Northern Nevada Water Planning Commission

STAFF REPORT

DATE: April 28, 2016

TO: Chairman and Members, Northern Nevada Water Planning Commission

FROM: Chris Wessel, Water Management Planner,
Dan McEvoy, PhD, Desert Research Institute

SUBJECT: Review and possible recommendation to the Western Regional Water Commission ("WRWC") to approve a proposal from the Desert Research Institute ("DRI") for evaluation of long-term regional precipitation / climate variability data, and continuation of regional precipitation monitoring, in an amount not to exceed $37,989 from the Regional Water Management Fund ("RWMF"); and possible direction to staff – Chris Wessel, NNWPC Water Management Planner and Dan McEvoy, DRI.

SUMMARY

Washoe County sponsored a precipitation gauge monitoring program over the last 17+ years, through its former Department of Water Resources, as part of its early regional water resource planning efforts. Since the consolidation of the County's water utility with the Truckee Meadows Water Authority, the precipitation gauge monitoring program no longer has a funding source. Recognizing the importance and value of precipitation data for regional water planning, staff has looked into taking over the program as part of its regional water planning statutory mandate.

The program involves data collection and maintenance of 77 manual gauges (the "Network") where measurements are collected. The gauges are serviced twice a year. The intended use of the precipitation data was to validate existing perennial groundwater recharge estimates within the targeted hydrobasins. The Network data has recently been compiled electronically and provides a unique opportunity to analyze the quality of Network precipitation records and use the data to validate spatial estimates of precipitation, while potentially improving existing groundwater recharge estimates. At staff's request, the Desert Research Institute ("DRI") has submitted the attached proposal to provide DRI personnel to: 1) assist in the monitoring and maintenance of the Network ($21,883); and, 2) perform an extensive analysis on the Network precipitation records and compare data to several gridded precipitation products ($16,106). This component will be a one-time expense.

Dan McEvoy PhD, Applied Climatologist for DRI, will be the lead scientist for the project. He will provide a brief presentation regarding the proposed project.

FISCAL IMPACT

If approved, the fiscal impact to the RWMF will be $37,989. Budget authority is located in Fund Group 766, Fund 7066, Account Number 710100, Professional Services, Cost Object WP310007.

RECOMMENDATION

Staff recommends that the NNWPC review the proposal, and, if acceptable, make a recommendation to the WRWC to approve the project and enter into an Interlocal Agreement with DRI for that purpose.

CW:jd

Attachment: DRI Proposal

Washoe County Rain Gauge Network: Continued Operation Plan and Historical Data Analysis

Personnel: Dan McEvoy, Greg McCurdy, and Albert Wolf, Desert Research Institute (DRI) and Western Regional Climate Center (WRCC)

Purpose

Washoe County installed and maintained a storage rain gauge network (Network) of over 80 gauges with records that date back to the late 1990s. Following the recent merger of the Washoe County water utility with Truckee Meadows Water Authority, the Network program responsibilities have been assumed by the Western Regional Water Commission (WRWC). The program involves data collection and maintenance of manual gauges where measurements are collected and gauges are serviced twice a year. The intended use of the precipitation data was to validate and potentially improve existing groundwater recharge estimates that are commonly calculated using Hardman maps or Parameter Regression on Independent Slopes Model (PRISM; Daly et al. 1994) data. Additionally, Network could be used to provide improved monitoring of regional water sources and supplies. Precipitation measurements outside of the Network are sparse in this region, especially central and northern Washoe County, and minimal efforts have been put into validating spatial estimates of precipitation. The Network data has recently been compiled electronically and provides a unique opportunity to analyze the quality of Network precipitation records, use the Network data to validate spatial estimates of precipitation, and potentially improve existing groundwater recharge estimates. We are proposing to 1) have Desert Research Institute (DRI) assist in the monitoring and maintenance of the network and 2) perform an extensive analysis on the Network precipitation records and compare data to several gridded precipitation products.

Scope of Work

Task 1: Network Monitoring and Maintenance

DRI has a long history of weather station installation and maintenance and Greg McCurdy and Albert Wolff have extensive experience in this field and have spent significant time in remote regions of Nevada. DRI will assist WRWC staff in the collection and maintenance of the Network. This partnership between WRWC and DRI staff will help to develop familiarity with the locations of gauges, routes to follow, measurement process, precipitation record keeping, and gauge maintenance. Fieldwork will be conducted twice a year, one in the Fall and one in the Spring, to the Network to empty gauges, record precipitation measurements, and perform maintenance on all gauges.

Task 2: Network historical data analysis

Washoe County staff has recently compiled all of the Network data (from 83 gauges) into a digital Microsoft Excel data base. For each gauge the measurement start and end date, total precipitation, and number of days in the accumulation period are listed. Latitude, longitude, and elevation metadata are listed for most stations. This data format allows for comparison to daily gridded spatial estimates of precipitation from commonly used products such as the PRISM and Daily Surface Weather and Climatological Summaries (Daymet; Thornton et al. 1997). Prior to comparison to gridded data a thorough QA/QC of all Network data will be conducted to eliminate any spurious measurements. Dr. McEvoy has extensive experience with weather station data QA/QC and evaluating gridded data products in complex terrain using ground based observations. McEvoy et al. (2014) used observations from the Nevada Climate-Ecohydrological Assessment Network (NevCAN; Mensing et al. 2013) in eastern and southern Nevada to evaluate spatial estimates from PRISM, Daymet, and the University of Idaho's gridded meteorological data (gridMET; Abatzoglou 2011). A highlight and take home message from McEvoy et al. (2014) is that using independent observations (not used to generate gridded data; e.g., NevCAN and Network) is recommended to evaluate and potentially improve gridded data estimates. Jeton et al. (2005) evaluated PRISM 1961-90 and 1971-2000 normals over Nevada and show that control points used as input to PRISM are somewhat dense spatially in southwest Washoe County, but there is a major decrease in station density from about Pyramid Lake to the northern extent of Washoe county where few control points exist (Figure 1). The Network could provide valuable insight on the performance of gridded data products in the data sparse regions of Washoe County.

Daily data from PRISM, Daymet, and gridMET will be obtained for the grid point nearest to each Network station. At each location gridded data will be summed to match the measurement periods for the entire observed record. For example, a measurement period starts on 10/14/1998 and ends 2/1/1999 with a total of 110 days. Gridded data estimates for this exact period will be summed and compared to the observed values. Error statistics including correlation, bias, and root mean squared error will be computed at each station using the entire record. Since measurement periods all have different lengths it will be difficult to obtain monthly, seasonal, or annual values, and the uncertainty in the statistics will increase. A final report will be written to summarize the results from the data analysis and discuss implications for potential hydrologic applications using the Network data such as groundwater recharge estimates and precipitation trend analysis.

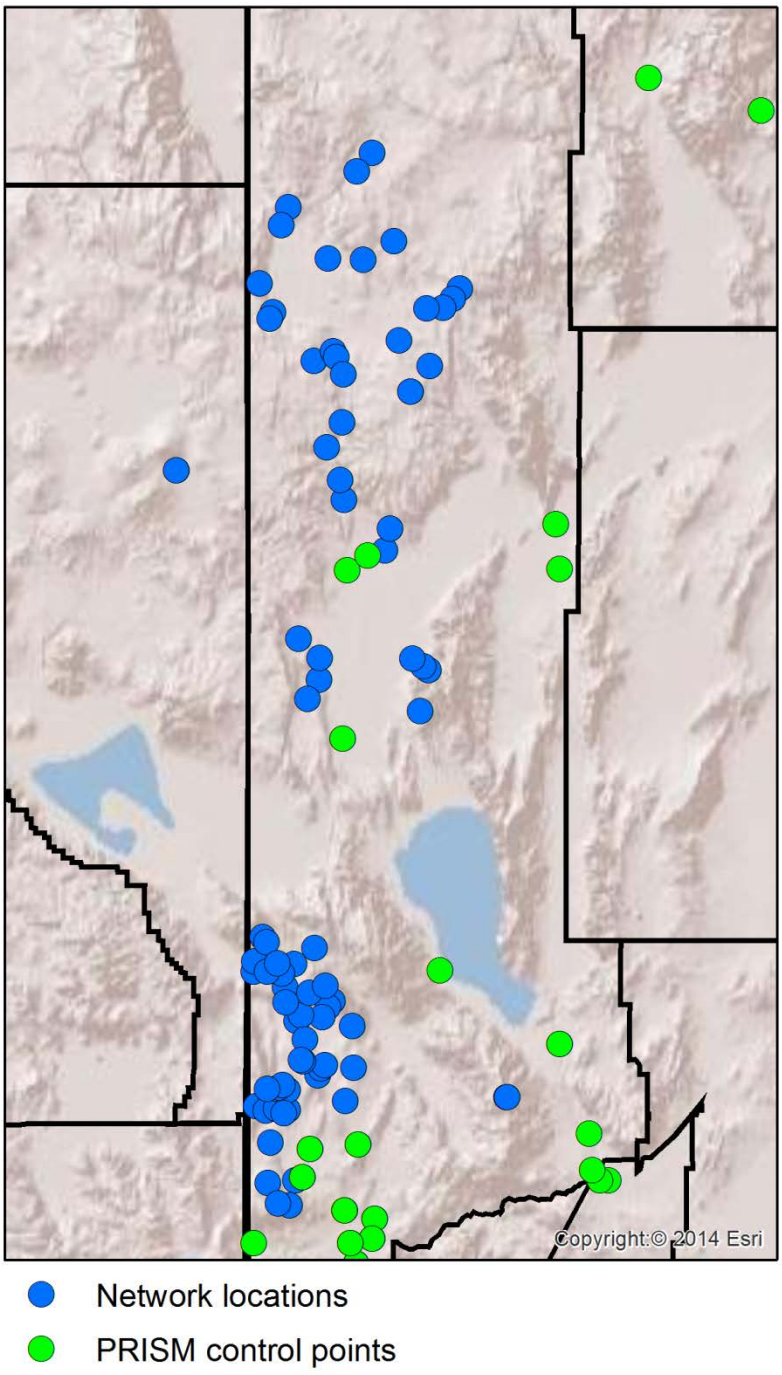

Figure 1. Network locations (blue dots) and PRISM control points (green dots) used in Jeton et al. (2005).

Cost Estimate

The following cost is an estimated cost breakdown for completion of the work outlined above.

Task 1: Network Monitoring and Maintenance

Description	Time	Total
Greg McCurdy rate	0.5 (months)	$12,859
Albert Wolff rate	120 (hours)	$5,894
Travel mileage		$2,797
Supplies		$333
Total		$21,883

Task 2: Network historical data analysis

Description	Time	Total
Dan McEvoy	1.75 (months)	$16,106
Total		$16,106

Estimated total project cost (1 year): $37, 988

References

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