

## **Attachment 1**

### **EWDP MANUAL WATER LEVEL DATA CENSORING PROCESS**

#### **SECTION 1: METHODOLOGY**

The method used by the Nye County Nuclear Waste Repository Project Office (NWRPO) to systematically identify and censor invalid water level data collected at EWDP monitoring wells has identified several anomalous data points. Continuous water level data encompassing all four phases of well construction were analyzed. The method employed was as follows:

- ◆ A hydrograph was plotted for each well in the EWDP water level database (RGED V. 3.9); data plotted consisted of manual water level measurements. (Hydrographs are available for review upon request.)
- ◆ Each hydrograph was visually examined and anomalous data points identified. An anomalous data point is one that is significantly different from other measured water levels in a given well that cannot be explained on the basis of barometric pressure fluctuations or earth tides.
- ◆ Each anomalous data point was investigated to determine the reason for the apparent discrepancy. This review consisted of researching the wells history as documented in the dedicated Scientific Notebooks and searching for explanations for the inconsistent data. In some cases it was necessary to research the history of nearby wells when it seemed possible that activities at those well sites could have affected the water level measurement in question. Posted metadata for some wells were also referenced. The personnel responsible for the visual review of the hydrographs were Tom Buqo and Bob Wilcoxon, contractors to Nye County. The personnel responsible for the review of the individual data points were Bob Wilcoxon and Jamieson Walker, contractors to Nye County.

#### **SECTION 2: RATIONALE FOR CENSORING DATA**

The research results for each well and associated anomalous data are described in detail in Section 3. In general, there were various causes discovered for the anomalous data. In some cases water level measurements were taken when the well was still in a post-drilling recovery period. Some measurements were taken during or immediately after the well was pumped for either an aquifer test or in preparation for a sampling event. In one instance, a measurement was taken with a faulty water sounder and in another the water level measurement was determined accurately but recorded incorrectly. Residual drilling mud in one borehole was responsible for an inaccurate measurement. Posted metadata for a Westbay equipped well explains an invalid measurement identified to be a result of

the well not being in equilibrium. Finally, one apparent anomalous water level measurement appears to be the result of the Scotty Junction seismic event.

### **SECTION 3: EVALUATION OF ANOMALOUS DATA:**

*Note: Hydrographs for the following wells are shown in the Appendix and are available for review upon request.*

#### **NC-EWDP-1DX deep:**

Pre-August 20, 1999 water level measurements are anomalous and on May 6, 1999 the water level is more than 8.5 ft lower than previous and subsequent measurements that bound it. The deep piezometer string had been pumped just prior to taking this water level measurement in preparation for a sampling event and the hydrograph illustrates that the well hadn't achieved full recovery until August 20, 1999. From August 20, 1999 through June 2004 the hydrograph curve remains relatively flat and never deviates by more than 0.6 ft. Consequently, the early measurements are not consistent with the static water level in this well and are recommended for censoring.

#### **NC-EWDP-1DX shallow:**

The spike in the hydrograph is created by a single water level measurement recorded on August 27, 1999. This measurement was not reproduced and there is no back-up data to support it; however, it is not recommended for censoring because it may be a response to the Scotty Junction seismic event which occurred on August 1, 1999.

#### **NC-EWDP-2DB:**

The last valid water level measurement in this well was taken on January 29, 2002. All subsequent measurements are invalid. On February 24, 2002 Beylik Drilling set up on the borehole and attempted unsuccessfully to drill out a bridge at 2,962 ft. Considerable quantities of drilling mud were used in the process and the well was never developed. The mud was left in the hole in order to maintain stability until further work can be done.

#### **NC-EWDP-3D:**

All water level data prior to April 8, 1999 is recommended for censoring. 3S and 3D were connected hydraulically until 3S was grouted and sealed on April 8, 1999. In addition, the water levels at 3D were affected by drilling, pump tests, and sampling events at both 3S and 3D. As shown on the hydrograph, water levels did not equilibrate until after February 2001. For preparation of water level maps, only use post February 2001 data.

#### **NC-EWDP-4PA:**

The hydrograph for this well displays an instantaneous rise of almost 2.5 ft on May 15, 2000. The remainder of the graph is relatively flat and consistent. This measurement was not reproduced and no back-up data exists to support it

#### **NC-EWDP-4PB:**

All data for this well on and prior to February 3, 2000 is recommended for censoring. The outliers on the early part of the hydrograph are a result of the well being in a post-drilling recovery phase. The first ten measurements in the database record were taken

within 19 hours after drilling was completed. The February 3, 2000 measurement was taken prior to airlifting. The spike in the hydrograph on November 9, and December 30, 2001 are in agreement with water levels at 4PA and should not be censored.

**NC-EWDP-5SB:**

Censor all water level data prior to February 25, 2000. The well hadn't fully recovered from drilling and development operations until then.

**NC-EWDP-7S:**

Research reveals that a pump test was being conducted at this well on March 27, 2001, the same date of the anomalous water level measurement. This measurement is a draw down level and not representative of static levels and is therefore recommended for censoring.

**NC-EWDP-7SC-Z1:**

The water level data recorded on September 13, 2002 is recommended for censoring. This was a drawdown measurement produced by the AMS pump during a sampling event on this date.

**NC-EWDP-7SC-Z4:**

The declining water levels of Zone 4 in this well appear to be anomalous; however, until further measurements are obtained this data is not recommended for censoring. The declining water levels in this zone have been addressed in RIDs 5449, 5757, and 5819. This zone may have been damaged due to drilling and/or completion activities; however, other USGS monitoring wells in Crater Flat (GEXA wells 3 and 4) show similar trends but of lesser magnitude. Care should be exercised in the evaluation of this data and any gradient calculations based upon data from this zone should be properly qualified.

**NC-EWDP-9SX:**

Metadata written for this well explains that the anomalous water level measurement taken on November 8, 1999 in Zone 2 is incorrect. This measurement was not reproduced and no back-up data exists to support it. It is recommended that this measurement be censored.

**NC-EWDP-12PA:**

Anomalous water level measurement taken on February 26, 2003 was not reproduced and no back-up data exists to support or explain this abrupt water level rise. This measurement is recommended for censoring.

**NC-EWDP-12PC:**

Water levels prior to May 25, 2000 were effected by drilling, airlifting, and sampling operations and should therefore be censored.

**NC-EWDP-19D:**

All water level data collected and recorded from May 5, 2000 to August 7, 2002 is recommended for censoring due to extensive testing and well development at the ATC site.

**NC-EWDP-19IM1:**

All water level data recorded for 19IM1 prior to March 2004 should be considered to have serious limitations due to many activities performed at the ATC. The first measurements shown on the hydrograph were taken immediately after Westbay installation and seem to indicate an approximate gradient in the well. Subsequent to this there were pump tests performed at the ATC, tracer tests, packers installed, sampling events, and packers removed. The data after packers were removed from 19IM2 on August 7, 2002 seems to indicate that water levels were averaging out and cross flowing between zones may have occurred. Until NWRPO can collect and process current and future Westbay probe data from 19IM1, it will not be possible to confidently determine static levels in this well. Therefore, no action is recommended to be taken but this data has limitations and should not be used for water level maps.

**NC-EWDP-23P deep:**

A water level measurement on September 25, 2002 may have been taken correctly but recorded incorrectly in the Scientific Notebook. In the Notebook it was written as 425.6 ft. This single measurement is outside the range of values for all other records for 23P deep. It is recommended that this measurement be censored.

**NC-EWDP-WASHBURN-1X deep:**

There are several outlying points on this hydrograph. The water level measurements recorded on April 8th and 9th of 1999 are invalid as they represent pre-development levels. The records show that the well was not swabbed until April 30, 1999. Water levels may have been affected by sampling and pump test activities conducted at nearby NC-EWDP-19D from May through June 2000. Four outlying data points representing less than 0.5 feet of deviation from static appear on the graph during this period. It is recommended that all water level data recorded prior to June 2000 be censored. After this date the water levels recorded appear to exhibit normal seasonal flux.

**SECTION 4: SUMMARY**

The anomalous data points identified and discussed in Section 3 of this report are tabulated in Table 1 and the hydrographs displaying the associated outlying data points are shown in the Appendix and are available for review upon request. It is recommended that these data points be censored by the NWRPO. As presented in Section 3, they do not represent static water levels in the EWDP field area. Anomalous manual water level measurements for 14 EWDP wells will be censored.

The other 21 EWDP wells do not require water level data censoring and are also shown in Table 1. Based upon this review, the RGED will be updated to censor the designated data by completing the censored data fields for each well for each censored data point.

TABLE 1

## WATER LEVEL DATA CENSORING OF EWDP WELLS

WELL ID	SENSOR DATA		DATE OF ANOMALOUS MEASUREMENT	REASON FOR CENSOR	DOCUMENTS REFERENCED	COMMENTS
	Y	N				
NC-EWDP-1DX deep	X		pre 8/20/1999	Well was pumped for sampling event and hadn't achieved full recovery	RID 5354	
NC-EWDP-1DX shallow		X			RID 5354	Anomalous data point for 8/27/99 was not reproduced and there is no back-up data supporting this deviation from normal water levels; however, the water level may have been a response to the Scotty Junction seismic event of 8/1/99.
NC-EWDP-1S		X				
NC-EWDP-2DB	X		post 2/1/2002	Measurements after 2/1/02 are invalid due to mud in hole	SNB 116; RID 4681; RID 5382	
NC-EWDP-3S		X				
NC-EWDP-3D	x		pre 2/2001	Water levels not in equilibrium until after February 2001	RID 5354	
NC-EWDP-4PA	X		5/15/2000	Water level not reproduced and no back-up data exists to support it	SNB 102; RID 3734	
NC-EWDP-4PB	X		On and before 2/3/2000	Water level data in January 23, 2000 is a result of the well still in a post-drilling recovery period; Well was completed on February 3, 2000.	SNB 110; RID 3734	Spike in hydrograph on November 9, and December 30, 2001 are in agreement with water levels at 4PA and should not be censored
NC-EWDP-5SB	X		Prior to 2/25/00	Well had not recovered from drilling and development until February 25, 2000	RID 3732 and 3734	
NC-EWDP-7S	X		3/27/2001	Pump test conducted at 7S on 3/27/01	SNB 118; RID 4681	
NC-EWDP-7SC-Z1	X		9/13/2002	Drawdown level due to AMS pumping at sampling event	SNB 143, pg 95	
NC-EWDP-7SC-Z4		X			SNB 155, pgs. 40 and 157; RID'S 5449, 5757, 5819	The data from Zone 4 is not recommended for censoring but care should be exercised in the use of this data
NC-EWDP-9SX	X		11/8/1999	Water level not reproduced and no back-up data exists to support it	RID 5354	
NC-EWDP-10P deep		X				
NC-EWDP-10P shallow		X				
NC-EWDP-12PA	x		2/26/2003	Water level not reproduced and no back-up data exists to support it	SNB 144, page 48	
NC-EWDP-12PB		X				
NC-EWDP-12PC	X		Prior to 5/25/00	Censor prior to May 25, 2000 due to drilling, airlifting, and sampling operations	RID 3734	
NC-EWDP-15P		X				
NC-EWDP-16P		X				
NC-EWDP-18P		X				
NC-EWDP-19D	X		From 5/5/2000 to 8/7/2002	Extensive testing and development at the ATC	SNB 124, page 97; SNB 134, page 312; RID 3734; RID 5382	
NC-EWDP-19IM1		X	Prior to 3/2004		ATC-SNB 134	Data is not recommended for censoring but prior to March 2004 should not be used for water level maps because it has limitations due to activities at ATC.
NC-EWDP-22PA deep		x				
NC-EWDP-22PA shallow		X				
NC-EWDP-22PB deep		X				
NC-EWDP-22PB shallow		X				
NC-EWDP-22S		X				
NC-EWDP-23P deep	X		9/25/2002	Water level recorded incorrectly	SNB 138	
NC-EWDP-23P shallow		X				
NC-EWDP-24P		X				
NC-EWDP-27P		X				
NC-EWDP-28P		X				
NC-EWDP-29P		X				
WASHBURN-1X DEEP	X		Prior to 6/2000	Water levels recorded on 4/8 and 4/9/99 were pre-production levels; water levels prior to 6/2000 were affected by the aquifer test at the Garlic Well and possibly at NC-EWDP-19D.		