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State of Idaho
DEPARTMENT OF WATER RESOURCES
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April 23, 1999

Ervin Gilbert
Portneuf-Marsh Valley Canal Co.
Downey, ID 83234

Re: Recommendations for Gaging Reservoir Level

Dear Mr. Gilbert:

During our river tour last autumn we discussed several alternatives for gaging reservoir levels at the Chesterfield Reservoir. I had promised to send you some ideas and information about gaging levels.

One of the ideas I think we discussed last fall was use of a pressure transducer and data logger to measure and record water levels. I believe we ruled out all options for installing a device within the shaft or vault that goes down to the control gate in the middle of the outlet conduit because of concerns about draw-down at the gate. The remaining options then are to install a transducer submerged below the reservoir water surface or install a transducer fixed above the reservoir water surface. I believe that installing a submerged pressure transducer is the best option at this site for the following reasons:

- The transducer can be submerged below the water surface and thus out of view from the public, and therefore less vulnerable to vandalism or damage from watercraft.
- Electric cable from the transducer can be placed in a rugged flexible conduit that can be more or less buried or hidden within the riprap on the upstream side of the dam.

The following type of equipment is suggested for this application:

- Pressure Transducers: Install a transducer with a range between 10 and 20 psi (this range will measure maximum water depths between about 23 and 45 feet respectively). The 20-psi transducer will provide the full reservoir depth range. However, a transducer can also be set at some elevation above the lowest point of the reservoir thereby allowing you to go with a lower psi range. Lower psi range transducers have greater resolution. Additionally, going with a lower psi range transducer and thus measuring a shorter depth range would avoid the need to have additional electric cable. As per our rating table, the 10-psi transducer could cover volumes between 2867 AF and the 20,500 AF, or the full capacity (between elevation 5375 and 5398 feet). Pressure transducers cost between $500 and $700 depending on the manufacturer. My current experience with these transducers is very minimal. Idaho Power Company has used different makes of pressure transducers in their

reservoirs for several years now and has found that INW is the transducer that best fits their needs. A vendor that we work with from Logan, Utah has had a lot of success with Keller pressure transducers. I have enclosed some literature and contact information on several different transducers.

- Electrical Cable and Conduit: Cable is supplied with the transducer and normally runs between $1.50 and $2.00 per foot. You would need a sufficient length to go from the transducer to the stilling well house above the dam. A length of 40 to 50 feet should be adequate for a 10-psi transducer. It is always a good idea to get some additional length of cable or estimate on the higher side for cable needs. The cable should be installed in a fairly rugged flexible conduit. Idaho Power uses a conduit that they obtain locally from an electrical supply shop. It is a very tough flexible plastic conduit that is difficult to cut through. I believe the conduit they use is about one-half inch and costs a little under $2.00 per foot.

- Data Logger/Recording Equipment: There are a number of different types of data loggers available on the market. Many of them have several different options for capturing and viewing data. The option that one chooses depend on the type of resources you have and how frequently data is logged. The cost of a data logger is about $700 to $800. The department and other water districts have purchased Campbell and Dryden R2 data loggers over the past several years. For this application, I think the logger can be programmed so that it only has to be downloaded perhaps several times per season, or even several times per year, and still record a sufficient number of values to obtain average daily levels. Most loggers can be downloaded directly to a personal computer (PC). In most applications, data are downloaded directly to a laptop PC in the field. Having a laptop in the field also allows for on site monitoring and calibration of the transducer. However, many loggers can be set up so that data is stored on a small card that is pulled from the logger and then replaced by a similar card. The card is then downloaded at an office to a desktop PC using a card reader. Other options for downloading include swapping data loggers on site and downloading one logger in the office, or just disconnecting the logger and downloading it directly at the office.

  Another issue that needs to be considered at this site is having some type of visible recorder display. I think one of the objectives of having some type of gage recorder is to provide daily readings to the watermaster and/or other interested water users. Some loggers have built-in LCD type displays. Separate peripheral or attachment units can be connected to the logger for displaying data. I believe most of these display units however need to be activated by pushing a button. If the watermaster has a key to the outlet gate and shed, the probable location for housing the data logger and power source, then he can read and record the levels either daily or on some regular basis. The watermaster then can post the readings at some convenient location where other users can see if necessary.

- Power Supply: A battery will be required to provide power to the sensor and data logger since electricity is not available at this site. A 9 or 12 volt battery that is

recharged by a solar panel and regulator usually supplies power to the logger and transducer. Batteries can be obtained for under $75. A solar panel and regulator can probably be obtained for under $300. Another option may be to have a re-charged backup battery that can replace the battery on site.

Attached to this letter is a diagram suggesting how the equipment may be installed. The department and Water District 01 has purchased several different types of transducers and data loggers from a vendor in Logan, Utah called Intermountain Environmental Inc. The staff there is very knowledgeable and can actually do much of the installation work if necessary. I believe the Utah DWR has also used this vendor. Their proximity to the site may be helpful in terms of service.

You may also want to think about applying to the Idaho Water Resource Board (IWRB) for a loan or grant to assist with this project. Also, The Bureau of Reclamation (BOR) can sometimes provide both technical and financial assistance on this type of project. The BOR assisted the McCammon Ditch Company on installation of the stilling well and recorder for the measuring device in their ditch. I can provide you a contact from the BOR if you wish to pursue getting assistance from them. I would be happy to help with any applications to the IWRB or providing any other assistance relative to this matter.

As per our meeting last fall, IDWR does expect the Portneuf Marsh Valley Canal Co. to begin taking action on this project this spring.

Sincerely,

Tim Luke

Tim Luke

Cc: Arlin Olson, Watermaster
Eastern Region

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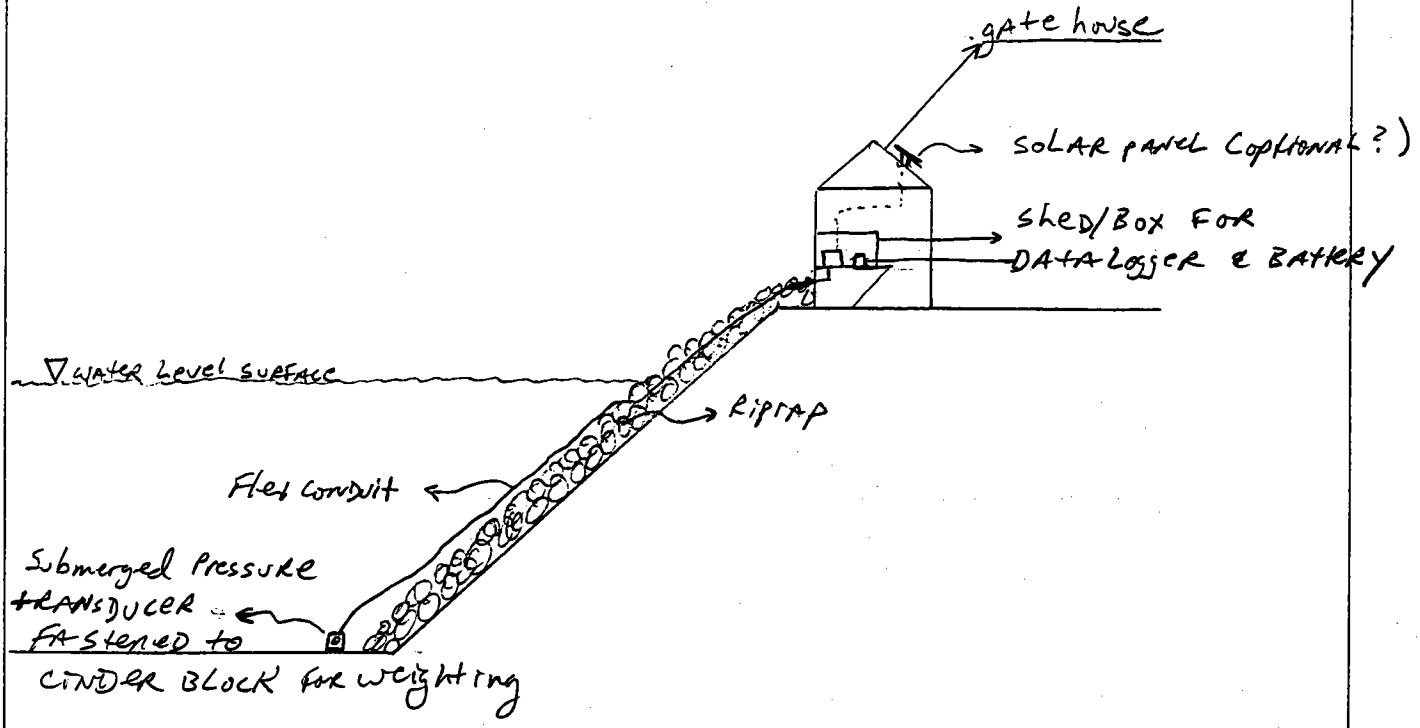
Chesterfield Reservoir

Suggested/DRAFT Schematic of TRANSDUCER/DATA Logger installation
T. Luke, IDWR 4-26-99



Note: TRANSDUCER can be placed @ higher elevation in reservoir. Caution may need to be taken if placed in RIPRAP.