



Attachment A: Planning Scenarios TAG Comments Received through November 3, 2017.

Comment Number	Comment Author	Organization	Subject	Comment	Response
5	Steve Harris	Harris Water Engineering	SWSI Overview	It is not clear to me who is going to use the model, part of SWSI or BRTs. Seems pretty complicated to expect the BRTs to use the model(s).	CWCB is currently working on guidance to BRTs to aid in post-SWSI planning. Further details about how SWSI data and will be conveyed to the BRTs and guidance for how BRTs can use SWSI data in the upcoming post-SWSI planning efforts are being developed as part of the SWSI Update.
11	Larna Kaatz	Denver Water	SWSI Overview	Moving forward, what opportunities will there be in comment on and review the process? Please update Figure.	The TAGs were established to advise CWCB and the technical team during the Methodology Development phase of the SWSI Update. In subsequent phases of work, the CWCB anticipates engaging with Basin Roundtables as the primary source of feedback.
13	Larna Kaatz	Denver Water	SWSI Overview	The process is not completely clear. Please explain how SWSI, the BIPs, and IPPs will work together? For example, how should the BIPs be updated with significantly changed gaps?	CWCB is currently on working guidance to BRTs to aid in post-SWSI planning. Further details about how SWSI data and will be conveyed to the BRTs and guidance for how BRTs can use SWSI data in the upcoming post-SWSI planning efforts are being developed as part of the SWSI Update.
17	Larna Kaatz	Denver Water	SWSI Overview	We recommend the IPPs be evaluated as part of this process or that a process be designated for evaluation by the BRTs so to understand the implications to these projects under different future conditions, particularly climate change.	Evaluation of Identified Projects and Processes (IPPs) are not part of the SWSI Update. However, the SWSI Update will develop guidance for implementing a consistent method for representing and using IPPs in post-SWSI Update planning work that can best utilize data generated from the SWSI Update technical work. Additionally, SWSI Update work will review existing IPP lists developed by the BRTs and describe how to link IPP data to other datasets such as the Source Water Route Frame work and StateMod model.
4	Steve Harris	Harris Water Engineering	Scenario Planning	I gap and shortage seem to be the same thing. Why use one of ag and another for M&I?	Agreed. We are moving towards using "gap" instead of "shortage" for all aspects of the project.
14	Larna Kaatz	Denver Water	Scenario Planning	Figure 2 and Table 1 would benefit from a simple graphic depicting the drivers of change. Figure 2 includes drivers and implications.	Agreed. A graphic aligned with this concept will be developed for the Scenario Planning TM.
15	Larna Kaatz	Denver Water	Scenario Planning	Business as Usual scenario says that recent trends continue into the future and one of those trends is that there is a slow increase of denser developments in large urban areas. This is not the case in our service area. How was this trend determined?	The scenario narratives were developed by the IBCC prior to the Colorado Water Plan based on their observations and experience of growth patterns and trends.
31 a	David Graf	CPW	Scenario Planning	Scenarios A - E bracket a range of potential futures. Another approach would be to simply choose from a subset of global hydrologic models and down scale to Colorado that consider a similar range of hydrologic ranges to consider.	Elements of the method described in this comment could be incorporated into future planning efforts. However, for the current SWSI Update, we have been directed to employ the scenario planning process described in Colorado's Water Plan.
31 b	David Graf	CPW	Scenario Planning	RE: Cooperative Growth and Adaptive Innovation scenarios (C and D), I think recognition on the social values dimension that these scenarios represent the implementation of stream management or integrated water management strategies to meet environmental and recreational needs should be considered as a focus for these scenarios, and referenced explicitly in the narrative descriptions.	The narrative descriptions were developed prior to the SWSI Update based on extensive input from a larger group of stakeholders and therefore cannot be changed at this time. However, the recommendation of explicit reference to stream management will be taken under consideration for future scenario description efforts.

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31 c	David Graf	CPW	Scenario Planning	RE: Cooperative Growth and Adaptive Innovation scenarios (C and D), another consideration could be to combine these two scenarios, since there isn't much difference philosophically; changes to certain drivers (population and climate assumptions) shift the likely response and outcomes, but Scenario C is already bracketed by other scenarios presented.	The narrative descriptions were developed prior to the SWSI Update based on extensive input from a larger group of stakeholders and therefore cannot be changed at this time. However, the recommendation to consolidate scenarios will be taken under advisement for future scenario description efforts.
31 d	David Graf	CPW	Scenario Planning	RE: the Hot Growth scenario (E), I think it's good to present as a fairly bleak supply/ demand scenario, but at some point, water supplies will be limiting to growth. How much does the gap and growth rate become (inversely) related, or more simply, when does lack of water limit growth in CO? The result in the current 'hot growth' scenario might be an over-estimate of demands, which leads to certain outcomes in the modeling or proposed IPPs.	A key step in the scenario planning description development process is to ask the scenario planning team if the scenario is truly plausible. It is generally agreed by the scenario planning team that this scenario tests a bleak, but plausible, scenario.
31 e	David Graf	CPW	Scenario Planning	Not sure I understand how the hydrologic input gets adjusted in Scenarios C-E.	The details of climate adjusted hydrology by scenario are provided in the Water Supply Methodology Technical Memorandum.
32	David Graf	CPW	Scenario Planning	Re: Hot Growth Scenario. It might be argued that since it's hotter and drier elsewhere, everyone comes to CO? Would that lead to more headwater/ west slope growth than predicted? Does the scale capture changes to headwater communities vs rural communities where water or agricultural economies might be lost?	Yes, this scenario does assumed greater growth in higher altitude / cooler locations in Colorado and reduced agricultural lands.
34	David Graf	CPW	Scenario Planning	Re: Land Use Changes: It might be worth addressing directly how land use and water supply (or M&SSI Demand) would be related (or not). I do think the range of responses as represented is fair, and in all likelihood, water won't limit growth for quite awhile.	Many of the scenarios described "more or less dense" development to test the inter-relation between land use, population location, and water demands. However, there is not an assumption that water limitations restrict population growth.
35 c	David Graf	CPW	Scenario Planning	For Scenarios C and D, I'd appreciate verbiage in Table 2 for the narrative under 'Social Values' to reflect a commitment to meet statewide stream management planning goals. This doesn't quantify demands, but as those streamflow needs become more clearly defined, cooperative programs used to meet those needs will develop under C and D, and might increase incentives for water saving measures and reduce demands for Ag and/or M&I. Clearly, the response is complicated and uncertain, but these are the optimistic scenarios.	The narrative descriptions were developed prior to the SWSI Update based on extensive input from a larger group of stakeholders and therefore cannot be changed at this time. However, the recommendation of explicit reference to stream management will be taken under consideration for future scenario description efforts.
12	Laurna Kaatz	Denver Water	M&SSI Demand	It appears that the methodology uses some aspects of scenario planning and some from other probabilistic approaches (population estimates). Please clarify this in the document and explain the rationale.	The one area where this occurs is in the population estimates where the existing population forecast models are limited by the type of variables currently used to forecast population. A brief description of the background behind the selected approach will be provided.
22	Jim Hall	Northern Water Conservancy District	M&SSI Demand	Does SSI use need to be included as a potential driver, for instance possible future oil shale demand? If not, the memorandum should document why SSI is not considered a driver.	The last sentence of the Hot Growth Scenario states "there is large production of oil shale, coal, natural gas, and oil in the state." The SSI demands are therefore increased under this scenario to capture potential increased SSI oil shale demands.
35 b	David Graf	CPW	M&SSI Demand	In Table 2 (Adjusted M&SSI demands) not sure why there's a different adjustment to Scenarios C and D re: Regulations and Technology (-6% vs -7%). Should they both be 6%, or is significantly improved technology anticipated under D? If so, I'd suggest adding to this savings (ie, -10% or more).	Agreed that both scenarios have aspects of regulations and technology that will reduce M&SSI water use. Scenario D is assumed to have significantly improved technology to explore the difference in this future as compared to Scenario C.
25	Jim Hall	Northern Water Conservancy District	Ag. Demand	The impact of increased irrigation efficiency will primarily be to change the timing, not the amount, of flow in the river and subsequent availability of water downstream. Transition to more efficient irrigation methodologies will continue changing the timing of flow. The report is unclear whether this will be modeled. The impacts of increased irrigation efficiency should be included in modeling efforts or the technical memorandum should address why this isn't important.	The Agricultural TAG members are considering options on how to adjust system efficiency in the Planning Scenarios. The Agricultural Diversion Demand methodology will be revised based on their final recommendation.

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1	Steve Harris	Harris Water Engineering	Hydrologic Modeling	The hydrology modeling estimates natural flows then recalculates water diversions and demands. Is there a process to verify the model reasonably replicates current conditions.	Yes, the water allocation (StateMod) model results are compared to historical streamflow, diversions, and reservoir contents during calibration of the model. CWCB and DWR continue to improve the data used in the models and are hopeful that the models and data will be improved as the basins use the information during their next Basin Implementation Plan efforts.
2	Steve Harris	Harris Water Engineering	Hydrologic Modeling	I am concerned that model over estimates current diversions and the associated gap because it is theoretical diversions based on estimated acreage and StateCU. Actual diversions may be less and the gap overestimated in 2050.	For Current conditions, the models simulate diversions that closely correlate with recorded diversions (refer to the individual model documentation available on the CDSS website for comparisons of this information in each basin). For Planning Purposes, the CDSS modeling platform are appropriate for analyzing the "what-if" situations as presented in the Planning Scenarios at a basin-wide scale.
3	Steve Harris	Harris Water Engineering	Hydrologic Modeling	Seems like all of the model runs are for 2050. I think there should also be current model runs to see what gaps exist. Then 2050 gaps can be compared to the current gaps to get a better handle on relative difference between now and 2050. This would also mostly alleviate my concern in comments #2 because the 2050 gap would be relative to the current gap rather than a fixed number.	Yes, the Water Supply Methodology outlines analyses for both Current and 2050 Planning Scenario conditions and the 2050 demands and gap results will be reflected relative to the Current conditions.
6	Steve Harris	Harris Water Engineering	Hydrologic Modeling	The flow difference between observed, 25 and 50 percentile is not clear. What is actual flow difference between the three - maybe show the average yearly flow for the time period for a couple selected nodes.	Thank you for your review of the adjusted hydrology. Development of the climate-adjusted hydrology was completed under the CRWAS-II effort and is under review by CWCB. The results will be made public after their review and will be documented in the final SWSI report.
10	Lurna Kaatz	Denver Water	Hydrologic Modeling	How have CDSS and StateMod been updated since the last SWSI evaluation?	Improvements to the CDSS models include completion of the South Platte DSS model, refined irrigated acreage, refined operations, improved resolution on small tributaries, and extension of the models. Please refer to the individual model documentation available on the CDSS website for more information.
18	Lurna Kaatz	Denver Water	Hydrologic Modeling	Natural and managed vegetation will change as the climate warms but in not considered in the hydrologic modeling. This change will have significant implications on the natural system modeling and demand modeling. We recommend the state complete a sensitivity analysis to understand the impacts of changing vegetation, that it be noted in the documentation, and be identify this as a key research need moving forward.	As you noted, both the natural vegetation and cultivated crops will likely experience changes by 2050, however these changes are difficult to predict and quantify. Future SWSI efforts may incorporate this type of analysis, however budget limitations preclude this from the current SWSI Update.
20	Lurna Kaatz	Denver Water	Hydrologic Modeling	The MRT submitted a letter seeking simple climate sensitivity runs be completed as part of this analysis. This would add significant value by providing insight into how climate changes -temp, variability, precip - will impact the basins independent of other changes. Please consider including this analysis in SWSI.	As noted, there is value in understanding how the demands would vary in the future based on climate changes alone, independent of other factors. The SWSI Update strives to provide technical data to support the Planning Scenario narratives as presented in Colorado's Water Plan, and budget limitations preclude additional sensitivity or scenario analyses.
28	Heather Dutton	San Luis Valley Water Conservancy District	Hydrologic Modeling	Are the climate scenarios based on studies from the individual basins (there has been work by BOR in the upper Rio Grande) or the Statewide outlook, or a combination of the two?	The climate scenarios are based on hydrology modeling completed by BOR in 2010 and 2014 using global circulation models (CMIP3 and CMIP5) climate projections downscaled to the state level.
30	Matt Cook	HDR	Hydrologic Modeling	The scale/resolution for gap reporting should be at the lowest practicable level (i.e., water district/entity) in order to better prepare the BRTs for applying IPPs in updating their respective Basin Implementation Plans	The SWSI consultants will strive to summarize results at the lowest resolution that is appropriate based on the data availability and resolution of the models.
33 a	David Graf	CPW	Hydrologic Modeling	Re: Climate Conditions: Could use specific model outputs from global climate models (ie, from the State Climate Change Report (maybe this is already the approach): (see http://cwcb.state.co.us/public-information/publications/Documents/ReportsStudies/ClimateChangeReportFull.pdf) - plenty of information to tap from.	Incorporation of climate adjustments in the SWSI Update is guided by policy decisions from the IBCC, work completed under the CRWAS-II effort, and the narratives presented in Colorado's Water Plan.

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33 b	David Graf	CPW	Hydrologic Modeling	Re: Climate Conditions: It might be worth understanding the underlying climate assumptions made to represent hydrologic inputs for the different scenarios, specifically C, D, and E. These adjustments to the hydrology driver were not very well defined.	The development of climate adjusted crop demands and hydrology was developed and documented under the CRWAS-II effort. The CRWAS-II results are currently under review by CWCB staff, however should be available publicly soon.
35 a	David Graf	CPW	Hydrologic Modeling	I think proposed range of model inputs appears reasonable and can't really offer refinements to your parameter choices at this time, but would suggest some flexibility or ability to revise/ reconsider these parameters in the future (by BRTs or by other iterations of SWSI) should be made explicit.	Noted, this input will be taken into account during future planning work.
35 d	David Graf	CPW	Hydrologic Modeling	'Stream Flows' is the primary driver on the one hand (... in deciding what hydrologic inputs to initiate the model with), but over the time series or modeling space selected, it also is the most important model output. Not sure how to resolve this 'chicken and egg' issue exactly.... Can you help with a clear description? Or maybe a matrix of how the model handles different hydrologic inputs under the different 'response' scenarios.	Please refer to the Water Supply Methodology documentation for more information on how the models operate based on natural flow inputs, allocate water to meet demands according to the Prior Appropriation System, and output simulated streamflow.
39	Jenny Bishop	Colorado Springs Utilities	Hydrologic Modeling	I have a serious concern about the lack of acknowledgement of the current reliance on groundwater and the very real scenario of groundwater aquifers being stressed beyond use in the not too distant future. In the tech memo it sounds like the authors are counting on the same groundwater supplies being available in the future, and aren't anticipating additional groundwater users. That seems very unrealistic.	This comment was reiterated in the Agricultural TAG meeting. The SWSI consultants will work with augmentation providers and conservancy districts in the South Platte, Arkansas, and Rio Grande River basins to apply appropriate assumptions to ground water usage in the future.
40	Jenny Bishop	Colorado Springs Utilities	Hydrologic Modeling	Another concern is the reliance the SWSI update is putting on the work that individual basin BIPs did to identify the water supply gap in their respective basins. Again, I'm not sure that water users outside of larger populations centers have been appropriately accounted for.	This is the first SWSI analysis conducted within the context of Colorado's Water Plan and Basin Implementation Plans. A primary goal is to provide tools and data sets for Basin Roundtables to use in updating their BIPs. The SWSI Update team will work to appropriately account for water users across the state, but Basin Roundtables can enhance the analysis during BIP updates if needed.
41	Jenny Bishop	Colorado Springs Utilities	Hydrologic Modeling	The technical memo also states that it will be left to individual basins to determine how the gap will be mitigated. My main concern about leaving it to individual basins, and not the entire state, to meet the gap is that the only basins with potential water supplies, like the Colorado Basin, may use the "not my basin, not my problem" excuse to preclude additional water supply development in the water rich basins.	Your concern is noted. The water planning processes established by the State of Colorado, which include SWSI, BIPs, and Colorado's Water Plan, contemplate both localized and statewide efforts. Localized planning occurs at the basin level via BIPs. Colorado's Water Plan incorporates local planning and statewide objectives to provide a consolidated plan for the entire state.
42	David Taussig	White - Jankowski; Arkansas BRT	Hydrologic Modeling	I think reaching out through SWSI/TAG to rural water providers would be a good idea. Some of these smaller communities may not have what is thought of as a "gap" based on future growth, but a gap related to infrastructure or dwindling groundwater supply issues. For example, yesterday I heard that the Town of Walsh has a well that is going dry. They may need to buy water elsewhere to replace the existing well. Or like we saw with the Homestake partners diversion works needing improvement. I suspect the same aging infrastructure problems are plaguing other rural water providers. If their water system fails because of an infrastructure problem that seems to create a "gap" - maybe not how the State has been traditionally viewing the gap (more people need more water) - but a lost water supply means a replacement will need to be found. Another example was the Huerfano situation where orphan wells were not be augmented. Again, a unique problem, but just as real as El Paso County sprawling.	The SWSI consultants will work with augmentation providers and conservancy districts in the South Platte, Arkansas, and Rio Grande River basins to apply appropriate assumptions to ground water usage in the future. This will include discussions regarding rural communities or water users and their likely sources of water supply in the future.

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43	Dave Stone	Town of Limon	Hydrologic Modeling	To elaborate further on the gap created by the need for replacement of a well, in some situations there may not be other water available in the vicinity creating a crisis condition for survival. In Limon for instance, should we have no shallow alluvial water in the Upper Big Sandy I would guess the closest alternate source for the volume we use may be as far as 25 to 40 miles away. Also, although Limon is not affected by the Ogallala a significant portion of rural eastern Colorado is, especially those not along the Arkansas or South Platte. What does further mining of that source do to the sustainability of those communities as the availability diminishes?	The SWSI consultants will work with augmentation providers and conservancy districts in the South Platte, Arkansas, and Rio Grande River basins to apply appropriate assumptions to ground water usage in the future. This will include discussions regarding rural communities or water users and their likely sources of water supply in the future.
36 a	David Graf	CPW	Sign Posts	It was not clear how conditional water rights will be treated when determining water supply availability.	Please refer to the individual model documentation available on the CDSS website for more information on which water rights have been included in the models.
36 b	David Graf	CPW	Sign Posts	Biological signposts can be much more difficult to assess significance or importance, or significant changes can occur rapidly in response to passing certain ecological thresholds, some of which can be unrelated to streamflow (e.g., fire, development...). I think there are valid ways to quantify a biological 'expectation' moving forward (ie, similar age-class structure or biomass over a 10-yr running average on Reach X...) and thus some ability to monitor toward a signpost, but would expect that this will occur in the future as the post-SWSI approach is discussed.	Noted-this information is very helpful and will be considered as signpost monitoring approaches are developed as part of post-SWSI Update efforts. Part of the development of biological signpost monitoring will involve researching what environmental and biological signposts are currently being monitored by other entities and where data gaps can be filled in.
36 c	David Graf	CPW	Sign Posts	Tying signposts to 'State Action' will be another step entirely, but presenting the concept is an important 'Next Steps' component.	The relationship between future signpost monitoring efforts and State action/funding will be refined as signpost monitoring methodology is developed.
37	Steve Harris	Harris Water Engineering	Sign Posts	I like the idea of signposts on how things are going but think you should start this SWSI by looking back at 2005 and 2010. Track things such as: population estimates especially front range, irrigated acreage decrease especially in the South Platte, temperature and rainfall at baseline stations (I would be most comfortable if Nolan, the State Climatologist did this rather than CWCB staff.), improvements to STATEMod and what they are, and other items that are important that others can think of.	This input will be considered as future signposts monitoring efforts and methodology are developed post-SWSI Update.