LOCKHEED MARTIN CORP

Moderator: Courtney Chambers
September 18, 2012
1:00 pm CT

Courtney Chambers: I'd like to give you today's speakers on woody vegetation on levees. Mr. Pete Rabbon joined the Institute for Water Resources in May of 2006 to manage the new Corps' National Flood Risk Management program. At the end of 2010 he transitioned to a special assistant where he currently serves. The objective of the Flood Risk Management program that Pete works on is to integrate and synchronize the diverse flood risk management projects, programs and authorities within the Corps of Engineers and work with counterpart projects, programs and authorities of the Federal Emergency Management Agency, other federal agencies, state organizations and regional and local agencies. Mr. Rabbon has over 35 years of professional engineering experience. Prior to the Corps, he spent the last 20 years in the area of flood management for the state of California. In his most recent state position he served as general manager of the California State Reclamation Board and executive officer of the California Water Commission. Previously he has worked in private practice as well as in county and state government.

Then Dr. Maureen Corcoran is the Associate Technical Director for Water Resources Infrastructure at the US Army Engineer Research and Development Center in Vicksburg, Mississippi. Dr. Corcoran received her doctoral degree from the University of Mississippi in Geology and has been employed in a

research capacity at ERDC for over 20 years. Some of Maureen's past work has included serving as project lead on data collection efforts in the Interagency Performance Evaluation Team to support Hurricane Katrina research. She served as principal investigator for several work units in the System-Wide Water Resources Program involving geomorphic response in fluvial systems and also served as focus area leader under the Sediment Processes Studies for (SWWRP). She currently serves as a project manager for the Woody Vegetation on Levees research at ERDC and Program Manager for the Water Resources Infrastructure Program. You can find many of Dr. Corcoran's published technical reports, technical notes and peer-reviewed journal articles.

All right. At this time, we would like to begin. And I will give Pete the presentation rights and you can proceed.

Peter Rabbon: Okay. Thank you Courtney, appreciate the opportunity. As we get started - everybody please remember to mute your phone. As we get started, I want to first refocus on why we're even talking about vegetation. And the whole purpose of what we have been trying to do is to reduce flood risk.

And there's lots of activities, lots of issues, lots of action that can help us reduce flood risk. And bringing Corps levees to standards is one way to help reduce flood risk. And part of bringing those Corps levees to standards is to look at the vegetation issues and try to figure out how to resolve those vegetation issues along with many other issues that are out there that we have to be collaborative with such as endangered species, (shaded river) and aquatic habitat and whatnot. But again the main focus is the Corps' trying to reduce flood risk.

Regarding the vegetation policies themselves, some key points here. We do have current standards. Uncertainty is an issue, and the Corps traditionally had erred on the side of caution when we do have issues of uncertainty. And during the process -- and Maureen will speak more about (the) new science information -- we are definitely open to new science, new information, and are looking for that type of information that we can use to make improvements to our standards.

One item that we are not using to modify our standards is anecdotal information such as the grandfather that's lived here for 80 years and has never seen a problem. That's good anecdotal information, but we want to go beyond that and use good quality science to make improvements to our standards.

Regarding the standards, this gives you an idea of what we are looking at. The first list vegetation is obstruction. That really is just looking on the ground operation and maintenance activity. The second group of items vegetation is the direct impact to focus more on the structural stability and the ability for the levees to function as they were designed. And there's just a few pictures to give you an idea of the O&M issues, couple ideas of the structural stability and functioning.

Okay, this is the slide I want to spend some time on. Now keep in mind when I first started, our goal is to reduce flood risk. Many, many ways you can do that. One of them is to transition the levees to Corps standards. And this shows three options that we can do that. We can either - and to try to describe this a little bit more, we are moving - we want to take the levees as they exist -- on the left-hand side -- and transition them through one of these options -- one or more of these options -- to reduce flood risk.

The middle one is simply meet the ETL standards. And here's the - contrary to popular belief, our standards do allow vegetation on levees.

We also have created what we call a National Solutionarian Team, which we are actually asking them to help develop new options and standards for new options that we can use that meet the standards to transition the levees to our current standard.

Courtney Chambers: Pete -- excuse me, this is Courtney -- it appears we're on a different slide than you're presenting from. What slide number are you on right now?

Peter Rabbon: I am on Slide number 5.

Courtney Chambers: Okay. Can you try clicking that arrow to the right and see if it affects our view?

Peter Rabbon: On my computer - are you seeing it go back and forth?

Courtney Chambers: No we're not. Just a second. Let me make sure that you still have the presenter rights.

Man: We're having the same problem in Seattle here.

Peter Rabbon: What slide are you on Maureen?

Dr. Maureen Corcoran: It didn't advance. It's - I'm on Slide 3.

Courtney Chambers: Pete, it looks like your name disappeared from the presenter's list. So you must have gotten disconnected some way. So if you could transition to Maureen I will give her the presenter rights.

Dr. Maureen Corcoran: That's why it's good to have two computers.

Courtney Chambers: Yes, that worked out great. I'm glad you all are together today. Okay, now we see Slide 4, Key Concerns.

Peter Rabbon: Okay. And that explains why Maureen kept on pointing at me.

Courtney Chambers: Oh great. Okay, thank you.

Peter Rabbon: Okay. Slide 4, I'm going to go back a little, just point out some activities pictorially on the need for the standards an O&M perspective and a structural and functioning perspective.

Okay, we are now on Slide 5 entitled Options.

Courtney Chambers: Yes.

Peter Rabbon: Okay. This is what I was referring to in terms of reducing flood risk and transitioning the levees from the last slide that you see to the right. And you can do that through three options.

The middle option there is simply meet the standards, which does include the ability to have vegetation on the levee cross-section. But it does not allow the vegetation within the core part of the levee itself.

And there's two other ways to transition your levee to Corps standards, either through the system-wide improvement framework process -- and I'll talk more of that on the next slide -- or the vegetation variance process.

Now one item I want to bring up here that is very important to understand is it is optional to transition your levee to Corps standards. You don't have to - the levee owner does not have to maintain their levees to Corps standards if they choose not to.

However they are excluding themselves from some federal opportunities. One of those is this process that we're looking at here will allow the levee maintainer to be eligible for PL84-99, which means they are eligible to receive federal funding to rehabilitate their levees. But it is their choice. If they choose not to be eligible for that program, that is definitely their decision to make.

Well let me talk about these three different - or the - primarily just the system-wide framework and the vegetarian variance process and how to transition your levees to reduce flood risk. Okay, the system-wide improvement framework -- we're on Slide 6 -- that policy was issued in November 2011. And we've the bullets there that tell you what it does.

The first bullet is the PL84-99 to allow you to continue to be eligible for federal funding on rehabilitating your levees after a high water event, but it also helps prioritize the work. And what we are looking for - we are asking individuals or organizations to submit a (SWIF) -- as we call it -- that it should be prioritized worst first. So for example if they have substantial erosion issues, stability issues and vegetation, they are making the determination in the field that the worst-first item happened to be the - may the erosion and the stability and vegetation falls lower on the list in terms of transitioning your levees for repair.

Couple of other bullets there, the intergovernmental collaboration because we have recognized that this issue needs to be resolved among numerous entities

including the resource agencies. And what the (SWIF) does, it does provide time to transition your levees. So while you maintain eligibility, we are also giving them time to do this. It's not you have to fix your levees in one year or two years.

Regional differences, we do know that the issues are different across the country. And then finally it is a two-step process. First step is submit a letter of intent and then subsequent approval of that letter of an intent, you have two years to develop your plan. And that's just develop the plan, then after the two years you initiate implementation of the plan.

The last two bullets there, some quick changes. We do have 12 letters of intent that have been received. Five have been approved and we expect to have all the letters of intent. Currently we (unintelligible) approved by the end of the month.

There's only one (SWIF) plan that's been sent to headquarters, and that plan actually needs quite a bit of work. And so what we are doing is (vertically) working with the (field) to try to get that into an acceptable form rather than simply sending it back denied.

Courtney Chambers: Right. Pete excuse me one more time. Can I just remind our participants to make sure your phone is on mute. We're getting some pretty consistent background noise. Can you just double-check that? Thank you.

Peter Rabbon: Okay. And the second method to transition your levee to Corps standards is to literally change the standard on what you're transitioning to. The vegetation variance request policy allows you to go through a process -- that if you can do the justification -- allows for a permanent change on how you manage the vegetation.

Now that particular policy guidance letter has been in draft form for the last year-plus. It's been put in the federal register two times. We are still in the process of making edits to it and I'm not going to go through the bullets here, but there were the edits that were made between the first and second time it was in the federal register.

But what's more important is this is where we currently are. We do have the second set of comments and the PGL is currently being held in draft form until we can finish some discussions and negotiations with National Marine Fishery Service regarding consultation. And so we will not finalize the PGL until those discussions are complete. We do not have a date on when we expect to have those discussions complete and there's an active lawsuit, and so the discussions are being held at a very high level and we're having to be cautious as we move forward to make sure that there's no improper melding of these issues.

And with that, Courtney that is a quick update on where we are in trying to transition levees that have vegetation issues. Did you want to save questions for the end and let Maureen go through her presentation now?

Courtney Chambers: Whatever you all's preference would be. If you'd like to take questions now on Part I, that's fine.

Peter Rabbon: Okay. Let's take a couple questions now and then make sure we save enough time for Maureen, and then we can do additional questions later.

Courtney Chambers: All right, that sounds good. How about we take five minutes right now and then we'll proceed and then we'll have time for additional questions at the end.

Dr. Maureen Corcoran: That's fine.

Courtney Chambers: Okay. If you have a question, remember to take your phone off of mute before asking or utilize the Chat feature.

(Herb Bessy): Yes Pete, this is (Herb Bessy) from (Wahall) district. My question is should we follow the draft guidance in the PGL in the interim or should we continue to follow the ETL?

Peter Rabbon: It's my understanding that the draft PGL is to be used for those that are interested in submitting a variance request.

(Herb Bessy): Pete are you aware of any folks that have actually tried to do that?

Peter Rabbon: There has only been one entity and that was Sacramento Area Flood Control Agency for their (Notomis) project, and they did receive a variance request. What they did is they widened the levee -- some people might call it a levee setback -- so that the vegetation stayed on the waterside. And that part of the levee was then termed deemed as a planting berm because of the widening of the levee. And the official levee then was in that widened area.

(Herb Bessy): Thanks Pete.

Peter Rabbon: Yes, and it was candidly though a very difficult process, but we are hoping as we go through more of these that we'll be able to make it a little cleaner process and less onerous.

Courtney Chambers: Okay (Pete), it looks like Sacramento district has a question.

(Tannis Tolan): Hi Pete, this is (Tannis Tolan) with Sacramento. We have some questions and discussion around the notion of levee owners choosing to not be in compliance with any of our standards and really falling out of the PL84-99 eligibility and want to make sure that that is correct for federal levees. And then a validation on when we're working through the planning program. We are now getting non-federal partners who are asking that we might consider designing not to federal standards, not to the Corps' standards. And I'm wondering what is the currently perspective on the planning phase.

So we have two of those - two questions in that one.

Peter Rabbon: Okay. The first question asking if the levee-maintaining agency or levee owner can really not elect to meet the Corps standards for federally authorized levees, they can. Now will there be other consequences besides ineligibility of PL84-99, and the answer is yes. There will be other consequences based on the legal documents they have signed that said we will operate and maintain the Corps standards. However that particular remedy has not been exercised within the Corps to my knowledge, so we do not know how that remedy will be exercised if we are put in a position to do that.

Regarding can the Corps in their study process recommend projects that are not compliant with Corps standards, my understanding is that no they cant. However a locally preferred project could recommend that, but they would require a waiver from the ASA Civil Works office. And some of those discussions actually either have just been initiated or are soon to be initiated. But if that is - if you think that may be the case, you should start working through your (writ) very soon so we can start coordinating with ASA Civil Works.

(Tannis Tolan): Terrific. Thank you very much Pete.

Courtney Chambers: All right, any other quick questions for Pete before we proceed?

Peter Rabbon: Okay. Thank you Courtney.

Courtney Chambers: You're welcome. Thank you Pete. Okay Maureen, I'm switching to your presentation and you should be good to go.

Dr. Maureen Corcoran: Okay. Thanks Courtney and good afternoon and good morning, depending on what time zone you're in. My presentation provides an overview of the research conducted by ERDC concerning the effects of woody vegetation on levees.

And for those of you who were at the Levee Vegetation Symposium in Sacramento a few weeks ago, this is the same presentation that I delivered there. So those of you who attended, I apologize and don't blame you if you go eat your lunch. But I will have some more detail perhaps on our future next FY projects.

First I'd like to give you some background on why ERDC is involved in this issue and how this came about. In June of 2007 our headquarters at (USACE) requested that we conduct a literature review on the effects of woody vegetation on the structural integrity of the levees. The literature review revealed that there were only just a few publications that related directly to this topic. Because of these results of the literature review, we began our research on two processes that may be influenced by the presence of woody vegetation, those being seepage -- which we focused on the initiation of internal erosion and also changes in hydraulic conductivity -- and also on slope stability, which in this case we dealt with simple deep-seated failures.

In September of 2011, we released the technical report on the research which can be downloaded on our Water Resources Infrastructure Web site which you see at the bottom - the link at the bottom of the slide. The literature review as well as transcripts from our other webinars are on this site as well.

Oh also I'd like to note that during this presentation you'll hear me use the terms woody vegetation and trees interchangeably. In this research our focus was on trees and not on shrubs.

A few of the data gaps that we found after completing the literature review are that full mechanics are usually assumed in these studies because of the lack of the detailed geotechnical research. Tensile strength of tree roots for different species were not well-documented. We also found that previous slope stability models did not account for root characteristics such as the morphology of root and - morphology and topology.

We also found that most of these models were based on channel banks and not levees, and perhaps most importantly that all aspects of levee vegetation when studying the effects were not addressed in a single research project.

And I'd like to tell you that we were able to clear up these research gaps, but we - while we did contribute to improving the collections say of the tensile strength and modeling the actual tree roots for seepage and slope stability, there's still much research that needs to be done to further the - our understanding of the effects of woody vegetation on levees.

The objective of our research was to develop a method - our method that quantifies - that can be used to quantify the impact of woody vegetation on levees by using scientific and engineering tools. The focus was on developing or refining these methods because of variability in studying woody vegetation

on levees makes providing general statements on our research as to their effects on the structural performance very difficult or impossible to make.

Our approach was divided into four broad tasks that you see here. The first one I've already mentioned, the literature review. The second one was to select study sites. This depended largely on the input from our districts and levee stakeholders. The third task was to conduct field data collections which also includes the selection of tools and techniques that we could use to collect data, of course the type of data that we would be collecting. Some of the field data that we did collect was based on the required model input. The fourth was to run numerical models on seepage and slope stability. I'll talk a little bit more detail about each of these tasks. As I mentioned earlier, the literature was very limited on the subject of woody vegetation on levees. Because of this, we expanded the review to include research that would be helpful to our own research. Some of these other topics include the effects of trees on channel stability and also the effects of tree removal on riverbanks.

As I also mentioned earlier, the study sites were selected based on input from districts and levee stakeholders, but also we did have to consider levee geometry and the soils, geology, geographic setting, the availability of geotechnical data and the tree species that was present. Of course we also needed to consider the accessibility of the sites as well.

We listed these sites as site characterization and site assessment, and we did that to distinguish the level of research that we directed towards these sites. For the site characterization we did field data collection as well as numerical models. For the site assessment, the data collection was varied. We collected soils data, did some geophysical surveys at all of these sites with the exception of Lake Providence. This was basically an observation site where sand boils were occurring along an oxbow lake, not a levee. But we found it very

interesting this is surrounded by Cyprus trees. They're located around the oxbow and some of the tree roots acted as conduits for the flow. We are located in Vicksburg, Mississippi so we had a site here to test our equipment prior to deploying it to the other site.

These are photographs to show you four of the tests of the sites that we studied. And you can see that the variability in trees near the levees of - at each site. For the most part the maples in Pennsylvania were removed prior to our visit. In Sacramento and Albuquerque the dominant species was cottonwood and in New Orleans you can see the woody vegetation at the toe of the levee next to the former fence line. These particular trees in this photograph were hackberry and have since been removed. The (Danville)'s silver maple -- as I mentioned -- were removed. The Sacramento trees and also the Albuquerque trees are still on site.

For the field data collection, we selected tools and techniques that were published and researched perhaps for other purposes, but we also consulted with academia and private industry and also the California vegetation team as well.

We of course recorded the tree species and used existing literature to define the general root system, but we did use our geophysical survey to further identify specific root systems. For the tensile strength measurements, we modified a root pullout apparatus that was originally developed by the University of Nottingham Trent in the UK. We did rely on geotechnical reports for soil properties even though we did conduct field testing on soils as well.

Some of the trees that we studied are listed here. We did not consistently test the same species at each site due mainly to the different species - tree species present in different geographic regions.

We wanted a non-invasive way to map the root systems which of course is very difficult to do. We used several different geophysical methods but had the most success in using resistivity. But however the results from the surveys were not consistent for all the sites. Where resistivity worked on one site, electromagnetic surveys worked better at other sites.

Also we were not able to calibrate each site to determine the validity of the resistivity surveys and other geophysical surveys as well. As you can see here in this geophysical cross-section that we could not easily calibrate -- or in this particular example -- we could not identify individual roots but rather entire root systems as well.

We did use this information in our models - in our slope stability and seepage models. We defined what we referred to as a cohesive root ball which was a root mass directly under the tree and right outside of the tree - again with this method identify individual tree roots.

I mentioned that we were able to calibrate some of our geophysical surveys. This is an example of what we refer to as in situ mapping. We expose the roots by blowing the soil away using a high-pressure air lance after we ran a geophysical survey. And once we did this -- once the roots were exposed -- we were able to digitize individual roots with a handheld digitizer and then use these data to produce a calibrated photographic model of the roots. We were then able to do - we were able to do this without harming or removing the tree.

This is an example of a more invasive method using LIDAR to identify the roots. As you can see, we get much better detail on the root systems. But as I mentioned, this is an invasive method so the tree was removed after we did this process. We actually brought it back to our environmental lab and weighed it to determine the actual weight of the tree. We then used this information in our 3D models.

To gather the tensile strength, I mentioned the root pull-out test that we modified. But a difficulty that we had was that the device sunk down into the soil because of the weight of the root that we were trying to pull. So we did have to reinforce this with the (rebar) that you see in this photograph. We then used these results in our slope stability models. Again this method was also used without harming or removing the tree.

Now we did use models because of the variability in soil properties, the root soil interaction and the root systems as well. We used existing 2D models for slopes and seepage -- slope stability and seepage -- while our 3D models used code that we developed in house.

This is a list of the primary computational tools that we used. SEEP2D is actually contained within our groundwater modeling system. We use that also -- the GMS -- to generate our grid. (U Texas 4), that accepted slope stability model which the geotechnical community is very familiar with and our 3D code -- as I mentioned -- was developed - or I should say further developed for this project.

For the seepage model, we actually looked at three different types of what we referred to collectively as our seepage analysis. Those are the first one, changes in hydraulic conductivity which are based on the assumption that tree rots alter soil permeability. The second was looking at if a tree root actually

produced a defect in the levee blanket. And the third one was what we referred to as macropore heterogeneity and that is a random arrangement of the permeability.

For the sensitivity analysis on the hydraulic conductivity, we set the K -- the hydraulic conductivity -- equal to the surrounding soil -- in one instances that equated to having no tree there -- and we then varied it by increasing and decreasing it by orders of magnitude.

This gives you an example (unintelligible) looked at with the different locations of the trees. You can see here we looked at several different sites. Now of course we weren't able to sample trees at each of these sites, so we just moved into models based on this. This is the Sacramento levee that you see here. The pink area is a (flurry) wall. We varied the water elevation then to determine the loading on the site and how these zones reacted to that.

This is the second method where we actually looked at a root imbedded as a defect that could possibly lead to internal erosion. On a macropore heterogeneity, as I said before it's just a random arrangement of permeability within the confines of the root zone which we defined by the geophysical surveys. Gives you a close-up on what we looked at. As you can see, each triangular element was assigned a different hydraulic conductivity.

On the slope stability model or input for (wind load), tree weight, the phreatic zone and the pore pressures we actually derived from our slope stability. We used root reinforcement just as a new (Texas 4). The cohesive root ball we define again by the geophysical survey.

This gives you a little bit more detail on how we conducted and the results of some of our slope stability models. As you can see, the 3D model we actually

were able to use the LIDAR. Unfortunately we don't have an algorithm that can go in and convert the LIDAR directly into the 3D models. So we actually had to go in and more or less digitize these by hand from the LIDAR surveys, which was obviously very time-consuming. Hopefully with further development if we go in that direction, we can actually establish an algorithm that could do this.

The product that we produced from all this research was that we have a technical report that documents these methods and our results. The approach was developed and tested by us from field data - existing field - well, our field data and geotechnical models and also existing geotechnical data as well. One of our biggest accomplishments was that we did further develop the root pull-out device. We are able to actually pull tree roots much larger than had been recorded in the past. And someone asked this questions when were at the symposium. We knew enough to cut the tree - cut the root from the tree, so we didn't actually pull the tree - the root when it was still attached to the tree. And the other thing that was quite substantial from this research was that we developed the 3D models that can be used in these type of analyses.

Now that leads us to the research questions. These are what techniques are useful in identifying the spatial extents of root systems in place. Our field method's successful in identifying in situ soil properties that may be affected by a root system and then in turn affect levee performance.

The third one is what are the parameters identified in the numerical models that may be sensitive to the presence of a root system and what variables are most critical to the structural performance of the levee and the tree location and specific conditions that would most likely pose problems, and of course the underlying question does woody vegetation affect the levee structure.

Let's take these individually. What techniques are useful in identifying the spatial extent of root system in situ? As I mentioned earlier, electrical resistivity imaging measurements proved very useful but weren't consistent in determining the actual cohesive root ball.

The ground-penetrating radar, the GPR was (effective) in predicting a location and orientation of individual roots, but there again we don't have enough calibration to actually again have this consistently used at all sites.

Our field method's successful in identifying these soil properties in situ that may be affected by the root system. We measure the hydraulic conductivity around the root mass of a tree in the field and we compare this to the hydraulic conductivity measured around a control site that did not contain tree roots - within the same reach of the levee, but these numbers did not always correspond to what was used in the models and that leads us to a lot of variability always seen in the hydraulic conductivity in the field.

What are the parameters that are identified in numerical models that may be sensitive to a presence of a root system? The major impact that we saw (three) was its loading caused by its weight. The root strength did not seem to be a critical parameter for deep-seated sliding. This is again just on deep-seated sliding, not shallow failures. The hydraulic conductivity had little-to-no impact on seepage paths or gradients. There again, this is just on the site that we tested under the site characterization -- very limited sites within specific conditions.

What variables are the most critical to the structural performance of the levee and of tree location, specific conditions that would most likely pose a problem? Again this is just on the areas that we studied. Under the study, we found that the trees located on the slope that were above - located above the

phreatic surface had limited effect on the seepage. The trees beyond the toe of the levee are at the (D water) drainage ditch as we saw in Albuquerque did not make any appreciable difference to the value of the exit gradient. The trees in the upper part of the slope decreased the factor of safety because they add weight. The trees near the toe increase the factor of safety because of the reinforcing effects of the roots. The mid-slope - trees at mid-slope seem to have a lesser effect on the factor of safety because they act as a load.

But the wind load -- which was very difficult to model and we still are working to further the study on this -- was that we did find the factor of safety was decreased. Again we feel that we need further study on this before we make any more conclusions on the wind load.

The strengthening effect of the roots to deep-seated failure mode is really insignificant. In other words, we did not find that they provided any reinforcing on deep-seated failures.

Okay now that leads us to the underlying question, does woody vegetation affect the levee structure. As I mentioned earlier and kind of alluded to this, the complexity and of course the variability associated with so many different things -- such as root systems, the soil, the geology -- makes a single definite answer really impossible with this research and with any further future research we feel sure.

Reductions on the factor of safety reflect again very specific conditions and the same is true for the increase in the factor of safety. If the flow field and the pressure conditions are within the bounds of safety without woody vegetation -- in other words if you have no problems, preexisting problems -- it appears that it will be equally safe if the - if living woody vegetation is present.

Again this stresses the fact this is not decayed or diseased trees but actual healthy, living trees which at times -- as everybody knows -- is difficult to assess if a tree is not diseased.

Factors such as past performance of the levee and presence of sand boils for instance should also be considered before any - making any final statements. The impact of trees on levees should be analyzed on a case-by-case basis. This report -- as I mentioned it earlier -- documented on this Web site. It is publicly assessable. It's not restricted.

And I'll leave you with a photo that was taken last year in an area right across the river from where I live. We experienced record flood and this year we're in record drought. So as you can see, there are trees that are along this overbuilt section of the Mississippi River.

With that I'll open it up to any questions Courtney.

Courtney Chambers: Okay, that sounds great. Thank you Maureen.

So again you can remove your phone off of mute and speak up to ask a question or utilize this Chat feature. And again please send that message to everyone if you have a question for the presenters.

Dr. Maureen Corcoran: Hey Courtney while we're waiting on some questions, I need to point out -- which I had said I would at the beginning -- some of our future research. That includes what we're working on or to define some areas within our policy guidance letter, one being pit dimensions. We are working on that now. That will be completed, probably published by the end of October.

We're also next FY working on evaluating bridge scour equations. Both of those are requirements within our PGL, we we're providing better tools to use in this - in requesting a variance.

(Steve Duba): Maureen it's (Steve Duba) from SAD. Are there resources available to do this case-by-case analysis of the tree - trees if - and their effect on specific levee segments?

Dr. Maureen Corcoran: Thank you for asking that. That is another topic that I just left out, and we have been working on awarding a contract -- but it won't be conducted by ERDC or the Corps of Engineers -- to actually look at vegetation observation throughout the United States. So that's one way that we're doing that.

But in addition - so that's going to address some regional variability. In addition to collecting any vegetation observations, we're also looking at any maintenance requirements and any tree removal. So it's really going to include more than just providing us information that we need on this case-by-case basis. So we're looking forward to getting that information, and that should be conducted the - during FY '13.

Peter Rabbon: Pete Rabbon and responding to some of the - or part of the Chat questions. My presentation is available to be released to the public in PDF format.

Courtney Chambers: Okay, thank you....

Peter Rabbon: Maureen how about yours?

Dr. Maureen Corcoran: Same. Mine as well.

Courtney Chambers: Okay. And on that note, those presentations in PDF format are available on the webinar site for today which is on the Gateway Learning Exchange under the -- or on the Environment Gateway, excuse me -- under the Learning tab. And I'm just about to post that link to where we host all of our archived Web meetings.

(Mark Arbilly): This is (Mark Arbilly) in Philadelphia district. I had a question. What is the current planning guidance letter have for recommendations for vegetation on levees in light of this research?

Peter Rabbon: Okay, this is Pete Rabbon and let me restate that slightly. The PGL has not - the draft PGL has not been modified as a result of any research we have received to date. However the research that is being done by ERDC now we're hoping can help applicants through the PGL process.

(Steve Duba): Pete could you elaborate a little bit on how that research is going to benefit a sponsor?

Dr. Maureen Corcoran: I'll answer that. On the first one, I'll give you a little bit more detail on the pit dimensions. Right now we - you have to estimate the pit dimensions for a overthrown tree which we use in the PGL as we reference one peer-reviewed publication. So what we have done is actually collected more information. This is existing information. We did not do any field analysis to obtain this information ourselves. And we developed an envelope curve where you could actually form a better estimate on that pit size. That's one way.

Another requirement in the PGL is for scour and the prediction of scour around a tree. Right it's left up to the requester as to what bridge scour equation that could be used. So what we're doing is evaluating all of the existing bridge scour equations.

We're using flume studies to validate these here at ERDC - or flumes, and we'll be able to provide hopefully a better list of these equations and what type of sites that they would be useful in. For instance if you had a clay levee, what would be the bridge scour equation that could be used for that versus a sand levee.

Does that answer your question?

(Steve Duba): Yes, partially.

Dr. Maureen Corcoran: Okay.

(Steve Duba): Just try - we do have several levee sponsors that are preparing letters of intent and starting to prepare (SWIF)s, and all of them have vegetation issues. And I was just trying to sort out in my mind how they would approach the vegetation variance process based on what we know today.

Peter Rabbon: Yes, and the vegetation variance process can be included in the (SWIF).

(Steve Duba): I'm sorry to dominate the questions, but is there a sample? Has anybody put together a vegetation variance request yet that headquarters feels is adequate?

Peter Rabbon: There has been one that was approved and that's the one I described previously for the (Notomis) project at SPK. And that is the only one that has been - the only one that's been submitted. It's the only one that's been approved.

Man: As a template.

(Steve Duba): Could that be accessed as an example?

Peter Rabbon: I'm sure it'd probably be easiest to get it directly from SPK and I - it's a pretty in-depth, pretty rigorous - it's the only one we have if you want to use an example.

The draft PGL though does - one major modification that was made to that was to start initiating vertical discussions through the (writ) before any local sponsor gets too far down the road so we can make sure that they are doing the right work and so we can maximize the effectiveness of the time and resources they devote on this.

So even after you get a hold of (Notomis) as an example, you really should start initiating discussions vertically within the Corps and with the sponsor before they start committing their serious resources to it.

(Bill Dejager): This is (Bill Dejager), SPN, and I'm seeing that in this presentation the depiction of tree roots seems to be what you see in a moderately moist environment. In the western US we have a lot of places that have either arid conditions or summertime drought and we very often have tree species that are very thirsty. They're liable to grow their roots in a very (non-symmetrical) fashion when they're in an environment where the water is limited in location.

Like to see some work done investigating the geometry of tree roots in that kind of environment. It could be very helpful to use to get a better understanding of what typical patterns are when you have a river or stream with a moist area and then a levee where it gets dry very fast as you move away from the stream or you may have roots perhaps going down under the levee if there's a permeable layer, or maybe not. It all depends.

But it'd be helpful to have some work done on this subject rather than from the perspective of eastern US where it's always (fairly) well-watered under typical conditions across the landscape.

Courtney Chambers: All right. It appears that Maureen and Pete have lost contact, so I'm going to try to get in touch with them through chat and have them redial. I'm not sure what happened there, but they said all of the sudden they were unable to hear. Sorry.

(Bill Dejager): I could maybe email it in. I don't know.

Courtney Chambers: Okay.

Man: They had those sites in Sacramento and Albuquerque (unintelligible).

(Bill Dejager): Well I turn it off just so you can hear them at least. This is the one, right?

Courtney Chambers: Okay, let's give them just a few minutes and see if they're able to get back in with us quickly.

I know what we can do in the meantime. I've had some questions in the past about where the webinars are hosted, and so let me show you right quick, following that link that I just posted.

Okay, I'm sharing my desktop. Okay, I just clicked the link over there in the Chat feature that I sent and it's going to take you to this site right here, and this is the Civil Works Environment Gateway. And over here on the left-hand side you can see the Communities of Practice and you can go to Ecosystem Restoration, Environmental Benefits or Environmental Stewardship all under the Civil Works Environment page. And any of these pages you can access

these archived webinars through this Learning tab right here under - further down.

You scroll down and you'll see - we have a number of learning resources. Just one second. We have a number of learning resources listed here. And then down here you'll see upcoming Web meetings. And then in our archived Web meetings, we have our past webinars loaded - so for instance risk management.

Here's where you can find the bios for our presenters as well as the PowerPoint presentations. The transcript -- which is the word-for-word recording of what's been shared in a Word document -- and then you can view the video, which the video consists of the PowerPoint slides with audio over them just like if you were experience the webinar live.

So I hope maybe that will help you all in the future if you've never been able to access the recorded Web meetings.

Okay Maureen or Pete, were you all able to get back online?

Peter Rabbon: We are back...

Courtney Chambers: Oh great.

Courtney Chambers: Oh via Blackberry. Okay, well that's - I'm not sure what happened. We are all still here. So if we could wrap up a few questions here. That last question, could you go ahead and re-share your question? I bet Pete and them got cut off.

(Bill Dejager): Yes, this is (Bill Dejager), SPN, and I'll just try - do briefly that roots tend to be opportunistic and in many cases when you get out West where we have either arid environments or environments where we have - so it'd be a summer drought, roots of trees that are water-demanding like willows and cottonwoods will tend to grow in a very non-symmetrical manner to where the water is rather than out in all directions.

And I'd like to see some work done on this - some field (phase) done on this topic to get a better stance of what common patterns are in the field. Thank you.

Dr. Maureen Corcoran: Hi. I think you're asking what type of field studies have been done to actually account for the variability in the root systems. And you're right, we do understand that there is quite a bit of variability in the way they grow based on soil and the geographic region especially.

To answer your question, we have not done any detailed studies on this. We have done field studies where we recorded the root growth. What we have done within our model (tabbers) was - what I showed you was what we took from our geophysical survey, but we actually altered that into if root systems will - would grow in direction and have different length.

We have coordinated -- as I mentioned -- our research with a California research team and they have actually collected a lot of data on root characterization. We're going to use that hopefully in future research.

Courtney Chambers: All right, are there any last questions today?

(Herb Bessy): Maureen, (Herb Bessy) here out of (Wahall District). Say I just had a follow-on questions here and I wonder, you know, you recognize that there's a huge

amount of variables and your research is very difficult and may not end up with any definitive answers.

However you've also touched on the - some of the variables that have cropped up and maybe the effects that they may provide. I wonder if you've considered compiling a master list of all variables to consider and the detrimental or - effects that each one may provide, such that we can pass that on to our inspectors out in the field to consider trees that might be, you know, in the marginal area of the levee.

Dr. Maureen Corcoran: Hi (Herb), good you're on the line. We have something that's not useful the particular requirements that you're stating right now, but what we have I'll describe to you. We could talk more about this later on a one-on-one phone call.

We actually put together a table that describes the different variability that I mentioned such as soil properties. But we link that - the processes to actual failure mode, so we're linking the mechanisms to the failure mode. And then we also have incorporated on how these trees can have an effect or an impact, and that would be either negative or positive.

So we have something - we have that done because we did that to see - I think what you're trying to arrive at is how are the trees influencing the variables. However though we're not at the point to release that to be used in the field, which is I think the application that you would like it for.

(Herb Bessy): Thanks Maureen. I'll contact you later.

Dr. Maureen Corcoran: Okay.

Courtney Chambers: All right, thank you all for your participation, for your questions. And thank you for a great presentation Maureen and Pete.

END