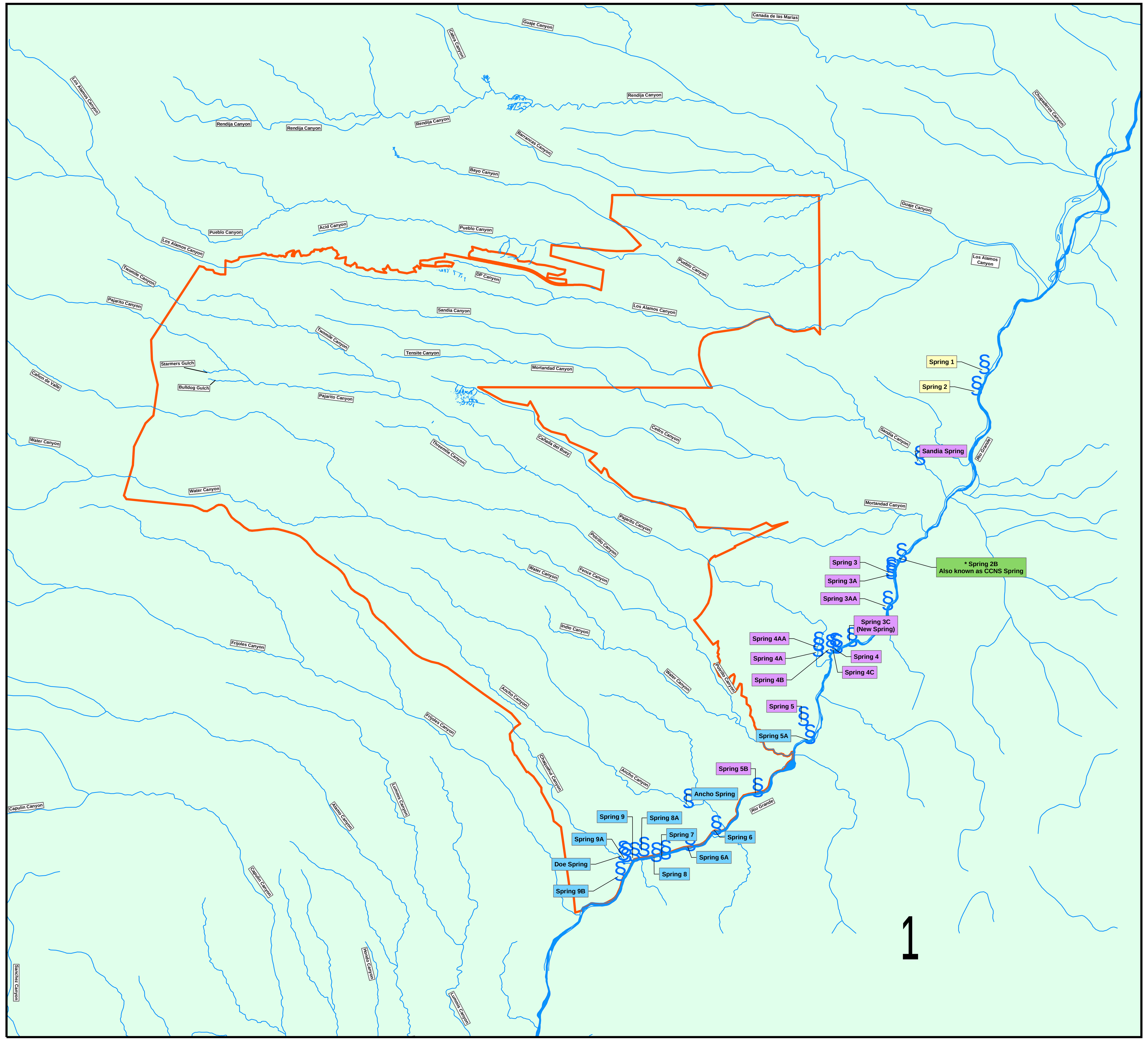

Hydrochemical Profiles for Select White Rock Canyon Springs, Los Alamos, New Mexico

WR Canyon Springs
Drainage
LANL
Ca + Na HCO3 Ground Water
Ca HCO3 Ground Water
Na HCO3 + SO4 Ground Water
Ca + HCO3 + SO4 Ground Water

1:31,680

0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
Miles

1 inch equals 0.5 miles

DATA SOURCES:
RRES Remediation Services Project,
Los Alamos National Laboratory
NMED DOE Oversight Bureau

PROJECTION:
New Mexico State Plane Coordinate System,
Central Zone
North American Datum, 1983

Map produced by K. Granzow, April, 2004
NMED DOE Oversight Bureau
134 State Road 4, Suite A
White Rock, NM 87544

State of New Mexico
Environment Department

DOE Oversight Bureau

Hydrochemical Profiles for Select White Rock Canyon Springs, Los Alamos, New Mexico

By

Michael R. Dale, Kim Granzow, Dave Englert and Steve Yanicak
New Mexico Environment Department, DOE Oversight Bureau

ABSTRACT

Springs located along and near the White Rock Canyon reach of the Rio Grande are considered to be points of discharge from the upper saturated portion of the regional aquifer beneath the Pajarito Plateau and the Los Alamos National Laboratory (the Laboratory). General hydrochemical characteristics of these springs were determined by Purtymun, et al. (1980). Purtymun, et al., segregated the springs into four distinct groups with the grouping based on the sodium and calcium bicarbonate type, sulfate content and total dissolved solids. A more detailed evaluation of the available data shows that additional hydrochemical signatures exist. As noted on Plate 1, certain springs can be grouped based on their sodium and/or calcium bicarbonate type and sulfate content. North to south spring profile plots (Figures 1 – 8) for a variety of constituents and parameters show that:

- **elevated concentrations of the anions chloride, sulfate and nitrate persist at the 4 Series Springs indicating a man-made influence to some portion of the recharge waters (Figure 1);**
- **elevated perchlorate is noted at the 4 Series Springs (Figure 2):**
- **low (< 1 - 2 pCi/L) tritium activities at most springs indicate ground-water ages in excess of at least 100 years (Figure 3);**
- **a tritium anomaly at the 4 Series Springs (except Spring 4A) indicates that some portion of recharge is derived from a shallow/youthful (<50 yrs) source (Figure 3);**
- **dissolved silicon increases to the south (Figure 4);**
- **dissolved strontium decreases to the south (Figure 5); and**
- **stable-isotope results (Blake, et al., 1995) (NMED unpublished data) for the west-side springs are consistent, suggesting a recharge source from the central to western portion of the Pajarito Plateau (elevations determined by the method used by Vuataz and Goff, 1986) (Figure 6).**

Additional distinctions exist between the White Rock Canyon Springs, especially when comparing springs located on the west side versus the east side of the Rio Grande. Generally, springs on the east side have higher concentrations of uranium, sodium, sulfate, carbonate and bicarbonate, and dissolved solids. More recent notables related to White Rock Canyon springs include the drying of the east-side springs 2A and 3B, and the discovery of previously undocumented springs - Springs 3C, 4B, 4C, 4AA, 6AA, 6AAA and 9C (Plate 1). These interpretations can be beneficial to assessing environmental impacts as well as water-resource management conditions, e.g. long-term water attainability.

The importance and NMED perspective of this finding, although not a health concern, is more supportive evidence for a hypothesis of a deep ground-water pathway –or connection- from a source of these parameters (notably tritium and perchlorate) above the Pajarito Plateau to springs at the Rio Grande. Additionally, this information supports a collaborative effort by state (NMED & State Engineer), federal agencies (DOE & USGS), Los Alamos National Laboratory (LANL) and State Universities (UNM, NMIT, NMSU) to characterize and model deep ground water for quality and quantity on the Pajarito Plateau and within the Espanola Basin.

Figure 1
Nitrate, Sulfate and Chloride Concentration Profile for Selected White Rock Canyon Springs

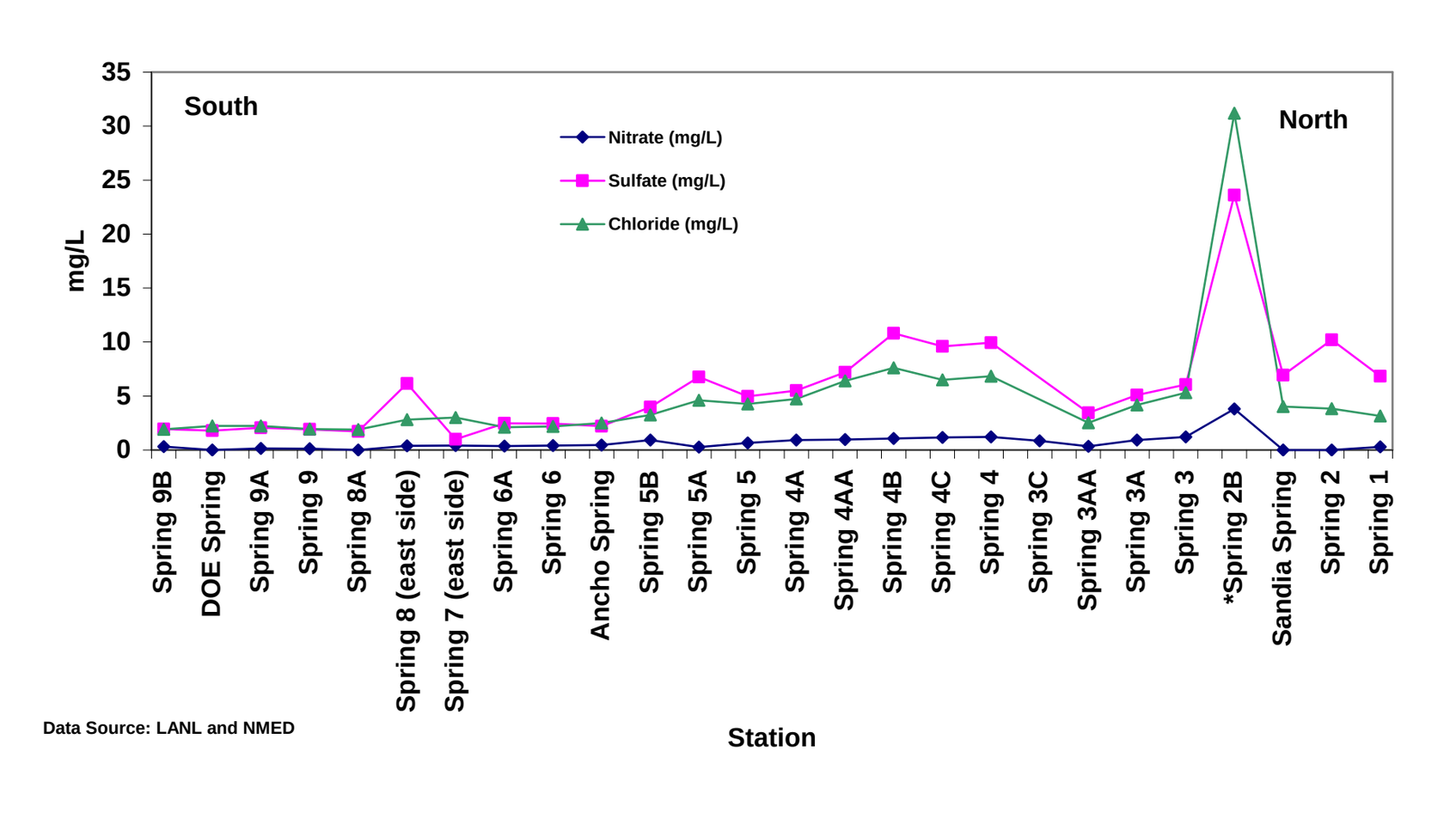

Figure 5
Strontium Concentration Profile for Selected White Rock Canyon Springs

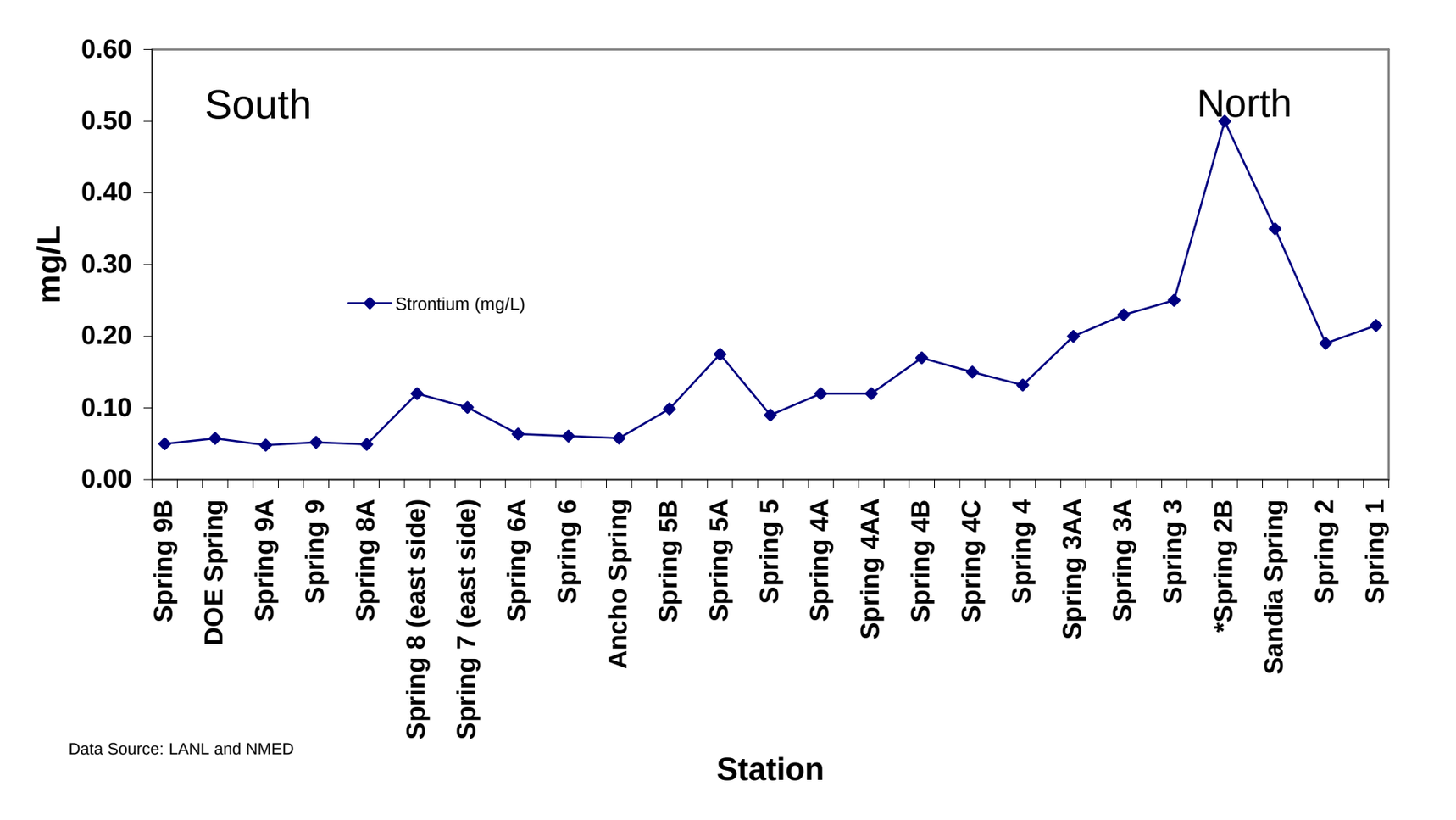

Figure 2
Perchlorate-Concentration Profile for Selected White Rock Canyon Springs

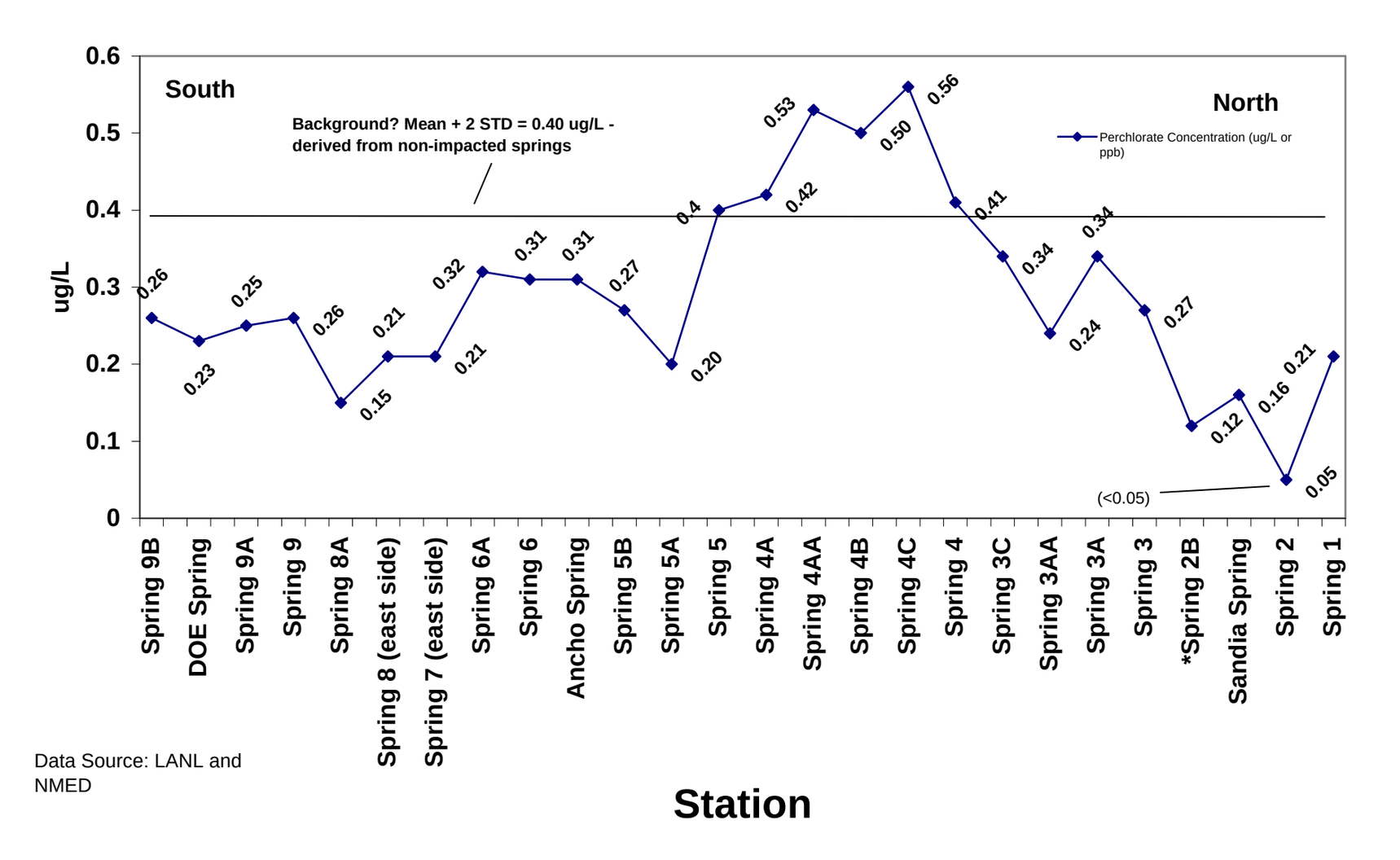

Figure 6
Delta [18]O Results for Selected White Rock Canyon Springs

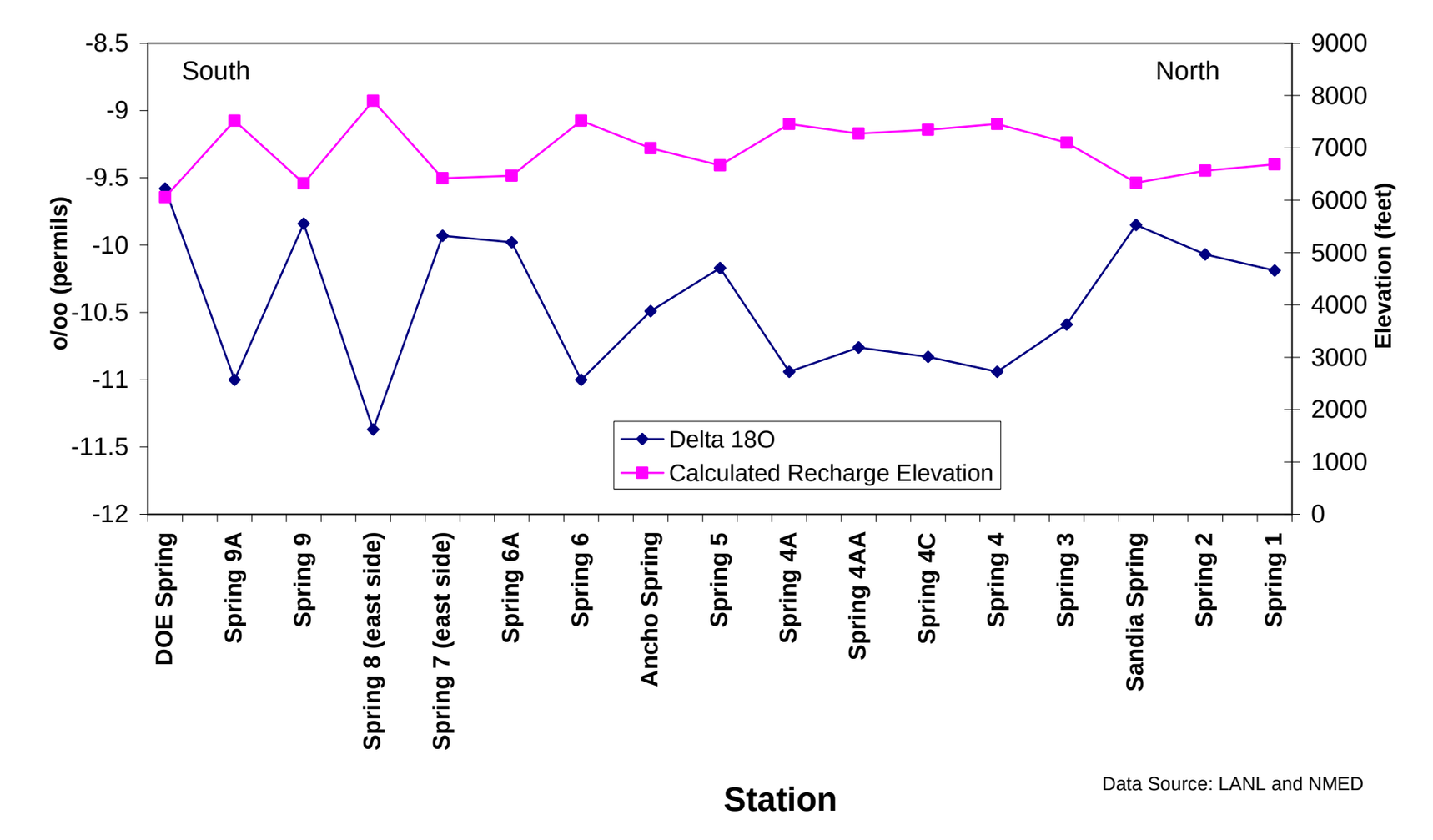

Figure 3
Tritium-Activity Profile for Selected White Rock Canyon Springs

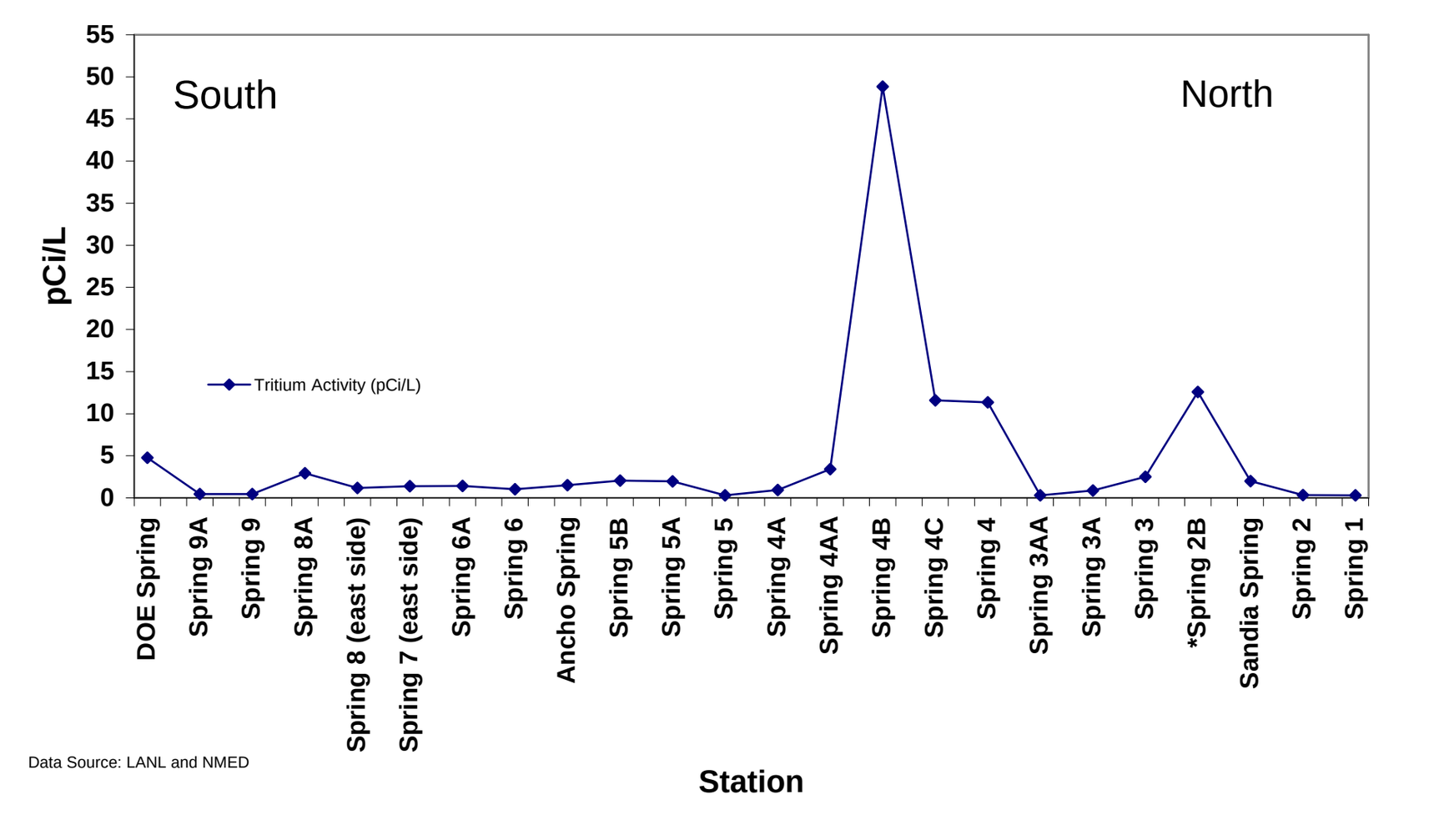

Figure 7
Total Dissolved Solids Concentration Profile for Selected White Rock Canyon Springs

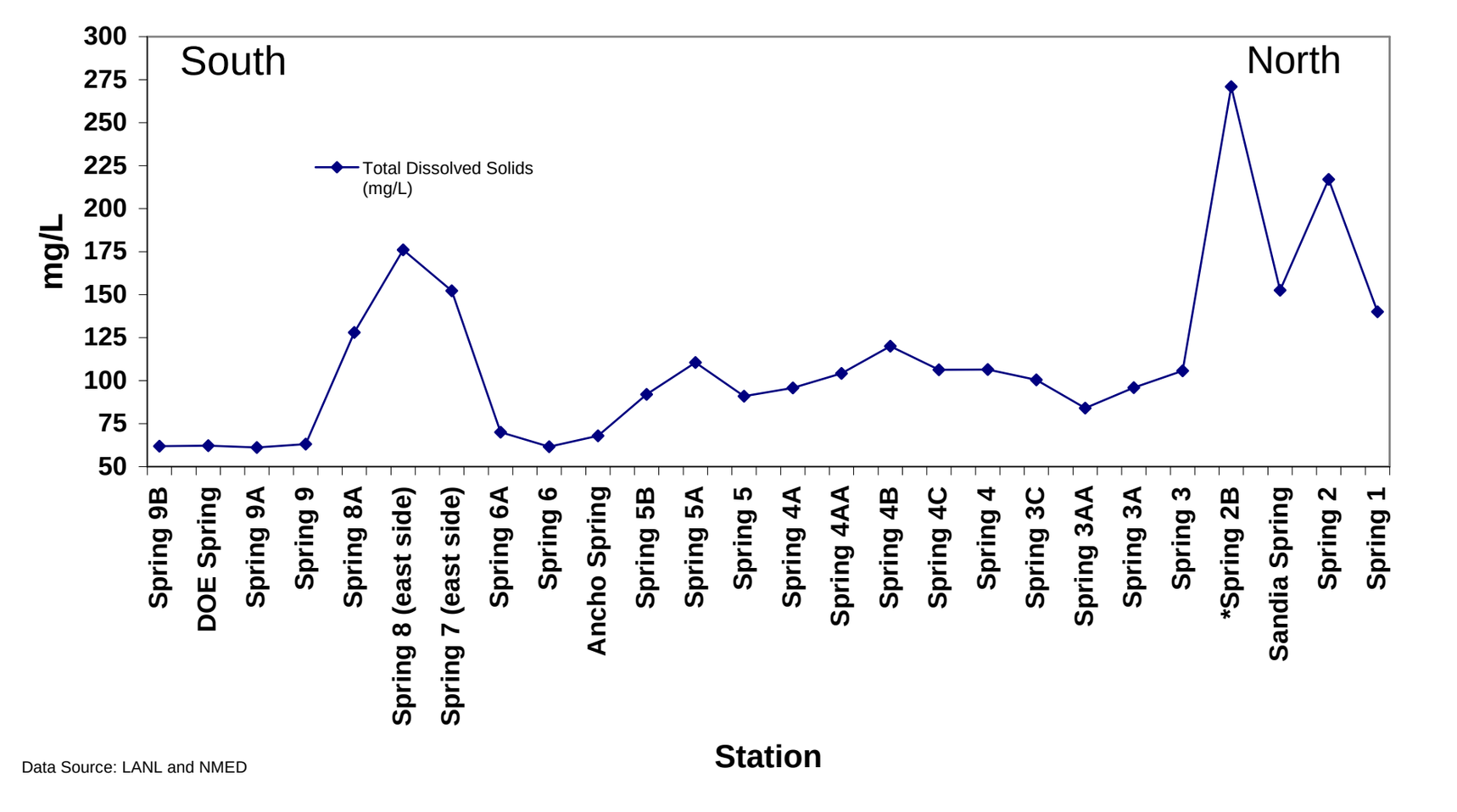

Figure 4
Silicon Concentration Profile for Selected White Rock Canyon Springs

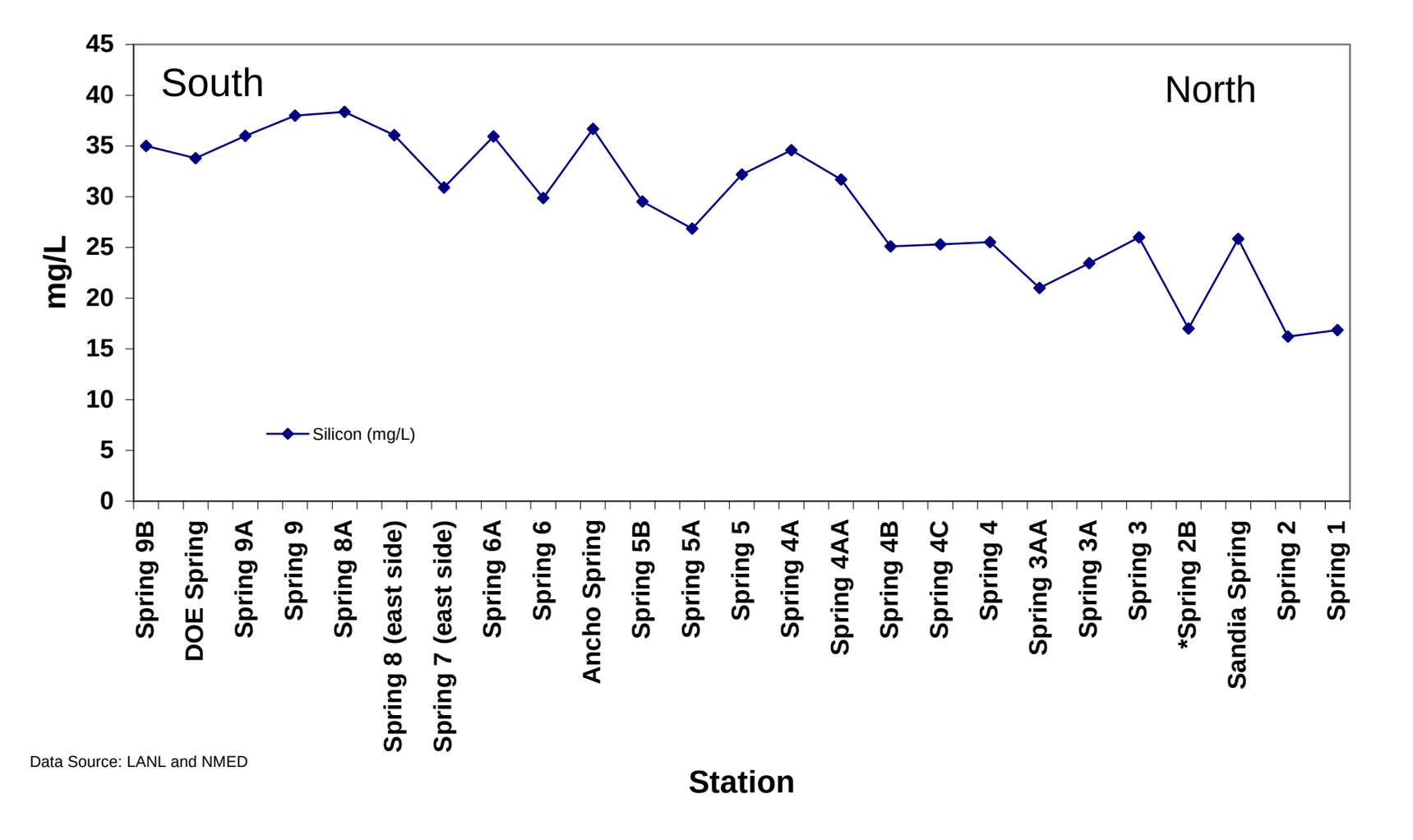

Figure 8
Bicarbonate Concentration Profile for Selected White Rock Canyon Springs