at this moment, we're gonna have to ask for a pause, and we'll go into recess, and once we have full quorum, you know, quorum back in we'll come back. For now, we stand in recess. . . . *(gavel)* . . .

RECESS: 10:37 a.m.

RECONVENE: 10:46 a.m.

CHAIR ATAY: . . . *(gavel)* . . . Okay, thank you, Members. We're reconvening our Water Resources Committee meeting here this Wednesday, October 31, 2018. We now have, once again, reestablished quorum. I do want to mention that we're still back at bare quorum; however, we are almost nearing our completion of today's meeting. Members, and any other Members got any questions for Dr. Leary or, and/or for the Department? Okay. I do have a question, not for Dr. Leary, but for the Department. Department, what's the current funding level for this project?

MS. BLUMENSTEIN: Thank you, Chair. We've started...the FY '19 is the first year that we embarked on the bioeconomic model and the funding level is about 95,000. So, we saw this the first year more or less as a pilot, not as an established line item grant yet, but we are proposing to spend about the same funds in FY '20 to, we think it's really worthwhile both because we've been pushing other grantees to be innovative and efficient and this was sort of something that we looked for, how can we make cost-effective decisions knowing what heli time costs and the enormous acreage of the East Maui Watershed, how do we prioritize with the funds we had. We don't have unlimited funds so --

CHAIR ATAY: Okay.

MS. BLUMENSTEIN: --we're proposing this for the next fiscal year as well.

CHAIR ATAY: Okay, thank you for that. And I do want to apologize in today's process of the meeting. Normally, I ask Department to give a statement before I go into...I went straight into Dr. Leary, but so, at this time, Ms. Blumenstein, do you have any other additional statements to add from the Department of Water Supply?

MS. BLUMENSTEIN: Thank you. I think actually Dr. Leary has covered most of the points, but, yes, again, I just want to emphasize I think this is an opportunity for you all Members, also, to see what opportunities there are and there are more models out there that can be utilized, not specifically for what we are asking Dr. Leary to do was just prioritizing the mauka above 1,300 feet critical watershed area but for other, using other funding sources, there's definitely opportunities for more cost-effective management for Miconia, which we still see as a, one of the major threats. And again, the goal here is to have mortality outpace recruitment and we know this is a long shot, but it's not impossible and there's really just funding sources lacking over a longer period of time. Not saying that the current measures are not efficient and effective, but Maui Invasive Species Committee are addressing 119,000 acres and Miconia is one of many invasive species, not mentioning the ungulates and so on. So, we really hopeful that this is gonna give us a more targeted approach to address Miconia over the next few years.

CHAIR ATAY: Thank you for that. And with that, you know, with interest, I was following this particular issue of Miconia, and I know the original and initial grants that the County got involved for several years. The initial goal of the grants were to focus on eradication of Miconia, but as the plants matured and the birds were able to continue its transport then we've shifted towards containment and after listening to Dr. Leary's presentation today it's quite evident to me that we are in an asset protection phase of, with dealing with, in particular with Miconia. And if we are focused on protecting primarily our main objective, protecting our watershed, and the management of our watershed, then the focused area of protecting that asset, I would assume looking at the mapping would be to try to reestablish control of any Miconia outbreak or any Miconia growth above the flume that's in our watershed. I mean, I can see the mapping that there's a large out planting or outgrowth of Miconia all along the Hamakua Coast but for the watershed management section I would say one of our first areas just like as you mentioned earlier 1,300 feet elevation would be the area of the watershed that we want to focus protecting first. I see, Member King, you have a question here?

COUNCILMEMBER KING: Well, no, Chair, I just wanted to make the comment that as we're entering into the next year's Budget Session and your...you've got the guidelines for the grants out there that one of the issues, one of the points that we should be looking for from grantees is how you can incorporate, how you can collaborate with the other groups that are doing watershed protection so that we can make more effective use of the helicopter time, for instance, 'cause we know other watershed protection groups are using helicopters and they're using the ballistic technology, the herbicidal ballistic technology. And so, if we can start coordinating some of this, we might be able to get more bang for our buck but what the...you know, after listening to all these different watershed projects, Chair, which have been excellent and I really commend everybody and thank you, Dr. Leary, for being here. But I feel like we need, you know, we need to invest in a summit of all these watershed projects so we can collaborate. You know, maybe we need to do more collaboration on the various technologies including, you know, more than one target for, you know, for the helicopters for the herbicidal

ballistic technology. And if we start coordinating like that, we might be able to cover more ground. But I feel like there's a lot of different efforts out there, individual efforts and we're hearing repetitive efforts for different types of plants but, you know, maybe the thing to do is to look at how we can make a more comprehensive --

CHAIR ATAY: Department?

COUNCILMEMBER KING: --effort.

MS. BLUMENSTEIN: Thank you, Chair. Yeah, that's a very good point, and I think maybe what's been missing is sort of a synopsis of the actual collaboration that is ongoing because there are. We know that one partner has a drone and they don't use it, somebody else will. You find a species in, you know, that's not your target you're going to address it there and then. So, I mean, we can work if the Chair would want to see something like that, more of a summary of where those collaborative efforts actually happen 'cause we know they are. They may just not have been summarized.

CHAIR ATAY: Yeah. I agree with that, Department. You know, I think where we are today, we've evolved. We evolved to the level of we have X amount of dollars that is to address the protection and the management of our watersheds through the forms of distributing grants. Maybe we're at a point of evolution to relook at how do we restructure or reorganize the various RFPs that we put out and that we collectively and collaboratively work together with all the agencies. Member Cochran, I saw your hand up.

VICE-CHAIR COCHRAN: Thank you. Yeah, thank you, Chair. So, I mean, I applaud everyone's efforts and again, that's an awesome idea to be more, you know, on the same page and partnering and all that. But I almost feel like, you know, not just one helicopter, we need a army of helicopters right now. I mean, let's just get like this guerilla warfare attack, boom. You know, and yeah, it's gonna expend a lot of money upfront but you know what we're gonna get a handle on it finally. We're gonna bring it down to size that's manageable. We gonna contain it and now we're gonna go back to our every day, you know, existence of containment. Right now, it's out of control and it's still spreading and moving. It's not gonna happen with the efforts we're doing. I just...I do not see it. But if we're gonna say money is gonna hinder us, we're not gonna get anywhere you know. We gotta just, yeah, tighten the belt whatever it is, but there's money and we just gotta prioritize it for this. You know, it's kind of like trying to get on the illegal short-term rental thing. Let's just head in it, get a grip, and then start managing, right. I mean, this is similar kind of example I think, but it's gonna take a lot, yeah, I get it. But you know what, we're not gonna get ahead of this at all if we keep doing it at the pace we are. It's just not. So, it's scary to think we're gonna continue year after year, decade after decade like this because the dots are gonna roll over our island and our environment is our economy, nobody can live without water, watersheds the most, you know, biggest priority that we need to protect. That's my general thing, but how's about the water system is a scary thought, you know, how it's traveling and moving our invasives all over the place right now. So, the ditch system,

how's EMI kicking in here? How are they helping us with the protective measures to stop the movement as best that they can? Where are they helping us on?

CHAIR ATAY: If...Dr. Leary, if you're in a position to answer you can.

MR. LEARY: Yeah, I'm in a position to say I'm not. I can't answer that. So, I...and I should say full disclosure when I suggested that the flume system may be contributing, that is pure conjecture, I'm speculating. It looks like it. I mean, the dots follow the lines, but we don't have evidence of that nor...and but it's plausible without calling anyone out. I'm not familiar with EMI's role but certainly they have been good partners to the ISCs and the watershed partnership for allowing access. In terms of how they are actively managing their infrastructure and properties, I'm not aware and I wouldn't be able to comment on that.

VICE-CHAIR COCHRAN: Okay. Well, I think that should, you should be aware. I think that party ought to be at the table in the discussion. You know, it's like, oh, yeah, you want to come clean my house, I'll let you in the door, come clean my house. You know, access is great but access isn't everything. The water systems are spreading the ants. The water systems are spreading the frogs. It's a known fact. So, to say it's just kind of conjecture, I think it's happening. I bet my life on it. So, I think they need to be at that table, so if you haven't been talking to 'em it'd be nice if we were all talking. Thank you, Chair.

CHAIR ATAY: Thank you for that input. And once again, I think it's input that's being offered to the Department of Water Supply to, I think, the timing depending...I would highly suggest, you know, considering a potential summit, a gathering of all stakeholders and all those involved in the watershed grants and landowners, everyone who's involved to...I think we're evolved to a point where we really need to look at our, protecting our assets. We have X amount of dollars that comes out of this grant program. How do we best utilize it? So, thank you once again. Department, go ahead.

MS. BLUMENSTEIN: Thank you, Chair. Yeah, I just want to...I certainly concur that there's much more that needs to be done but I also want to emphasize what I say every time that these are water rate funds utilized for grants and we have to prioritize the benefits to existing and new customers. And, you know, a couple years back where some of the responsibilities of watershed protection were moved from the Office of Economic Development to the Department but there's still, you know, we're not utilizing general funds. We're at about 4 percent of our total budget in grant subsidies, which is more than any other county does and we're way ahead of the targets of the freshwater initiatives in terms of how much we spend of watershed protection in relation to millions of gallons that we serve. So, I definitely hear that other water purveyors need to come to the table, other funding sources needs to be addressed. So, I'm not saying that we're at our breaking point, but we fund specific function and we have funds, you know, dedicated to that but we cannot expand infinitely. Thank you.

CHAIR ATAY: Thank you for sharing. Members, I want to say thank you to Dr. Leary for your presentation today, and once again thank you again, Members, for attending today's Water Resources Committee meeting. There being no further business this meeting...well actually, discussion has been exhausted, so I want to defer this matter and if there's no objections.

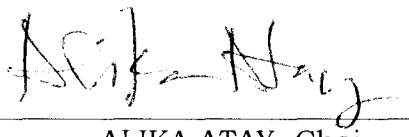
COUNCILMEMBERS VOICED NO OBJECTIONS.

ACTION: DEFER.

CHAIR ATAY: And now there being no further business, this meeting of the Water Resources Committee will stand adjourned. Thank you. . . . *(gavel)* . . .

ADJOURN: 11:00 a.m.

APPROVED BY:



ALIKA ATAY, Chair
Water Resources Committee

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Transcribed by: Michelle Balala

CERTIFICATE

I, Michelle Balala, hereby certify that the foregoing represents to the best of my ability, a true and correct transcript of the proceedings. I further certify that I am not in any way concerned with the cause.

DATED the 26th day of November, 2018, in Kihei, Hawaii

Michelle Balala