KANSAS GEOLOGICAL SURVEY
Analytical Services Section

LGS OF 90-99

NITRATE UV-SPECTROPHOTOMETRIC SCREENING METHOD FOR THE TECHNICON AUTOANALYZER II SYSTEM

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General Discussion:

Nitrate(NO_3) absorption of UV-radiation at 220 nm follows Beer's law up to a concentration of 89 mg/l in this automated procedure. Filtration of samples is necessary if suspended material is present. Interferences from hydroxide and carbonate species are eliminated by acidification of blanks, samples, and standards with HCl. Dissolved organics may exhibit absorption at 220 nm. Thus, a second measurement is made at 275 nm where the organics exhibit some absorption but NO_3 does not. The absorption at 275 nm is used to make matrix corrections for the calculation of NO_3 values from the 220 nm absorption data.

Diluent-Blank-Wash Solution:

Place 10 ml of redistilled(6M) HCl in a one-liter volumetric flask and dilute to volume with distilled water. Mix thoroughly.

Samples and Standards:

All samples and standards should contain 1 ml of redistilled(6M) HCl per 100 ml of solution.

Calibration Solutions:

Working standard solutions are prepared from a 100 mg N/l potassium nitrate stock solution(0.361 g KNO_3/500 ml). 1 ml volumes of redistilled(6M) HCl are placed into 100 ml volumetric flasks, followed by appropriate volumes of the stock solution, and then dilution to the marks with distilled water. Mix throughly. The volumes of the stock solution needed in the preparation of the calibration standards are as follows:

ml of 100 mg N/l stock	mg NO_3/l
1	4.43
5	22.2
9	39.9
20	88.6

Operating Notes:

1. Place a 40/hr-4:1 cam into the sampler. Connect the manifold to a 15 mm flowcell in the sample compartment of the spectrophotometer. Set the wavelength to 220 nm and turn on the UV-light source. Allow about one hour for the system to warm up.

2. A Kel-F probe should be used in the "B" position of the sampler arm. The "B" wash receptacle is used in order to minimize the possibility of HCl contamination to other chemistries which are run on the system.

3. Turn on the recorder when normal flow is achieved in the system. Confirm that a bubble is not trapped in the flowcell. With the Baseline Knob at its mid-range point and the Balance Knob at the 0 Abs point, adjust the mechanical reference beam attenuator so that the recorder pen comes to rest in the 5-10% scale area. Allow the system to attain a steady response and then proceed to set the baseline to 0.0 with the Baseline Knob and the 88.6 mg NO_3/l standard to a scale reading of about 93% with the Std. Cal. Knob.

4. Measure the absorbance of blanks, standards, and samples at 220 nm. Change the wavelength to 275 nm and reset the baseline to 0.0 by using only the Baseline Knob. At this point DO NOT CHANGE THE INITIAL SETTING OF EITHER THE STD. CAL OR THE BALANCE. Measure the absorbance of samples and blanks at 275 nm.

5. The net NO_3 absorbance of a sample is given by:

$$Abs_{NO_3} = Abs_{220} - 2(Abs_{275})$$

6. The absorbance data for the blanks and standards are divided into two calibration curve segments, 88.6-22.2 mg/l and 22.2-0.0 mg/l. Net Abs_{NO_3} values for samples in conjunction with the appropriate curve segment are used to estimate NO_3 levels with the aid of a parabolic curve fitting routine. The $2(Abs_{275})$ correction used for the absorbance by organics may be a poor approximation for samples rich in soluble organics, such as landfill leachates. For these samples it is important that NO_3 screening values be verified by some other method.

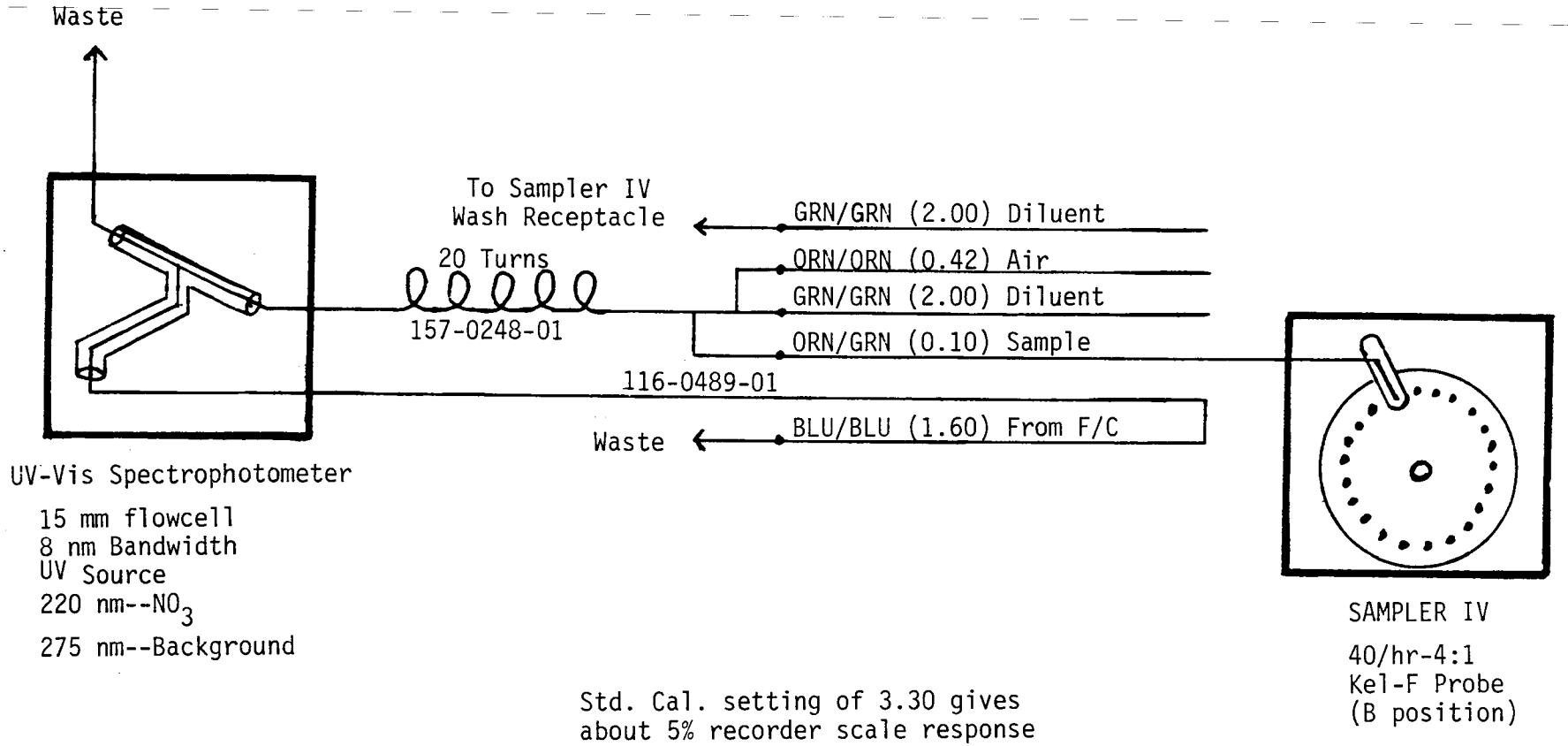
7. If sample dilution is necessary, the diluent-blank-wash solution should be used in making the dilutions. It is important that the acidities of the blanks, samples, and standards all be fairly similiar.

References:

APHA, AWWA, and WPCF, 1985, Nitrogen(Nitrate) 418A. Untraviolet Spectrophotometric Screening Method: In Standard Methods for the Examination of Water and Wastewater, 16th ed., APHA Pub., Washington, D.C., pp 392-393.

NO_3 UV-Spectrophotometric Screening Method

Range: 0-89 mg/l NO_3



Std. Cal. setting of 3.30 gives about 5% recorder scale response for the 4.43 mg/l NO_3 standard at 220 nm.

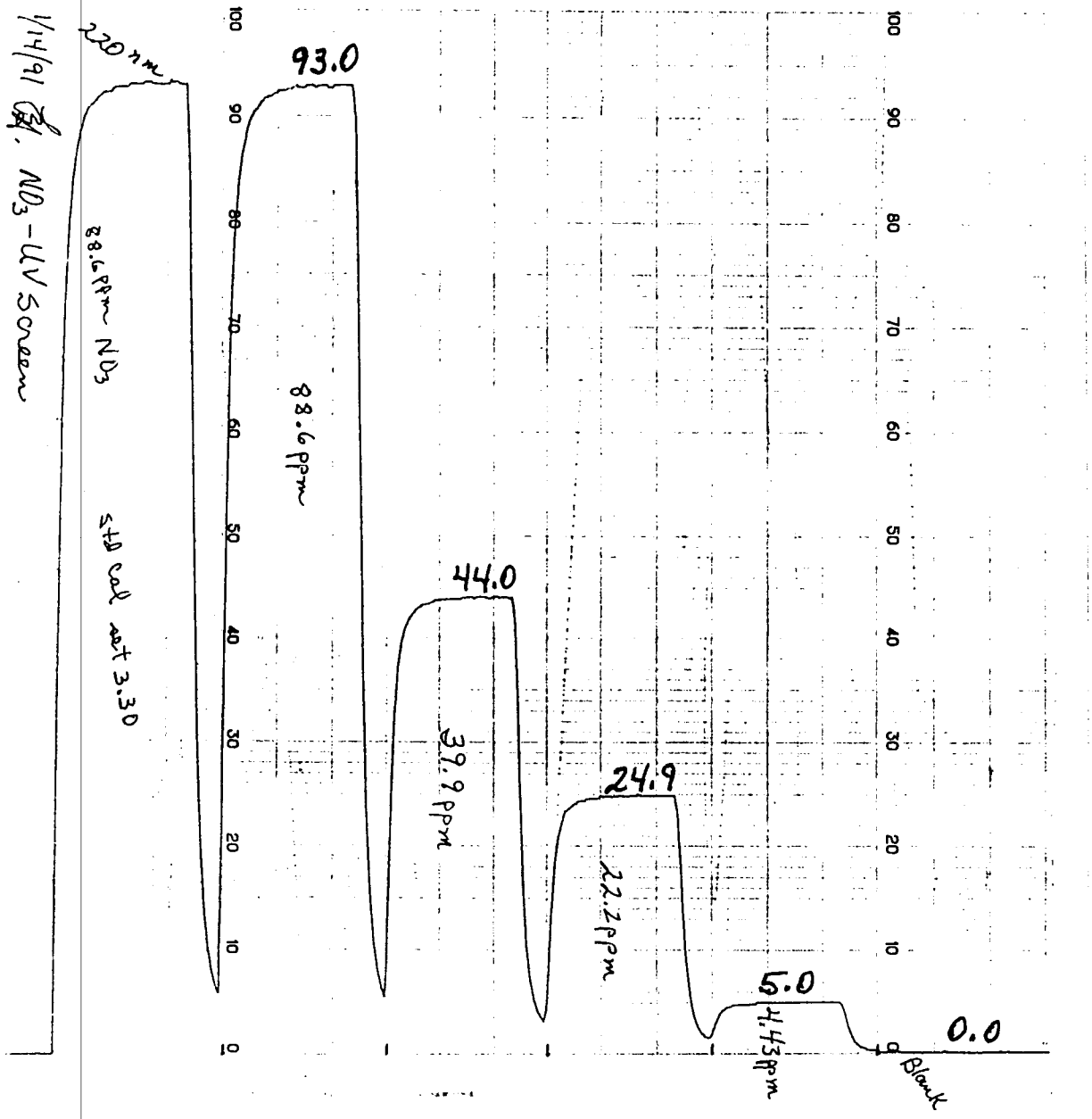
NO_3 UV-Screening Calibration Series

Curve: 88.6-22.2 mg/l

r^2 = 0.9998
a_0 0.205865
a_1 0.858736
a_2 0.000986

Curve: 22.2-0.0 mg/l

r^2 = 1.0000
a_0 -1.6667×10^{-8}
a_1 0.884601
a_2 0.000280



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