Chehalis Basin Local Actions Program • Technical Advisory Group

MEETING 4 SUMMARY

Date: Monday, December 14, 2020
Time: 1:00 pm – 5:00 pm PST
Location: Zoom online meeting

Purpose of Meeting

The purpose of the Local Actions Program (LAP) Technical Advisory Group (TAG) Meeting 4 was to continue discussion of the near-term approaches for:

1. Climate change: review of maps with 50% flow increase, conclusions and next steps
2. Potential for increasing floodplain storage, with the following question for the TAG: Is the potential for additional floodplain storage significant enough to pursue as one element of several potential elements within the local actions program. If so, how, why and where?
3. Addressing bank protection for channel migration and floodplain erosion hazards, with the following questions for the TAG:
    a. What technical considerations do you have for providing bank protection that would not have a significant impact on natural processes and functions?
    b. What technical considerations do you have for providing bank protection in critical locations that may negatively impact natural processes and functions?
    c. What thoughts do you have on goals for building a bank protection program?

Meeting Notes

These meeting notes are intended to be a public record of key points, questions, and discussion topics raised during the meeting. They are not intended to be transcripts. The meeting was recorded on Zoom.

Technical Advisory Group Schedule

Jim Kramer (meeting facilitator) reviewed upcoming meetings (next one is January 8, 2021) and noted that a Doodle poll will be sent out shortly to schedule a meeting for the first part of March.

TAG Meeting 3 Debrief

Jim summarized feedback on the TAG Meeting 3 technical information provided. Key takeaways and follow up questions regarding floodplain storage included:

- Ultimately need to understand how action in tributaries might affect the whole basin
- Other potential locations for floodplain storage:
    - Black River has potential.
    - Skookumchuck reservoir: there is an opportunity to create flood storage.
    - Floodplain reconnections provide storage and flow reduction during much smaller floods and local water level reductions.
    - Effect of removing natural constriction at Mellon Street.

Key takeaways and follow up questions regarding Potential Local Flood Protection Actions (Structural and Nonstructural) included:

- Other areas that should be considered potential priorities: Bishop Road or Monte Elma Road, Grand Mound, Satsop, Scatter Creek, Galvin.
- Other structural options: road elevation, I-5 levees/elevation, Long Road levee, coordinate with habitat projects, etc.

Results of Updated Climate Change Analysis

Larry Karpack (Watershed Science and Engineering) summarized information regarding near-term climate change analyses. This information was presented to the Chehalis Basin Board on December 4, 2020. The *UPDATED Local Actions Program Near-term Technical Analyses for Office of Chehalis Basin: Magnitude of Late-Century Flood* memorandum (December 1, 2020) was provided in advance of the TAG meeting.

A review of the predicted late-century catastrophic flood (i.e., 100-year flood in 2080) compared to peak historical flood events at several gages within the Chehalis River Basin was presented. Additionally, an analysis was completed showing the effect on the floodplain of flood flows increased by 50% (versus 26%, as described in the SEPA Draft EIS). The analysis was completed within the Chehalis River mainstem and portions of upper basin tributaries (Riverflow 2D model area). From this information, figures were created and shown during the presentation that depicted depth and areal extent for the FEMA floodplain (areal extent only), current modeled floodplain, and 26% and 50% increases.

The University of Washington Climate Impacts Group is completing an analysis of spatial variations in precipitation throughout the basin. The precipitation projections will be obtained from 12 global climate models under the RCP 8.5 emissions scenario. The draft analysis is anticipated to be completed by mid-January for use in near-term additional hydraulic modeling analysis (available by the end of March 2021).

Key comments, questions, and discussion topics:

- For much of the floodplain, flooding in the historical condition is valley wall to valley wall. While the extent of the floodplain is not projected to increase in all areas, there is a projected increase in flood depth for 26% and 50% increases in flows. Furthermore, there are several areas of widening beyond the current floodplain extent under the 26% and 50% flow increases, as shown on the figures (see slide 17).
- Modeled current conditions for the 100-year flood may be higher (or lower) than the FEMA 100-year floodplain due to differences in flows, channel geometry, topography, or other changes in the river or floodplain.
- For flood depths, the figures show a comparison of 50% increases in flows as compared to current modeled conditions for the 100-year flood. The figures show the depth of flooding (50%, due to projected climate change) is in addition to the modeled flood depth for the current 100-year flood.
- Where the river has area to widen, the increase in flood depth may not be as great as compared to more constrained river reaches. In areas where the river is not able to widen, flood depths would increase to a greater extent.

- Jim Kramer noted that the Chehalis Basin Board's planning assumption is that land use agencies should manage for future predicted floodplain based on climate change. This information will be discussed at the Implementation Advisory Group to determine the implications of trying to manage the floodplain given potential increases in floodplain extent and flood depth.
- *Question*: One TAG member asked how the analysis was completed given the effects on the Satsop River and Wynoochee River during the peak flood event in 1996, which did not correspond with effects from the 2007 flood on other tributaries.
  Response: The model took into account hydrologic conditions during the 100-year flood over the entire length of the Chehalis River mainstem. In the Chehalis River mainstem, above Grand Mound, the tributaries in the upper basin contribute to flooding at about the same recurrence level as the mainstem. On the Satsop and Wynoochee, flooding is generally closer to a 5 to 10-year event when the mainstem Chehalis is experiencing its highest floods. At the mouth of the Satsop to about Highway 12, flooding is controlled by the Chehalis River. Upstream of Highway 12, different hydrologic information would be needed to assess upstream contributions to flooding. Additional near-term work being completed for the Local Actions Program will assess flooding in the various tributaries using available existing models, or other means as described in the hydrologic analysis memorandum.
- *Question*: What is the statistical variation (or margin of error) in the modeled additional flood depth? Or does the range explain that?
  Response: These are relative comparisons (if off by a foot in the current condition, it can be assumed it would be off by a foot in the future condition). It's a modeled result compared to another modeled result. Showing the mapping at a 0.5-foot resolution was not meant to suggest that the modeled depths are accurate to within 0.5 feet. The intent was to provide a high-level comparison of minor to major increases, rather than to project absolute flood depths.
- One TAG member noted that other discrete areas, such as I-5 and Highway 12, will be under water with a 50% increase in flood flows.
- Specific suggestions from TAG members:
  - Include only four colors on flood depth maps. For example: below a boot (knee high), from boot height to waders, up to a head and over a head.
  - Create a map or series of maps that show the total depth of flooding (current + projected) in the Chehalis River mainstem. Kramer also noted that showing 26% and/or 50% increases will help as well.
  - As we continue to discuss the 100-year floodplain, it is very important to clearly state how and where it was developed as it will differ based on where the analysis is focused. From what was discussed, please confirm an analysis was performed that verified the mainstem flooding controlled the flood extents in the lower portions of the tributaries. However, it should be noted that larger flood flows and thus flood extents may exist in the tributaries, which may be different than tributary flood flow inputs in the current basin-wide hydraulic model.

Potential for Increasing Floodplain Storage – Restorative Flood Protection

Leif Embertson and Tim Abbe (Natural Systems Design) summarized information regarding the Restorative Flood Protection analysis in the North Fork and South Fork Newaukum River, as described in

the Restorative Flood Protection technical analyses (links to the presentations were sent out as an attachment along with the TAG 4 Meeting Agenda in the same email). The presentation included a summary of the analysis as bulleted below.

- The North Fork and South Fork Newaukum channels are incised, so there was an opportunity to create more floodplain storage if their original (historic) floodplains were to be reconnected. Current inset floodplains are 20-25% the width of historic floodplains.
- Relative elevation mapping, LIDAR, incision assessment, description of current inset floodplain relative to historic floodplain (at time of European settlement), digital reconstruction of historic floodplain (prior to incision), and erosion assessment was completed to determine historic flood channel and erosion factors based on forested areas and non-forested areas.
- From the analysis, developed treatments to create floodplain storage through reconnection and roughening:
    - Discrete log jams
    - Log reinforced riffle
    - Roughness floodplain treatments (flood fences, reforestation)
- Also evaluated relocation of structures and infrastructure in North and South Forks of Newaukum
- Model was calibrated to the 2009 flood event (2-, 10-, and 100-year flows) and partitioned to sub-reaches. All of the models were done with unsteady flow input hydrographs.
- Preliminary Results
    - For 2009 event, 3% reduction in peak flow at the downstream confluence area. Some of that is due to the double-peak event in 2009 (or large magnitude flood).
    - For the 100-year flood event, the effect doubled to 6% reduction in peak flow within the study reach.
    - There was increased effectiveness (in downstream attenuation) in the 2-year flow (10% reduction in peak flow).
    - For water storage, there is a 10,000 acre-foot in temporary storage. But given slope characteristics, the actual flood attenuation effects were limited.
    - Also incorporated low, medium, high groundwater infiltration potential compared to existing and proposed conditions. Factors included how recent a flood occurred before the next flood hits. High groundwater infiltration resulted in substantial downstream attenuation – reducing downstream flood peak by 26%.
    - The main variables controlling downstream flood attenuation are roughness, gradient, and groundwater infiltration. Attenuation is inversely related to gradient, increasing as gradient diminishes, particularly for gradients less than 0.003. Attenuation effects are relatively minor for gradients greater than 0.003. Increasing roughness can double the attenuation but is secondary to gradient. The area of floodplain that can be engaged is also important since it effects temporary storage and groundwater infiltration.
    - Modeling results showed that groundwater infiltration can have the most significant effect on attenuation but is dependent on soil characteristics and antecedent moisture content. Modeling showed that high end estimates of infiltration in the Newaukum could lower downstream flood peaks by 26%.

    - Flood attenuation increases with roughness, lower channel slopes (less than 0.3%), and more frequent events (like 10-year flood event), and attenuation increases with groundwater infiltration.
    - Looked at broader applicability in the Chehalis River mainstem and parts of South Fork Chehalis where there are lower channel slopes. The best candidate sites are 25% or less in the channel systems in the upper Chehalis Basin.
- Additional findings
    - Current FEMA floodplain mapping is inadequate. In the Newaukum pilot study, hydraulic modeling showed that peak flows with a 100-year recurrence interval inundate substantially more area than existing FEMA flood insurance rate maps. Increases in peak flows resulting from warming climate will further exacerbate flood extents.
    - Current erosion hazard mapping is inadequate. Erosion is a natural process and is essential for creating/sustaining critical habitats. The Newaukum pilot study found that forested banks eroded at less than half the rate of banks with grass or shrubs. Erosion is gradually widening the inset floodplain that began developing after historic channel incision (4-6 feet). Thus, erosion is enlarging the floodplain, which is increasing the extent of aquatic habitat and increasing flood conveyance and temporary storage.
- Conclusions
    - Opportunities for relocating residents, businesses and agriculture to upland areas (will be discussed at Implementation Advisory Group)
    - Some landowners are receptive to relocating, and erosion hazards were the greatest concern in the Newaukum study area
    - Not effective in attenuating large floods in the upper Newaukum River but would have beneficial effect on attenuating more frequent events (10-year recurrence flood)
    - More effective in attenuating smaller floods (given factors previously mentioned), and there is also a benefit to aquatic habitat
- The presentation concluded with success stories for an ASRP early action project in the Satsop River Basin for reducing flood damage with 1-year flood and 2-year flood. NSD noted that there is a potential for flood damage reduction to structures (55-75 structures) within the Satsop Riviera.
- *Question*: Are soil conditions and depth to groundwater also important variables for "antecedent conditions" related to infiltration potential?
  Response: Yes, they are driving factors in the modeling conducted for RFP.
- This analysis has not been completed for the entire Chehalis River Basin. Dave Bingaman noted that the RFP could be considered in the overall package of flood damage reduction actions for the entire Chehalis Basin.
- In summary, there is a localized benefit through moving people out of harm's way and combining this action with habitat restoration. Flow attenuation at the 100-year flood level (Board's goals) would not be achieved, but other benefits could be realized.
- One TAG member noted that it would be interesting to do more analysis in the low gradient areas and the groundwater storage potential to determine potential downstream effects.

Potential for Increasing Floodplain Storage – Local Actions Program Analyses

Larry Karpack (Watershed Science and Engineering) summarized information regarding actions to increase floodplain storage and reduce flood damage in the Chehalis River Basin as described in the *Summary and Evaluation of Options for Increasing Floodplain Storage Memorandum* (October 30, 2020) and the *Supplement* to this memorandum (December 3, 2020). The presentation included a summary of the analysis that was previously presented at the TAG 3 Meeting, as well as updated analyses for increased floodplain storage opportunities. The updated analyses described the results of all of the "YES, NO, MAYBE" options.

Key comments, questions, and discussion topics:

- Larry described the results of the analysis, where a total of 2,064 acre-feet of potential floodplain storage was identified within the modeled floodplain:
    - Total potential storage in nineteen YES or MAYBE locations is 1,553 acre feet
    - Sites with a total of 511 acre-feet were categorized as unlikely to provide floodplain storage without impacts (i.e., NO)
- For each potential storage site, the estimated amount of storage (in acre-feet) is provided in Table 1 of the memorandum *Supplement*. In addition, supplemental notes are provided for each NO site describing why it was eliminated from further consideration.
- The evaluation for potential storage location 17 (along the Skookumchuck River near I-5 in Centralia) was described. Approximately 300 acre-feet of storage is possible. This location was eliminated from further consideration due to the potential impacts and costs outweighing potential benefits:
    - Using this storage area would shift flooding from east side of I-5 to west side
    - Potential storage area is currently fully developed with residential and commercial structures
    - Possibly 300 acre-feet here – the FRE provides 65,000 acre-feet of storage and reduces water levels in Centralia by about 0.04 feet per 1,000 acre-feet of storage
- The evaluation of potential storage location 20 (Black River) was described. This is the largest of all identified storage areas. WSE described the potential hydraulic and environmental complexities along with property ownership. This is probably not a good candidate site for near-term evaluation for the following reasons:
    - There are 20+ parcels with different owners within the potential storage area (private and property).
    - For hydraulic analysis, would need to first do field reconnaissance to refine the existing conditions model and then see what effect would be if the railroad is removed and if the contributing Black River hydrology was refined in the model.
    - For environmental effects, the vast majority of the site is wetland and Oregon spotted frog is present on State-owned land. Changes in flooding may not be an issue for Oregon spotted frog, but it is another consideration that would need to be investigated to determine if this is a viable site for additional flood storage.

The TAG divided into four breakout groups to discuss one question related to floodplain storage:

1. Is the potential for additional floodplain storage significant enough to pursue as one element of several potential elements within the local actions program? If so, how, why, and where?

The conclusions of this discussion will be provided at the January board meeting. A summary of the conclusions will be provided to the TAG for review prior to presenting to the Board.

Input from breakout groups included:

- Floodplain storage is worth pursuing as one element of a Local Actions Program.
- There is a benefit in creating flood storage to reduce the number of property owners that would need to be protected or relocated.
- There are unanswered questions: more clear definition of the goals (for example, is flood damage reduction only, is there an acre-foot of storage goal, a specific number of structures where flood depths/damage are reduced)? Are there potential effects downstream that should be considered?
- One advisory group member noted that the entire floodplain should be vacated to reduce flood damage.
- Attendees agreed that analysis of Black River floodplain storage should be pursued:
    - Too many property owners with the assumption that it would cost too much is for the Board to decide. TAG members cautioned about shutting down the idea at this time without input from the Board and criteria on cost-benefit.
    - The fact that there is an existing wetland could be valuable for this analysis. Effects to spotted frog would need to be considered/evaluated, but it may not cause an issue. The property ownership includes public property, which could be helpful.
- An analysis should be conducted to evaluate all of the identified potential flood storage projects (including RFP) together. For example, how much flood storage would be provided if all opportunities were pursued?
- Suggestion for a pilot project that is synergistic between the LAP, ASRP, and RFP. This could be in areas where there are willing landowners, with the intent of showing how all of these programs can benefit the local community in proximity to the project. One TAG member noted that there are typically synergies with ASRP and flood reduction.
- Groundwater storage cannot reduce peak water levels, but may be able to shave off the peak and reduce velocities. Would like to see a pilot study to determine if groundwater storage and recharge would provide a benefit. Opportunity to work with Streamflow Restoration planning.
- There would be a benefit at lower flood levels if storage was included where we are already looking to remove structures or improve habitat.
- There could be localized benefit on some tributaries that could reduce flooding at events below the 10-year flood.
- There would not be a big benefit for large scale projects – i.e. no far reaching effects.
- None of the flood storage options provide significant benefits at the 100-year flood.
- A question was asked regarding whether or not the floodplain storage projects are in line with FEMA and other floodplain management regulations. The answer was that it is complicated if a project is within the FEMA floodplain or floodway. Otherwise, it is generally “do no harm.” County regulations need to be followed but these are generally up to the County.
- There was widespread consensus that FEMA mapping needs to be updated.
- Flood storage on tributaries could reduce velocities and erosion in the tributaries especially in smaller systems.

Potential Bank Protection Strategies

Merri Martz (Anchor QEA) provided an update on near-term erosion-focused mapping and described potential bank protection techniques and hypothetical bank erosion and protection scenarios as described in the *Summary and Evaluation of Potential Bank Protection Strategies Memorandum* (October 23, 2020).

For the near-term erosion hazard mapping, the Office of Chehalis Basin is moving forward with a qualitative analysis with initial map development for Board and stakeholder visualization in about 100 miles of rivers, based on additional feedback from Ecology and the Conservation Districts. The analysis will start by compiling existing maps and supplementing where needed. The analysis will look at where erosion is occurring now and where it could occur in the future, in a qualitative sense.

For the bank protection strategies, Merri provided an overview of the near-term and long-term options, previous draft bank protection strategies developed for the ASRP, existing regulations, and the current situation in the Chehalis River Basin along with a few example scenarios. Additionally, bank protection techniques were generally described with a reference to where this information can be found in the *Summary and Evaluation of Potential Bank Protection Strategies Memorandum.*

The TAG provided feedback on the following questions via JamBoard (link):

1. What technical considerations do you have for providing bank protection that would not have a significant impact on natural processes and functions?
2. What technical considerations do you have for providing bank protection in critical locations that may negatively impact natural processes and functions?
3. What thoughts do you have on goals for building a bank protection program?

The information provided in JamBoard will help frame the discussion for the Chehalis Basin Board. In terms of the comments provided, Andrea McNamara-Doyle noticed that there were not many ideas or suggestions for helping private landowners. There were also comments about prioritizing public infrastructure over private. Andrea encouraged the TAG to think of ways to provide assistance to private landowners. Cynthia Carlstad reiterated the need for strong criteria in how to address landowner and land use considerations. Concerns were raised about paying to protect private landowners, and what the landowner would be required to do as well.

Potential ideas that garnered additional support from TAG members included:

- Careful consideration of upstream and downstream impacts of armoring banks.
- Putting bank protection at margins of CMZ is preferred, or establishing corridors that provide sufficient space to allow natural processes to create and sustain critical habitats and forested riparian buffers.
- Look for opportunities to tie bank protection with other enhancement projects in the vicinity (i.e., fish barrier removal, other tributary enhancements, etc.).
- Create strong criteria to limit the situations where hard armoring would be allowed. For example, limit it to only protecting critical infrastructure, roads and bridges?
- Alternatives analysis should be conducted to find least impactful option. The alternatives analysis needs to look broader than specific site and be done at larger scale.
- Eliminate any riprap or sheetpile placement without substantial mitigation within same reach.

- Criteria for protecting public infrastructure will likely be different than for protecting private property.
- Assess reach-scale functions to address root problem, not band-aids at individual properties.
- Carefully consider the liability to local entities, governments in paying for bank protection for private landowners. Who is responsible for maintenance?
- How to prioritize bank protection considering there are so many landowners that may want assistance?

Next Steps and Summary of Follow-Up Actions

The next Technical Advisory Group meeting is scheduled for Friday, January 8, 20201, from 8:00 AM to 12:00 PM PST.

Below is a summary of follow-up actions identified during the meeting:

- Jim reviewed upcoming meetings (next one is January 8, 2021) and noted that a Doodle poll will be sent out shortly to schedule a meeting for the first part of March.
- Specific suggestions from TAG members for the near-term climate change analysis:
    - Include only four colors on flood depth maps. For example: below a boot (knee high), from boot height to waders, up to a head and over a head.
    - Create a map or series of maps that show the total depth of flooding (current + projected) in the Chehalis River mainstem. Kramer also noted that showing 26% and/or 50% increases will help as well.
- A summary of the conclusions from the bank protection strategy discussion, particularly around goals, will be provided to the TAG for review prior to presenting to the Chehalis Basin Board in January.