

January 21, 2010

U.S. Department of Energy  
Office of Legacy Management  
ATTN: Jack Craig  
Site Manager  
3600 Collins Ferry Road  
Morgantown, WV 26505

**SUBJECT:** Rulison Long-Term Hydrologic Monitoring Program Sampling and Analysis  
Results for 2009

Dear Mr. Craig:

The U.S. Department of Energy (DOE) Office of Legacy Management conducted annual sampling at the Rulison, Colorado, Site for the Long-Term Hydrologic Monitoring Program (LTHMP) on May 11 and 12, 2009. Samples were analyzed by the U.S. Environmental Protection Agency (EPA) Radiation & Indoor Environments National Laboratory in Las Vegas, Nevada. Samples were analyzed for gamma-emitting radionuclides by high-resolution gamma spectroscopy and for tritium using the conventional and enriched methods.

### **Site Location and Background**

The Rulison Site is located in Garfield County in western Colorado (see attached Figure 1). The Rulison test was designed and conducted to evaluate the use of a nuclear detonation to fracture the tight, gas-bearing formations in the Piceance Basin for enhanced natural gas production. A 43 kiloton device was detonated on September 10, 1969, at a depth of 8,426 feet below ground surface within the Williams Fork Formation of the Mesaverde Group.

Sampling locations (see attached Figure 2) are a combination of wells and surface water locations. Sampling locations range from within a few hundred feet of surface ground zero (SGZ) to over 4 miles from SGZ. EPA performed the LTHMP sampling from program inception in 1972 through 2007. The results of the historical monitoring at Rulison have consistently shown that groundwater and surface water at the sampling locations have not been impacted by nuclear-test-related contamination. In 2008 DOE reviewed all previous LTHMP data and completed an evaluation of future sampling locations. DOE concluded that monitoring of distant groundwater and surface water locations was not an effective method to detect detonation-related contamination. The evaluation determined that a monitoring program focused on detection of contaminant migration from the detonation zone was warranted. The new monitoring program will emphasize sampling of natural gas production wells, which are considered the most likely pathway for transporting detonation-derived contaminants. In addition to sampling gas production wells in the vicinity of the site, sampling will continue at groundwater and surface water locations near SGZ, as those locations are used to verify success of surface remediation activities.

## Sample Analytical Results

Sample analysis results are shown in Table 1. The results demonstrate that none of the sampling locations are being impacted by detonation-related contaminants. Three sampling locations yielded a reportable value of tritium activity using the enriched tritium analysis method. The values ranged from 19.7 to 25.8 picocuries per liter (pCi/L). Conventional tritium analysis for these same three locations resulted in no detectable activity. These results are consistent with background levels for tritium. For comparison, the EPA drinking water standard for tritium is 20,000 pCi/L. Figures 3 and 4 show historical enriched tritium sample analysis results, the EPA drinking water standard, and a line representing the natural decay rate for tritium. In Figure 3 it can be seen that the historical enriched tritium analysis results parallel the natural rate of tritium decay, an indication that additional tritium from detonation-related contamination is not being detected. All other tritium sample results were below detection limits. All high-resolution gamma spectroscopy results for gamma-emitting radionuclides were below detection limits.

Table 1. Rulison LTHMP Water Sample Analysis Results

Sample Location	Collection Date	Tritium (pCi/L)	Gamma Spectroscopy (pCi/L)
Cary Weldon (private well)	05/12/2009	ND <sup>c</sup>	ND <sup>d</sup>
Wesley Kent (private well)	05/12/2009	ND	ND
CER Test (private well)	05/12/2009	ND	ND
Daniel Gardner (private well)	05/12/2009	25.2 <sup>a,b</sup>	ND
Kevin Whelan (private well)	05/12/2009	ND	ND
Morrissania Ranch (private well)	05/12/2009	ND	ND
Patrick McCarty (private well)	05/12/2009	ND	ND
Tim Jacobs (private well)	05/12/2009	25.8 <sup>a,b</sup>	ND
City Springs (spring)	05/11/2009	ND	ND
Spr 300 Yrd N of GZ (spring)	05/12/2009	19.7 <sup>a,b</sup>	ND
Sprg 500 ft E of GZ (spring)	05/12/2009	ND	ND
Battlement Creek (creek)	05/12/2009	ND	ND
Potter Ranch (spring)	05/12/2009	ND	ND

<sup>a</sup>Analyzed using both conventional and enriched tritium methods.

<sup>b</sup>Result from enriched tritium analysis method.

<sup>c</sup>Conventional tritium detection limit was 159 pCi/L; enriched tritium detection limits ranged from 3.74 to 3.89 pCi/L.

<sup>d</sup>Gamma spectroscopy detection limits are species-specific and sample-specific and range from approximately 5 pCi/L to 170 pCi/L.

ND = Not detected.

## Conclusions

Tritium and gamma-emitting contaminant concentrations in water samples collected at Rulison are consistent with historical sample analysis results. The results continue to verify that groundwater and surface water at the sampling locations have not been impacted by detonation-related contaminants.

Jack Craig  
Control Number 10-0184  
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If you have any questions concerning this report, please contact me at (970) 248-6477.

Sincerely,



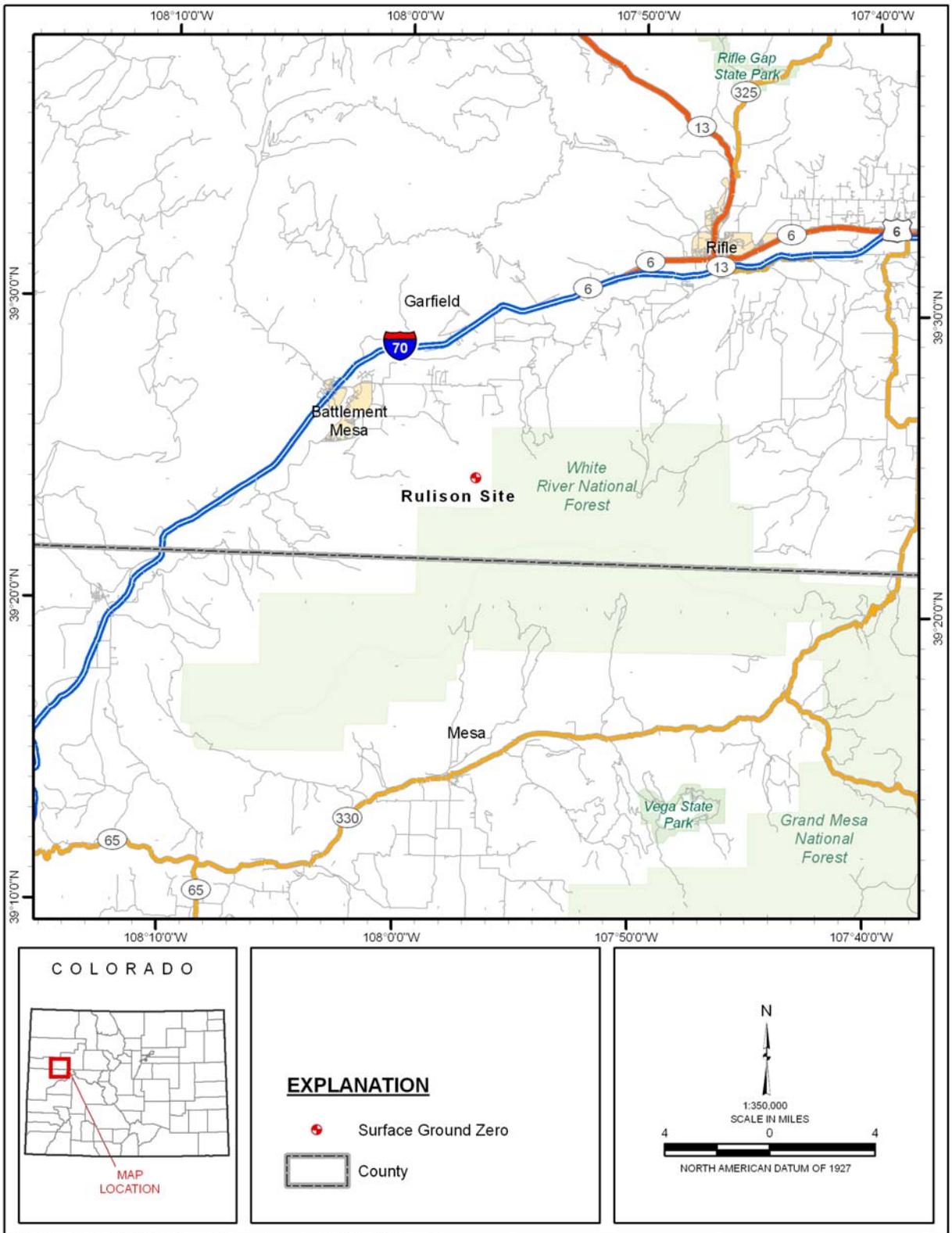
*For*

Richard D. Hutton  
Task Manager

Attachments

cc: (electronic)  
Jack Duray, Stoller  
Rex Hodges, Stoller

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Figure 1. Rulison Site Location Map

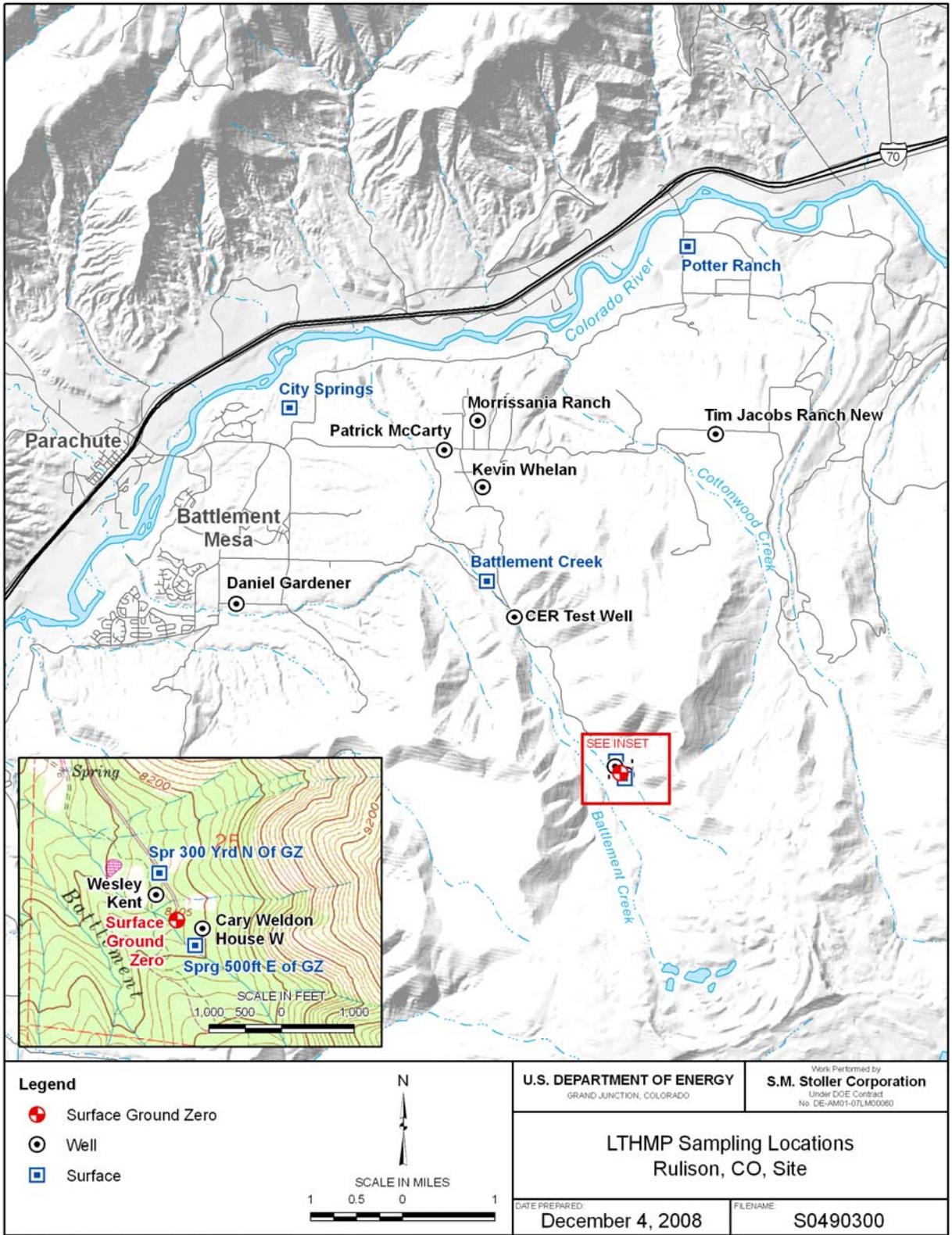


Figure 2. LTHMP Sampling Locations, Rulison, CO, Site

### Rulison Site Enriched Tritium Concentration for Wells

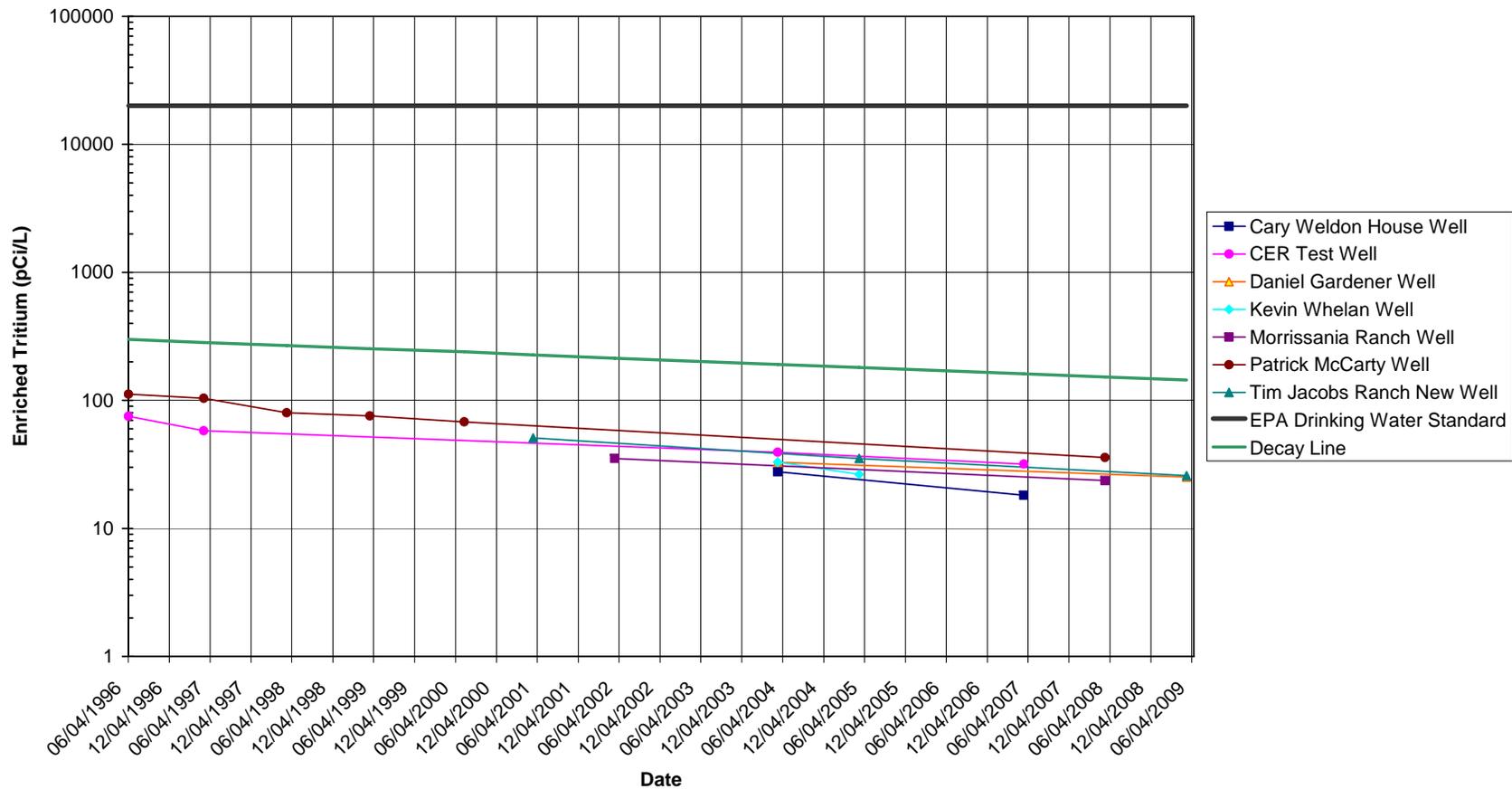


Figure 3. Enriched Tritium Concentrations-Wells, Rulison, CO, Site

### Rulison Site Enriched Tritium Concentration for Springs/Surface Water

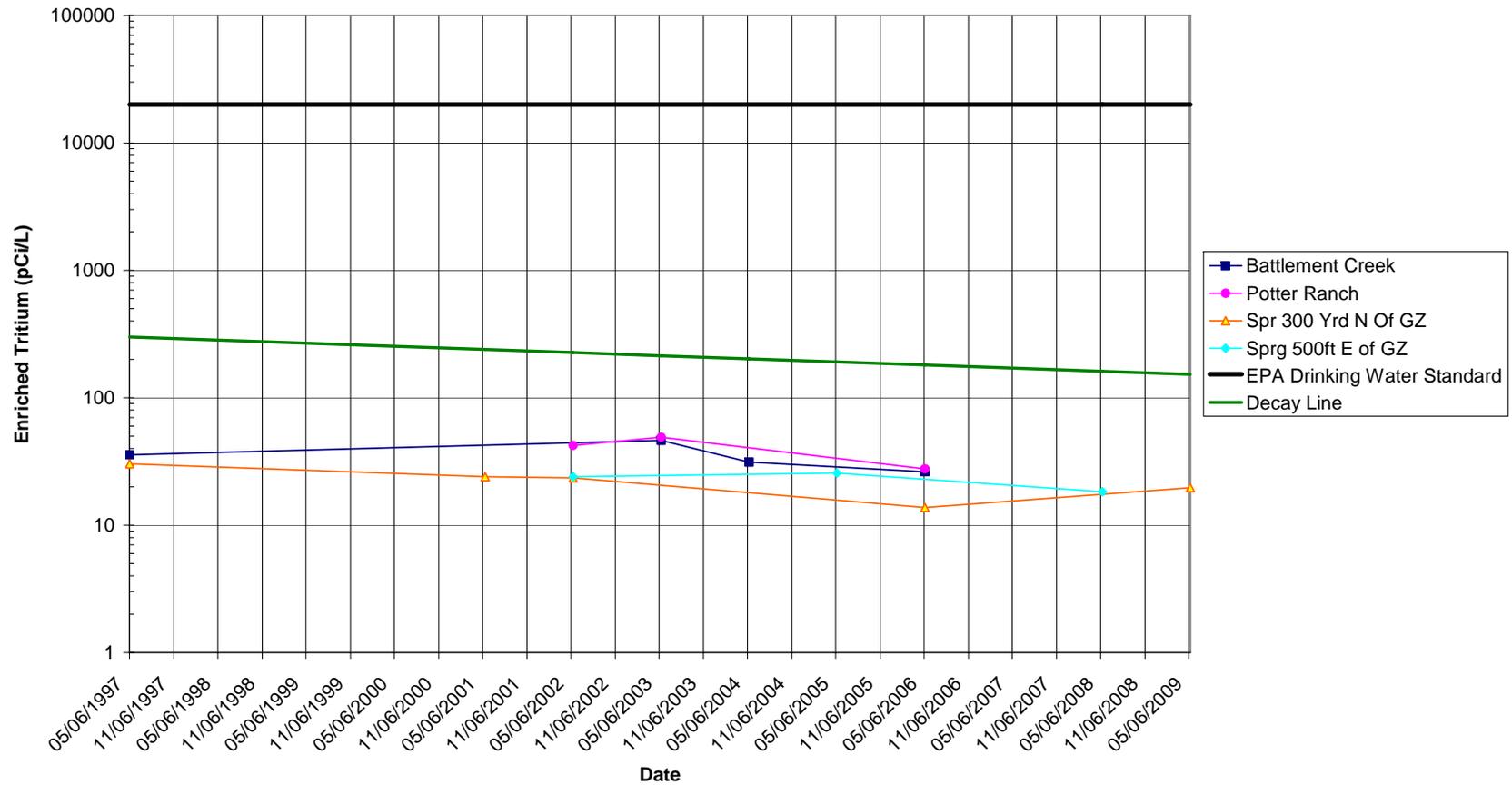


Figure 4. Enriched Tritium Concentrations-Surface Water, Rulison, CO, Site