

MEMORANDUM

Date: August 6, 2012
To: Water Right File 37-8205
From: Michele Edl
Re: relevance of weather station data

I have been asked to comment on and make recommendations in response to a letter from Brockway Engineering dated July 5, 2012.

In my memo to this file dated June 19, 2012, I argued that no meaningful comparison could be made of the data from a recently installed experimental weather station to data from a long-standing, official weather station. However, based on statements in this letter, comparisons are being made.

I believe that the Department would agree that the weather at the permitted place-of-use is different than that documented for the microclimate at the Hailey Airport. A long period of high quality data from the weather station is not necessary to reach that conclusion. So is there any value to the data being collected at the Clarendon weather station?

This memo addresses issues that I see opposing attempts to make data comparisons and to draw worthwhile conclusions.

General data review; quality control and quality assurance.

Official weather data is scrutinized by personnel familiar with weather data extremes vs data outliers, and sensor and data logger malfunctions. The strength of data comparison depends on data quality. The Department should have no role in vetting the data collected from this or any weather station.

Is there a program of routine sensor maintenance and data review in place for the Clarendon weather station?

Method clarification needed—standard weather station or other?

For the sake of argument, let's say that this weather station has been constructed to meet FWS siting standards¹ and that Brockway Engineering has a period of high quality data from its instrumentation. How would that data be used to calculate the mitigation rate and volume requirements for this permit?

My reading of the December 30, 2009 technical memo authored by Brockway Engineering, appears to put at least some of the instrumentation at non-standard elevations. On page 2 of the memo where the empirical method is described, the measuring point is 2 meters (~6.5 ft) above the surface, but the FWS standard sensor height for recording wind is 30-33 ft above ground level.

Data from a non-standard station cannot be meaningfully compared to a standard station.

Instrument/Data errors

Even serious, commercial instrumentation can only measure weather parameters to limited accuracy. Display resolution does not equal instrument accuracy.

Due to the limitations of memory or equipment design, data logger manufacturers introduce rounding into the data. Inaccuracies in the readings may be incorrectly attributed to the sensor being out of calibration and there is little that can be done to avoid that initial rounding. However, repeated calculations on

¹ [http://www.ofcm.gov/siting/pdf/fcm-s4-1994\(Siting\).pdf](http://www.ofcm.gov/siting/pdf/fcm-s4-1994(Siting).pdf).

already rounded data (e.g. accumulating 15-minute data into hourly or daily values) can introduce cumulative errors far in excess of the initial error.

When comparing data values from two stations you must allow for error in the observations from **both** stations. A rigorous statistical analysis is more complex but a sum of the errors from both stations would be a good first approximation. The Department is able to assume that the Hailey Airport would measure most weather parameters to 5-10%.

Have errors been established for the instrumentation at the Clarendon site?

Wind parameter localization

I concur with Brockway Engineering in that wind speed has a significant influence on evaporation. But wind speed, more than any other weather parameter, is highly localized.

Turbulence caused by obstructions means that both wind speed and direction vary with height above the ground. Wind speed data are only a record of wind at the point where the anemometer is installed. The wind speed at a standard height of 30 ft above ground level does not describe the wind at ground level.

Wind speed records from this station should be treated simply as a descriptor of a condition at this station. The owners of the Clarendon weather station can say something about how the wind in the current month at their site, differs from the wind in the previous month at their site. However, they cannot make specific and meaningful comparisons between wind conditions their site and any other station. Nor can they represent the wind speed at the standard anemometer elevation to be the wind speed at some other measuring point closer to the ground.

Weather data trends

As part of my analysis of the issues facing the Department as a result of the construction of this weather station and the potential use of its data, I consulted a meteorologist friend. Although he agreed that the Hailey Airport would provide the most solid basis for climatology, he also recognized that there would be some large scale trends in the Clarendon weather. Those trends included colder air temperatures and lower dewpoint temperatures on average, than the Hailey Airport. He also supposed that there could be more wind due to the site's higher elevation and general east-west orientation.

An experienced meteorologist/climatologist could find and advocate for other trends in the data that would be relevant to the mitigation plan and yet are not obvious to the Department at this time. Department personnel should not take on the role of weather forecaster.

Conclusions/recommendations

The Department should not accept the role of data manager for this data. The Clarendon weather station data should be subjected to QC/QA before it or any conclusions based on the data are submitted to the Department.

If Clarendon weather station data is compared to Hailey Airport data, the equipment and instrument errors from both stations should accompany the comparison.

The Department should not accept the role of weather forecaster for Deer Creek canyon. A weather based mitigation plan is expected to be based on past data not future predictions. Even if a short term trend between the Hailey Airport and the Clarendon weather station can be recognized, the Department should hesitate to apply that trend as a constant in a mitigation plan.