KOOTENAI RIVER HABITAT RESTORATION PROGRAM
MODELING SUBGROUP MEETING
MARCH 20TH: 8am-5pm and MARCH 21ST 2013: 8am-12pm.
FINAL MEETING NOTES

Meeting Location: Cedarbrook Lodge, SeaTac/Seattle, Washington

Attendees:
Matt Daniels, RDG
Karl Eriksen, USACE
Stanford Gibson, USACE
Rich McDonald, USGS
Chris Nelson, RDG
Jon Nelson, USGS
Mitch Price, RDG
Sean Welch, BPA
Molly Wood, USGS

Context for Modeling Subgroup within Kootenai River Habitat Restoration Program

The Kootenai Tribe of Idaho has established technical and policy level groups to provide input, review and recommendations to support and enhance planning, design and implementation of the Kootenai River Habitat Restoration Program (KRHRP) projects. These groups include the Design Team, Peer Reviewer Advisory Team (PRAT), Co-manager Agency Review Team (CMART), Core Adaptive Management Team (CAMP), Modeling Subgroup, and KRHRP Policy Team. In addition to these groups the Tribe is conducting one-on-one outreach with individual landowners, outreach to community members and stakeholders, and coordination with various permitting agencies, at various stages of design and project implementation.

The role of the Modeling Subgroup is to review and provide input to the Tribe (directly and via the Tribe's Design Team) on modeling products developed to meet project feasibility and design needs, provide input in the interpretation of modeling results, and provide input regarding additional modeling necessary to support feasibility analysis and/or design of the individual KRHRP projects. Modeling Subgroup input is used by the Tribe and their Design Team and helps support development and refinement of information to be provided to the PRAT, CMART, CAMP, and KRHRP Policy Team through the Tribe's KRHRP processes.

Purpose of Meeting and Desired Outcomes:

- Review hydraulic and sediment modeling efforts to date in support feasibility analysis and design of 2013 and 2014-2015 KRHRP projects specifically:
    - Review flood risk modeling
    - Review sediment monitoring and sediment surrogate modeling
    - Review sediment routing model
    - Review 2012 project performance modeling objectives and actions
    - Review FaSTMECH Simulations for Middle Meander Alternatives
    - Review FaSTMECH Simulations for Meander Reach Substrate Enhancement Project (Shorty's Island and Myrtle Creek)

  - Discuss hydraulic modeling for 2014-2015 projects
  - Review planned Meander Reaches concept feasibility analysis
- Secure Modeling Subgroup feedback on possible model refinement and recommended future tasks.

DAY 1 – MARCH 20, 2013

1. KRHRP Background Info (Matt Daniels, RDG) (9:00-10:15 am)

The purpose of this presentation was to update the Modeling Subgroup on the overall focus of the KRHRP, progress to date and upcoming work. The desired outcome of this session was that all participants have a working knowledge of the current status of the project and context for the subsequent modeling discussions.

MD reviewed Kootenai River Habitat Restoration Program goals. He provided an update on focal species and recent developments in understanding of Kootenai River White Sturgeon (KRWS) life stage history. Projects completed to date include Phase 1A & 1B, upper Meander (in the Braided Reaches), and the North Side Channels. Projects on tap for 2013 and beyond include 1A Extension, Middle Meander, Lower Meander, Bonners Ferry Islands (BFI), the Straight Reach, Substrate Enhancement Pilot Project and additional out year projects in the Braided Reaches and/or Meander Reach projects. Highlights from the 2011 and 2012 projects were presented including pre- and post-project photos. Preliminary designs for 2013 projects were presented. The timeline for integration of feedback from the modeling subgroup into technical analyses and alternatives development for 2013 and 2014 projects was discussed. *See presentation 01 – Background.*

Additional clarification from the Tribe's team: An update on the status of the 2013 and 2014 projects was provided to the Kootenai River White Sturgeon Recovery Team in February 2013, a Policy Team meeting is scheduled for May 2013 to discuss policy level issues and input, a PRAT meeting is tentatively scheduled for October 2013 to review and discuss 2014-2015 projects and out-year project concepts, and a CMART meeting is tentatively scheduled for October or November 2013.

Questions and Discussion:

- In response to discussion about need for additional modeling meetings, SW noted that Peer Reviewer Advisory Team (PRAT) also provides input to projects. *Additional clarification from Tribe's team: Please note the additional information above regarding the multiple review processes. The modeling subgroup has an important role in the project that fits within the larger context of technical and policy review.*
- General interest in spawning info presented – photoperiod, temperature dependent – incidentally coincident with descending limb of hydrograph. MD noted that recruitment bottleneck is likely early life stage survival.
- RM noted that the assumption is that few eggs are hatching, however little effort has been made to capture juveniles; need to have a robust sampling plan. *Additional clarification: There are ongoing discussions occurring with the Tribe, IDFG, MFWP, BC and others to develop and coordinate a robust monitoring plan for the KRHRP within the constraints of available funding.*

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This is part of the CAMP participants responsibilities and will also be a topic of discussion with the PRAT and CMART.

- Tetratech estimated June 2012 peak flow of 61 kcfs to be a 100-yr event – part of hatchery design.
- SW – noted innovative use of reed canarygrass as bank treatment.
- SW – BFI design needs to consider elevation and roughness of exposed surfaces to ensure that organics are not seasonally stripped and vegetation has an opportunity to develop. *Additional clarification: Yes, this has been a topic of discussion in the PRAT, CMART and CAMP.*
- MW – asked about number of qualified contractors for 2011-2012 work completed. MD responded that 6-8 contractors applied, a list of qualified contractors was developed. The selected contractor demonstrated a willingness to work with community and use local labor when possible. *Additional clarification: The Tribe implemented a formal process to issue an RFP, review, and select a general contractor in 2011 and again in 2012. There were a number of different variables that contractors were ranked on in addition to those noted above. Tribal Council members were directly involved in the selection process.*
- SW – noted that the selected contractor was also able to work with design team to refine design concepts prior to implementation. *Additional clarification: the Tribe established a separate contract to provide constructability reviews.*
- KE – inquired about difficulties with permitting? MD responded that the Tribe and their contractor, Meridian Environmental, have had early communication with agencies and the BA for each project smoothed the way.
- SW – noted discrepancies in OHWM determination. MP clarified different approaches:
    - State of Idaho – useable lands approach
    - USACE – perennial vegetation
    - IDFG – flood deposits
    - RDG – bankfull indicators
- JN – Expressed concern regarding apparent inability to reconnect larger areas of floodplain in restoration activities. As the project moves downstream, can we develop other opportunities along these lines? SW responded that ~60k acres of wetlands have been lost. RM noted that fish growing in wetlands may attain 4 – 5x the size of fluvial stocks. Recommended adding Jeff Mount / Peter Royal, who conducted Russian River studies to the PRAT. *Additional clarification: the Tribe will be investigating a range of potential alternatives in the Meander Reaches with the PRAT, CMART, Tribe's Program Managers, Tribal Council and community members. The majority of lands in the Meander Reach are privately owned, so as was the case in the Braided Reaches, landowner willingness to engage with the projects is essential. There are also limited opportunities available on wildlife refuges (USFWS, Creston, IDFG managed).*

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Summary of agreements, recommendations and/or actions:

- The Tribe will consider recommendation to add Jeff Mount or Peter Royal as a PRAT member or in another review capacity.

2. Flood Risk Management (Mitch Price and Chris Nelson, RDG) (9:15-10:15 am)

The purpose of the review and discussion of flood risk management was to:

- Review the 1-d model and results
- Request specific input regarding the modeling approach
- Integrate feedback from the modeling subgroup into the flood risk analysis

Key questions the Design Team wanted input from the Modeling Subgroup on were:

- Development of synthetic flows
- Calibration using global optimization
- Evaluation of difference in water surface elevations resulting from projects

MP provided background to Flood Risk modeling approach this included: 2005 COE Bonners Ferry Flood Level Study Report, 2005 - 2010 USGS HEC-RAS Model, 2012 COE HEC-RAS Model, and 2013 Flood Compliance HEC-RAS Model. CN provided description of work completed to date including: review of available hydrologic data, review of 2012 USACE RAS model, development of 2013 flood compliance RAS model and comparison of results between 2012 USACE and 2013 flood compliance models. *See presentation 02-Flood Compliance.*

Questions and discussion:

- There was general agreement that the USACE model was a planning-level model and RDG's model was a design-level model. As such RDG's model is expected to be more accurate – confirm with calibration.
    - KR added in his review of the draft meeting notes that RDG should move forward with this model and complete the FRM analysis. RDG should consult with the floodplain regulator (County or State) to determine their requirements. Keep Seattle District Water Management advised of any potential changes.
    - *Additional clarification: FEMA (State & County) requirements are for flood insurance purposes and are generally less stringent than the USACE Water Manager requirements. Because the USACE is responsible for flood risk management at Bonners Ferry, FEMA will default to them. Ultimately, as Karl has noted elsewhere, and the water managers have also indicated: The design needs to demonstrate zero-rise for the BFI & SR projects such that project implementation does not affect their current FRM operations.*
    - In reviewing the draft meeting notes, SW added that much effort has been made to compare the RDG – USACE 1D models. SW believes due diligence has been shown as a comparative analysis between the USGS/RDG and USACE models. Suggest not spending much more time trying to prove which is better. Present the differences and move on. SW suggested, considering any modifications that the USACE model has (i.e., storage areas in the Meander Reaches) and incorporate those into the design scale model. At the meeting Mitch said, "Fully calibrated unsteady and report to present to water

managers". SW suggests not making this any more complicated than it needs to be. Will the unsteady modeling be performed to look at storage area attenuation for diking district appraisal for Meander Reach Planning? Considering the "sluggish" nature of this reach can't this just be handled with steady flow? Are there any other needs that the unsteady model will address that are critical?

- *Clarification from RDG:*
  - *The objective of the comparison of the USGS/RDG models was to clearly document which model refinements RDG added for design scale evaluation and why.*
  - *The above comment regarding unsteady modeling is misleading as it implies that unsteady modeling of known flood scenarios is not warranted. Unsteady modeling of known flood scenarios was conducted to evaluate flood risk for the CRT model and this is the model that USACE provided to us to test the projects against. While the design scale model is "better" in that it has more refined geometry, it would be a notable deficiency to not include the boundary condition sets of known flood scenarios that were provided with the CRT model.*
  - *Unsteady modeling may preformed to look at storage area attenuation for diking district appraisal for Meander Reach for select design configurations.*

- *Additional clarification: The design team approach for evaluating flood risk and demonstrating zero-rise for future proposed projects is similar to the USACE approach. That is, to use the design scale calibrated model with both steady synthetic boundary condition sets for FRM thresholds, as well as unsteady boundary condition sets of measured flood scenarios (e.g. WY2012) that were provided with the CRT model. Even though the reach is "sluggish", there is notable lag for both downstream flow and upstream backwater that effects flood response and cannot be accurately modeled using steady flow. Unsteady flow scenarios are straightforward to implement and is similar to how flood risk was evaluated in the USACE model. The design team is recommending unsteady modeling for select flood scenarios to demonstrate zero-rise flood compliance for the BFI & SR projects to the USACE.*
- At the meeting KE said, "We regulate to 1764 and operate real time to this gage". SW interprets this as Karl keeping a practical view of this effort. He mentioned that the bottom line is if habitat work in and around Bonners Ferry will result in any required operational changes at the dam.
  - *Clarification from RDG:*
    - *We recognize that measured data for flood response is more practical than modeled data. The intention of the analysis is to demonstrate that project implementation will not require subsequent operational changes at the dam in order to manage to FRM thresholds. Considering that we need to demonstrate zero-rise before the project is implemented, we are*

using these datasets for model calibration over a range of practical boundary conditions.

  - SG agreed in his review of the notes that RDG has done due diligence in comparing models.

- SG commented that the RDG design-scale model appears to be better than the CRT planning level model (which was developed with different objectives) but that the number of cross sections are profligate, and should be reduced. SG noted that the RDG model could be plugged back into the WAT at about 25% of the current cross sections.
- SG provided recommendations for the braided reach model schematic including placing cross sections at head and tail end of each island, checking for consistent flow in side channels and eliminating XS's with interchange of flow between side channels and main channel.
- JN noted the large difference in resolution between the two models and raised the question of what needs to occur to resolve observed discrepancies between RDG's model and the USACE model to satisfy flood compliance concerns.
- SW asked about coordination with FEMA and with USACE for the levees.
  - MD responded that coordination with FEMA will take place after coordination with USACE water managers. Coordination will take place with the City for levees.
- RM suggested extending Meander Reach cross sections beyond the levees into the floodplain.
- JN suggested using 2D feature in RAS 4.2 Beta.
- There was a discussion on best approach to model pile fields, options include: blocked obstruction / bridge piers / increasing manning n. SG suggested running sensitivity analysis of blocked obstructions vs. piers and noted that blocked obstructions will increase wetted perimeter.
- MW identified a joint initiative between USGS and NWS to publish flood inundation maps http://wim.usgs.gov/FIMI/. If acceptable to the Tribe, this could be a good place to post Kootenai model results in an effort to inform the local community.
- KE said that the CRT Model may be of a lower resolution than the previous USACE model, and commented that models are not used to inform operations when flood conditions reach critical levels. Instead, they rely on the real time gages and on-the-ground observers. Karl indicated that we may want to also evaluate the older model. KR clarified in his review of the draft meeting notes that he was not suggesting that more work was needed to move forward, only that the two models had different levels of detail.
- CN mentioned that RDG needs to confirm information in the 3-way lookup table matches the results generated by the CRT model.
- MD recommended that future efforts should focus on differences between pre- and post-project conditions rather than discrepancies between RDG and USACE models – provided that folks agree that RDG's model is more accurate.

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- General agreement that the USACE model was a planning-level model and RDG's model was a design-level model; RDG's model is expected to be more accurate. That will be confirmed by RDG with calibration scheduled for Q2 of 2013. Will then be used as the basis for demonstrating flood compliance for future projects as well as the final sediment routing model.
- Agree that future flood risk modeling efforts will utilize a calibrated design scale model and focus on difference between pre- and post-project conditions over a range of representative boundary conditions.
    - RDG will confirm that information in the 3-way lookup table matches the results generated by the CRT model.
- RDG will consider other recommendations during development of information for future modeling meetings

3. Sediment Data (Molly Wood, USGS) (10:30-11:45 am)

The purpose of the review and discussion of the sediment data collection and sediment surrogate modeling was to:

- Review the sediment collection and sediment surrogate modeling work
- Clarify how that effort is being used to support the KRHRP project design and review planned products and timeline
- Review strengths and weaknesses of approach and basic assumption and secure input from Modeling Subgroup on key questions.

Key questions the Design Team wanted input from the Modeling Subgroup on were:

- How to improve sand relations
    - Install a 2nd 1.5MHz ADVM
        - Tilt down along bed or install near bed to try to better capture zone of sand transport
    - Measure sediment and velocity profiles
    - Measure profiles with ADCP and relate to SSC

The purpose of the sediment sampling is to provide sediment samples to evaluate and refine sediment surrogate technologies at three gages on the Kootenai River to support design and adaptive management activities for the Kootenai River Habitat Restoration Program. Sampling activities in 2012 included suspended and bedload sampled. In 2013 QA/QC and verification samples will be collected. Subsequent years will include QA/QC of freshet and descending limb.

MW provided overview of sediment data collected by USGS. Sediment monitoring has been performed using a variety of methods at 3 USGS gages: Below Moyie, Crossport, and Tribal Hatchery. Acoustic Doppler Velocity Meters (ADVMs) have been deployed to monitor acoustic sediment surrogates. Automated samplers have been deployed to measure suspended sediment concentration using ISCO "grab" sampler triggered by backscatter from the ADVMs. Suspended sediment concentrations have

been measured using Equal Width Increment (EWI) method for the 3 sites. Sampling has targeted the rising limb of the hydrograph. A regression relationship between EWI samples and autosampler grab samples has been developed. Daily sediment loads have been estimated using the LOADEST regression model. See presentation 'Sediment Surrogates_MWood_KRHRP_MM_2013'

Questions and discussion:

- JN indicated that acoustic surrogates likely provide poor estimate of sand concentration in the Kootenai and recommended estimating the sand component using empirical relationships.
- MW noted a large difference between sediment concentrations measured in samples collected at the Tribal Hatchery in the 2005-2007 vs. current study. MW unsure whether the difference can be attributed to a change in sediment supply, hydrologic or morphologic conditions, or some aspect of the sampling protocols during the 2005-2007 study.
- SW stated that it is important to do our best to nail down the sediment relationships for use as boundary conditions in the routing model and to bracket the range of uncertainty.
- RM indicated that having a continuous sediment surrogate record is valuable for establishing a sediment load baseline and long term deviations noting it will be important to continue measurements to evaluate project performance; he also qualified that in a supply limited system with temporal bed change it's hard to get more accurate than order of magnitude scales.
- MW confirmed that there is a higher level of uncertainty related to the suspended sand content derived from the empirical relations and noted they will see what they can do to improve these. She will stay in touch regarding any updates to the sediment datasets.
- JN commented that while acoustic sediment surrogates work well for uniform grain size distributions, the temporal evolution of suspended grain sizes in the Kootenai is problematic with only two frequencies; this results in low reliability predictions for suspended sand, as shown by the presented data.
- JN noted that the loads seem very low. He commented that we might possibly be under-predicting the load because most of the transport is occurring during a small time period, and recommended looking at the data in the most conservative way by focusing on the highest concentration samples and times.
- SG said that his thoughts on the sensitivity of the routing model to the sediment data are evolving. Noted that the system appears to be very supply limited (relative to transport potential) and even if the river was delivering 20% of the transport capacity vs. 10%, we are still operating with sediment deficit. As such, the model is not likely to be highly sensitive to the gradation of the inflowing load (which is fortunate, since those data are very uncertain).
    - KE commented in edits to the draft notes: Interesting conclusion given that this study has far more sediment data than a typical restoration study. Just use what you have and complete the analysis.
- SG noted that while the acoustic surrogates are good to establish baseline, he recommended that in order to develop a gradational breakdown time series for the routing model, we should gravitate towards the best available EWI data and then check against other available datasets.

- KE also recommended using the EWI data to develop the boundary conditions for the routing model. He highlighted seasonal difference in sediment load and suggested that this may be addressed by treating as combined curves. He also warned against trying to refine predictions within ½% when the measured data is variable within an order of magnitude. KE added in review of draft notes that there is more than enough data, make reasonable input data sets and complete the analyses.
- JN/SG/KE recommended doing an analysis using only the highest SS loads to estimate the overall magnitude of annual loads for the purpose of eliminating potential LOADEST/acoustic surrogate error and comparing annual load results with the long term monitoring cross sections used to measure volumetric bed change.
    - MW added in review of draft notes that her understanding was that we would develop different relations for different seasons or backscatter "regimes" then sum results from each to calculate annual load – not use a relation based on the highest SS results to estimate loads for the whole year. Just want to clarify.
    - SW added in review of draft notes that it may be most effective at evaluating project activity on sediment capture floodplain development.
    - JN added in review of draft notes that he thinks the point was that errors in the regressions at high flows/concentrations are all that matters for what we truly want to know. Don't bother with regressions over the entire range of flows, as it is really only important to have a decent predictor at the highest flow when the majority of material is moved. We need to think about what we actually need to know rather than just applying the standard technique for developing a rating, which essentially weights errors at low flows and concentrations (which we don't care much about) as strongly as errors at high flows and concentrations (which we do care about).
- In edits to the draft notes SW asked, what are the ultimate answers to be questioned with the sediment routing model? He suggested need to ensure that the information is distilled and processed to support the 1D sediment transport model. Decide on boundary conditions, distribute to your SME's for feedback and get on with the modeling. Recommend spending some dedicated time with Stanford. He can provide some strong feedback and "balance" to the effort. How does the sediment input and transport processes as measured at the gages support the understanding of volumes and process to support floodplain deposition and sediment recruitment processes? Assume that the bed is immobile, there is limited exchange and sediment processes are primarily suspended sediment throughput? If this is the hypothesis then test with the model (i.e., fine sediments being generated or passing through the braided reaches and being transferred to Meander Reach?) How can the restoration actions be designed to change this mass transport and capture these sediments to develop floodplains and interior depositional features? Are the bars at a point of evolutionary stasis (i.e., large area in front of Fodge's across from lower meander)? This has always looked like a large point bar that never quite develops (a function of gravel mining, hydraulic regime, available sediment)? If sediment transport processes are most important from Moyie to Ambush than is there a need to try and roll the sediment transport effort into the revised Meander Reach model? Sean added the following from the notes he took at the meeting:
    - "Supply limited will not be as sensitive to supply as erosion of the bed"

- What are the salient components of Molly's research and how do these relate to model architecture and boundary conditions?
- Supply limitation (Nelson) relative ability to capture sand transport (hydro acoustics will ultimately provide a limited answer).
- How will the model support "testing" of the floodplain surfaces?
- How will the model be used to evaluate change in channel conditions within the BR?

Agreements, recommendations and/or actions:

- USGS planning to publish Scientific Investigations Report in 2014/2015.
- USGS will continue sampling for verification of relations.
- RDG will coordinate with UGSG to address other questions as part of scope refinement for USGS tasks.

4. Sediment Routing Model (Mitch Price, RDG) (1:15-3:45 pm)

The purpose of the review and discussion of the sediment routing model was to:

- Review the sediment routing model and key assumptions.
- Secure input from the Modeling Subgroup regarding use of the model, interpretation of the outputs for existing and proposed conditions.

Key questions the Design Team wanted input from the Modeling Subgroup on were:

- On a reach scale what does the sediment routing model tell us about erosion and depositions over a "typical year" and at unique points in the hydrograph? Look at stochastic extrapolation of these results to extended time frame predictions.
- What are transport effects over the steepest energy grade-line?
- What is the stability condition considering a large change in load (or gradation)?
- Considering the reach is quasi-stable, at what sediment load or gradation change does stability change.
- What is the sustainability of transport & conveyance capacity by size class?
- Output interpretation (i.e., erosion and deposition trends, reach effects, localized effects)

MP presented an overview of Phase 2 Sediment Routing Model development and preliminary results. The model is intended to answer questions about reach-scale mass balance and system dynamics between RM144-160. The current model geometry is based on the 2010 USGS HEC-RAS model and will be updated with the design scale flood risk model schematic once completed in Q2-2013. Current model boundary conditions include a range of scenarios based on USGS sediment load estimates and hydrology for WY 2006 – 2012 to evaluate the range of uncertainty in geometry, hydrology, sediment loads, and transport function performance. Model calibration/validation data includes 17 long-term monitoring

cross-sections (which are surveyed bi-annually) and various scour chains throughout the reach installed between 2009 and 2012. *See presentation 04 – Sediment Model.*

Questions and discussion:

- SW commented in his review of the draft notes that he is not sure the model needs to be updated. Won't the Braided and Straight reaches remain the same? And isn't this the most important area to evaluate sediment transport (i.e. BFI)?
- *Additional clarification: Updating the model schematic to match the design scale flood risk model schematic is straightforward and will insure that changes in the braided and straight reach are represented.*
- SW noted that the objective of the routing model is to address three questions: (1) level of project sustainability relative to sedimentation, (2) ability to promote reach scale floodplain formation, and (3) risk management, for example understanding how BFI may interrupt or change the existing sediment transport regime. SW added in comments on draft notes that he is very interested in some EG vs. FG modeling comparisons. Need to get the EG condition pinned down to support BFI planning and design effects (risk) and cumulative Phase 1 and Phase 2 project restoration effects on system. Additional work on the EG condition is scheduled for Q3-2013
- MW said that focusing on the comparisons of pre/post project output could be meaningful to identify changes in reach scale trends. Also noted that while it may be possible to develop time series estimates of the suspended fraction gradation, it will be challenging considering the smaller dataset.
- MW suggested that it would be helpful to present sediment measurement and routing results for the same time periods at the next meeting.
- RM reflected on the project timeframe commenting that we are behind the curve with the modeling and he is worried that it is not informing the design process. He said that especially with regards to the BFI, we need to know if we can successfully promote floodplain development and questioned if we are going to create large moonscapes?
- JN noted that the loads could be higher and suggested that we focus on the big picture relative measures of bed change versus annual load.
- SG indicated that the model should reflect what we know about the system – relatively stable and supply-limited.
- SG suggested checking for a bust and/or bias in the sediment load and/or bed change calibration data; he also noted that the sediment budget needs to be settled before we can infer much from the routing model predictions.
- SG noted that the pronounced erosion trend in the Phase 1 reach of the model appears to be a result of the fine fractions of the cover layer being exhausted while the cover layer is too thick to be broken up and expose the finer sub-pavement.

- SG indicated that we may need to coarsen the bed gradations upstream to balance the pronounced erosion trend with observed data. He noted that processing the video pebble count data on a volumetric basis using a shape factor could slightly coarsen the grain size distributions by about a grain size class. He also suggested removing the very coarsest grain sizes (e.g. >LC) resulting from the log-normal grain size distribution synthetic fits which create numerical armoring artifacts.
- SG indicated that cover layer should be specified no thicker than 2 times the D_{90}
- SG commented on decreasing the VFS fraction at higher discharges to account for addition of coarser fractions and recommended adding the wash load back into the upstream load boundary condition.
- SG provided the following list of additional recommendations:
    - Removing 75-90% of the cross sections will improve stability and run time
    - Consider checking the cross section calibration data (and the general trend of the calibration with a comparison of surfaces). The single beam surface may be weaker than more recent surfaces, but it is likely to provide better calibration data than 17 cross sections.
- KE, SG, JN recommended doing 'back of envelope' calculations to confirm estimates of annual loads from measurements versus long term cross sections. This would dial in the overall sediment budget. KE added in his comments on the draft notes that many things can cause differences in cross-section (some real, some errors) and small differences can become large volumes when multiplied by long reaches. When the "measured" change of bed gravel far exceeds the "measured" suspended sediment load, something is wrong.
- KE said that the incoming load curves need to balance with field measures of bed change used for calibration, noting the sensitivity of the routing model to the bed gradations. He reminded us to focus on how we are going to use the routing model. KE clarified in his comments on the draft notes that given the magnitude of the "measured bed changes" presented, he would not suggest that any model be calibrated to them. He added that given the localized scale of the restoration actions and the reach scale of the sediment model, don't over-analyze the input data.
- KE said that Beth Faber at USACE would be a good resource for how to estimate flow probability in a managed system.
- MD noted that we have learned the system is supply limited and relatively stable; the objective now is to evaluate project performance. Does the modeling support the assumption that the river will not build floodplain surfaces on its own?

Agreements, recommendations and/or actions:

- RDG will utilize the calibrated flood risk model and proceed with developing the existing conditions sediment model based on input from the modeling subgroup.
- RDG will refine the EG sediment model calibration based on available data and recommendations of the modeling subgroup.

- RDG will develop modeling scenarios to test reach-scale critical uncertainties related to pool sustainability and floodplain development for proposed projects as recommended by the modeling subgroup.
- Timeline for next steps:
    - Q2-2103. Hydraulic calibration of design scale flood risk model
    - Q3-2013. Development & calibration of existing conditions sediment routing model
    - Q4-2013+. Continue evaluation of critical uncertainties for proposed projects.

5. Monitoring 2012 Project Performance (Matt Daniels and Mitch Price, RDG) (4:00-5:00 pm)

The purpose of the review and discussion of the 2012 project performance monitoring was:

- Clarify the overall approach to physical and biological monitoring of the KRHRP projects
- Review types of physical monitoring, metrics, timing and frequency, etc.
- Review 2012 Upper Meander project monitoring instrumentation and initial output, and North Side Channels project monitoring
- Solicit input from the Modeling Subgroup monitoring

Key questions the Design Team wanted input from the Modeling Subgroup on were:

- Provide general observations regarding project performance
- Provide general recommendations for maintenance

MD presented 2012 project performance monitoring objectives and examples of monitoring conducted. Monitoring metrics presented include: geomorphology, aquatic habitat, riparian vegetation and others. MP provided overview of instrumentation installed and surveys completed to monitor performance of the Upper Meander project. Modeling results and post-runoff photos for the North Side Channels Project were compared and discussed. *See presentation 05 – Monitoring.*

Questions and discussion:

- SW recommending doing maintenance on Upper Meander structure and not doing maintenance in the North Side Channels.
    - In comments on draft notes SW suggested considering lashing displaced LWD elements to remaining structure with sisal rope. He is concerned that the vibration and buffeting from the current could dislodge additional piles. Let NSC evolve and equilibrate.
- In terms of the modeling results and pot-runoff photos for the NSC project, SW added in comments on draft notes that he would be very interested in seeing computed scour estimates by equation relative to measured values. On section figures and as a plot.
- MW said that we should select the locations of the scour sensors to minimize the chance of getting damaged. She also noted that it's important to realize the potential for sensor mounts to move and suggested seasonal re-survey as warranted.

- KE noted that some USACE gages use steel pipe instead of electrical conduit to protect cable runs.
- RM said it would be helpful to obtain as-builts for the Upper Meander and follow-up bathymetry data sets to help calibrate bed evolution model predictions for pool development.
- JN suggested the use of repeat bathymetric measurements of the Upper Meander project combined with evolution calculations could be used to guide the Middle Meander megapool design.
- SG noted the fast construction timeline and recommended that lessons learned be addressed for future project phases.
- SG said that he was surprised we are not seeing shoaling in the North Side Channels and that this speaks poorly for surface recruitment. He suggested that a simple approach such as floodplain sediment traps could be used to better quantify rates of floodplain deposition.
- KE said that it seemed like there was bank erosion along the shorelines between the barbs and we should identify whether these locations are unique or not. He noted that there are lessons to be learned.
    - SW asked in comments on the draft notes, how deep are the piles at the bottom of the middle meander in the pile rock fill structure (downstream of old south channel inlet)?

Agreements, recommendations and/or actions:

- RDG will use sonar bathymetry to measure as-built conditions for Middle Meander pool excavation
- Evaluation of maintenance needs will occur following 2013 high flows and will follow the procedures outlined in the monitoring plans and adaptive management plan.

6. FaSTMECH Simulations for Middle Meander Alternatives (Rich McDonald and Jon Nelson, USGS) (5:00-5:30 pm)

The purpose of the review and discussion of the Middle Meander alternatives FaSTMECH simulation was:

- Review and discuss modeling and interpretation
- Identify and discuss implications for middle meander design and selection of alternative to recommend to Tribe

Key questions the Design Team wanted input from the Modeling Subgroup on were:

- Provide general observations for model results

RM and JN provided a synopsis of the 2D modeling completed for the Middle Meander alternatives. Six alternatives were modeled for a range of flows from 15 – 57 kcfs. Results presented include water surface elevation, depth, velocity magnitude and direction, and boundary shear stress. Hard copies of presentation materials were provided.

Questions and discussion:

- SW noted how this reach-scale alternatives analysis fits with the compressed implementation timeline. He suggested that a lower meander concept alternative be incorporated in the model considering that the 3 meander projects function together.
- MD asked if a bed evolution model could be used to provide additional information for design/sustainability of the megapool(s).
- JN agreed that coupling the design analysis with the downstream meander would be good to focus on if the modeling of the selected design alternative indicates a pronounced downstream effect.
- JN noted the difference in the angle of attack on the cusp between project elements and suggested the design tie into that hard point near the South Arm inlet to prevent flanking.
- SG said that he is presumptively in favor of letting the river do the work for the megapool, however the scour sensor data from the upper meander project seems to indicate an asymptote on scour.
- KE noted that it was an interesting alternatives analysis….
- MD Discussed need to wrap up the analysis with a brief memo from USGS that addresses specific questions from RDG
- In subsequent comments on draft notes SW added that he would recommend that the cumulative project effects be tested by incorporating a larger reach (upper, middle and lower meanders). It is clear from RM's analysis that the downstream end of the MM will affect the hydraulics and design of the LM and potentially the NSC inlets.

Agreements, recommendations and/or actions:

- RDG prepared a memo summarizing final design development including the modeling of design configurations by USGS and input received from technical experts.

7. FaSTMECH Simulations for Shorty's and Myrtle Creek Substrate Enhancement Pilot Project (Rich McDonald and Jon Nelson, USGS) (5:30-6:00 pm)

The purpose of the review and discussion of the Meander Reach Substrate Enhancement Pilot Project FaSTMECH simulations was:

- Review and discuss modeling and interpretation
- Address sustainability concerns regarding substrate enhancement projects

Key questions the Design Team wanted input from the Modeling Subgroup on were:

- Do models address project sustainability concerns
  - Will substrate surfaces remain clear of sand
  - How much sand will fill the interstitial spaces

KOOTENAI RIVER HABITAT RESTORATION PROGRAM
MODELING SUBGROUP MEETING
MARCH 20TH: 8am-5pm and MARCH 21ST 2013: 8am-12pm.
FINAL MEETING NOTES

RM presented physical and biological data and sediment transport modeling results for the Shorty's South site. He noted that sand bed conditions and dunes are not pervasive; some areas have clay shelves and gravel. Model results show that sand transport at proposed sites should result in cleaning of the substrate at the Shorty's South site. Similar conditions are inferred for the Myrtle Bend site. See presentation 'Simulations for Shorty's Island Substrate Enhancement Project'.

Questions and discussion:

- Discussed need to summarize the analysis in a memo from USGS/RDG to the Tribe
- MD noted that because of the history and story behind the project, there is a need to package this analysis up with an interpretive memo from USGS/RDG to the Tribe to address some specific questions and identify experimental components of the pilot project.
- SW will follow up with recommendations on how to proceed, which is likely a recommendation to move forward with the pilot project and robust monitoring plan. He noted that it's important to identify this pilot project as an experiment in order to minimize risk exposure.
    - In additional comments on draft notes SW indicated that RM has provided a unique and quantitatively rigorous analysis that clearly identifies a focus zone based on scour, erosion and substrate embedment analysis. This represents a considerable step forward from the previous submittal and carries the weight of USGS objectivity from Jon's Lab. Suggest that we correlate the modeled footprint to physical observation (videography) and bed morphology mapping to define lowest risk region and footprint for placement. There has been a tremendous investment of time, effort and resources in the evaluation of this project. It would be appropriate to acknowledge the efforts and outcomes - recommendations of the sustainability workshop and address these issues, outcomes and subsequent analysis with documentation. This could include an evaluation of the design effort in reducing critical uncertainties and review the design and quantitative assumptions relative to project effects. Seems there are physical and biologic performance criteria that could be listed with risk and risk countermeasures in a matrix?
- MP suggested that the Tribe reach out to Mike Parsley (USGS) to develop the sampling plan. This could be started immediately and presented at 2012 PRAT. Perhaps IDFG could then execute the monitoring plan. *Additional clarification from Tribe's team: Efforts are currently underway to develop and expanded biological monitoring plan for the Substrate Enhancement Pilot Project and the other KRHRP project in coordination with the other co-managers. The Tribe has a Core Adaptive Management Team that has been established to help guide and review both short-term physical monitoring and adaptive management and longer-term biological monitoring and hypotheses testing. This effort includes expertise from biologists including the co-managers, PRAT, University of Idaho, and members of the Tribe's KRHRP team.*
- MW noted that a clear and well-defined monitoring plan would be essential for evaluating project performance relative to biological measures. *Additional clarification from Tribe's team: Please see previous note.*
- SG commented that the USGS analysis is useful because it identifies specific potential modes of failure (e.g. Rogue Dune) and helps us consider how the project would respond. He noted that 3x D_{50} seems high for these processes but it likely doesn't matter.

- SG mentioned that ARS is actively conducting long-term flume flushing studies which may provide some useful information. SG & RM discussed Daniele Tonina work that was used for the analysis.
- KE commented that measures of success will be up to the biologists.
    - SW asked in comments on the draft notes, how will success be measured? Be clear on design assumptions and be clear on the uncertainty. What can be controlled and what can't.
- In comments on draft notes SW said that Myrtle would have been more likely to have been a historical spawning site due to lateral migration into the fan.

Agreements, recommendations and/or actions:

- RDG will refine substrate patch geometry based on model results
- RDG will refine patch locations based on 2013 egg mat data
- RDG and USGS will prepare a memo documenting efforts to reduce critical uncertainties
- Recommend identifying physical and biological performance/success criteria
- Recommend coordination with IDFG and PRAT to confirm study design and monitoring protocols for data collection, data processing and reporting

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DAY 2 – MARCH 21, 2013

Recap Discussions (8:00-9:30 am)

Notes from this discussion are provided at part of previous day's discussion notes.

1. Hydraulic Modeling for 2014 Projects (Mitch Price RDG) (9:30-10:30 am)

The purpose of the review and discussion of the 2014 project hydraulic modeling was:

- Review and discuss modeling and interpretation
- Identify key areas of interest/concern
- Review USGS 2013 Modeling SOW & Schedule

Key questions the Design Team wanted input from the Modeling Subgroup on were:

- Additional calibration flows (WY2011-WY2013)
- Better scour estimation approaches
- Alternatives for higher resolution reach scale &/or project scale model(s)
- Cumulative Effects Modeling
- Calibration correlations for synthetic flows

- Suggested model revisions?

MP reviewed project concepts for Bonners Ferry Islands and Straight Reach, results for 35% design and 2013 hydraulic modeling milestones. *See presentation 09-2014 projects.*

Questions and discussion:

- JN pointed out the influence of bedrock near the bridges.
- JN and MP to follow up on eddy viscosity settings and alternatives for specifying spatially varied LEV as a model input.

Bonners Ferry Islands

- SW suggested comparing 2d WSE's to 1-d model results using same measured data in calibration for both models. In additional comments on the draft notes SW added, Consider building off of the existing island near the bridge and adding additional islands. Even with presence of bridge, hydraulic conditions make this lower risk. Recommend a risk matrix - register be developed for the project that show the risk category, supporting analysis to manage the risk, uncertainty around the analysis and how this has been incorporated into specific design elements. Hydraulic Risk to infrastructure and morphology, Sedimentation risk, Geotechnical risk to BFI sustainability and foundation conditions, Biological risk…etc.
    - Go back to earlier alternative with complex island margins and fringe geometries.
    - Pursue a geotechnical evaluation for bearing capacity for BFI, solicit feedback from PRAT, consider bring a geotechnical engineer on contract to evaluate project.
    - Evaluate final grading plan with sed transport model.
- SW recommended maximizing number/size of islands near bridge; could use Fastmech polygon tool to check impact of islands before grading.
- SG suggested bounding islands with XS's at tip of up/ds ends; check ineffective areas to be accurate for no-rise analysis

Straight reach

- Fish ladder concept – provides holding habitat
- SW recommended focusing on bank structures, substrate placement and effects on velocity and making structures as large as possible.
- MD indicated that the target velocity is ~1 m/s
- SG suggested using a 'sharp mobile-front sediment transition'
- MP questioned if adding pools would help to maintain scour? Also questioned how winter flood operations may be functioning as flushing flows considering the transport potential and limited seasonal supply during the fall FRM operations.
- JN questioned if there is enough energy to move sand?
- Discussion that the next step is development of alternative configuration layouts for 35% design (RDG June 2013) and model objectives/simulations to be completed by RDG/USGS by Oct 2013 for presentation at PRAT.

- SW added in comments on the draft notes that it is interesting how the structures could influence "hydraulic sinuosity" within the reach. The team is right on with concept. Make structures big and enhance bed with SSP. Good reference hydraulic and habitat analogues in this reach with two bedrock outcrops. Use these as design references but add ecological complexity with planting.
- In follow-up comments on draft notes SW suggested that draft plans, specifications elevations need to be developed for review. He is concerned about the timing relative to the environmental compliance process. This is very different than the previous work and his suspicion is that it will require a more formal environmental compliance process. Recommend getting Shappart rolling on what is needed and when. Please keep the COTR in the loop on this. *Additional clarification from Tribe's team: The Tribe's team is in ongoing and active dialog about environmental compliance, the review process and timing. We appreciate the recommendation to keep Lee Watts in the loop and will do so. Please bear in mind that the Modeling Subgroup is a single piece of a much larger review and coordination effort. SW and LW will both be included in future CMART workshops to review additional analysis associated with this project and the Tribe is actively coordinating with the Environmental Compliance lead.*

Agreements, recommendations and/or actions:

Following are next steps in the design and modeling process.

June1-June15	Design refinement - RDG develops surfaces for 3 to 5 design layouts
June15-Sept15	USGS modeling - Rich and Jon prepare models for the layouts
Aug15-Oct1	Design refinement - RDG post processes and compiles USGS results and prepares info for PRAT/CMART
Aug15-Oct1	Value engineering - RDG coordinates with Goodfellow Brothers for construction means/methods and phasing
Nov15-Dec31	Preliminary design
Late Jan/Early Feb 2014	Modeling subcommittee meeting
Feb-Mar 2014	Final design

3. Phase 3 Meander Reach Feasibility (Matt Daniels, RDG) (10:45-11:30 am)

The purpose of the review and discussion of Phase 3 Meander Reach feasibility discussion was:

- Review the initial list of potential Meander Reach projects currently being considered (this may not be an exclusive list at this stage) and provide context for overall restoration strategy
- Review planned modeling and identify recommendations for additional data and/or modeling needs

Key questions the Design Team wanted input from the Modeling Subgroup on were:

- Provide general observations regarding concepts
- Provide suggestions for modeling and data needs

MD reviewed the Phase 3 concepts and ecosystem challenges. *See presentation 10- Phase 3 Feasibility.*

KOOTENAI RIVER HABITAT RESTORATION PROGRAM
MODELING SUBGROUP MEETING
MARCH 20TH: 8am-5pm and MARCH 21ST 2013: 8am-12pm.
FINAL MEETING NOTES

Questions and Discussion:

- SW suggested adding annual pumping cost to storage area curves for economic prioritization. He also suggested adding levee and thalweg elevations.
- In comments on the draft notes, SW suggested revising the 1D model to create a Phase 3 meander reach inundation map. Overlay with lot lines to guide restoration focus and potential future acquisition program.
- SG commented that use of drainage districts for flood attenuation would likely have very little effect on reducing flood risk.
- General agreement on benefits of focusing restoration on tributaries and floodplain reconnection.
    - SW also asked in comments on the draft note about prioritizing tributary habitat efforts to support kokanee production?
- JN identified main stem avulsions and subsequent abandoned oxbows as a potential restoration opportunity.
- MD raised the idea of 'dusting off' the larval drift proposal prepared by USGS. Which SW thought was a great idea.

Agreements, recommendations and/or actions:

- General agreement among the Modeling Subgroup participants on benefits of focusing restoration on tributaries and floodplain reconnection (noting that no biologists were present).
- Concept refinement will take place over the next few months and additional discussion of modeling needs will take place at the next modeling meeting.