Water Supply Reserve Account – Grant and Loan Program
Water Activity Summary Sheet
September, 24 2013
Agenda Item 18(a)

Applicant: Conejos Water Conservancy District

Water Activity Name: Radar Monitoring & Hydrologic Modeling in the Upper Rio Grande Basin to Develop Accurate Stream Flow Forecasting

Water Activity Purpose: Technology Demonstration Project

County: Conejos

Drainage Basin: Rio Grande

Water Source: **Conejos** River

Amount Requested: $200,000 (Statewide Account), and $37,000 (Rio Grande Basin Account)

Matching Funds: $215,000 (40%) from CWCB Construction Fund Appropriation; $86,300 (16%) awarded from USBR Water Smart Program

Staff Recommendation
Staff recommends approval of up to $200,000 of Statewide WSRA funds and up to $37,000 of Rio Grande Basin WSRA funds to help complete the Radar Monitoring and Hydrologic Modeling for in the Upper Rio Grande Basin to Develop Accurate Stream Flow Forecasting.

Water Activity Summary:
Streamflow in the Rio Grande and the Conejos River comes mostly from snowfall. In the Upper Rio Grande (URG) Basin, water managers must rely on the accuracy of precipitation forecasts by the Division of Water Resources (DWR) as the basis for their decisions on the storage, release, and beneficial use of water. Ideally, these forecasts should be based on accurate estimates of snowfall, careful monitoring of the water content and behavior of snowpack, and a good understanding of snowmelt, run-off, and streamflow. Inaccurate streamflow forecasts are causing unnecessary curtailment of ditches, over- or under-delivery of Colorado's compact obligations, and a disruption of the priority system. This Project will evaluate and implement new data collection, data integration and modeling methods and seeks to reduce/eliminate errors in water supply forecasts.

This Project has four major components: 1) use radars for precipitation estimation of winter storms, 2) develop additional ground instrumentation for radar calibration and to fill modeling gaps, 3) feed precipitation estimates to gridded spatial snow and hydrologic models, 4) present the results to the science advisory team and stakeholders, 5) analyze the results of different techniques and 6) write a final report. The Project tackles the age old question of "are point data and modeling better than spatial data and modeling?" Our hypothesis is that it is superior and beneficial in wet and dry years. The Project's will site a mobile X Band polarized radar for the full winter seeing most or all of the Conejos River Basin and develop 1km gridded precipitation estimates for each winter storm to feed two operational NWS snowpack models (SNODAS and Snow-17) that are coupled three hydrologic models (NWS-SACSMA, NWS-RDHM, and WRF-Hydro). The Science Team decided that due to the burn area in the Rio Grande is was best to model the Conejos as this comparison will work best in a less disturbed basin. In essence it is difficult to forecast with any models in a burned watershed. In essence there are about seven SNOTEL sites in the Rio Grande that drive the Snow-17 model that was created in 1972. With the use of mobile radars we will create about 300-400 SNOTEL sites to feed the SNODAS model which was created in 2003. In essence the ball need to move forward and we need to start using more modern and superior physics based models but the key component is to now feed them with a lot more accurate data. Another key component

to the project is what we call the "legacy component" where ground instrumentation purchased for the project will serve two purposes which are two help validate and refine the radar precipitation estimates and then fill gaps in at different elevation bands to give more data for decisions and modeling to the currently subjective analysis of snow totals at elevation bands below the current SNOTEL network.

Threshold and Evaluation Criteria
The application meets all four Threshold Criteria.

The application articulates how the project meets the Evaluation Criteria as summarized below:

Tier 1: Promoting Collaboration/Cooperation & Meeting Water Management Goals & Identified Needs: There is broad stakeholder input and collaboration in this project including the USBR, CWCB, NOAA-National Severe Storms Lab, National Center for Atmospheric Research, Conejos WCD, San Luis Valley Irrigation District, DWR, West Gulf River Basin Forecast Center, Portland-NRCS, Colorado River Basin Forecast Center, Manassa Water Users Association, etc. The single most critical water issue confronting the Rio Grande is the management of surface and ground water. Also important to note is the ground water model and Supreme Court decrees that require the April 1 streamflow forecast numbers as input to the ground water modeling and administration work. A better April 1 streamflow forecast will also benefit ground water management.

Tier 2: Facilitating Water Activity Implementation: Without this funding, this Project would not be implemented. This is a demonstration of technology project that is providing new data and modeling techniques for consideration and comparison to existing technologies. This Project builds on the collective knowledge in the field of snowpack and hydrologic modeling and takes it that next step by forcing those models with quality radar derived precipitation estimates. This project has statewide and national implications to all River Basin Forecast Centers that forecast volumes of water and all administration agencies that apportion water based on forecasted volumes.

Tier 3: The Water Activity Addresses Issues of Statewide Value and Maximizes Benefits: This Project has values statewide and nationally and that is why it is well coordinated with federal interests. There is a large science advisory team to comment on products and reports. This Project addresses the need for better information and modeling for the number one issue in the Rio Grande which is accurate administration of surface and groundwater. It was also the highest rank proposal to the USBR Water Smart Program in its category and is matched with CWCB funds from the Construction Fund. The legacy component of additional mountain instrumentation will continue to benefit modeling and management at the project completion.

Discussion:
This Project is very unique in nature in that a local agency agreed to use their project to leverage funds in Basin fund and then the statewide account and partner with the state and federal governments to work towards the collective good which could be a 21st century data and modeling forecasting system. This is much needed all over the state and in the west for water supplies. This Project is $37,000 local funds and $200,000 Statewide funds that are matched with $215,000 CWCB funds and $86,300 USBR funds or the rations 1:1.25 WSRA funds to other funds.

Issues/Additional Needs:
CWCB staff requests that the following issues be addressed during contracting and project execution:

- It can be difficult for the State of Colorado to contract directly with the National Center for Atmospheric Research and its recommended that the Conejos WCD contract with NCAR

- The CWCB has an existing contract with NOAA-NSSL and a Scope of Work and cost estimate for the radar deployment and data processing work. The CWCB will contract with NOAA for the Radar work. The Conejos WCD will contract with NCAR for modeling and instrumentation needs.
- There are benefits to having no overhead on instrumentation purchased when funding does not go through NCAR. An equipment purchase list should be provided by NCAR but purchased locally. Some funding provided by the USBR will also purchase equipment for this project and the NCAR overhead rates are unavoidable.

Staff Recommendation:
Staff recommends approval of up to $200,000 of Statewide WSRA funds and up to $37,000 of Rio Grande Basin WSRA funds to help complete the Radar Monitoring and Hydrologic Modeling for in the Upper Rio Grande Basin to Develop Accurate Stream Flow Forecasting.

All products, data and information developed as a result of this grant must be provided to CWCB in hard copy and electronic format as part of the project documentation. This information will in turn be made widely available to Basin Roundtables and the general public and will help promote the development of a common technical platform.

In accordance with the revised WSRA Criteria and Guidelines, staff would like to highlight additional reporting and final deliverable requirements. The specific requirements are provided below.

Reporting: The applicant shall provide the CWCB a progress report and will host regular briefing calls among the advisory committee and Science Team and summarize those discussions. The applicant will also coordinate participation and incorporating comments of the science advisory team. The progress report shall describe the completion or partial completion of the tasks identified in the scope of work including a description of any major issues that have occurred and any corrective action taken to address these issues.

Final Deliverable: At completion of the project, the applicant shall provide the CWCB a final report that summarizes the project. This final report will include formal written comments in the appendix from the science advisory team and project stakeholders.