



Standard Guide for Displaying the Results of Chemical Analyses of Ground Water for Major Ions and Trace Elements—Diagrams for Single Analyses¹

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1. Scope

1.1 This guide covers the category of water-analysis diagrams that use pictorial or pattern methods (for example, bar, radiating vectors, pattern, and circular) as a basis for displaying each of the individual chemical components that were determined from the analysis of a single sample of natural ground water (see Terminology).

1.2 This guide on single-analysis diagrams is the second of several standards to inform the professionals in the field of hydrology with the traditional graphical methods available to display ground-water chemistry.

NOTE 1—The initial guide described the category of water-analysis diagrams that use two-dimensional trilinear graphs to display, on a single diagram, the common chemical components from two or more complete analyses of natural ground water.

1.2.1 A third guide will be for diagrams based on data analytical calculations that include those categories of water analysis graphs where multiple analyses are analyzed statistically and the results plotted on a diagram (for example, the box, and so forth).

1.3 Numerous methods have been developed to display, on single-analyses diagrams, the ions dissolved in water. These methods were developed by investigators to assist in the interpretation of the origin of the ions in the water and to simplify the comparison of analyses, one with another.

1.4 This guide presents a compilation of diagrams from a number of authors that allows for transformation of numerical data into visual, usable forms. It is not a guide to selection or use. That choice is program or project specific.

NOTE 2—Use of tradenames in this guide is for identification purposes only and does not constitute endorsement by ASTM.

1.5 *This guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances. This ASTM standard is not intended to repre-*

sent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.

2. Referenced Documents

2.1 ASTM Standards:

D 596 Practice for Reporting Results of Analysis of Water²

D 653 Terminology Relating to Soil, Rock, and Contained Fluids³

D 1129 Terminology Relating to Water²

D 5754 Guide for Displaying the Results of Chemical Analyses of Ground Water for Major Ions and Trace Elements—Trilinear Diagrams for Two or More Analyses²

3. Terminology

3.1 *Definitions*—Except as listed as follows, all definitions are in accordance with Terminology D 653.

3.1.1 *anion*—an ion that moves or would move towards an anode; thus nearly always synonymous with negative ion.

3.1.2 *cation*—an ion that moves or would move towards a cathode; thus nearly always synonymous with positive ion.

3.1.3 *equivalent per million (epm)*—for water chemistry, an equivalent weight unit expressed in English terms, also expressed as milligram-equivalent per kilogram. When the concentration of an ion, expressed in parts per million (ppm), is multiplied by the equivalent weight (combining weight) factor (see explanation of equivalent weight factor) of that ion, the result is expressed in epm.

3.1.3.1 *Discussion*—For a completely determined chemical analysis of a water sample, the total epm value of the cations will equal the total epm value of the anions (chemically balanced). The plotted values on the water-analysis diagrams described in this guide can be expressed in percentages of the total epm (although all illustrations are in milliequivalent per litre) of the cations and anions of each water analysis. Therefore, in order to use the diagrams, analyses must be converted from ppm to epm by multiplying each ion by its

¹ This guide is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.21 on Ground Water and Vadose Zone Investigations.

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² *Annual Book of ASTM Standards*, Vol 11.01.

³ *Annual Book of ASTM Standards*, Vol 04.08.