ERDC-EL
Moderator: Courtney Chambers
April 1, 2014
1:00 pm CT

Courtney Chambers: Okay, at this time I'll give you today's speakers on nutrient modeling and capabilities with HEC-RAS by Dr. Billy Johnson and Dr. Zhonglong Zhang. Dr. Billy Johnson is there research civil engineer in the water quality and contaminate modeling branch at the ERDC Environmental Laboratory. Dr. Johnson develops and applies multi-dimensional hydro dynamic and hydro logic models. He works with various ERDC laboratories as well as universities, private companies - federal government - state and local governments in this development and application. He is currently interested in developing physically based - nutrient and chemical bait transport processes to the distributive hydro logic model GSSHA. As well as continuing to work with ERDC team members to add sediment capabilities to the reservoir water quality model - now as CE-QUAL-W2.

Our second speaker is Dr. Zhonglong Zhang - a senior scientist for Vagal Technical Services working at the ERDC Environmental Laboratory. Dr. Zhang performs applies research to the support - to support the development and enhancement of the water shed and water quality model - sponsored by the Army Corps of Engineers. He incorporates basic research from the published scientific literature - also with - also along with numerical technics to create tools and methodologies to solve water resources problems. He also applies these watershed and water quality models for TMDL - integrated watershed - water quality - eco system restoration and environmental sustainability projects.

Additional information about our speakers can be found in their bios posted on the learning exchange - along with today's PowerPoint and recorded meeting. We're very happy to have you guys with us today.

So at this time I'm going to give Billy the presenter rights - enter listen only mode.

Operator: All participants are now in listen only mode.

Courtney Chambers: And we can begin.

Dr. Billy Johnson: Okay. Can you hear me there Courtney?

Courtney Chambers: We can. Billy, it might be a little better if you can speak into the handset. It's a little echoey.

Dr. Billy Johnson: Okay, how's this?

Courtney Chambers: That's great. Thank you.

Dr. Billy Johnson: Okay. All right, I appreciate the opportunity to talk to you today. This is a work unit where we've working with the Hydraulic Engineer Center to add nutrients capabilities to the model. And we've actually progressed to the point to where, we have a beta version as well as we're doing some demonstrations and actually starting to do some reimbursable studies with the model - so pretty excited about the capabilities that are coming out with this model here. So let's see - do I have the...

Courtney Chambers: Yes sir. You should be able to advance.

Dr. Billy Johnson: I just hit the wrong thing. Can you get me back?

Courtney Chambers: Oh, Okay. I'm sorry. Oh yes, we passed the presenter rights on, here you go.

Dr. Billy Johnson: Okay, thanks.

Courtney Chambers: You bet.

Dr. Billy Johnson: Okay, sorry about that. But anyway the development team was myself - Dr. Zhang, who will be talking a little bit later here. And - excuse me - we've also been working with (Mark Jenson) and (Cindy Lowney) from HEC in terms of the GUI and model integrations work.

Some of the problems that we're trying to address with this development is, you know, develop a, you know, riverine unification modeling capability. There have been models in the past that have, you know, tackled parts of this. But in terms of a more comprehensive - being able to look at a branching type network and more, let's say - I guess detail unification processes. We feel like, you know, the things that we put together here with HEC-RAS development is superior to a lot stuff that has been done in the past - at least as you come to the riverine portion of the hydrologic and hydraulic cycle there - also wanted to increase our capabilities of looking at total maximum daily load - analysis - TMDL analysis - supporting ecosystem management restoration projects.

If you were with us last week, we talked a little bit about some of the riparian vegetation work that we're doing. And the idea here is to develop, you know, some capabilities within HEC-RAS that can better allow us to tackle ecosystem management type projects.

And then also, looking at other regulatory and non-regulatory decisions - so if you're, you know, let's say if you're getting into looking at reservoir releases.

And you want to try to optimize some of those operation plans…being able to give you some more capabilities for that. So the purpose of the project was to improve and develop a set of state of the art nutrient simulation modules, short for NSM.

And here the idea behind the development is to develop modules that can be linked with a variety of other models. So while we're - in this particular project, we're linking with HEC-RAS. It's also, the modules are setup that we can link with other hydronic codes as well. And then finally also to, you know, as I mentioned to link with HEC-RAS, we wanted to link with the hydraulics and the sediment.

To give it sort of a full blown flow, sediment, and water quality capability there. So I mentioned, developing modules. It's going to be a three tiered system. And I'll talk a little bit more about the three tiers there.

But the idea here is where we're developing modules that will be tightly coupled. And when I say tightly coupled, basically integrated at the compile level. So once we have a release version of HEC-RAS with NSM - that will be on the HEC Web site. Then a person will go and actually download HEC-RAS - and you won't necessarily see a NSM model or module. It will basically be at compile level. So when you start up your model preprocess or model postprocessor, a lot of the water quality capabilities will be imbedded within that.

So you'll start up your HEC-RAS model just like normal. If you were going to do a hydraulic or sediment analysis, you would then see that you would have some capabilities of inputting the initial boundary conditions for water quality.

You could specify water quality rate coefficients. There will be a simulation button that will let you kick off a water quality run. And then there will be some viewers at the end - or in the post processing portion of the model, that will let you look at concentrations and fluxes coming out. For those not familiar with HEC-RAS, it's basically, you know, sort of the premier one dimensional – 1D hydraulic model, used not only within the Corps of Engineers but a lot of other federal agencies - private consulting firms within the US as well as outside the US. So it's got a fairly long history, a large user community.

And, its really one of the state of the art 1D hydraulic models. Compute river of velocity stages – profiles, etc. Geo RES is sort of the pre and post processor, you know, for the model.

It can do steady state as well as unsteady flow. And then if you're going to get into sediment analysis, they sort of have a step type - quasi unsteady capability. HEC-RAS can simulate sediment transport, movable beds that result from scour and deposition.

A lot of viewers in terms of the graphical user interface. Again, a fairly robust data storage system - so it - not only is it nice in terms of managing your boundary condition data as wells as your model output. But it also helps to facilitate that if you can get other models writing to and from DSS - to be able to make model linkages a lot easier between different modeling systems.

Okay, so stepping into the NMS, again we mentioned it's a three tiered system here. A level one is what we would say is more simplistic - you know, water quality capabilities.

It's limited state variable that you can see here. In terms of stat variables and derived output - the processes are little simpler than what you're going to see at level two.

As you step into level two, we turn on things like carbon cycle. As well as we start getting into multi algae groups and so you're getting into a little bit more sophisticated modeling than you might really need. Whereas level one can kind of take care of maybe some of the more typical type water quality analysis you might need. If you start getting into needing to actually model the bed sediment, then you can - level three is basically (detoro)'s bed sediment digenesis model.

You'll find that, for those familiar with water quality models, you'll actually find these - you know the bed sediment digenesis model incorporated in a number or models such as ICM - W2 now - a new version of W2 has (detoro)'s bed sediment digenesis model.

So it's becoming sort of the start of the art, you know, model for looking bed sediments. And I think with that I will let Dr. Zhang talk a little bit more detail about the NSM tiers - as well as to discuss some of the demonstrations and testing that we've been doing in support of validating the model as well as getting the model certification done.

Courtney Chambers: Dr. Zhang, are you there? We can't hear you - you might still be on mute, possibly.

Dr. Zhonglong Zhang: Okay. Can you hear me now?

Courtney Chambers: Hello. Yes we can.

Dr. Zhonglong Zhang: Okay, sorry about that.

Courtney Chambers: That's okay.

Dr. Zhonglong Zhang: We have three levels that I say each level represents different state of process. This is level one. So when you look at the (unintelligible) we (unintelligible) like nine state of (unintelligible).

So for each state (unintelligible) it's different process. So one of the difference between (unintelligible) is a state of air paw is different for any (unintelligible). Does not include four carbon cycle.

We use the same POD represented in the carbine parts. So also we have one - and I'll say group - so (unintelligible) we did a 40 (unintelligible) review. We look at some of the quality - (unintelligible) wasp. Basically give out by the EPA.

Also we look at some of the water quality model developed by brand. So say (unintelligible) one - (unintelligible) two. (unintelligible) I same. We tried to come up with some of the kinetics bass the (unintelligible) for the real water quality model.

So that (unintelligible) and not one model can handle all the problem. We (unintelligible) base all the (unintelligible). So basically and same one we have less state of air paw, less process. So less data needs.

So in (unintelligible) we add more state of air paw (unintelligible) major difference from I say one is that we have three (unintelligible) group. Also we add a four carbine cycle - besides that, when you look at the particular organic sand (unintelligible).

Carbine nitrogen phosphoresce she also divided into a (unintelligible). This state of air paw equally on the same tool - it's much similar with some of the state of air paw in the (unintelligible) tool (unintelligible) same.

This we also keep faster opportunity if we want to link to other (unintelligible) 3D model. We have similar water quality state of air paw. Besides that we also add one cell D group.

This is a multiple group. Can say there some of the waste water treatment plan - maybe this (unintelligible) to the (unintelligible). So we include the SOD. You can had all that with eyes maybe different kind of waste water treatment (unintelligible) facility.

This has different, like waste water - so we can use SOD (unintelligible). That part for the point (unintelligible) - for both - (unintelligible) one (unintelligible) two. (Unintelligible) like water carbine kinetics. For once the parted would (unintelligible) to review this last term.

Also for some of the release from sediment to water quality - water (unintelligible). The user basically has to specify that for example like sediment oxygen demand. Ammonia - phosphorus release.

We realize this is some say we missed between link of water (unintelligible) by sediment. So for NSM three basically we use same water quality kinetics in the same tool. We add bad sediment layer.

We actually model the bad sediment layer. Basically we use like the (detoro)'s sediment digenesis model - this sediment digenesis model already (unintelligible) into different water quality model.

Like (unintelligible) - I same (unintelligible) wasp (unintelligible) EPA model. So it's very standard - state art (unintelligible) kinetics. So this is basically set in digenesis model - state verbal. And the process basically what we track is the (unintelligible) deposit was set into the simulator biological chemical process.

On the set of digenesis - also some of the nutrients released back to water column. We basically, simulated dynamic interactions between water column in that segment.

It's (unintelligible) like (unintelligible) - one, two basically user - specify that for each segment. For this one, basically, we simulate this parameter dynamically for each time stamp.

So this give the opportunity (unintelligible) segment - that (unintelligible) and then later (unintelligible), you know, water column. So then we can use this term of this sigma di- Geniuses model - can track dynamic interacts into water column for that segment.

This is (unintelligible) from the HE (unintelligible). Basically is this - we - the snap stops do come out. But the main (unintelligible) is still the same. Basically they add two - bottom two manual item - (unintelligible) model inputter (unintelligible) the model opt review.

So this is for the model input actually, basically you can specify the bouncing conditions from the input. One (unintelligible) for the bouncing conditions - for each state of verbal, you have (unintelligible) bouncing condition.

Also, you can actually specify from the existing TSS file if you put that time service stat into the DSS. You can spec it from hear or you specify from Excel file or can do other copy things - information into the table in here - aso (unintelligible) you can specify it from here.

Besides bouncing conditions and (unintelligible), you also need to specify the water quality parameter. This is - and I say (unintelligible). Actually all this parameter you can specify here.

Basically, in here once you specify this you can look at some connections between each state of verbal. This is the - and I say (unintelligible). Once I need to point - right now it if you download from HEC Web site so - when I say one, you can only specify one set of state of verbal.

We have updated this. You can actually specify this state verbal state (unintelligible). Basically, you can divide into what a quad (unintelligible). For each region you can specify different set of parameter.

Once you round model, you basically can look up with the front here. The output - reading and writing to a binary file, you can view from here. At same time, also include a time serve (unintelligible) also included in the DSA.

One of my things, this (gooey) is you can directly compare - directly compare - observe the data and the model out for the front of the (gooey). So that's (unintelligible) for the model categories.

I will keep a little bit of discussion about what we have done for the (unintelligible). We basically, used this lower (Minnesota) as we were - as a test case.

The reason we used this one - lower (Minnesota) (unintelligible) has years - observed the data. Also in the past, there a (Seco) W2 model has been (unintelligible) lower (Minnesota).

We basically used some of the data from (Seco) W2 a prize rest. And (unintelligible) tried to evaluate some of the capability of (unintelligible) - for the lower (Minnesota) we were about like 40 miles from the conference with Mississippi.

We were there five case (unintelligible). Basically, the first one we used as a bouncing (unintelligible). All others we tried to use a (unintelligible). I got so stumped at the results from the last case - like we were miles 3.5.

Okay this is some of the - little bit of history. So, yes, in here we develop (Seco) W2 - use tools one to six data set. (Seco) W2 would be fully categories - (unintelligible) to use six years data - basically, a (unintelligible) we - around the same period of time with (Seco) W2.

This is the cross section - what look like lower (Minnesota) rear. Basically, we start from like - I think this is the model from (unintelligible) district that they provide us status data (higress) model.

Actually, a reason the (Seco) W2 model is the (unintelligible) from this same (higress) model. We basically used the status data (higress) (unintelligible) model.

We turned into a unsteady state model. First we did some model categories and (unintelligible) parts. This is some of the results from the last case. And I observed my (unintelligible).

It's no surprise the (Higress) that produce pretty good results for the flow part. This is the (unintelligible). This is the surface (unintelligible) water (unintelligible).

We have the results from the (unintelligible) case (unintelligible) and so some of the results are for the last case. Basically, first the step we categorized the (unintelligible) parts. Once (unintelligible) parts is category to that, we start to add water quality to (unintelligible) model. We start a category (unintelligible) water quality.

One thing - its nine things the (unintelligible) is basically it's the (unintelligible) (hyzordic) is category then that means in the future water qualities (unintelligible). It's not an answer (unintelligible) you have to (unintelligible) again.

Basically, we just use the existing results from the (Hyzordic) model. We just round the water quality parts. So this is the last (unintelligible) temperature (unintelligible). When you look at this time serves as comparison (unintelligible) to observe data and model results.

It's (unintelligible) roles. Also this is - product is of the solids. Basic it's product is of solids like tree (unintelligible). Basically, you check if the (unintelligible) parts is (unintelligible) to observe that. That's the - observe that pretty well.

This is some of the, you know, (unintelligible) solid. One thing I need to point is - and I say wow (unintelligible) simplify (unintelligible) solids in the same (unintelligible). It's when you look at the pick parts, it didn't pick up by the model because we have simplified the (unintelligible) - actually (Higress) (unintelligible) the four instead of the model.

So if some parts is more important maybe you can turn out the (Higress) set of model. For the water quality - okay this is the organic and nitrogen results. Want to say - as your (unintelligible) - this rights is wrong. Actually this is temperature - supposed to be alleges - for somehow we probably made a mistake.

So for the algae - for the organic and nitrogen - this is the ammonia and considerations are pretty low. When you look at organic and nitrogen, it's pretty much the four of the (unintelligible) of the algae.

During summertime algae concentrations high also, okay. And nitrogen's high - similar as the (unintelligible) hydrogen like ammonia. This is nitrate. Also some of the results - organic phosphors - actually, one thing need to point, is for the phosphors most is tightly associated with the, you know, organic (unintelligible) sediment.

So it's very (unintelligible) to have good results for organic (unintelligible) sediment - in order to cast some of the phosphors. So when you look at this very correlated to this - you know, organic suspend sediment.

For some parts we did not pick up because of the organic suspend sediment. Besides that, this model results pretty (unintelligible) matched to observe the data. Also when you look at (unintelligible) oxygen, (unintelligible) results obviously - pretty much the (unintelligible) the seasonal variation.

Besides the (unintelligible) of the comparisons between model results - observe data - and also computer sums the statistic for each space we have - like a four space. This is some of the statistic results - our square, also (unintelligible) ICE.

This is relative in an error. When you look at a sum of the statistic or number - for the water quality (unintelligible), actually this is really, really good. So when you look at our square only, I think only two below the - two state (unintelligible) below the .5 - our other - pretty much when you look at is the sum of every high.

So the results look like the model really cuts out what we observed in the field. So when you look at the relative errors - pretty much, really most are less than 10% - so some higher like the organic suspend sediment - also (unintelligible) OD.

(Unintelligible) a little bit higher because I think the (unintelligible) limitation is in one because (unintelligible) but equal to four common cycles. Also (unintelligible) CP this kind of lump parameter is maybe it's not best parameter for the water quality modeling.

So we actually impose SN into ISM2. So little bit of summary, actually, ISM why into (Higress), we have (unintelligible) test the (unintelligible) day to us some. And it is (unintelligible) - or worked fine. Besides that we (unintelligible) to the (Minnesota) (unintelligible), when you look at the results it's pretty much - we can produce - reproduce - observe the data.

Also gave pretty good results - one of the (unintelligible) because of (Higress). It's really pretty complicated also the (unintelligible) model - so that's once (unintelligible) with ISM. So we can really do (unintelligible) for the water quality simulation.

One thing is this - because ISM is - one, it's pretty simplified. There are some limitations because we (unintelligible) some of the limitations. That's why we

add (Isam) and (Isam) 2 and (Isam) 3. I also did some testing using the same tool. We have not finalized that yet.

Maybe we'll actually we will come up something to report for that same tool (unintelligible) lower Minnesota (unintelligible). Same tool you can basically look at the different types - the LJ group - also (unintelligible) group. Also and (unintelligible) can simulate or compensate.

So one of the - also advantage is for the approach we add water quality into (Higress) is because most of (unintelligible) model, you already got the (Higress) (unintelligible) model. But (unintelligible) advantage is - it's a, you know, fairly easy - also really to save time and cost to turn all the water quality models - like when I say (unintelligible).

Especially, ones I like to point out is - I did some comparison between the (Higress) and the (unintelligible) and the (Seco) W2 model for this learning (unintelligible). I look (unintelligible) as some of the results (unintelligible) comparable. Some (unintelligible) (Seco) W2 - but a little bit of better. But you include the computations, you know, (unintelligible) is six years old in (unintelligible).

So if round (Seco) W2 for six years - take you (unintelligible) eight hour. So that's the major difference especially when you consider some collaboration parts. I think that all. I give back to the Billy.

Dr. Billy Johnson Okay thanks, thanks Zhong. Okay so, yes Zhong kind of touched on, you know, some of the benefits of linking the water quality and the HEC-RAS.

And, you know, pretty much every district uses HEC-RAS, you know, in a variety of ways in terms of project - whether they're doing some sort of

sediment study or whether they're doing, you know, some sort of operation of maintenance type thing. Where they want to look at releases from reservoirs and so forth.

So the idea there is that if we put in water quality and HEC-RAS then you can basically take these existing models and very quickly just turn on the water quality functions and capabilities. And then basically, you go straight into, you know, sort of your ecosystem management scenarios that you can run there. So, the capability that we want to give the Corps is to be able to provide cost effective, a science based or physically based, water quality impact assessment, for supporting these type projects.

And in terms of the products that have come from this work unit. Like say, we've got the three NSM, DLL. And these, you know, basically DLL is Dynamic Link Library. So, you know, they can be linked to other hydrodynamic codes. Such as, we do have a version of NSM that's linked with ADH - the coastal hydraulics lab, multi dimension model.

We've worked linking NSM with the GSSHA model, you know, doing some over land - as well as channel type nutrient fate and transport. And then I think pretty much HEC-RAS - and I think for right now, those are three main ones that we've worked with. And then finally, the HEC-RAS model itself - with the NSM linked into it.

A couple of reports that are coming out this year - and these are more, sort of, supporting the model certification effort. But the first report is looking at the actual - the formulations. You know, so you can kind of get into the details of just what's being computed with NSM.

Excuse me - and then the application evaluation that we just went through. So we go into a quite a bit more detail in terms of just what we did with the Lower Minnesota River.

As Zhong mentioned, he's pretty well done the NSM 1. There may still be a little bit of tweaking that he's doing with that. But we're also moving on towards looking at NSM 2 and 3. And eventually, they'll be a report that comes out of that, that will also go towards model certification.

And so with the last slide, you know, pretty much now a days a lot of the planning products that come from EMRRP have to go through a model certification process. So that's where we're at right now with the HEC-RAS NSM. We do have a Beta version of the model that we're using for testing, in fact. In working with Kansas City district and Omaha district, we're in the process of setting up HEC-RAS NSM for a number of reaches on the Missouri River.

So we feel, you know, confident enough in the model right now that we are starting to move more into looking at doing some reimbursable studies and also working to eventually get this as a release code that will be downloadable from the HEC Web site.

I would say for those that are interested, you know, and don't want to necessarily wait for that release version to be placed out on the HEC Web site. We can work with other districts or other partners if they want to, basically, be Beta testers.

You know, if they have studies that have an immediate need for the model, then we can work with you - in terms of trying to get to you a little bit quicker. And maybe work with you to be a Beta tester on the model.

So I think that pretty much covers what we wanted to go through. We wanted to leave a little bit of time in case in anybody had any questions and wanted to go back and look at anything in particular.

Courtney Chambers: Great, okay Billy, we're going to return to interactive mode.

Recording: All participants are now in interactive talk mode.

Courtney Chambers: All right, so now if you have any questions, you can take your phone off of mute. And we'll be able to hear you.

(Jason Smith): This is (Jason Smith) in Rock Island District. I'm a study manager for the Minnesota River study and one on Iowa Cedar, as well. And we've been working with (Chuck Doner)'s group on the GSSHA modeling effort there. And I was wondering Billy, is the - you mentioned that the NSM code has been updated to work within in GSSHA. Is that a working version. I mean is that all said and done - or is that still kind of a work in progress. I haven't heard one way or another from (Chuck) and his group.

Dr. Billy Johnson: Right, you know, to be honest, I would say that's still probably a work in progress. We got to a point - with it - to where we were doing some testing with the (Ogolly) Watershed up in Wisconsin.

And got to a certain point. But then, you know, the system wide research program was the one that funded that. And before we could actually finalize and maybe do a more full blown and a testing and debugging, that research program essentially ended.

So I think they're, you know, there some capability within GSSHA to do some things. But I would say there's still some work that needs to be done with that.

(Jason Smith): Okay, very good.

Courtney Chambers: All right, any other questions today? Ijust sent the link to the archive files for this webinar series. So today's recorded meeting will be posted there along with our past meeting. So you can send that link to maybe any of your colleagues that you feel like might benefit from the information shared today or if you want to just share the archived meeting.

There's also a place under the learning exchange tab where you can sign up for webinars or direct colleagues again to sign up for notifications - any other questions or discussion this afternoon?

(Jason Smith): I don't want to drag it on. This is (Jason Smith), again. I just have one question for Zhonglong.

Dr. Zhonglong Zhang: Yes.

(Jason Smith): What's the time scale again, you mentioned. From looking at those graphics, it was hard to tell if that was period of analysis - was, you know, a month or a year or what the end the role was on those.

Is this a longer range simulation to where if you wanted to look across say respective scenarios - future scenarios that you could simulate, you know, 20 years period of record or would it be more like a year period of record or an event.

Dr. Zhonglong Zhang: For this application, 6 years because I only got the six years data from ’01 to ’06. The time stamp actually is a (unintelligible) for the water quality (unintelligible) where are (unintelligible).

So basically, you can count the results for any time step - like hour, you count daily, you can (unintelligible).

Dr. Billy Johnson: I mean I think for HEC-RAS, it wouldn’t be a problem running something like a 20 year timeframe.

Dr. Zhonglong Zhang: No actually, for the hydraulic (unintelligible) like six years - like wow. I think probably less than an hour for the water qualities for six years. So actually they’re pretty stable.

Dr. Billy Johnson: and the way they’ve got it set up (Jason), is that once you run the water - once you run he water quantity and you get your flows right - and even the sediments right. Then you can basically lock that down.

And then just use that output from that simulation to just run your water quality over and over without having to go back and run the hydraulic event again.

Dr. Zhonglong Zhang: Yes because we use like (unintelligible) approach. So basically once hydraulics set in place we basically (unintelligible) files every time we (unintelligible) water quality, we just read up the front there.

Man: Okay.

Dr. Zhonglong Zhang: (Jason) I have a question. Are you planned to expand this Minnesota Rivers HEC-RAS model?

(Jason Smith): Well that's what we're trying to figure for the, you know, (Ann) and others on the technical team, we've been talking about it. But, you know, with a integrated study of sorts that we're working on, intent would be to simulate different, kind of, future scenarios and understand the hydrologic and water quality implication to those and geomorphic changes.

So we've kind of been exploring. And I know we've talked with you a little bit about the SWAT model but also looking at the GSSHA model and the SWAT model and HSPF model and different models to maybe reproduce the hydrology and the geomorphic conditions for these respective scenarios.

And then, kind of, where - what I'm thinking about now is if we did have these different land use scenarios and we're looking to very drastically different land use scenarios in order to get a sensitivity analysis at least initially.

And then we regenerate the hydrology - run it through HEC-RAS. And I'm wondering if you would then be able to use the NSM module or if you would lock in the hydrology in the sediment transport from your original existing conditions scenario.

And then you'd just look at NSM in terms or your new land cover - land use map. I'm not sure which way you'd go on that. Do you have any thoughts?

Dr. Zhonglong Zhang: we have the capability, you know, the HEC-RAS. You can actually - we can read the - as a boundary from watershed - you know, whatever scenario you have.

Actually, we have the tools here, you know, for the (unintelligible) model and the outputted. You can - we can do active reading to the DSA's by (unintelligible) as a bounding (unintelligible) can (unintelligible) from there.

(Jason Smith): Okay.

Dr. Zhonglong Zhang: So that will (unintelligible) somewhere if you (unintelligible) from watershed - the (unintelligible) landscape change that you can draw waters in model Once you draw waters in model, we can (unintelligible) input of DSA's. Then we can do the detail analysis of (unintelligible).

(Jason Smith): Okay.

Dr. Billy Johnson Yes we didn't mention it here. But we have a time scenario management tool that allows you to take SWAT output and let's say HSPF output and write that in to DSS.

And then you can use that DSS file to read in boundary conditions into HEC-RAS. So if you had a SWAT model and you had - let's say, existing conditions. Then you had, you know, various scenarios. Then you would just write the output - wherever you needed it- from those various SWAT model runs.

And then you would have different boundary conditions for each existing condition and scenario that would feed into HEC-RAS. And then you could look at, you know, how that changes the water quality, you know, via NSM.

(Jason Smith): Okay, sounds like we have some more discussions to have. I don't want to hold up our teleconference here - thank you guys very much for the input. One last - I guess one last thought on the NSM.

Does it - are the inputs very specific to a real tight and real fine HEC-RAS model? The reason I ask is because I've been maybe challenging our folks to think about whether we could get away with, you know, more of a planning level HEC-RAS model or we're using (unintelligible) existing (unintelligible) data.

And maybe using less detailed information - less detailed cross sections in order to arrive at some kind of a plan in frame work - that may not get you down to flood forecasting and real tight cross sections but would help to cover the basin, for example in a pretty quick time spend.

Is it real sensitive to the symmetry and that kind of area in terms of the processes that are happening or is more fluctuate based on your inundation extent and some of your flood periods?

Dr. Zhonglong Zhang: I think probably less (unintelligible) for the water quality because for the water quality - actually is not necessary. We have to use the same segment to reach the hydraulic model.

Because for the water quality, actually you can define water quality (unintelligible) defines this - the second day's courser then the (unintelligible) hydraulic model. So for some parts - maybe sensitive for some parts, I guess it's not that sensitive. Because user (unintelligible) quantity, we use closer (unintelligible) - even if you have detail level because we are (unintelligible) difference.

(Jason Smith): Yes, okay great. Thank you very much. I appreciate you addressing my questions as a part of this conference call.

Courtney Chambers: You bet, thanks for getting on with us (Jason) - one other opportunity here for any other questions. Okay well with that, Billy or Zhong, do you all have any final comments?

Dr. Zhonglong Zhang: I don't.

Dr. Billy Johnson No, the only thing I would say is thatwe are pushing forwards with trying to do some studies with this. And so I would just encourage people that even if you're not sure whether or not, you know, you're ready to kind of get into it, if you have any questions and want to give us a call - or even go back over some slides, you know, and see whether or not this would be useful for your projects, we're more than happy to do that.

Courtney Chambers: Great, all right. Well thank you very much Billy and thank you Zhong for sharing all the information today. Participants thank you for joining us. And I want to just let you know that future meeting information will be shared from the Gateway email address. So watch your email for future announcements. And I hope you all have a wonderful afternoon. Thanks again, for joining us.

END