



REPLY TO  
ATTENTION OF

**DEPARTMENT OF THE ARMY**  
**SEATTLE DISTRICT, CORPS OF ENGINEERS**  
P.O. BOX 3755  
SEATTLE, WASHINGTON 98124-2255

November 24, 2010

CENWS-EC-ES-GE

MEMORANDUM for Record:

SUBJECT: Lessons Learned From Dam Safety Automation Upgrades at Chief Joseph and Howard Hanson Dams.

GENERAL: Seattle District is currently performing an upgrade of the automated dam safety instrumentation systems at four of our projects. The legacy Geomation System 2380 dataloggers and text file based data storage system are being replaced with Campbell Scientific hardware and a SQL database managed with WinIDP software. We have now completed the upgrade at our Chief Joseph and Howard Hanson dams. So far this work has accomplished the replacement or new installation of 79 dataloggers which read more than 980 instruments. Historic readings from these two projects, which in some cases go back to the 1970's, have been successfully imported into the new database.

Overall, the District is pleased with the performance of the new hardware and software. Remote communication with the dataloggers is possible from anywhere on the Corps network. Reading frequency and programming can be changed remotely at any time, while it is relatively easy to provide access to real-time data plots. Reading data flows efficiently to the SQL database, and complex historic plots can be batch processed whenever desired.

LESSONS LEARNED:

1)

**Consider help to get started.** Campbell equipment and programming is very different from Geomation. Even with extensive automation experience, Seattle District used a contractor who had excellent Campbell and WinIDP experience to begin the upgrade. The Contractor designed a pilot installation of right bank piezometers at Chief Joseph dam, programmed the necessary dataloggers, assisted with initial setup of WinIDP and SQL, and provided support while Corps personnel installed and setup the hardware. The contractor also assisted with the initial design of the Howard Hanson dam upgrade. After working with the contractor, the District

learned how to work with the new equipment and software and was able to complete the installations at Chief Joseph and Hanson dams with minimal support.

2)

**Campbell programming is different than Geomation - You might need additional channels.** Most programming, although different, still fundamentally works like in Geomation 2380's. For example, reading VW piezometers is fairly straight forward. However we've had more challenges to do some more specific (and exotic) readings. It took quite a bit of effort to successfully read both ratios and total resistance for potentiometer type joint meters. Turns out we need two differential channels for the readings with Campbell rather than just one channel as read with Geomation. Consequently, we had to buy some additional dataloggers (with more channels) to be able to read more than one multiplexer at a location.

3)

**You might need new boxes.** Campbell equipment is more modular than Geomation and an upgrade installation can require more space. Some existing NEMA boxes at Chief Joseph dam had to be replaced with larger ones to hold everything.

4)

**Don't forget the voltage regulators.** Geomation 2380s have built in charging regulators for solar panels, while Campbell equipment does not. You will need replacements for new installations that use internal regulators.

5)

**Plan on replacing PCs with servers.** Although the Campbell software, is perfectly capable of running on fairly low performance PCs, from a practical standpoint things work better if it's run on a server. A lot of it is due to our current IT regime, where standard PCs are constantly being scanned, auto upgraded, logged off, and rebooted. Servers are treated much better, with less frequent interruptions. The main datalogger software can be installed as a service and run 24/7 for months at a time without interruption.

6) **Don't worry about radio communications.** There was some concern that the higher frequency (900MHz spread spectrum vs. 457 MHz) and lower powered (100mW vs. 5 watt) Campbell radios would not work as well as the old Geomation equipment. This has not turned out to be the case. With the exception of one remote datalogger at Chief Joe, where an additional repeater radio had to be installed, Campbell radios work as good as or better than legacy Geomation radios.

7) **Set up WinIDP on Your Legacy Geomation System for a Seamless Transition to Campbell.** We learned that you can set up the new WINIDP project database and run WINIDP on your existing Geomation PC. Then current data coming in from the Geomation dataloggers is automatically loaded into the new database. This allows a gradual and seamless upgrade. You can start plotting on the WinIDP system before you start the physical upgrade. Disconnect a Geomation datalogger, hook up to Campbell, and you can do the switchover gradually without interruptions.

8) **The biggest challenge and obstacle to upgrading and operating automated dam safety instrumentation systems is ACE-IT.** NWS has had several interruptions of instrumentation data during dam safety critical events and numerous problems with acquiring equipment and maintaining the functionality of our systems due to ACE-IT. There is no indication at present that there is an effort to improve this situation. As a consequence you will encounter the following:

a) Incredible delays; throw your project schedules out the window. Getting hardware and software furnished and installed through the ACE-IT process will take orders of magnitude longer than you think. For example, I've been waiting on two servers (to continue the automation upgrade process at additional projects) since March.

b)

Security upgrades and system outages will throw your remote PCs and networked servers offline. Random changes in permissions will keep you from accessing computers and running software. The time for solutions is very inconsistent, sometimes prompt, but usually not. You will lose productive time dealing with these issues on a regular basis. If this happens during a flood or other emergency at a project (as has happened several times at the Seattle District) there will be some undesired exciting moments getting everything running.

c)

Poor service for installation of new software or required software upgrades. The ACE-IT system does not have enough technicians to be able to promptly respond to tickets requesting service.

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