CPB Exh 26

Expert Rebuttal Report on SNWA 3M Plan dated August 2, 2017, authored by Dr. Bruce A. Roundy.

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Expert Rebuttal Report on SNWA 3M Plan relative to the Cleveland Ranch in Spring Valley, Nevada, requested by Kirton McKonkie on behalf of the Cleveland Ranch and the Corporation of the Presiding Bishop of The Church of Jesus Christ of Latter-day Saints.

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Executive Summary

My review of previous documents from the 2011 Nevada State Engineer Hearing (e.g. McLendon 2011 and many others) and 2017 documents on hydrology and environmental effects of proposed groundwater withdrawal (Drici et al. 2017, Marshall et al. 2017), as well as the 3M Plan to address those effects finds major areas of uncertainty that put the Cleveland Ranch at risk. **A lack of knowledge in drawdown effects on water availability and potential recovery after loss and restoration of water availability over uncertain time frames puts stakeholders at risk from a monitor-manage-mitigate approach.**

1. The conclusion that Cleve Creek-associated watering of the Cleveland Ranch wetlands and wet meadows is not tied to the groundwater aquifer that SNWA will pump from is contradicted by evidence that the water is connected (Jones and Mayo 2011). **This illustrates that the monitor-manage-mitigate approach is based on a lack of agreement on hydrologic and thus environmental effects of withdrawal.**

2. **Drawdown that reduces water availability for dependent species, plant growth and survival, as well as stock water use of springs especially on mesic, but also on shrubland, and terrestrial woodland areas will risk loss of environmental values and livestock production.**

3. The 3M Plan, while proposing intensive assessment, triggers, and actions associated with groundwater withdrawal in **mesic habitats, fails to account for time lags in the monitor-manage-mitigate process and therefore puts these habitats at risk for environmental damage, as well as seasonal or multi-year loss of livestock production. This is a major problem with the monitor-manage-mitigate approach: the time required to quantify effects on water availability, associating these effects with groundwater withdrawal, and finally restoring water availability puts the system at risk.**

4. **The 3M Plan to monitor and mitigate loss of water availability on shrubland areas is inadequate to address loss of spring water for localized forage production and stock water in a timely way to avoid loss of livestock production on these areas.** Proposed restoration of shrubland areas is problematic due to lack of precipitation and fine-textured, saline-sodic soils.

5. The 3M Plan to monitor and mitigate effects of groundwater withdrawal on terrestrial woodland (Rocky Mountain juniper) is inadequate to avoid loss of this woodland. **The uncertainty in actual hydrology that supports this woodland puts it at risk from a monitor-manage-mitigate approach.** The 3M Plan proposes monitoring of tree cover and tree recruitment, but if mature trees cavitate (lose their internal water conductivity) due to a major lack of water availability to roots, they will die and the mature woodland will be lost. **Preservation of the mature woodland, not restoration of the woodland through mitigation is what is required by the policy to avoid environmental damage.**

Introduction

I reviewed the Drici et al. (2017), Marshall et al. (2017), McLendon (2011), and SNWA (2017) reports on hydrology, environmental impacts, and proposed monitoring and mitigation of SNWA diversion of groundwater from Spring Valley. I also reviewed many previous documents and transcripts from the Nevada State Engineer (NSE) hearing in October 2011, as well as the NSE Ruling and Judicial Remand 6164 of that ruling. I previously wrote and submitted an evidentiary report for the 2017 hearing (CPB_EXH_22) which emphasized the effects of dewatering the Cleveland Ranch wetlands, wet meadows, and other habitats. I herein submit my expert opinion relative to the 3M Plan to monitor, manage, and mitigate effects of SNWA groundwater extraction on the Cleveland Ranch.

The whole approach of phased pumping while monitoring, managing, and mitigating hydrologic (water rights) and environmental impacts is based on a lack of certainty upfront on what the effects of pumping will be. This puts stakeholders like the Cleveland Ranch in a position of receiving potential irreversible damage by groundwater withdrawal. The Marshall et al. (2017) report and 3M Plan (SNWA 2017) review in detail water rights and environmental concerns and propose triggers for investigating, managing, and mitigating effects. **However, the uncertainty of hydrologic effects and associated environmental effects of pumping, as well as their potential recovery under the 3M Plan makes this whole process an experiment with major risk being assumed by the stakeholders.**

This report focuses on parts of the 2017 3M Plan which address the remanding of Ruling 6164 requiring SNWA to "Define standards, thresholds, or triggers so that mitigation of reasonable effects from pumping of water are neither arbitrary or capricious in Spring Valley, Cave Valley, Dry Lake Valley, and Delamar Valley." The 3M Plan identifies unreasonable effects (P1-2), and then describes a monitoring system to alert investigative, management, and mitigation triggers. It then states the resultant actions that may be employed when the data show crossing of a threshold to activate triggers.

The 3M Plan for Spring Valley separates environmental habitat into three main categories: mesic, shrubland, and terrestrial woodland habitats. I address concerns for each of these habitats.

Mesic Habitat

Mesic habitat as defined by Marshall et al. (2017, P5-3) consists of wetlands, meadows, riparian, woodland and other vegetation where shallow groundwater is near open water. For the Cleveland Ranch, this would include wetlands, wet meadows, and possibly dry saline meadows as delineated by McLendon (2011). These areas receive surface, spring, irrigation, or groundwater from Schell Creek Range precipitation delivered through Cleve and other streams on the west side of Spring Valley.

The main approach by the 3M Plan to protect mesic habitat is to protect senior water rights by monitoring well levels and spring flows. For Spring Valley and the Cleveland Ranch properties, this approach is based on the following assumptions:

1. The mesic habitats are dependent on water from Cleve Creek which is distributed by subsurface flow from the alluvial fan and irrigation ditches that capture surface flow.

2. If senior water rights well levels and spring flows are maintained, then mesic habitats will be maintained.

3. The water from Cleve Creek that supports the mesic habitats is not connected with the aquifer water from which SNWA will pump (Drici et al. 2017, P6-32), therefore SNWA drawdowns will not affect Cleveland Ranch mesic habitat.

4. Monitoring of surface flow, wells, and springs will be adequate to trigger actions to avoid conflicts with senior water rights.

Mesic Habitat Concerns:

Many of the Cleveland Ranch mesic habitats are in Blocks 2 and 3 and within <3 to 10 miles of SNWA's points of diversion (POD). **Assumption 3 is contradicted by evidence from Jones and Mayo (2011) that both recent and much older water are found in some of the distal spring discharge and shallow groundwater areas. Proposing to withdraw groundwater when the water availability connections are uncertain puts the system at risk of failure, but is the basis of the 3M Plan to monitor and mitigate.** Mitigation actions will be triggered when spring or stream discharges are below + 10% of the permitted diversion rate for 6 continuous months and it has been determined that this is a result of SNWA pumping. **Assumption 2 is viable only if dewatering of the mesic areas is recognized and responded to immediately, otherwise seasonal dewatering will jeopardize forage production, wildlife habitat needs, and recovery. By the time the 6 month continuous deficit is noted and it is determined that the deficit is due to SNWA pumping, major loss of forage, stock water, and wildlife habitat will ensue. Just one growing season without additional water from springs and shallow groundwater will dry up some of the mesic habitat.**

a) Although the methodology for determining if decreased flows are a result of SNWA pumping is described in Section 3.2.2 of Marshall et al. (2017), the concern is timing. A major lag in this determination could jeopardize seasonal forage and possibly stock water on which the Cleveland Ranch depends, as well as affect recovery of mesic habitats. If SNWA pumping does draw down mesic habitat water over a 6-month continuous period which includes the spring to fall growing period, then some forage production for that season will already have been lost. **The 3M Plan does not specifically address how environmental and production resources will respond to a lag between determination of groundwater withdrawal effects and mitigation (restoration of water or other actions), nor how this this potential lag will affect recovery of those resources.** For the Cleveland Ranch production, seasonal loss of water availability will require either more immediate forage replacement by SNWA to support the Cleveland Ranch herd, or compensation for selling off and rebuilding the herd. This is a major risk of the pump and mitigate strategy.

The 3M Plan considers the Cleveland Ranch water rights for surface stream flow in Block 3 to be disconnected from the aquifer that SNWA will pump (3M Plan P2-25, category E in Table B-3), so no

hydrology monitoring is proposed to assess effects of drawdown on associated stream and irrigation flows near these water rights (Fig. 2-8). There are three basin fill wells proposed south and south east of this mesic habitat on which the Cleveland Ranch depends. If the surface waters are connected to the aquifer and drawdown depletes subsurface water, thereby reducing the extent of surface water distribution, these three wells may not be close or sensitive enough to determine withdrawal effects.

Water connections between the surface waters, springs, irrigation ditches, subsurface waters, and the deep aquifer need to be well understood before any SNWA withdrawal is approved for a number of reasons: 1) to help to rapidly determine whether later changes in water availability are associated with SNWA drawdown or not; 2) to elucidate the consequences of proposed mitigation actions like lining irrigation ditches or part of Cleve Creek (3M Plan P3-24), and 3) to decide if additional monitoring wells are needed.

(b) The 3M Plan (P2-16) says that if no monitoring data are available, it will be assumed that well production capacity is at the water right diversion rate. Technical and other problems may result in a lack of data, but this statement potentially places the senior water rights holders at risk when data collection is the responsibility of SNWA. **Effects of lack of data to be collected by SNWA should not jeopardize the senior water rights holders.**

c) Senior water rights baseline assessment is proposed for 3 years to develop seasonally adjusted regression (SALR) estimates of 99.7% lower control limits to trigger mitigation. This is a very short time frame to capture the range of wet, dry, and other years in the Great Basin. **SNWA should adjust up this time period or support their 3 year assessment period with available climatic data. Effects of future climate change should also be addressed.** There is major uncertainty about current and future use of groundwater in the Colorado River Basin as shown by evidence of major withdrawal presented by Castle et al. (2014).

d) **If SNWA drawdown does drain wetlands, does SNWA have a permit for wetland drainage as required by Section 404 of the Clean Water Act?** This wasn't addressed in the 3M Plan. The 2011 BLM EIS stated that "No jurisdictional wetland delineations have been completed for potential GWD Project ROWs in any groundwater development areas within the proposed pumping basins." (Page 3.5-6).

Shrubland Habitats

Shrublands comprise most of the area that is potentially impacted by withdrawal in Spring Valley (Marshall et al. 2017, Fig. 5-2). The 3M Plan used satellite imagery and the resulting land cover map to delineate low and medium density shrubland with ≤ 20% and > 20% cover (Marshall et al 2017 p 5-3). These shrublands include facultative phreatophytes such as greasewood, rabbitbrush, and saltgrass, but may also include non-phreatophytes such as big sagebrush and winterfat on non-saline soils and shadscale and other salt bushes on alkaline soils. The Cleveland Ranch has permits to graze livestock on three large BLM allotments in Spring Valley. The Bastion allotment in Block 1 is mainly comprised of medium density shrubland (Marshall et al 2011, Fig. D-1) and is of most concern because it is in the SNWA discharge area. This allotment is permitted for 1,776 AUMs (animal unit months), and supports 148 cows on about 13,800 acres. The overall forage production across this allotment is very low, making localized areas associated with spring discharge and higher forage production or stock water availability critical to use of this extensive allotment. Shrubland may be intermixed with much more productive mesic habitats (Marshall et al. 2017). These are areas where spring flow, run in, or shallow

groundwater supplements growth of salt grass, alkali sacaton, and other perennial herbaceous forage plants beyond what would occur on the 10 inch annual precipitation.

The 3M Plan accepts that SNWA pumping will reduce groundwater depths below that accessible by facultative phreatophytes in some shrubland areas and that the result will be to convert medium shrublands to low-density shrublands. An investigation is triggered when the mean annual NVDI or percent live shrub cover for either group falls below the 95% lower control limit (Table 3-7). When investigation is triggered, management actions such as additional analysis and preparation of mitigation plans may be activated. Mitigation actions are only taken when mean annual NDVI or percent live shrub cover for either low or medium-density shrubland falls below the low-density shrubland 95% lower control limit for 5 consecutive years.

Shrubland Habitat Concerns

For the Cleveland Ranch, the main concerns are that SNWA pumping will reduce forage production and stock water availability on spring-fed localized areas within their BLM allotments. Pumping that reduces the water table below 1.5 m greatly decreases saltgrass cover (McLendon 2011) and therefore production. **The NVDI and live shrub cover monitoring along with the 5 consecutive- year- deficiency required to activate mitigation will either not detect or fail to detect in a timely manner decreased stock water availability or forage production from these localized areas.** Lack of stock water would make large areas of their BLM allotments unavailable for grazing to the Cleveland Ranch, as well as limit growth of some localized and productive forage. The 3M Plan does map these springs (Fig. 2-1), but does not seem to recognize the importance of herbaceous forage and stock water in these areas. These springs are also detailed in Map 1.1, C.P.B. EXH -001 (Resource Concepts, Inc. 2011). **The 3M Plan does not adequately address effects of withdrawal on localized areas of surface and shallow groundwater that support herbaceous forage and stock water in shrubland habitats.**

The 3M Plan fails to:

1. Delineate localized spring fed-areas of stock water availability and higher forage production within the shrubland habitat.

2. Monitor these areas for potential groundwater loss.

3. State more rapid-response triggers and mitigation actions that protect the groundwater, stock water, and herbaceous forage productivity of these areas.

4. Map low and medium-density shrublands and give an estimate of medium-density shrublands that will be converted to low-density shrublands by pumping.

5. Include herbaceous species cover in ground-transect monitoring to detect non-shrub changes that could be associated with groundwater withdrawal, especially in spring discharge areas.

Additional concerns about mitigation of shrubland groundwater withdrawal include (Roundy 1985, 1987):

1. Mitigation restoration of vegetation on these low-precipitation (10 inches per year) shrublands is all about water availability. Successful revegetation will require irrigation for establishment of plants from direct seeding or transplanting.

2. Basin soils are problematic for drill seeding. They generally are silt loams with a vesicular crust and low infiltration rates, especially when sodic. Yet seed coverage by drilling seeds or some other soil disturbance is necessary for establishing plants from direct seeding. When fine-textured soils are disturbed by drilling and plant establishment is limited due to lack of precipitation, surface soil integrity may be lost, resulting in major dust generation. This happened after the Milford Flat fire rehabilitation seedings in shadscale areas in Utah (Duniway et al. 2015).

3. Plant materials are limited that are adapted to arid and saline soils, but some introduced and native grasses are available.

4. Because restoration of these areas will require irrigation, weed control, and some experimentation, it will be costly.

5. Cattle graze the herbaceous plants like salt grass much more than greasewood in shrubland areas. The shrubland areas are where water extraction is most expected. **Simply put, SNWA expects that the cone of depression will lower groundwater below the level that it can be used by facultative phreatophytes in shrubland habitats. How this will affect stock water availability and herbaceous production on the Bastion or other allotments hasn't been adequately addressed by the 3M Plan.**

6. Grazing management is proposed as a way to compensate for loss of forage from groundwater withdrawal. Grazing management can maintain forage production given the environmental potential of a site. **However, if the environmental potential decreases (e.g. water availability and forage growth shifts to depend entirely on precipitation rather than precipitation and groundwater), grazing management will not increase forage production, but rather maintain limited production associated with limited precipitation.** Water availability when temperatures are favorable for growth is the main driver of forage production on Great Basin semiarid rangelands.

Terrestrial Woodland Habitat

This habitat was delineated by Marshall et al. (2017) to include the "Swamp Cedar" community of Rocky Mountain juniper that occurs in the SNWA discharge area in Block 2. This habitat is also referred to as the Swamp Cedar ACEC (Area of Critical Environmental Concern) and has environmental as well as Native American cultural value. Rocky Mountain juniper is not normally dependent on groundwater because it mainly grows at higher elevations where precipitation sustains it. However, in Spring Valley it is recognized by Marshall et al. (2017) as being influenced "by shallow (and, in some areas, likely perched) groundwater, precipitation, surface runoff, and subsurface drainage". The 3M Plan lists aerial-imaged tree cover, three piezometers, a nested deeper well and precipitation station adjacent to the ACEC. In addition, it lists 100 by 100 m ground plots in medium and low density vegetation areas. These plots are to be monitored 5 years before pumping and will include counting seedlings and saplings, measuring sapling height, and taking ground photos to track recruitment and survivorship. There is no mention of counting survivorship of mature trees. Triggers are activated based on a loss in tree cover as sensed from high resolution aerial imagery in relation to baseline tree cover.

Terrestrial Woodland Concerns

Extra water availability from the capillary fringe of groundwater, perched water tables, or from runoff-run-in surface water apparently supports this population (McLendon 2011). McLendon (2011) observed a gradient in understory species apparently associated with a gradient in water availability within the

requirements of Rocky Mountain juniper itself. **Without knowing the exact hydrology that supports this population, there is uncertainty in projecting its survival under groundwater withdrawal.** If the population is mainly supported by groundwater, withdrawal below 10 feet could doom it to extinction (McLendon 2011). Although the cover monitoring proposed by the 3M Plan may adequately detect tree cover changes, the withdrawal of shallow groundwater may cause a threshold response in mature tree survival. That is, once sustaining groundwater is withdrawn, there could be large-scale mature tree die off. It would be counter to the stated objective of "Unreasonable Effect to Avoid" in the 3M Plan to withdraw groundwater, note major tree die off, then mitigate by replanting. The 3M Plan monitoring focuses on tree recruitment and cover changes, but pumping could endanger survival of the mature trees. **Once these trees desiccate, they will not recover with mitigation rewatering.** Juniper trees in general are resistant to cavitation (loss of water connectivity in the plant and ability to draw water from the roots into the leaves). However, Rocky Mountain juniper generally occurs in wetter areas and has lower resistance to drought and freezing-induced cavitation than other juniper species (Willson and Jackson 2006). Loss of water for a growing season, while SNWA determines cover responses could result in embolism (air penetration into connecting tissues) and dessication of mature trees. Again, **the pump and monitor, then mitigate approach puts the juniper woodland at risk. Specific dependence of this population on groundwater and effects of pumping on the groundwater should be clearly understood before pumping is approved.** Although the 3M Plan lists as a mitigation approach replanting and woodland enhancement on the SNWA Osceola Property, **reforesting the woodland is not a suitable response to environmental effects of withdrawal. The long-lived trees of the mature woodland should be maintained by avoiding loss of the special environmental conditions which support them.**

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