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Cotter Corporation
General Office

DIAL 303-232-8218
2635 WEST ALAMEDA PARKWAY SUITE 201
LAKEWOOD, COLORADO 80226

January 21, 1981

Mr. Albert J. Hazle, Director
Radiation and Hazardous Waste
Control Division
Colorado Department of Health
4210 East 11th Avenue
Denver, CO 80220

Dear Mr. Hazle:

In accordance with the task completion schedule discussed in Cotter's December 19, 1980 and January 5, 1981 letters, as modified by Cotter's January 22, 1981 letter, to the Department, Cotter encloses herewith ten copies of the Surface Water Monitoring Report.

This report is responsive to the Department's concern expressed in Item 3 of its September 18, 1980 letter to Cotter. However, please note that, per Item 3 (3) (d) in the September 18 section of Cotter's December 19, 1980 letter to the Department, we have not enclosed herewith the preliminary design drawings for possible diversion and runoff control structures. These drawings were not submitted today because at the present time they would only be illustrations of early conceptual thinking without sufficient data or on-site survey information to substantiate the credibility of the concept(s). Accordingly, due to the need for additional surveying and the need to develop more detailed designs based on the survey information, Cotter will submit these drawings with the Conclusions and Recommendations Report on March 16, 1981.

If you have any questions regarding this letter or enclosure, please contact me at your earliest convenience.

Sincerely,

J.P. McCluskey
Executive Vice President

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PRELIMINARY REPORT ON DEVELOPMENT OF OPERATIONAL SURFACE WATER MONITORING PROGRAM AND PROCEDURES FOR COTTER CANON CITY, COLORADO MILL SITE

1. General

Development of an operational surface water monitoring program, including data analyses and related investigations for the Cotter mill site and vicinity are addressed in the following paragraphs. The Cotter mill site is located about 1½ miles south of the Lincoln Park area of Canon City, Colorado (Figures 1 and 2).

Based upon a review of existing data, Wahler Associates has prepared a plan for conducting an operational surface water monitoring program for both quantity and quality at the Cotter mill site and vicinity. The activities associated with the surface water monitoring program are in accordance with the Colorado Department of Health regulatory guidelines pertaining to operational radiological monitoring programs and the Federal Environmental Protection Agency (EPA) water sampling and analytical procedures. These include the following considerations:

a. The surface water monitoring program has been designed to satisfy the requirements set forth below:

(i) To provide adequate monitoring of the surface water discharges needed to help establish baseline hydrological conditions, if possible, and to assess the existing hydrological environment at and in the vicinity of the mill site.

(ii) To provide adequate data to describe the likely variation(s) in surface water discharges in terms of water flow and selected physical, chemical, and biological quality parameters. Radiochemical concentrations in recently collected surface water samples are presently being analyzed by Hazen Research in Denver, Colorado.

(iii) To establish a procedure for reporting all measurements to the Department.

b. Equipment and structures necessary to accurately measure and sample the quantity and quality of surface water discharges at and in the vicinity of the Cotter mill site will be installed, maintained, and operated in accordance with EPA procedures applicable to surface water monitoring programs.

2. Selection of Surface Water Monitoring Sites

Monitoring sites for the operational surface water monitoring program are shown on Figure 2. These include locations within and outside the Cotter property. A description of these sites is presented in Table 1. Many of these sites have been used by Cotter and its consultants prior to the commencement of related investigations by Wahler Associates. An initial field reconnaissance trip was performed in October, 1980 by a Wahler hydrologist to select additional surface water monitoring sites and to determine what types of streamflow/water level measurement instruments (i.e., crest-stage gages, staff gages) were best suited for monitoring purposes. In particular, the selection of additional sites to monitor runoff quantities and quality from areas impacted by current and future mill-related activities was considered imperative. Additionally, Wahler's hydrologist selected several off-site monitoring locations for measuring runoff quantities and quality for the purposes of assessing the impact on the quality of surface waters that may be due to other closely situated industrial sites (i.e., slag piles, waste dumps, etc.) and to note any potential influence these sites may have on the De Weese Dye Irrigation Ditch located in the Lincoln Park area (Figure 2). This aspect of the surface monitoring program will be discussed in detail in the Analytical Chemistry Report, to be submitted by Wahler Associates in February, 1981.

In developing the operational surface water monitoring program, Wahler Associates has worked closely with Cotter's environmental technicians responsible for the routine data gathering activities. A Wahler hydrologist, during previous and future field trips, has provided and will continue to provide assistance and/or training in the collection of data such as field water quality measurements, water quality sampling methods for subsequent laboratory analyses, discharge measurements, and maintenance of monitoring devices. Frequent sampling of surface water runoff will be needed to firmly establish its general physical and chemical nature.

3. Procedures for Installation of Surface Water Monitoring Devices

a. Crest-stage Gage Sites

Crest-stage gages were installed at two locations (identified on Figure 2) on streams within and outside Cotter's property in order to obtain peak water level discharge information. The stream cross sections will be surveyed in February, 1981 and be used to develop stage-discharge relationships for the gaging sites.

Construction of the crest-stage gages were in accordance with U. S. Geological Survey (USGS) design procedures (Figure 3). The perforated basket attached to the bottom of the wooden staff gage contains ground cork. Flood waves entering the intake holes rise inside the pipe and the ground cork adheres to the wooden gage, thereby indicating the maximum water level of the flood wave. The gage height of the flood crest is then obtained by direct measurement along the wooden gage between a reference point on the gage and the indicated floodmark. The lips of the top caps of the gages will be referenced to relative stage elevations in feet (arbitrary datums) by surveying. The top caps and pipe sections of both gages will be painted orange to aid in referencing the established relative elevation of each gage.

Each crest-stage gage is fastened to a large wooden post embedded in concrete in the streambed.

b. Staff Gage Installations

Three-foot porcelain-enameled staff gages were installed at various locations within and outside Cotter's property as shown on Figure 2. At culvert locations on streams, the 3.00-foot mark on the staff gages will be referenced to the invert elevations at both ends of the culverts by surveying (culvert slopes will also be determined). Stage-discharge relationships will then be developed. The culvert gage sites will best serve the purpose of monitoring low to moderate flow conditions. Other staff gages installed in the surface water impoundments (Table 1) are presently used to monitor monthly pond levels.

4. Procedures for Surface Water Sampling

The basic concept in determining the water quality characteristics of surface waters is to obtain a series of samples that encompass a wide range of water quality conditions. Since stream water quality can vary widely, depending upon runoff and other conditions, the operational surface water sampling program has been established to determine the expected quality variations with discharge. Samples will be taken at various stage intervals in streams for several storm events until the range of the water quality parameters are determined. It is desirable to monitor five or six moderate- to high-intensity storms per year or until a firm data base is established. Water samples will be collected from surface impoundments on a monthly basis.

Monthly and periodic surface water samples have been collected previously by Cotter personnel at the various sampling locations shown on Figure 2. Results of the water quality tests on these samples will be

addressed in the Analytical Chemistry Report by Wahler Associates

5. Recommended Monitoring Procedures

Wahler Associate's recommended operational surface water monitoring program includes water level and/or flow measurements of streams and impoundments, and water sampling for physical, chemical, biological, and radiological quality analyses. The construction and installation of the surface water monitoring devices were discussed in Section 3. The recommended monitoring procedures are discussed in the following paragraphs.

a. Water Level Measurements

The procedure for reading the crest-stage gages is described in Section 3.a. These gages should be checked after every storm event during which there is observed or expected measurable runoff.

Staff gages at culvert locations and in surface impoundments should be read on a frequent basis depending on the observed runoff conditions. The frequency of readings will be a matter of judgment on the part of the technician(s). For instance, if the water level at a particular culvert monitoring station is noted to change within a matter of minutes, water level readings should be taken every five to ten minutes until the water level drops below the elevation of the culvert inlet invert. At this point, water probably will be ponded upstream and there will be no flow through the culvert. The maximum time interval between staff gage readings during an intense storm event/condition is one hour. Daily measurements are a maximum time requirement where flows are expected to be sustained over a period of days or weeks and where there are no observed or expected sudden streamflow variations. It is imperative that free-flow conditions through the culverts are maintained by periodically clearing obstructions from the culverts.

Flow through the culverts should be monitored for the storm duration(s) to the best extent possible. This will enable determination of total runoff for a given storm event or condition.

b. Water Quality Sampling

A sufficient number of water samples collected from the surface waters at and in the vicinity of Cotter's property are necessary to accurately assess the existing surface water quality and to establish baseline conditions, if possible. Furthermore, because of the limited data base for surface water quality, the expanded list of water quality parameters noted in Table 2 should be evaluated to insure that there is sufficient data to identify the operative water quality relationships at and near the mill site. The frequency of sampling the surface waters is presented in Table 3.

c. Summary of Monitoring Procedures

i) It is recommended that Cotter mill personnel keep abreast of local weather forecasts of storm activity to insure that a minimum amount of time is used to marshal the manpower needed for manual streamflow monitoring and water sampling. It is recommended that five or six moderate- to high-intensity storms per year be monitored and that water samples be collected over a range of one-half foot stage intervals on streams during any given storm, if possible.

ii) During periods of storm runoff, stage readings at the culvert monitoring stations should be recorded at selected time intervals, and particularly as frequent as may be necessary during the rising and recession portions of flow stages in order to acquire adequate data. Judgment should be used relative to frequency of monitoring when stages lower significantly.

iii) Stream velocities are not to be directly measured as part of the operational surface water monitoring program but rather, stage-discharge relationships (rating curves) for the crest-stage gage sites and staff gage locations will be developed and utilized.

At the stream sampling sites shown on Figure 2, manual sampling should be done in the main thread of flow, not too close to the banks or "dead area(s)", characterized by little local mixing. The greatest frequency of surface water sampling in streams will be during the high stages. However, for all streams, wading is considered dangerous, and the implementation of adequate safety precautions is recommended in water depths of about three feet or more where stream velocities are high. For the surface impoundments, depth-integrated water samples should be collected. A small boat will be necessary for this purpose.

All collected surface water samples will be handled according to standard methods. One sample set of three bottles per sample with the proper preservatives added, should be used for the laboratory analyses of physical, chemical, biological, and radiological parameters. Field measurements of temperature, pH, specific conductance, and dissolved oxygen will also be made (see Table 2). Cotter presently has an established quality control program using standard methods.

The allowable time lapse between collection and analysis of water samples is small for some of the water quality parameters since they are subject to change as a function of storage time. These parameter values should be determined immediately. Proper sample containers should be used, and care should be taken to insure that they are not contaminated. The collected samples should then be sent to the laboratory within 24 hours for testing.

6. Continued Operational Surface Water Sampling, Data Analyses, and Report Preparation

The surface water monitoring program discussed above will augment present attempts to more thoroughly understand the hydrologic environment at and near the mill site. This program also will provide the basis for continued monitoring of surface waters in order to identify the positive effects of tailings transfer operations, etc. or avert or otherwise mitigate against adverse environmental impacts of mill-related activities, if any.

After the initial stages of the surface water monitoring program are complete, data and records of streams and surface impoundments, including surface water sampling, will be acquired by Cotter personnel on a continuous basis. Copies of all records will be sent to Wahler Associates periodically. After one year of data collection, Cotter will submit to the Department a Surface Water Data Summary Report. This report will present the data in graphical and tabular form acceptable for inclusion in Cotter's Annual Report. This data summary report will include a baseline description of the surface water hydrologic environment, comparison of the data to annual averages and to other watersheds in the region, and the results of a review of the published data or other elements of environmental reports.

Selection of additional or alternative surface water monitoring sites for the operational program will be identified during the engineering studies for the planning and design of future tailings disposal facilities (i.e., future impoundment lifts) and surface water runoff control structures, and after results of additional surface water quality analyses are available.

Subsequent annual reports will update data on surface water runoff and associated water quality measurements obtained from the operational monitoring program.

TABLE 1

SURFACE WATER MONITORING STATIONS

STATION NUMBER	LOCATION *
502	Arkansas River at Grape Creek
504	Arkansas River at Four Mile
505	SCS Reservoir
515	Sand Creek NW of Mill
519	Plum Creek
520	De Weese Dye Ditch, upstream of confluence with Forked Gulch
521	Forked Gulch as it crosses under Western Forge Road
522	Unnamed channel as it crosses under Western Forge Road
523	Sand Creek at toe of SCS Dam
524	Pool behind SCS Dam on Sand Creek
525	Unnamed small impoundment
526	De Weese Dye Ditch, upstream of confluence with unnamed channel
527	Unnamed channel upstream of De Weese Dye Ditch
528	Unnamed tributary to Sand Creek as it crosses under mill entrance road
529	Pool behind Diversion Catch Dam
530	Unnamed tributary to Sand Creek upstream of Oak Creek Grade Road and southeast of gap in ridge
531	Unnamed tributary to Sand Creek upstream of Oak Creek Grade Road and southwest of gap in ridge

* Refer to Figure 2 for location.

TABLE 2

EXPANDED LIST OF SURFACE WATER QUALITY PARAMETERS FOR ANALYSES

Aluminum

Arsenic

Bicarbonate

Cadmium
Calcium
Carbonate
Chemical Oxygen Demand
Chloride

Copper
Dissolved Oxygen*
Dissolved Solids, Total

Hardness
Iron, Soluble
Lead
Lead-210
Magnesium
Manganese

Molybdenum
Nickel

pH*

Polonium-210
Potassium
Radium-226
Selenium

Sodium
Specific Conductance*
Sulfate
Suspended Solids, Total
Temperature*
Thorium-230
Uranium
Vanadium
Zinc

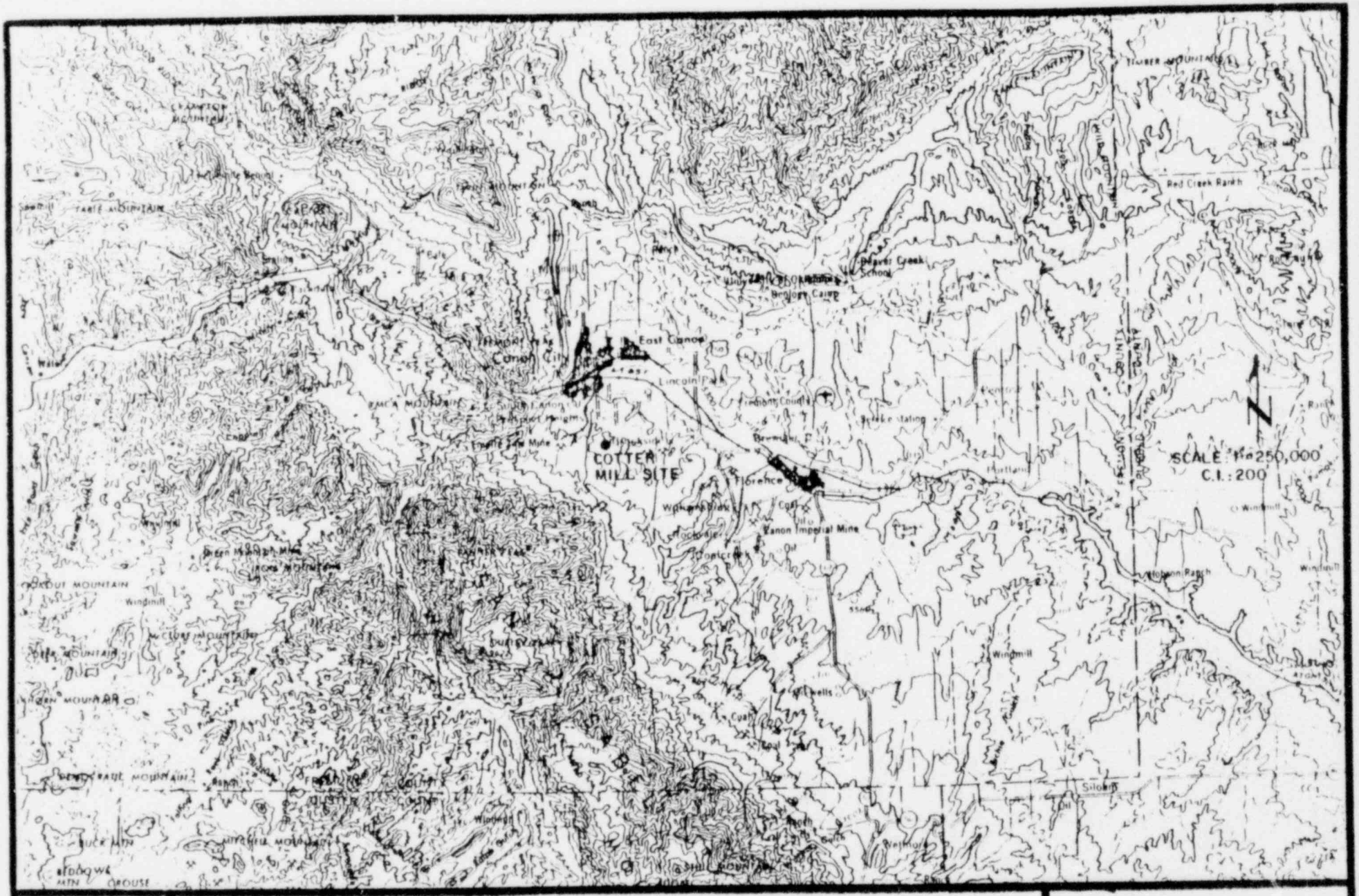
*Field determinations.

TABLE 3

FREQUENCY OF SAMPLING FOR SURFACE WATERS

All quality parameters	Ephemeral channels	At each observed runoff event; at least five or six moderate- to high-intensity storms per year
	SCS Reservoir; De Weese Dye Irrigation Ditch; Unnamed storage pond; Pool below toe of SCS Reservoir.	Monthly for one year

NOTE: At the end of one year, the data will be reviewed and recommendations made on changes in water quality parameters or frequency of sampling.



Wahler Associates

LOCATION MAP

REFERENCE: USGS QUADRANGLE: PUEBLO, COLORADO (1954).

FIGURE: 1

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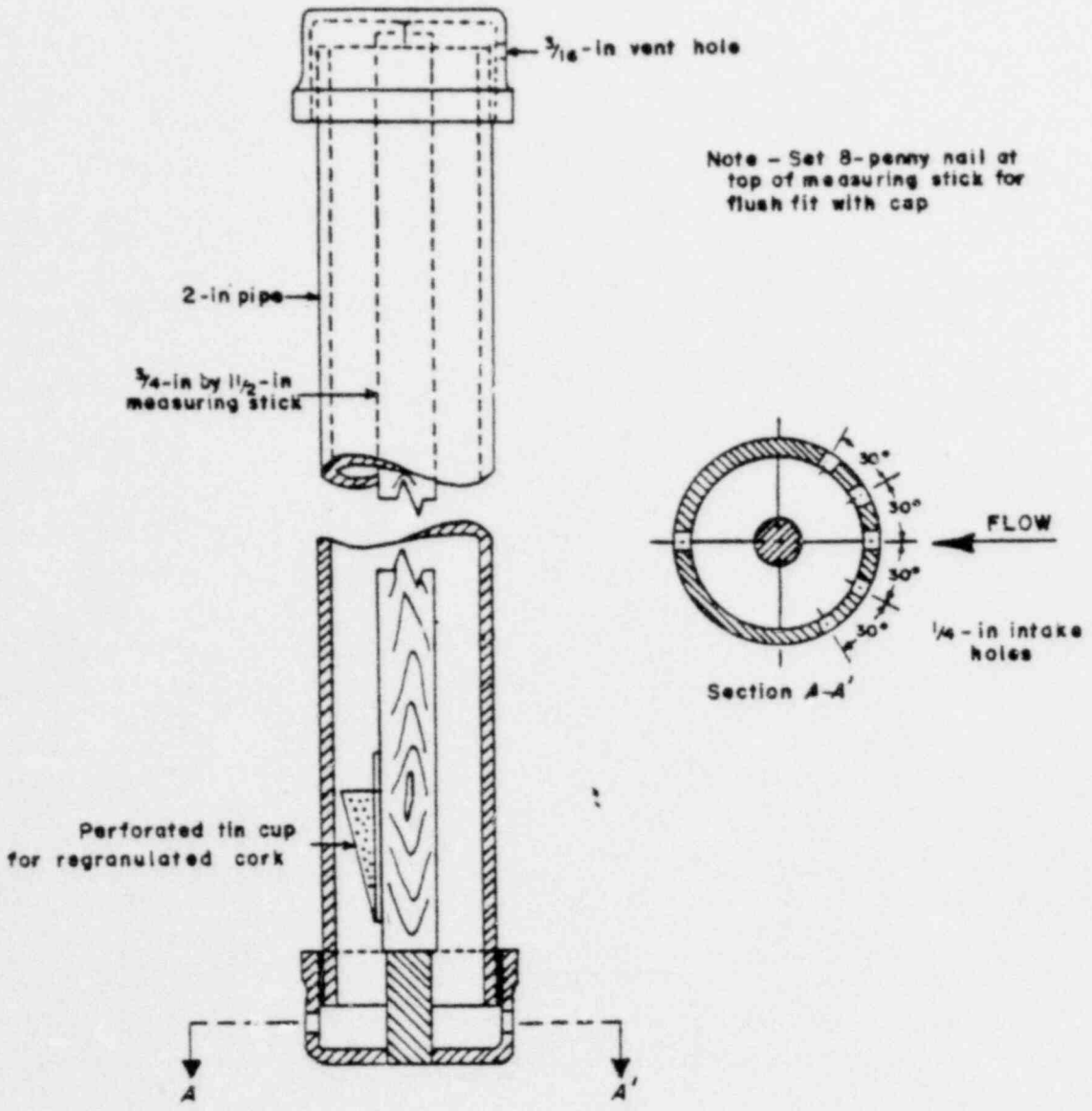

REFERENCE: U.S. GEOLOGICAL SURVEY, 1968, STAGE MEASUREMENT AT GAGING STATIONS, TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS, CHAPTER A7, BOOK 3, U.S. GOVERNMENT PRINTING OFFICE, WASHINGTON, 1968.

Wahler Associates	USGS CREST-STAGE GAGE DESIGN DETAILS	FIGURE: 3

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