Meeting Summary

I. Welcome, Introductions and Agenda Review (Gregg Ellis, ICF)

Gregg Ellis brought the Lower American River (LAR) Bank Protection Working Group (BPWG) meeting to order. He initiated a round of introductions (see Attachment A for a list of meeting attendees).

Gregg provided an overview of the agenda, noting he made two minor changes. 1) Greg Kukas will give an update on the Water Control manual at the next meeting of the LAR BPWG. 2) Gregg reordered the agenda so that the update on the historic LAR Design Drawings would occur earlier in the meeting. No other changes were made to the agenda.

II. Initial feedback on November 15 meeting summary

Jim Morgan provided general feedback on the meeting summary and discussions in general; he requested that when meeting participants describe a site of concern, they use river mile as the geographic identifier so people have a sense of where the location being discussed is located (since most people can relate to river miles as compared to reach number or other terminology) Gregg responded that using consistent nomenclature when possible makes sense and river miles are likely the best choice.

III. Update on collection of historic LAR Design Drawings and Cross Sections

Gregg introduced this item and asked Gary Estes provided an update on his research for historic design drawings and cross sections of the LAR. Gary stated he got in touch with Ryan Larsen at the Corps, who has relevant historic information compiled in a database. Gary said he would like Ryan to attend a future meeting of the LAR BPWG to review information he has compiled including cross-sections, designs, etc. He noted that this information is not the only source of drawings and cross-sections. Gary continued that Ryan had been reviewing Operations/Maintenance manuals for built projects, and for the past seven years has been gathering as-built drawings for Corps projects. The drawings are online (at cdec.gov), but security clearance is required to access them. Public agencies can access them, but others could not. Ryan might be able to give a demonstration of the website and share examples of what is out there at an upcoming meeting.
Gary also noted that the National Archives in San Francisco (actually located in San Bruno) also holds drawings. They do not have as-built drawings, but drawings done by survey teams, and those could be additional options for gathering historic information. The drawings only cover certain sections of the river, not the entire river. Gary took pictures of some drawings and provided to KC Sorgen.

Action Item: Gregg will talk to Ryan about attending an upcoming BPWG meeting so he can provide an overview of the archives he has and how the group could access them.

IV. Brief recap of December LAR Field Trip – (Gregg)

Gregg opened up this item and asked for feedback on what participants enjoyed about the field trip, what lessons we can learn for improvement for future filed trips, and other areas of the river to see at a future field trip. He noted that conditions are much different on the river today than on the field trip due to recent rain events. He also reminded the group that the bench on Site 3 that could not be accessed during the tour because of moderately high water levels is inundated even more at this time.

Comment: Joe stated that he thought it was a very good field trip and is in favor of doing another. He learned about Paradise Bend during the tour, and what concerns there are for that site. He noted that he briefed the Parkway Coalition about the field trip.

Comment: Lilly stated that she thought the field trip was well done and appreciated the thoughtful way the trip was organized and the sites that were visited.

Comment: Annalisa thought the field trip was helpful, especially for newer members of the working group.

Comment: Tim commented that he liked seeing the tree canopy at Site 3 and appreciated the detailed discussion about construction of the site and planting procedures.

Comment: Dan commented that the various sites have had flows that have ranged from 15,000 cfs to 30,000 cfs to 80,000 cfs, and it would be worthwhile to visit the sites again in May to see how high flows have affected them.

Comment: Dale said that the golf course has had a lot of activity as a result of the storms, including downed trees and areas being underwater.

Comment: Joe said he thinks the field trips are a good outreach mechanism, in that the regulars he sees at his local coffee shop saw the group out on the field trip and later asked him questions.

Action Item: Gregg will explore getting approval to do another field trip.

V. Update on 2017 high flows to date (Tim Kerr, ARFCD)

Gregg invited Tim Kerr of the American River Flood Control District (ARFCD) to provide an update on the district’s activities relative to recent high flows. Tim told the group that the ARFCD patrols (with some help from Sacramento County staff) and maintains the levees. When crews are patrolling, they are looking for changes along the levees, as well as looking for signs of levee distress, sinkholes, seepage on the land side (which can be a trigger for erosion), and downed trees. He said it is easier to make distinctions when the levees are well maintained. District crews have been conducting many patrols due to the high water flows, and when flows are above 10,000 cfs they patrol the levees every day in the daytime. When flows get above 35,000 cfs, they patrol on a 24-hour basis. The area of patrol is along both sides of the American River up to approximately Arden Way, a half mile downstream from the confluence on the Sacramento River, the North Area streams, and some levees that they maintain for SAFCA.
Tim showed pictures of storm damage taken in January and February at several locations along the American River including near Richards Boulevard, CSUS Alumni Grove, Cal Expo and Bushy Lake, the Del Paso Boulevard Flood Gates, Bell Marine Sand and Gravel, and some along the Sacramento River near the City’s water intake.

Tim discussed some of the issues discovered on the levee patrols, as seen in his pictures. Eucalyptus trees are at risk of snapping or toppling from ground saturation and high winds. There were several large root balls from downed trees at various locations, which could initiate localized erosion and scour or shorten seepage paths. Many locations had high water levels, and roads and facilities were completely inundated. Paradise Beach experienced erosion damage, which may not be as visible later in the spring when grass has grown in. North of the American River but still within ARFCD’s patrol area, the railroad tracks at the confluence of Arcade Creek and Steelhead Creek, they noticed the railroad ballast was experiencing seepage. This occurs when Arcade Creek gets up to 25 feet. The gauge at the I Street Bridge measured water levels almost up to 30 feet.

Tim noted the crews discovered a sinkhole on February 10 at the county’s Manlove Pump Station, which is located on the south levee (left bank) of the American River, upstream of Watt Avenue near Waterman Way. They closely monitored the rate of sinking, and over a two-day period it continued to get bigger so crews surrounded it with fencing. Sacramento County crews made temporary repairs to the sinkhole on February 14 but it continued sinking. While it was stabilized enough for the time being, additional repairs will need to take place in the summer.

**Question:** Steve Chainey asked if Tim got metrics on root balls when they were patrolling.

**Answer:** Tim responded that they did not get a lot of data because they are operating with a limited number of staff and working to remove obstructions on the levee as quickly as possible to facilitate ongoing patrols. He said photo documentation is the only recording of metrics.

**Question:** Tim Washburn asked if Tim Kerr removed the downed tree on the Sacramento River upstream of the City’s intake.

**Answer:** Tim responded the tree is still there.

**Question:** Tim Washburn said it would be worthwhile to get more data from the downed tree, as they are all learning opportunities.

**Answer:** Tim said that a biologist from the Department of Water Resources asked to be alerted when trees fell so her crews could get out there. He said he could notify her, but that he cannot leave some of the trees down for too long because they need to clean up the levees for safety purposes.

**Comment:** Tim Washburn replied that SAFCA staff could be dispatched out to locations.

**Question:** Steve Chainey asked if Tim had records of each tree fall, including when and where falls occurred.

**Answer:** Tim responded that he was unsure if they had that much data because the district is very limited with the number of crews available.

**Comment:** Tim Washburn stated that if Tim called SAFCA, they could augment resources because they need a better understanding of what is happening in these tree fall events.

**Comment:** Steve Chainey stated that forensics can be done from the photos, too.
**Comment:** Tim Washburn suggested that after the meeting, he and Tim could review the photos again to take notes on items of interest and then follow-up on those.

**Answer:** Tim said he would provide Tim Washburn with contact information for his superintendent.

**Question:** One of the participants asked what was represented by the green color on the ARFCD map.

**Answer:** Tim responded that the green areas are the parcels that are within the ARFCD area and are assessed.

**Question:** Steve Chainey asked if any thru-seepage was observed in locations where trees that were uprooted.

**Answer:** Tim responded there was no seepage visible on the eucalyptus trees along the American River Parkway.

**Question:** A meeting participant asked if there had been problems with oak trees being damaged in the storms.

**Answer:** Tim responded that crews had not noticed damage during these storms, but an oak did fall in November and damaged a house and neighboring tree. The district offered to remove the tree since it was in the flood control easement.

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**VI. Data Collection for 2 Dimensional Hydraulic Model (Dan Tibbitts, SAFCA; Chris Bowles, CBEC)**

Dan began the discussion about the use of 2 dimensional (2D) hydraulic modeling and the need for a good 2D model of the LAR.

He began by discussing the merits of 1 dimensional hydraulic models, noting that if the American River were divided up into individual cross-sections going up the river, at certain frequencies the 1D model could provide a good representation of what is happening hydraulically for a flow or range of flows. However, many conditions need cross-sections that are perpendicular to flow. The American River has unique situations where flows do not always move in a direction directly downstream; instead it could be flowing in unique directions. Because of this variability, there is a need for a 2D model so a multidirectional aspect can be examined. Dan stated that a 2D model is a grid of the entire river, not just cross-sections cutting across the river, and it solves equations for each intersection on the grid. The model can account for flow going in different directions depending on topography or vegetation conditions, for instance.

Dan said that 2D models have existed since the late 1990s. One was developed for the LAR by Ayres and Associates and was used for better understanding of spawning beds. The model was refined in the early 2000s to address releases at Folsom Dam as high as 165,000 cfs. It was later updated with modern topography and bathymetry.

The existing model platform is RMA 2D. It is relatively unstable, so using it can be problematic. For example, it takes a lot to get the model to balance. This along with changes to topographic and bathymetric data and overall model platform instability indicates there is a need to develop a new or updated 2D model for the working group and other agencies. The Water Forum needs a stable 2D model to analyze restoration sites and the work of this working group would benefit from a good model to analyze bank erosion. Because of this, a decision was made to hire CBEC to develop a new model for multiple uses on the LAR.
The model is being developed using the Hydrologic Engineering Center River Analysis System (HEC-RAS) 2D software. It has features enabling it to be a grid for restoration activities and to represent a wide range of flood flows with erosive forces, including flows under 100 cfs and over 100,000 cfs. A 1D model cannot handle such a wide range of flows or provide the multi-directional aspects of flow.

Question: What do you mean by stable/unstable?

Answer: Computer software on RMA 2D is unstable. Sometimes modelers have to trick the model into coming up with solutions (that are within reason). This work is very computer intensive. It is better to use a more stable platform. With RMA, it is difficult to run unsteady flow conditions. The HEC RAS 2D is more stable for that environment.

Question: Do you have to adjust flow for an unstable model?

Answer: You have to step the model down. When you have shallow nodes, that portion of the model becomes unstable and crashes, so you have to turn off outer elements so that they are not taking that into account when solving the equations. That is why the engineer/modeler has to do substantial additional work to resolve those issues.

Question: How long has the HEC RAS 2D version been used?

Answer: The Flow 2D started in 2000. HEC incorporated that software into the RAS program. RAS 2D has been available for two or three years.

Following Dan’s discussion, Chris Bowles further discussed use of the model via a PowerPoint Presentation. He noted that various sections of the 2D model were built for Reclamation gravel augmentation projects, but the model was not continuous through the entire river; instead, it only focused on areas where gravel projects occurred.

Question: One of the meeting participants asked what bathymetry means.

Answer: Chris responded that bathymetry is the shape of river channel itself – the area that is typically inundated.

Question: Lilly asked if the model has a sediment mobility component.

Answer: Chris responded it does not at the moment have that component, but could be purchased and added on at a later date.

As he discussed the scope of work to develop the new 2D model, he noted his team will consider issues from the older 2D model and look for ways to improve upon them. One of the big breakthroughs with modern 2D model development is the ability to use “green LDAR” to collect topography and some bathymetry through its ability to penetrate water up to five meters as it collects data, allowing him to collect bathymetry and topography data much more efficiently. The modeling team will have to wait until flows and turbidity drop in late spring or summer so the green LIDAR can physically see through the water.

As he discussed the existing data being used to build the model, Chris said he has replicated the coverage from Nimbus Dam to the Sacramento River based on DWR topographic data from 2008 and bathymetric data from 2006, and has reasonably good data on calibration points.

Question: Tim Washburn asked if Chris is collecting calibration data right now during this high flow events.

Answer: Chris responded that he is collecting data and recording it from stations at Fair Oaks and Watt. He has high water mark surveys from high water events and drone surveys/aerial photos.
Chris continued the presentation by showing slides of aerial drone flights in December at 30,000 cfs, in January at 60,000 cfs, and in February at 80,000 cfs.

**Question:** One of the meeting participants asked if the aerial view was looking upstream.

**Answer:** Chris responded the view is looking downstream.

As he continued his presentation, Chris showed a video of 80,000 cfs water flows at Paradise Bend in February.

**Question:** One of the meeting participants asked Chris if the aerial imagery from the drone was orthorectified (e.g., being matched to known points on the ground).

**Answer:** Chris responded that he was not using ground control and orthorectification.

Chris continued the presentation by showing changes at Sacramento Bar from September 2016 and January 2017. This location is the site of the most recent Water Forum/Reclamation gravel augmentation and channel modification project for purposes of fish habitat restoration.

**Question:** Steve Chainey noted that in the past and current conditions presented, Chris did not mention vegetation roughness.

**Answer:** Chris responded that he will digitize old historic maps and aerial photos of vegetation, and will then digitize current data. He can then input the approximate roughness values, which are needed for modeling purposes.

**Comment:** Steve Chainey commented that when County Parks was considering authorizing use of Parkway land for mitigation sites, they had detailed mapping of vegetation roughness patterns. There could be some changes now because of fire and mitigation planting, but that data could be useful.

**Response:** Chris agreed that the information is important and could be useful, but would need some updating.

**Comment:** Ron Melcer noted that another resource that can be a good foundation for vegetation is GIS data from the Department of Fish and Wildlife’s biology website. He will send Chris a link to the website.

Dan noted that once they have the model running, there will be a need for everyone working on the same platform to track cumulative impacts. The intent of the model is to be able to compare the cumulative effects of what has been done at a bank protection site (and any other project site, bank protection or otherwise) to a baseline. The baseline would be established when the model is complete in approximately nine to 12 month.

**Question:** One of the meeting participants asked who owns the model.

**Answer:** Dan responded that all agencies involved in restoration and flood control efforts own the model, and that SAFCA’s involvement is to help facilitate incorporation of all the various data and future projects into the model.

**Question:** One of the meeting participants asked who controls the model.

**Answer:** Dan responded that it has not yet been determined who will control, our house and manage, the model. SAFCA will propose to DWR, USACE, and Reclamation that CBEC house the model for now. DWR has a library of models, and in the future the model could possibly be placed there, with staff assigned to manage it.

**Comment:** One of the meeting participants commented that there should be a decision on who will control the model.
**Answer:** Dan responded that DWR would probably control the model but the details remain to be worked out.

**Comment:** One of the participants noted that DWR and the Central Valley Flood Protection Board are in charge of monitoring physical activity in the river channel and should have oversight.

Gregg closed out the discussion of the 2D model by noting that this topic will be discussed further and those discussions will either take place within the BPWG or be shared with the BPWG.

**VII. Update from Water Forum on existing and proposed fish projects in leveed reach (Lilly Allen, Water Forum)**

Gregg introduced Lilly Allen so she could provide the working group an update on what the Water Forum is doing in the LAR regarding fish habitat restoration projects. He noted the update would be brief and would not cover all projects. She can come back with more detail at another meeting.

Lilly distributed a two-sided handout. On the front side was a map that identified projects that are upstream of the leveed reach of the LAR and have been or are going through the permitting process. She noted that most of the projects on the map have previously had restoration work conducted before, but are undergoing a re-permitting process. This is being done so they have the flexibility to modify the sites in the event they start underperforming.

On the back of the handout was a map with two new sites. These sites were pulled from the other list of sites currently going through permitting in an attempt to avoid delays in the permitting process. These two sites are further downstream from the others and are within the leveed reach. As such, they require additional consideration and coordination from a flood control perspective. Lilly noted she will work with the working group on innovative and creative solutions for these sites, and others, in the future. It will also be interesting to see these sites after this season’s high flow events.

Lilly noted that Mississippi Bar is the only location to get gravel, if it is needed, and Sailor Bar is an extraction site to get gravel and put it back in the river. She also stated that the Water Forum would like to work on one upper site each year, or one over a two-year period, depending on funding. The sites are not yet designed.

**Question:** One of the working group members asked what the map colors represent.

**Answer:** Lilly responded the colors do not represent anything unique about the different sites, each site simply has its own color.

**Question:** Dale asked if there were versions of the map that identify past projects, commenting that not all projects are on the map. He asked if a map could show past restoration/project sites.

**Answer:** Lilly responded that the map currently only shows active Water Forum sites, but that different iterations of the map are possible.

**Question:** One of the working group participants asked if Reclamation has funded all of the restoration projects.

**Answer:** Lilly replied that Reclamation has provided the majority of the funding, but that some funding has also come from has come from the Fish and Wildlife Service and the Water Forum.

**Question:** Ron Melcer asked Lilly to talk about the Water Forum’s goal for these projects, and if they were associated with other restoration programs.
**Answer:** Lilly responded that some funding is through the CVPIA Anadromous Fish Restoration Program, Reclamation mitigates for the dam and that funding is delivered to the Water Forum. The projects are therefore federally-funded projects.

**Comment:** Tim Washburn commented that the Water Forum facilitates enhancement of fisheries and aquatic habitat as part of their agreement. Lilly stated the Water Forum is looking to enhance native species.

**Question:** Who is the lead for this? Who picks the sites? Who has end responsibility for the design?

**Answer:** Lilly responded that the Water Forum works with CBEC and other cooperating agencies and tries to decide what can be done within their yearly budget. Chris Bowles noted the process to choose sites is a very collaborative one done with other state and federal agencies, as well as county parks, to choose sites. They all weigh in on which sites should be restored.

**Comment:** It was noted that when the water level goes down this spring, priorities for restoration sites may change based on new conditions.

Gregg closed the discussion by saying we will continue to coordinate with Lilly to have the Water Forum provide updates at our working group meetings in the future.

**VIII. Update on NHC work effort (Brian Wardman, NHC)**

- Understanding Numerical Models
- Progress to date
- Anticipated schedule/milestones

Brian Wardman gave two presentations about the work NHC is doing for the working group.

**Presentation 1: Understanding Numerical Models**

Brian’s first presentation focused on what numerical models are, what they mean, why they have to be adjusted or calibrated, and what is meant by unstable models.

**Model Concepts, Equations, Inputs and Assumptions, and Bed Roughness**

Brian discussed that there are three model concepts, and that numerical models look at control volumes, such as cross sections or reaches. Brian told the group there is no true solution on partial differential equations, and that is what can create model instability. Many models can come close to solving the equations and some do a better job than others at getting answers, but no model has the perfect solution. He continued that when working on model inputs and assumptions, there are uncertainties with flow, bathymetry and topography. The equation to be solved with these models are momentum loss, and, for example, how flow could be faster on one side of a channel than the other. Brian pointed out that river bed or channel “roughness” (e.g., physical elements that differ from a smooth surface such as rocks, cobbles, vegetation) is incorporated into a hydraulic model by assigning Manning’s n values. He continued that the key steps to putting a model together are to collect data and use that data to make an estimate, and then work to find a value that matches water levels and what is observed. The model utilizes empirical inputs and then is calibrated to see what best represents what was observed.

**Question:** Tim Washburn asked Brian what happens if you want to estimate the addition of more roughness, and what happens to water surface elevation.

**Answer:** Brian responded that those estimations rely a lot on engineering judgement, but it can be done.

**Comment:** Tim Washburn continued that this gets at a question about what this does for water surface elevation. He noted that (when working with the Corps or Reclamation Board) there is a need to know how much capacity there is in a channel, and often times there is not regulatory tolerance to allow
roughness, and thereby water surface elevations, to increase. He asked how to work with potential changes with Manning’s n values. It is hard to make projections in how Manning’s n values might affect water surface elevation.

**Answer:** Brian responded in agreement, saying that 2D models can get convoluted and no one model solves everything. While there are general rules of thumb for Manning’s n values, they are inherently subjective.

**Question:** Tim Washburn asked if Brian is looking at changes in water surface elevations to the tenths of an inch. He said his point was that it is important to understand the regulatory landscape and to what degree changes will be measured with regard to water surface elevations and levee heights (and therefore amount of levee freeboard). One of the ultimate questions is what is a tolerable increase in water surface elevation when considering increases in roughness values to enhance wildlife and aquatic habitat.

**Answer:** Brian responded that he understood Tim’s question and that is a concern with numerical models, they give precise outputs that are based on many assumptions. He gave an example that if the Manning’s n value is .03 at one reach and then is changed to .04, calibration data and outputs cannot be exact. Thus, you need to have a good baseline and defensible assumptions and be able to explain why changes are happening and explain all of that to the regulating agencies and determine how it fits into the regulatory thresholds.

**Comment:** Dan noted the model is a tool, and it can look at sensitivity, such as the upper limit of hydraulic impact and lower impact. It can give book ends.

**Comment:** Tim Washburn stated that there has to be confidence in the tools being used in order to adequately support the cases being made to regulators.

**Comment:** Dan told Tim and the group that there was a meeting in January with the Corps, State Board, SAFCA and the Water Forum to discuss the approach to hydraulic modeling on the LAR and that group of agencies will continue to coordinate and continue assessing which model and inputs provide a good tool to estimate impacts.

**Comment:** Tim Washburn commented that working group participants and others need to be conversant in the tools being used for various analyses. He emphasized that people should be able to understand or argue why they do or do not like a given tool. People need to understand the parameters of what agencies are trying to accomplish, such as public safety, environmental values, or recreation, and by having a reliable tool or tools, people can have objectivity or understanding about what is being analyzed.

**Response:** Chris Bowles responded that models are approximations. When one looks at the rise of water surface elevation to a tenth, that data may just be “noise” in the model. It is so hard to predict a level of accuracy. Vegetation representation has a lot of research around it. Modelers are using Manning’s n values in practice, but that could change a lot in the next 10 years. They are getting more refined answers. The tools for the LAR will be the latest and greatest, good for predicting trends, changes, and identifying fatal flaws. But they are not exact.

**Question:** Chuck Watson asked if the effect of vegetation varies with the depth of water over it and if that can be modified (e.g., the Manning’s n value of a given type of vegetation changes as the depth of water increases or decreases).

**Response:** Brian responded that that could perhaps be modified, but that is not something he can commit to. Lower flows for habitat modeling could maybe be modified. He noted that some sensitivity testing needs to be done on the model to look at the effects of varying Manning’s n with depth.
As Brian discussed the types of models, a participant asked if he could explain a figure shown of Suisun Bay. Brian described that the figure shows what used to be a managed marsh, then modified to be a tidal marsh. With the boundary condition raised, the model figures out how water propagates through the marsh. He continued that the model is being used to look at modifications to the channel to adequately flood and drain the site. Brian noted that 1D models are simpler, and look at flows going straight out through a cross-section. This gives only one answer – an average velocity – so it is a good model to figure out water surface elevation and the capacity of channels. But it has limitations when looking at more complex sites and scenarios.

**Question:** A participant asked if an assumption is made in a 1D model that at any given cross section, the velocity of water is the same.

**Response:** Brian responded yes, it is an averaged value and that the flow is perpendicular to the cross section.

### Variability between Models

As Brian discussed the variability between 2D models, he commented that they account for turbulent momentum loss and channel roughness, for example, in different ways. The way they process input data is different.

**Question:** Tim Washburn asked if the RAS 2D model is reasonable.

**Response:** Dan responded that the RAS 2D model might be used for site design. More importantly, it is a platform to measure cumulative effects. There may be needs to model a small river reach using a different model platform that will give additional information beyond what RAS can provide. This would require development of an additional 2D model platform, but the different platforms can rely on the common set of baseline input data (e.g., bathymetry and topography).

**Comment:** Tim Washburn noted that SAFCA left that possibility (of developing a different platform) open in the contract with NHC for the Paradise Bend work.

**Comment:** Dan stated that the RAS model is not the right model for every site. Complexities at a site might require that another model be used.

**Comment:** Brian stated that, at a minimum, the RAS 2D model will do a good job providing a baseline.

### Model Selection Application

Brian said that to decide if a 1D or 2D model should be used, you have to look at the scale of the issue, the dominant processes you want to understand (such as flow velocity or depth), and what model gives best result.

### Model Cascade

Brian showed a slide that gave an example of what was taking place at a particular point in the river. He said on a small scale they would see fish hiding behind a rock and on a large scale they would see movement in the river. 2D models can show small scales and large scales.

### Bullock Bend Example

Brian used a 2D model of Bullock Bend, a recently modified/restored site along the Sacramento River, to show how a model can be utilized to analyze a site. He said to assist in getting permits for the project, they modeled the baseline condition and proposed modifications to understand changes in flow patterns.
and the possible effects on the flood control system (as well as how the site would perform for its restoration purposes). They used the CVFED HEC-RAS model, which provided the appropriate site-specific information. It had boundary conditions set using the model. They used different scenarios at upstream and downstream ends of the site based on water surface elevations, and build the 2D model.

**Question:** Dale asked what the length of the modeled reach was.

**Response:** Brian responded that the modeled reach was about 2 miles and upstream and downstream boundary conditions were defined with existing data from another larger scale model.

**Using Model Data**

Brian discussed that to use model data, you have to assume a range for the model and test for the range. It is important to understand the models degree of sensitivity to your assumptions, and you need to know the model’s limitations.

As this presentation wrapped up, Gregg noted it would be posted to SAFCA’s website.

**Presentation 2: Update on NHC’s erosion analysis on the American River**

Brian’s second presentation provided an update on the erosion analysis being done along the LAR. The work is taking place from approximately river mile 5 to river mile 8, and may move upstream to further understand any erosion or influencing factors in that area. He noted they are looking at scour processes, and explained bank erosion and levee erosion processes.

**Site Characterization Scope**

Brian explained that they are in the process of characterizing sites within the focus reach, and as a part of that they will look at the results of this seasons high flows. They will get out and investigate as soon as flows recede.

**Update Revetment Inventory Scope**

Another part of NHC’s scope is to document pastbank protection and determine information about design, why the work was conducted, and when. He noted he had design protection information from the late 1980s, downstream of Site 3 and Site 4 and will coordinate with various parties to complete the effort.

**Question:** Tim Washburn asked if the designs for the two sites mentioned were 1986 generated sites.

**Response:** Brian responded yes, they are.

**Comment:** Tim Washburn responded that the group drove by that site on their field trip. It is the rip rap site downstream of River Park and upstream of Interstate-80, and the other is upstream of H Street.

Brian noted his team will follow-up with field investigations when flows come down, and then update the database to have a better understanding of what is out there.

**Review Project Hydrology Scope**

As Brian discussed the task to review project hydrology, he noted that Paradise Bend is influenced by water levels in the Sac River.

**Question:** Tim asked if 2D modeling will inform the task.

**Response:** Brian responded they are using DWR HEC-RAS models for this work.
He continued by saying they will utilize the Sacramento River HEC RAS model to identify appropriate upper and lower bounds for assumptions about boundary flow conditions on the Sacramento River, as those are the conditions that dictate stage and velocity in the lower 5 miles or so of the LAR. After determining the Sacramento River boundary condition, they analyze the hydrology of the LAR and look as stream power and work done during a flow event. The stream power is the amount of force pushed against a stream bank during that flow event.

Brian picked five high flow events from the recent past, and used synthetic model outputs from the Corps based on their analysis of the updated Water Control Manual. He presented and discussed the differences in flow volumes, durations, and peaks between the five events.

**Question:** A participant asked if having a given flow for a longer duration could have a greater impact than the same flow at a shorter duration. Also, if the American River ramps up flows sooner than a corresponding increase in the Sacramento River (and therefore a different/lower boundary condition), is that an effect?

**Comment:** Gregg noted that Rick Bettis had raised similar questions via email in advance of the meeting.

Brian showed a graph that represented the occurrence of water events and how they compare to baseline conditions. He said that for data above the dotted line, he will need to do more work using the new water control manual outputs. For data that is clustered, there is good agreement in small events. When the events aren’t scattered, there is not much change in hydrology. Additional work and interpretation will need to be done with this data.

**Comment:** Tim Washburn said the conclusion by the Corps is that there is not a substantial change in erosion rates due to the new manual.

**Question:** What are the outlier points to the upper right?

**Response:** They are from the 1986 event. The differences reflect the 1986 flows exceeding the design release at that time of 115,000 cfs.

**Comment:** That is a good example of a difference with the new water control manual, because the peak is lower but synthetic work is greater.

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**Continuing work**

Brian discussed that as work continues, they will run the various flow scenarios through the 2D model to better understand conditions.

**Comment:** Tim Washburn commented that he assumes they will go up to 160,000 cfs for some sustained period, which hasn't been seen in reality for the period of record.

**Response:** Brian agreed.

**Comment:** Tim Washburn continued that 160,000 cfs is considered to be an extreme flood that gets well beyond 200-year flood protection. He would like to feel confident that the channel can withstand that high release if it has to, and if put in that position it does not substantially alter the values of parkway.

**Comment:** Tim Washburn said he would like agreement by the end of year on what the priorities would be to protect the LAR river system from flow events reaching 160,000 cfs.

Brian ended his presentation following Tim's comment. Gregg said the goal of the working group is to carry this conversation forward and get an update on modeling and other tasks that NHC is conducting, and these items will continue to be discussed in more detail as the analyses move forward and more information becomes available. He then asked if participants had additional questions.
**Question:** Chuck asked if the working group could get a summary from consultants on various depths of flow and how that influences roughness values (e.g., Manning’s n values). He said if we ignore the potential variations in value, it could result in unanticipated effects in the channel.

**Response:** Brian noted they will not ignore the variability of N values. Following a meeting with DWR and the Corps, they decided they needed a properly modeled baseline and a tool to consider modifications, but the model will not be the only answer. They will be able to examine assumptions and say if one is different and why it is.

**Question:** One of the meeting participants asked if new assumptions can be made later in the process with a baseline model.

**Response:** Brian said yes.

**Comment:** Dan commented that if CBEC is successful in getting one single model to calibrate for low flow (say 1,000 cfs) and then 80,000 cfs, but if they cannot make the model calibrate at the highest flows (115,000 to 160,000 cfs), the reason would probably be because of the effect on vegetation as the primary driver on the n value. They will try to keep to one model, but if it does not calibrate, they will use two separate models to represent low flow and flood flow. That way, the N value and a coarser mesh for flood flow would be the difference.

**Question:** One of the meeting participants asked if the N value has been manipulated in this manner for other projects.

**Response:** The group was not sure but Dan responded that CBEC can conduct some sensitivity analyses to evaluate the model’s response.

Brian also commented that the model covers 22 miles and cannot be accurate everywhere. It will not be within 5 centimeters. N values change in smooth canals with little change in water surface elevation. He said they will not hit every calibration point over 22 miles. Gregg asked that Chuck be included in future discussions on this topic. Dan responded that as Chris gets the modeling effort underway, they can all monitor how well they can get it to calibrate. Chuck noted they may be able to calibrate water surface elevation but that may not give accurate representation of actual velocities.

Steve commented that he would like the working group to have a future discussion about the uncertainty in assumptions that are made about vegetative roughness. It is the primary tool used to calibrate the model, but there is no such thing as fixed, finite roughness conditions of vegetation. There are many variables. This information was unimportant when we wanted to know if we could pass a 100 year flood in freeboard. At that time we could make assumptions that were not risky. When looking if a mitigation site would increase or decrease roughness and you need a permit, those nuances become important. Sometimes there is high roughness in a model in a mid-channel island, but in a flood flow, the channel has been stripped and no vegetation remains. We need to understand what we are learning from the model to see how uncertainties affect assumptions.

Gregg closed the discussion by confirming that all of this discussion is a continuing topic for the working group and the modelers will come back to share information.

**IX. Meeting Wrap-Up and Next Steps – Review key discussion points and next steps**

The next meeting of the LAR BPWG will take place on Tuesday, April 18, 2017.
**Action Items:**

Gregg reviewed the action items that were captured during the meeting:

- Use the term and measurement of “river miles” for consistent nomenclature and physical location
- Schedule another field trip in spring/summer 2017
- Follow up with ARFCD on collecting data on tree falls
- Gregg to invite Ryan Larsen (Corps) to future working group meeting to discuss historic design information that he has collected
- Continue coordination with Lilly Allen on providing periodic updates on fish restoration projects
- Continue discussions on deciding who will house and maintain the 2D model
- Continue discussions on the effects of flow depth on the N value and how to clarify uncertainties

**X. Adjourn**

The meeting adjourned at 3:46 p.m.