BUREAU OF RECLAMATION
TECHNICAL SERVICE CENTER
DENVER, COLORADO

TRAVEL REPORT

Code: 86-68560 **Date**: May 8, 2006
PRJ-1.10

To: Clifford Pugh
Manager, Water Resources Research Laboratory

From: Tom Gill, Hydraulic Engineer, Water Resources Research Laboratory

Subject: Travel to Laughlin (NV), Needles (CA) and Blythe (CA) area

1. Travel period: May 1-5, 2006

2. Places or offices visited: Field sites near Laughlin and Needles, and Reclamation's Blythe Hydrologic Office

3. Purpose of trip: Two objectives of the trip were to: 1) Participate in a field tour/inspection of flow measurement sites in the Laughlin and Needles vicinity; and 2) Conduct a flow measurement training course for personnel of the Blythe Hydrologic Office and others.

4. Synopsis of trip: My travel on Monday (05/01) included a flight from Denver to Las Vegas (NV), and a drive on to Laughlin. On Tuesday I met up with the other participants at a filling station south of Laughlin. We spent the day viewing selected flow measurement sites at pumped diversions from the Colorado River which are monitored and maintained by the Blythe Hydrologic Office. At the first site visited, (FMTC2), field measurements were taken using a surveying level and stream gaging equipment for use as part of the training workshop.

Canal flow measurement structures/equipment viewed included long-throated flumes and a Sontek SW acoustic doppler profiler. Each of the long-throated flumes consisted of metal crest and converging ramp sections that were installed in concrete-lined trapezoidal channels. At each of the flume sites visited, electronic level sensing, and flow datalogging equipment linked to radio telemetry units had either been recently installed or were in the process of being installed.

I traveled on to Blythe Tuesday evening after the field visit. The flow measurement workshop was held at the Hampton Inn in Blythe on Wednesday and Thursday, concluding mid-day Thursday. Participants included: Dan Bunk (BCOO 4664); Gary Colvin (BIA - CRIT); Dave Gunderson (BCOO 4670); Richard Hedrich (BCOO 4620); Chris Kochiss (BCOO 4661); Michael Lendway (BCOO 4662); Ruth Thayer (BCOO 4200); Oney Urguiza (BIA – CRIT); John Weiss (BCOO 4660); Will White (BCOO 4663); and Bruce Williams (BCOO 4623).

A key focus of the workshop was use of the WinFlume software to design and/or calibrate long-throated flumes. Initial sessions were devoted to examining physical and hydraulic relationships, including conservation of energy, conservation of mass, specific energy & critical flow, and the dimensionless Froude ratio which are the basis on which the WinFlume software functions. Workshop exercises were performed with WinFlume, first using an example problem from the WRRL flow measurement course materials, then using field data obtained from the FMCT2 site during the field visit on Tuesday. At the conclusion of the workshop, I returned to Las Vegas Thursday evening and flew back to Denver Friday morning.

Conclusions: Based on observations made during the field visit, along with items raised in workshop discussions, it is evident that the Blythe Hydrologic Office has given considerable attention to detail in site setup and site maintenance for the Colorado River diversion flow measurement sites in its charge. Pre-existing flume sites have been surveyed for "as-built" dimensions and to confirm that flume crests are level. Flumes found out-of-level have been re-leveled. In cases where questionable canal and/or lining conditions might impact measurement, flumes have been relocated a short distance to more favorable sites.

Electronic level sensing, control, and telemetry equipment has been selected to attain a high expected level of performance and reliability. This site visit and workshop were requested to ensure to that efforts to date in setting up flow monitoring equipment have been done appropriately, and so that personnel who will be monitoring and maintaining the flow measurement structures have a good understanding of what constitutes suitable operating conditions and what to look for as indicators of less-than-desirable conditions.

The lone item observed during the field visit that may warrant further attention is the placement of level sensors at some of the flume sites. During the workshop, appropriate location for head measurement was discussed, and ILRI publication 58 (*Water Measurement with Flumes and Weirs,* Clemmens et.al. 2001) was referenced with the conclusion that appropriate location is 2 to 3 times the maximum sill-referenced energy head upstream from the upstream edge of the sill, or one time the maximum sill-referenced energy head upstream from the beginning of the converging transition – which ever condition defines the further upstream location. At some of the field sites visited, a re-examination of whether the latter criteria, (one time the maximum sill-referenced total energy head upstream from the converging transition), should be the controlling criteria may be warranted.

Action correspondence initiated: At the conclusion of the workshop, uncertainties persisted as to the Froude Number output generated by WinFlume, and the ability to use WinFlume to predict suitable upstream flow conditions for obtaining consistent staff gage readings. Findings of follow-up investigation of this issue will be e-mailed to workshop participants other than BIA personnel who currently do not have e-mail access. Arrangements will be made for mailing information to BIA participants.

cc: BCOO 4660 (Weiss)
BCOO 4200 (Thayer)
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SIGNATURES AND SURNAMES FOR:

Travel to: Laughlin NV, Needles CA and Blythe CA area

Date or Dates of Travel: May 1 - 5, 2006

Names and Codes of Traveler: Tin Gill (86-68560)

Traveler:

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Tom Gill, 86-68560 **Date**

Laughlin NV, Needles CA and Blythe CA area

Noted and Dated by:

_____ _____

Clifford Pugh, Manager **Date**
86-68500 - Water Resources Research Laboratory