SHASTA RIVER
REMOTE WATER QUALITY AND FLOW MONITORING STATION
#94-HP-08
FINAL REPORT

Great Northern Corporation

August 21, 1996

#14-48-0001-94538
Shasta River Monitor Project, #94-HP-08

Abstract:

The Shasta River CRMP determined that a real time data monitor with the ability to transmit voice data via telephone would assist local CRMP members and resource managers in ascertaining the status of the Shasta River.

Great Northern Corporation, on behalf of the CRMP, applied for and received a grant from the Klamath River Task Force to install a monitor on the Shasta River at the Montague/Grenada Road bridge.

The monitor is in place and records temperature, conductivity, current stage level, maximum daily stage, and minimum daily stage.

The telephone number is (916) 459-0416
**KELLER-PSI CALIBRATION REPORT**

Customer: GREAT NORTHERN CORP  
Model No: 173-110-9005  
Serial No: 95577  
Pressure Range: 0 to 5 PSIG  
Excitation: .5 mA  
Output: 0-20 mV

Test Date: 02-28-95  
Test Excitation: .5 mA  
Test Temperatures: Room = 27 C  
Cold = 0 C

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<th>RFSL</th>
<th>Ra Temp Outputs</th>
<th>Ra Temp Outputs</th>
<th>Error XFSD</th>
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<th>----Run #2------</th>
<th>----Run #3------</th>
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Maximum Static Error: -0.109 %FSO  
Maximum Thermal Error @ Cold: 0.020 %FSO/C

Maximum Non-Repeatability: 0.057 %FSO

Slope: 0.287 psi/mV

Electrical Termination: Black - Input  
Red - Output  
Green - Output  
White - Input
Monitor Accuracy: Dave Webb

Monitor Accuracy: The monitoring station records several parameters. The accuracy for each is as follows:

Pressure: The equipment used (Keller PSI #173 0-5 psi pressure transducer) is rated at plus or minus .0.1% of full scale anywhere within its range. 5 psi x .001 = .005 .005 x 2.3 ft/psi = 0.0115 ft. 0.0115 x 12 = .138 inches, or roughly 1/8 inch. In addition, the accuracy will be much greater at that pressure at which the transducer is field calibrated. See attached calibration report.

Conductivity and Water Temperature: The conductivity/temperature probe is a Campbell Scientific model 247. Temperature accuracy is rated at plus or minus 0.4°C. Conductivity accuracy is plus or minus 5% of reading at 0.44 to 7.0 mS/cm, and 10% of reading from 0.005 to 0.44 mS/cm. Discussion: Comparisons of the temperature recorded by the monitor with those obtained by a laboratory grade thermometer indicated accuracy well within the above specs in the temperature range encountered in the river. No opportunity has presented itself for calibration testing of the conductivity sensor. However, absolute conductivity readings have never been observed in the Shasta to be high enough to be of concern. Conductivity trends were sought as an index of irrigation water return. The accuracy available has been more than adequate to track changes through the irrigation season. The pressure transducer initially appeared to be operating outside its specifications. Investigations first focused on installation, physical location, and temperature range. Neither the installation nor the temperature range appeared likely to be a source of error. Investigation of the physical location however, raised several questions. The pressure transducer is located in a stilling well. The same stilling well is used by the Calif DWR Watermaster to gauge river flows. It was re-built about 1980. There is a staff gauge located in the river immediately upstream of the stilling well. At the time of installation of the remote monitoring station, it was calibrated to the reading on that staff gauge. Periodic field checks were then made over time to assure that it was tracking the river consistently and accurately. Those field checks indicated that the readings of the staff gauge did not correspond to the river height as reported by the CR10. Eventually, we fabricated a second staff gauge and installed it in the stilling well, calibrating it to the staff gauge in the river at the time of installation. Observations of the two indicated that the height of the water in the stilling well was not following the height of water in the river very well either. Further investigation showed that the inlet pipe to the stilling well had been disconnected, and hence the well was not a true stilling well. That discovery was made near the end of the irrigation season,
and high water prevented further efforts to improve accuracy. Over the winter of 1995-6 contact was made with the DWR supervising watermaster to discuss the weir and stilling well. We both agreed that greater accuracy was desirable. At the present time, efforts are getting underway locally to make a series of flow measurements at the weir site which will allow DWR to create a new stage height-discharge curve. In addition, we will be investigation ways to improve the function of the stilling well. Finally, once water levels drop with the arrival of hot weather, field observations will be made numerous times over a one day period in order to compare the readings of the staff gauge in the stilling well with the heights as reported by the CR10. That should then allow full discrimination of the various sources of error. Appropriate corrections can then be made.

Volunteer contributions: Labor installing telephone line @ $500, much of time spent learning how to program CR10 @ $800, 1,000 ft telephone wire @ about $25/ft.= $250, Keller PSI pressure transducer @ $700, mounting box @ $700, air temp. sensor @ $50, Telephone junction box and hardware @ $150
Volunteers assisting with telephone line installation