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LMS/RBL/S11219
Task Order LM00-502
Control Number 14-0147

November 26, 2013

U.S. Department of Energy
Office of Legacy Management
ATTN: Art Kleinrath
Site Manager
2597 Legacy Way
Grand Junction, CO 81503

SUBJECT: Contract No. DE-AM01-07LM00060, S.M. Stoller Corporation (Stoller)
Task Order LM00-502, Other Defense Activities – Other Sites
Rio Blanco, Colorado, Site Long-Term Hydrologic Monitoring Program (LTHMP) Sampling and Analysis Results for 2013

REFERENCE: Task Order LM00-502-07-618, Rio Blanco, Colorado, Site

Dear Mr. Kleinrath:

The U.S. Department of Energy (DOE) Office of Legacy Management conducted annual sampling at the Rio Blanco, Colorado, Site for the Long-Term Hydrologic Monitoring Program (LTHMP) on May14–16, 2013. The samples were shipped to the GEL Group Inc. laboratories for conventional analysis of tritium and analysis of gamma-emitting radionuclides by high-resolution gamma spectrometry; a subset of water samples collected from wells near the Rio Blanco site was also sent to GEL Group Inc. for enriched tritium analysis. All requested analyses were successfully completed. During this sampling event, a small bladder pump in well RB-D-01 had to be replaced. A new bladder pump of similar size was installed, and the sample was collected. Samples were collected from a total of two onsite wells, four private wells from nearby locations, and nine surface water locations. Samples were analyzed for gamma-emitting radionuclides by high-resolution gamma spectrometry; tritium was analyzed using the conventional method with a detection limit on the order of 400 picocuries per liter (pCi/L). Three locations (RB-D-03, RB-S-03, and the Johnson Artesian Well) were analyzed using the enriched tritium method, which has a detection limit on the order of 3 pCi/L.

Site Location and Background

The Rio Blanco site is located in Rio Blanco County in western Colorado (see enclosed Figure 1). The Rio Blanco test was designed and conducted to evaluate the use of nuclear detonations to fracture the tight, gas-bearing sandstone reservoirs in the Piceance Basin for enhanced natural gas production.

The test involved the simultaneous detonation of three nuclear devices stacked vertically to create a single elongate chimney.

Each of the three detonations had an estimated yield of 33 kilotons. The test was conducted on May 17, 1973, at depths of 5,838; 6,230; and 6,689 feet below ground surface in the upper portion of the Mesaverde Group and the lower portion of the Fort Union Formation. The test failed to create a single elongate chimney.

Sampling locations (see enclosed Figure 2) are a combination of wells and surface water locations that range from approximately 100 feet from surface ground zero (SGZ) to 7 miles from SGZ. EPA performed the LTHMP sampling from program inception at the Rio Blanco site in 1976 through 2007. Results of the historical monitoring at the Rio Blanco site have consistently shown that nuclear-test-related contamination has not affected groundwater and surface water at the sampling locations. DOE has evaluated the LTHMP and concluded that monitoring shallow groundwater and surface water at locations both near to and distant from SGZ was not an effective method to detect detonation-related contamination. The evaluation concluded that an updated monitoring program focused on detecting contaminant migration from the detonation zone was warranted. Natural gas production wells are considered the most likely pathway for transporting detonation-derived contaminants. Therefore, the updated monitoring program emphasizes the sampling of natural gas production wells in the vicinity of the Rio Blanco site, in addition to the ongoing LTHMP sampling and analysis. Results of the natural gas monitoring program are available online at www.lm.doe.gov/Rio_Blanco/Documents.aspx, under the heading "Natural Gas Well Monitoring Results."

Sample Analytical Results

Table 1 shows sample analysis results. The results demonstrate that none of the sampling locations are being impacted by detonation-related contaminants. Conventional tritium analytical results for all of the sampling locations were below detection limits. Each monitoring year, approximately 20 percent of the locations are analyzed using enriched analytical methods. In 2013, the 20 percent of enriched locations were wells, and no surface water locations were tested using the enriched method. Figure 3 shows enriched tritium values from wells near the site, and Figure 4 shows historical results of enriched tritium analyses from surface water locations. Both figures show the EPA drinking water standard for tritium, 20,000 pCi/L, and the tritium decay line for comparison. Figure 4 shows that very few of the historical sample results from surface water locations that have exceeded the detection limit. No other radionuclides were detected by the high-resolution gamma spectrometry analysis.

Table 1. Rio Blanco LTHMP Water Sample Analysis Results

Sample Location	Collection Date	Tritium[a] (pCi/L)	Enriched Tritium (pCi/L)	Gamma Spectrometry[b] (pCi/L)
RB-D-01 (onsite well)	05/16/2013	ND		ND
RB-S-03 (onsite well)	05/14/2013	ND	2.04	ND
RB-D-03 (private well)	05/14/2013	ND	0.637	ND
RB-W-01 (private well)	05/14/2013	ND		ND
Johnson Artesian Well (private well)	05/16/2013	ND	0	ND
Brennan Windmill (private well)	05/16/2013	ND		ND
Fawn Creek 500 ft Dwn (surface location)	05/16/2013	ND		ND
Fawn Creek 500 ft Ups (surface location)	05/16/2013	ND		ND
B-1 Equity Camp (surface location)	05/15/2013	ND		ND
CER #1 Black Sulphur (surface location)	05/15/2013	ND		ND
CER #4 Black Sulphur (surface location)	05/15/2013	ND		ND
Fawn Creek #1 (surface location)	05/15/2013	ND		ND
Fawn Creek #3 (surface location)	05/16/2013	ND		ND
Fawn Creek 6800 ft Up (surface location)	05/16/2013	ND		ND
Fawn Creek 8400 ft Dw (surface location)	05/16/2013	ND		ND

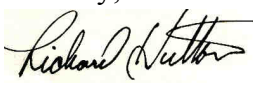
[a] Conventional method tritium detection limits ranged from 144 pCi/L to 147 pCi/L.
[b] Gamma spectrometry detection limits are nuclide-specific and sample-specific.
[c] Estimated value (less than 3 times the detection limit).
ND = not detected

Conclusions

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

Please contact me at (970) 248-6477 with any questions.

Sincerely,



Richard D. Hutton
Project Manager

Enclosures

cc: Rex Hodges, Stoller

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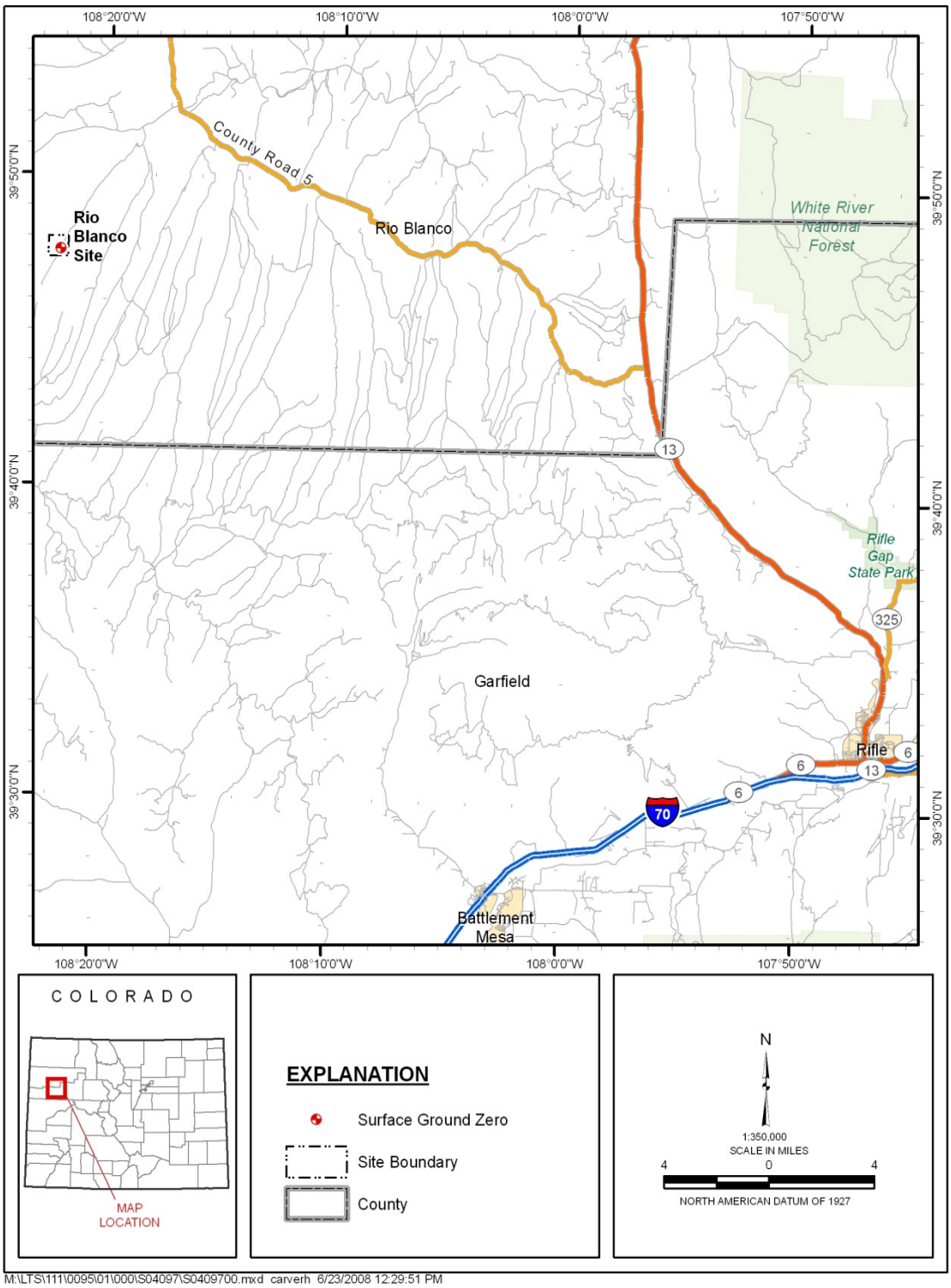

Figure 1. Rio Blanco, Colorado, Site Location Map

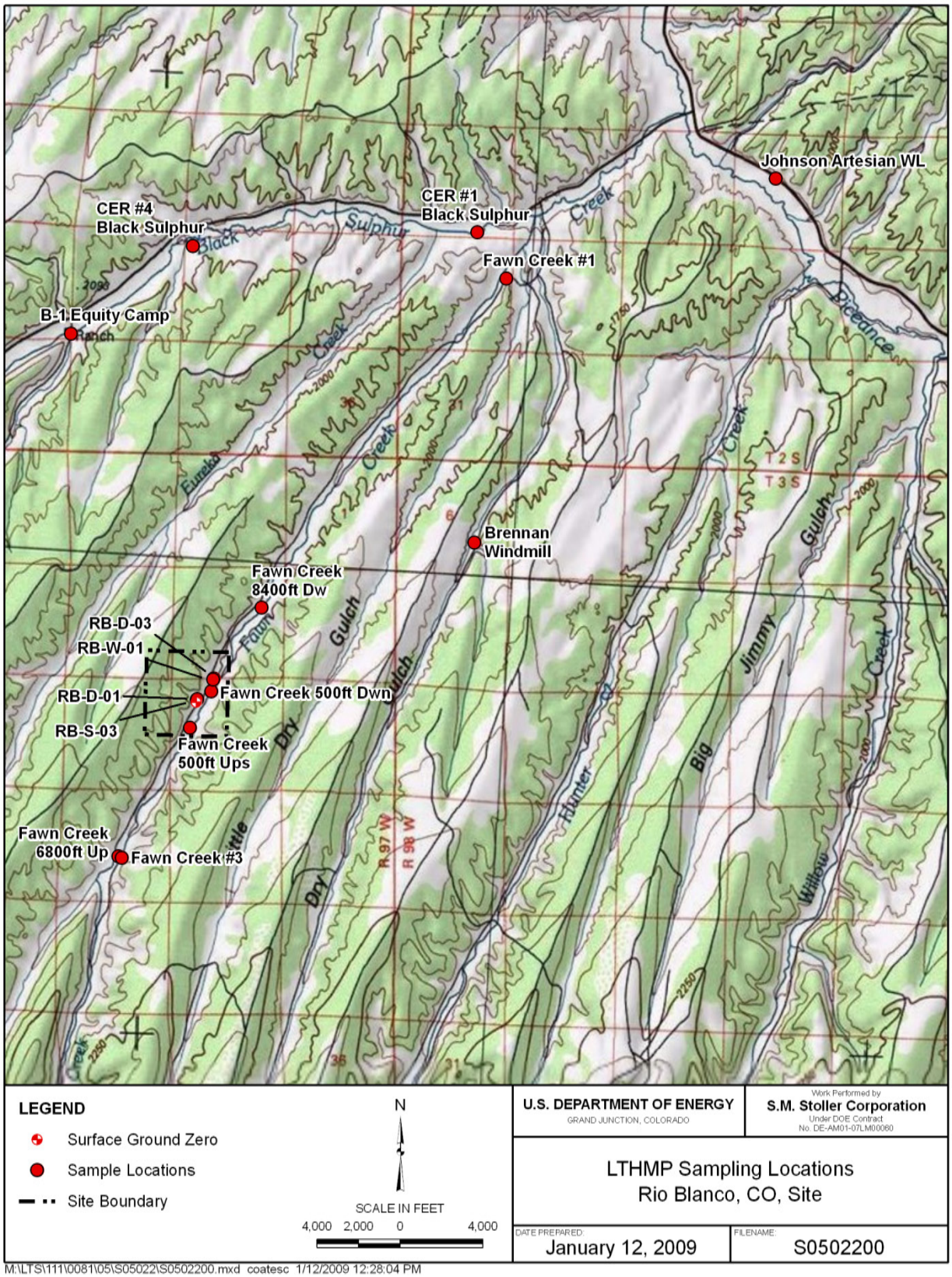

Figure 2. LTHMP Sampling Locations, Rio Blanco, Colorado, Site

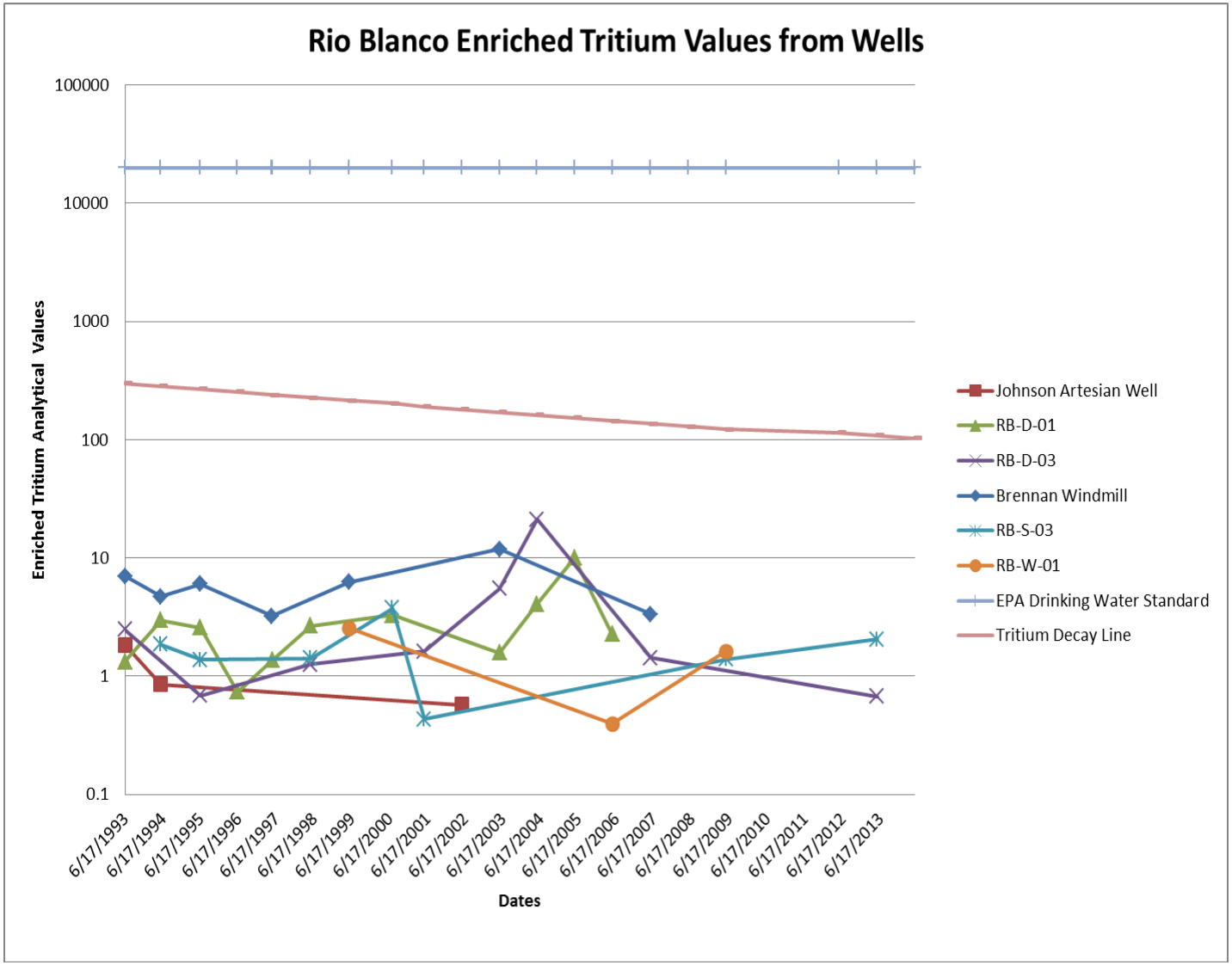

Figure 3. Enriched Tritium Analysis Values from Wells Near the Rio Blanco, Colorado, Site

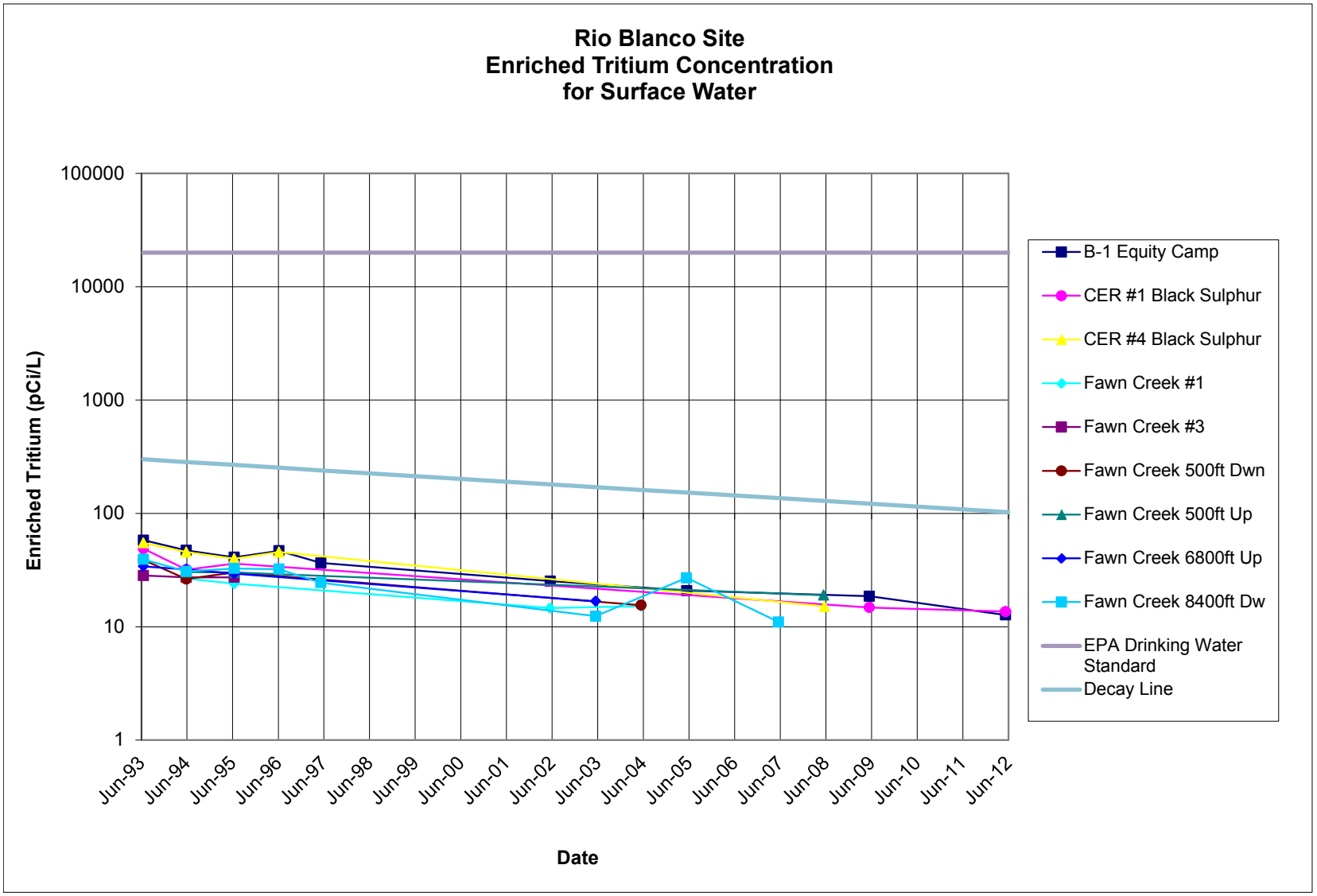

Figure 4. Enriched Tritium Analysis Values for Surface Water Near the Rio Blanco, Colorado, Site