Groundwater Sustainability Plan - Basin Setting and Monitoring Network Chapters
Public Review Draft- Summer 2020
Compiled Comments, 9/9/2020

#	Commenter Name	Commenter Organization	Chapter* (BaS or MoN)	Section	Line #s or Figure #	Comment
1	James Brobeck	Vina SHAC	BaS			(As of 8/10/2020) My questions about the interbasin flow volume discrepancy remain unanswered. The draft author (Davids Engineering?) replaced the contradictory interbasin flow data in the initial Butte and the Vina drafts with the following data-less paragraph: "Interbasin flows are dependent on conditions in adjacent basins. It is recommended that GSAs refine estimates of subsurface groundwater flows from and to neighboring basins through coordination with GSAs in neighboring basins during or following GSP development and through review of modeling tools that cover the Sacramento Valley region, including the C2VSim and SVSim integrated hydrologic model applications developed by DWR." County staff has advocated for artificial recharge since the days of Ed Craddock, despite extensive past and present opposition and significant legal water rights issues. Staff and consultants continue to do so by shepherding the Tuscan Water District intention to facilitate expanded conjunctive use to experiment with in-lieu recharge. The efficacy of artificial recharge and the ability to achieve sustainable goals would be predicated to some extent on how groundwater flows between GSA "basins". The initial basin setting graphs and maps are not in the draft documents, but may still indicate the assumptions of water purveyors in these GSAs and beyond.
2	James Brobeck	Vina SHAC	BaS		143+	Line 143: "it is recognized that groundwater flows across each of the defined boundary lines to some degree." There is general agreement that subsurface flows move from the VS (Vina Subbasin) from the NE to the SW…especially from VS into Glenn/Colusa Counties and into the BS (Butte Subbasin). Line 150 Bottom of the Basin: It must be emphasized that the "base of freshwater" in the VS normally operates with robust piezometric pressure that prevents downwater leakage and supports overlying freshwater strata. The total absence of reference to the pressurized dynamics of this freshwater system in the setting is conspicuously absent from the document. The actual depth to the lowest portion of the aquifer system may be 700-1200' BGL while the piezometric pressure may present leakage as high as ground level when the pressure reaches artesian pressure. DWR previously divided the Sac Valley aquifers into four zones. We therefor would be well served by having four GW elevation maps, one for each zone, to get an accurate representation of the lateral and vertical groundwater flow directions. They might be different for each zone and between zones at different times of the year. These maps should be done for each sampling event to see if there's a significant change in direction of flow. This level of monitoring would help us understand if pumping in one area during the irrigation season significantly change flow direction of the source(s) of water to the pumps or cause drawdowns in areas that wouldn't be expected looking at the non-pumping contours. Since they're there to help we should ask DWR to produce GW contour maps for each of the 4 zones or we might make significant errors in basin management.
3	James Brobeck	Vina SHAC	BaS		269+	Line 269 "Geologically, the 269 Upper Watershed consists primarily of volcanic, granitic, and metamorphic 270 rocks that do not have any appreciable primary porosity. Fracturing within 271 these rock units may occur locally but the fractures are not pervasive on a 272 regional scale, which limits the amount of water that can percolate into the 273 bedrock geologic units and the volume of groundwater available to migrate to 274 other regions such as the valley alluvial groundwater basin on the Valley Floor" The existence of reliable producing deep (600-900') wells in Cohasset and (possibly) Forest Ranch belies this long-standing characterization of relatively unreliable shallow "fractured rock" wells in these foothill/mountain communities. There is some indication that these deep mountain wells are tapping geological and recharge connection to the lower Tuscan Aquifer system. These deep wells are relatively new, have significant piezometric pressure, and should be on file with Butte County Environmental Health well construction logs.
4	James Brobeck	Vina SHAC	BaS		315+	315 "precipitation on the valley floor and in the Lower Foothill 316 area is a predominant source of recharge for much of the Vina Subbasin." The mechanism of recharge that creates piezometric pressure in the lowest portion of the Tuscan aquifer as well as in the deep mountain/foothill wells must be considered as we attempt to identify and manage the recharge source zones.
5	James Brobeck	Vina SHAC	BaS		323+	323 "This dataset can serve as a starting point indication for areas 324 conducive to natural or managed recharge. Large portions of the Subbasin 325 generally received a moderately good to good rating (Figure 1-7), except for in 326 the southeastern area of the Subbasin. Additional considerations will be 327 important for specific evaluation of any proposed recharge project." Presumptions of the efficacy of applied water for intentional recharge may be logical for unconfined shallow aquifer zones but are illogical when attempting to maintain/restore deep confined pressurized zones. The setting document makes no effort to differentiate recharge efficacy between the different zones when discussing recharge projects that dominate the management action discussions.

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6	James Brobeck	Vina SHAC	BaS		381+	381-426: The detailed description of the Tuscan formation describes 4 layers. This may be the origin of the DWR description of Sacramento Valley aquifers divided into 4 zones. The setting description of Tuscan 'a' & 'b' fails to describe the important piezometric pressure that exists under normal conditions that may be destabilized by over "exercising" of the lower Tuscan layers. The deepest portion of Tuscan 'a' extends into Glenn County where the deepest Tuscan wells are located. Assuming that the 3000-5000 GPM wells that GCID has to supplement their river supplies, this information is critical for our efforts to compose inter-basin cooperation.
7	James Brobeck	Vina SHAC	BaS		507+	507 "In addition, all of the layers can now be represented as having 508 more realistic lateral changes in sediment type (gravel/sand vs. silt/mud), 509 which can be related to hydraulic conductivity and confined/unconfined 510 conditions for more detailed groundwater studies." Details that help us model lateral aquifer response to pumping are important considering the pressurized lower Tuscan foundation is shared by several GSAs. Details that help us model lateral aquifer response to pumping are important considering the pressurized lower Tuscan foundation is shared by several GSAs. The impacts to surface water and shallow wells resulting from pulling deep water is both delayed and long-lasting. According to a 2014 report by Davids Engineering "Management of connected surface and groundwater systems is challenging for several reasons. First, the duration of streamflow depletions caused by pumping depends on the spatial scale: in general (depending on soil conditions and strata) the greater the distance or depth between groundwater pumping and an affected stream, the lower the magnitude but the longer the timescale of depletions. As a consequence, the ultimate effects of pumping can occur significantly after pumping starts, or even after pumping has ceased. The timescales involved in aquifer responses to pumping and other stresses can be on the order of decades, making it difficult to associate cause with effect. As such, monitoring must account for this lag in impacts. In general, the longer the timeframe for effects to be observed at a given monitoring point once they become evident, the longer those effects will persist, even if the pumping causing the effects is halted immediately." The Northern California Water Association ("NCWA") document, Sacramento Valley Groundwater Assessment Active Management – Call to Action, underscores the importance of long-term monitoring to understand the impacts of groundwater pumping on basin recovery and impacts to streams.
8	James Brobeck	Vina SHAC	BaS		603+	603 "This leaky aquifer system has varied hydraulic connectivity 604 between different depth zones in different areas of the subbasin." This paragraph admits there are data gaps in the understanding of vertical flow patterns and should describe how water can leak upwards when the potentiometric pressure of the deep confined aquifer is greater than the overlying layers. Vertical flows direction and volume will change during deep pumping. A single groundwater elevation contour map doesn't say anything about vertical flow direction. The maps of changes in depth to groundwater might give a better indication of the general areas where changes in vertical flow are occurring. Areas of greater change in depth, likely mean there is also greater reduction in groundwater levels between two or more adjacent aquifer zones, suggests that there might be changes in vertical flow direction. To be accurate, you need the actual change in groundwater elevations between the different zones for different times, such as the four DWR zones in spring and fall. You would also want to know what the magnitude, gradient, and any change in the direction if the vertical flow. With the groundwater elevation differences in each adjacent aquifer zone you can determine the magnitude of the change in vertical gradient, and the direction of the change, a reduction or increase in upward (+) or downward (-) flow. You need to have the vertical groundwater elevation change for two sampling periods and the distance between the average elevation of the screened zones of the wells. With that information you could make a map of the magnitude of vertical elevation change, change in vertical gradient, along with the change in direction either upward (+) and negative (-). For example, if I have a shallow water table aquifer overlying a deeper confined aquifer, a clay layer separates the two aquifer zones. If the static condition, non-pumping, has the elevation of the confined aquifer piezometric surface above the shallow aquifer water table elevation, then the vertical flow direction is upwards (+). If pumping causes the confined aquifer piezometric elevation to drop, but it still remains above the shallow water table, the flow direction is still upwards, but the magnitude (gradient) is less. The shallow aquifer may be receiving less recharge from the deeper aquifer, or at least there's no condition to cause leakage downward. If the pumping causes the confined aquifer piezometric elevation to drop below the shallow water table elevation, now the vertical flow is downward (-). The shallow aquifer now has a condition where there may be downward leakage and it's being drained. If pumping is in an aquifer zone that's vertically between a shallower and deeper zone, the pumping can reduce recharge to adjacent zones, induce downward flow from the shallow zone, or induce upward flow from the deeper zone. It all depends on the magnitude of the groundwater level changes and the initial static or the non-pumping condition.

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9	James Brobeck	Vina SHAC	BaS		632	632 “Due to the variance in hydraulic connectivity between zones in different areas 633 of the Subbasin and between different depths, a single principal aquifer is 634 defined. In most cases, patterns of groundwater levels in nested wells suggest 635 some degree of connectivity.” The “single principal aquifer” defined seems to simplify the complexity of our shared aquifer system. Vertical connectivity between layers interspersed with aquitards is clear but piezometric elevation differences indicate more dynamic complexity than what seems to be implies by “single principal aquifer”.
10	James Brobeck	Vina SHAC	BaS		649	649 “Relatively 650 shallow groundwater in some areas of the subbasin support Groundwater 651 Dependent Ecosystems and stream flows.” The TNC GDE guidelines incorrectly limit GDE depths to <30’. Valley Oak Woodlands require access to water tables as deep as 80’ according to the USDA Forest Service. The urban forest of Chico provides many environmental services and should be considered as we expand our GDE GW monitoring network
11	James Brobeck	Vina SHAC	BaS		777+	777 “However, comparison of the 778 reports illustrates how in the period between their issuance, groundwater 779 conditions have tightened, and as forces ranging from population growth to 780 climate change play out, the value of well-informed water management policies 781 and practices is likely to increase.” “forces” should emphasize the expansion of GW irrigated agriculture that may occur as some rice farms switch from SW irrigated rice to GW irrigated orchards as well as new ground that is likely to be developed without regional land use planning that might preserve unirrigated grazing land. Population growth/urban expansion is less likely to increase demand than agriculture, especially if urban planners encourage xeriscape landscaping and water recycling.

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12	James Brobeck	Vina SHAC	BaS		801+	801 “Wells showing depths to first encountered groundwater deeper than 802 500 feet were eliminated from the data set. The remaining readings were 803 sorted by well depth. Wells having identical state well number site codes 804 were then filtered to select the shallowest well from each nested well 805 cluster.” This paragraph implies that flow directions will be based on lateral flow in the shallow aquifer. It is vitally important to understand flow direction, both vertical and lateral, in all portions of the freshwater aquifer. Eliminating deep aquifer data eliminates piezometric influences on GW flow patterns.
13	Mike Crump	Stakeholder	BaS/Mon			It would help identify location and boundaries of the various items illustrated on all the Figures/maps if major county roads were also shown in addition to the state highways. Also on Figure 1-6, I could not find what the various colors meant.
14	James Brobeck	Vina SHAC	Mon		9	The long-term health of native phreatophytic valley oak habitat is associated with maintaining a minimum range of groundwater levels. Baseline habitat monitoring is an important data collection objective because it allows for a better understanding of the existing water resource requirements of the native habitat and the evaluation of potential impacts associated with potential changes in water resource management practices. In order to identify potential habitat impacts associated with potential changes in water management practices, a program-specific network of shallow monitor monitoring wells should be developed to detect changes in water levels over the shallowest portion of the aquifer.
15	James Brobeck	Vina SHAC	Mon		21	Because fresh water is not as dense as salt water fresh water in the Sacramento Valley floats on top of vast deposits of saltwater. If excessive pumping occurs, a cone of depression develops in the fresh groundwater, and a cone of ascension forms in the underlying salty groundwater causing intrusion into the fresh aquifer system.
16	James Brobeck	Vina SHAC	Mon		30	The existing network has significant deficiencies resulting in critical data gaps. 1) Vertical interbasin flow patterns need to be assessed. 2) Habitat monitoring of the shallowest portion of the system must be expanded to identify baseline and dynamic water levels that support phreatophytic ecosystems.
17	James Brobeck	Vina SHAC	Mon		53	MTs for the Chico Urban Area should honor the BMOs established by the community: Basin Management Objectives for the Chico Urban Area reflect groundwater levels adequate to sustain municipal, agricultural and domestic use and the quality of streams and groundwater dependent vegetation. These groundwater levels reflect the natural seasonality of the groundwater systems.

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18	James Brobeck	Vina SHAC	Mon		134	The well table should show screen levels (both standard elevation above sea level and depth below surface). Habitat Monitoring The long-term health of riparian vegetation, wetland species, and number of other native habitat are commonly associated with maintaining a minimum range of groundwater levels and an appropriate level of interaction between surface water and groundwater resources. The lowering of groundwater levels due to natural climatic changes or the interception of groundwater underflow to surface water systems due to the increased groundwater extraction associated with water management programs, have the potential to impact the native habitat areas. Baseline habitat monitoring is an important data collection objective because it allows for a better understanding of the existing water resource requirements of the native habitat and the evaluation of potential impacts associated with potential changes in water resource management practices. In order to identify potential habitat impacts associated with potential changes in water management practices, a program-specific network of shallow monitor monitoring wells should be developed to detect changes in water levels over the shallowest portion of the aquifer. In evaluating impacts to certain wetlands species, it is important to discern both the rate of groundwater level change, as well as the cumulative change over the entire year. Data collection and monitoring frequency should be appropriately selected to support the temporal and long-term evaluations. TNC guidelines that limit GDE monitoring to <30' are insufficient to measure Valley Oak Woodland habitat that requires access to the capillary fringe of water table as deep as 80'. Existing Valley Oak groves should be surveyed and monitored. Urban forests that have unirrigated trees that remain robustly foliated during summer/fall drought should be considered as GDE. Urban forests are know to provide a range of environmental services to residents. We must identify the root depth of urban trees, establish a monitoring network sufficient to protect this valuable GDE.
19	James Brobeck	Vina SHAC	Mon		386	It is normal to have five or more nodes to resolve a feature of interest but the monument spacing is shown to be 3-10 miles. This implies that subsidence that may occur in a 1-3 miles zone may be invisible to the monitoring grid. Will satalite monitoring be frequent and nimble enough to observe the intitial stages of subsidence?
20	James Brobeck	Vina SHAC	Mon		53	Summertime stream monitoring of BCC, LCC,BC, Mud Creek and Rockcreek to identify the timing and location of dewaterings as well as the presence of listed species in spawning as well as rearing cycles should be implimented.
21	Bruce Smith	Citizen	BaS	1.1.6.1	553, 554 Fig 1-9A	Important to note electric logs used to devine formation boundaries in AEM cross section
22	Bruce Smith	Citizen	BaS	1.1.8, 1.1.8.1	599-605	There are four principal aquifers in the Vina Subbasin. The shallow Aquifer, the intermediate aquifer and the upper and lower deep aquifers. This data gap needs to be better defined using well logs and cross sections and conceptual models that show flow paths. This section from 599-605 implies one principal aquifer. Gives the false impression that surface recharge then recharges other/lower aquifers. They may not be connected.
23	Bruce Smith	Citizen	BaS	1.1.8.2	649-651	Groundwater Dependent Ecosystems requires more discussion
24	Bruce Smith	Citizen	BaS	1.1.8.3	730, 731	The term release large amounts (What is a large amount)
25	Bruce Smith	Citizen	BaS	1.1.9.8	765-760	Can AEM do stream flow paths?