

## AFTERNOON SESSION MAY 11, 2010

>> MR. DOYLE: I guess we're ready to go. If everyone could take a moment, find a seat, please. While folks are taking a seat, a couple of things for our folks on the web. Anybody who is on the web that has a question, particularly for this afternoon or even for tomorrow can send it in through the e-mail site that's on the registration web page and they will be picked up here and addressed to the either two panels that we will have this afternoon. I hope everybody enjoyed the lunch, again, very much grateful to our sponsors who helped us enjoy this afternoon. I hope everybody had a chance to chat among yourselves and, certainly, talk to some of the NGS folks about what we discussed this morning. We went through quite a bit and the rationale for why we need to move in this direction. And as Dru so very well pointed out, it's not a matter of so much why but if we will do it. We certainly will do this, it is a matter of how and several excellent points were covered. And just to reiterate those, the interaction from you is vital. We've said that several times and we want to make sure that's well understood. But we have a number of opportunities now that did not – they were not available to us when we were doing the NAD 27 and the NAVD 88. Dave Z talked at length about some of the workshops and seminars that we did at that time. Dave was involved in that, ED McCay, myself, John Bossler and several others and we roamed all over the country giving these workshops. Just like Dave said when it was all done everybody was like, you never told me that was going to happen. And so we have no illusions. And we are doing this now, we are outreaching to our state geodetic advisors. The geodetic advisors are out there talking at the local level with various surveying chapters; they are talking with GIS forums in their states and in their regions, was certainly involved at the national level with organizations like the American Congress on Surveying and Mapping, and the American Society for Photogrammetry and Remote Sensing, and a few others, and we do a lot of personal contact and that's good. We need to keep that but we now have the advantage of contemporary tools like webinars, and I think we have been reasonably successful with some things we have done. So we would encourage you that if you have specific things, whether it is just a general topic you want to hear more about in greater depth, or maybe it's something you want to take back to your specific agency, maybe it's something we need to tailor to the Core of Engineers, or USGS, or FAA, or whomever. We are very very happy to entertain any of those kind of activities. I will not trivialize it, I won't say they are easy to do, but they are certainly not the complexity that it would be to arrange a seminar that somebody might fly out and do that kind of thing.

A really important item: When you go to the break or before you leave today, you get a coffee mug. Mission Earth, NOAA coffee mug and even more important, don't forget this, they will be on the table outside, I never everybody would have to walk around with all the coffee cups but pick one up this afternoon. But more important than that; we got popcorn. So get some popcorn and it is NOAA popcorn; this is real official NOAA popcorn. You will not find that anywhere else, so this is your tax money hard at work.

Okay. This afternoon, we have a couple of panel sessions that will focus on these individual topics, the change, the migration to a geometric datum. Where in the past,

we talked about the horizontal datum, two dimensional as Richard Snay pointed out. NAD 83 has transitioned from a two dimensional reference frame to one that is three dimensional, now four dimensional. So we will have a panel of some of our experts that will talk about the detail issues and we would entertain your comments and questions at that time. So hopefully, maybe that will solidify more of your ideas for some of the minute sessions that we again encourage you to sign up for tomorrow. One on geometric and after the break, we will do one on the geopotential. So the geometric panel will be Juliana Blackwell, Director of the National Geodetic Survey, Dr. Giovanni Zellis who is the CORS manager, Richard Snay, now retired, but previously in charge of that division, my boss, Giovanni's boss, Jerry Nader from the NGS lab. Mike Kramer from the Geodetic Survey, Canada, and Marti Ikehara, who is our state geodetic advisor to California, and obviously dealing with an area in which velocity is just a day-to-day function for Marti. So if our panelists will come on up, they may have an agenda of some sorts and they will begin the discussion.

>> MS. BLACKWELL: Thank you for coming back from that wonderful lunch. We're going to start off with just a few comments. There is no set agenda, this is an opportunity for you all to ask some questions, give us your ideas about the geometric datums. If there were things that weren't clear in some of the earlier presentations related to geometric side. Please feel that you can ask those questions now, too, so that if you're unsure about something, chances are there is somebody else who is unclear. You've been introduced to the panel and we would like to hear from you. There are a couple of microphones, I understand, that are going to be around, so we do want you to be able to speak into the microphone so we can all hear you. And I would ask who wants to lead off? Otherwise, we will have to ask ourselves questions and we already know the answers to those questions, so it would make us look really good. Anyway, is there someone down there, and if there is a particular individual you would like to address it to, let us know that as well.

>> MR. DOYLE: Please identify yourself and your agency or company.

>> Mr. Abdullah: (Inaudible) I'm chief scientist with Fugro data so we are not government, not federal but federal is our client. And we are grateful to them. There are some things I want to add here. I'm really glad you did that because we have so much what you call it, we were upset, angered. I don't want to say we are angry about the whole issue of 2007 and the way you rolled it out. This has created the chaos in our industry, not on the Government, I'm not sure, but especially as a private where we have a client, they have 86 and code 96 and then, 2007, I mean for laymen people, this is very confusing. You start asking clients tell me what you need, they tell you which one is better we ask you and then, you put it on the paper. We understand the evolution has to go through that. The problem with the 2007, the way it's been rolled out, your conclusion, that is what we didn't understand because we saw minor changes, we are not going to give you two to convert. This is a disaster for us because if I did a project in 2007 HARN and I need to take advantage to use it for the 2007, although one centimeter or 2 centimeter. But to be honest to the client, I cannot do it. People start affecting it because HARN 96, we start labeling because there is no tool. It is really

important that – I don't think it's too late to think about for a tool for the years so people can convert whether 86 from HARN 96 to 2007 and back.

Then my second point, I really agree with geocentric system. I'm glad you're all on – we all on one page on this one. It is very important to go that direction. But to please, I urge you, if you go with a new system, just go with ITRF. Just go with ITRF like the DOD did and bless it and publish it, give all the data we have over America, over North America to that international society because we all agree, it is the most accurate, we all agree it is the best tool they are using and this method like the gentleman presented. And we got enough confusion from 27, through 2007, let's just impress something everybody understand it, WGS 84 went to it and we don't have to educate people any more. If somebody – because I saw a lot of the discussion, we don't want to move people data from system we have to stay within the closed change but that is not true. When you move from HARN to 2007, you ruined that system. For me, the map is not published any more, it is a new system, a new of 983 but just because a neutralization, that is new step, whatever you have two years ago, cannot use it unless you convert it. So what I'm saying, because of that, let's do that leap for very courageously, let's go to ITRF, bless it and just support that international community. Thank you.

>> MS. BLACKWELL: Thank you for those comments. We realize that we did not properly release 2007 and prepare people for the 2007 realization of NAD 83. What we have learned from that process, we can talk about that probably for the rest of afternoon, but I hear what you're saying and we did make a decision not to provide those transformations. We are talking about and demonstrated through Dr. Snay's presentation is that we love transformations. We'd love to be able do them but it didn't make sense to do them for this shall change we saw on the 2007 realization. And people have other thoughts and comment and we have heard that from a number of individuals as well. So thank you for bringing that up.

The other topic that you mentioned is to go straight with ITRF. I think you're one voice in that, and I'd like to find out, not polling everybody but maybe that is not a bad idea. If people are passionate about this, I just like to get a raise of hands to see between the two options that were demonstrated earlier about having the ITRF, or the North America, or plate-fixed, who would vote for ITRF only? Interesting. And the other way around with the plate fixed version? The one on the end, I bet, right. The one from California. Interesting

Yes, sir.

>> MR. SNAY: (low audio) I joined the CORS program in 1995 and my job back then, Bill Strange was in charge, my job was to come up with a coordinator the clause. And from day one, we always produced both for the NAD 83, 96 and ITRF, whatever most recent one. So it is not a new idea. And I would like to perpetuate that. Now, most users when I go out in the states and talk, they were not living in a NAD world because they live in a state plan coordinate world and they are tied to NAD 83. So I suspect if there were more state representatives here, the vote would have probably been a little

bit different. From looking at the hands here, ITRF won out easily. But I think we are sophisticated enough to deal with two official reference frames. We have been doing it since 1995. You might not have realized that but it's not new.

>> MS. BLACKWELL: Anybody else on the panel want me to explain the vote?

MS. MARTI IKEHARA>> Sure! I think that in California, we are so used to dealing with coastal motion velocities. My predecessor, and he's been retired over ten years, did a really good job on educating our users in California about coastal motion and the absolute necessity to account for horizontal motion. In fact, it is in our California codes, the public resource as code, that you must use velocity model to deal with the – must use a model to deal with that. So, we have – sure there is kicking and screaming at the beginning. Fortunately, my predecessor took a lot kicking, and I didn't have to. But people want the best product, including our users, and they have come to realize that to do the best work you must take into account these motions and this is geodetic survey. And if you want to be able to work in that field, then you have to be, I guess, sophisticated enough to be able to use the tools that are available. So I think, it may take some time for the rest of the country or the non-west coast to catch up with considering the velocities but I think it is a durable thing and I think we need to give our users credit for being able to accommodate that and get used to the concept and take that into account especially with the tools and be able to hardware and software to enable to us be that accurate and that correct.

>> MS. BLACKWELL: Anybody else?

>> SPEAKER: I might add that NGS is one of the analysis center office the IGS, in fact about the coordinating analysis center so a major participate in the ITRF and a significant number of CORS stations are included in that. So we have an excellent foundation for beginning that, and also, we are committed to establishing, what we call a foundation CORS network, like an even more fundamental set of about one for two dozen stations which, I expect, we would maintain with an idea toward a centennial time frame for a determination, this sort of thing. That's where we see the reference frame needs to be. My – I guess what I would dread is, ten years from now, will you pick up, have something the size of a watch and it will tell you your position to a few centimeters with all the satellites that will be up. And you stand over one of our marks and get different coordinates. That is just not acceptable. Why should it be that way? So I think the endorsement of a single international reference frame seems like a more logical way to go and look ahead to the tools available in the future. I think that's what we want to be able to use and support.

>> KEVIN KELLY, ESRI: I wanted to go back to what this gentleman was suggesting about the NGS 2007 and the transformation. We have a similar situation at ESRI. That people call us up and they say, where is the transformation between NGS 2007 and the previous realizations. And we give the explanation that there is not one and NGS is not going to provide one and say oh, well, can you provide one for us, ask us to provide one for them. And we say, well, certainly, we can, but then we say, should we? Perhaps we

should not be the ones to do that. So, considering there it's going to an interim about – we're talking the new reference frame of over a period of five to ten years, so this situation is going to persist for at least the interim period. So my suggestion or question for NGS was would you provide us with guidelines or best practices as to how we might do that, or how other users might do that? Short of actually doing the transformation of computing one yourself. Just give us a guidelines and ideas as to how we can then implement that or whether users actually want to do that, really need that transformation even though it is only a couple of centimeters.

>> MR. DOYLE: I'll take a shot at that one since I was somewhat tasked with looking at that issue and will give it to Lou here. I was tasked with looking at that issue subsequent to the completion of the 2007 adjustment. Hopefully everybody is a familiar with our national transformation model NADCOM. NADCOM works quite well with NAVD 38 and from NAD 83 to the HARN from the HARN to results of the 2007 adjustment. As Juliana pointed out it, positional differences in most areas of the country are quite small, with the exception of California, parts of Washington and Oregon, they were typically in the one-and-a-half to less than three centimeters in both components. So we are talking small numbers here. When we developed NADCOM, for example, going from 27 to 83 at the one Sigma level, it was fifteen centimeters of uncertainty. And going from NAD 83, 86 to each state's HARN, remember, we did them by state or pairs of states, the uncertainty in that transformation went down to about five centimeters. So it got considerably better because we had removed a considerable amount of the regional distortion.

Well, when we looked at the issue of taking all this GPS data that had been collected going back almost as far as the original HARNs, what we found is that in trying to model those differences, the shifts were only two centimeters and the standard deviation would be 1.8 or 2.1 centimeter. And in some cases, the distortions were larger than the shift. Why would we provide a transformation? That was the biggest compelling reason. And now, what we are talking about, remember this, we are talking about a national model. NADCOM is a national model, even a state model, state by state. In addition, and this was less of an issue but a minor issue; NAD 27 was two dimensional; NAD 83, 86 was two dimensional, latitude and longitude. We did not integrate or publish any ellipsoid heights until we started the publication of HARNs roughly about 1989 or 1990. So, if you look at NADCON is it purely two dimensional transformation tool, latitude and longitude, NAD 27 to 83 86, or 83 86 to the HARN in whatever state you're in. Now, we are talking about three dimensional tool, so NADCON is not designed to do that. That is a grIDDed format and would not work well with 3 dimensional. So we would have had to written some form of a – not a three parameter – not parameter but some kind of seven parameter transformation in and of itself not significantly a big issue. But again, when we looked at the data, what we found, there were distortions and we are getting smaller now, all the time, and that's the problem, getting into micro surveying and coming up with transformations that can identify and it is difficult.

One of the things that – well, I learned this from my great mentor, Joe Dracup, blessings and peace be upon him, but Joe taught all of us when we were developing our

workshops for transformations, 25, 30 years ago, and we had been talking about this ever since, if you need get from reference frame A to reference frame B and maintain your original level of integrity, you need to readjust with original observations. There is no other way to get around it. The transformation tools that we have developed generally speaking were designed for mapping, charting, and sort of broader GIS issues. They were never designed to take a high accuracy survey on NAD 27, run it through NADCON – Oh yeah, I got a first order survey NAD 27, run it through NADCON, I got a first order survey on NAD 83, does not work that way. We do realize now that there was a tremendous number, and certainly known for many years, that much of GPS data that's been collected over the last 15, 20 years has never been submitted to NGS for publication as part of the NSR and so a lot of this is held at the local level and regrettably, most people withhold coordinates and heights and not their observations. So that makes it somewhat problematic for them to perform those readjustments. And this leaves us with that complexity, how do we develop a transformation tool that serves those needs, yet mathematically, we can't do it? Certainly not on this a regional level or a national level.

There are, and Kevin makes a good point on this, that there are, certainly, any number of tools that would be available for the user to develop transformations at a local level, county level, or municipal level where you're dealing with much smaller differences in the solutions. I have done several of those for a number of communities and generally speaking some pretty good luck. Although I have to tell you, there are some areas of the country where they did some early GPS surveys in the early 1990's and when we look at the distortions that were inherent in those, and we noticed they are somewhat significant. So it is dependent upon the nature of data and there is no one set way of looking at this. But I think Kevin makes a really good suggestion and something I think we would take to heart to sit down with a number of users and we can certainly pursue this through the activities that we have, not only with ESRI, but certainly with AAGS and ACSMS to come up with some protocol that is everybody would feel happy with that we can kind of bless and users could pick those up and bring their own data into to perform the transformations so that's kind of the background on that transfer. Once we go in the future, now it is a little bit different because the NSRS was all about the CORS. So the CORS are held fixed and whatever we do in the future will be based on the CORS. As Richard pointed out, we have a very very rigorous transformation. It is virtually a perfect transformation there. Whatever we do in the future, this should not be a problem. Would you agree with that Richard?

>> RICHARD: Very much so.

>> MR. DOYLE: Thank you. Lou.

>> LOU: I'm with South Carolina Geodetic Survey, former director of the National Geodetic Survey. First, I'm in the minority about having a crustal plate-fixed coordinate system. Being at the state level, dealing with surveyors, mappers, engineers, we cannot change our coordinates, that only changes at a centimeter a year. That puts an unnecessary financial burden on 45 states because there are four states that are

moving. I highly recommend a plate-fixed coordinate system. If you go to the state societies, you will get a similar response. And I'm agasp at the fact that we will not have a state plain coordinate system. Come on people, you don't think surveyors and engineers use latitude and longitudes or geocentric coordinates. They use state-plain coordinates. That is a fact of life and if you don't have a plate fixed and you don't have an NAD 83 type coordinate system, you're throwing away state-plain coordinates and I think that is a no-sell, right off the bat. But I do have some positive things to say. I'm really always in favor of improving accuracy. I am. And I think GRAV-D is a phenomenal idea even though every surveyor will tar and feather me between coordinates change one more time.

>> MR. DOYLE: We were sort of hoping on that.

>> LOU: Right. But I will say something, if FEMA and the Corps of Engineers aren't 150 percent behind you, it is doomed to failure because half of all flood maps are still on 29 and our surveyors are still surveying on 29. So, you got to have the big guns behind you if you're going to change the vertical coordinates.

>> MS. BLACKWELL: Did you say if they are or unless they are?

>> LOU: Unless they are behind you, 150 percent. But I think, just as a critique, I still hear you talking about a horizontal and a vertical. Yes, because Dan Roman talked one thing, Richard talked about – are you building a three dimensional coordinate system. That's the sale; four dimensional, five if you want to throw in time. I mean, orthometric and ellipsoid heights and time. Well, the point is, I think the sales pitch is one coordinate system, one datum, however you want to describe it. Get away from the horizontal and vertical, that is kind of a historic thing.

And on the legal aspect, anybody who thinks that marks are not important has never surveyed in their life. I don't care if the coordinates change on them, but you always start property and boundary survey from points on the ground. And the law is defined not as the 49th parallel, but as where the physical marks are in the ground that mark the 49th parallel and Dave Ingraham on a TV program not too long ago, a surveyor nowadays, those retrace the steps of the former surveyors. If there is no mark, you cannot retrace the steps. Take it from me trying to retrace a 1721 State boundary – blaze marks on elm trees. Well, there are no elm trees anymore, so marks regardless of the importance to the National Geodetic Survey, extremely important at the local and State level. And one more thing about changing coordinates with time. You know, our State has nine terabytes of geographic information data. Does that mean we're going to have to, every time we call up an Ortho image, we will have to run a transformation based on time? I don't think that makes any economic sense. So, rethink that, I reiterated them and we're a state that has a real time network. We don't use OPUS in South Carolina because we can get centimeter realization on any of the NAD 83 in 60 seconds or less and we're not the only state. There are at least a half dozen states that have imagined what I call high density CORS network that are operating in real-time. I hear very little, if any, comments on real-time in your discussion of building this new

network. It is coming; more and more states are doing to build them and so you need to be prepared not to think of 1200 CORS but of 12,000 or 15,000 CORS running across the United States.

I think I had one more thing. Oh, and our biggest consumer, our biggest users now, because I didn't hear this either, our two biggest users are construction for automated grading and precision agriculture. The peanut farmers in our state have invested \$30,000 worth of equipment to run off our real-time network. They get 50 more pounds of peanuts per acre as a result, and amortize costs of all that equipment in one growing season. So thinking about users, let's get away from the surveyor and mappers and think about other industries that are becoming heavily dependent on very high precision positioning. And I'll be quiet.

Don't say it.

>> MR. DOYLE: That was the one that wanted me to get you tarred and feathered. Giovanni did you want to comment on real-time since you're the CORS guy? Make some comments on the real-time aspect here? We didn't mention it specifically, but it's part of it.

>> GIOVANNI: Real-time comes in. NGS is not a forefront, no question about that. The discussion here though, whatever we decide here, immediately translates into the real-time. I don't think the real-time has to be treated as a separate beast. Simply fall out from it. The question here with a lot of discussions on the accuracy and precision here is what do the users really need because if we're talking here that users really want centimeter level accuracy. At the centimeter level all the game changes. We can no longer do simple transformations from one datum to the next. You have to go back to raw observations that you collected and reprocessed them over time repeatedly. It is a very inconvenient prospect for many of us, nobody likes doing it. We are in the CORS right now, and we have some systematic errors in our processing software in the way we define the reference frame. The international reference frame, the analysis center that normally have the highest accuracy level of the frame have discovered these same problems. We have gone back and recomputed all GPS satellites orbits, all station coordinates back from 1994 to the present. We basically recognized there was a flaw in the system; we could not solve it with a simple transformation or a series of transformations. We had go back to ground zero and rebuild it. You have three terabytes of data or fifteen terabytes of data, there does come, depending on what you're looking for, you may have to go back and ortho-rectify. I'm not saying you have to, I'm saying it depends what you're trying to stand up and say, my data is good enough to meet the following criteria. That is not for us to define. What we have to define is we have to come up with a system that will meet the majority of your needs. And we actually have to be better than your needs by a significant margin because there are all sorts of errors that can creep in both within your work and our own work and ultimately in your work because you are rightly trying to expend the smallest amount of time and effort to access the frame. You don't want to go through the whole nine yards that we go to. And that's going be the big trade-off issue. As we start

talking, as we moved from meter, down to ten centimeters, down to centimeters, it gets awful tricky to squeeze that final amount out. There is a lot of massaging that has to be done that is very time consuming. And I don't have an answer on that, but I would be curious as part of the feedback that you give to us is to tell us what I really only care about my coordinates to the meter level. If all you care about things to the meter level, it does not matter what data you use in a lot of instances. Maybe once in NAD 83, whichever version it is, it's really not going to matter. If you're uncertain about the meter level, well, then, things change and so the real-time, again do you want accuracy in an absolute sense or in a relative sense within your state? If that is good enough for you, I'm sure that in a real-time network, you can do that. Our responsibility though lies at the national level. So we can't provide a frame that will only work in a given state at that level. We have to make sure that it is seamless every which way you go. So those are my comments.

>> (low audio) What concerns me though they don't need. (audible) Sorry, I said I was not going to talk any more. Centimeter, real-time relative, that is what we need, that's what the user needs. I don't care where my position is relative to some place in Afghanistan, or even New Mexico for that matter. I want centimeter locally. And the states are building these networks right now and if you don't accommodate, you will wind up with 48 different datums and you will have your new ITRF datum that nobody else is going to use.

>> MR. DOYLE: Bill? Go ahead.

>> MR. HENNING: Is it on now? Bill Henning, NGS, also licensed land surveyor in Maryland. Lou, you made some really good points, as you always do, and some of them need augmentation and further discussion, obviously. You're absolutely right, surveyors do not need one centimeter, or even two centimeter accuracy; they need one centimeter precision. And the networks are going to provide the accuracy to a certain level. That's what we're after at NGS, to provide access to the National Spatial Reference System at a certain level in centimeters. It will not be the precision they need, that is up to them to achieve from their real-time network, in many cases, and you have an excellent one in South Carolina. Also, the marks on the ground, as a licensed land surveyor, I know about marks on the ground, and yes, the boundary markers, are what you retrace. The control marker is another animal. So control markers can be active stations but obviously, retracing the boundary, you look for the marks on the trees and other tell-tale signs. Also, real-time networks to my knowledge, most manufacturers are not able to use in velocities in their network coordinates, so if that is implemented in a fully dynamic datum, that is going to be a problem for software for real-time network. Right now, state interim process so you're dealing with time and you will have to reprocess back to that time, which is not a problem. What we are trying to do is provide access to a certain level, and understanding that the accuracy – a lot of it is lost in the noise of the solution; however, the relative precision is gained by the survey or geospatial professional at that level. And there are other things to but I just wanted to make the point that the accuracy is really the minor issue, precision is the major issue.

>> MR. DOYLE: Hello. Sir.

>> GEORGE: Yes, I'm George, Federal Aviation Administration aeronautical information management. With all respect to the ladies in California, I voted for the fixed ITRF in a parochial sense; that way the United States would be in compliance with the International Civil Aviation Organization's standards of recommended practices.

Lou, I got to take up a few little issues with you. In a world global air navigation harmonization sense, which is the way that I have to think, I would like to see the whole world on the same plane, latitude, longitude, and elevations which is the basis of the a lot air navigation getting from one place to another. That way, the transformation of the transfer in relation between countries to safely get from point A to point B aviation-wise, can be realized. I'm quite sure that NGS is well aware of the relationship with the FAA. We had a relationship for the past fifty years. Mr. Mark Howard, here, is the manager for aeronautic survey program and gives us latitude, longitude, and elevations. But, I'm more concerned with looking down the road, at the roll out of the new datums. Earlier, you all said that you will provide a conversion which is – that's pretty obvious and then, going along with that, chances are you will stick to an established timeline roll out and give people lead time. In the meantime, but what I'm most interested in is the magnitude of change. So is there an anticipated magnitude of how far in the future-sense that latitude and longitude and elevation is going to shift? Now – longitude is going to shift. Even though we surveyed down to level, we don't need that kind of accuracy. The magnitude is going to change to the meter level, then, in the FAA, we are going to have a problem with the 18,000 instrumental geodetic approaches that we gave NGS millions of dollars to verify and collect.

>> MR. DOYLE: Richard, do you want to look – discuss the issue of the magnitude?

>> MR. SNAY: (inaudible) Yes. I think the answer may be years away, but is there an anticipated amount that horizontal or – (audible) Well, the shift would be on the order of the two meters in a three-dimensional sense. And it would depend where you are in the world how much of that translation projects into the horizontal plane and how much on the vertical dimension at that point. But, you can compute that right now, going from the CORS 96 realization of the NAD 83 to ITRF 2000, or ITRF 2005, I just heard over lunchtime that ITRF 2008 has been approved just last week. So there is going be a little tweaking but it is past all the muster and it'll just be here within a month or two, ITRF 2008. So 2.2 meters but depending where you are, how that vector translates into horizontal and vertical differs.

>>SPEAKER: In CONUS two meters will affect tens of thousands of our products. That's why a good roll out, a good lead time of transformation is very good in our world.

>> MR. DOYLE: If you can – there use tools like HTDP or if you look at that CORS that we have out there, you will see the ITRF position with the NAD, do an inverse and get

the numbers. Since this is an international issue, Mike, can you speak to that from the Canadian perspective?

>> MIKE CRAYMER: Sure. I guess we don't really have any plans to move away from NAD 83. That's not to say that we are not going to in the future but right now, you have to realize in Canada, it is a little different situation, more of a partnership between the Federal Government and conventional governments play a much stronger role in defining the reference frames. I guess what I can say is that now half our province still officially use the original realization of NAD 83, we still have not switched to the more up to date one based on ITRF. So getting some of them and have just switched within the last year so asking them to change even in 3, 4, 5, 6, 7 years would be very difficult. That's not to say that we won't eventually. In fact, I'm here mainly to gather information and ideas on how we might be able to accomplish this, learn from your experience. So, but your actually moving to a new datum will help us. So when you do, and I'm assuming you will eventually adopt a new datum. That will certainly give us more strength in bringing forward the idea to our clients. We have a very conservative surveying community and geodetics community in Canada, and as I said, some are still using the original version of NAD 83; our official vertical datum is still NGVD 29. We still have not moved or didn't move to NAD 88. So, we are a pretty conservative bunch and it is pretty tough even though we see the obvious benefits of doing this for scientific work, we use ITRF and there is no question, we use a plate-fixed system. We even where helping design a new stable North America reference frame a couple of years ago. So we have all these reference frames in mind and we do participate in generating them and we use them in our scientific work but for our legal system, is still NAD 83 and very difficult to change in the several year time frame. In fact, some provinces have it written in law and can't change it for another probably, ten years, at least, probably fifteen years, if ever. It took something like seven years to get this NAD 83 written in the statute law, will probably take at least as long again, so a little different situation in Canada. But hopefully when you do adopt a new geometric reference frame, that will certainly give us the impetus to do the same, make it easier.

>> DR. MADER: I would like to ask Lou a question. Where did you get your coordinates for your South Carolina reference station? Did we provide them?

>> LOU: We seeded the network using two 24-hour OPUS solutions to get the network started. And now, we have our own integrity monitoring software where we do a 24-hour solution every day. And we recomputed and watched the coordinates to see which ones are agreeing well, which ones are not. I will say since you brought it up, we cannot hold the NGS CORS value in our network. They have too much air for us to hold and still get one centimeter relative accuracy, not precision. This is compared against the height-mod coordinates, given by the National Geodetic Survey, we get one centimeter coordinate comparison with our networks. I call that accuracy. And we use latitudes and longitudes too. So we are running now our own independent NAD 83 South Carolina network.

>> DR. MADER: All right, how do you assure that you're in the NSR?

>> LOU: Because when we visit, we visited up to a thousand NGS height-mod coordinates and compare our real-time coordinates against the published NGS coordinates. 400 of them have been first order benchmarks, which agree within two centimeters Orthometric height, not precision, accuracy. So we are recognizing NAD 83 and NAVD 88 at the centimeter level in South Carolina right now which makes me question why we need a new datum at all, that being a player, you want to change the datum, fine. Like Canada though, don't expect states to jump in and change their legislation. That is probably another ten year process just like it would be in Canada to get the legislation changed from NAD 83 to whatever. That is a simple solution, just don't change the name of it, change that datum, don't change the name.

>> MR. DOYLE: Well, first of all, we are here to talk about the ten year plan, so we are talking ten years out, none of this is happening any time soon. One of the things mentioned early on and several of the speakers earlier today reflected on this, the changing nature of space-based position, improvements in GPS alone, plus GLONASS, GALILEO, and COMPASS, and as someone pointed out, whatever else comes along in the next ten years, will provide virtually, anyone, not just surveyors, but virtually anyone, real-time, unaugmented, no ground control, no CORS, no broadcast, nothing, within a half meter, maybe better. I hear some people talk about ten centimeters real-time, about the size of the palm of your hand, that's ITRF, the coordinates of the satellite, so when that occurs, I don't think it is a "if it occur," it is "when it occurs," and that's what we been focusing on. When that occurs, the demand will be - we got to have the data. I've got this new pipe in the ground, and a surveyor put it there, and it's got coordinates on it but it is NAD 83 and I'm a meter away, I'm three feet away, obviously, the surveyor put it in the wrong spot and put it where it belongs. And I think that's the impetus that we see to move this. In addition, several people came up to me and I know they must have said this to other NGS folks at the lunch break, they certainly said it to me, that is, and you reflected on, we can't talk about a single reference frame any more. We can't talk about just horizontal like we used to in the old days, or vertical but these are all integrated. And one of the things that I picked up on from the 2007 adjustment was not the improvement in the horizontal component, that was almost kind of a no-brainer, that was easy; it was the improvement in the vertical that gave the data to Dan Roman and the Geoid team the foundation for them to build a better geoid model. So it's really about the vertical coming out of, and if we're truly going to provide the best vertical which we will talk about in the next panel session, that really means you have to have the best geometric reference frame to fit it to. So these go kind of hand in hand. If you want a really really good vertical, you have got to have a different geometric realization and that is part of it and all the discussions we need. We really have to have and hard discussions much like you're bringing and that is really good. The lights are killing me here.

Do you have some other comments, please? Dave?

>> MR. ZILKOSKY: Dave, now retired and enjoying it. You will get to like it Richard. And I got some North Carolina people who would like to tar and feather you too I can

bring them down. No, I think Lou brought up a couple of good points that I hope the panel will take back. I put up on my slide and the roles and responsibilities. You got the real-time CORS and increase, there is conflict between what's private and what's Fed so a lot of stuff NGS didn't do, that they could have done, but they didn't because of some of the conflict of interest that the private industry was pushing back on, the states picked this up and private industry pick this up, but my point is it is all needed, and Jerry was bringing up, you need NGS's, even OPUS, to control but you need the CORS to be able to control the states, and for the states to be able get to the locals. And it all has to fall together. So you have to talk about your roles and responsibility and agree to them. NGS has agreed to the CORS, and they're going to do that forever. I'm not sure what the agreement is in the states but that is something you have to come to the table with. If NGS is looking for them to do their part then, now you are committing to doing it years down the road. So that is an important point that we need to pay attention to. Another point, and Dave you mentioned it about it is really just one, talking about replacing three-dimensional type datum, orthometric height and time dependent. So going on the fourth dimension, I guess my question really is, in the ellipsoid height, not sure if it fits into the next panel or this one, it kind of bridges – goes both ways. Who mentioned construction, a really big industry as well as your flood-point manager, and you have a lot of flood-point research here. Over the last decade but I'm chair of the committee, so I hear a lot of their input. And they are saying, from a height standpoint, they need sub-centimeter. Talking about over a corridor is anywhere from ten kilometers to a few kilometers. They want sub-centimeters. So my question is, are there plans to do research to be able to provide the ellipsoid height down to that sub-centimeter level in near real-time? I know talking to Dan that the geoid heights will be there. I'm interested in are we really focusing on the ellipsoid height to that level of accuracy and operational programs OPUS two seconds or something.

>> DR. MADER: We worry about that Dave and I would not be optimistic that you can do that. There is too many factors you have no control over. I hate to blame everything on multipath but if you move from one place to another, even if we calculated the antennas, your antenna is not just that hulk of metal but hulk of metal and everything around it and if that changes, it will influence the patterns, sub-centimeters heights in a dynamic situation. We can't do sub-centimeter in a fixed ITRF site where the conditions never change from day-to-day and get repeat ability at the sub-centimeter level. But you're doing that along the roadway is foolish. I just don't see how that would happen. Sorry.

>> GIOVANNI: From an accuracy perspective, the ITRF is throughout thoughts individual stations the GPS component is no better than a centimeter. So that is currently the best we can do right now in an absolute accuracy sense. And the realization within the reference community is the reference stations themselves have to be overhauled and rebuilt from scratch. We discovered all sorts of problems. But there is a big trade off because we start computing a new site, will be a new velocity, and we discovered some new aspects, and how are we going to support that in that transition period? So right now, the best absolute-sense is a centimeter. So right now the rovers will be a lot noisier than that.

>>DR. MADER: You mentioned roles and responsibilities. And again, I'm thinking of Lou here, what I see NGS's primary role, my personal experience, opinion, we would like to be responsible for the coordinates on your reference stations what you do inside the states is your business, stating over simplifying. But we need responsibility for those coordinates and velocities and we can work those out we'll do that but obviously, some sort of national or global adjustment. You don't need to know that you're in a grab ball frame, fine, you don't wear but you get that benefit whether you like it or not. Just ignore it but there are other key points for which it does matter and again, I want to say again, our concept of reference, we have had the times scale in mind or the frequency with which we recompute over reference frame is faster than a decade. Sea level monitoring, whatever else you want to worry about, we need to think centennial time frame and we have to really worry about how do we establish those marks in the ground because, I agree with you, marks are not going away. What I view is we don't – we're not in the marks business like we used to be, but providing the tools by which you can do whatever you want in terms of marks and know that it is consistent with the NSRS through tools like OPUS and coordinates for our reference stations. That's what I would see happening.

>> MR. SNAY: I would like to think a little bit more optimistic. What we are working on now at NGS is to use the GLONASS data, because the Russians hope to have that fully operational by the end of this year. And what we are doing specifically is now producing or will be soon producing GLONASS orbits just like we introduced GPS orbits and become part of the IGS service. We will be distributing GLONASS data from those CORS sites that can get GLONASS. And in fact, most of the real-time networks in the United States, at least the newer ones, do collect GLONASS as well as GPS because it is found to be beneficial for our real-time networks. And the third thing is we are trying to make OPUS so that it can process GLONASS together with GPS, it would not process GLONASS by itself, but together with GPS. So those three things we hope to have operational within the next year or so, so that we can bring in the GLONASS. And, of course, in a week or so from now, they will launch the first GPS 2F satellite which will have the first operational L-5 and we will be then moving into using the L-5 signal which will help us get a better hold on the ionosphere, of course, that will be many years before they have enough satellites to make a difference but we will – I should say my former colleagues will do that.

>> MR. DOYLE: Is that what we're going to do?

>> MS. BLACKWELL: Dave, we have some questions on the phone as well as coming through the e-mail.

>> MR. DOYLE: Go ahead phone caller.

>> MIKE: (phone audio) This is Mike with the BLM. Is it my turn?

>> MR. DOYLE: Hey Mike! Go.

>> MIKE: Hey Dave. I got a statement, and a couple of questions that I need clarification on. First one is probably for Richard. In response to your question from the FAA, you said the vector would be about two meters changing by location. Is that the two-dimensional or three-dimensional vector that you're referring to?

>> MR. SNAY: That is three dimensional vector. You have that.

>> MIKE: Okay. We can see the need given especially the loss on the vertical of going to a new datum. What we are especially concerned about is the ability to relate our resource information in data between datums and reference systems. It is, to us, critical that the tools are in place to provide these transformations in some fashion. Because, I mean, within the BLM, it took us over a decade to transform NAD 83 slash XX. Even with the lead time now, it's going to be prohibitively expensive. The question will be can we afford to transform everything or so we are going to need to see these tools in place. Big concern that I got right now is the implementation of a lot of these changes. I'm starting to see data, and I think sometimes, the folks back there are too in love with the science. And we're not paying enough attention to what we need on to ground. I got ongoing projects for a couple of years that we are using the same control OPUS-based, back to CORS, relative to passive marks. When you implement the new CORS, that will start creeping, the changes and I posed this to a couple of the web conversations. But I don't have a good idea of the magnitude you're talking about. If you keep putting in these little creeping changes we will end up with big disconnects, and in our surveys, both now and in possibly ten years. So we got to have the tools in order to keep all of our surveys related. So, I'd really like to see consideration of this besides the development of the final tools but, help us in the meantime. That's the end of the statement.

>> MR. DOYLE: Thanks Mike, Juliana?

>> MS. BLACKWELL: Thank you for Mike for calling in. I think we have every intention of being able to provide those tools to be able to transform the information back and forth through from one datum to another. Now, if the data is not here, if it is held at State and local level, then that information will have to be manipulated, adjusted, and transformed by the entity that is holding that data, but I think – I know – that NGS has every intention of being able to provide this. I can say this because I'm the director. I learned that from John Bossler earlier today. It will be done.

>> MR. DOYLE: Who's performance plan will that be in?

>> MS. BLACKWELL: Well, that will be on multiple people's performance plan. And yes, Dave, we still have those, it has not changed that much in a year. So, it is a big concern and it is something that we will have information, we will have prototypes and demonstration areas that we can utilize these type of tools and show people, hands on type of things, what this will do. And get some feedback from individuals before the final release and the final implementation, which, again, is years out. Being able to do this on demonstration and from the pilot project perspective and have people see the

differences that it is going to make in their live and use that information and use the tools that they can touch it and feel it and throw stones and give us that feedback. That's why we are starting this process now. And so, we want you to help us to continue to build the right tools and provide the right information to make this successful. And I don't know if anybody else has anything they want to add? Certainly nothing contrary to that, I'm sure, but anyway.

>> MIKE: Just as a suggestion, I'll ask Don Buehler if he will send one over but the new DOM important survey, like as an example, we're now talking about using coordinates as collateral evidence of positions and if we don't have the means to be able to relate survey, now and in the future, that I mean, that's been an idea that's been a long time coming but relegated very fast to the trash bin without the proper tools to do that. So I would just like this to be kept in mind.

>> MARTI IKEHARA: I want to just add maybe something like modified inverse tool as opposed to a transformation tool, just to show what kind of shifts you might be looking at. But I just wanted to also add, that I think and this is kind of to Lou's point, that we feel that we need to provide the information, whether you use it is your choice, ultimately of course. You know as an example in California, in addition to the hundred plus CORS NGS operating, I'm not keeping exact count, 800 others see GPS stations and we have velocities on those and coordinates. Not only do we have 2007 coordinates, but we also have 2009 epic coordinates that the California Spatial Reference Center published. You can use those if you choose to, or you can stick to 2007 or you can stick to 1991 point 35 if you want to. But I think we feel the need, the responsibility, to provide the reference frame that is best. And whether you choose to use it ends up being your decision. Whether you need to use it ends up being your decision. That's the way we are looking at it being able to provide the system. And whether you need or want to utilize it is ultimately, your decision.

>> MR. DOYLE: I'm really relieved to hear you say that, I know one of the biggest issues that I address almost on a daily basis, are exactly that people coming to NGS with data sets that don't match and you will ask some of the questions, well, what reference frame was it in? Was it is NAD 83? Well, which NAD 83? Or they will say WGS 84 and you will say which WGS 84 and you get the deer-in-the-headlights look. And we discussed this in great length here at NGS and which is why we are very aggressive and in part what we'd certainly like to see is an outreach to our federal partners here to make sure that all of us in whatever documentations we have, whatever protocols we have, we are describing the need, the importance for the metadata, the coordinates system. If you're in-state coordinates: which foot are you using? Are you using the real foot? Or, the wrong foot, like you do down in South Carolina? The U.S. Survey foot or the international foot. That is just one area in which, again, it's the deer-in-the-headlights look, there's a lot of people who don't understand those things. We have a tremendous number of new users of high-end geo-spatial data that certainly do not come from a background of geodesy, even land surveying or cartography, they come from many other disciplines, and all of us as Feds, if we have various geospatial programs, it's the important for all of to us work together to have

protocols that will ensure the integrity of this data so that when Juliana comes to me or anybody else and says okay, you need to help develop this tool, that we know we are developing one that meets the needs of all of our partners here. And as several people have pointed out, even though our focus is on the federal side of the equation, it just boils right down to Lou said it talking about FEMA and the Corps of Engineers. That's what happens at the state level, our representatives, you guys really are the big gorillas in the room, and we are aware of that. And we work closely with both organizations because we want to make sure that what we are doing across the board is consistent, so everybody is getting the same message. The gentlemen here has been waiting very patiently here.

>> Dave, we are backing up on the internet questions okay, so we'd like to do those first if we can.

>> MR. DOYLE: Oh, I'm sorry, let's do some internet questions.

>>STEVE HILLA: OKAY, we got some statements here from the people on the webinar. The first one says BLM want plate fixed. The second one is from Earl Burkholder, who some off may know, he says I vote for ITRF only. Tony Williams with the Ohio Department of Transportation says that I believe that no matter what system we use, it will leave to be a fixed reference system in time and not be a fluid coordinates system, surveyors will need to be able to go to a fixed coordinate. Some states may be affected but most are not and for states, most areas are fixed point in time with occasional updates would be fine. I would agree with Lou that what we need is a fixed coordinate system we are especially interested at the Ohio Department of Transportation, and we need to be able to repeat the same point on the ground at the centimeter level, we currently gets two to three centimeter horizontally and four vertically using a real-time network based upon our CORS and coordinates can't move or that makes our network useless. From a pilot and geodesist, with regards to the FAA issues, the WAAS is already ITRF so I would think that the FAA would be in favor of the change to ITRF. And the final comment Lou brought up another good point, unless the State has a real-time network, they may not have seen a lot of the problems we have seen with NGS coordinates. And that is the final statement.

>> MR. DOYLE: Alright, I'd like to thank all of our partners out there who are online for taking a few minutes to give some thought to submit those. They are, again, part of the same thread that we hear here. We do have some conflict, obviously, and that's exactly why we are having this summit, to get our feet wet here, and hear just what these issues are all about. Again, this gentleman has been waiting very patiently.

>>MR. ABDULLUH: And for the people on the phone, I'm Mr. Abdulluh. I agree totally with the lady on give the user the choice. What we really felt, we felt has kind of a going back to the 2007, that's how we felt. We felt that NGS took a decision on our behalf, we are the user and as it seemed also they echoed to give the three centimeters what the difference. Three centimeters is a big deal. With LiDAR we provided four or five centimeter vertical so if you know there are three centimeters, this is when I contract a

surveyor, we are cause to the courtesy of the ground control. So, I would like the NGS to really focus on that geodetic quality and there are a lot of users. They don't care about that but the majority of aerial geospatial. Now, we are so if those are wrong, we are in big trouble. But if you have a way to improve it, please do. And Dave, to your remark that the danger of the background of the community being with this, this is a very critical issue. In my organization, I always educate people. This is the most dangerous one for a mapping company of any provider of geospatial. It is very difficult to understand. People shy to talk about it because they don't want to look stupid. So, it is something not talking about when you got transformation and least squares and like that. So the NGS need to have a leadership role now to take that part. So what I'm saying, I don't like anybody to put their hands in the conversion. I would like to see more regulation. The government will be okay on this side. So I don't mind it. So if the NGS on their web site are great, why don't you give me real-time conversion of anything, I mean with all my respect to the HTDP and this, I mean, let's have something user friendly. We are in the 2010, this program is the future and you guys could not write in C so we can use it. So those kind of things – DOS command, this is a huge efforts of the NGS, it is a huge effort but reflect it to us, and just following, diminish. So, I would like to see really a sexy tool on your website to convert any geodetic so I would have less need to people not educated on their own to convert it. So it will be you're responsible about it and your responsibility, do it for us. If we need to do our own too, we will provide the help, the transformation but really, you need to give any layman person with the right tool and you don't have it. The HTDP, with all my respect, you can time dependent now – there is no way you can go from 8 to 6. I but why can't I do it in the background when I have NAD 83 86. The only NAD 83 in it is CORS 96. What I do now if I have NAD 83 to go do CORS 96, what tool did you give me to convert from 86 to CORS 96. So I go to HTDP to go from WGS 1150 and so on. So, that's – I mean, you are doing a great job but please help us in that. The conversion of the 2007, I mean, like everybody, we need the tool. It is not like – we need a tool. And I'm not sure why we are talking about transformation. Why can't you just do a gridded table like you suggested all these networks. You have it published in CORS 96 and ITRF now. Just do that adjustment and produce a table, a gridded table even one centimeter better than just judging – the last comment I want – really like to hear, I thought when we went to 2007 because part of it is problematic HARN between the states when we start seeing these differences. But I'm surprised the difference is negligible. But even if it is negligible, we will need it the ITRF 0005, one or two centimeters, they did not abandon that. It is small, we are not going to publish, they publish. DOD followed with WGS. So my question, why you following after the fact, after the adjustment, the difference is negligible is there any reason behind that? I mean, we used simple and buoyant, we didn't have to it, we didn't have more GPS? Thank you.

>> MR. DOYLE: Sexy tools, I kind of like that idea. I'm not sure we can talk about it in mixed company.

>> MS. BLACKWELL: Is that in the ten year plan? Where's Drew, I think that falls under the ten year plan. We do need to update a lot of those tools. We talk about this and struggling with getting the resources aligned to improve the look and the use and

the user friendliness of those tools. Dave, do you want to say anything else about the transformation?

>> DAVE DOYLE: We did look at doing it within that – that was actually the very first step that we picked up because that's been the tool that we used going back since 1990 and worked very successfully. What we did find is that the uncertainty was, again, as I pointed out earlier, when we looked at the transformation, yeah, we give you a number but the uncertainty of that even at the one sigma level was almost as large as the shift itself. So if I give you a transformation, if the coordinates has changed two centimeters and I give you a transformation with an uncertainty of 1.6 centimeters, what have in done for you which is not much. In addition, going to the 2007 adjust was three dimensional. So that really means a whole new transformation tool. Again, in and of itself, that was not a problem, but we don't have a gridded three dimensional transformation tool. Something like a 78 parameter. You do point out that the issue is we should have sort of one-stop-shopping in a transformation. We all agree with that. That's one of the things that from division to division, we can all agree about here at NGS, we all agree we need one tool sort of transformation on steroids. We have something like that in the works right now. Those of you who are familiar with the datum, the vertical datum transformation tool that we have developed cooperatively with our partner in CO-OPS, the Center for Oceanic Graphics Product and Services in the Office of the Coastal Survey. That is the first step. If you look at V datum now, you find most of those transformations already embedded in there. We have talked about taking that tool in one form or another and just expanding it. The problem we run into there is it is not just a NGS tool but a NOS tool, you got to be onboard with our other partners as well as the magnitude of the data. So that is a program that Doug Brown – where is Doug Brown. He was in the room earlier Doug Brawn, the geodesist program manager at NGS is here, been here, and he's got the lead now on the datum and I know that will be a topic for him, that having multiple transformation tools very confusing. So, that is something that is very much on our radar screen to address. But, our biggest issue, regardless of what form the transformation tool takes, much has been reiterated and time again here today is the quality of the transformation, not just giving you a number. How good is that number? And as Giovanni pointed out, if we give you a number whether for CORS, a passive mark, or a transformation, it has got to be better than what your needs are. If it isn't then the tool don't make any sense. These are some of the difficulties we are facing right now in this society and we have a question. Oh, question from the web.

>>STEVE HILLA, reporting for Callers: Okay. This is from Mark Cheeves and he says I'm attending the webinar from my office in Frederick, Maryland. And I'm going to disagree with you all. All technology is slowly killing the surveyors role in society, tasks that always require surveyor can now be done by non-surveyors. Steam comes out of my ears when I hear surveyors complaining about having to deal with different coordinate values on the same point. This is our job. I think that we want to hang on to all the voodoo we can. We want our clients to be baffled and feel they need us. But on a more serious note, and to respond to Lou, I realize that we are married and stuck to State plain coordinates, but does it strike anyone as odd that we are using an antique

one part in ten thousand system? It seems to me we should move everybody to geocentric ITRF coordinate as soon as possible. Is that not the future?

>> MR. DOYLE: Good points. Lou, do you want to say something? I got a response, but do you want to say something?

I would like to respond to one issue on the state plane coordinate system because I hear this over and over and over again. That state plane coordinates are no better than one part in 10,000. I would like to get a little bit of background. The state plane system was developed at the coastal survey in 1934 at the request of the North Carolina Department of Transportation. It was designed such that the parameters, the zones and the configuration, the architecture of the state plain boards were designed such that if the surveyors talking 1930's, now, if the surveyor never applied a scale factor, than the work would be no worse than one part in 10,000. Which was basically the accepted technology of the time, transits, and tapes, uncalibrated tapes, etc. There is absolutely no reason, today, to think that it has one part in 10,000. If surveyors, and Mark is right about this, it is a little bit of the voodoo, if the surveyor or other users apply the appropriate scale factors or conversion, whichever is required, there is no loss of integrity of data. Zero. Zip. None. One of the best examples I can think of, a couple of years ago, the State of Kentucky wanted to implement a single zone coordinates, they were previously, and still are, a two-zone system. And they came to us and we debated some of the questions. And of course, it would make the scale factors larger, for those of you not familiar with scale factors to make it fit the State line coordinates system. And one of the things I did at that time, was give a presentation in Montana. Montana being only slightly larger than Kentucky. When we did the NAD 83, prior to that, NAD 87, Montana had four separate zones because it was so big. They went to a single zone in NAD 86. I was giving a workshop and I went up there and said point-blank, are you having any problem with us? And it was – the look was kind of like, are you silly? No, let's move on to something more substantial. That is one aspect of it. Any of these plain coordination systems whether we're talking about state plane coordinate systems or UTM, while they do have certainly, some scale factors that need to be taken into account, it's all about the education. The gentleman here points out, it is about the education, and that's certainly something we can all agree on here and certainly. We are certainly very attuned to this at NGS and we are doing our best now. And again, I want to highlight again, this is something we want to hear from you, what is it you want to see from us, not only whether it's the data, data is one part of it. But the education whether that is in face-to-face workshops something from NGS to particular organizations, whatever, you tell us what you think is necessary to help you – webinar, whether it is within the NAD 83 and 88 as it exist now or to whatever it is that we will do ten years from now. So, any more – do we have any more questions on the phone or web? No, good to go. Any more, Kevin?

Comment [d1]: This is the end of the recording.

>> Last one before the break.

>> Kevin, I don't know where it is every time this gentleman makes a comment, I feel like I have to make a comment too.

>> I'm quite certain that the products that NGS is willing to produce for us over this course will they are going be excellent scientific tools but, or data and other tools. Regarding the models and tools that Juliana brought up when the BLM fellow was talking about it, I was thinking about how NGS has approached the antenna calibration or antenna modeling situation whereby many vendors would contribute antenna models to be calculated and the user community got back tools that they could use to do their (low audio). Regarding models and tools for dealing with transformations and other types of things, I was wondering why would it not be valuable for NGS in some way to publish or make available mathematical models and algorithms for software that is currently cumbersome and difficult to use. And the user community certainly will provide back very excellent sexy tools that the rest of the user community will be happy with, that will do the job that your tools do but are just simply cumbersome to use. You will get that from the software community and a number of software developers will provide that back. And these can be provided very easily like you done with antenna models and this way, we don't have to have a situation where NGS goes into contact with various people, make these available and let the user community reproduce, good software with good interface that is the user community will be happy with and will do the job that you need to get down for your users.

>> Thank you.

>> ( low audio ) Juliana: We have a lot of your information available for people to take and use and to reformat and do what we want to do with it. We have user contributed software that is available that some people have done similar things maybe not in the area that you have mentioned, but all the information we have is available. Our software is available for the people. I agree, a lot is old code, it's not sexy but, you know, we are limited in how many how much resources we can put into making something that will then look like we spent too much time and made it too beautiful where we let other aspects of our work fall behind. So we know we need to bring things up to make it easier for people to use and I think that we would encourage input and support from other developers in making things integrate better into other types of software. And I think we continue to encourage and there have been several discussions at ESRI and other conventions and conferences about what our data is and then, people can do with it what they wish to make it useful to them.

We're trying to understand what types of tools, what types of software. And the data is there, all the CORS is there. So we are not against that, we are just struggling with how to manage our resources to do the types of things that you're asking to do. So, education and outreach, better tools, ways to work with the private sector and other state and federal agencies to make sure the information is provided in the way they need it. And there are specific things – perhaps we can talk off line about ideas that you have or tools that you need or things that you think could utilize our data into what you already have existing that will make it a more user friendly better product overall. We would like to have those discussions. We can't guarantee the details today but we are certainly open to those types of discussions.

>> One last question before we go to break.

>> SPEAKER: My name is (low audio) engineer of Fairfax County and now, since I don't have a serious job, I'm a consultant. Any way, I just wanted to make a comment from our experience working in the County and with other counties and states. I don't have the answer for the issues that have been raised regarding absence of tools, not having difficulty from 1986 to 2007 but one of the ways that we could avoid in hindsight, you can say so, we had in 1909 when we started the foundation of the GIS, we made a policy decision that all the work we do, we will do with the state-of-the-art technological and tools and so we incorporate and coordinate all our work with the NGS. We were one of the first users of the GPS when the satellites were not fully operational status. We also used almost 2,000 leveling of that work with instruments for which specifications were not even written by the NGS. So we worked very closely and we made a policy decision that all the work that we do, we will book them. We do not know what the future will be because the technology was just beginning to change. So we made a decision, all of our work would be in the NGS reference framework so that if there is any change subsequently, it can be handled easily. In the process since 1990, 1909 to 1992, we generated almost 1, 500 benchmark and GPS over 300 GPS stations in a 400 square mile territory, very small. You will find a benchmark, you throw a stone, you will find a benchmark and all of it was in the national database. So we are very proud of having worked with the NGS, knowing where the future is going. In 2003, we undertook height organization for positioning to NAD 29 to NAVD 88. We had excellent benchmarks already 1500 as I mention to you. But we made 124 monuments network and GPS after everything was done. And we did include old and new HARN stations. Would you believe there are 13 HARN stations in the County of Fairfax. Five I created, two fundamentally for airborne GPS operations so – (low audio) experimentally fixed so we submitted that data and fortunate that in 2007, all the networks was in the national data base at the same time when the transition took place in 2007. So we have now pain in our neck so to say, all of the control systems the latest, we don't need any tools for conversion. So I think it is a question of also, a policy at local level that if you see the foresight, and you have your data and into proper format and be a part of the national database, you will avoid all these pains later on. So, that way, we sleep tight, NGS whatever they do, they do and because they are custodian and responsible for NSRS.

>> DAVE: We are happy you rest well at night. Let's call it 3:10, so go ahead and take a half hour break and get some coffee, whatever. And thanks for our panelists for a very lively discussion and all the comments out there.