Central Nevada Regional Water Authority Groundwater Monitoring Program Annual Report for Fiscal Year 2017-2018

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WATER LEVEL MEASUREMENTS:

The single-most objective of the Central Nevada Regional Water Authority Groundwater Monitoring Program is to collect, on an annual basis, water level measurements from 51 wells in 12 groundwater basins, or Hydrologic Area's (HA's). It is important to note that the 51 wells were selected in concert with the USGS and the Nevada Division of Water Resources (NDWR). These wells, which are comprised of thirty-five percent USGS MX wells and sixty-five percent "other" type wells (stock, mining, unused), are called index wells, since it is possible the water level information collected from these wells can be used to 1) determine temporal trends, 2) identify the occurrence and movement of groundwater, and 3) help quantify subsurface flow between basins. The 12 groundwater basins are as follows: Kumiva Valley-HA 079 (3 wells), Granite Springs Valley-HA 078 (3 wells), Big Smoky Valley-HA's 137A and 137B (5 wells), Newark Valley-HA 154 (6 wells), Railroad Valley-HA's 173A and 173B (6 wells), Long Valley-Central Nevada-HA 175 (6 wells), Butte Valley-HA's 178A and 178B (8 wells), Ruby Valley-HA 176 (4 wells), Jakes Valley-HA 174 (2 wells), Clayton Valley-HA 143 (3 wells), Alkali Springs Valley-HA 142 (3 wells) and Clover Valley-HA 177 (2 wells). The Nevada Division of Water Resources does not collect groundwater pumping data from wells in these 12 groundwater basins.

WATER LEVEL OBSERVATIONS:

Static groundwater level in a well is obtained using either a 500-foot Kevlar Electric Tape, or where appropriate, a weighted 500-foot steel tape. All observations are recorded in feet and tenths of feet.

In 8 of the 12 Program basins, static water levels fluctuated somewhat, generally in response to drought, or where above average precipitation occurred.

The other four groundwater basins, (Railroad Valley, Clayton Valley, Alkali Springs Valley and Jakes Valley) experienced noticeable water level changes in the recent past, due in large part, to groundwater pumping and/or drought.

In Railroad Valley (HA 173B), the well called "Railroad Valley MX-107"has declined 2.8 feet from 2009 thru 2017. This well is situated within a few miles, as the crow flies, from a large alfalfa growing operation at Nyala, (See Graph #1).

In Clayton Valley (HA 143), the well called "Silver Peak WO-2", a truck fill well, shows a steady decline on the order of 2.6 feet from 2007 to 2017. This may be due to the fact that the well is adjacent to, and down gradient from, "Silver Peak WO-3 Well", which is the municipal water source for the Town of Silver Peak, (See Graph #2).

Also, in Clayton Valley, one unused stock well, located in south Clayton Valley, known as "South Clayton Valley Unused Stock Well", has remained dry five years in a row, probably indicative of drought and de-watering throughout the valley for Lithium mining purposes. It is likely this well has become "sanded-in" over time, as well. Water levels have been collected at this well for 50 years (1967 to 2017), but this well has recovered, periodically, throughout the 50 year period of record. Local residents volunteered, that groundwater pumping has been significant in Clayton Valley over the years, due in large part, to the Lithium mining operation in the valley, which utilize distillation pond type recovery processes, which are in turn dependent upon, large scale groundwater pumping.

Also, this year (2017), the well known as "Clayton Valley Northeast Stock Well", is again dry. Static water level in this well was typically near 171 feet. I sounded this well to be near 200 feet in depth. The well is dry and reported as such. Last year I observed a new Lithium mining complex constructed approximately one mile north, and down gradient from, "Clayton Valley Northeast Stock Well". This year (2017), the new mining complex has constructed two very sizeable distillation type recovery ponds, adjacent north from the complex. The stock well is dry due to down gradient de-watering activity for Lithium recovery.

In adjacent Alkali Springs Valley (HA 142), a significant drop in water level has been observed at the "Goldfield Mine Well" from 2007 to 2017. The drop in static water level is now 22.6 feet; likely due to water withdrawals for mining activities, which tap the same aquifer as the Goldfield mine well, (See Graph #3).

In Jakes Valley (HA 174), the well known as "Jake's Valley Large Diameter Stock Well", this year (2017), shows a decline of 7.7 feet, attributable to lack of precipitation/snowpack within this HA, and possible pumping for livestock watering purposes. This well is also known for its slow recovery process, (See Graph #4).

<u>HYDROLOGIC OUTLOOK:</u>

This year, for comparative purposes, I have included a U.S. Drought Monitor Map of the State of Nevada. The map on the left side indicates Nevada's drought status on October 10, 2017, at the conclusion of field work. As seen by the yellow coding, only a small percentage (1.3%) of Nye and White pine Counties were drought affected during 2017. The map on the right side, however, indicates Nevada's current drought status as of February 13, 2018. The yellow coding on the map delineates Nevada's drought status as "abnormally dry". The brown coding delineates those areas of "moderate drought", mainly portions of eastern White Pine and Lincoln Counties, but also extending down through eastern Clark County as well, (See Drought Monitor Map).

POST FIELD WORK:

Following field work, Authority groundwater level measurements are forwarded electronically to NDWR for inclusion into their homepage (water.nv.gov) accessible database, located under "Mapping and Data", then "Water Use and Availability", then "Water Level Data". Once in "Water Level Data", simply VIEW the HA of your concern. All 2017 groundwater level measurements from the 51 wells monitored by the Authority were entered into NDWR's water level data base by mid October 2017; a fast turn-around time by NDWR.

Nevada Division of Water Resources does not show the 51 wells as being CNRWA sites if an Authority index well was given a Site ID number by the USGS, or if the well was given a Site Name by NDWR. The USGS Site ID number is a fifteen digit number based on the Latitude/longitude of any given well. The Site Name is based upon the HA number, the Township/Range, section ¼ ¼. The NDWR data base lists each well by Site Name first, the Site ID second (if one exists), and then if applicable, by common name. This methodology mitigates any confusion as to which well is being identified. Water level measurements made by CNRWA field personnel are recorded and credited in the NDWR database as "CNRWA" acquired water-level measurements. All water level measurements, from each of the twelve valleys, are appropriately grouped within their proper hydrologic area (HA). Most, but not all, of the Authority's index wells have past (historical) water level measurements associated with them, although intermittent, which is extremely important from a historical perspective, as rise or decline in groundwater levels can only be viewed over periods of years. All 51 index wells are now permanently part of the continuous CNRWA monitoring program.

CNRWA WELL MEASUREMENT REPORT:

To facilitate dissemination of Authority index well water level information, a report entitled "Central Nevada Regional Water Authority Well Measurement Report, dated September 2014", was constructed in 2014 using "WORD" format (an electronic WORD file), which is updated annually with the most current water level measurements. This report lists each index well and associated water level data from the earliest date the information was collected until 2017. The subject report: Central Nevada Regional Water Authority Well Measurement Report , is attached.

ADDED WORK TASK(S) FOR FY 2017-2018:

For FY 2017-2018: There were no additional work tasks to address, other than routine data collection/field work, the reporting thereof, and construction of annual report.

MONITORING EFFORTS IN OTHER BASINS-ONGOING:

SNAKE VALLEY BASIN (HA 195): Snake Valley Basin, located within Utah and Nevada, has a sophisticated groundwater monitoring program. The Utah U.S. Geological Survey is committed to a

50-year groundwater monitoring program, specifically in response to the proposed Southern Nevada Water Authority (SNWA) Groundwater Development Program in eastern Nevada. In addition, the SNWA monitors 5 wells quarterly on the Nevada side of the basin in Hamlin Valley (HA 196). These quarterly observations, made by SNWA, are recorded in the NDWR water level data base. Also, U.S. Geological Survey (Carson City) drilled two, deep wells (one into Ely limestone, the other into alluvium) near the southern toe of the Snake Range near Big Springs Creek in 2009 and 2010. One well is Big Spring NW well (alluvium); depth 460 feet. From November 2009 to February 2014, there have been 23 static groundwater level measurements made at this well, in addition to 4 water quality samples. Over this period, static water levels fluctuate between 226.7 feet to 228.2 feet. This well was measured each 6-months by USGS and water levels entered into NDWR data base. Now Big Spring NW Well, (since 09-16-2014), is continuously monitored by transducer-recorder. The second well is Big Spring SW Well (Ely limestone), Hamlin Valley; depth 700 feet. From September 2010 to February 2014 there have been 19 static groundwater level measurements made in addition to 4 water quality samples. Over this period, static water levels fluctuate between 352.5 feet to 357.5 feet. Also, a full aquifer stress pump test was performed on this well. This well is continuously monitored (since 09-08-2014) by transducer-recorder, and water levels for both wells, are entered into NDWR's data base. It should also be noted that the Nevada portion of Snake Valley (south from Highway 50) and Hamlin Valley, were intensively canvassed in 2009; meaning: every well that could be found was inventoried and static water levels procured.

SPRING VALLEY BASIN (HA 184): SNWA monitors a large number of wells in Spring Valley and provides the data to NDWR for inclusion into the NDWR database. USGS operates a well network in Spring Valley as well, but north from Highway 50 to Big Hardpan. USGS, in 2010, intensively canvassed Spring Valley south from Highway 50 to the Limestone Hills for the location of wells, and procured water level measurements on all inventoried wells. The NDWR data base contains 58 records for Spring Valley Basin.

STEPTOE VALLEY BASIN (HA 179): NDWR operates a monitoring network throughout Steptoe Valley and water level data are extensive. NDWR data base contains 104 records for Steptoe Valley. This network is monitored annually in the spring.

WHITE RIVER VALLEY BASIN (HA 207): NDWR expanded its water level monitoring network in White River Valley beginning in 2012. Measurements were made during spring of 2013. These are annual measurements and there are 31 listed records for this basin in the NDWR water level data base. In addition to NDWR monitoring, SNWA also monitors a number of wells within the basin.

UPPER REESE RIVER VALLEY BASIN (HA 056): NDWR monitors, on an annual basis, 35 wells within this basin. This basin portion lies south from U.S. Highway 50, trending towards the headwaters of the Reese River. NDWR collects no pumping inventory within this basin.

GENERAL OBSERVATIONS:

Groundwater monitoring for fiscal year 2017-2018 shows some groundwater fluctuation in eight of the twelve valleys. The other four valleys, (Clayton Valley, Alkali Springs Valley, Railroad Valley and Jakes Valley), had wells with a noticeable drop in water level. Clayton Valley is most significant, as "Clayton Valley Northeast Stock Well" now is dry, due to ongoing de-watering practices associated with Lithium mining.

Noticed this year (2017), a no name, usually perennial flowing, high altitude spring, on the east side of Newark Valley was again seen flowing robustly, an indicator of above average snowpack. Roads in many of the 12 basins were powder pocket dust, and in northern Butte Valley, some were extreme.

Fiscal year 2017-18 field work was accomplished in four (4) separate trips, by dividing conjoining valleys into groups or segments for efficiency. These four separate trips (A, B, C & D), require 10 field days and generate a mileage figure of nearly 3,200 miles.

ATTACHMENTS (6):

HYDROGRAPHS: Attached are four hydrographs based on CNRWA monitoring data that show areas where water level declines or recoveries are known to be occurring.

(GRAPH #1): Railroad Valley MX-107. Measurements indicate decline in water levels due to large nearby alfalfa growing operation.

(GRAPH #2): Clayton Valley Silver Peak WO-2 Truck Fill Well. Measurements show gradual decline, due to its proximity from an adjacent, and up-gradient, municipal withdrawal well.

(GRAPH #3): Goldfield Mine Well. Measurements show influence of mining activity which tap the same aquifer as the Goldfield Mine Well.

(GRAPH #4): Jakes Valley Large Diameter Stock Well. Measurements show a 7.7 foot decline due to lack of winter precipitation/snowpack, and probable pumping for stock watering purposes.

DROUGHT MONITOR COMPARISON MAP: Hydrologic outlook glance between two years.

WELL DATA REPORT: Central Nevada Regional Water Authority Well Measurement Report.