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# POTABLE WATERS

GOVERNMENT

## DOCUMENTS

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## HEARING

BEFORE THE

### COMMITTEE ON COMMERCE

### UNITED STATES SENATE

NINETY-SECOND CONGRESS

SECOND SESSION

ON

### Amendment 410 to S. 1478


TO AMEND THE FEDERAL HAZARDOUS SUBSTANCES ACT, AS  
AMENDED, AND FOR OTHER PURPOSES

MARCH 20, 1972

Serial No. 92-57

Printed for the use of the Committee on Commerce

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GOVERNMENT

THE GOVERNMENT OF THE STATE OF TEXAS  
COMMISSIONERS OF THE GENERAL LAND OFFICE

REPORT OF THE COMMISSIONERS OF THE GENERAL LAND OFFICE

FOR THE YEAR ENDING DECEMBER 31, 1907  
THE GENERAL LAND OFFICE HAS THE HONOR TO REPORT TO THE COMMISSIONERS OF THE GENERAL LAND OFFICE THAT THE LANDS BELONGING TO THE STATE OF TEXAS ARE AS FOLLOWS: ...

... THE LANDS BELONGING TO THE STATE OF TEXAS ARE AS FOLLOWS: ...

... THE LANDS BELONGING TO THE STATE OF TEXAS ARE AS FOLLOWS: ...

## POTABLE WATERS

MONDAY, MARCH 20, 1972

U.S. SENATE,  
COMMITTEE ON COMMERCE,  
*Washington, D.C.*

The committee met at 10:05 a.m., pursuant to notice, in room 5110, New Senate Office Building, Hon. William B. Spong, Jr., presiding.  
Present: Senators Moss and Spong.

### OPENING STATEMENT BY SENATOR SPONG

Senator SPONG. The hearing will come to order.

This morning the subcommittee on the environment will examine the need to strengthen the Federal regulation of drinking water.

Senator Hart normally occupies this chair during subcommittee hearings. For the purposes of today's activities, however, he has relinquished the chair. I regret that he cannot be here.

The subject of drinking water is a facet of environmental quality which has, for the most part, escaped public and governmental scrutiny. As we will learn later on this morning, our present concern has been much too long in coming.

In mid-1970, what is now the Water Supply Programs Division of the Environmental Protection Agency completed a study of 969 drinking water supply systems. The results were alarming.

Forty-one percent of the systems failed one or more of the recommended or mandatory limits for contaminants. Three-quarters of the operators of treatment plants were improperly trained, and state programs of surveillance and control were found to be weak.

In short, to quote Mr. Ruckelshaus of the EPA in hearings before the House last year, ". . . the study pointed out that some state and local governments are not giving adequate attention to the job of supplying safe drinking water to their citizens."

The study was published in July of 1970 and Mr. Ruckelshaus' statement before Mr. Rogers' House subcommittee occurred last May. At that time, Mr. Ruckelshaus stated that the EPA could not support legislation, but that the Agency was identifying what changes would be necessary in the Federal program.

We will be most pleased to learn of the progress of those studies and what recommendations EPA now has to give us.

Staff member assigned to this hearing: Michael B. Brownlee.

(The amendment to S. 1478 follows:)

92<sup>D</sup> CONGRESS  
1<sup>ST</sup> SESSION

# S. 1478

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IN THE SENATE OF THE UNITED STATES

AUGUST 6, 1971

Referred to the Committee on Commerce and ordered to be printed

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## AMENDMENT

Intended to be proposed by Mr. HART (for himself and Mr. MAGNUSON) to S. 1478, a bill to amend the Federal Hazardous Substances Act, as amended, and for other purposes, viz: On page 27, line 6, insert the following:

- 1           **TITLE III—POTABLE SUBSTANCES**
- 2   **DECLARATION OF FINDINGS AND STATEMENT OF PURPOSE**
- 3       **SEC. 301. (a) The Congress finds—**
- 4           (1) that increasing quantities and types of pesti-
- 5       cides, organic chemicals, toxic chemicals, toxic metals,
- 6       and other contaminants are entering the public water
- 7       systems that serve as sources which supply the Nation
- 8       with water for drinking, recreation, and other human
- 9       uses; that many of these new contaminants are either not
- 10      detected or not removed by established water testing and
- Amdt. No. 410**

1 treatment methods; and that these contaminants are con-  
2 sumed by the public or otherwise come into contact with  
3 the public thereby presenting a potential hazard to the  
4 public health;

5 (2) that the public should be provided with ade-  
6 quate quantities of water that is safe for drinking, rec-  
7 reation, and other human uses;

8 (3) that due to the interstate nature of many water  
9 supplies and natural sources, the origins of various con-  
10 taminants, the sale and shipment of such contaminants  
11 or products made through the use or production of such  
12 contaminants through interstate commerce, and the  
13 danger to the public of consuming water or of otherwise  
14 coming into contact with water containing such con-  
15 taminants, the Federal Government has the responsi-  
16 bility of establishing minimum national water hygiene  
17 standards (hereinafter called standards) in order to en-  
18 courage State and local governments in the promulga-  
19 tion and enforcement of equivalent standards; and

20 (4) that State and local governments are in need  
21 of assistance in supplying the quality of water required  
22 for drinking, recreation, and other human uses, and to  
23 that end the Federal Government should supply techni-  
24 cal assistance, research and development information,  
25 testing information, assistance for the planning and im-

1        plementation of comprehensive State water hygiene  
2        programs, assistance for the development and demon-  
3        stration of new or improved methods of making water  
4        safe for drinking, recreation, and other human uses, and  
5        assistance for the training of individuals involved in the  
6        public health aspects of our Nation's raw water sources,  
7        water treatment works, and distribution system up to  
8        the free flowing tap of the consumer.

9        (b) The purposes of this title are—

10        (1) to assure that the public will be provided with  
11        water that is safe for drinking, recreation, and other  
12        human uses;

13        (2) to initiate and accelerate a national research  
14        and development program to achieve a high level of  
15        safety and adequacy in public drinking water supplies  
16        of the Nation;

17        (3) to establish minimum national water hygiene  
18        standards and national drinking water standards, and to  
19        recognize that the implementation and enforcement of  
20        such standards should be the primary responsibility of  
21        State and local governments; and

22        (4) to provide financial and technical assistance  
23        to State, regional, and local governments in connection  
24        with the planning, development, and operation of com-  
25        prehensive water hygiene programs; to provide grants

1 for demonstration and development of new or improved  
2 methods of making water safe for drinking, recreation,  
3 and other human uses; and to provide for the training  
4 of individuals involved in the public health aspects of  
5 our Nation's raw water sources, treatment and purifica-  
6 tion works, and distribution system up to the free flowing  
7 tap in order to assure that such personnel are compe-  
8 tently and adequately trained.

9 PUBLICATION OF STANDARDS

10 SEC. 302. (a) Within ninety days after the date of  
11 enactment of this section, the Administrator of the Environ-  
12 mental Protection Agency hereafter referred to in this section  
13 as the "Administrator"), shall publish proposed national  
14 drinking water standards which shall prescribe the minimum  
15 quality of water allowable for drinking which can exist in  
16 any public water system in the United States, and shall pub-  
17 lish the maximum permissible levels for any chemical, bio-  
18 logical, physical, radiological, or other contaminants which  
19 have been or may be found within such water. Such standards  
20 shall pertain to all features of the water supply (including  
21 but not limited to the raw water source, the treatment works,  
22 and the storage and distribution system up to the free flowing  
23 tap, and the adequate construction, maintenance, and oper-  
24 ation thereof) and shall include any substance or matter  
25 which may cause or transmit infectious disease, chemical poi-

1 soning, chronic disease, or other physical impairment to  
2 man which has or may have any other effect on the public  
3 health or which may affect the esthetic appearance, odor,  
4 or taste of such water. In establishing such standards, the  
5 Administrator shall take into consideration the recommenda-  
6 tions of the National Water Hygiene Advisory Council estab-  
7 lished under subsection (j) of this section.

#### 8 National Water Hygiene Standards

9 (b) Within ninety days after the date of enactment  
10 of this section the Administrator shall publish proposed regu-  
11 lations and standards relating to bacteria, viruses, caustic  
12 agents, or any other organic or inorganic substances which  
13 are hazardous or may be potentially hazardous to the public  
14 health in the lakes, rivers, streams, bays, inlets, or other  
15 inland and coastal waters of the United States which supply  
16 water for drinking, recreation, or any other activity where  
17 man comes into direct physical contact with such water, or  
18 which act as conduits of any food source for human consump-  
19 tion. Such standards shall be for the purpose of insuring that  
20 adequate quantities of safe and esthetic water for drinking,  
21 recreation, and other human uses are provided to the public.  
22 Such standards shall pertain to all substances or contaminants  
23 (including but not limited to chemical, biological, physical,  
24 and radiological contaminants) which may cause or transmit  
25 infectious disease, chemical poisoning, chronic disease, or





1 or between two States is below or fails to comply with any  
2 standards or regulations promulgated under the provisions  
3 of this section, or if the Administrator determines that any  
4 State or interstate agency has not provided for adequate  
5 enforcement procedures for requiring minimum compliance  
6 with such standards and regulations, the Administrator shall  
7 notify the affected State or States, persons not in compliance,  
8 and other interested parties of such failure to comply with  
9 Federal standards, regulations, or procedures. If a State so  
10 notified, fails to take remedial action within a period of thirty  
11 days after the date of the notification by the Administrator,  
12 subject to additional extensions not to exceed ninety days  
13 when determined by the Secretary to be in the public interest  
14 and so published, the Administrator may request the Attor-  
15 ney General of the United States to bring a suit on behalf  
16 of the United States in the appropriate United States district  
17 court to require compliance with such standards, regulations,  
18 or procedures. The court, giving due consideration to the  
19 practicability and to the technological and economic feasi-  
20 bility of complying with such standards, regulations, and  
21 procedures, shall have jurisdiction to enter such judgment as  
22 the public interest and the equities of the case may require.  
23 In the case of any person who is notified by the Adminis-  
24 trator of remedial action to be taken to comply with such  
25 standards, regulations, or procedures and who fails to take

1 such action within the time specified by the Administrator,  
2 the court may also assess a penalty up to \$1,000 for each day  
3 of violation after the end of such specified time. In determin-  
4 ing the amount of such penalty, the court shall take into ac-  
5 count the efforts of the defendant to comply with such  
6 standards, regulations, or procedures in question.

#### 7 Court Jurisdiction

8 (g) The district courts of the United States shall have  
9 jurisdiction to restrain violations of this section. Actions to  
10 restrain violations shall be brought by, and in, the name of  
11 the United States in the district court of the United States  
12 for any district in which such person is found or resides or  
13 transacts business. Upon application by the United States  
14 and after notice to such person, the district court shall have  
15 jurisdiction to issue an order requiring such person to appear  
16 and give testimony or to appear and produce documents,  
17 and any failure to obey such order of the court may be pun-  
18 ished by such court as a contempt thereof.

#### 19 Abatement of Dangerous Water

20 (h) When the Administrator finds after investigation  
21 that a raw water source or a public water system is con-  
22 taminated to an extent dangerous to the health and welfare of  
23 the users of that water, and that the procedures outlined in  
24 subsections (c)-(g) of this section would not be adequate

1 to protect the users from that danger because of the im-  
2 mediacy of that danger, he shall have authority to take such  
3 actions and to make such regulations as he may deem neces-  
4 sary and proper in order to secure the health and welfare of  
5 the users of that contaminated water, including, but not  
6 limited to, the issuance of a public order requiring the im-  
7 mediate abatement of use of that contaminated water.

#### 8 Records

9 (i) Every department, agency, and instrumentality  
10 of the Federal Government and of a State, of any interstate  
11 agency, or of any privately owned water delivery system,  
12 and every person applying for or receiving assistance under  
13 this section shall establish and maintain such records, make  
14 such reports, and provide such information as the Admin-  
15 istrator may reasonably require to assist him in establishing  
16 such standards and regulations under this section and in  
17 determining whether such department, agency, instrumen-  
18 tality, or person has acted or is acting in compliance with  
19 this section. Officers or employees duly designated by the  
20 Administrator, upon presenting appropriate credentials and  
21 a written notice to the appropriate department, agency, in-  
22 strumentality, or person in charge, is authorized to enter any  
23 establishment or facility or other property of such depart-  
24 ment, agency, instrumentality, or person in order to deter-  
25 mine whether such department, agency, instrumentality, or

1 person has acted or is acting in compliance with this sec-  
2 tion including for this purpose, inspection, at reasonable  
3 times, of records, files, papers, processes, controls, and facili-  
4 ties, and for the purpose of testing any raw water source or  
5 other feature of the public water systems. A separate notice  
6 shall be given for each such inspection, but a notice shall  
7 not be required for each entry made during the period cov-  
8 ered by the inspection. Each such inspection shall be com-  
9 menced and completed with a reasonable promptness. All  
10 information reported to, or otherwise obtained by, the  
11 Administrator, or his representative, pursuant to this sub-  
12 section which contains or relates to a trade secret or other  
13 matter referred to in section 1905 of title 18 of the United  
14 States Code shall be considered confidential for the purpose  
15 of that section, except that such information may be dis-  
16 closed to other officers or employees concerned with carrying  
17 out the provisions of this section.

18 National Water Hygiene Advisory Council

19 (j) (1) There is hereby established a National Water  
20 Hygiene Advisory Council (hereafter referred to in this sec-  
21 tion as the "Council") which shall consist of fifteen members  
22 appointed without regard to the civil service laws by the Ad-  
23 ministrator. The fifteen appointed members of the Council  
24 shall be selected from among members of various State, inter-  
25 state, regional, and local government agencies, of public or

1 private interests contributing to, affected by, or concerned  
2 with the quality and quantity of water for drinking, recrea-  
3 tion, and other human uses, and of other public and private  
4 agencies, universities, organizations, or groups demonstrat-  
5 ing an active interest in the field of water hygiene and pub-  
6 lic water supply, as well as other persons who have demon-  
7 strated an expertise in the area of water quality and quan-  
8 tity. Three members shall be appointed from the general  
9 public; three members shall be appointed from appropriate  
10 State and local agencies concerned with water hygiene and  
11 public water supply; and three members shall be appointed  
12 from representatives of private organizations or groups dem-  
13 onstrating an active interest in the field of water hygiene  
14 and public water supply. Each appointed member of the  
15 Council shall hold office for a term of three years, except  
16 that—

17 (A) any member appointed to fill a vacancy oc-  
18 ccurring prior to the expiration of the term for which  
19 his predecessor was appointed shall be appointed for  
20 the remainder of such term; and

21 “(B) the terms of the members first taking office  
22 shall expire as follows: Five shall expire three years  
23 after such date, five shall expire two years after such  
24 date, and five shall expire one year after such date, as

1 designated by the Administrator at the time of appoint-  
2 ment. The appointed members of the Council shall be  
3 eligible for reappointment.

4 (2) The Council shall advise, consult with, and make  
5 recommendations to the Administrator on matters relating  
6 to activities, functions, and policies of the Environmental  
7 Protection Agency (hereafter referred to in this section as  
8 the "Agency") in the field of hygienic water quality and  
9 quantity control pursuant to this section. The Administrator  
10 is authorized to utilize the services of any member or mem-  
11 bers of the Council, in connection with matters relating to  
12 the work of the Agency in the field of water quality and  
13 quantity control, for such periods, as he may determine.

14 (3) Members of the Council appointed under this  
15 section shall, while attending meetings or conferences of such  
16 Council or otherwise engaged in business of such Council,  
17 receive compensation and allowances at a rate to be fixed by  
18 the Administrator, but not exceeding \$100 per diem, in-  
19 cluding traveltime, and while away from their homes or  
20 regular places of business they may be allowed travel ex-  
21 penses, including per diem in lieu of subsistence, as au-  
22 thorized by section 5704 of title 5, United States Code, for  
23 persons in the Government service employed intermittently.  
24 Research, Technical Assistance, Information, Training of

## Personnel

1  
2 (k) (1) The Administrator shall conduct in the  
3 Agency, and encourage, cooperate with, and render finan-  
4 cial, technical, and other assistance to other appropriate  
5 public authorities, institutions, and individuals in the conduct  
6 of, and promote the coordination of, applied and theoretical  
7 research, investigations, experiments, demonstrations, and  
8 studies relating to the causes, diagnosis, treatment, control,  
9 and prevention of physical and mental diseases and impair-  
10 ments of man resulting directly or indirectly from contami-  
11 nants in water or to the provision of the adequate quality  
12 and quantity of water that is safe for drinking, recreation,  
13 and other human uses, including—

14 (A) improved methods and procedures to identify  
15 and measure the existence of pesticides, toxic metals,  
16 organic chemicals, radioactive substances, bacteria,  
17 viruses, and other contaminants in water used for drink-  
18 ing, recreation, and other human uses;

19 (B) improved methods and procedures to identify  
20 and measure the health effects of pesticides, toxic metals,  
21 organic chemicals, radioactive substances, bacteria,  
22 viruses, and other contaminants in water used for drink-  
23 ing, recreation, and other human uses;

24 (C) new methods of treating raw water to pre-  
25 pare it for drinking, so as to improve the efficiency of

1 water treatment and to remove contaminants from the  
2 water including biological or radioactive substances,  
3 pesticides, organic chemicals, toxic metals, and other  
4 potentially harmful substances; and

5 (D) improved methods for, and approaches to,  
6 providing adequate quantities of safe water for drinking,  
7 recreation, and other human uses to the public, including  
8 but not limited to improvements in water purification  
9 and distribution, sewage treatment, water pollution  
10 abatement techniques, and methods of assessing the  
11 health related hazards of other characteristics of water  
12 supplies.

13 (2) The Administrator shall cause to be conducted  
14 research dealing with the identification of contaminants found  
15 in water used for drinking, an assessment of the maximum  
16 safe limits of such contaminants, methods of detection of such  
17 contaminants which could be employed by State and local  
18 health and water officials, methods of eliminating such con-  
19 taminants, the identification of the sources of such contami-  
20 nants, and other matter consistent with the purposes of this  
21 section.

22 (3) In carrying out this section, the Administrator is  
23 authorized to—

24 (A) collect and make available, through publica-  
25 tions and other appropriate means, information per-

1 taining to, and the results of, research, investigations,  
2 and demonstrations with respect to providing adequate  
3 quality and quantity of water for drinking, together with  
4 appropriate recommendations in connection therewith;

5 (B) make available research facilities of the  
6 Agency to appropriate public authorities, institutions,  
7 and individuals engaged in special study;

8 (C) make available funds to assist public au-  
9 thorities (including water hygiene agencies), institu-  
10 tions, and individuals in the conduct of research in such  
11 instances and amounts which the Administrator deter-  
12 mines will promote the purposes of this section; and

13 (D) to make grants to, and contracts with, any  
14 State or interstate agency, municipality, educational in-  
15 stitution, and any other organization, in accordance with  
16 procedures prescribed by the Administrator, which may  
17 be made to pay all or a part of the costs, as may be de-  
18 termined by the Administrator, of any project which is  
19 designed—

20 (i) to develop, expand, or carry out a pro-  
21 gram (which may combine training, education, and  
22 employment) for training persons for occupations  
23 involving the public health aspects of raw water  
24 sources, water treatment and purification works, and  
25 distribution systems up to the free flowing tap; or

1           (ii) to train instructors and supervisory per-  
2           sonnel to train or supervise persons in occupations  
3           involving the public health aspects of raw water  
4           sources, water treatment and purification works,  
5           and distribution systems up to the free flowing tap.

6           (4) There is authorized to be appropriated to carry out  
7           the provisions of this section \$20,000,000 for the fiscal year  
8           ending June 30, 1972; \$30,000,000 for the fiscal year end-  
9           ing June 30, 1973; and \$40,000,000 for the fiscal year end-  
10          ing June 30, 1974. Sums appropriated pursuant to this sub-  
11          section shall remain available for obligation through the  
12          close of the next fiscal year.

13           Special Study and Demonstration Project Grants

14          (1) (1) The Administrator is authorized to make  
15          grants to any State, municipality, interstate agency, private  
16          or public nonprofit institution, or person for the purposes of—

17           (A) assisting in the development and demonstra-  
18           tion of any project which will demonstrate a new or im-  
19           proved method, approach, or technology for providing a  
20           safe supply of water to the public in both urban and  
21           rural areas of the Nation for drinking, recreation, and  
22           other human uses; and

23           (B) assisting in the development and demonstra-  
24           tion of any project which will investigate and demon-

1 strate health implications involved in the reclamation,  
2 recycling, and reuse of waste waters for drinking, recre-  
3 ation, and other human uses, and the processes and  
4 methods for the safe and esthetic preparation of such  
5 waters.

6 (2) Grants made by the Administrator under this  
7 subsection shall be subject to the following limitations:

8 (A) Grants under this subsection shall not exceed  
9  $66\frac{2}{3}$  per centum of the total estimated costs of con-  
10 struction of any facility and 75 per centum of the costs of  
11 any other project as determined by the Administrator.

12 (B) Grants under this subsection shall not be  
13 made for any project involving the construction of any  
14 facilities or altering any facilities in any public water  
15 system or raw water source in a State unless such project  
16 shall have been approved by the appropriate State water  
17 hygiene agency.

18 (C) Grants under this subsection shall not be  
19 made for any project unless the Administrator deter-  
20 mines, after consulting the National Water Hygiene  
21 Advisory Council for their recommendations as provided  
22 by subsection (j) of this section, that such project will  
23 serve a useful purpose relating to the development and  
24 demonstration of new or improved techniques, methods,

1 or technologies for the provision of safe water to the pub-  
2 lic for drinking, recreation, and other human uses.

3 (3) For the purposes of this subsection there are  
4 hereby authorized to be appropriated \$10,000,000 for the  
5 fiscal year ending June 30, 1972; \$15,000,000 for the fiscal  
6 year ending June 30, 1973; and \$20,000,000 for the fiscal  
7 year ending June 30, 1974. Sums appropriated pursuant to  
8 this subsection shall remain available for obligation through  
9 the close of the next fiscal year.

10 Planning and Improvement Grants for State Water

11 Hygiene Programs

12 (m) (1) The Administrator is authorized to make  
13 grants to State water hygiene agencies and interstate water  
14 hygiene agencies in an amount not to exceed 75 per centum  
15 of the cost of planning, developing, establishing, and im-  
16 proving public and private water supply facilities and raw  
17 water sources in order to provide safe water to the public  
18 for drinking, recreation, and other human uses.

19 (2) The Administrator is authorized to make grants  
20 to State water hygiene agencies and interstate water hygiene  
21 agencies in an amount not to exceed 50 per centum of the  
22 cost of maintaining and operating programs for the planning  
23 and improvement of public and private water supply facilities

1 and raw water sources in order to provide safe water to the  
2 public for drinking, recreation, and other human uses.

3 (3) A grant under this subsection may be made only  
4 if the Administrator determines that a State or interstate  
5 plan, submitted to the Administrator, conforms to the  
6 following:

7 (A) The plan must provide for the administration  
8 or for the supervision of administration of the plan by  
9 the State water hygiene agency, or, in the case of a plan  
10 submitted by an interstate agency, by such interstate  
11 agency.

12 (B) The plan must provide that such agency  
13 will make such reports, in such form and containing  
14 such information, as the Administrator may from time  
15 to time require to carry out his functions under this sub-  
16 section.

17 (C) The plan must set forth the procedures,  
18 policies, and methods to be followed in carrying out  
19 and administering the State and interstate plan.

20 (D) The plan shall provide for the expansion or  
21 improvement of the State or interstate program for the  
22 provision of safe water to the public for drinking, rec-  
23 reation, and other human uses.

24 (E) The plan shall provide for such fiscal-control  
25 and fund-accounting procedures as may be necessary

1 to assure proper disbursement of and accounting for  
2 funds paid to the Agency under this subsection.

3 (4) The Administrator may from time to time pre-  
4 scribe such terms and conditions for grants to State and  
5 interstate water hygiene agencies as he may find necessary  
6 to carry out the purpose of this subsection.

7 (5) The Administrator, within ninety days after the  
8 date of enactment of this section shall promulgate regulations  
9 establishing a procedure for awarding grants under this sub-  
10 section which—

11 (A) provides that projects will be carried out in  
12 communities of varying sizes, under such conditions as  
13 will assist in solving the community water supply and  
14 raw water source problems of urban-industrial centers,  
15 metropolitan regions, and rural areas, under representa-  
16 tive geographic and environmental conditions; and

17 (B) provides deadlines for submission of, and  
18 action on, grant requests.

19 (6) In making considerations and establishing regula-  
20 tions for grants under this subsection, the Administrator  
21 shall, so far as practicable, give due consideration to the  
22 extent of the population served, the extent of the actual or  
23 potential water hygiene problem, and the financial need of  
24 the respective State or interstate agency.

25 (7) No State or interstate agency shall receive any

1 grant under this subsection during any fiscal year when its  
2 expenditures of non-Federal funds for other than nonrecur-  
3 rent expenditures for water hygiene programs will be less  
4 than its expenditures were for such programs during the pre-  
5 ceding fiscal year; and no State nor interstate agency shall  
6 receive any grant under this subsection with respect to the  
7 maintenance and operation of a program for water hygiene  
8 unless the Administrator is satisfied that such grant will be  
9 used to supplement and, to the extent practicable, increase  
10 the level of State, local, and other non-Federal funds that  
11 would, in the absence of such grant, be made available for  
12 the maintenance or operation of such program, and will in no  
13 event supplant such State, local, or other non-Federal funds.

14 (8) Not more than 10 per centum of the total funds  
15 appropriated under this subsection shall be granted for the  
16 water hygiene programs in any one State. In the case of a  
17 grant for a program in an area crossing two or more State  
18 boundaries, the Administrator shall determine the portion  
19 of such grant that is chargeable to the percentage limitation  
20 under this paragraph for each State into which such area  
21 extends.

22 (9) There is hereby authorized to be appropriated to  
23 carry out the provisions of this subsection: \$15,000,000 for  
24 the fiscal year ending June 30, 1972; \$20,000,000 for the  
25 fiscal year ending June 30, 1973; and \$30,000,000 for the

1 fiscal year ending June 30, 1974. Sums appropriated pur-  
2 suant to this subsection shall remain available for obligation  
3 through the close of the next fiscal year.

#### 4 Interstate Cooperation

5 (n) (1) In recognizing that providing water for drink-  
6 ing, recreation, and other human uses to the public is a  
7 responsibility of State and local governments, and further  
8 recognizing that State and local governments are best able  
9 to implement and enforce water hygiene standards in order  
10 to insure a supply of safe water, the Administrator shall  
11 encourage cooperative activities by the States and by local  
12 governmental units for the provision of hygienic water which  
13 is at least equal to or is stricter than the national water hy-  
14 giene standards and the national drinking water standards.

15 (2) The Administrator shall, in cooperation with the  
16 appropriate water hygiene agencies of the States, assure  
17 that all public water systems provide water for drinking,  
18 recreation, and other human uses which is equal to or stricter  
19 than national standards.

20 (3) The Administrator shall draw on the expertise of  
21 State water hygiene agencies to amend and update stand-  
22 ards as may be necessary.

23 (4) The Administrator shall work closely with the  
24 various water hygiene agencies to provide them with in-  
25 formation and technical assistance to facilitate the providing

1 of water for drinking, recreation, and other human uses  
2 which conform with national standards.

3 Water Supplies and Raw Water Sources Owned and  
4 Operated by Federal Installations

5 (o) It is hereby declared to be the intent of the Con-  
6 gress that any Federal department or agency having juris-  
7 diction over any building, installation, or other property,  
8 which is or will be served by a federally owned or main-  
9 tained drinking water supply or raw water source, shall,  
10 insofar as practicable and consistent with the interests of the  
11 United States, cooperate with the Administrator and with  
12 any State or interstate water hygiene agency in complying  
13 with all applicable State and local government drinking and  
14 other water hygiene standards, regulations, and requirements  
15 and in complying with all applicable Federal water hygiene  
16 and drinking water standards, regulations, and requirements.

17 Administrative Regulations

18 (p) (1) The Administrator is authorized to prescribe  
19 such regulations as are necessary to carry out his functions  
20 under this section.

21 (2) The Administrator, with the consent of the head  
22 of any other agency of the United States, may utilize such  
23 officers and employees of such agency as he deems necessary  
24 to assist him in carrying out the purposes of this section.

1           (3) There are hereby authorized to be appropriated  
2 to the Administrator such sums as may be necessary to  
3 enable him to carry out the functions of the Agency under  
4 this section other than those provided under subsections  
5 (k), (l), and (m) of this section.

6           (4) Upon the request of a State or interstate water  
7 hygiene agency, the Administrator may assign personnel of  
8 the Agency to such agency for the purposes of carrying out  
9 the provisions of this section.

10          (5) The Administrator may make payments of grants  
11 under this section (after necessary adjustment on account  
12 of previously made underpayments) in advance or by way  
13 of reimbursement, and in such installments and on such  
14 conditions as he may determine.

15          (6) The Administrator shall take such action as may  
16 be necessary to assure compliance with provisions of the  
17 Act of March 3, 1931, as amended, known as the Davis-  
18 Bacon Act (46 Stat. 1494; 40 U.S.C. 276a-276a (5) ). The  
19 Secretary of Labor shall have, with respect to the labor  
20 standards specified in this paragraph, the authority and  
21 functions set forth in Reorganization Plan Numbered 14 of  
22 1950 (15 F.R. 3176; 64 Stat. 1267) and section 2 of the  
23 Act of June 13, 1934, as amended (48 Stat. 948; 40 U.S.C.  
24 276c).

## Office of Water Hygiene

1  
2 (q) The Administrator shall establish within the En-  
3 vironmental Protection Agency an Office of Water Hygiene  
4 whose responsibility it shall be to carry out the purposes  
5 of this section.

## Definitions

6  
7 (r) As used in this section—

8 (1) The term “Administrator” means the Administrator  
9 of the Environmental Protection Agency;

10 (2) The term “Agency” means the Environmental  
11 Protection Agency;

12 (3) The term “municipality” means a city, town,  
13 borough, county, parish, district, or other public body created  
14 by or pursuant to State law;

15 (4) The term “person” includes a corporation, com-  
16 pany, association, firm, partnership, society, joint stock com-  
17 pany, individual, municipality, and any political subdivision  
18 of a State;

19 (5) The term “water hygiene agency” with respect to  
20 any State means the State health authority, except that in  
21 the case of any State in which there is a State agency other  
22 than the State health authority charged with the responsibil-  
23 ity for water hygiene, it means such other State agency;

24 (6) The term “State” means a State, the District of  
25 Columbia, the Commonwealth of Puerto Rico, the Virgin  
26 Islands, Guam, and American Samoa;



Senator Spone. With that said, let me welcome Mr. Robert Fri, Deputy Administrator of the Environmental Protection Agency. I understand that Mr. Fri will be accompanied by Mr. James McDermott, who is Director of the Water Supply Programs Division of EPA.

Good morning, gentlemen.

**STATEMENT OF ROBERT W. FRI, DEPUTY ADMINISTRATOR OF THE ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.; ACCOMPANIED BY JAMES H. McDERMOTT, DIRECTOR, WATER SUPPLY PROGRAMS DIVISION**

Mr. FRI. Good morning, Mr. Chairman. James McDermott is on my left.

I am pleased to have the opportunity to appear before this committee to testify on EPA's program for the protection of drinking water and to discuss amendment 410 to S. 1478, the proposal relating to that program.

Mr. Chairman, with your permission, I will read this statement and in the interest of focusing on particular aspects, I will make some amendments as I go.

The Federal Government's responsibility for protecting drinking water is centered in the Environmental Protection Agency, which inherited this authority from the Department of Health, Education, and Welfare in 1970.

Historically, this program has been based on the Federal responsibility for preventing the spread of communicable diseases in interstate commerce, pursuant to the Public Health Service Act.

Under this Act, EPA enforces regulations which preclude interstate carriers from utilizing water from sources which have not complied with certain required drinking water standards.

Regulations adopted under that authority are used to enforce standards for those systems which serve interstate carriers; presently, this enforcement authority applies to only 665 out of an estimated 30,000 public water supply systems serving both large cities and small towns and applies only as such water is used by interstate carriers.

Under that authority drinking water standards have been established. These U.S. Public Health service standards, last revised in 1962, contain certain mandatory limits as well as recommended limits concerning physical characteristics and chemical and biological constituents affecting the quality of the water. Our regulations concerning drinking water also deal with requirements for effective control programs to limit the future risk potential or of structural or operational defects of water supply systems.

Violation of the mandatory aspects of the standards lead to prohibition of the use by interstate carriers of water drawn from that system pending the application of additional treatment or the development of an additional drinking water source.

The standards impose these mandatory limits on levels of coliform bacteria, arsenic, barium, cadmium, chromium, cyanide, lead, flou-

ride, selenium, and silver intake which can clearly affect the health of the user.

In addition, the standards recommend limits on certain physical characteristics and chemical constituents of drinking water which are primarily of aesthetic concern in that they impart undesirable taste and odors to the water, cause discoloration of plumbing fixtures and the like.

Since the jurisdiction of our existing program is limited to those water supply systems serving interstate carriers, our enforcement covers only half of the 160 million people served by community water supply systems. We would point out, however, that most large cities and the States use the standards in regulating the quality of their drinking water supplies.

Mr. Chairman, you have summarized the problem quite accurately in your opening statement. Let me simply reiterate some of the findings of our studies.

An extrapolation of the community water supply study, a field inspection and evaluation of 969 community water supply systems conducted by HEW in 1970, indicated that approximately 5.4 percent of the national population or 8 million people are served water that is potentially dangerous in that it fails to meet the mandatory standards set by the Federal Government.

These 8 million people receive unsafe water from an estimated 5,000 of the Nation's community water supply systems surveyed in the community water supply study. In the majority of cases these deficient systems are smaller systems serving smaller communities.

In terms of public health impact, the national health figures indicate that during the 10-year period from 1961 to 1970, there were at least 128 known outbreaks of diseases or poisoning attributed to drinking water.

As important as the current safety of this country's water supply system is, the fact remains, that many of our Nations water supply systems are subject to potential problems because individual systems contain structural or operational defects, because they are manned by improperly trained personnel, and because many State and local control programs are inadequate.

From this brief description of where we stand today, several deficiencies clearly emerge in the overall national approach to providing safe public drinking water supplies. First, the application of federally enforceable standards is not broad enough to cover all community water systems. Second, State and local control programs, because of deficiencies in their planning, training, and enforcement activities, are not providing adequate regulation of local water supply systems. Finally, from a reliability standpoint, many of the systems themselves are not capable of delivering drinking water of acceptable quality on a continuing basis because of their lack of adequate facilities and sufficient numbers of trained personnel.

We believe the major responsibility for correcting these problems must remain on the State and local level. However, in view of the shortcomings which we have found in our studies, and which we have enumerated for you today, we have concluded that Federal legislation is needed to address certain aspects of the overall situa-

tion. As a result, we are recommending to the committee what we believe to be the essential ingredients for legislation to correct the problems of providing safe, reliable supplies of drinking water.

Such legislation should, in our view, contain the following elements:

1. The Administrator should be authorized to set national drinking water standards, which would be addressed to all health related aspects of drinking water. These standards would limit the chemical, biological, radiological, or other health related contaminants that might appear in drinking water. The standards would also include requirements for the operation and maintenance of water supply systems insofar as necessary to assure achievement of the health related limits I have described. We believe that the setting of such standards should be a Federal responsibility because standards needed to protect public health do not vary with locality and the Federal Government can bring greater resources to assess the complex health and technical aspects involved.

2. The application of such standards should be clearly limited to drinking water supplied, and not to raw water sources. Extending the purview of standards beyond the goal of upgrading the quality of drinking water and supply systems would be a duplication of the provisions of the Federal Water Pollution Control Act, under which standards have already been established and would continue to be established relating to such raw water sources.

3. In addition to the national standards which related to health aspects, we believe that EPA should develop and publish recommended limits relating to other constituents and characteristics affecting drinking water, such as taste, odor, and color. I would emphasize that these would be recommended limits as distinguished from the standards which specify mandatory limits. Such recommended limits are helpful as guidelines for States and localities to set out desirable characteristics for which they should strive for their public drinking water supplies even though a health risk is not involved.

4. The primary enforcement responsibility for drinking water standards, in our opinion, should lie with the States and localities. Federal authority to enforce the drinking water standards should come into play only if the States and local governments fail to act. Primary responsibility for assuring safe drinking water now rests with State and local government, and that is where we are convinced it should remain. The difficulties that we have identified with the national programs of drinking water do not stem from the present roles of respective levels of government but rather from inadequate coverage of enforceable Federal standards and from inadequate State and local programs. The solution of these problems would not, in our opinion, be effected by changing the roles of Federal or State Governments in this area, but by assuring the enforcement of national standards and by strengthening State and local programs. In order for enforcement to be effective, a dual requirement should be included which would provide in cases where substantial adverse health risks are involved for immediate notification first, to State authorities and, through the States, to the Ad-

ministrator and second, and most importantly perhaps, to the users of the water supply system. Such notice should include the extent and nature and possible health effects of such noncompliance with national standards and the remedial measures which will be taken to correct the problem. Additionally, in cases where the State or locality fails to take prompt remedial action, the Administrator should have authority to institute administrative orders as appropriate to regulate the uses of the water supplies in question, prohibit new connections, regulate the source of contamination or prohibit delivery of contaminated water.

5. Each water supply system authority should have to report regularly—at least annually—to the State agency regarding the quality of water delivered. The States should also have to report to the EPA annually regarding the quality of water delivered by each system in the State. Such a reporting system is important because it would provide continuing and pertinent information as to contaminant level, and operation, and maintenance procedures of the individual water supply.

6. States and localities should develop strong programs of surveillance, enforcement, technical assistance, training, and long-range planning. We see a Federal role in this regard directed toward the provision of research and technical assistance in those areas that are beyond the capabilities of the States.

7. Any drinking water legislation should clarify that the Administrator continue to be authorized to promote and conduct research into all aspects of water hygiene. We believe such research is necessary to provide the scientific data and methodology that will enable the Federal, State, and local entities involved in the supplying of drinking water to effectively perform their respective responsibilities.

Mr. Chairman, it appears that many of these elements, which we consider necessary in any Federal drinking water legislation, are provided in Amendment 410 to S. 1478.

Let me depart from my prepared statement at this point, however, to suggest one improvement in that amendment which we think is most important. It seems clear to us that adequate notice of failure of the drinking water supply system to produce water of adequate quality should be provided to both the state agency and the Administrator but more importantly, to the public that uses the drinking water. Therefore, we think that an adequate piece of legislation should contain the following kind of procedure which I have partly alluded to in my prepared remarks.

First of all, it seems to us that there should be Federal standards or regulations for the surveillance or monitoring of water supply systems. These standards would indicate the minimum requirements for the frequency of samples, the constituents to be tested and the like. The water supply system in our judgment should be required on the basis of these samples to notify its users either of the failure of the system to meet those standards, if that is the case, or, if the system does not perform adequate surveillance, of the failure of the system to do the monitoring that is required of it. This requirement would enable the people who use the water to be fully cognizant, not only of the quality of the water that they are drinking, but also

the steps that are being taken by the local system to insure that deviation from the national standards are adequately detected. The data so collected as well as an indication of what notice has been given should be provided in the annual reports to the state agencies and the administration to which I alluded earlier. We believe that this thread of monitoring, notice, and reports is essential to drinking water legislation at the Federal level.

Returning now to the prepared statement, we do have some difficulties with a few aspects of the amendment. We do not believe that program grants as suggested in section 302(m) are necessary or desirable. We prefer that enforceable Federal standards coupled with adequate monitoring requirements would serve to stimulate improved local programs, and it is because we believe so strongly that the public, the individual citizens, should be apprised of the problem that we believe citizen action will require the resources to be mobilized at the state and local level to insure that high quality drinking water is supplied.

Secondly, we feel that the standards published pursuant to section 302(a) of that amendment should not apply to the raw water source of drinking water supply. In the same regard, the "National Water Hygiene Standards" of section 302(b), which relate to various undesirable substances in lakes, rivers, streams, bays, inlets, or other inland and coastal waters are, in our view, an inappropriate requirement. These two provisions are duplicative of, and in possible conflict with, the provisions of the Federal Water Pollution Control Act and its amendments now pending before the Congress. Under that act, water quality standards have been established for various surface waters. Those standards specifically address water to be used as drinking water supply. Multiple inconsistent standards directed to the same end are not only unnecessary, they would in all likelihood thwart both the solution to the drinking water as well as the pollution problem.

We also have some difficulty with section 302(j) of amendment 410 which would establish a "National Water Hygiene Advisory Council." We would prefer not to have such a body created by statute and feel that it would limit the administrative flexibility so necessary to properly perform our responsibilities.

That concludes my prepared statement, Mr. Chairman.

I would be happy to answer any questions that you might have.

Senator SPONG. Thank you very much, Mr. Fri. At hearings last May before Congressman Rogers' House subcommittee, the subject of viruses in drinking water was raised. The record of that hearing reveals that if present in drinking water, viruses could be cause for grave concern, but that the art of detecting them was at a primitive stage. Has our ability to detect viruses increased since last May, and, if so, have you found any viruses in the drinking water supply systems of this country?

Mr. Fri. There has been research work going forward on that subject, Mr. Chairman. I will let Mr. McDermott comment as to the specifics in a moment. It remains difficult to detect viruses. We have done some work on samples with fairly sophisticated equipment which would bring the samples to a central location where that

equipment is available, and we have detected viruses in some water supplies beyond the level which we think we would like to see if we were to set a national standard for viruses.

This is a very important, and as you know, a very difficult and complicated matter of scientific research, one on which we are trying to move forward.

Senator SPONG. I take it your answer to my question would be that the detection methods have improved but very little, and, secondly, that you have found viruses in drinking water supplies?

Mr. FRI. That's right. What we are looking for in detection methods here is a detection method which could be used successfully by 30,000 water supply systems and which hopefully requires a relatively simple and straightforward piece of analytic equipment. To my knowledge, we haven't come up with that simple a piece of equipment. It can be done with more sophisticated, fairly expensive equipment, like electron microscopes.

Senator SPONG. Thank you. Would you now elaborate on what Mr. Fri has said?

Mr. McDERMOTT. Certainly. We have essentially two problems here. The first is the ability to capture a sample of the virus. The second problem is how do you analyze for what we have termed a needle in the haystack, in that we do not really expect substantial concentrations of virus in drinking water.

At the present time there is no operational technique that can be broadly applied to the Nation's water supply systems. As you noted, we are in the process of conducting research to develop the improved techniques, both to capture and to identify viruses. We would emphasize that this is a research project, and we are still in the midst of it.

In fact, we are in the process of redesigning some of our experiments at the present time. But, yes, we have found viruses in drinking water in at least two out of three cities that we have investigated. These are well-run systems, practicing good treatment of water drawn from surface water sources.

Senator SPONG. Are these the systems in Massachusetts that there has been some report about in the press?

Mr. McDERMOTT. Yes, sir. We have looked at two systems in Massachusetts, and one in Connecticut.

In the case of the Connecticut system, we found virus neither in the 10 raw water samples nor in the 10 finished water samples after treatment. In large measure, we suspect this has to do with the excellent raw water quality of the source.

On the other hand, in two communities in Massachusetts, we found five positive samples out of 32 in the distribution system of one community and two positive virus samples out of 32 in a second community or roughly 9 percent of the overall distribution system analysis that we performed.

Senator SPONG. Were these the first discoveries of viruses in treated drinking water in the United States?

Mr. McDERMOTT. This was the first in the United States, to the best of our knowledge, sir. There have been scattered reports overseas on occasions and there have been situations in which viruses

have been identified in well water systems serving restaurants and other types of establishments. However, the scope of our study is quite different. We are investigating community water supply systems supplied by good water treatment plants in the current context of our technology, involving coagulation, sand filtration, and disinfection. Frankly most of our community drinking waters are not treated to this extent. At least half the people of the country are served by ground waters which should not contain virus, unless there has been contamination of the ground water.

Senator SPONG. What are the diseases caused by the viruses that you have discovered?

Mr. McDERMOTT. We have identified three virus families, specifically, echo virus, rheo virus, polio virus in these several systems. There are well over 100 different species of enteric viruses for which one might look. Echo can be involved in diarrhea, flu symptoms, the grippe, vomiting. These symptoms are not unusual. The rheo virus has not been typed as to disease systems, but it is suspect because it is known to be of enteric origin, and in all likelihood it is also contributing to certain levels of disease.

Polio, on the other hand, is quite prevalent in our raw water resources for the simple reason that most people are inoculated with the polio vaccine and subsequently shed virus in their waste. We aren't particularly concerned about the polio in that most people are inoculated, but it does suggest that perhaps the polio virus would be a good indicator organism for monitoring the effectiveness and efficiency of our water treatment processes.

Senator SPONG. How about meningitis?

Mr. McDERMOTT. Yes, viral diseases are involved in several types of meningitis. Certainly infectious hepatitis is also a virus. Unfortunately, we do not know how to identify a hepatitis virus in the laboratory, so we do not know how to look for it in the environment. That would be the other way of answering the question.

Senator SPONG. Are the two communities in Massachusetts where you have found this Billerica and Lawrence?

Mr. McDERMOTT. Yes, sir.

Senator SPONG. On a percentage basis how many people in the United States are exposed to water supplies and treatment similar to the two cities where viruses have been detected?

Mr. McDERMOTT. Approximately half the population or roughly 80 million people are served by community systems that draw upon surface water sources. The very limited data we have at this point would suggest that where the raw water quality is good and effective treatment is being practiced, we need not be too concerned about finding virus in the distribution system. Thus, I would hazard a guess and say perhaps that about 25 percent of the total national population, 40 million people are exposed to circumstances similar to those under investigation in Massachusetts. However, at this point, sir, let me state that, yes, we have found virus but this is a precursor to the epidemiological work needed, to draw the correlation between drinking water quality and the prevalence of virus and disease within the community, as well as to conduct the work on process research to find out how to make existing processes more effec-

tive so we can come up with a documented virus standard. This is not just a question of physical facilities. It could be improvement in the operating procedures through the training of the personnel—the whole quality control program.

Senator SPONG. You have already mentioned that viruses have been found in untreated supplies.

Mr. McDERMOTT. Yes, sir. We have found viruses throughout the aquatic environment wherever we have looked. Approximately 30 percent of the fresh water and salt water samples analyzed to date have show virus of one type or another with the concentration depending upon the prevalence of pollution.

Senator SPONG. In your statement, you make a point, and I am inclined to agree, that the primary enforcement responsibility should lie with the states. However, on page 9 you say that Federal enforcement should ensue only if substantial adverse health risks are involved and the state or locality has failed to take action. I am wondering why we should tolerate any adverse health risk if the state or locality has failed to act. Under our air and water pollution laws we give primary enforcement authority to the states; but if any violation occurs, the Federal government is authorized to step in if the states do not act. Is there any distinction here?

Mr. FRI. I think the principle involved is the same, Mr. Chairman. We are talking about substantial adverse health risks in terms largely of the failure to meet the national health-related standard. There is, in the case of drinking water, some components that will adversely affect health in the long term—heavy metals which will buildup slowly—which do not in the same sense as, say, the Birmingham situation in air, represent an imminent hazard which requires essentially instant action. I suppose there is a distinction here which suggests that the Federal government ought not to rush in at 24-hour periods and close down water supply systems due to any given violation of the standard.

Basically, what we are talking about is asserting Federal authority if the state fails to take appropriate action for the specific component of the national standard of which it is in violation and which needs to be corrected.

Senator SPONG. Are you talking about any violation?

Mr. FRI. I am referring to a violation of the health-related standard. If the State or local government fails after the process of notification to take action, it seems to me that if they are not going to act, then the Federal government should step forward to do what it can to see that remedial action is taken. I think our preferred course in some cases would be to urge the State or locality to move along, but if all else fails, we would act.

Senator SPONG. Do you think there should be a prior determination that a substantial adverse health risk is involved?

Mr. FRI. I think the simpler course is to establish the violation of the national drinking water standard, to insure that notice is given to determine what the State is doing about it, and then for the Federal government to move in the appropriate way. Once you have set a standard which is meant to protect the public health, unless you are in a crisis situation which requires immediate action, and

such cases do occur, fooling around with the determination of substantial adverse kinds of words is not necessarily germane. When there is a crisis situation, such as occurred in Riverside, Calif. 3 years ago, where there is clear and present danger, or imminent hazard, call it what you may, a very quick Federal action would be required if a State does not or will not act.

Senator SPONG. I worked on both the air pollution legislation and the water pollution legislation when I was on Public Works, until a year ago, and I am taking a page from your book in arguing about standards that may conflict with each other. I don't want procedures to be different where they don't have to be. It occurs to me that in the case of drinking water or air quality or water quality, if we make the procedures as nearly the same as we can, there will be less confusion. I would hope so. I would appreciate your view on it.

Mr. FRI. In the main, I would agree, Senator. There are close parallels involved, although there also are some differences.

Senator SPONG. Amendment No. 410 makes no distinction between water used for interstate carriers and other public water supplies as to the enforcement of standards. Currently, the Federal Government is authorized to enforce directly prohibitions against interstate carriers transporting contaminated drinking water. Should the responsibility for interstate carriers remain with the Federal government, or should it shift to the State?

Mr. FRI. It would seem to me that the responsibility for preventing the use of contaminated waters by interstate carriers, although I really hadn't thought of changing it, would therefore continue to reside with the Federal government. Our problem is less with the adequacies of that authority in terms of protecting people in interstate carriers, than it is with that authority as a basis for our regulatory standard setting procedures.

Senator SPONG. I have some more questions, but I wonder if Senator Moss would like to ask questions at this time.

Senator Moss. Thank you, Mr. Chairman. I have just one or two.

Following up on what you have been saying about viruses, that viruses have been detected in low quantities in waters in some areas, are the quantities so low that we should not be concerned about those viruses, or are they of sufficient volume that we should be concerned?

Mr. FRI. I think, Senator, if I may answer that question first, we are concerned to the extent that we are doing the research work necessary both to determine what sort of a standard ought to be set, and to determine what kind of process technology is required to bring the viral count down to that level of standard.

I don't think, and Mr. McDermott can comment on this, that our data thus far suggests the need for—I will overstate this—panicky kinds of actions, but they do suggest clearly the need for concern. We are trying to move within the context of our regulatory program to do something about the problem.

Senator Moss. Do you have power to do something about it now other than study further?

Mr. FRI. Under the Public Health Service Act we have the power to establish a standard for viruses which we could enforce only to

the extent that waters so contaminated would not be used by interstate carriers, which isn't very wide-ranging authority. As I pointed out, it is protective of less than 1,000 of the 30,000 systems that are supplying water to the general public.

Senator Moss. It is my understanding that the EPA sets standards for drinking water on interstate carriers, but that Food and Drug must enforce the standards. Is that correct?

Mr. FRI. Strictly speaking, that is so, yes. We establish the standard, determine the violation, and Food and Drug notifies the interstate carrier and actually enforces the prohibition. As a practical matter, we also find ourselves having a very strong tendency to notify the carriers and the State or locality involved in the problem as soon as we detect it.

Senator Moss. Wouldn't it be simpler if it were all in one agency?

Mr. FRI. Simpler, I suppose.

Senator Moss. If you are determining the standard, and then you have to hand it over to them to enforce it, it seems to me that that is complicated and probably fraught with chances for delay.

Mr. FRI. It can be. We have some programs which are arranged that way. For example, the Coast Guard is the enforcement agency on some oil spills in our water pollution program. It depends heavily on who is best equipped to enforce against a particular entity.

As a matter of course, the FDA deals more with interstate carriers than we do and when it comes to actually working with the carrier and inspecting what is on the carrier, FDA tends to be better set up to do it as part of its normal responsibility. I don't know as a practical matter that there is that much confusion.

Senator Moss. Would the amendment we are discussing here this morning be helpful in clearing this up in any way?

Mr. FRI. This amendment would be most helpful, not so much in clearing that up, but in clearing up the question of how do you get at the system itself. Right now the Federal Government really doesn't have much, if any, authority to move against the water supply system that is causing the problem. All we can do is say that the water cannot be used by an interstate carrier.

It seems to me the more important problem is to get at the problem rather than simply not permit the use of water by some selected carriers.

Senator Moss. I know there are some problems with bottled water. There was a story in the Star last July describing bottled water with bacterial counts up to 75 times that found in the highest tap water sampled in the Washington area. It is my understanding that EPA is now conducting a study of bottled water. Are there any results from that study?

Mr. FRI. I will let Mr. McDermott give you some of the initial results. We have conducted some initial studies in bottled water. We have found in the samples that we have collected that there is some relatively minor infraction of the standards involved. More importantly, the operating and sanitary conditions of the plants that are bottling the water appear to need improvement.

But in terms of the actual water itself that is put in the bottle, our samples suggest relatively minor infractions in most cases.

Do you want to comment on the specifics, Jim?

Mr. McDERMOTT. Yes. The report is still in preparation, sir, so we cannot give you a final report at this time. However, on the other hand, as Mr. Fri has said, the water quality deficiencies were relatively minor. On the other hand, we have to realize this was an examination of only 25 of several hundred bottling works.

Generally speaking, the larger plants were providing the best quality and had the fewest health risk problems associated with the bottling process. The smaller plants had quality deficiencies and/or evidenced the greatest number of health risk problems with the bottling facilities, the physical facilities, and the attitude and experience of the workers.

There was also one common deficiency: Very few of these plants were analyzing the water that they were distributing. If any chemical and bacteriological analyses were being performed, they were being performed by the larger plants and then only occasionally. So there is this very real question of what is being placed in the bottle and what is being shipped to the consumer.

Senator Moss. Does the FDA retain some authority over water quality standards for bottled water?

Mr. Fri. Yes, I suppose they do as to standards under the general provisions of the Public Health Service Act. Additionally and importantly, bottled water is kind of a manufactured product, although there is not much manufacture involved, and the FDA, far more than we, is in the business of going into a plant, determining the sanitary conditions, and establishing whether proper practices are being followed and proper sampling analysis is being done of the product.

We have not worked this out or talked with FDA much on the subject, but as I understand it, their enforcement authority would extend to these kinds of things. Again they are pretty well set up to do this while we are less in the business of going into a plant, determining sanitary conditions, and so forth.

Senator Moss. This looks like another example of divided jurisdiction, doesn't it?

Mr. Fri. Yes, it is.

Senator Moss. Thank you very much. I appreciate your answers and your testimony.

Thank you, Mr. Chairman.

Senator Spang. I want to return to the virus subject for just one more question.

A very small number of virus particles constitutes an infectious dose. Would it be true to conclude that if the virus can be detected in a water supply, then it could cause disease?

Mr. McDERMOTT. Virologists feel that one plaque-forming unit, that is, one viral particle that grows in the laboratory media does constitute an infectious dose. I think we have to make a distinction here, and this is partial response to your question, Senator Moss, between infection and disease. The diseased person manifests a variety of symptoms and really recognizes that he is sick, whereas an infected person has the material in his system, but doesn't necessarily show the symptoms of the disease. It has been estimated that of

every 100 to 1,000 people who are infected, only one will manifest the clinical symptoms of disease. However, it isn't quite as simple as these statistics suggest in that an infected individual can serve as a carrier, a source within the community, and transmit this disease to the people.

Further, there is the suggestion and the high probability that viral diseases are not self-limiting. That is to say that a pregnant woman could transmit a viral infection to the fetus, leading to delayed effects which might not show up for several years. This is of real concern to us as well. We are at the beginning of really finding out the significance of water born virus, and the best that we can do right now is to tell people that in our judgment, properly designed and properly operated treatment plants, subject to adequate surveillance and applying existing technology every day will provide the best safeguards that are currently available. I think the general health of the population would suggest that we have been doing a pretty good job but it is obvious from the community water supply study that we have got to do a better job, particularly in the smaller communities.

Senator SPONG. Was more than one particle found in the communities that we have been talking about in Massachusetts?

Mr. McDERMOTT. This was an experiment, and we were trying to determine whether we had a method sensitive enough to find one particle, Senator. The experiment wasn't set up to determine how many plaque-forming units were present in each sample. We know we found at least one in each of these positive samples. Now that we have established that we can identify one virus in 20 liters of water, we will, as I noted, redesign the experiment to further refine the analytic technique involved. Then we will really begin to get a handle on this problem. As you noted, this was an initial breakthrough, in that it is the first time it has been done in the United States.

Senator SPONG. In your statement, Mr. Fri, you take exception to the presence of program grants in section 302(m) of the amendment. Do you object to grants to the States to operate their programs, as well as to grants for the construction of facilities?

Mr. FRI. Yes.

Senator SPONG. I am going to quote from page 16 of the EPA-CEQ issue paper. I quote: "We feel that Federal financial support should be provided to supplement to the extent practicable an increase in the level of State program funding, contingent upon the adoption of appropriate enabling and regulatory authority regulations, policies and procedures, and the development, implementation, and operation of effective programs."

EPA evidently felt this was necessary last summer. What has happened since then to change your position?

Mr. FRI. First of all, as to the subject of that issue paper, I have here a variety of issue papers which range in alternative formulations from no grant at all—

Senator SPONG. I have one or two.

Mr. FRI.—to very substantial grants, my point being that was a paper that surfaced as an alternative by the staff.

In reviewing the alternative, we concluded for two reasons basically that we do not support State program grants at this time. One is that we feel in this area, it is substantially a State and local responsibility. In the main, the resources should be mobilized at the State level. Secondly, as I am sure you know, Mr. Chairman, this administration has generally taken a stand that the more appropriate way to support a variety of State programs is through the revenue-sharing proposals that have been advanced by the President, rather than through a series of small categorical grant programs.

I think in this case, particularly as you look at the variation among the States in public versus privately operated water supplies, at the level of effort that the State is putting forward, and at the quality of the raw water the State is dealing with throughout the State, that the most appropriate way to approach this is as part of the total State responsibility. This responsibility can, and we believe should be, supported through the revenue-sharing approach; to the extent State funds are generally inadequate to do an awful lot of things.

Senator SPONG. You are telling me, then, that the change in opinion constitutes EPA judgment, and not something from the office of management and budget?

Mr. FRI. Yes.

Senator SPONG. But you are also in here today telling us that the States should be the ones to enforce the EPA standards. If we are looking to revenue sharing down the road, do you envision that whether the States use the money for this will be a matter of their option or will there be some directive to them? This is not an unfriendly question. I have been sympathetic to revenue sharing in principle, but the more I see of it, the more I think of the blind man and the elephant: It just depends on what part of the elephant you are touching what you think revenue sharing is.

Here we have an example where we are going to put forth legislation dealing with standards for water supply systems, and you and I agree that this should be done. I also agree with you that the States should have the responsibility for doing it. But I really want to know how, if they are going to enforce these regulations, we are going to be sure that they are adequately funded. You tell me revenue sharing.

Mr. FRI. That's right. We have gone through part of the community water supply study, and made an examination of how much money each State spends per capita and per system. There are terrific variations ranging from less than \$100 per system to—the funny case is in the District of Columbia where it goes very high, \$14,000 or something, but that is one system or a very few systems.

As a matter of fact, States which do very well, like Connecticut, have very low expenditures. Some States where we know we have got problems have expenditures very much above the mean. All of this suggests to me that although probably the overall financial effort is a little low, that there are so many variables involved that the wisdom of the categorical grant program and the ability of the categorical grant program to get the right amount of money to the right State to do the right kind of thing is going to be very limited.

Some States will have too much, and some will have too little. I prefer the notion of revenue sharing, which says that the Federal government has imposed a requirement and will step in if that requirement is not met and which makes available to the State a general fund for a variety of purposes. The State can insure that that requirement is met by applying the financial resources as it sees fit. It may, for example, impose a user charge if the State cares to, as a method of generating funds internally within the State for its State program activities. If it would prefer to go that route, rather than use something from the general fund, that is fine with me, too.

Senator SPONG. I am particularly interested in those provisions of the bill authorizing research on water recycling because of reports of possible water shortages in the metropolitan Washington area. Is EPA presently engaged in any research on the recycling of water?

Mr. FRI. We are involved in several areas, particularly in the water pollution aspect of the program. I will ask Jim to comment specifically from the water hygiene standpoint. Let me, however, support the concept of water recycling. As you look at available water supplies and available water usage for the next 50 years or so, it is clear that water supplies will tend to come from recycled water.

Senator SPONG. I have some figures here on that point. Our present consumption is 200 billion gallons a day, I am told. We have a supply available of 700 billion gallons a day. You mentioned, I believe, 30 years down the road. By the year 2020, I have that the projected use will be 1,300 billion gallons a day. Do those figures seem correct?

Mr. McDERMOTT. Yes, sir; they are right out of one of our reports.

Mr. FRI. The ones I have in front of me.

Senator SPONG. What is the outlook in terms of financial feasibility of utilizing recycled water?

Mr. FRI. The financial feasibility of it?

Senator SPONG. Yes.

Mr. FRI. Give me a 20-year time program, that may be what we are talking about, and I would say it is not bad.

Mr. McDERMOTT. There is no question that we are reusing water today. It is indirect reuse and the level of this indirect reuse is going to increase as we move into the future. The statistics that you cited earlier, Senator, were national statistics compiled to get people to face up to this fact, as the intensity of indirect reuse increases, we will move toward situations where direct recycling of sewage as a source of community water supply may be necessary. This is the sticky-wicket: drinking water standards are not capable of satisfying those types of situations.

Senator SPONG. Is EPA involved in any research on tapping ground water, particularly in areas facing shortages of surface water?

Mr. McDERMOTT. Not to my knowledge, sir. This would water resource development type of investigation.

We certainly work in concert with the Corps of Engineers and the Geological Survey, and other Federal agencies in planning studies. For instance, we are working with the Corps and others on a regular

basis and have prepared a recent report on the metropolitan Washington area.

Senator SPONG. Are you aware of any investigation by any other Federal agencies on the possibility of utilizing ground water as a source of drinking water to a greater degree?

Mr. McDERMOTT. Currently 50 percent of the population is being served by ground water.

Mr. FRI. My answer is no, I am not aware of the specifics. We have introduced this subject with the Corps in their waste water study, for example. We have looked at the question of ground water recharge as a method of waste treatment and at a lot of related kinds of projects, but I don't know specifically of a project in EPA directed toward the further exploitation of ground water as drinking water supply.

Senator SPONG. You don't know of any other agency?

Mr. FRI. No, we can check and provide a further answer for the record.

Senator SPONG. I would appreciate your doing that.

(The following information was subsequently received for the record:)

The Department of the Interior is the principal Federal agency charged with formulating and administering programs for the management, conservation and development of natural resources, including ground water. The major role in this regard is divided among several offices, bureaus and branches.

The Office of Water Resources Research administers the water resources research and training authorized by the Water Resources Research Act of 1964, as amended. OWRR does not maintain its own laboratories or perform "in-house" research. An estimated \$12.4 million was budgeted for FY 1972 and FY 1973 for water resources research, investigations and experiments by grant assistance to States, independent educational institutions and private foundations, institutions or individuals. It is estimated that less than 10 percent of the total effort in water resource research is directed toward ground water.

The Geological Survey performs surveys, investigations and research to produce data and information relevant to the location, quantity and quality of ground water resources in the United States. Research emphasis is placed on increasing the understanding of fundamental principles of water occurrence, movement and interaction with its environment and also increasing the accuracy and usefulness of water data through improvements in technology. About \$38 million was appropriated for water resource investigations in FY 1972. An additional \$20 million in matching State funds was contributed by the States. Of the total \$58 million about 25 percent is directed toward ground water problems.

The Office of Saline Water funds research and development of processes for converting saline water to fresh water. Basic and applied research, development and evaluation are conducted by means of contracts or grants to Federal and nonfederal agencies, institutions and private organizations or individuals. The FY 1972 appropriation for research is \$5.9 million. It is estimated that about 50 percent of the total is used in the development of processes to utilize brackish ground water. An additional \$200,000 is committed to preliminary research on hardware for use in desalination of geothermal water.

The Bureau of Reclamation, operating in 17 Western States and Hawaii, performs engineering and economic investigations of proposed Federal reclamation projects for the conservation and utilization of water and related land resources. In FY 1972 \$10.5 million was budgeted for general engineering and research. None of these funds were directed towards drinking water research. However, a special project in the Imperial Valley of California was funded for \$800,000. A 4,000 to 8,000 foot deep well is planned to tap hot geothermal brines. If the well is successful, the Office of Saline Water will collaborate in the project by installing a desalting plant in an effort to augment potable water supplies in the Colorado River Basin.

The Corps of Engineers, Department of Defense conducts comprehensive river basin studies and special studies to resolve unique or especially complex water resources problems. However, ground water investigations and research are usually confined to the needs of specific projects or are a part of routine civil works investigations.

The Department of Agriculture, Agriculture Research Service has directed a small amount of effort to ground water quality problems on small farm water supplies.

The Environmental Protection Agency budgeted \$165 million in FY 1972 for research and development which included \$53.4 million for water related research. Funding for ground water research amounts to \$378,000 (\$153,000 in-house and \$225,000 grants or contracts), which relates primarily to prevention of ground water pollution. In addition, a small (\$52,000) two-year contract has been awarded to develop comprehensive standards for water well construction. The need for these standards was determined in the Community Water Supply Study and studies of individual home or rural water supplies. It was found that poor well construction practices were the contributing factor in bacterial contamination of drinking water. The development of improved well construction standards for use by the well drilling industry, engineers, municipalities and Government agencies will be a positive step toward elimination of unsafe drinking water and will stimulate future utilization of ground water to a greater degree.

Mr. McDERMOTT. This is a basic responsibility of the Water Resources Division of the Geological Survey. They frequently conduct investigations to detect new sources, and I believe promotion is part of their responsibility. We are primarily concerned with the development and implementation of standards.

Mr. FRI. We will provide the answer for the record.

Senator SPONG. I understand what your responsibility is. We are trying to build a record on who is looking into this.

We thank you very much for your testimony here this morning.

Dr. Daniel Okun.

Dr. Okun, we appreciate your being here with us this morning.

#### STATEMENT OF DR. DANIEL A. OKUN, SCHOOL OF PUBLIC HEALTH, UNIVERSITY OF NORTH CAROLINA

Dr. OKUN. Thank you very much, Mr. Chairman.

My name is Daniel A. Okun. I am professor of environmental engineering and head of the Department of Environmental Sciences and Engineering in the School of Public Health of the University of North Carolina at Chapel Hill.

Except for some 3 years in the Army overseas during World War II, I have been involved in water quality management studies as a consultant and as an educator continuously since 1937.

I served as a member of the advisory committee representing the American Public Health Association in preparation of the 1962 Public Health Service Drinking Water Standards.

However, I am here today as an individual, a professional in the field, concerned with the quality of our environment.

Only when they travel abroad do Americans begin to appreciate the quality of water service afforded them at home.

Mr. Chairman, I only last night came in from Singapore where I represented the National Academy of Sciences at a recent workshop on water resources, the environment and national development in

Singapore. My particular subject of responsibility there was water reuse.

However, professionals in the water quality field have begun to be seriously concerned about public drinking water quality in the United States.

The people, too, have begun to express concern for drinking water quality, as is reflected by their increasing use of bottled water. Bottled water use is a valid indicator of public uncertainty with the quality of our public water supplies, particularly because bottled water is 5,000 to 10,000 times more expensive per gallon than water delivered from public supplies.

Are people justified in questioning the quality of their public water supplies? No doubt, questioning will soon be justified if we do not immediately begin to invest in the improvement of community water supply systems.

About half of those who take their drinking water from public water supply systems in the United States use waters part of which only hours before had been discharged from some industrial or municipal sewer.

Conventional wastewater treatment does not remove most of the chemicals that originate in industry and in the household nor does it eliminate the viruses that are ever-present in human wastes. And even conventional wastewater treatment is not yet fully available in the United States and, where available, its efficacy is in constant question because of poor plant operation.

Furthermore, conventional water treatment often fails to remove or significantly reduce the concentration of dissolved organic chemicals and the heavy metals that are often present in waters drawn from polluted sources.

Three matters are of concern: The biological quality, the chemical quality, and the esthetic quality of drinking water.

First with regard to the biological quality of drinking water, the United States has a proud record in the elimination of the waterborne scourges that pervaded the world at the turn of the century. Typhoid, dysentery, and cholera are almost never to be found in the United States.

However, even with this record, we cannot afford to be sanguine. Elsewhere in the world, explosive outbreaks of cholera have occurred in areas where the disease has been endemic. With the rapid travel that has shrunk the world, cholera has shown up in areas where the disease has been absent for decades.

The barriers that have been established against waterborne bacterial diseases cannot be relaxed. The need for vigilance is demonstrated by the waterborne epidemic of salmonellosis, a bacterial disease, that occurred in Riverside, Calif. in 1965, with some 16,000 cases and three deaths.

In addition to the threat from bacterial diseases, viral infections are troublesome. Viral infections are much more widespread in the United States than is indicated by clinical disease alone. Ninety to ninety-five percent of infections of infectious hepatitis go undetected. Sporadic cases of infectious hepatitis are not isolated instances of the disease, but are more likely the clinical manifestations from among

a much greater number of subclinical cases resulting from large-scale exposure to viral infections.

The primary sources of viruses of human origin are the secretions and excretions of man that enter water with domestic wastes. Because they normally multiply only in living cells, viruses occur in water in quite low concentrations.

However, the infective dose for a viral disease need only be very small, as Mr. McDermott has just pointed out, so that the ingestion of contaminated water may result in a high rate of infection, with no large number of clinical illnesses. These infected individuals then become infective and subsequent person-to-person contact with high concentrations of virus may very well be responsible for a relatively high rate of infectious hepatitis.

Infectious hepatitis is a debilitating disease, with effects ranging from those that are not at all apparent to those that may be dramatic, such as was the case with the Holy Cross football team.

Because the virus of infectious hepatitis cannot be grown outside the human host, we are truly fumbling in trying to assess its presence in the environment, the effectiveness of water treatment processes, and the degree to which we are exposed. That infectious hepatitis is important cannot be denied. Despite the fact that infection generally confers immunity, I venture to say that we all know individuals who have in recent years been seriously ill with infectious hepatitis. The disease is so widespread, but so ill-reported, that its economic impact from worktime lost and for medical care is virtually impossible to assess. But that the cost of infectious hepatitis to society is quite high cannot be gainsaid.

The sad state of our knowledge with regard to viruses can be demonstrated by the following quote from the 1962 Public Health Service Drinking Water Standards:

Insofar as bacterial pathogens are concerned, the coliform group is considered a reliable indicator of the adequacy of treatment. As an indicator of pollution in drinking water supply systems, and indirectly as an indication of protection provided, the coliform group is preferred . . . Whether these considerations can be extended to include rickettsial and viral organisms has not been definitely determined.

We use bacterial numbers as a standard of quality primarily because they can be measured and because, as stated in the Drinking Water Standards:

Virology techniques have not yet been developed to a point where virus enumerations can be recommended as a routine procedure in microbiological examination of drinking water.

We have no evidence that a water that meets bacterial standards will be free of the virus of infectious hepatitis. Therefore, because municipal wastewaters always contain such viruses, and because waste water treatment processes are known to be ineffective in eliminating them, we must assume as Dr. J. W. Mosley, an outstanding authority on viruses in water, has stated that the possibility exists that:

. . . present standards of water treatment are not adequate to prevent low levels of virus from producing what appear to be sporadic cases of infectious hepatitis and other viral diseases.

This possibility is particularly pervasive where heavily contaminated waters are used as a source of supply, a very frequent occurrence indeed.

For example, many of our larger cities, such as Cincinnati and New Orleans, take in water supplies from rivers that are heavily contaminated with viruses.

Viruses, in the presence of organic matter, appear to be unusually resistant to conventional water treatment procedures. Because virological techniques are so primitive, few water supply systems are in a position to evaluate this hazard.

However, in a major European city recently, viruses were reported in 18 percent of more than 200 samples taken from the distribution system. You have heard from Mr. McDermott about recent results in the United States.

A major priority in our water quality program must therefore be research into methods for propagation of the infectious hepatitis virus in the laboratory, in order that an assessment of the effectiveness of water treatment methods for the removal of the viruses can be made.

Pending a successful conclusion to this research, a considerably greater investment must be made in virological monitoring to establish a background of data to develop an indicator virus that can be readily monitored. Such an indicator can be used to assure safety with regard to the virus of infectious hepatitis, just as we use the easily-identifiable coliform group of bacteria as an indicator for the safety from bacterial disease.

Now, chemicals in water: Hundreds of new chemical compounds are being introduced into our environment annually. Few of these are assessed for their potential impact on the health of man, particularly on the synergistic effect they may have when acting together or in concert with other types of environmental stresses. Some of these chemicals, although at higher concentrations than are likely to be found in water, have been shown to cause cancer, genetic damage, or malformations at birth.

The impact of the long-term ingestion of low levels of chemical contaminants is very difficult to ascertain. Because the effects of such chemicals ingested in low concentrations over long periods are slow and insidious, and are likely to be similar to those effects manifested by aging or other chronic diseases, their significance is particularly difficult to establish.

However, we know that carcinogens, mutagens, and teratogens are being discharged in waste waters and become part of the water supply of a substantial portion of the population.

For example, waste waters in England have been shown to contain two well-established carcinogens, 2,4-benzpyrene and 1,2-benzanthracene, albeit at low concentrations.

Other hazards likely to be found in polluted waters include petroleum products and aromatic amino and nitro compounds. Radioisotopes, particularly in concert with other chemicals, constitute cancer hazards to the general population.

The highly toxic pesticides are particularly troublesome, often not because of the toxic effect of the chemical itself, but because of highly toxic impurities that result from their manufacture.

The prolonged or lifelong consumption of water containing such organic chemicals contributes or adds to the total carcinogenic burden from all sources for exposed individuals.

Radiation is known to cause genetic damage. The Genetics Study Section of the National Institutes of Health some years ago expressed fear that some chemicals may constitute a more serious mutagenic risk than radiation. A number of chemicals, some very widely used, are known to induce genetic damage in some organisms. And a chemical that is mutagenic to one species is likely to be mutagenic to others.

The study section stated that special attention should be given to the low concentrations of highly mutagenic compounds that are brought into contact with large populations. They point out that, even though the compounds may not be demonstrably mutagenic to man at the experienced concentrations, the total number of deleterious mutations induced in the whole population over an extended period of time could be significant. Among the chemicals with mutagenic potential are the new industrial plastics and chemical sterilants.

The thalidomide episode demonstrated the teratogenic potential of certain chemicals, and the Food and Drug Administration has identified certain pesticides to be teratogenic. Combinations of teratogens have been found to produce greatly potentiated—that is, accelerated—effects.

A recent report in *Science* (January 14, 1972) describes experiences with polychlorinated biphenyls (PCBs), “\* \* \* widely used industrial chemicals that were never intended for release to the environment.” Even small doses of PCBs can be toxic and they have been found to contain highly toxic impurities.

Some scientists believe that municipal and industrial sewer outfalls are major sources of PCBs in the environment. And, of course, this means that they come with the water supply because they are only slowly degradable in the environment.

Some organic chemicals undergo rigorous studies to establish their toxicity or safety. However, if all chemicals as they are developed are required to undergo lengthy, intensive and comprehensive investigations prior to their acceptance for general use, the cost of these investigations and of the delays in authorizing their use would be prohibitive.

René Dubos has observed that new techniques and new substances are introduced so rapidly that a requirement for testing all of them would paralyze progress.

However, such investigations must be initiated, and we must at the same time intensify our research and monitoring programs to identify those chemicals that appear in water supplies to assure their removal. This requires an investment of an order of magnitude that we have not yet been willing to make.

Once again, the 1962 Public Health Drinking Water Standards indicate how far we have to go. For example, the following substances that have been demonstrated to have undesirable health effects in water, in addition to those listed before, are not even mentioned in the Standards: antimony, bismuth, boron, cobalt,

molybdenum, mercury, nickel, chlorinated hydrocarbons in wide variety, organic phosphorous compounds, carbamates, and a wide range of other chemicals used in the home, on the farm, and in industry, all of which find their way into our water supplies.

Monitoring of these chemicals and tracing their fate in our water management programs and treatment processes is absolutely essential if we are to assure Americans of the safety of their public water supplies, and not by learning of their health effects at a later date after they have occurred, thereby using Americans as guinea pigs.

Now, to the esthetic quality of water. Rapidly growing population and increasing rates of urbanization and industrialization are exerting greater and greater pressures on our limited water resources.

Although nature renews the volume of fresh water available, we have been profligate in its use so that communities have had increasingly to turn to polluted sources to meet their needs. Where once we boasted of the salubriousness and the quality of our water supplies, now we grudgingly accept the product provided, often with distaste.

We have all seen the signs reading somewhat as follows: "Please flush the toilet, our neighbors downstream need the water."

Waters drawn from highly contaminated sources require the addition of many chemicals that may render the water distasteful, and as noted earlier, people have turned to bottled waters. Ironically, bottled waters do not undergo the surveillance that public supplies do and are often less safe, as shown recently by the *Washington Star*.

Unless we make a commitment to improve public water supply systems, our proud heritage of quality water will have been lost.

#### WATER POLLUTION VERSUS WATER SUPPLY

A common misconception is that efforts in water pollution control result in direct improvement of the quality of our drinking water supplies. Such benefits as may accrue to the quality of drinking water supplies from efforts in water pollution control are tangential at best.

Over the years, our efforts in research, education, and regulation in water supply have decreased as our concern for water-pollution control has increased.

As an educator, I can see the impact in the universities, which is no doubt similar to the impact in Government. Because of the availability of funds for research and training in water-pollution control, students and faculty have focused on municipal and industrial waste treatment to the virtual neglect of efforts in the water supply field. In only a few institutions has any research effort been directed to water supply. The story is the same in State regulatory agencies where water supply surveillance programs are grossly understaffed.

#### REGIONALIZATION

In the United States, some 35,000 separate public water supply systems serve 160 million people. In Britain, on the other hand, more than 50 million people are served by fewer than 300 separate systems.

In other words, we require more than 100-fold more systems to serve only a three-fold greater population. Even in the congested areas of the country, small systems proliferate.

The significance of this statistic is that, in the United States, we have many small systems, systems too small to be served by adequate technical personnel.

The result, as was eloquently demonstrated in the 1970 community water supply study, is that smaller systems are far more likely to provide inadequate service and poor quality water than are large systems.

Therefore, with its many small systems water service is poorer in the United States than in Britain. Furthermore, about 25 percent of our population is not served by any water system at all, as contrasted with Britain where more than 99 percent of the population is served from public supplies.

The Federal government now has responsibility for water used on interstate carriers and, sad to say, several communities serving interstate carriers have had their water supplies recently declared to be unapproved for such service.

National standards of drinking water quality are highly desirable, but it is clear that many small supplies will be in immediate violation. State regulatory agencies will be almost powerless to exact compliance from small systems which do not have the technical resources for the monitoring and treatment necessary to assure water safety.

The promotion of regional systems, as was enacted into law in North Carolina in 1971, I am proud to say, is one way to help assure proper design, construction and operation of small systems. Another way is through enhanced technical assistance to the states.

In conclusion, we must provide greater resources for the water supply field, resources for state grants, for research and operations as well as to assure adequate education and training opportunities for all personnel in the field.

I applaud the intent of the proposed legislation. Its enactment and implementation will go far toward improving the quality of life and health status of all Americans.

Senator SPONG. Dr. Okun, we thank you very much for your testimony here this morning and your contribution to our record.

You have stated that viruses were recently found in 18 percent of more than 200 samples from the distribution system of a major European city. Would you please tell us in what city these samples were taken and what the source and the extent of treatment were in this case and whether similar conditions exist in this country.

Dr. OKUN. These samples were taken from the system in Paris, France, where the water drawn from the River Seine was believed to be adequately disinfected with chlorine. I believe that, as Mr. McDermott says, we are quite uncertain as to the status of the virus concentration in waters in distribution systems in the United States. Where a system has had very heavy chlorination and good supervision of operation, I would expect that the likelihood of finding viruses would be very small.

On the other hand, we have many water systems where the controls are less than adequate, particularly in some of the smaller systems, and particularly systems that take water from highly contaminated sources. I would suspect that examination of systems throughout the country would reveal much of what was found in these two communities in Massachusetts.

The point I believe to be made, Mr. Chairman, is that we just haven't invested enough to find out what the virus situation really is, and it seems to me a shame that we should be operating in such ignorance in so vital a matter that concerns so large a segment of our population.

Senator SPONG. You mentioned that Mr. Fri and Mr. McDermott this morning testified that for the first time we have found viruses in treated drinking water in the United States. Are you alarmed by this?

Dr. OKUN. I am not alarmed in the sense that I believe that precipitate regulatory action prohibiting the use of these waters is called for. I am alarmed that we seem to be very slow in recognizing viruses as a problem and manning the program that would identify the real seriousness of it and begin to control it.

The problem, as was mentioned, is that infectious hepatitis is probably the most troublesome of all the viral diseases, and we can't even test for the virus. The reaction of other viruses to treatment processes is highly variable. In some instances, certain types of viruses have been shown to be destroyed after exposure to chlorine disinfection for only a few minutes, while others have resisted destruction over periods of 30 and 40 minutes.

So, there is much that we don't know. As the sources of pure waters are exhausted, we increasingly are forced to use more and more polluted water sources. We should not build ourselves into a corner by using contaminated waters about which we do not know enough to assure protection to the American people.

Senator SPONG. You say that a primary conclusion of the community water supply study was that smaller systems are far more likely to provide inadequate service and poor quality water than are larger systems. You have proposed the promotion of regional water supply systems to deal with this problem. Let me ask you if you think regionalization is a feasible alternative in the United States, particularly in the Western States where the distance between small communities is so much greater than in Great Britain?

Dr. OKUN. It is one of the actions that should be taken. I don't believe that regionalization alone would solve this problem. I have seen small communities that draw water from highly polluted rivers where the quality of the operating surveillance is very poor. The man who operates the plant is perhaps a high school graduate. He has gone to short courses but doesn't understand virology, doesn't understand bacteriology, doesn't understand chemistry, and at best follows by rote the instructions that he may have been given by a State health department or whatever agency is responsible for drinking water surveillance. And representatives of that agency may only visit him once every 2, 3, or 4 years.

I am concerned that we have these situations. In areas where it is feasible to regionalize, this is one way that it might be done. But, I

believe that we need a wide range of actions, including increased resources at the regulatory level, not only for regulation but for surveillance of operation and for education and research.

Senator SPONG. You mentioned in your statement that 90 to 95 percent of the infections of infectious hepatitis go undetected and that these subclinical cases, meaning those we don't notice, may be largely responsible for the spread of this disease and the sporadic outbreaks which occur.

Is this also the case for other waterborne agencies of disease, bacterial and chemical, as well as viral?

Dr. OKUN. This is not likely to be the case for chemical contaminants, because these are not likely to be produced systemically in large quantities after ingestion.

On the other hand, biological agents and viruses, once ingested by the human host, may multiply in the enteric system of the host, who would then discharge large numbers of these bacteria and viruses and thus become infective.

I would like to read one paragraph, without identifying initially when it was written, that applies to this particular question. I will just substitute the words infectious agent for the word that is in the original quote.

If the "infectious agent" had no other means of communication than person to person transmission, it would be constrained to confine itself chiefly to the crowded dwellings of the poor and would be continually liable to die out accidentally in a place for want of the opportunity to reach fresh victims. But there is often a way open for it to extend itself more widely and to reach the well-to-do class of the community. I allude to the mixture of the evacuations of the "infectious agent" with the water used for drinking and culinary purposes, either by permeating the ground and getting into wells or by running through channels and sewers into the rivers from which entire towns are sometimes supplied with water.

Now, that "infectious agent" might today just as well be viruses. The infection referred to in this paragraph was cholera, and this was written by Dr. John Snow 120 years ago.

Senator SPONG. I thought maybe Julius Caesar wrote it.

You have told us this morning that the benefits which accrue to the quality of drinking water from efforts in water pollution control are tangential at best, and you have given us examples of how funds and manpower needed in the area of water supply have been assigned to problems in water pollution control. Yet, if substantial progress can be made toward reducing water pollution during the next decade, will not the nature of water supply research and treatment and perhaps the need for resources in these programs be altered to a significant degree?

Dr. OKUN. That is a very good question, because that has been part of the problem we have been facing. I believe that we need both programs to go on simultaneously. The problem with protecting public water supplies is that this is generally done after the fact. If we depend on water pollution control programs, these do not offer us sufficient defense.

For example, a new industry in a community that discharges its wastes into a river which becomes a water source for a community downstream may be utilizing an entirely new chemical and the water pollution control procedures may not yet have developed either for

monitoring this chemical or for removing it in waste treatment. So, we will always have an impossible situation with water sources that are subject to pollution from materials about which we know very little.

So, if we are to assure that water drawn from polluted sources is safe, we have to, at the same time, man a program that looks after water supply as its first priority.

Now, a good part of the investment made in water pollution control—and this is a proper investment, I am not denying this—is for protecting water for recreational purposes, protecting it for fishing purposes, and for aesthetic purposes. The removal of organic matter as measured by the standard pollution parameter, biochemical oxygen demand (BOD), has no relationship at all to drinking water quality. BOD is a measure of the organic load in the system, but it doesn't identify or quantify the organic chemicals which may be of health significance.

So, the water pollution control program is necessary and may reduce slightly the pressure on community water supplies, but if we wait for the water pollution control program to provide us with safe drinking water, I believe we would always be well behind.

Senator SPONG. Thank you very much, Dr. Okun, for your testimony.

Mr. Ralph Nader.

**STATEMENT OF RALPH NADER; ACCOMPANIED BY ELIZABETH ATHANASSIOU; AND WAYNE MOORE**

Mr. NADER. Thank you, Mr. Chairman.

With me today on my left is Elizabeth Athanassiou, who is a physicist, a candidate for the Ph.D. degree from the University of Pennsylvania, who will be working continually on this problem of drinking water quality.

On my right is Wayne Moore, who is a bioengineer, who has been looking into the problem, particularly with emphasis on viruses.

I am grateful for your invitation to comment on the problem of drinking water quality in the United States and the improved policies which this subcommittee should consider in its deliberations.

One of the foremost organizing questions for such deliberations, which will foreshadow some of the difficulties in implementing several of the corrective remedies envisioned in pending legislation, is why it has taken so long for public attention to be focused on drinking water quality? In a decade when water pollution and contaminated food supplies regularly receive front page media treatment, there was nearly complete silence on contaminated drinking water. Surely, close observers of the pollution problem could not have believed that the torrent of industrial, agricultural, and municipal wastes cascading into our waterways suddenly ceased and desisted just at the water purification systems. Certainly they knew that these systems were heavily oriented toward the control of bacteria and inequipped to adequately screen out such categories of contamination as pesticides, heavy metals, hormones, viruses, and chemicals. They also knew that the applicable drinking water standards were oblivious to many water pollutants and too limited toward others. Finally,

they could see that many drinking water supplies for cities and towns came from notoriously polluted bodies of water such as Lake Erie, Lake Michigan, and the Mississippi and Potomac Rivers.

Why, then, the reluctance to speak out and propose changes regarding a clearly deteriorating situation, apart from the scarcity of funds. I suppose one reason is that the public has been led to develop a complete faith, a complete trust in our drinking water. Such faith and trust encourages a "mum's the word" attitude by officials and authorities lest, it is believed, a shocked dismay leading to an unreasoned hysteria or panic develop. Where perfection is expected, the deviation looms larger. Moreover, any focus on drinking water safety is likely to intensify the fluoridation controversy, which officials strive strenuously to avoid. The Public Health Service has a very prime responsibility for contributing to a kind of antiscientific attitude on the issue of fluoridation, polarizing the issue enormously with the help of those who are also against fluoridation, and generating an almost pariah atmosphere around the issue of drinking water quality as a result. Finally, the difficulty, given present detection and research levels, of connecting waterborne diseases and other harms with contamination, permits a complacency that generates a cloak of secrecy over even documented waterborne disease outbreaks.

So, although Congress is getting around at last to investigating what may well become consumer problem No. 1 in the seventies, these attitudes and practices will not go away with the enactment of new legislation but will continue to be persistent factors in deciding how well new policies are administered and enforced. It is obvious that public opposition to water pollution generally is only a fraction of what would be the opposition to those industries known to contaminate the drinking water supply indirectly through such water pollution. To the extent that authorities are indentured or connected to powerful local industrial and commercial interests, there is a strong motivation to dampen or foreclose such predictable public responses.

The possible standards and populations at risk against which to evaluate the health status of drinking water are numerous. Conventionally, however, the measure is whether the drinking water meets the limits set by the current Drinking Water Standards (DWS)—which were last revised in 1962. The DWS is now being revised and for good reason. It is incomplete in major areas of known contamination. For example, it does not provide for any standards relating to mercury and other heavy metals, sodium, pesticides, herbicides, chemicals such as PCB and hormones—to name a few areas. And it is inadequate in other areas such as turbidity, and total organics. So using the present DWS as the evaluative measure has to represent the most minimum approach.

The first national community water supply survey, released in 1970, covered 969 public water supply systems in the United States during 1969. The survey showed that only 59 percent of the supplies met the DWS. Samples from tapwater showed that 16 percent of the study population drank water that did not meet the recommended DWS and 5 percent drank water that did not meet the mandatory limits, i.e., that was potentially dangerous in any amounts. A 1970 State-requested survey of Tennessee water supplies reported that

the corresponding percentages were at least 51 percent and 12 percent respectively. According to a July 1971 EPA-CEQ issue paper, 25 percent of 160 million persons served by community water supply systems are using water which exceeds recommended drinking water limits as narrowly defined. I suppose if we include all the other potential contaminants, that figure would go up very considerably.

Data on waterborne disease outbreaks are incomplete but what are available show that, on the average, there is one outbreak per month in the country, causing at least over 100 persons to become ill. That is the standard—causing over a hundred persons to become ill. Other studies show 142 epidemics of gastroenteritis between 1945 and 1960, probably due to bacteria of the salmonella genus, but possibly also to enteric viruses. While the frequency of occurrence of waterborne disease is an indication of water quality degradation, the adverse health effects over time due to the presence of toxic chemicals and other wastes in drinking water are more difficult to detect.

In 1963 a U.S. Senate report—that is the Senate Committee on Public Works—asserted that “(a) major new water pollution problem has emerged with the growth of the synthetic chemical industry.” These industries have unleashed synthetic organic chemical products such as detergents, plastics, and synthetic fibers to add to the already heavy pollution from steel, textiles, food processing, petroleum, and nonferrous metals industries. With 12,000 potentially toxic chemicals now used by industry and the introduction of about 500 new chemicals a year into manufacturing processes, the extent of the unknown is ominously proliferating.

Consider the observation of two specialists on carcinogens, Drs. Wilhelm C. Hueper and W. D. Conway. Mr. Chairman, I think this is a very concise summary which illustrates not only the range of the problem but its style, and its style is really very important. For example, this hearing room has been packed in previous years on cat-and-dog bills. There are hearing room bills that are packed on ITT type situations. But because this is kind of a plain, boring, nonanthropomorphic threat to the health of the country, we have great difficulty generating the requisite concern, and you are holding what I believe is the first Senate hearing during this century squarely on all fours dealing with drinking water quality.

Senator SPONG. Mr. Nader, I was present, I believe, at the first extensive air pollution hearings. We had four people in the room. Two years later, they were beating down the doors wanting to know why we had not done more. But there were only four people.

Mr. NADER. In fact, I would think that the same pattern would repeat itself. I see every reason for the drinking water quality problem to become one of the major consumer and political issues in the country in the next few years, once the facts are known and once the consumers realize that even though it does not come wrapped in a cellophane package, it is very much a consumer item.

Let me quote Dr. Wilhelm Hueper and Dr. Conway's observations:

“The most common and often prolonged, and, therefore, the most dangerous contact with carcinogenic pollutants of water occurs when water thus contaminated is used for drinking purposes and in the preparation of food. It is here important that most of the agents \* \* \* (arsenicals, chromium, radio-

active substances, chlorinated hydrocarbon pesticides) are retained in the body and may accumulate in certain organs, such as the liver, skin (arsenic), bones (radioactive matter), or fat tissue (chlorinated hydrocarbons), from which they later on may gradually be released thereby causing a continuous or prolonged exposure of the tissues with the carcinogens." \* \* \* "This particular type of exposure to environmental carcinogens (that is, long term) has been found from wide experiences on man and experimental animals as being most effective for the production and the development of cancers not infrequently becoming manifest months, years or decades (in the case of human beings) after such contacts have ceased and often the causative agents may have totally disappeared from the tissues."

Investigators in Holland have noted death rates to be higher from cancer in municipalities which obtain their drinking water from polluted rivers. While Dr. Henry A. Schroeder of the Dartmouth Medical School, who has testified before this committee, observed that "there is a good correlation of certain qualities of municipal water supplies (with high concentrations of trace metals) and deaths from congenital abnormalities in the United States."

The director of the Water Utilities Department of Dallas, Tex., Harry J. Graeser, declared in March 1970 that "We are surely moving towards the time when a major waterborne problem, either from ingestion of long-term materials or from a severe epidemic, is going to appear upon the scene and create a national hysteria and a crisis in water hygiene." It is doubtful whether there is a shred of justification for the secrecy which frequently cloaks local waterborne disease outbreaks. The task force on water pollution of the Center for Study of Responsive Law, for example, was told of a dysentery outbreak in a Southern town which affected several thousand people. The task force reported that "Even the Federal Government could get no information on the outbreak until a promise of 'confidentiality' was extracted from the U.S. Surgeon General—a promise which extended even to the name of the town."

In reviewing the findings about drinking water quality the most significant fact to emerge is how little has been researched nationally and in localities. The Federal Government during the past 2 years spent an average of \$2 million on research. Thus, warning signs of serious special impact problems from drinking water hazards remain just that—warning signs. An EPA task force report on environmental problems of the inner city, September 1971, noted the following:

"The quality of many city waters is degraded by municipal and industrial wastes. The pollution problems become intensified in congested central city areas where deterioration of water and sewer facilities are commonplace \* \* \*.

"Pollutants from storm sewer runoff, raw or inadequately treated sewage, and industrial wastes, along with excessive blue-green algae growth, are mainly responsible for producing the foul taste, odor and coloring of some urban water supplies.

"Such pollution contributes to nonpotable water and can cause mild discomforts such as vomiting and gastric upsets. A nationwide survey, reported in a 1970 study indicated that algae was considered by 241 water works officials to be the most frequent cause of foul taste and odor in water supplies \* \* \*.

"Organisms such as thin red blood worms in piping (Midge larvae) which generally indicate polluted water, have occurred in mu-

municipal drinking water in at least 17 scattered municipal systems, including New York City and Washington, D.C. The combined presence of worms and bad taste make some urban water unfit for domestic use \* \* \*."

That is one of the understatements of the report. Also, the thin red worms have a peculiar affinity for appearing through the water taps of slum tenements. These thin red worms did not appear on Park Avenue in New York City. They appeared in Harlem, and when a few disturbed residents objected to the city officials, they were assured a few days later that although indeed there were thin red worms in their drinking water, they were considered nonharmful and nontoxic. To continue the quote by the EPA study previously:

Methemoglobinemia, a disease affecting infants less than three months old, is caused by the bacterial conversion of the relatively innocuous nitrate ion to nitrite. The physiologic effect is oxygen deprivation, or suffocation. Acute cases of "blue babies" may only be the tip of the iceberg. Nitrates have been found to interact in the stomach with secondary amines from drugs, food flavoring or decaying meat to product nitrosamines. Some nitrosamines are carcinogenic, and teratogenic.

This EPA report goes on to describe why big city waste water systems and water distribution systems have deteriorated. Thus three problems—(1) the special impact of contaminated water on the inner city, (2) on infants, (3) and the contamination which afflict water after purification and before coming out of the tap from the aged distribution pipes—have been studied very little. This, of course, is inexcusable and perfectly reflectful of our institutionally insane priorities. Would this committee care to inquire how many thousands of wasteful Government programs inside and outside the military could be curbed to let the EPA deploy more than \$2 million of research on a commodity inbibed by 200 million Americans?

The inadequacies of present water systems are partially seen in the poor record of compliance with the 1962 DWS. 56 percent of the 969 water supplies surveyed were deficient in one or more of the following ways: source protection, disinfection and/or control of disinfection, clarification and/or control of clarification and pressure in the distribution system. Small supplies in rural areas often have very poor compliance records. In addition, 79 percent of the systems had no sanitary survey in the year preceding the 1969 National Survey, with only 64 percent having had a sanitary survey in the preceding 3 years. Ninety percent failed to meet the biological surveillance criteria of the DWS, with 85 percent failing to take the minimum number of samples over a given period and 69 percent failing to take samples at even half the required rate. Of the 31 percent of the systems which did bother to take at least half of the required samples, 48 percent did not meet the bacteriological quality standards. Part of the explanation for this deplorable record is that only 483 people made up the water surveillance staffs of 38 States servicing 155 million people, an average of 13 public health personnel with an average funding of \$160,000 per State.

There is nearly no data on compliance with chemical and radiological standards but the little there is matches the biological records for lack of compliance.

Only 10 percent of the systems had adequate cross-control programs; 54 percent did not have any cross-control ordinance and the

rest were not implementing the existing ordinance. It is relevant to note that 35 percent of all the outbreaks of waterborne disease associated with public water supplies, for the period 1961-70, were caused by faulty cross-connections.

If the requirements of the DWS, developed 10 years ago, cannot be met, how can the undertrained, underequipped water supply personnel cope with the multiple new and old threats to the quality of drinking water such as chemicals and viruses? Even a properly operated conventional treatment plant which handles bacteria, color, and turbidity is not geared to handle the spectrum of new toxic chemicals which have found their way into the water system. Even the proposed 1972 DWS do not list maximum allowable limits for the following compounds which may be contaminating drinking water: estrogens, hexachlorophene, PCB, NTA, and phthalate esters, for example. (PCB has recently been located in startling concentrations in ocean water.) The reason given is lack of sufficient data—once again reflecting the poverty of effort to find out.

Viruses illustrate a category of contaminants for which no limits are listed in the proposed 1972 DWS owing to a lack of sufficient and conclusive data. In fact, there is a whole list of heavy metals and other contaminants<sup>1</sup> which the revised proposed standards are not dealing with on the grounds that sufficient studies have not been made to determine either their presence or their minimum level for toxicological effect. With the exception of the hepatitis virus, there is not the kind of conclusive evidence the Government wants to show that virus can be transmitted by the water route. Poliovirus has been isolated from drinking water in France and in the U.S.<sup>2</sup> Research work on virus is in progress, according to the EPA.<sup>3</sup> The viricidal action of chlorine is being studied. I think it is also important to study at what point do excessive amounts of chlorine, dumped into water to combat other hazards, have a harmful long-term effect. I believe the city of Cincinnati has determined the enormous increase it is using of chlorine in the past 10 years. The extent of endemic disease caused by viruses contaminated water is unknown. There is good evidence to show that viruses, even at the low levels at which they occur in drinking water, are capable of infecting humans and causing disease. One type of virus can cause damage to heart tissue of the fetus even though the infection of the mother is subclinical.

It is clear that rarely has there been such a legislative gap as the one which S. 1478 is striving to fill. The present authority of EPA's

<sup>1</sup>"Nickel, tin, vanadium, lithium, boron, beryllium, antimony, molybdenum, uranyl ion, viruses, hormones, adhesives, coatings, solvents, asbestos and carcinogenic and/or teratogenic organic compounds" (EPA Drinking Water Standards, 1971 Revision, to be published)

<sup>2</sup>In 1970, for the first time, polyomyelitis virus was isolated from a contaminated well in Michigan (ref. Mack, W. N., Lu, Y.-S. and Coohon, D. B., Michigan Agricultural Experimental Station, Journal No. 5276; also, H.S.M.H.A. Health Reports, mar. 1972).

In France, polio plus other enteric and non-enteric viruses were isolated from treated drinking water in the period 1959-1963. The water samples were taken in Paris (Coin, L., Menetrier, L. M., Labonde, J. and Hannoun, M. C., p. 1-10. *Advances in Water Pollution Research*, Proc. 2nd Int. Conf., 1964, Tokyo, Jaag, O., ed. (1965), Pergamon Press, New York) and in the province of Meurthe-et-Moselle (Foliguet, J. M., Schwartzbrod, L. & Gaudin, O. G., *Bull. W. H. O.* 35, 737 (1966)). The results of Coin et al. were later contested by Coulon et al. (Coulon, G., Netter, R. (1967). *Bull. Inst. Natn. Santé Rech. Med.* 22, 941; and Coulon, G., Netter, R. & Nejmi D. (1968), *Bull. Inst. Natn. Santé Rech. Med.* 23, 1347).

<sup>3</sup>See the testimony of Robert W. Fri and James McDermott, E. P. A., earlier at these hearings. Preliminary results show the isolation, for the first time, of polio, echo and reoviruses in properly treated drinking water from public supplies in Massachusetts.

water hygiene program is limited to preventing the spread of communicable diseases. This means that only bacteriological and related standards can be enforced. And note how the enforcement operates from the Federal level. It takes two quite narrow directions—EPA can notify the Federal Drug Administration that a certain area's water supply falls below safe bacterial levels and the FDA in turn can stop interstate carriers such as trains and planes from using such water. That is the limit.

What is required is a systematic policy which produces adequate DWS with sufficient authority and funds to enforce them, and prompt revision of these standards with adequate planning of water resources for the future. The emphasis must be on prevention, on foreseeing and forestalling the long-term as well as short-term risks and ravages on human health from the chemicals, bacteria, pesticides, toxic metals, radioactive substances, hormones, viruses and many other wastes which are making our water heavy with silent violence.

The following recommendations are offered by way of strengthening the proposed bill, S. 1478:

1. Public notification. The results of all laboratory analyses of the required samples of drinking water should be made available to the public on a regular basis, as they appear. Every effort should be made by the State and/or local public health authorities to educate the public as to the meaning of the drinking water standards, so that they may be in a position to interpret the meaning of the water supply reports. In addition, in cases where maximum allowable limits have been exceeded, the public should be routinely informed of any resultant health hazards whether short term or long term via the news media or other communications channels. In that context, Mr. Chairman, I would like to note that because of high nitrate concentration in the San Joaquin Valley in California, at least two communities have placed printed warnings on water bills mailed to customers. Now, apparently in one community, parents are sent additional warnings against the ingestion of tapwater by infants. Dr. Thurston Larsen of the Illinois State water survey told the Center's task force, previously, that pediatricians and hospitals in parts of Illinois have been issued special warnings five or six times within the past 3 years.

2. Emergency plan of action. Water supplies should be required to have a suitable plan of action, in case of emergencies affecting the quality of the drinking water or the operation of the plant. This could include emergency reserves or alternate sources to provide water for drinking and culinary purposes.

3. Every major city should have an adequate reserve supply of raw water, so as to compensate for annual variations in the main raw water source(s) such as drought. Washington, D.C., has a reserve we understand of only 1.5 days.

4. There should be a suitable program of cooperation between the pollution control agency and the water supply agency to insure effective protection of the raw water source against pollution. This is especially desirable in view of the limitations of the conventional water supply plant and such occurrences of pollution crossovers as

that at Endicott, N.Y.<sup>4</sup> I might add here, Mr. Chairman, if it is determined that abatement from the primary pollution source must be the preferred course of action in order to insure our drinking water standards, this is going to generate a veritable revolution in the stringencies of standards that are now labeled water pollution quality standards, because as the previous witness noted, the prime functions of these water quality standards are to preserve the environment for fisheries, for recreational use, for esthetics. Once it is determined that the prime priority is drinking water, because if you safeguard it for that, you usually safeguard it for all the other three secondary purposes, then, we may have to very drastically revise both our thinking and our policies dealing with the water pollution standards that have to be met in the future.

5. A detailed, exchangeable and retrievable records system for outbreaks of waterborne diseases should be required and accessible to the public as well as to governments.

6. A detailed annual report by EPA should be required in the bill to include a candid recounting of obstacles, problems, needs, violations, warnings and accomplishments for the use of Congress and citizens.

7. More meaningful and deterrent-directed sanctions are necessary, to include rights to judicial review by aggrieved citizens of the actions or inactions by agency officials. In this context, if I may, Mr. Chairman, I would like to draw attention to the deliberation of the Senate Commerce Committee on the Independent Product Safety Bill which attempts in its draft form to establish a kind of civil servant accountability. I do not know any more important reform for getting the intent of Congress observed by the executive branch than to lower the barrier or the institutional buffer of the executive agency or department that shields Government officials and civil servants from the kind of routine accountability that many people in the private sector of our economy and many people in private institutions from universities to athletic teams are exposed to. Unless we can always, in every legislation designed to protect the public, develop not only an accountability to Congress but also an accountability which can be initiated by the aggrieved citizen or citizens, we have lost a major opportunity to go past lipservice and nominal legislation into meaningful, substantive change.

I think that one of the most fundamental reasons for all of these problems such as the General Accounting Office recounts almost

<sup>4</sup> The pollution episode at Endicott, N.Y., which occurred during the years 1964-1968 (Randall, A.D. (1970), *Jour. A.W.W.A.*, 62, 716) illustrates the need for continuous monitoring of both raw water source, and finished water for distribution to the public. The so-called Stable Well, a riverbank well, was used as a safe water supply for Endicott for 19 years. It was contaminated by bacteria travelling 180 feet through the soil, from the sewage-pollution in the Susquehanna river. This crossover was induced by various excavations, such as for bridge piers, 200 ft. upstream from the well, and for a water main 85 ft. downstream. This affected the riverbed and disturbed the geological stratification, increasing bacterial infiltration rates.

It is also reported (Akin, E.W., Benton, W.H. & Hill, Jr., W.F., p. 59, *Proc. 13th Water Quality Conf.: Virus & Water Quality, Occurrence and Control*, Feb 15-16, 1971, Urbana, Ill.) that virus (and bacteria) can travel up to 100 ft. in porous soil media. Thus, in at least two known instances, viruses travelling through the soil: 1) from a cesspool to a summer camp well, and 2) from faulty sewer lines to a municipal well, were responsible for outbreaks of hepatitis. Additional data indicate that enteroviruses can survive up to 150-170 days in soil; also, poliovirus was found to survive for at least 100 days in tap-water kept in a refrigerator, while the hepatitis virus lasted for at least 10 weeks in relatively clean water (for, ex., see *Water Treatment and Examination*, Holden, W.S., (ed.), 1970. Williams and Wilkins Co., Baltimore).

daily in its reports and the congressional investigative committees show affecting the refusal of the executive branch agents and departments to implement policy, to enforce the law is the fact that we have not set up a framework for civil service accountability.

When the Secretary of Housing and Urban Development, Mr. Romney, stated 2 weeks ago in a much too little publicized observation that Federal urban programs have almost uniformly failed, such remarks should, I think, generate a much more detailed concern about how programs that are amply funded at times and that are slated for implementation under adequate congressional authority just dissipate and completely collapse.

The civil service accountability, the development of fiduciary duty between civil servants and other higher Government officials and the public are very important remedies to consider. Otherwise, the Government official has nothing to lose for systematic inaction, for refusal to administer policy, for refusal to enforce the law. And a maximum security of tenure in the civil service and in the Government is a prime conditioning factor for maximum irresponsibility or lethargy.

8. In section 302 (h), the term "dangerous to the health and welfare of the users" should be defined in terms of the DWS and not left ambiguously loose.<sup>5</sup> Sanctions should relate to the magnitude of the hazards to which water consumers are exposed. When the DWS are set, due consideration is already given to the questions of technological feasibility and related matters so that the courts should not be given such a broad *de novo* review of such factors. As a minimum, the public should be notified of any noncompliance on the part of a water supply system. In addition, a definite timetable for conducting nationwide surveys should be established in the proposed legislation. An explicit timetable for revising the DWS should also be made explicit. We should not have to wait another 10 years.

9. The National Water Hygiene Advisory Council should be required to hold open meetings with full transcripts. The Motor Vehicle Safety Advisory Committee of the Department of Transportation does just that, and the council has not been impeded in carrying out its work and in engaging in candid discussion. Careful language should be drafted to insure adequate representation of water consumers along with the various establishments provided for in the proposed S. 1478. I think the bill should also make sure that the advisory council should have no policymaking function whatsoever.

The existing advisory committee setups on drinking water to EPA are virtually policymaking units. It is true they can be overruled or

<sup>5</sup>Of 20 chemical contaminants with toxicological significance, the safety factors allowed for in the 1971 Revision of the Drinking Water Standards are as follows: 10 have safety factors less than or equal to 10; 4 (including nitrate), have safety factors close to one or possibly worse (Note that methemoglobinemia can result from consumption of high nitrate drinking water even for only one day). For 5 contaminants, safety factors cannot be defined for lack of suitable data (maximum allowable limits have been proposed for them however). Also, there is really no safe minimum dose for radioactive contaminants. In the case of sodium, for financial reasons, the max. allowed level is over 13 times the permissible dose (from water intake) on a strict diet, and such persons (on a strict diet) must be warned against drinking water containing over 20 mg/l.

The preceding shows the extremely marginal character of the safety factors, even when it is possible to define such factors—Hence, the need for a strict definition of "dangerous" drinking water in terms of the Drinking Water Standards.

changed by EPA officials, but the role they play, in my judgment, is too powerful for deciding such important public health issues. That should be the prerogative of a governmentally instituted framework.

Finally, it is urged that the Senate Commerce Committee, in reporting out this bill, will inform citizens in its report about the serious deterioration of water quality, the increased risk levels which are now in the categories of unknowns, and the public's stake in doing something about it.

From now on, it should no longer be possible for the public to think of water pollution without also thinking of drinking water hazards. Thank you.

Senator SPONG. Mr. Nader, thank you.

On your final recommendation, I can assure you that the report will do just that.

I have some questions here. I would like to digress for just 1 minute, because I was interested in your discussion of accountability. I have some agreement with what you have said, but you talked about the academic and the athletic world. What accountability does the academic world have where tenure has become the order of the day, and the athletic world where players and coaches treat contracts as if they didn't exist at all, jumping from one basketball league to another, and this sort of thing? I was interested in your observation that they are accountable, because in my judgment they are not.

Mr. NADER. I deliberately picked those two examples, because they were hard ones.

Senator SPONG. I agree with you.

Mr. NADER. Now, in athletics, for example, there are two forms of accountability. One is if you don't perform, you are rather instantly judged by anywhere from 10 to 50,000 people, and millions on television.

Second, if you don't perform, there is what is called a bench filled with straining athletes who can't wait to replace you.

Third, you can be fined and suspended, as indeed baseball players and football players are by coaches.

I will agree that the Washington Redskins, with approximately 53,000 tickets in their stadium held by only 14,000 ticket holders, blacking out the television when the Redskins play in Washington, D.C., represents ultimate unaccountability of the management. But when it comes to the players, you can see how there is a whole range of accountability if they don't produce.

As far as the contracts are concerned, whether a player is a piece of property or a human being, I think the Congress should get around to really determining that.

Senator SPONG. The Supreme Court may start on it today.

Mr. NADER. And the antitrust issues, as well. When it comes to Universities, notice there is at least a 3-year or so period before tenure. But when the Secretary of Interior or the head of the Public Health Service are appointed, right then they attain the immunity from accountability that can operate. Faculty also are increasingly being judged by students. And they are very sensitive to student evaluations that are published at the end of the year.

Furthermore, there is now a rising current of thought in academia that this strict tenure isn't a good thing, that in some ways it protects professors from infringements on their academic freedom, but on the other hand, it has all the other problems which generate laziness and nonrenewal and things of that sort.

Senator SPONG. Similar to what you talked about in the Civil Service?

Mr. NADER. Right. The Civil Service has gone full swing. It was a reaction to the spoils system of the Jacksonian era and prior, and now we have a spoiled system, not a spoils system, where there is an insulation from the kind of immediate political ejection of the officials by their superiors in the White House or elsewhere, but there is an enormous detriment or an enormous liability because it is simply not adequately responsive.

The head of the pesticide regulation division in the Department of Agriculture and his predecessors for 20 years had serious violations documented in their files of the pesticide regulations. According to a GAO report out in, I believe, 1968, there had been not a single referral of these violations to the Justice Department for prosecution. In effect, these gentlemen repealed the law. They didn't come out and say it, but by their behavior, they repealed the law, and people who have been perhaps poisoned or harmed by these pesticides, directly attributable to violation of the regulations, had no grievance.

I might add that many of the judicial recourses, such as mandamus actions, were not developed just a few years ago. Very paradoxically, perhaps, they were developed well before the Civil Service. The equitable powers of the court were developed in the ancient common law where perhaps they had a stronger sensitivity to the need to always develop alternative review systems and doctrines for institutions.

Senator SPONG. Well, the basic case in law setting up judicial review in the United States was a mandamus proceeding, *Marbury v. Madison*.

In assessing the need for legislation of this type, we are forced in many cases to compare the urgency of the need with other issues of the day. You and I touched on this during the course of your statement, but I would be interested in your opinion as to how drinking water regulation stacks up against such other concerns as air and water pollution, toxic substance control, and product safety.

Mr. NADER. Well, I think the criteria for judging which is more important has to be the proximity and frequency of exposure to the human body. When you are dealing with, for example, air pollution, we are dealing with something quite as intimate as drinking water at times. When we are dealing with toxic substances that come in the form of consumer products, we are dealing with a lower population of risk, because some consumers don't buy the product.

So, clearly on that criteria, if drinking water isn't first among equals, I don't know what would be. I think that it is basic again to repeat that it is mostly a matter of style. You see, for example if ITT ran our drinking water supply, there would be more concern now displayed by Congress. And because drinking water policy and

practice are so decentralized and because it is so difficult to nail down cause and effect, and because of the lack of research and development outside the particular water supply establishment, we are at the position that we are now.

I would think that EPA is going to have to deal quite seriously with how it is going to allocate its particular budgetary dollar in the water pollution area and drinking water area from now on at a much more compelling rate.

Senator SPONG. Despite the late start, you view this as of equal concern?

Mr. NADER. Yes. Fortunately, there will undoubtedly be people who will be subjected to the most severe maladies in the next 10 to 50 years, because of what they have been drinking up to now. So we have discounted quite a few years into the future; the old saying, don't postpone what you should have done in the 1920's any longer, certainly holds here.

Senator SPONG. I would like to return to the thin red worms. Is there reason to believe that the urban poor receive water of a lesser quality than those in more affluent neighborhoods?

Mr. NADER. Yes, there is, largely because of the exceptionally deteriorated water pipe distribution system, and their vulnerability to external contamination as well. That is, the pipes themselves generate a kind of contamination, I believe some cadmium and chromium comes from that. But they are also vulnerable to external—in one of the pipes, it was discovered, for drinking water, there was a 30-inch water snake, for example. It is interesting how a 30-inch water snake could get in that far to the system.

Senator SPONG. The amendment under consideration calls for Federal enforcement of a standard only if the state fails to enforce it. In most cases, the Federal Government could act only if it had given the State 30 days to enforce the standard. If an extreme condition existed so that it was necessary to stop prior to the 30-day period, EPA could act directly. You indicate you would like to see direct Federal enforcement of all standards. In the past you have been critical of the role of the States in the control of air and water pollution. Does your position on this legislation stem from that experience, and would you share that with us?

Mr. NADER. Yes, and it also stems more comparatively with the meat and poultry inspection laws. That is, the meat inspection law had exactly the same type of phrase, that if the state standards and enforcement practices were at least equal to or higher than those of the Federal Government, the Federal Government would not have an enforcement role.

That has been almost disastrous, because the states have an extremely jealous concept of their jurisdiction here, and their meat inspection standards and enforcing practices have been rubber-stamped by the U.S. Department of Agriculture, even though they don't deserve to be, that is, the States themselves became a very potent lobby, the State departments of agriculture, and in this case the waterworks officials would become a very potent lobby.

My approach to it is to have dual enforcement. I don't think that the Federal government can get down into localities certainly with

the speed that a really alert municipal or State enforcement arm could at all times. So, I would be very much for dual Federal and State and local, as the case may be, enforcement. I have made this proposal before dealing with consumer bills, and for some reason the very contemplation of the dual enforcement system has been alien to many people. But I think it is well worth trying, and I don't see any particular problem in it, particularly because they are all the same standards.

If they are all national standards, you don't have a problem of one agency enforcing one set of standards and another agency enforcing another. You do, however, have two options for enforcement. If the locals are reluctant to enforce or they don't have enough resources to enforce, then always the Federal Government could come in coterminously.

Mr. MOORE. I would like to add something to that. I think that with the public notification concept, the public would also act as an enforcement agency, because, you see as it is now, the only thing that the public is really aware of is when a small red worm turns up in their water supply or when it tastes bad.

Senator SPONG. Or when a football team is lost.

Miss ATHANASSION. I would like to make a point as to the worms. Sometimes people are told that they are harmless in themselves. This may be true. However, sometimes they ingest bacteria and virus which then become immune to the disinfecting action of chlorine. So in that sense, they should be taken care of.

Mr. MOORE. What I was saying was that if the public were notified of the results of the tests conducted on their water supplies with regard to their chemical and bacterial quality, then the public certainly would, I think, in a case of noncompliance, compel the local agencies, the States, and even the Federal government, to comply.

I think it is also important to note again that we can't leave in this bill, the ambiguous approach, that when the water becomes "dangerous," we should start to act. We really, I think, have to rely on our drinking water standards, and say that when the water doesn't meet the drinking water standards, then it is dangerous, particularly when it doesn't meet the mandatory standards.

I have attended the EPA Advisory Council's meetings concerning the revision of the 1962 DWS and without exception, all the clauses that had to do with public notification have been dropped. The water suppliers feel that the public would be unduly alarmed if they found that their water was polluted and contaminated; and I think the public has a right to be. So, they have taken this sort of protective attitude, dropping all public notification clauses from the drinking water standards. If this bill does not include these, I am afraid they will never be included anywhere.

Senator SPONG. That leads to this next question. Amendment 410 does not have a provision to allow citizens the right to bring suit to force compliance with drinking water standards or force EPA or the States to perform their mandatory duties properly. Should citizens have standing to enforce discretionary duties as well as those which

are merely ill-advised, rather than an arbitrary or capricious act? Would you suggest that such a provision be added to this legislation as was done to the Clean Air Amendments of 1970, the water pollution legislation, and other pending environmental legislation?

Mr. Nader. Yes, very definitely. It is not only good draftsmanship in terms of trying to close out the likelihood of a de facto repudiation of Congressional policy by administrators, but it is also a part of a new dimension in what self-government is all about. I think we have reached a limit in this country for wholesale delegation of very important public duties to bureaucracies. Now, we are trying to take back part of it by mandamus actions, by citizens' suits, by class actions, and all the recent judicial decisions, such as broader standing before the FCC, the Church of Christ decision, and many others that have come around in recent years. I think this provision that you have just mentioned is really very important.

I think that Mr. Moore's point about changing the definition of dangerous is very compelling. One only has to look at the FDA to see how it has interpreted "imminent peril" and other provisions of the Food and Drug Act to illustrate that even where you have a drug that you can see and feel and it is prescribed, that there is an enormous reluctance to move rapidly unless there is a sudden tragedy, like the thalidomide disaster, where thousands of infants were born in Europe with deformed limbs. Unless the term dangerous is replaced by noncompliance with the drinking water standards phrase, we are going to allow such an enormous amount of agency discretion as to render the pressures on that agency almost irresistible for inaction.

Senator SPONG. I helped draft two of those class action sections in various bills. Although I am a lawyer, I have been very much afraid of unjust enrichment of the legal profession in dealing with what I think are capricious legal actions.

Therefore, I have always insisted, along with Senator Baker of Tennessee—we have been reasonably successful thus far—that the administrators be given some opportunity and some notice to perform before the suit can be given. This was to prevent just any citizen initiating a suit as a result of some alarm that was passed on to him without the State officials or the Federal officials or anyone else being given notice and an opportunity to perform before they were actually taken into court. I don't know that there will be a class action section added to this bill, but that is the type we are dealing with in the toxic substances bill.

Mr. NADER. Of course, there is a little difference in the sense that one can hardly envision a suit for money damages in this context.

Senator SPONG. Right.

Mr. NADER. So you are dealing with, in effect, mandamus actions, and a mandamus action, quite apart from the need to move very quickly because of an emergency, but a mandamus can be mooted by an agency doing what the mandamus action requests. I don't think there needs to be a period providing the agency with another opportunity to remedy the condition.

Senator SPONG. We thank you very much for your testimony, and for your suggestions.

We have a panel coming up later in the day of those who deal with the water systems in the country, and I shall certainly ask them to comment on what you have had to say. After they have testified, if you want to file anything further for the record, we will be pleased to hear from you.

Mr. NADER. May I just say one more thing, Senator, because you put your finger on a point that I think is a widespread reaction here in Congress whenever class action provisions are recommended. The image of an aggressive ambulance chaser or money-grubbing lawyer is evoked, not really to argue for limitations on attorneys but actually to defeat the right of the citizens, per se.

Senator SPONG. I am interested in the former, not the latter.

Mr. NADER. In case you ever have to argue this point with your colleagues, I might suggest that medicare was an enormous bonanza for those gentlemen who received the ambulances in the hospitals, namely, doctors, and it is now a scandal, not only a bonanza, it is the subject of criminal prosecutions by the Government for overcharges by many medical practitioners, and yet nobody has said let us abolish the rights that patients receive under medicare in order to curb this. What we should do is to curb the abuse and leave the rights.

I think we should make that distinction very clearly, because I have had it told to me again and again in testimony before the Congress, whenever this issue comes up, some Senator, usually a Representative, tells me how about the ambulance chasers, and is this a lawyer's relief bill? I think it is very important to make that clear distinction, curb the abuses that may arise from lawyers, but reserve the citizens' rights.

I would also add that there may be some speculative lawyers filing suit, but I haven't seen many speculative judges giving them what they want. So we have that judicial constraint as well.

Senator SPONG. Thank you very much.

I thank all of you for appearing here this morning. We are going to recess until 2:15, and we will hear from the other witnesses at that time.

(Whereupon, at 12 noon, the hearing was recessed, to reconvene at 2:15 p.m., this same day.)

#### AFTERNOON SESSION

Senator SPONG. The hearing will be in order.

Initially, I would like to apologize to you, gentlemen, for holding you over until this afternoon and to thank you for staying to present your views on this legislation.

The hearings went a little longer this morning than I had anticipated, but I feel we are making a good record on this legislation and we are very pleased to have you here.

You gentlemen can testify in any order that you may wish and we will question you after we have heard from all of you.

STATEMENT OF JOHN E. VOGT, CONFERENCE OF STATE SANITARY ENGINEERS; ACCOMPANIED BY PROFESSOR LEONARD B. DWORSKY, WATER RESOURCES CENTER, CORNELL UNIVERSITY; CHARLES C. JOHNSON, AMERICAN PUBLIC HEALTH ASSOCIATION; DR. JAY H. LEHR, NATIONAL WATER WELL ASSOCIATION; CHARLES A. BLACK, AMERICAN WATER WORKS ASSOCIATION; STANLEY E. KAPPE, P.E. AND EXECUTIVE DIRECTOR, AMERICAN ACADEMY OF ENVIRONMENTAL ENGINEERS; AND PROFESSOR ROBERT BAUMANN, IOWA STATE UNIVERSITY, PAST PRESIDENT, AMERICAN ASSOCIATION OF PROFESSORS IN SANITARY ENGINEERING

Mr. Vogt. Thank you, Mr. Chairman, we appreciate your patience and your being able to hear us this afternoon. My colleagues and I welcome the invitation and opportunity to appear in support of the Federal legislation aimed at improving the quality of community water supplies for the Nation.

Now, I would like to first introduce myself and then my colleagues.

I am John E. Vogt, immediate past chairman of the Conference of State Sanitary Engineers. I am representing the Conference of State Sanitary Engineers today.

At my extreme right is Dr. Jay H. Lehr, executive director of the National Water Well Association.

On my immediate right is Mr. Charles A. Black, president of the American Water Works Association.

On my left is Mr. Charles C. Johnson, associate director of the American Public Health Association, and on Mr. Johnson's left is Professor Leonard B Dworsky, representing the university's council on water resources.

Also with us today is Dr. Robert E. Baumann, representing the American Association of Professors of Sanitary Engineering, and Mr. Stanley E. Kappe, executive director of the American Academy of Environmental Engineers.

I think I have introduced all my colleagues, Mr. Chairman.

I would also like to state at this point that my colleagues on the panel concur in the statement that I am going to present on behalf of CSSE. We discussed this at a meeting yesterday and they are in concurrence with this statement.

The Conference of State Sanitary Engineers welcomes the invitation and the opportunity to appear in support of Federal legislation aimed at improving the quality of community water supplies for the Nation.

I won't read the next paragraph, I have already introduced myself.

Senator SPONG. I might say to all of you that your statements will be printed in the record in full and you may testify from them as you wish.

I would not want you to leave out anything of importance, but I would encourage you wherever possible to hit the high spots.

Mr. VOGT. Very well, Mr. Chairman, I will do that.  
 Senator SPONG. Fine.

Mr. VOGT. The membership of the CSSE is deeply involved in the conduct of community water supply programs at the State level aimed at assuring safe, adequate and palatable public water supplies.

The next portion of my statement gets into the interstate carrier program. I think that was discussed this morning and I don't believe I need to go into it further except to say that the interstate carrier program has been a partnership between the State and Federal water supply agencies working in concert with the water supply utilities on the local scene to assure the safety of the water consumed by people riding the public carriers interstate.

It has worked in the past and we feel that we would like to see an expansion of this partnership. Recognizing the advantages of this partnership, the conference in December 1968 did adopt a position statement supporting the partnership and urged that any Federal legislation on public water supplies should strengthen and extend this partnership to a national program and not merely a Federal program.

A copy of this position statement is attached and I would ask that it be made a part of the record.

Senator SPONG. Very good, without objection it will be.

Mr. VOGT. In November of 1970, the conference reaffirmed this earlier position and I have also attached a copy of that position statement and would ask that it be made a part of the record.

Senator SPONG. Without objection.

Mr. VOGT. I will now comment on specific provisions of amendment No. 410 to S. 1478.

The conference of State sanitary engineers supports provisions for establishment of national drinking water standards with authority for the States to adopt standards equally or more restrictive. We believe the time schedule should be adjusted so as to permit thorough study and investigation for up to 1 year prior to publication and thereafter promulgation soon after consideration of comments received.

We support the concept of a Drinking Water Council. We believe, however, the Council should have a strong legislatively mandated role in the program.

We support those provisions for, (a) research, technical assistance, information and training of personnel, and (b) special study and demonstration project grants.

We support water supply program grants to the States with a mechanism of federally approved State plans and programs as prerequisite conditions for a program grant.

We support emergency authority for the administrator to take action in the event that a community water supply presents an imminent and substantial endangerment to the health of the community and the State does not act.

We believe that these provisions of the amendment would initiate a strategy to greatly strengthen the technical and financial assistance from the Federal Government to the States and water utilities,

permit filling in the research and training gaps, and assure the full use of the State and local personnel integrated as a part of a national program to enforce drinking water standards.

That portion of the language of the amendment for which we have real concern focuses on the enforcement sections. In order to carry out these provisions would require the Administrator to conduct routine inspections and surveillance of every community water supply system in the Nation. This would be necessary to determine whether the systems comply with the standards or regulations provided for in the bill. This could not be accomplished by a few engineers in a regional office.

Good government and efficiency of operation dictate that State resources be integrated and utilized in an optimum fashion as part of the national safe drinking water program and that they not be duplicated.

The program grant provisions would afford the device whereby the Administrator of EPA would in effect contract with a State to do the leg work involved in the national program. The program plan which the State would submit annually would need to be approved by the administrator and would be the contractual arrangements.

If the State failed to faithfully perform under such an arrangement the Administrator would impose appropriate sanctions to include withdrawal of financial support which it can be assured would be most effective.

We are convinced that through the constraints built into the provisions of the program plan to insure satisfactory performance by the States, coupled with the authority for the administrator to take positive action under emergency conditions which transcend State capabilities assures strong and effective enforcement of the drinking water standards.

The duplicative aspects of Federal inspections, monitoring, laboratory surveillance, et cetera, now being experienced in certain other environmental program areas need to be expressly avoided.

I would like to digress a little, Mr. Chairman; by this I mean that in determining the compliance of physical facilities with a standard, a good deal of engineering judgment needs to go into this determination. With a duplication of surveillance and inspections this could result in differing judgments being made with differing and contradictory recommendations to the water supplier which would be most confusing and very difficult for him to develop a program of corrective action.

Thus, the conference of State sanitary engineers strongly recommends modification in the language so that enforcement of standards is a State responsibility.

We in CSSE considered how best we might offer specific comments or recommendations on amendment No. 410 now before your committee. Of the alternate proposals considered the one thought to be most constructive and helpful to the committee would be to prepare a draft version incorporating in some specific language the principles that we believe should be included in such legislation.

Accordingly, this course of action was taken and, Mr. Chairman, I have a draft version of this, taking into account these specific

recommendations that I would like to be included as a part of my statement.

Senator SPONG. They will be received.

Mr. VOGT. I will certainly not go into a discussion of the draft in detail. I would just like to very briefly hit the highlights.

First of all, it does provide for primary drinking water standards allowing a year's time for their development. The reason for the year is to permit sufficient research of the literature and sufficient information to be gathered to determine the figures that might go into any group of standards.

It establishes a council balanced with members of the general public and those having expertise in the water supply field and it provides the council with a strong mandated authority.

It also provides for research and technical assistance and demonstration grants as well as for program grants to the States which is really the key to the enforcement of the standards.

Then, it also provides for emergency powers for the Administrator in the event of an imminent public health hazard and the State does not act.

Now, in this particular approach, we have included the issuance of administrative orders against the water supplier and if these orders are not complied with then the administrator could seek the support of a Federal district court to enforce that order to require corrective action.

In other words, we believe that the important item is correction of deficiencies rather than extraction of fines or civil penalties. We are interested in a safe water supply to protect the public health.

This draft was shared with my colleagues on the panel last week and at a meeting yesterday we discussed it.

Now, I am able to state that there is a consensus on the principles that are incorporated in this draft. Obviously in the short time that we had it was not possible to discuss it thoroughly and to agree precisely on all of the language. However, I can say that as far as the principles that are involved here—there was a consensus on those.

We would be very pleased to work with your staff on language or to provide whatever assistance and input that we could to assist in any way in development of the language of the bill.

That concludes my statement, Mr. Chairman, and I would now like to call on Dr. Lehr of the National Water Well Association.

(The statement and attachments follow:)

STATEMENT OF JOHN E. VOGT, IMMEDIATE PAST CHAIRMAN,  
CONFERENCE OF STATE SANITARY ENGINEERS

The Conference of State Sanitary Engineers welcomes the invitation and the opportunity to appear in support of Federal legislation aimed at improving the quality of community water supplies for the nation.

I am John E. Vogt, Past Chairman of the Conference of State Sanitary Engineers. I am employed by the Michigan Department of Public Health as Chief of the Bureau of Environmental Health, and have been in this position for twelve years. Prior to that I was a sanitary engineer assigned to the department's public or community water supply program for twenty years.

I am especially pleased that our Michigan's Senator Hart is one of the principal sponsors of legislation that seeks to upgrade this nation's public water supplies.

The Conference of State Sanitary Engineers comprises the chief sanitary engineering official of each of the departments of health of the states, territories and possessions of the United States. The Conference celebrated the 50th anniversary of its founding in May of last year. Among other responsibilities for programs aimed at a quality environment and protecting the health of people, our members are responsible for the administration of the community water supply programs in their respective states. Hence our interest in Federal legislation pertaining to community water supplies and our desire to provide you with advice and assistance based upon the collective thinking and considerable experience of our members.

Our membership is deeply involved in the conduct of community water supply programs at the state level aimed at assuring safe, adequate and palatable public water supplies under our respective state laws. Up to now the Federal involvement has been very minimal. Legally this has been under the Public Health Service Act and the Surgeon General's (now in the Environmental Protection Agency) regulations governing water used on interstate carriers such as trains, aircraft, buses and boats. This is a joint federal-state program involving a small percentage of the total number of community water supplies in the nation. For example it covers 15 water supplies out of the total number of 750 community water supplies in the State of Michigan.

Although small as Federal programs go much good has come of it. The drinking water standards developed for this program, the concepts of water supply engineering design and operation, the research—meager as it has been, and other aspects of a water supply program have been of benefit to the states. In other words, the concepts of the interstate carrier water supply program have carried over into the total water supply program of the state. Further some of the very basic principles coming out of the early studies and research by Public Health Service engineers are today followed in the practice of water supply engineering.

This interstate carrier program is a partnership between the state and Federal water supply agencies working in concert with the water supply utilities on the local scene to assure the safety of the water consumed by people riding the public carriers traveling interstate. It has worked!

Recognizing the advantages of this partnership the Conference of State Sanitary Engineers in December 1968 adopted a position statement supporting the partnership and urging that any Federal legislation on public water supplies should strengthen and extend this partnership to a *National* program, not merely a *Federal* program. A copy of this position statement is attached and made a part of this statement.

In November 1970, the Conference reaffirmed and extended the earlier position statement on the subject of Federal legislation on public water supplies and a copy of this statement is attached and made a part of this statement. The thrust of these position statements is that we need a National program and one that utilizes the capabilities and resources of the Federal government, states and local water utilities without duplication of effort and manpower.

I will comment now on specific provisions of Amendment No. 410 to S. 1478.

1. The Conference of State Sanitary Engineers support provisions for establishment of national drinking water standards with authority for the states to adopt standards equally or more restrictive. We believe the time schedule should be adjusted so as to permit thorough study and investigation for up to one year prior to publication and thereafter promulgation soon after consideration of comments received.

We support the concept of a Drinking Water Council. We believe, however, the Council should have a strong legislatively mandated role in the program.

3. We support those provisions for:

(a) Research, technical assistance, information and training of personnel, and

(b) Special study and demonstration project grants.

4. We support water supply program grants to the states with a mechanism of Federally approved state plans and programs as prerequisite conditions for a program grant.

5. We support emergency authority for the Administrator to take action in the event that a community water supply presents an imminent and substantial endangerment to the health of the community and the state does not act.

We believe that these provisions of the amendment would initiate a strategy to greatly strengthen the technical and financial assistance from the Federal government to the states and water utilities, permit filling in the research and training gaps, and assure the full use of state and local personnel integrated as a part of a national program to enforce drinking water standards.

That portion of the language of the amendment for which we have real concern focuses on the enforcement sections. In order to carry out these provisions would require the Administrator to conduct routine inspections and surveillance of every community water supply system in the nation. This would be necessary to determine whether the systems comply with the "standards or regulations" provided for in the bill. This could not be accomplished by a few engineers in a regional office.

Good government and efficiency of operation dictate that state resources be integrated and utilized in an optimum fashion as part of the national safe drinking water program and that they not be duplicated.

The program grant provisions would afford the device whereby the Administrator of EPA would in effect contract with a state to do the leg work involved in the national program. The program plan which the state would submit annually would need to be approved by the Administrator and would be the contractual arrangements. If the state failed to faithfully perform under such an arrangement the Administrator would impose appropriate sanctions to include withdrawal of financial support which it can be assured would be most effective.

We are convinced that through the constraints built into the provisions of the program plan to insure satisfactory performance by the states, coupled with the authority for the Administrator to take positive action under emergency conditions which transcend state capabilities assures strong and effective enforcement of the drinking water standards. The duplicative aspects of Federal inspections, monitoring, laboratory surveillance, etc., now being experienced in certain other environmental program areas need to be expressly avoided. Thus the Conference of State Sanitary Engineers strongly recommends modifications in the language so that enforcement of standards is a state responsibility.

I very much appreciate the opportunity of appearing before you today on behalf of the Conference of State Sanitary Engineers. We would like to assist in any way possible to bring about the worthwhile objective of this legislation, namely assuring the safety of this nation's community water supplies.

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STATEMENT OF POSITION OF EXECUTIVE BOARD, CONFERENCE OF STATE SANITARY ENGINEERS ON FEDERAL LEGISLATION COVERING PUBLIC WATER SUPPLIES

The membership of the Conference of State Sanitary Engineers has been for many years and continues to be deeply involved in assuring the safety of the water delivered by the Nation's public water supply systems. Responsibility is based upon state law and supervisory control is carried out by the state water hygiene surveillance programs. The Conference believes this primary responsibility for supervision and enforcement of drinking water quality standards should remain as is without duplication by any Federal agency.

The Federal government has authority to evaluate public water supplies used as a source of water by public carriers traveling in interstate commerce. This has been exercised by the Public Health Service and now under Federal reorganization by the Environmental Protection Agency. The Service has provided technical assistance to the states in the conduct of their water hygiene programs. This has varied in degree through the years and more recently has been quite minimal.

It is recognized by all that a partnership is needed between the state and Federal water hygiene agencies working in concert with the suppliers of water on the local scene to assure the safety of this Nation's public water supplies. There has been interest to formalize this by Federal legislation.

Although past efforts have been effective the Conference of State Sanitary Engineers believes a renewed national effort is needed to assure continued and improved protection of public water supplies. The Conference believes further that Federal legislation is desirable and timely and CSSE should participate actively in the development and support of legislation. Such legislation should include provisions for:

1. The development and promulgation of National drinking water quality standards covering biological, chemical and physical properties to be implemented by the states.
2. Research and demonstration programs relating to the total field of public water supply.
3. Traineeships and fellowships for graduate study in water supply and related fields.
4. Training for personnel of state water hygiene agencies.
5. Training for personnel of public water supply agencies.
6. Grants to state water hygiene agencies to strengthen and expand their programs.
7. Augmenting the staff of experts within the Federal water hygiene agency to provide technical assistance to the state water hygiene agencies.
8. Development of a cooperative program for evaluation of state water hygiene activities.

STATEMENT OF POSITION OF EXECUTIVE BOARD, CONFERENCE OF STATE SANITARY ENGINEERS RELATIVE TO FEDERAL LEGISLATION ON PUBLIC WATER SUPPLY PROGRAM

BACKGROUND

Through the years it has been recognized that the primary responsibility for supervisory control and regulation of all public water supplies is vested in the states. The Conference believes this primary responsibility should remain as is without duplication or overlapping by any Federal agency. Public water supplies have played a diminishing role in the spread of disease because of improvements in water treatment processes, the training of plant personnel, and the sanitary control of water supplies. Waterborne disease today is relatively uncommon in the United States. These accomplishments are due largely to the combined efforts of state health departments and the water supply industry.

Although past efforts have been successful a renewed national effort is needed to cope adequately with complex wastes difficult to define and treat arising from new technologies and to assure continued protection of public water supplies.

The Public Health Service has statutory authority to evaluate public water supplies used as a source of water by interstate carriers under the Interstate Commerce clause of the Federal Constitution. The Public Health Service also has provided technical assistance to the states in the administration of their water supply programs; however, the consultation during the last few years has been limited.

RECOMMENDATION

The federal-state partnership relative to public water supplies needs to continue and should be strengthened in an appropriate manner, fully recognizing the responsibilities of the two levels of government. Such strengthening should take the following form of support from the Public Health Service in areas of common need by the states.

1. Develop and refine drinking water quality standards based upon research and historical information.
2. Conduct research programs relating to the total field of public water supply.
3. Develop and make available training programs for personnel of state health departments to strengthen state programs.
4. Support State training programs for water works personnel.
5. Augment the staff of experts within the Public Health Service to give increased consultative support and assistance to state health departments on difficult or special problems.

S. 1478—AMENDMENT No. 410

To amend S. 1478 to protect the public health by improving existing and developing new programs to assure an adequate quantity of safe water for drinking and other human uses, and for other purposes.

Sec. 1. (a) The Congress finds—

(1) That increasing quantities and types of pesticides, organic chemicals, toxic chemicals, toxic metals, and other contaminants are entering the community water systems that serve as sources which supply the Nation with

water for drinking; that many of these new contaminants are either not detected or not removed by established water testing and treatment methods; and that these contaminants are consumed by the public thereby presenting a potential hazard to the public health;

(2) That the public should be provided with adequate quantities of water that is safe for drinking;

(3) That due to the interstate nature of many water supplies and natural sources, the origins of various contaminants, the sale and shipment of such contaminants or products made through the use or production of such contaminants through interstate commerce, and the danger to the public of consuming water containing such contaminants, the Federal Government has the responsibility of establishing minimum national drinking water standards in order to encourage the States to promulgate and enforce equivalent standards or to enforce the national standards; and

(4) That State and local governments are in need of assistance in assuring the quality of water required for drinking, and to that end the Federal Government should supply technical assistance, research and development information, testing information, assistance for the planning and implementation of comprehensive State drinking water programs, assistance for the development and demonstration of new or improved methods of making water safe for drinking, and assistance for the training of individuals involved in the management and safe operation of our Nation's community water supply systems.

(b) The purposes of this Act are—

(1) To assure that the public will be provided with water that is safe for drinking and associated human uses;

(2) To initiate and accelerate a national research and development program to achieve a high level of safety and adequacy in community drinking water supplies of the Nation;

(3) To establish minimum national drinking water standards, and to recognize that the implementation and enforcement of such standards is the primary responsibility of State and local governments; and

(4) To provide financial and technical assistance to the States in connection with the planning, development and operation of comprehensive community water supply programs; to provide grants for demonstration and development of new or improved methods of making water safe for drinking; and to provide for the training of individuals involved in the management and safe operation of our Nation's community water supply systems in order to assure that such personnel are competently and adequately trained.

#### DEFINITIONS

SEC. 2. For purposes of this act:

(1) The term "Administrator" means the Administrator of the Environmental Protection Agency.

(2) The term "Agency" means the Environmental Protection Agency.

(3) The term "municipality" means a city, town, borough, county, parish, district, or other public body created by or pursuant to State law and having jurisdiction over the supply of water to the public, and an Indian tribe or an authorized Indian tribal organization.

(4) The term "State" means a State, the District of Columbia, the Commonwealth of Puerto Rico and the Virgin Islands.

(5) The term "community water system" means any system of pipes and structures through which water is obtained and delivered for drinking or domestic purposes to the public generally by a public body created by or pursuant to state, territorial, or Federal law and having authority over the supplying of drinking water including an investor-owned water utility.

(6) The term "supplier of water" means an entity that owns or operates a community water system.

(7) The term "Council" means the National Drinking Water Council, established under this act.

#### NATIONAL DRINKING WATER STANDARDS

SEC. 3. (a) The Administrator shall, after consultation with the Secretary of Health, Education, and Welfare and with the approval of the Council publish proposed regulations prescribing national primary drinking water stand-

ards and national secondary drinking water standards within twelve months after the date of enactment of this act. The Administrator shall afford interested persons an opportunity for written comment on each such proposed regulation. After considering such comments, he shall promulgate, within sixty days after publication of such proposed regulation, such primary and secondary drinking water standard with such modifications as he, after consultation with the Secretary of Health, Education and Welfare and with the approval of the Council, deems appropriate. The Administrator may, from time to time, revise such standards following the procedure required by this subsection for promulgation of such standards.

(b) (1) National primary drinking water standards, prescribed under subsection (a) shall be drinking water standards the attainment and maintenance of which are requisite to protect the public health. Such standards—

(A) Shall apply to each community water system in the United States.

(B) Shall contain the maximum or minimum permissible levels for any constituent which may have an effect on the health of man;

(C) Shall contain criteria and procedures to assure a dependable supply of drinking water which meets the requirements of subparagraph (B); and

(D) Shall apply to drinking water supplied to consumers in bottles or other containers.

(2) National secondary drinking water standards prescribed under subsection (a) shall be drinking water standards the attainment and maintenance of which are requisite to protect the public welfare. Such standards—

(A) Shall apply to any constituent in drinking water which may affect taste, odor, or appearance of such water.

(B) Which may otherwise affect the public welfare.

(C) May vary according to geographic and other circumstances.

#### NATIONAL DRINKING WATER COUNCIL

SEC. 4. (a) There is hereby established a National Drinking Water Council which shall consist of fifteen members appointed by the Administrator after consultation with the Secretary of Health, Education, and Welfare. Five members shall be appointed from the general public; five members shall be appointed from appropriate State and local agencies having responsibility in the field of community water supply; and five members shall be appointed from representatives of organizations or groups demonstrating an active concern and which have expertise in the field of water hygiene and community water supply. Each member of the Council shall hold office for a term of three years, except that—

(1) Any member appointed to fill a vacancy occurring prior to the expiration of the term for which his predecessor was appointed shall be appointed for the remainder of such term; and

(2) The terms of the members first taking office shall expire as follows: five shall expire three years after the date of enactment of this title, five shall expire two years after such date, and five shall expire one year after such date, as designated by the Administrator at the time of appointment. The members of the Council shall be eligible for reappointment.

(b) The Council shall review, consult with, and make recommendations to the Administrator on matters relating to activities, functions, and policies of the Agency under this act; and further the Council shall be empowered to review and approve or disapprove the national drinking water standards provided for in Section 3(a).

(c) Members of the Council appointed under this section shall, while attending meetings or conferences of such Council or otherwise engaged in business of such Council, receive compensation and allowances at a rate to be fixed by the Administrator, but not exceeding \$100 per diem, including traveltime, and while away from their homes or regular places of business they may be allowed travel expenses, including per diem in lieu of subsistence, as authorized by section 5704 of title 5, United States Code, for persons in the Government service employed intermittently.

#### RESEARCH, TECHNICAL ASSISTANCE, INFORMATION, TRAINING OF PERSONNEL

SEC. 5. (a) The Administrator shall conduct and promote the coordination of, research, studies, and demonstrations, and render financial, technical, and

other assistance to appropriate public agencies, institutions, water supply utilities, and individuals in the conduct of research and studies relating to the causes, diagnosis, treatment, control, and prevention of physical and mental diseases and impairments of man resulting directly or indirectly from contaminants in water, or to the provision of an adequate quality and quantity of safe drinking water, including—

(1) New and improved methods to identify and measure the existence of contaminants in drinking water and to identify the source of such contaminants;

(2) New and improved methods to identify and measure the health effects of contaminants in drinking water;

(3) New and improved methods of treating water to prepare it for drinking, to, among other things, improve the efficiency of water treatment and to remove contaminants from the water; and

(4) New and improved methods for providing adequate quantities of safe water for drinking to the public, including but not limited to improvements in water purification and distribution, and methods of assessing the health related hazards of other characteristics of drinking water supplies.

(b) In carrying out this act, the Administrator is authorized to—

(1) Collect and make available information pertaining to research, investigations, and demonstrations with respect to providing adequate quality and quantity of safe drinking water together with appropriate recommendations in connection therewith;

(2) Make available research facilities of the Agency to appropriate public agencies, institutions, water supply utilities, and individuals engaged in studies and research relating to water supply;

(3) Make grants to, and contracts with, any state or other public agency, educational institution, water supply utility, any other organization, and individuals in accordance with procedures prescribed by the Administrator, under which he may pay all or part of the costs (as may be determined by the Administrator) of any project or activity which is designed—

(A) To develop, expand, or carry out a program (which may combine training, education, and employment) for training persons for occupations involving the management and safe operation aspects of providing safe drinking water;

(B) To train instructors and supervisory personnel to train or supervise persons in occupations involving the management and safe operation aspects of safe drinking water.

(c) There are authorized to be appropriated to carry out the provisions of this section \$20,000,000 for the fiscal year ending June 30, 1973; \$20,000,000 for the fiscal year ending June 30, 1974; and \$30,000,000 for the fiscal year ending June 30, 1975.

#### SPECIAL STUDY AND DEMONSTRATION PROJECT GRANTS

SEC. 6. (a) The Administrator is authorized to make grants to any public agency, educational institution, water supply utility, any other organization, and individuals for the purposes of—

(1) Assisting in the development and demonstration of any project which will demonstrate a new or improved method, approach, or technology for providing a safe supply of drinking water to the public; and

(2) Assisting in the development and demonstration of any project which will investigate and demonstrate health implications involved in the reclamation, recycling, and reuse of waste waters for drinking or other useful purposes and the processes and methods for the safe and esthetic preparation of such waters.

(b) Grants made by the Administrator under this section shall be subject to the following limitations:

(1) Grants under this section shall not exceed 66 2/3 per centum of the total cost of construction of any facility and 75 per centum of any other costs, as determined by the Administrator.

(2) Grants under this section shall not be made for any project involving the construction or modifications of any facilities in any community water system in a State unless such project has been approved by the State agency charged with the responsibility for safety of drinking water.

(3) Grants under this section shall not be made for any project unless the Administrator determines, after consulting the Council, that such project will

serve a useful purpose relating to the development and demonstration of new or improved techniques, methods, or technologies for the provision of safe water to the public for drinking or other useful purposes.

(c) For the purposes of this section there are hereby authorized to be appropriated \$15,000,000 for the fiscal year ending June 30, 1973; \$25,000,000 for the fiscal year ending June 30, 1974; and \$35,000,000 for the fiscal year ending June 30, 1975.

GRANTS FOR STATE COMMUNITY WATER SUPPLY PROGRAMS

SEC. 7. (a) The Administrator shall pay to each State that has:

(1) Adopted and enforces drinking water standards which are no less stringent than the applicable national primary standards or has agreed to implement and enforce the national primary drinking water standards promulgated as provided in Section 3(a) and

(2) Adopted drinking water standards which are no less stringent than the applicable national secondary standards and encourages suppliers of water to meet such standards or has agreed to encourage supplies of water to meet the national secondary drinking water standards promulgated as provided in Sec. 3(a),

the share due each State of the funds appropriated for any fiscal year pursuant to subsection (h) to financially assist in the cost of carrying out a community water supply program set forth in an annual plan approved by the Administrator.

(b) Each State's share shall be that percentage determined by dividing the population of the State by the population of the Nation.

(c) The Administrator shall approve any annual plan which is submitted by the State Community Water Supply agency if such plan—

(1) Provides for administration of the plan by the State Community Water Supply agency;

(2) Provides that such agency will make such reports, in such form and containing such information, as the Administrator by regulation may from time to time reasonably require to carry out his functions under this act;

(3) Sets forth the plans, policies, and methods to be followed in carrying out the State plan;

(4) Sets forth the status with respect to compliance with the primary drinking water standards of every community water supply in the State;

(5) Provides a statement of remedial actions being taken against those community water supplies not in compliance with the primary drinking water standards;

(6) Provides for the review of plans and control of construction of new or modified community water supply systems;

(7) Provides for surveillance of the operation of community water supplies;

(8) Provides for surveillance of water supplies serving carriers in interstate commerce as set forth in regulations by the Administrator;

(9) Sets forth the actions being taken to obtain compliance with the secondary drinking water standards;

(10) Lists personnel, laboratories, and other resources and facilities employed in the State community water supply program;

(11) Provides such accounting, budgeting, and other fiscal methods and procedures as are necessary for the proper and efficient administration of the plan.

(d) The Administrator—

(1) May approve the plan of a State Community Water Supply Agency in whole or in part or he may disapprove of the plan in its entirety.

(2) Shall not disapprove any plan or part thereof without cause and without first giving reasonable notice and opportunity for hearing to the State Community Water Supply Agency.

(3) Shall calculate the State's share on the basis of the plan or parts of the plan approved.

(e) (1) Whenever the Administrator, after reasonable notice and opportunity for hearing to a State Community Water Supply Agency finds that—

(A) The plan submitted by such agency and approved under this section has been so changed that it no longer complies with a requirement of subsection (b) of this section; or

(B) In the administration of the plan there is a failure to comply substantially with such a requirement,

he shall notify such agency that no further payments will be made to the State under this section (or in his discretion that further payments will not be made to the State for projects under or parts of the plan affected by such failure) until he is satisfied that there will no longer be any such failure. Until he is so satisfied, the Administrator shall make no further payments to such State under this section (or shall limit payments to projects under or parts of the plan in which there is no such failure).

(2) If any State is dissatisfied with the Administrator's action with respect to it under this subsection, it may appeal to the United States Court of Appeals for the circuit in which such State is located. The summons and notice of appeal may be served at any place in the United States. The findings of fact by the Administrator, unless contrary to the weight of the evidence, shall be conclusive; but the court, for good cause shown, may remand the case to the Administrator to take further evidence, and the Administrator may thereupon make new or modified findings of fact and may modify his previous action. Such new or modified findings of fact shall likewise be conclusive unless contrary to the weight of the evidence. The court shall have jurisdiction to affirm the action of the Administrator or to set it aside, in whole or in part. The judgment of the court shall be subject to review by the Supreme Court of the United States upon certiorari or certification as provided in title 28, United States Code, section 1254.

(f) (1) The Administrator shall, prior to the beginning of each calendar quarter, estimate the amount to be paid to each State under the provisions of this subsection for such calendar quarter, such estimate to be based on records of the State and information furnished by it, and such other investigations as the Administrator may find necessary.

(2) The Administrator shall pay to the State from the allotment available therefor, the amount so estimated by him for any calendar quarter, reduced or increased, as the case may be, by any sum by which he finds that his estimate for any prior period was greater or lesser than the amount that should have been paid to such State under this section. Such payment shall be made through the disbursing facilities of the Treasury Department, in such installments as the Administrator may determine.

(g) The population of the States shall be determined on the basis of the latest figures furnished by the Department of Commerce.

(h) There are hereby authorized to be appropriated to carry out the provisions of this section:

\$10,000,000 for the fiscal year ending June 30, 1973;

\$10,000,000 for the fiscal year ending June 30, 1974; and

\$15,000,000 for the fiscal year ending June 30, 1975.

Sums appropriated pursuant to this section shall remain available for obligation until expended.

#### EMERGENCY POWERS

SEC. 8. (a) Whenever on the basis of a report or after evaluating a State community water supply program there is substantial evidence that a community water supply system may be contaminated to an extent dangerous to the health of the users of that water, the Administrator may conduct an investigation of such community water supply system. When the investigation confirms that such community water supply system is so contaminated as to be dangerous to the health of the users of that water and the action taken or proposed to be taken by the State Community Water Supply Agency would not be adequate to protect the users from that danger because of the immediacy of that danger, the Administrator shall have authority to take such actions as he may deem necessary and proper in order to protect the health of the users of that water, including, but not limited to, the issuance of a public order to the supplier of the water requiring immediate action to correct any deficiencies and to do whatever is necessary to supply a safe water.

(b) Upon failure of a supplier of water to comply with such an order of the Administrator, the Administrator may commence an action in the appropriate district court of the United States for enforcement of the order or such other relief as may be appropriate.

#### WATER SUPPLIES OWNED AND OPERATED BY FEDERAL INSTALLATIONS

SEC. 9. Each Federal department or agency having jurisdiction over any building, installation, or other property, which is or will be served by a

federally owned or maintained public water system or raw water source, shall comply with all applicable primary drinking water standards promulgated under section 3(a) and shall be encouraged by the Administrator to comply with the secondary drinking water standards promulgated under section 3(a).

OFFICE OF COMMUNITY WATER SUPPLY

SEC. 10. The Administrator shall establish within the Environmental Protection Agency an Office of Community Water Supply with the responsibility to carry out the purposes of this act.

GENERAL PROVISIONS

SEC. 11. (a) The Administrator is authorized to prescribe such regulations as are necessary to carry out his functions under this act.

(b) The Administrator, with the consent of the head of any other agency of the United States government, may utilize such officers and employees of such agency as he deems necessary to assist him in carrying out the purposes of this act.

(c) The Administrator shall make use of the personnel of State community water supply program staffs to the extent feasible to carry out his responsibility in certifying water supplies used by carriers in interstate commerce with the objective of eliminating duplication of federal and state efforts.

(d) Upon the request of a State agency, the Administrator may assign personnel of the Agency to such State for the purposes of carrying out the provisions of this act.

(e) The Administrator may make payments of grants under this act (after necessary adjustment on account of previously made underpayments) in advance or by way of reimbursement, and in such installments and on such conditions as he may determine.

(f) The Administrator shall take such action as may be necessary to assure compliance with provisions of the Act of March 3, 1931, as amended, known as the Davis-Bacon Act (46 Stat. 1494; 40 U.S.C. 276a-276a(5)). The Secretary of Labor shall have, with respect to the labor standards specified in this paragraph, the authority and functions set forth in Reorganization Plan Numbered 14 of 1950 (15 F.R. 3176; 64 Stat. 1267) and section 2 of the Act of June 13, 1934, as amended (48 Stat. 948; 40 U.S.C. 276c).

(g) Add a subsection, if needed, to cover funding authorization for responsibilities of the Agency to carry out the provisions of the Act over and above grant authorizations.

Senator SPONG. Dr. Lehr.

Dr. LEHR. Mr. Chairman, the National Water Well Association represents the entire underground water supply industry in the United States, as well as members of 52 foreign countries. Among our members are numbered this country's leading ground water geologists and hydrologists, its water-well-drilling contractors, as well as virtually all manufacturers and suppliers involved in ground water supply.

Seventy-seven percent of all municipal water supply systems are served by wells bringing our vast underground water supplies into our homes. Another 12 million families are served by individual ground water systems. Therefore, the 100,000 individuals working in ground water supply are deeply involved in the process of bringing pure drinking water into the homes of the American public.

In just a few sentences, I will briefly review what has already passed here today, and then add, I think, a discussion of two items that have not been discussed in any detail, and some of which does not appear in the written testimony that I have turned in.

I would like to make side comments before that on questions you brought up. One was the fact that we do not have adequate technology to test for virus in our drinking water. I might add that in gen-

eral, the technology in water supply lags far behind our space-age society, and you may be amused to note the absolute verified fact that you cannot buy a faucet for your kitchen sink, guaranteed against leaking, anywhere in the United States. So we are way behind.

I may further point out that the comment Ralph Nader made about this being the first time there has been a congressional committee hearing on the drinking water problem is not true. Congressman Paul Rogers' Subcommittee on Public Health and the Environment of the Committee on Interstate and Foreign Commerce addresses itself to this subject in hearings held last May 24 through 26 1971. I think most of the people here at this table have been banging on the doors of Congress for 10 years, trying to get some attention to drinking water legislation, and that in fact, Mr. Nader is relatively new on the scene, so he can hardly blame the rest of the public for being apathetic in the past.

I think we are all pleased that we could get together and bring testimony to bear that hopefully will correct a situation which has persisted all too long.

Overconfidence or apathy seems to pervade the public's attitude with respect to drinking water. Common daily experience, plus a current myth about the future, falsely implies that the quality, safety, and adequacy of our municipal water supply systems are above reproach. Perhaps the myth can be stated as follows: Everyone knows we have launched a massive water pollution control effort and that waterborne disease outbreaks are a thing of the past.

This statement is simply not true and the dangers of this misinformation are illustrated by the epidemic at Riverside, California, in 1965, which affected 18,000 people, the 30 percent gastroenteritis attack rate in Angola, N.Y., in 1968 due to a failure in the disinfection system, and the 60 percent infectious hepatitis attack rate which afflicted the Holy Cross football team in 1969 as a result of the ineffective cross connection control procedures.

From the standpoint of environmental health, the point of all of this is that here we have potentially lethal contaminants which have been allowed to build up to possibly dangerous levels in water, perhaps affecting many elements in the ecological balance, without coming to attention of Federal authorities—it is, after all, a national problem—and then dealt with in a piecemeal fashion by several agencies which rarely communicate their findings to each other.

It is this sort of fragmentation which presumably led to formation of the EPA. But is EPA organized in such a way that a problem such as mercury contamination can be dealt with swiftly and effectively?

The answer to this questions, I believe, must be no until a greatly strengthened Water Hygiene Administration is established within the Environmental Protection Agency.

By the 1930's, the state-of-the-art in municipal but not rural drinking water treatment advanced to a point where waterborne disease was all but eliminated. As part of our way of life, people expect to travel anywhere in the United States and drink water from public supplies without the fear of getting sick.

A 1970 study report by the Division of Water Hygiene noted that all too many Americans are drinking potentially dangerous water containing bacterial indicators of waterborne disease. Therefore, the near term activities that will preoccupy the Federal Water Hygiene Program must be an enumeration of deficiencies found in municipal and State water supplies, and a study of the scope of water needs in areas not served by central water systems.

I think for a long time we mesmerized ourselves with the thought that the only problem we had was water pollution control. As a result, little attention has been given to the water hygiene aspects of our water problem. Water pollution control efforts can assist delivery of safe water to the consumer's tap.

For the most part, since the publication of the old Bureau of Water Hygiene Community Water Supply Study in 1970, our new formal concern toward the problems of drinking water has been entirely directed toward that segment of the American public which has running water in their houses. As has been indicated, the state of our Nation's community water supplies is less than desirable, but how much worse is the state of an estimated 6 million American families, representing over 20 million citizens who have no water in their homes.

This pattern is quite typical in poorer rural areas. A recent study in South Carolina showed that 22.5 percent of the Negro children in four counties had large roundworms due to poor water supplies and inadequate sanitation. Amebic dysentery and infectious hepatitis are other diseases common in rural areas. Usually rural water supplies are not treated to remove bacterial pollutants from barnyards, outhouses, septic tanks, cesspools and abandoned open wells. In one county of Virginia, poor subsoil filtration resulted in pollution of most underground supplies at some time during the year.

The Stand Tall Commission of South Carolina, a group organized by the State's electric utilities, has become aware and concerned over these problems. A survey they made in McCormick County, S.C., showed over 56 percent of the homes to be without running water and indoor toilets. They need help, and this voluntary organization wants to give it to them, but progress can only be slow without some organized, standardized, federally sponsored program to alleviate the plight of these rural poor. Argue if you will over the role of the Federal Government in welfare payments, but there cannot be debate over the right of all citizens to high quality drinking water, the very sustenance of life.

One project funded by the Office of Economic Opportunity, entitled the Demonstration Water Project, in Roanoke, Va., has shown that with minimum financial support and a maximum of organizational overseeing, these programs can work in the United States.

Demonstration Water Project is showing that adequate water supplies can be brought to isolated rural residents at prices within the range of low-income families. The project has obtained an agreement from the Farmers Home Administration to use its water association program for the first time in areas in which central water systems are not feasible. This agreement may prove to be an important breakthrough in making water available to all rural resi-

dents. It permits the development of comprehensive area-wide water facilities, properly installed at lower construction and financing costs than the residents would pay for individual wells, along with long-term centralized management and maintenance of the system.

Our committee was not called in to help rehabilitate the Buffalo Creek water supply system, because for the most part there simply was no Buffalo Creek water supply system. This area, like much of Appalachia, did not have a system to rehabilitate. They had no drinking water before the flood, and they have none now. The beat goes on.

As billions are spent to clear our rivers, virtually nothing is spent to protect adequate water supply systems or improve those that are inadequate, and worst of all, nothing is being done to create systems where there are none. The Nation rages in debate over a guaranteed income, maybe it is good, maybe it is bad, but let one man or woman say that every American does not deserve a home water supply free from debilitating diseases.

Federal assistance and leadership is essential for training, research and development for stimulating State programs and solution of regional, interstate, metropolitan, and indeed rural supply problems.

The drinking water problems of this Nation, as well as the functions and responsibilities of a water hygiene program constitute one of the few unrecognized environmental problem areas and thus presently constitute a major program void which has developed from a previously disorganized approach to the environment. This void is being broadened by the apparently noncategorical approach being taken to funding in the Environmental Protection Agency. To review, the first new point is the fact that we are talking about improving the water supply for about 170 million people that have water and I am saying we have completely forgotten at least 20 million people that have no water.

The second point deals with the manner in which we do this.

An excellent article by A. H. Walker and J. W. Lorsch, entitled "Organizational Choice: Product vs. Function," in the November-December 1968 issue of the Harvard Business Review, described the pros and cons of substituting an action organization into either functional divisions or program divisions. It stated that functional divisions worked well where tasks were standardized and all procedures were very clear. Continuous duplications of work or similar problems can be carried out in a most efficient manner under such an organizational breakdown; but when you have to solve a problem and do something creative and innovative, a program type divisional orientation is far better because you can see the entire problem through from beginning to end.

EPA has basically divided into functional divisions and this may, indeed, be unfortunate where creative problem solving is needed. I think the entire Nation is aware that our environmental problems will need a great deal of creativity brought to bear in order to lick them.

I personally believe that any hope we can have of adequately solving or correcting our Nation's drinking water problems must rest in an agency charged with handling the entire problem. I think that

agency belongs in EPA, but I strongly recommend that such an agency be established outside of EPA before letting it be literally drowned beneath the \$2 billion annual expenditure for men and machines in the fight against pollution of water we do not ordinarily drink.

Reorganization of the Federal environmental programs into EPA has been no panacea to our problem. It has not consolidated our effort. The circuitous approach to the development of an environment organization has lost us a significant amount of time while submerging some critically important agencies such as the former Bureau of Water Hygiene now called the Water Supply Division of the Water Program Office or some such thing. It does not matter what it is called, because EPA has weakened it into almost total ineffectiveness. On a consensual basis we all agree that the administrator should have the freedom to organize all programs under his purview. At the same time we must be concerned lest the water hygiene program disappear through amalgamation or functionalization or be so dwarfed by comparison with other organizational units as to interfere with the launching of a new legislative initiative which this committee is considering; an initiative which all provisional organizations concerned with water supply agree is now of critical importance.

I am seriously concerned with what will happen if Congress recognizes the need for drinking water legislation and increased budget authority without directing that the program remain intact. Even if Mr. Ruckelshaus is inclined to retain the program, should he decide to resign from the agency in the future, the water supply program may be subject to butchery by the remaining administrators before a new administrator becomes familiar with the organization.

I have spent more than one-half of my life trying desperately to protect our environment. I am disturbed at the extinction of the California condor, the Carolina parakeet, and the scores of other animals extinct or endangered, and thus I am pleased that the fish in our streams are receiving attention to the tune of nearly \$1 billion in water pollution control efforts.

But—but what about that great endangered species called homo sapiens or just plain people? When, I ask, do we stop using them for guinea pigs and instead use an ounce of prevention instead of a pound of cure.

Thank you.

Senator SPONG. Thank you very much.

(The statement follows:)

STATEMENT OF DR. JAY H. LEHR, EXECUTIVE DIRECTOR  
OF THE NATIONAL WATER WELL ASSOCIATION

BACKGROUND OF NWWA

The National Water Well Association represents the entire underground water supply industry in the United States, as well as members in 52 foreign countries. Among our members are numbered this country's leading ground water geologists and hydrologists, its water well drilling contractors, as well as, virtually all manufacturers and suppliers involved in ground water supply.

Seventy-seven percent of all Municipal water supply systems are served by wells bringing our vast underground water supplies into our homes. Another

12 million families are served by individual ground water systems. Therefore, the 100,000 plus individuals working in ground water supply are deeply involved in the process of bringing pure drinking water into the homes of the American public.

Our overall objectives are: "to assist, promote, encourage and support the interests and welfare of the water well industry in all of its phases; to foster, aid and promote scientific education, standards, research and techniques in order to improve methods of well construction and development, and to advance the science of ground water hydrology; to promote harmony and cooperation between well contractors and scientific agencies relative to the proper development and protection of underground water supplies; to encourage cooperation of all interested groups relative to the improvement of drilling and pumping equipment; to collect, analyze and disseminate to the public facts about the role of the water well industry in the economy of the nation; and to advance generally the mutual interests of all those engaged in the water well industry, in their own and the public welfare."

At present, NWWA is actively involved in research projects with the Office of Water Resource Research, in the Department of the Interior, and the Environmental Protection Agency and the Department of Health, Education and Welfare. All of our work has brought us to the clear realization that a tremendously improved national water hygiene program is critically needed. I am therefore, pleased to be here to speak in support of the passage of legislation along the lines of Amendment 410, to the Federal Hazardous Substance Act (SB 1478), sponsored by Senators Hart and Magnuson.

However, I should say at this point that I question the desirability of placing the future of this extremely important legislation as an amendment under the Hazardous Substance Act, where it will be delayed if the original legislation should be held up. This legislation should be considered separately and, as my testimony will show, certainly falls under the purview of the Committee on Commerce if it includes all of the elements involved in water hygiene.

#### THE ROLE OF A WATER HYGIENE OFFICE IN THE NEW ENVIRONMENTAL PROTECTION AGENCY

The Water Hygiene Program within EPA should have the identity, legislative base and financial resources necessary to provide Federal leadership in assuring the safety and adequacy of drinking water. This activity is vital to each of us, in order to assure good health for the people of this Nation.

The drinking water problems of this Nation, as well as the functions and responsibilities of an Office of Water Hygiene, constitute one of the few unrecognized environmental problem areas, and thus presently constitutes a major program void which has developed from a previously disorganized approach to the environment.

#### DOES A WATER HYGIENE PROBLEM EXIST TODAY

Overconfidence or apathy seems to pervade the public's attitude with respect to drinking water. Common daily experience plus a current myth about the future, falsely implies that the quality, safety and adequacy of our municipal water supply systems are above reproach. Perhaps the myth can be stated as follows: Everyone knows we have launched a massive water pollution control effort and that waterborne disease outbreaks are a thing of the past.

This statement is simply not true and the dangers of this misinformation are illustrated by the epidemic at Riverside, California in 1965 which affected 18,000 people, the 30% gastroenteritis attack rate in Angola, New York in 1968 due to a failure in the disinfection system, and the 60% infectious hepatitis attack rate which afflicted the Holy Cross football team in 1969 as a result of the ineffective cross connection control procedures.

The recent discovery of critical amounts of mercury in our water supplies as a result of industrial waste disposal is even more conclusive evidence of the existence of very current water hygiene problems.

The former Federal Water Quality Administration, now part of EPA, assumed the primary epidemiological role of digging up facts on the extent of contamination. But FWQA had little capability for assessing human health

effects of mercury, and even its data collection system based on quickie telegraphed reports, may not be adequate. Likewise, the Food and Drug Administration has limited jurisdiction, coming into the picture only when mercury or other chemical contaminants is taken up in the food chain.

The National Communicable Disease Center (now known as Center for Disease Control) probably is best equipped to provide an over-all assessment of the health effects, but it comes into the present picture late.

From the standpoint of environmental health, the point of all of this is that here we have potentially lethal contaminants which have been allowed to build up to possibly dangerous levels in water, perhaps affecting many elements in the ecological balance, without coming to attention of Federal authorities (it is, after all, a national problem) and then dealt with in a piecemeal fashion by several agencies which rarely communicate their findings to each other.

It is this sort of fragmentation which presumably led to formation of the Environmental Protection Administration. But is EPA organized in such a way that a problem such as mercury contamination can be dealt with swiftly and effectively?

The answer to both these questions I believe, must be found in the establishment of a greatly strengthened Water Hygiene Administration working within the Environmental Protection Agency.

#### PAST SUCCESS IS THE KEY TO CURRENT FAILURE

In a somewhat different sphere, scientific work on chlorine and the discovery that it can disinfect drinking water is a major cause of the pollution of our waterways. I do not refer to the role that chlorine itself may play as a "pollutant", although, astonishing to say, this has been the subject of very little research. Rather, the confidence that chlorination would make any water supply "safe" no matter how badly polluted to start, is the keystone of our sewage disposal system, namely "dump in the nearest river".

Speaking before the Diamond Jubilee Meeting of AWWA in 1956, Abel Wolman characterized the accomplishments of our forefathers over the preceding century, from the standpoint of the sanitary quality of the Nation's public water supply system, as "one of the most dramatic improvements in public health that the world has ever known". As a result of past progress such words as typhoid, dysentery and cholera have become anachronisms. For instance, diseases which plagued the cities of the East Coast in the mid-1880's have all but disappeared, such as typhoid fever, which has declined from 75-100 deaths annually per 100,000 persons to less than 0.1 on a National basis.

By the 1930's, the state-of-the-art in municipal but not rural drinking water treatment advanced to a point where waterborne disease was all but eliminated. As part of our way of life, people expect to travel anywhere in the United States and drink water from public supplies without the fear of getting sick. In other times and in other countries, the accomplishment of that feat would be considered an idealistic dream. Yet, the water works industry of the United States under unifying controls of Federal and state health regulations made the dream come true during the first half of this century. All three elements, a knowledgeable and dedicated industry, a strong Federal control effort, and intelligent determined regulation at the state level, were required to accomplish the feat.

There is ample evidence that after achieving safe water for the entire nations public supplies, Federal and state efforts began to lag. Adequate water systems were never established in rural areas—there was no equivalent of the rural electrification efforts. Control in many areas has now still further relaxed. Criteria, standards and design practices are still pointed toward prevention of communicable disease as they were in the 1920's. Not as they are now in 1971.

During the 1950's and 1960's, Federal, state and local program emphasis shifted from stressing the treatment and protection of our drinking water systems to curbing the discharge of organic pollutants at the source. The resultant decrease in interest or concern has led to a backsliding of state and local community water supply programs which were evaluated against the U. S. Public Health Service Drinking Water Standards. In the face of lagging efforts at the Federal level and in some states, imperfections in the nation's water supply are beginning to show up.

A 1970 study report by the Division of Water Hygiene noted that all too many Americans are drinking potentially dangerous water containing bacterial indicators of waterborne disease. Therefore, the near term activities that will preoccupy the Federal Water Hygiene Program must be an enumeration of deficiencies found in municipal and state water supplies, and a study of the scope of water needs in areas not served by central water systems.

#### THE RURAL WATER PROBLEM

For the most part since the publication of the old Bureau of Water Hygiene Community Water Supply Study in 1970, our new formal concern toward the problems of drinking water has been entirely directed toward that segment of the American public which has running water in their houses. As has been indicated, the state of our nation's community water supplies is less than desirable, but how much worse is the state of an estimated 6 million American families, representing over 20 million citizens who have no water in their homes.

A high concentration of these people are very poor, living in economically depressed areas, or on fixed incomes throughout the United States. The lack of running water in these households unquestionably contributes to the poor state of the family, like a vicious circle. The men, women, and children in these homes are frequently debilitated by incipient illness producing lethargy and reduced vigor stemming from intestinal disorders produced by bad drinking water. Such disorders cripple any potential incentive to become productive individuals. Hardship definitely results from poor water. Children must stay home from school to haul water on laundry days and for bathing. Elderly and sick must haul water over long distances. Families pay excessive amounts for water. Young children are left untended while parents get water. Water sources are muddy in some seasons. Embarrassment occurs at school caused by smells and dirty clothes.

A survey was made in rural Virginia in 1970 which showed a distinct correlation between poor or insufficient water and health problems. A house-to-house survey had shown that 43 percent of all families in a four-county area had no adequate water supply on their property and no water piped into their homes. Instances of kidney and intestinal disturbances due to poor water were common. Lack of water for bathing, laundry, dishwashing, and other sanitary practices resulted in a widespread incidence of skin diseases (ringworm, impetigo), a severe dental decay and increased susceptibility to respiratory diseases.

This pattern is quite typical in poorer rural areas. A recent study in South Carolina showed that 22.5% of the Negro children in four counties, had large roundworms due to poor water supplies and inadequate sanitation. Amebic dysentery and infectious hepatitis are other diseases common in rural areas. Usually rural water supplies are not treated to remove bacterial pollutants from barnyards, outhouses, septic tanks, cesspools and abandoned open wells. In one county of Virginia, poor subsoil filtration resulted in pollution of most underground supplies at some time during the year.

The Stand Tall Commission of South Carolina, a group organized by the state's electric utilities has become aware and concerned over these problems. A survey they made in McCormick County, South Carolina, showed over 56% of the homes to be without running water and indoor toilets. They need help and this voluntary organization wants to give it to them, but progress can only be slow without some organized, standardized, Federally sponsored program to alleviate the plight of these rural poor. Argue if you will, over the role of the Federal government in welfare payments, but there cannot be debate over the right of all citizens to high quality drinking water, the very sustenance of life.

With regard to the health-economic relationship of safe and adequate water supply, it has been demonstrated within many of the developing countries of the world that a good water supply is an essential element in economic development. The U. S. Agency for International Development has spent over one billion dollars for water supply development in underdeveloped countries over the past 25 years. Many NWWA technical division and contractor division members have served in the forefront of the AID foreign effort because most water supplies were developed from ground water sources. These, and other prominent water supply experts, have said

for years that water supply development in the developing countries can best be achieved by national water policies which provide for institutions and procedures for capital financing. It is most unfortunate that these very principles that have been advocated internationally have not previously been applied to the economically depressed regions of our own country.

One project funded by the Office of Economic Opportunity entitled, the *Demonstration Water Project* in Roanoke, Virginia, has shown that with minimum financial support and a *maximum of organizational overseeing*, these programs can work in the United States. Demonstration Water Project, is showing that adequate water supplies can be brought to isolated rural residents at prices within the range of low income families. The Project has obtained an agreement from the Farmers Home Administration to use its water association program for the first time in areas in which central water systems are not feasible. This agreement may prove to be an important breakthrough in making water available to all rural residents. It permits the development of comprehensive area-wide water facilities, properly installed at lower construction and financing costs than the residents would pay for individual wells, along with long-term centralized management and maintenance of the system.

#### OUR WATER HYGIENE PROGRAM MUST BE UPDATED

Dr. Abel Wolman once said in an article entitled *Water, Health, and Society*, which appeared in the November, 1960 issue of the *Journal of the American Water Works*, that action by society to meet public health problems is rarely taken until certain criteria are met. In the case of water, he said the "best criteria is to show that the man is dead and that the water he drank killed him."

This philosophy of letting the nation's control over water supplies deteriorate until adverse health effects are noted is condemned. In fact, it is generally conceded that the involuntary use of our citizens for bioassay is immoral. Yet, isn't that precisely what is being done, when as a necessary condition for a budget increase, public health safeguards are allowed to fall lower and lower to the point where adverse health effects can be observed?

I think for a long while in this country we sort of mesmerized ourselves into thinking that the only water problems we had were water pollution control problems. As a result of that, very little attention was given to what we call the water hygiene aspects of the water problem.

The backsliding in local, county, state and Federal water hygiene programs can be traced to a lack of Federal support associated with the popular misconception, that water pollution control efforts are a panacea which will not only restore and enhance the quality of our lakes, streams and coasts to the benefit of fish and aquatic life and recreational pursuits but also guarantee delivery of healthful quantities of safe drinking water to the consumer's tap. This is not true insofar as drinking water is concerned.

Water pollution control efforts can assist the delivery of safe water to the consumer's tap but the community drinking water supply must be treated in any event. Pure water can be collected, treated and delivered to individual homes only under the close scrutiny of competent local, state and Federal programs.

These programs must begin to receive the needed resources to conduct necessary planning and research both to catch-up on past voids and looking to the future, to provide training and technical assistance to assure full application of existing technology and to conduct active, constructive surveillance and enforcement programs.

#### FEDERAL RESPONSIBILITIES

The Federal water pollution control efforts of EPA now exceed \$1 billion, while the Federal water hygiene efforts of the Bureau of Water Hygiene through F.Y. 1971 failed to exceed an annual expenditure of \$2.8 million. I am in complete agreement with the major attack being waged by EPA against water pollution. It must not be minimized in any way if it is to succeed. In contrast, however, I am appalled by minimal support being given to the Division of Water Hygiene.

It is crucial that we have support at the Federal level to overlap state boundaries and variations in state capabilities in the field of water supply.

There is no reason why there should be any better water supplies in one state than another, and the development of adequate criteria based on meaningful research is essential to our setting reasonable and understandable standards and then keeping these standards abreast of our changing environment.

The Federal government has a responsibility and a role which it cannot avoid, and the water supply industry in the United States certainly encourages and depends upon the Federal departments for fulfilling their responsibility.

#### COMMUNITY WATER SUPPLY STUDIES

A Community Water Supply Study was conducted in 1969 to determine the quality and dependability of water being delivered to a cross section of the population including many small towns up through the largest cities. A total of 969 public water supply systems located in 9 areas of the country were investigated. The study included 5% of the systems and 12% of the urban population on a National basis when compared with statistics from the last comprehensive facilities inventory conducted in 1962. In addition to large metropolitan systems like New York City, Cincinnati, and New Orleans, the study included 760 systems serving populations of less than 5,000 persons.

Using the 1962 PHS Drinking Water Standards as a guide, each water supply system was investigated on 3 bases. First, drinking water quality was determined by sampling the finished and distributed water and returning these to the laboratories of the Bureau of Water Hygiene for bacteriological, chemical and trace metal analyses. Second, the status of the water supply system facilities was determined by a field survey of the system and the gathering of information on (a) source of supply; (b) treatment, if any; (c) distribution system pressures, and (d) operations. Finally, the status of the surveillance program over the water supply system was evaluated by obtaining bacteriological water quality data for the previous 12 months of record from state and county health department files.

While we all hold the Drinking Water Standards in high esteem, an unexpectedly high number of communities exceed either the recommended or mandatory constituents levels and a surprisingly larger number of communities show deficiencies in operations and surveillance. For instance—in excess of 80% of 969 systems investigated, primarily communities of less than 100,000 people, failed to meet one or more of the provisions of the U. S. PHS Drinking Water Standards because of water quality deficiencies or system risks; one out of every four samples (based on 3,563 samples) exceeded one or more of the recommended limits in the Drinking Water Standards; 9% of the samples evidenced bacterial contamination at the consumers tap; 11% of the samples drawn from systems using surface waters as a source of supply exceeded the recommended organic chemical limit of 200 parts per billion; 53% of the systems evidenced physical deficiencies including poorly protected groundwater sources, inadequate disinfection capacity, inadequate clarification capability, and/or inadequate system pressure; 79% of the systems were not inspected by state or county authorities in 1968, the last full calendar year prior to the study and 50% of the chief operators of the supplies did not remember when, if ever, a state or local health department has surveyed the supply; 77% of the plant operators had inadequate microbiological training and 46% were deficient in chemistry relating to plant operation; cross connection prevention ordinances, plumbing inspection programs on new construction, and re-inspection programs were lacking in a vast majority of the systems studied; the study showed that as to training 61% of the personnel responsible for the operation of water treatment facilities have not had formal training even at the short course level; 77% were deficient in microbiological training and 72% were deficient in chemical training.

The smaller water systems often operated by part-time personnel, generally have the poorest records of operator training and experience.

Thus, the 1969 Bureau of Water Hygiene Community Water Supply Study showed the state of our nations drinking water not to be critical, but merely disgraceful. And the situation continues "normal" "all fouled up", as EPA basically ignores the need for a truly strong Water Hygiene program on the one hand, while it condemns water supplies for interstate use on the other hand. Some recent examples of this are the Pottsville, Pennsylvania

water supply, condemned by EPA on June 5 last and Gulfport, Mississippi, whose water supply was condemned this September 29. The former city was stopped from servicing interstate railroad trains and the latter from serving vessels in the Gulf of Mexico. Both water supplies exceeded bacterial limits in 5 of the 12 previous months.

It is amusing to note that whenever EPA bans a water supply for interstate use to prevent possible transmissions of communicable disease, its press releases are quick to add that the primary responsibility for protecting local citizens from their water rests upon the state. In other words, if you can afford to travel, EPA will help you; if you can't "tough luck Charlie".

#### PRESENT TASKS OF THE DIVISION OF WATER HYGIENE

The Division of Water Hygiene works to assure the safety and adequacy of the water that man ingests or otherwise contacts in his day-to-day activities by attempting to conduct a comprehensive program of research, development, technical assistance and training. But current funding makes it difficult if not impossible to succeed in their task.

The problems of the future require a greatly increased program of: (1) research; (2) planning; (3) technical assistance; (4) training; and (5) surveillance, if our society is to continue to be blessed with the benefit of adequate quantities of safe drinking water.

#### THE ADEQUACY OF WATER HYGIENE RESEARCH

We must not lose sight of research and development needs which exist today. Each of us faces a host of new questions on a day-to-day basis. One day the questions concern arsenic, the next day, nitrates. And how about mercury? Is there a general accepted detection method? And, once the measurement is made, what criteria is used to judge health effects?

It is evident that a broad program of research and development is vitally needed to investigate and elucidate potential hazards, thereby insuring the strength of the Nation's water supplies and to provide for a higher degree of efficiency and effectiveness in the management of water supply systems. For example, a recent Division of Water Hygiene Report summarized some of the potential hazards as follows: "Water for direct and indirect human ingestion contains varying amounts of organic and inorganic material and in some cases may harbor bacteria and viruses. In order to safeguard the health of the American public by having the mechanism to detect, analyze, and remove any hazard in water, many studies MUST be conducted. Compounds to which people are exposed number in the thousands and include herbicides, insecticides, corrosion inhibitors, water softeners, coagulants, coagulant aids, fecal material, industrial waste material and breakdown products, household waste material and breakdown products".

Using the carbon-chloroform-extraction technique, it is known that many if these organic and inorganic compounds are in drinking water. What we need to know is: (1) Specifically, which chemicals are in water?; (2) What is the concentration of each chemical in the water?; (4) Are the chemicals at the environmental concentration a hazard, either acute or chronic, to the health of the users?; and (5) If a hazard exists, what procedures can be used to effectively cope with the problem? It is equally apparent that virology criteria must be added to future editions of the Drinking Water Standards stressing the need to develop new methods of sampling, isolating, concentrating and enumerating enteric viruses. And, aside from detection procedures, health effects and constituent levels there is the need to develop and demonstrate new municipal and individual water treatment procedures.

#### MANPOWER AND TRAINING REQUIREMENTS

Providing a continuing safe and adequate water supply depends on a research and development program in water analysis, an ability to evaluate health effects of the water constituents, and a full understanding of treatment methodology. It progresses through the design and construction of suitable treatment and distribution facilities and ends with the proper operation of the facility under the guidance of a ground surveillance and technical assistance program. With this in mind, several areas of manpower need

emerge: (1) Engineers and technicians are needed to design and supervise the construction and operation of water treatment and distribution facilities; (2) Managers and operators are needed to supervise the operation and maintenance of water supply and distribution facilities; and (3) Research engineers and scientists are needed to conduct a water quality surveillance and technical assistance program at both the state and Federal level and to conduct the research and development program related to municipal water supplies.

It is estimated that in the next 20 years, over 20,400 new plant operators will be required. At the present time, the inadequate salary structure of most small public water systems has meant that the average operator in the small utility has less than a high school education. A Federal program to enforce mandatory certification of water plant operators based on the completion of a minimum level of general education (high school graduation) and specialized training is long overdue. Water treatment technology is sufficiently advanced, and the public health responsibility is so important, that the minimum specialized training need for a plant operator and/or manager in responsible charge of a water plant or system is the completion of a 2 year technical institute program in water hygiene technology. To attract competent people to enter this important field, a major change in the salary structure for operators and managers of the smaller, public water systems is essential. Such a salary structure is, of course, dependent on the availability of adequately trained personnel.

Thus, there is a significant and overwhelming need to develop a pool of trained operators at the post-high school or technical institute level. In the area of water pollution control, this need has been recognized to the extent that the Water Quality Act of 1970 recently passed by Congress authorized the expenditure of \$62 million for the training of men and women at the undergraduate level in the design, operation and maintenance of waste water treatment facilities. If we can justify such a program in pollution control how much more important is such a program in the area of water hygiene? This expenditure of funds for operator training is designed to provide more adequate training of people to operate plants for the production of water which can be returned to our streams. The need for similar legislative authority should be evident for training of operators for the operation of water facilities where the water is designed to be used for human consumption.

Even if we were willing to accept deficiencies in average chemical water quality, and we are not so inclined, who has the resources to provide on-the-job training, technical assistance, or short-courses on disinfection even if we could discount the numerous other prevalent community water system deficiencies? Certainly, the results show that the state and county health departments, as now financed, are hard pressed to inspect the community systems in an effort to detect and correct gross deficiencies let alone provide broad technical assistance and training.

It should be apparent to the entire professional community, local, state, university and Federal, that we can either wait for a major tragedy to occur and say "we told you so" or we can begin to face up to our program deficiencies and identify water hygiene program needs in a responsible professional manner.

The emphasis given to the number of individuals supported in training programs for professional careers in water supply in our universities is currently at its lowest ebb, and must be revitalized at the earliest possible time.

#### TECHNICAL ASSISTANCE

In addition to higher educational attainments, technical assistance programs are needed to improve the performance of persons already in positions of responsibility in water organizations and relevant government agencies; to keep such persons up-to-date as technological or program improvements are made; and to stimulate the development of standards for adequate water services in rural areas.

A set of training manuals for rural water company management has been developed in Virginia by Demonstration Water Project, and materials such as these could well provide the basis for a national training and technical assistance effort for rural areas. Such materials are long overdue: water com-

pany failures are common in jurisdictions too small or too poor to obtain professional managers and technicians.

There is also a growing need for Federal evaluation of the increasing flood of gadgets, devices and so called water purification equipment represented to make water safe for drinking. We at NWWA receive numerous requests for information substantiating the claims of the manufacturers. A technical evaluation facility should be provided for in the Water Hygiene program to protect our citizens from the misleading claims of these peddlers.

#### A NEED FOR PROTECTION AND SURVEILLANCE

On May 24, at the House of Representatives Subcommittee on Public Health and the Environment, Mr. Frank Clarke, the then Assistant Director of the U.S. Geological Survey, implied in his testimony, that the United States had an almost unlimited supply of ground water. This was pertinent because more and more drinking water supplies are being developed from this source. Unfortunately, this ground water is virtually unprotected and is in danger of being polluted just as our surface streams have been before it.

Water wells supply 77% of all municipal water systems in this country. These systems serve one third of the public and another 12 million families have individual well systems. The original water is normally very pure but poor system development and maintenance frequently contaminate it. Somebody has to help to see that easily reached high quality standards are maintained.

Essentially no money or effort has been expended in the past or recently to protect this resource which is ever growing in importance to our nations water supply. I would strongly hope that a properly staffed and financed water hygiene or community water supply agency would be charged with overseeing the protection of our nations vast ground water supplies.

#### A MANDATE FOR THE FUTURE

The National Water Well Association feels that implementation at the Federal level of a true water hygiene program rates a high priority in the total effort to meet the water supply problem and is necessary to enable the water industry to continue on its present self-sustaining utility basis to supply not only safe, but high quality water. We must strengthen and accelerate programs which will assure that all people have adequate quantities of safe water for drinking and other human use.

Many organizations less directly involved in public and private water supplies than my own National Water Well Association have reviewed our countries environmental problems and placed drinking water supplies high on the list. The American Chemical Society in a recent 1971 report, published by its committee on Environmental Improvement listed *drinking water quality* as the highest priority problem in our water environment. They particularly highlighted the tremendous deficiency currently existing in available research funds for water hygiene as compared to the dramatic needs brought into focus by the many recent reports of deficient water supply systems.

We know increasing quantities of pesticides, organic chemicals and toxic metals are entering the waters that serve as sources for the Nation's public and that many of these new contaminants are not being removed by established water treatment methods. Their daily consumption thereby, presents a potential threat to the people's health.

We know that in the absence of adequate planning, supervision and management, a proliferation of water supply systems has grown up to serve metropolitan areas, many of which are too small for efficient or safe operation, thereby resulting in hazards to the public health.

We know that inadequacies in the quality of drinking water and in the construction, operation and maintenance of drinking water supply systems have allowed the occurrence of disease outbreaks and that increased surveillance and attention to drinking water supply systems is needed to control and prevent public health hazards and to protect the health of the people.

We know that in many areas of the country, water shortages will necessitate thorough consideration of the reclamation and reuse of waste waters and that the health impacts and aspects of such reuse for drinking and other human purposes must be investigated and evaluated.

All people should be served by adequate quantities of safe water for drinking and other human uses and where public water supply systems are involved, these systems should provide water service meeting public health requirements.

Federal assistance and leadership is essential for training, research and development for stimulating state water hygiene programs and for the solution of regional, interstate or metropolitan area water supply problems.

As stated before, the drinking water problems of this nation, as well as the functions and responsibilities of a Water Hygiene Program, constitute one of the few unrecognized environmental problem areas, and thus presently constitutes a major program void which has developed from a previously disorganized approach to the environment. This void is being broadened by the apparently non-categorical approach being taken to funding in the newly created Environmental Protection Agency.

An excellent article by A. H. Walker and J. W. Lorsch, entitled "Organizational Choice: Product vs. Function", in the Nov.-Dec. 1968 issue of the Harvard Business Review, described the pros and cons of substituting an action organization into either functional divisions or program divisions. It stated that functional divisions worked well where tasks were standardized and all procedures were very clear. Continuous duplications of work or similar problems can be carried out in a most efficient manner under such an organizational breakdown; but when you have to solve a problem and do something creative and innovative, a program type divisional orientation is far better because you can see the entire problem through from beginning to end.

EPA has basically divided into functional divisions and this may, indeed, be unfortunate where creative problem solving is needed. I think the entire nation is aware that our environmental problems will need a great deal of creativity brought to bear in order to lick them. I personally believe that any hope we can have of adequately solving or correcting our nation's drinking water problems must rest in an agency charged with handling the entire problem. I think that agency belongs in EPA, but I strongly recommend that such an agency be established outside of EPA before letting it be literally drowned beneath the two billion dollar annual expenditure for men and machines in the fight against pollution of water we do not ordinarily drink.

Reorganization of the Federal environmental programs into EPA has been no panacea to our problem. It has not consolidated our effort. The circuitous approach to the development of an environment organization has lost us a significant amount of time while submerging some critically important agencies such as the former Bureau of Water Hygiene.

EPA was methodically taken apart last August, by the Editorial staff of "Science", the magazine of the American Academy for the Advancement of Science in an article titled "Environmental Protection Agency: Chaos or 'Creative Tension'? A few quotable condemnations of EPA from that article are pertinent, such as:

"it can be said that the agency's top echelons are not heavily endowed with experience in government administration or with environmental expertise".

and

"suspicion that political hiring took precedence over talent hunting at EPA have not been laid to rest by subsequent appointments. Apart from Ruckelshaus, two of the agency's six other highest officials not only are without expertise in environmental matters, but also are Republican attorneys from Indiana."

Dr. Myron Tribus, a Senior Vice President of the Xerox Corp. and a former Assistant Secretary of Commerce for Science and Technology, remarked as follows on the leadership of key environmental agencies in a paper he delivered before the 19th Annual Hydraulics Division Specialty Conference recently held at the University of Iowa:

"The challenge of environmental protection is different from almost every other challenge we have ever faced. Our government tries to serve as the enforcement agency, the educational agency, the research agency, the forecasting agency, the standards setting agency, the monitoring agency, and the source of laws and regulations. . . . To oversee this work, we shall require

the best technical talent we can muster. And this talent must be led by men whose competence for the job is beyond question.

"If the Federal Government appoints to the key positions men whose qualifications may be questioned, there will surely be set in motion a reaction, first in industry and then in the general public. If the key positions in the new Environmental Protection Agency are filled primarily on the basis of political considerations, if positions which should be held by men of the highest technical competence are filled by lesser men, we are at a poor beginning indeed.

"I have studied the duties and responsibilities of the top managements of the new Environmental Protection Agency and the qualifications of the men appointed to these positions. I have no reason to question either the sincerity or the integrity of these men. But, I should like to call attention to the disparity in stature between the administrations of EPA and, say the historic leaders of the AEC. If protecting the environment is as important as we say it is, why do we not find men of Nobel Laureate status near the top? I am greatly disappointed at the failure of the administration to seek out the very best men to lead technical efforts.

"The mobilization of the nation's top technical and industrial resources calls for more than the skills of a district attorney. An approach which emphasizes the lawsuit will be met by phalanxes of industrial attorneys. The war against pollution is to be judged by how much the environment is cleaned up and not by the fines collected. . . . Fundamentally, our problems stem from the fact that ours is a technological society run by technologically illiterate people. But because our problems are not purely technical, it will not do merely to replace them with technically trained people. We need to find ways to have the voices of technology heard, as equals, in the higher councils of government.

"My experiences in Washington, and what I have learned since leaving there, have taught me the importance of the views of the people who set the budgets and allocate the manpower. If they do not understand the job, neither the budget nor the manpower will reflect the necessary priorities. . . . Somewhere near the top of EPA, we must find absolutely first rate, technically qualified people, or else we must expect a continuing ecological crisis. . . . At this juncture we find ourselves caught between the style of government representatives who play politics as usual and the style of industry leaders who play business as usual. Neither is calculated to inspire the confidence of an increasingly disenchanted public."

These reports, and particularly the report from Science, lead me to believe that there is considerable in-fighting among top officials of EPA for increasingly larger slices of the budget pie. It is to Mr. Ruckelshaus' credit that the water hygiene program has thus far escaped the dismemberment suffered by other programs since joining EPA. However, I am seriously concerned what will happen if congress recognizes the need for drinking water legislation and increased budget authority without directing that the program remain intact. Even if Mr. Ruckelshaus is inclined to retain this program "in toto", should he decide to resign from the agency in the future, the water supply program will be subject to immediate butchery by the remaining assistant administrators before the new administrator becomes familiar with the organization.

It is not my intention to condemn EPA. They have done and are doing some excellent work. Mr. Ruckelshaus' ability and determination to serve the American public is unquestioned. What is questioned is the apparent lack of understanding for the desperate need of a highly visible, reasonably separate, financially independent agency, such as a "community water supply and water hygiene administration". The current direction of EPA is instead to submerge programs in a multiplicity of departments involved with individual limbs of the problem, but never the entire body of it.

The fault, however, does not lie entirely with Mr. Ruckelshaus and EPA. On May 25, he testified before Congressman Paul Rogers' subcommittee on Public Health and Environment of the Committee on Interstate and Foreign Commerce. He was questioned on his support, or lack of it, for drinking water legislation being considered by the House of Representatives. Congressman Rogers' questions clearly brought forth answers from Mr. Ruckelshaus indicating that as much as he may have wanted to take a positive

stand on legislation which would greatly increase the financial base for a water hygiene program within EPA, he could not do so because the Office of Manpower and Budget would not let him.

This fact is further supported by his statement of last June 16 before the American Water Works Association in Denver, where he announced the establishment of a Public Advisory Committee to be drawn from technical and professional associations for the study of drinking water standards. He said that this committee would evaluate EPA technical studies and make recommendations for legislation. Well, the groups who are participating in that advisory committee had a hand in the development of the legislation which was being reviewed by the Rogers Committee, but Mr. Ruckelshaus as much as he may have wanted to, could not comment upon it.

In this regard, it is interesting to me that during a previous interchange between Chairman Hart and Dr. Jessie Steinfeld, Surgeon General, USPHS, HEW, at hearings on the Effects of Mercury and other Toxic Metals on Man and the Environment before the Subcommittee on Energy, Natural Resources and the Environment, August 27, 1970, Dr. Steinfeld also ducked a question on the need for drinking water legislation on the basis of the impending transfer of the Water Hygiene Program to EPA. However, he went on to speculate that "shortly, you will be receiving proposals from the new agency (EPA) which will both clarify and I think amplify the needed (legislative) authority". This statement also implies to me that even HEW recognized a need for legislation. That was more than a year ago. It is difficult for me to understand why the Office of Management and Budget prevented either agency from taking a position on this issue.

If this sounds like a wholesale condemnation of organization by executive order, it is not—but it's close to it.

Do we really need a full-scale epidemic due to bacteria or toxic chemicals in our drinking water to get attention to the fact that outside of a small group of dedicated individuals, our water hygiene program was shelved back in 1930 when we effectively licked the previously prominent threat to health due to inadequately purified water.

If we had rested on our laurels in other areas of technology we would still be flying Lockheed P-38's and marveling at black and white television. The March of Dimes would have closed up shop after licking polio and the Christmas Seal campaign would have ceased after significantly curtailing tuberculosis.

But the men who made these strides did not stop. They forged ahead to new conquests as conditions changed and new challenges surfaced in our society.

Not so with water hygiene except for this small dedicated group working tirelessly with an insignificant budget to protect the water supplies of interstate travelers, the water hygiene program was abandoned.

I have spent more than ½ of my life trying desperately to protect our environment. I am disturbed at the extinction of the California Condor, the Carolina Parakeet and the scores of other animals extinct or endangered, and thus, I am pleased that the fish in our streams are receiving attention to the tune of nearly one billion dollars in water pollution control efforts.

BUT—BUT what about that great endangered species called HOMO SAPIENS or just plain people? When I ask, do we stop using them for guinea pigs and instead use an ounce of prevention instead of a pound of cure.

How many more cities like Angola, New York, have to have 30% of their population come down with gastroenteritis as in 1968. How many cities like Pueblo, Colorado, and Ashville, North Carolina, have to scream for help to produce higher quality water before we give assistance?

Many environmentalists walk around with buttons that say give the earth a chance. How about giving the people a chance?

Last year's community water supply study, completed by the EPA's Division of Water Hygiene clearly showed our drinking water supplies to be in horrible shape. No one is dying and an upset stomach won't kill you but the situation nevertheless, is disgraceful.

Before the community water supply study virtually no one ever knew that a Division of Water Hygiene existed in the U.S. Government. No one knew where to go with a problem on this subject. Finally, it has gotten some visibility, let's not let it fade away.

Because our water hygiene program is such a joke, one well known cosmetic firm is successfully selling water for facial treatment at a rate of \$38.22 per gallon. The bottled water industry gets 80¢ a gallon when for the same price you can get between 1500 and 4000 gallons of water out of your tap, depending on what part of the country you live in and if you have an individual well water supply, you can get up to 10,000 gallons for that price. We can desalt sea water in a variety of ways, conservatively, at \$1.00 per thousand gallons, is it not strange that people are paying millions and millions of dollars for bottled water at the rate of just under one dollar a gallon?

Obviously, the people have no faith in public drinking water. Traditionally, bottled water was used in the U.S. only as a status symbol of the affluent. The general public never had to worry about drinking our tap water—while you know that when traveling in most foreign countries you are quickly cautioned not to drink the water. U.S. travelers abroad traditionally live on a combination of bottled water and wine. Now the American middle classes are drinking bottled water at home, not for status, but rather for safety—they think. The joke is that bottled water has even less regulation and standard requirements than tap water, thus, the safety factor is more imagined than real. And, the biggest embarrassment of all to our industry, this country, and our concerned water hygiene program, is that qualified sources have reported that bottled water has been used in the White House almost to the exclusion of tap water.

Recently, someone began to take a long look at the bottled water industry, which is less regulated than any other water supply. Congressman Monagan introduced HR 4147, authorizing EPA to establish national quality standards for bottled water. Well, that is truly amazing. Bottled water certainly does have a rising market, but it is still infinitesimal compared to all sources of normal tap water, which is not regulated by EPA so why should bottled water be.

A study, sponsored by the Washington Evening Star during the past summer, did indeed prove that bottled water can and frequently does have poorer quality than available tap water.

As a result of the published report, two major supermarket chains suspended sale of (and the U.S. Supreme Court discontinued the use of) two brands of bottled water.

Certainly, bottled water quality should be regulated but not as established by a separate bottled water bill, rather by comprehensive legislation such as that recently submitted by Senator Hart and Magnason. This legislation could establish a highly visible and effective "Community Water Supply and Water Hygiene Administration" which would, at long last, oversee the rights and needs of the American public.

I recently called upon the Compliance Office of the Food and Drug Administration. I inquired about their interest in the newly publicized bottled water problem. Their representative replied that they are aware of it, but were not concerned over it. They have no plans to develop regulatory standards under FDA jurisdiction, feeling that it should definitely come within the mandate of EPA's water hygiene program. So what is EPA doing? The answer is NOTHING. Congressman Monagan in numerous attempts to obtain a reaction to the situation from EPA has received indications of official foot dragging on the issue.

It is significant to the proposed legislation and the Committee on Commerce that bottled water is sold in interstate as well as international commerce.

#### SUMMARY

On a conceptual basis, all party's will, of course, agree that an administrator should have the freedom to organize all programs under his purvue. In support of this broad conceptual approach, the NWWA testified in support of the creation of the Environmental Protection Agency just over a year ago pointing out that:

"The creation of this agency with the singular purpose of protecting our environment provides at least an opportunity to look at the environment as an integrated system upon which a coordinated effort can be made to improve its present status and prevent additional degradation.

"This agency will eliminate much of the present bureaucratic entanglement and will, thus, be better able to assist the local and state agencies to fulfill their own responsibilities. It will also be better able to make Congress aware of present inadequacies existing in our federal environmental programs. Until now, it is apparent that many departments of government have been concerned with a single pollutant or a single environmental medium. This fragmentation of effort has resulted in confusion, overlap and inefficient management making it impossible to view the total effect of any pollutant on the environmental system. The consolidation of the present agencies vitally concerned with the environment, will eliminate many of the aforementioned problems and will at the same time assure that we do not create new problems in the process of controlling existing ones."

At the same time, we indicated a sense of concern, however, less the water hygiene program disappear through amalgamation or functionalization or be so dwarfed by comparison with other organizational units as to interfere with the launching of a new legislative initiative which you gentlemen are considering and when all professional organizations concerned with water supply are in agreement as to its importance. Along these lines, we counselled the Blatnik reorganization committee, which was then considering the President's Reorganization Plan No. 3 of 1970, along the following lines:

"Therefore, the National Water Well Association urges Congress in its future deliberations to authorize comprehensive plans and appropriate required funds to establish this vitally important environmental program (i.e. water hygiene). Furthermore, we believe within the framework of this committee's consideration of the reorganization plan, that a strong recommendation should be made to establish a major organizational division within EPA to be charged with responsibility for providing (assuring) safe drinking water for the highest quality to the American public."

From a practical point of view, history provides little hope that the Executive Branch will develop an organizational panacea based on its past track record. The water supply and pollution control units were treated like step-children when they were located in DHEW during the 1950's and subsequent reorganizational experimentation with the water hygiene (water supply) program should not be left solely to the Executive Branch: Can this program be expected to receive adequate attention with low billing as a division within the Water Program Office of EPA wherein it is currently dwarfed by a ratio of 500 or more to one by comparison with the highly visible, high priority water pollution control effort?

No, we cannot expect that the Executive Branch will arrive at an adequate solution within a reasonable time. As we testified during the Roger's Committee hearings "Unfortunately, too often, less publicized programs, but not less important programs, take a back seat to matters that receive the most publicity."

To anyone other than a veteran federal organization expert, the history of federal organizational experiments will forever be a mystery but at least the outlines are there and there are lessons to be learned from our experiences over the last several decades.

Over 20 years ago, the conservation movement began to express concern with respect to the legislative base, financial capabilities and organizational placement of the water pollution control effort. In testimony supplied to the Blatnik committee (page 204, 3rd paragraph from bottom) Mr. Lewis S. Clapper of the National Wildlife Federation summarized the early history as follows:

"Some of us can recall when the Federal water pollution control effort was located in the "seventh subbasement" as a branch within a division within a bureau within a service within the Department of Health, education, and Welfare. At that time, the agency did not even rate line items in the budget and funds secured for the program were diverted into other activities."

Subsequently, water supply and pollution control efforts were merged to create the Division of Water Supply and Pollution Control which administered the water Pollution Control Act of 1956 under the direction of the Surgeon General. Dissatisfied with the lagging water pollution control effort, notwithstanding, substantial organizational base and appropriations, found the Congress addressing the organizational issue directly in 1965 by establishing the Federal Water Pollution Control Agency within DHEW. Shortly thereafter, the old Division of Water Supply and Pollution Control, which had become the Federal Water Pollution Control Agency, was transferred from DHEW to the Depart-

ment of the Interior by the President's Reorganization Plan No. 2 of 1966. However, the residue of health functions relating to water supply, shellfish, recreation and the health aspects of water pollution control were left behind in DHEW. Given the inadequate legislature and financial provisions under which these fragments then existed, which is the reason why you gentlemen are holding hearings on the Water Hygiene Act of 1971, these functions would have languished there but for the vision and leadership of C. C. Johnson. With the establishment of the Consumer Protection and Environmental Health Service in 1968, administrator Johnson merged the several responsibilities in an effort to create a viable organizational unit capable of conducting an integrated water hygiene program of research, development, training, technical assistance and enforcement.

Further, I submit that the development of a new legislative base and financial viability is not enough. You must also address the organizational issue less the very unit which has called attention to backsliding of our community water supply systems is buried so low on the organizational chart and/or broken up as a sacrifice to the functional approach at the very time when it should be used as a foundation to mount the new initiatives which you gentlemen appear ready to write into law.

And let there be no doubt about whether a crisis exists. A crisis does not exist. But the potential risk is rising. Thus, we must organize now in order to prevent a new crisis rather than wait, as in the case of the water pollution control effort, until the problem is all too evident. Thus, as C. C. Johnson indicated:

"The question we face is this: Are we going to wait until the public health statistics reveal a drinking water crisis or are we going to begin now to upgrade our water treatment and distribution systems to cope with the problems of our own time and place? In the case of water hygiene, as in all of the many environmental problems that face our Nation and the world today, if we must wait for epidemiological studies of human illness to convince us of the hazards it may well be too late."

To attack this problem, NWWA strongly points to the need for your action on three concurrent issues: legislative authority, financial authorizations, and the establishment of an organizational entity charged with the direct responsibility for implementing all facets of the legislation under your consideration.

Mr. VOGT. Our next panelist, Mr. Chairman, will be Mr. Charles Black of the American Water Works Association.

Senator SPONG. All right.

Mr. BLACK. Mr. Chairman, the American Water Works Association is a scientific and educational society whose objective is the advancement of knowledge of both the professionals in the field of public water supply and the public they serve toward the end of giving the American public the best water service that technology will permit. In the association, some 22,000 members representing all the disciplines and interests in the field contribute their efforts in the pursuit of this objective. Thus, the association is happy to accept your invitation to comment on amendment 410 to S. 1478, which proposes to amend the Federal Hazardous Substances Act to assist the water utility industry in continuing to provide high-quality water and water service to the public.

In working toward its objective of promoting better water service for the more than 175,000,000 Americans now served by public water systems, the association has been concerned that constantly diminishing Federal attention to the technical and training problems of the water industry at a time when its problems are burgeoning will inevitably lead to a crisis in water safety that will have to be met by an inefficient crash program. Although the association strongly believes that most of the problems of the field can best be solved at the level of government or private enterprise nearest the people served,

it has recognized that the small unit operations that constitute most of the Nation's 30,000 water utilities are not equipped to do basic research nor to provide advanced training in the developing technology of the field. Thus, it feels that the provisions of amendment 410 to S. 1478 for support of research and training, as well as those which would give assistance to State agencies in their surveillance and technical assistance roles, are important steps to assure the continued safety and service of community water supplies in the United States.

One basic problem with the bill is that it includes provisions relating to recreation waters and thereby creates confusion between drinking water and water hygiene standards. Such statements as "water safe for drinking, recreation, and other human uses" would seem to imply that the quality requirements of raw waters and treated waters are the same. Furthermore, recreation waters are now covered and funded in water pollution control legislation and should not be duplicated here.

Recognizing the desirability of uniform drinking water standards, the association supports the proposal to develop standards that cover chemical, physical, and radiological, as well as bacteriological, characteristics of water supply. It does not believe, however, that standards relating to such characteristics, nor to "viruses, caustic agents, or any other organic or inorganic substances which are hazardous or may be potentially hazardous to public health" should be developed in 90 days. Standards for drinking water quality must be established on the basis of scientific fact, not on the guesstimates of scientists who have not had the opportunity to do the basic research necessary to establish quality criteria. Emotion-based standards are not only wasteful, but can be dangerous in undermining the confidence of the public in water supplies that are safe.

The association suggests that the presently established Public Health Service Drinking Water Standards plus such other confirmed standards as are based on adequate research be put into effect as interim standards until new criteria, based upon research and experience, can be developed.

In supporting the development of Federal drinking water standards, the association certainly agrees with the intent that they be enforced through the existing State agencies which are already charged with this responsibility, limiting direct Federal enforcement to the interstate carrier supplies as at the present time. It does feel, however, that the potential overburden of reporting requirements and prescribed procedures that are part of the present plan to offer assistance to the States may negate the benefits of the proffered assistance. Perhaps the reduction of report requirements to cover only violations of the standards would make the assistance more effective without significantly diminishing the controls required.

The cooperative relationship of Federal and State agencies and local utilities advocated in the bill has been the secret of success in making the Nation's water service the best in the world. In the past few years, however, the input of both the Federal and State agencies to this team effort has decreased in effectiveness as most of the funds and training personnel have been diverted into the much more

publicized problems of pollution control. Restoration of the effectiveness of the water supply team at the State and local level, as the provisions of the bill would permit, can certainly be accomplished much more rapidly and economically than could duplication of their facilities and functions at the Federal level. The provision not only of funds but of personnel to assist States in putting their water supply surveillance and technical assistance programs on a level commensurate with the importance of safe water supply to the public is an important step. And the establishment, within the EPA, of an Office of Community Water Supply Programs will be an equally important step in giving the drinking water program the status it requires to make the Federal partner an effective member of the team.

The association feels that a National Water Hygiene Advisory Council can be a very effective means of providing a sound, practical base in the implementation of this legislation, but this will only be true if the Council is made up of representatives of the various elements of the public water supply field that have to do with the management, operation, and surveillance of community water systems. It is through the Council that the cooperative Federal-State-local relationship can be given official sanction and direct, effective communication. The current language of the bill does not prevent the appointment of such a Council, but it does permit the appointment of a council that would be unable to provide the base of practical experience and diverse viewpoints representative of the water supply field. The bill should include among the specified members of the Council at least three members of the water utility field to assure this practical input.

In addition to the above views on major provisions, there are a few other points upon which the association wishes to comment:

Under section 302(d), the Administrator is given sole discretion as to the adequacy of State enforcement procedures. This is certainly a matter upon which Council advice would seem in order.

In both section 302 (f) and (i), provision should be made to require that the findings of inspections and the information included in reports be furnished to the water utilities involved before being made public so that the utilities can take appropriate action to protect the public from the potential hazard and avoid inflicting upon the public the traumatic consequences of the kind of crisis that often results when the news media overdramatize the facts.

Under section 302(k), (l), and (D) "sewage treatment" and "water pollution abatement techniques" are included in the list of supportable research. Under other legislation, water pollution control research is, of course, already adequately funded. We would recommend eliminating these two items from the list to avoid dilution of this badly needed specific effort.

Under section 302(l) (i), "authorizing study and demonstration grants," it is not clear from the language whether investor-owned water utilities can participate in the program. As they constitute approximately 25 percent of the total number of community water systems, as many of them are among the best able to handle demonstration projects, and as we feel that the full resources of the field

should be available to participate in the task, we urge that their inclusion in this program be made specific.

The association will be very happy to offer further comment on the statements it has made or on any other features of the bill. It feels strongly that the support for research and training, as well as for State surveillance and technical assistance programs, are vital to the continued provision of high-quality water service to the public.

I would like to add one more comment, Mr. Chairman, if I may. I think we all realize that we are not making any more water these days. All water is recycled water. AWWA last year adopted a policy statement on water recycling and our research foundation has adopted this as a research project. We have applied for a grant from EPA to study this problem. We realize the importance of it. Our association is taking the leadership or at least endeavoring to take the leadership in the research on this very important problem since this can be, and possibly will be, a future source of raw water for our industries in certain areas. I have instructed our executive director to file with you a copy of our official policy statement which he will do.

Senator SPONG. We would be pleased to receive that, Mr. Black. Thank you very much.

(The statement follows:)

#### USE OF RECLAIMED WASTEWATERS AS A PUBLIC WATER SUPPLY SOURCE

The American Water Works Association recognizes that properly treated waste waters constitute an increasingly important element of the total available water resources in many parts of the North American continent as well as elsewhere in the world.

Historically, wastewaters have been reused after discharge of the effluents to streams and into the ground. This practice has provided dilution, separation in time and space, and has allowed natural treatment phenomena to operate before reuse. In contrast to such indirect reuse, planned direct reuse is increasingly being made of reclaimed waters for wide varieties of beneficial uses such as industrial cooling, certain industrial processes, irrigation of specific crops and recreational areas. Moreover, there is increasing use of reclaimed waters for planned ground water recharge.

The Association believes that the full potential of reclaimed water as a resource should be exploited as rapidly as scientific knowledge and technology will allow, to the maximum degree consistent with the overriding imperative of full protection of the health of the public and the assurance of wholesome and potable water supplied for domestic use. The Association encourages an increase in the use of reclaimed wastewaters for beneficial purposes, such as industrial cooling and processing, irrigation of crops, recreation and, within the limits of historical practice, ground water recharge. Further, the Association commends efforts that are being made to upgrade wastewater treatment and to improve quality before discharge into sources of public water supplies.

The Association is of the opinion, however, that current scientific knowledge and technology in the field of wastewater treatment are not sufficiently advanced to permit direct use of treated wastewaters as a source of public water supply, and it notes with concern current proposals to increase significantly both indirect and direct use of treated wastewaters for such purposes. It urges, therefore, that immediate steps be taken, through intensive research and development, by the AWWA Research Foundation and the Water Hygiene Division of the Office of Water Programs in the Environmental Protection Agency to advance technological capability to reclaim wastewaters for all beneficial uses. Such research and development is considered to be of greater national need than that now being directed to desalinization. It should:

1. Identify the full range of contaminants possibly present in treated wastewaters that might affect the safety of public health, the palatability of the water, and the range of concentrations

2. Determine the degree to which these contaminants are removed by various types and levels of treatment

3. Determine the long-range physiological effects of continued use of reclaimed wastewater, with various levels of treatment, as the partial or sole source of drinking water

4. Define the parameters, testing procedures, analytical methodology, allowable limits, and monitoring systems that should be employed with respect to the use of reclaimed wastewaters for public water supply purposes

5. Develop greater capability and reliability of treatment processes and equipment to produce reclaimed water of reasonably uniform quality in view of the extreme variability in the characteristics of untreated wastewaters.

6. Improve the capabilities of operational personnel.

The Association believes that the use of reclaimed wastewaters for public water supply purposes should be deferred until research and development demonstrate that such use will not be detrimental to the health of the public and will not adversely affect the wholesomeness and potability of water supplied for domestic use.

Mr. VOGT. Our next panelist will be Prof. Leonard Dworsky.

Dr. DWORSKY. I am Leonard B. Dworsky, and I am professor of civil engineering and director of the Water Resources and Marine Sciences Center at Cornell University, Ithaca, N.Y.

In these days of ecological concern, it is shocking to reflect that this hearing, in 1972, is perhaps the first ever held in the Senate of the United States specifically addressed to the subject of the purity of water used for drinking by every man, woman, and child in the Nation.

Other speakers on this panel have recognized this point and I believe that it is very important to keep this matter in mind.

My first task on joining the U.S. Public Health Service in 1946 was to bring to completion the work that had been started in revising the Public Health Service drinking water standards. Since the adoption of the 1946 revision of those standards attempts have been made to modernize and make effective the control over the quality of drinking water.

Until today, Mr. Chairman, no program has yet been devised by the Congress to protect the American people against chemical, virus, and bacteriological contamination of drinking water; no effective program has been established by the Congress to develop, through research, drinking water purification devices and equipment to safeguard our people against chemicals already present in the Nation's lakes and rivers; no concern has been shown by the Congress until today to insure the continued establishment of an office within this great Federal Government responsible for the purity of the water we all drink.

I was interested in listening to Mr. Lehr's comments about his concern for wildlife. I, too, am concerned about our natural resources in this ecological age. Yet, more concern has been shown for alligators and to the toxic materials fed coyotes and other predators; to the osprey and eagle than to the drinking water needed for human life. I simply ask for equal time for human beings.

I sometimes think that we have forgotten about human ecology. Your family and mine are rather important to us and we are rightly concerned about the water they drink.

I have prefaced my statement with these introductory remarks, Mr. Chairman, in order to thank you and the members of this com-

mittee, and especially to thank Senators Magnuson and Hart, for holding these unique hearings and for introducing in the Senate the legislation under consideration, as well as to stress the importance of the subject of this hearing.

Now, Mr. John Vogt, the chairman of this panel appearing before you on Amendment 410 to S. 1478, has presented you with a new draft bill as a substitute for the provisions contained in Amendment 410. I am pleased to represent three organizations this afternoon that join with the members of this panel, and the organizations they represent, in supporting the new draft bill.

I want to present a statement that has been prepared by Prof. Bernard B. Berger, chairman of the Environmental Quality Management Committee of the Division of the American Society of Civil Engineers.

Senator SPONG. That will be received.

Dr. DWORSKY. I would like you to note the experience of some of the persons involved in this hearing. Mr. Berger, for example, has been assistant chief for research of the Public Health Service's National Water Supply and Water Pollution Control program prior to his retirement in 1965.

During 1969 he was a special assistant for water resources to Dr. Lee DuBridg, the President's science adviser. He spent a large part of his career working at the Robert A. Taft Engineering Research Center, dedicated in 1954, for which he had responsibility for drinking water and other research. During much of that time his research funds were in the order of less than \$200,000; enough money to support three or four technical people.

The second organizational statement is by Prof. Robert Baumann and represents the American Association of Professors of Sanitary Engineering. Professor Baumann is a past president of the association and is one of the outstanding educators in American Universities in environmental matters.

With your permission, Mr. Chairman, I request that this statement be included in the record of these hearings.

Senator SPONG. That will be received.

Dr. DWORSKY. Thank you. The third organization I represent is the Universities Council on Water Resources. I am pleased to present to you a resolution passed unanimously at the 1970 annual meeting of the Universities Council on Water Resources held at the Virginia Polytechnic Institute, Blacksburg, Va., in my capacity as chairman of the Council's Committee on Water Quality. Prof. William Walker, head of the Virginia Water Resources Center at V.P.I. is one of the important leaders of the Council and heads our legislative committee. As a result of this resolution, bills were introduced in the House by Congressmen Howard Robison of New York and Paul Rogers of Florida to strengthen the national drinking water protection program in the Environmental Protection Agency.

Senator SPONG. I attended the 1970 meeting at Blacksburg.

Dr. DWORSKY. Yes; I recall that you did, Mr. Chairman.

Senator SPONG. Go right ahead, excuse me.

Dr. DWORSKY. While extensive hearings were held in the House Committee on Interstate and Foreign Commerce under the chair-

manship of Congressman Rogers (Subcommittee on Public Health and Environment) in May 1971, no report was issued on the bills under consideration as a result of inaction in the House. At our 1971 meeting in Corvallis, Oreg., we indicated to Mr. Rogers in a second resolution that we looked forward to their further action.

These two resolutions are part of my record and I would like to have them along with my statement included in the record.

Senator SPONG. They will be received.

Dr. DWORSKY. Last, I would like to speak about my own position, having spent nearly four decades at this work, and I would appreciate the privilege of letting me say a few words on some of these matters.

While we hold with what Mr. Vogt has said about the new draft bill that has been presented to you, I want to add that the most important single matter before us is the matter of chemicals in our natural water supplies and in our drinking water supplies. This is a matter that has not been given enough consideration by this Nation, by our water supply industry, or by the water pollution control program, and we are in grave need of a new and effective national effort.

Dr. Okun made a good presentation about this question and Mr. Nader added to it, but the most important thing before us is to gain new information through research about how to take out chemicals and other materials that are now in water. We must do this through research programs. Such programs need to be re-invigorated in order to develop the basis for needed new drinking water standards.

Let me suggest to you that there are a group of people to whom we all owe a debt for one public service, we have one of the great leaders, Mr. Henry Grazier, of the Dallas water supply system here today. But whether in the smaller or larger communities, we should recognize the people who have the responsibility to produce a safe drinking water everyday for all of us.

In the large cities they have well-trained people; in the smaller cities, less well-trained people. It is amazing that we are still able, everyday, to produce a water supply that is primarily safe. But, they have to be provided with new information. We cannot look to them for developing the new research because they have a large enough task of managing the facilities that we now have.

Thus, the large number of people, 175 million or more, that drink water out of the public water supply systems, have a great dependence on a few to protect us against environmental hazards.

I would like to move now to the ideas in my statement on demonstration grants. I believe, Mr. Chairman, that I would just as soon see the item of demonstration grants out of the bill. The reason is I don't think we need it now. Until we have something new to demonstrate, we don't need it. In the next several years, if we are able to have new technology developed so we can take out some 39 chemicals that the experts say we can't take out with our present technology, then at that time, I think it would be proper to have a demonstration program to show how to do it. Until that time, I think we can save ourselves some money and not get into that particular aspect of the bill.

Next, I think we should be concerned about bottled water in this bill. This matter has been mentioned today and I think a bottled water section should be provided in the bill. I suggest further that better protection for the interstate traveler ought to be provided in this bill. In the early days we used the Public Health Service drinking water standards for people traveling on steamships plying the Ohio River and Great Lakes that were, in older days, carriers of cholera from State to State. Then we used them on railroads and buses and airplanes. Today, most people travel interstate by automobile. We ought to have a concern for the many travelers that go across the country every day by the millions on the Interstate Highway System and on the National Highway System and find some way to provide protection for them.

Next, with respect to the toxic substances bill, I would suggest, if you find it possible, that you separate this bill from the toxic substances bill. You have had many hearings, I know, with respect to that bill, and it may be that you may further both bills by separating this one out and moving it forward on parallel with the other bill, which I know has a great many complications.

Finally, with respect to two matters on which there may be some conflict. One is the matter of whether we should have construction funds to help the cities build waterworks systems. There was some discussion in the House on this matter.

The second is the nature of the enforcement provision. If you find that these two matters cause enough concern to the committee so that it may tend to hold up the entire bill, I would hope that you would deal with what I call the basic provisions of the bill; the research, standards, training, education and State program grants, all of those things outside of enforcement and grants for construction.

One of the most important parts of the bill is the provision of grants to assist the States. This item is supported strongly. With respect to enforcement and construction grants for facilities, if this becomes a problem for whatever reason, I wish you would approve a bill that would at least have the basic provisions. If you feel you must have a bill with enforcement, I would hope that you would opt for that provision which I believe Mr. Vogt has included in his bill. I would prefer, personally to go along with the explanations provided by Mr. Nader this morning and I think that this is not very far from the provisions for which Congressman Robison testified in the House. This approach to enforcement provides something less than proposed by Mr. Rogers; something more than proposed by the A.W.W.A. provisions.

I hope you can find some reasonable solution to these matters. Let me close by saying that I would like you to note that water pollution is exacting a terrible price as a result of delays by the Congress, by not participating in a strong local-Federal team for several decades. We couldn't get around to making that decision, and the delays imposed have been a heavy burden.

Air pollution, too, is exacting a terrible price as a result of delays imposed by the Congress in not allowing the Federal Government to participate effectively in developing a strong Federal, State, local team between the deadly Donora, Pa., air pollution episode in 1948 and the several air quality acts beginning about 1967.

And I am suggesting to you that the price we have been paying for not developing effective and timely programs for water and air pollution will be minor if a serious breach is made in the wall—the drinking water supply systems of this nation—that protect all of us from the contaminants that exist, and hopefully from future new or larger volumes of known contaminants.

It seems to me the time has come when we must act. There is no point in delaying any further. I hope that you will find that this bill we propose will be an effective supplement to the Federal Water Pollution Control Act.

I agree with Mr. Lehr in his position there should be an agency to deal with this. I don't disagree with him concerning the needs of the 20 million people who don't have water supply systems available to them.

This completes my statement, Mr. Chairman. I have an historical document you may find interesting. It has 13 documents that itemize the need for drinking water research over the past 15 years.

As a contribution to public education, I would like to have this included in the record.

Senator SPONG. We would be pleased to receive it.

I very much appreciate your testimony. I agree with you about the urgency of the situation. I make no apology for Congress, though. You heard me in my brief exchange with Mr. Nader this morning about the beginning of the air pollution efforts in 1967. Frankly, it was only after the public interest developed to a point that legislation could be supported that we began to move in a direction that was quite obvious to many in the Congress for years before 1967. But there was a great change in the public attitude in the years 1967, 1968 and 1969 to the point where—I used to talk about air pollution and people would squirm in their seats. It was a very dull subject for them. I put people to sleep all over Virginia.

Then, suddenly, they were grabbing me and saying you have been on this committee, why haven't you done something.

I don't know how it all came to a head, but I daresay Mr. Nader was quite right this morning in predicting that we may find the same sort of history with drinking water.

Dr. DWORSKY. Our comments, Mr. Chairmen are addressed to the Congress. What we are trying to say is, look, you have had opportunities to consider these matters, and I know this is so because I helped prepare the legislation in 1947 for the first Federal water pollution control act.

So, I know the history well. I know there was a great deal of interest at that time, but we didn't have the keen interest that you are referring to during these last half dozen years. My hope would be to take advantage of our experience in these other fields, learn from them and no longer delay in this area so important to public health protection.

If something does happen it will be really quite a tragedy.

Senator SPONG. I think we have a responsibility that was pointed out this morning and that is to try to alert the public to some of the facts that you gentlemen are coming in here with. I don't think man understands what an endangered species he is becoming in terms of this.

(The statement and attachments follow:)

STATEMENT OF LEONARD B. DWORSKY, DIRECTOR, WATER RESOURCES AND MARINE SCIENCES CENTER, CORNELL UNIVERSITY

Mr. Chairman and members of the committee, my name is Leonard B. Dworsky and I am Professor of Civil Engineering and Director of the Water Resources and Marine Sciences Center at Cornell University, Ithaca, New York.

In these days of ecological concern, it is shocking to reflect that this hearing, in 1972, is perhaps the first ever held in the Senate of the United States specifically addressed to the subject of the purity of water used for drinking by every man, woman and child in the Nation.

My first task on joining the United States Public Health Service in 1946 was to bring to completion the work that had been started in revising the Public Health Service drinking water standards. Since the adoption of the 1946 revision of those standards attempts have been made to modernize and make effective the control over the quality of drinking water. As of Monday, March 20, 1972:

No program has yet been devised by the Congress to protect the American people against chemical, virus and bacteriological contamination of drinking water;

No effective program has been established by the Congress to develop, through research, drinking water purification devices and equipment to safeguard our people against chemicals already present in the Nation's lakes and rivers;

No concern has been shown by the Congress to insure the continued establishment of an office within this great Federal government responsible for the purity of the water we all drink.

More concern has been given to providing water for alligators in the Everglades; to the toxic materials fed Coyotes and other predators; to the Osprey and Eagle than to the drinking water needed for human life.

Mr. Chairman, I, too, am concerned about our natural resources in this ecological age. I simply ask for equal time for human beings.

I have prefaced my statement with these introductory remarks Mr. Chairman, in order to thank you and the members of this committee, and especially to thank Senators Magnuson and Hart, for holding these unique hearings and for introducing in the Senate the legislation under consideration, as well as to stress the importance of the subject of this hearing.

Mr. John Vogt, the Chairman of this panel appearing before you on Amendment 410 to S.1478, the Toxic Substances Control Act, has presented you with a new draft bill as a substitute for the provisions contained in Amendment 410. I am pleased to represent three organizations this morning that join with the members of this panel, and the organizations they represent, in supporting the new draft bill.

The views of the first organization is contained in a statement prepared by Professor Bernard B. Berger, Chairman of the Environmental Quality Management Committee of the Sanitary Engineering Division, American Society of Civil Engineers.

Professor Berger was the Assistant Chief for Research of the Public Health Service's National Water Supply and Water Pollution Control program prior to his retirement in 1965.

During 1969 he was a special assistant for water resources to Dr. Lee DuBridge, the President's Science Adviser.

With your permission, Mr. Chairman, I request that this statement be included in the record of these hearings. (Attachment A).

Mr. Berger's statement supports the new draft bill, specifically prefers to have the enforcement provisions applied through a State grant program whereby the Federal government, by having an opportunity to review the States program through a review process under a financial grant procedure, would maintain pressure on the States to produce the results desired.

He makes a very strong statement for the basic need for the legislation, for national minimum standards and particularly for new efforts concerning the chemical aspects of the problem.

In addition, the National Water Policy Committee of the American Society of Civil Engineers, and of which I am a member, under the chairmanship of Mr. Joseph Friedkin, strongly supports the enactment if a bill which will strengthen the Nation's policies and programs aimed at protecting the drinking water supplies of the American people.

The views of the second organization is contained in a statement prepared by Professor Robert Baumann of Iowa State University representing the American Association of Professors in Sanitary Engineering. Professor Baumann is a Past President of the Association and is one of the outstanding educators in American Universities in environmental matters.

With your permission, Mr. Chairman, I request that this statement be included in the record of these hearings. (Attachment B).

The third organization I represent is the Universities Council on Water Resources. I am pleased to present to you a resolution passed unanimously at the 1970 annual meeting of the Universities Council on Water Resources held at the Virginia Polytechnic Institute, Blacksburg, Virginia, in my capacity as chairman of the council's committee on water quality. Professor William Walker, head of the Virginia Water Resources Center at V. P. I. is one of the important leaders of the Council and heads our Legislative Committee. As a result of this resolution, bills were introduced in the House by Congressmen Howard Robison of New York and Paul Rogers of Florida to strengthen the national drinking water protection program in the Environmental Protection Agency.

While extensive hearings were held in the House Committee on Interstate and Foreign Commerce under the Chairmanship of Congressman Rogers (subcommittee on Public Health and Environment) in May, 1971, no report was issued on the bills under consideration.

At the Council's 1971 annual conference at Oregon State University, Corvallis, Oregon, a second resolution was passed unanimously indicating the high concern of the Universities Council about the quality of drinking water supplies, congratulating Mr. Rogers and the members of his committee for their interest and for the hearing held, and noting the need for action to bring the proposed legislation into being.

This conference is one of a series of meetings that have been held annually since 1965.

The Universities Council on Water Resources is an organization of universities that are active in both graduate education and research in water resources. The aim of the council is to encourage education and research in these areas and to provide a clearinghouse for information as well as a forum for discussion of questions of mutual interest.

The present membership of the Universities Council on Water Resources stands at 67 and each of the member universities is represented at council meetings by officially appointed delegates or their alternates.

Membership is open to United States universities only but a number of foreign universities have become affiliated with the organization. A list of the member universities is attached as Appendix A to the resolution and you will note that this list represents a very large group of major universities in the United States.

The Universities Council strongly urges the enactment of an effective program to protect the Nation's drinking water supplies, Mr. Chairman, and with your permission, I request that the resolutions of 1970 and 1971 be placed into the record of these hearings. (Attachment C).

Speaking for myself now, Mr. Chairman, as a person deeply concerned with the subject of drinking water protection during a professional career in environmental affairs spanning nearly four decades, I support the draft legislation proposed by Mr. Vogt and submit a brief commentary with respect to a few items of the proposal.

*Standards of Water Quality.*—The modernization of existing law to allow the effective development of standards of chemical quality for drinking water as well as of standards for biological, physical, radiological, or other contaminants and for other desirable qualities of drinking water is the most important aspect of the proposed legislation.

Let me digress here, Mr. Chairman, and suggest that the matter of chemicals is the single most important matter, I believe, before this committee.

Chemicals in our natural water supplies and in our drinking water supplies is a matter that has not been given enough consideration by this Nation, by our water supply industry, or by the water pollution control program, and we are in grave need of a new and effective national effort.

We again point out that at present the drinking water standards of the Federal government and their enforcement provisions apply only to communicable diseases. From my own knowledge as a result of 18 years in the Public Health Service, HEW's general counsels have held that, as I understand it, the matter

of enforcement of the Federal drinking water standards with respect to the interstate quarantine regulations do not apply to chemical standards.

This is a major reason why the provisions of the bills before this committee dealing with chemical standards and related matters are so important.

*Research, Training, Technical Assistance and Information.*—On the matter of research, I cannot emphasize too strongly that our present technology is not capable of taking out many of the contaminants that exist in the surface waters of the United States, or in the groundwater. Some 39 out of 50 chemical constituents that are likely to be present in water are earmarked as not able to be removed through standard drinking water purification technology.

We owe a great debt, Mr. Chairman, to the men and women who man the water supply systems and water purifications works that strive to provide, and for the most part still do provide, pure drinking water to over 175 million persons each day. The walls over which they stand guard to protect seven out of every eight citizens against chemical, bacterial, and viral contaminants contained in the polluted water resources of our country are very thin. Daily, these fragile walls are becoming less safe as they are increasingly assaulted by new chemicals or by increasing amounts of well-known substances such as mercury, cadmium, lead and similar materials.

At one time we thought we had an ability to take care of new pollutants that might affect the drinking water supply systems. As time went on, and as industry developed, we developed more sophisticated chemicals while normal drinking water treatment technologies stayed essentially the same. As a result, our ability to absorb new shocks, to meet new problems affecting the Nation's drinking water supplies, became less.

I am afraid we are at the stage whereby some day—and it might be very close—we might have one overly harmful chemical pass through this thin protective wall in an amount dangerous to humans. Then where do we go—what do we do? It is because of this that my concern is so large at the present time.

You say, "Prove it," and I don't know how I can prove it to you. Prudence would dictate, however, that we ought to be much better prepared for the future than we are.

*Enforcement and Financial Aid to Construct Water Systems.*—There are two items on which there is likely to be disagreement. The first pertains to Federal enforcement of drinking water standards. The second relates to the provision of financial aid to assist communities to construct water systems.

In formulating its program, I hope the committee will consider the bills before it in two parts.

First, to consider and recommend favorable action on those items I would identify as basic provisions. These include all provisions of the draft bill except for enforcement and financial aid to construct water systems.

If there is a disagreement that develops as a result of the testimony, I think we must not be delayed in enacting the basic provisions.

Second, to consider the items of enforcement and financial aid for construction apart from the basic provisions. If the committee finds there is substantial disagreement on these two items, they may find it preferable to reconsider them as experience develops in the basic provisions.

If, however, the committee is determined to enact an enforcement provision, I would support the proposal by Congressman Howard Robison in his testimony before this committee.

Similarly, if the committee is determined to enact a financial aid provision to help local agencies construct drinking water supply works, any new provision should consider the financial aid programs already authorized by the Public Works and Economic Development Act, and through the Farmers Home Administration and the Department of Housing and Urban Development.

*Demonstration Grants.*—I believe the provision for demonstration grants can be omitted at this time until research findings provide us with new drinking water treatment technology that can effectively be demonstrated.

*Bottled Water.*—I recommend, Mr. Chairman, that the committee take full cognizance of the important need to provide stronger state and federal supervision over the growing use of bottled waters, much of which is involved in interstate commerce. I hope the committee will draft an appropriate regulation for inclusion in this drinking water protection legislation.

*Protection of Interstate Travelers.*—A main purpose of existing legislation was to protect the health of persons traveling on common carriers between states. In earlier years this meant steamships and railroads. It has also in-

cluded buses and aircraft. But most people travel by automobile and this class of interstate traveler, by the millions, is afforded little protection. New legislation should provide for the protection of the traveling public, at least on the new interstate highway system as well as on the older national highways.

*Relation to Toxic Substances Bill.*—You and the committee, Mr. Chairman, have been deeply involved in the very large Toxic Substances Bill. I recommend that this important amendment concerning drinking water protection be considered as a separate bill apart from the Toxic Substances proposal. In doing so, it may facilitate action on both bills.

In closing, Mr. Chairman, I want to note that water pollution is exacting a terrible price as a result of delays imposed by the Congress in not allowing the Federal government to participate effectively in developing a strong Federal, State, local team during the 36 years between 1912 and 1948, and for the further delays imposed between 1948 and 1965 by not providing the financial and regulatory means.

Air pollution is exacting a terrible price as a result of the delays that were imposed by the Congress in not allowing the Federal government to participate effectively in developing a strong Federal, State, local team between the deadly Donora, Pennsylvania, air pollution episode in 1948 and the several Air Quality Acts beginning about 1967.

Yet the price we have been paying for not developing effective and timely programs for water and air pollution will be minor if a serious breach is made in the wall—the drinking water supply systems of this Nation—that protect all of us from the contaminants that exist, and hopefully from future new or larger volumes of known contaminants.

Thus, the Congress must not delay any longer on the matter of enacting a basic law that, supplemented by the programs under the Federal Water Pollution Control Act, will provide for the effective mobilization of the resources of this Nation to insure the continued availability and purity of the daily drinking water supply essential to the life of our people.

This completes my prepared statement, Mr. Chairman. I have also prepared a brief appendix to my statement containing a summary of the principal Commission reports and recommendations during past years. I believe these notes will be useful in developing a better understanding of what you and your committee are trying to achieve. While these notes appear in the 1971 House Hearings, I believe the educational value of this material to be important. Since some persons will see only this document I ask your permission to have it placed in the record of these hearings.

We are all grateful for the sense of urgency you have given the matters before you today, Mr. Chairman, and we want to extend our thanks to you and the members of the committee.

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#### STRENGTHENING THE FEDERAL DRINKING WATER PROGRAM—A STATEMENT ON BEHALF OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS

My name is Bernard B. Berger. I am Chairman of the Environmental Quality Management Committee of the Sanitary Engineering Division, American Society of Civil Engineers. I am also the Director of the Water Resources Research Center and Professor of Civil Engineering and of Public Health at the University of Massachusetts at Amherst, Massachusetts.

My statement is presented on behalf of the American Society of Civil Engineers. It reflects a personal experience extending over a third of a century, including responsibilities as Assistant Chief for Research of the United States Public Health Service Water Supply and Pollution Control Program up to 1965, at which time I joined the University of Massachusetts. During the greater part of this period, I was directly concerned with water supply research and particularly with trying to obtain funds and physical resources needed to undertake the important tasks confronting the Nation.

I need not emphasize the very close association that has existed between the American Society of Civil Engineers and the Federal Agencies concerned with water resources development in general and public water supply in particular. This latter association goes back to the first quarter of the century when the American Society of Civil Engineers was one of the agencies that participated in the early development of the Public Health Service Drinking Water Standards. These Standards have provided a guide to the Nation's States and communities in the development of systems for the development, treatment and distri-

bution of drinking water. Our Nation's fine record in protection of the public health against water borne disease is testimony to the effectiveness of these Standards. It is testimony also to the very close association that has existed between public officials concerned with the safety of water supplies and the engineers and scientists who were responsible for the planning, design, construction and management of these water supply systems. The Public Health Service Drinking Water Standards have been adopted with only minor changes by the World Health Organization and the Nations of the world.

The American Society of Civil Engineers noted with increasing concern during the last decade an apparent lowering of the priority of importance assigned by the Department of Health, Education and Welfare to its public water supply program. The low priority was reflected in the small budget provided for water supply activities, slightly more than \$2 million annually for the whole Nation. Of this sum approximately \$100,000 was devoted to research. It is encouraging to note that the Environmental Protection Agency, to which the Federal Water Hygiene Program was transferred, has increased the funding base. However, the annual Federal expenditure for protecting the quality of drinking water supplies currently amounts to only about two cents per capita. The consequences have been evident in the practical withdrawal of support for extramural research, particularly in the Universities, the reduction of training support programs, and a reduction in the number of technical personnel assigned to provide technical assistance on difficult problems to the States. The overall effect was the weakening of a program that had once been one of the most vigorous, vital and productive engineering efforts of the Federal government.

Among the reasons for this undesirable development, two appear to be particularly important, as well as ironic: the increasing strength of the Federal water pollution control program and the low incidence of water borne illness. Engineers and scientists engaged in water quality control, whether pollution control or public water supply, have always known that protection of public water supplies resulting from control of water pollution could be only partial at best. Any assumption that an effective Federal water pollution control program reduces the need for a strong and vigilant Federal water hygiene program is wrong and it is dangerous.

Those of us who were directly concerned with the Federal responsibilities and program in water hygiene have repeatedly called attention to the fact that the Nation's interest could not possibly be well served by what appeared to be unwarranted complacency regarding the status of public drinking water supplies. The dynamics of national growth and development inevitably produced new problems. For example, the stresses of metropolitan area growth reflected in increased water demand, in expansion of water distribution systems, and in efforts to develop new water sources have produced a condition in which our confidence in current technology for producing safe water for drinking purposes must be questioned. It is not reasonable that we wait until the stresses on our public water supplies are so great as to force us to make important decisions on water protection under crisis circumstances. The signs are evident wherever we look that now is the time to strengthen our public water supply programs in order to solve those problems already with us and to prepare for the new problems that will inevitably emerge. In this regard particularly, Federal guidance was effective in the past and we believe that with adequate supporting legislation, it will prove indispensable in the future. Such legislation should provide strengthened authority and increased resources for research, monitoring, technical assistance and transfer of information. Each of these provisions would constitute a most desirable underpinning for the Federal activities assuring the adequacy of public water supplies.

Research support must be directed to the clarification and definition of the problem areas so that we may be properly able to evaluate them and to find solutions for them. Those believed to be of immediate concern are reflected in the following questions:

What are the long-term toxic and carcinogenic implications of repeated exposure through drinking water to organics of industrial origin?

What are the toxic implications for the long-term of trace metals occurring in drinking water, and how may these be controlled?

How can water treatment plants reliably destroy viruses in sources of supply?

Are the Public Health Service Drinking Water Standards applicable to waters derived in large part from treated sewage?

What are the public health implications of deterioration of distribution systems at a time when these are being subjected to increasing use?

What fail-safe means are available to protect drinking water from unreported, undiscerned chemical spills in the water source?

What are the public health implications of the planning, design and management of water systems in the expanding metropolitan areas?

What are the public health implications of recreational use of impounded sources of drinking water supplies?

What is the explanation for the reported relationship between soft water and high incidence of cardiac illness, and what are the implications for water supply practice?

What new threats to shellfish sanitation are to be anticipated from expanding programs of mineral exploitations of the bed of estuaries and coastal waters?

The American Society of Civil Engineers urges that special provision be made to assure that the results of research are adequately field tested and demonstrated so that those who are responsible for the safety of the Nation's water supplies, from the initial step of planning to the ultimate step of water utility management, may utilize the results of research promptly and efficiently. As practitioners, we are aware of the undesirable delays that often occur between reporting of new knowledge and its practical application in water hygiene management. This gap in technology transfer must be closed.

Traditionally, our members have looked to the Federal public water supply program for essential information on new and unprecedented water supply problems and on ways to deal with them. We continue to depend on the Federal program for this important service. But we cannot do so with confidence unless the Federal program possesses adequate personnel, facilities and funds. The variety of technical tasks that the Federal public water supply program may be called on to perform is broad, ranging from problems of systems planning methodology to very specific problems concerned with evaluation of new chemicals proposed in the treatment of water supplies. The latter, in particular, represents a highly important and continuing need.

The American Society of Civil Engineers recognizes that the cost of determining the health significance of very low concentrations of chemicals to which the water consumer may be exposed repeatedly over a long period of time is great and we believe this cost must be borne by the producer, not by the public. However, the Federal public water supply program must be able to advise the States on the acceptability of such a substance. Obviously, the Federal agency must have the resources to evaluate the data presented by the producer. Actually, the test procedure must be one that is acceptable to the Federal program. It is not at all certain that such a procedure now exists. The American Society of Civil Engineers urges, therefore, that immediate attention be given to the development of an acceptable test protocol. The procedures called for would enable the Environmental Protection Agency to provide prompt and effective assistance to the States and municipalities on acceptability of new compounds proposed for use in water supply systems.

The increasing demands on public water supplies are forcing communities to consider as supplementary sources those bodies of water that had previously been rejected or would have been rejected on the basis of poor quality. It is now becoming clear that many such waters will be considered as potential sources of future drinking water supply. An evaluation of such sources requires an extremely careful study of the problems that impurities in these supplies will present and of the adequacy of available methods for removing these impurities. It is evident that this study will require the application of highly sensitive and complex laboratory analyses. However, few water hygiene laboratories are equipped at present to analyze water for viral content and the presence of low but possibly significant concentrations of organic and metallic impurities. Only a few States would be able to justify the expense of maintaining a laboratory possessing the highly specialized scientific staff and the powerful and costly equipment required for such analyses. Most States and communities must continue to depend on the Federal program for such technical assistance.

The Federal program must be able to assist the States and the municipalities in assuring the safety of water supplies by regular stringent testing of water purification plant performance. Such technical assistance will be more demanding in the future, because plants will be more complex and there will be more of them. Not only will base laboratory support be required but, in addition, highly trained engineers and scientists must be available for assignment to the States to assist in this task.

The recently completed Community Water Supply Study disclosed unexpected weaknesses in many public water supplies, particularly those serving small communities. This study covered only a small part of the Nation. It would be desirable that this study be resumed and expanded so that the full picture of the Status of the Nation's water supplies may be obtained. Beyond this, the American Society of Civil Engineers recommends that such an evaluation and survey be conducted regularly at intervals of perhaps 10 years. In addition, the Society recommends that the Federal Water Supply Program make a complete chemical analysis of all metropolitan area water supplies on an annual basis. The scale economies realizable by centralizing this important function could be substantial and the reliability of the data will be increased.

The Federal public water supply program must be able to assist the States in evaluating groundwater contamination resulting from increasingly intensive use of these sources of supply. Difficulties associated with such contamination will probably be aggravated by extensive use of soil in disposal of solid wastes. To provide this assistance, the Federal program must develop a corps of specialized groundwater engineers and scientists.

The American Society of Civil Engineers would support a policy of annual Federal program grants to the States to enable them to reinforce and maintain the technical staff and facilities needed to discharge their essential responsibilities in the protection of public water supplies. We believe that while present State technical staffs are competent and highly dedicated, they have shrunk rather than expanded in recent years despite the growing demands on them, and that they may not provide the supervision appropriate to a strong, dependable public water supply program. Such annual grants should be made subject to annual evaluations of performance.

We support the concept of low interest loans to water systems to assist them in providing an adequate public water supply and in updating and maintaining treatment and distribution systems. The availability of such assistance would remove the difficult barrier of financing that now prevents many of the smaller communities from developing adequate water supply systems.

We support the enforcement provision relating to Water Quality Standards as provided in the draft proposal presented by Mr. Vogt. It is our opinion that strong motivation exists for maintenance of high quality drinking water and that an informed public would demand such water and force public agencies to take all necessary steps to this end. In our opinion, the State water supply agencies may be depended on to do the job if two major conditions are met: (1) strict application of the Federal Interstate Quarantine Regulations as they apply to use of water on interstate carriers; and (2) withholding of State program grants on evidence of poor performance. It was indicated earlier that the American Society of Civil Engineers would support a provision for State program grants.

The American Society of Civil Engineers should, of course, wish to assist the Federal Water Supply Program in every practical way in attaining the highest possible goals of drinking water, quality and dependability.

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STATEMENT OF E. ROBERT BAUMANN, PROFESSOR OF CIVIL ENGINEERING, UTAH STATE UNIVERSITY

Gentlemen, I am here this morning to present the opinion of the American Association of Professors in Sanitary Engineering (AAPSE) concerning the panel's revision of Amendment 410 to S1478, the Safe Drinking Water Amendment. I served as President of this Association in 1969 and 1970 and have been asked by it to comment on the panels revised Amendment 410.

AAPSE's primary function is the betterment of environmental engineering education through support of improved curricula, teaching, and research. The universities represented in our membership graduate over 90 percent of all people receiving degrees in environmental engineering. According to a recent report,<sup>1</sup> our environmental manpower needs seriously outstrip the supply. For example, in 1970, we had 35,700 engineers and 69,500 technicians engaged in environmental work. At that time, our needs were for 44,000 engineers and 86,000 technicians. By 1980, it is estimated that we will need 105,000 engineers and 214,000 technicians in environmental work to meet our needs. If our drinking water industry is to be assured of its share,

<sup>1</sup>Trends in Environmental Health Engineering, D.R. Rowe, Engineering Education, p. 463-465, February, 1972.

we must reestablish the public interest in and attention to our water supply needs.

The American Association of Professors in Sanitary Engineering supports wholeheartedly the purposes and essential provisions of the Panel's Revised Amendment No. 410 of S1478. Our Association has repeatedly, in our appearances before committees of the House and Senate and before the public, called attention to the inadequate attention being given to the safety of our drinking water. At a time when Congress, and the public, has given increased attention to establishing standards of quality, training, research, and development programs, and construction grants for water pollution control, we have witnessed a steady, rapid decline in our attention to drinking water. Existing programs of training and research support in the area of public water supply have been eliminated. Program support has been reduced.

Amendment No. 410 of S1478 serves to reestablish a congressional and public-interest and priority in safeguarding our public water supply. We support its provisions, and consider their importance to be in the following order:

1. The establishment of *primary* drinking water "standards" to protect the public health. (This provision is undebatable.)

2. The establishment of *secondary* drinking water "standards" to protect the public welfare. (The public is not served well by a "safe" water which is so unpalatable that it turns to an "unsafe," uncontrolled water as an alternate supply.)

3. The establishment of the "standards" enforcement authority through the states to the Environmental Protection Agency. (The financial support to be rendered in support of the State Water Program Grants is essential to provide the local control necessary for a viable enforcement program.)

4. The establishment and financial support of a technical assistance and research program both within EPA and to outside persons to assure the development of improved techniques for location, development, treatment, and distribution of a safe water. (More support of the health implications of sodium, carbon refractories, and viruses in drinking water is essential. Methods of removing significant health or welfare related contaminants are important areas needing immediate study. Representatives of the academic profession together with a group of engineers in public and private practice are currently engaged in preparing a report on "Identification of Research Needs in Water Supply." This extensive survey of the literature to identify research needs should be available for distribution early this summer.)

5. The establishment and financial support of training programs for personnel to be engaged in the *design, management, and operation* of water supply facilities. (No process for improving the quality of drinking water can be effective unless it is properly *designed, constructed, and operated*. This will not be accomplished without the availability of more adequately trained engineers, scientists, technicians, and system managers. With current emphasis on other aspects of environmental quality, we should not lose sight of our needs for higher quality personnel in the public water supply field.)

6. The establishment of a *demonstration project* program for the purpose of demonstrating new or improved techniques. (The first five items above are absolutely *essential* to successful improvement of our national public water supply program. A demonstration grant program is most helpful and beneficial but the most expendable of the items in Amendment No. 410 if the research program studies are properly funded and carried out. If the support actually appropriated under this Amendment is reduced over those authorized, AAPSE would support their total assignment to accomplishing the objectives of the first five items mentioned.)

With these brief comments, let me indicate that the American Association of Professors in Sanitary Engineering endorses the provisions of this bill. Our Association members are intimately involved in training of scientists and engineers in the design and operation (and management) of public water supply facilities and in research and development studies to improve their performance. As a result, we would place greater emphasis in the bill to training of "individuals involved in the *design,*<sup>2</sup> management, and safe operation of our Nation's public water supply systems." We might also modify dollar

<sup>2</sup> *Design*, word added.

amounts authorized, and other minor details such as provision for training of personnel at the technician, undergraduate, and graduate levels. Training of design engineers for work in the environment recognizes the Master's level degree as the first professional engineering degree. Training support beyond this level might best be provided by a research fellowship program. We interpret the wording of Amendment No. 410 to give the Administrator authority to carry out such programs, and, therefore, do not suggest that any specific changes in wording be made. On balance, the Panel's Revised Amendment No. 410 to S1478 is a good bill which has the wholehearted support of our Association and our members.

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RESOLUTION PASSED AT THE 1970 ANNUAL MEETING, UNIVERSITIES COUNCIL ON WATER RESOURCES, BLACKSBURG, VA., JULY 29, 1970

RESOLUTION ON NATIONAL POLICY CONCERNING SAFETY OF PUBLIC WATER SUPPLIES

Whereas wastes discharged to many of the nation's water supply sources include a large and changing variety of refractory chemicals of real or potential significance to the public health; and

Whereas present water treatment technology as generally applied does not effectively remove these substances; and

Whereas the recent grave national crisis with respect to mercury, pesticides, and other materials shows clearly that classical epidemiological techniques do not signal the presence of many toxic contaminants of public health significance including subclinical or chronic effects on human health; and

Whereas present drinking water standards and monitoring practices are not adequate to disclose many such materials; and

Whereas a recent national survey of public water supplies by the Public Health Service disclosed many instances in which such supplies failed to conform to one or more of the present drinking water standards; and

Whereas federal responsibility for the safety of water supplies used in interstate commerce is lodged in the Bureau of Water Hygiene of the Public Health Service and such program has never been provided with an adequate legislative base nor administrative and budgetary support to carry out its responsibilities; and

Whereas this program is scheduled for transfer to the proposed new Environmental Protection Agency: Now, therefore, be it

*Resolved*, That federal responsibility for the provision of safe community water systems be recognized through new legislation applicable to all public water supplies, which would establish and maintain applicable national chemical, biological, and physical drinking water standards, strengthen and encourage state and local programs, provide for adequate monitoring and supervision, and substantially increase appropriations for these purposes together with a vigorous research program to establish the safety of water supplies under varying conditions of raw water quality and water treatment technology; and that steps be taken to assure that the public water supply program be given administrative status in the Environmental Protection Agency commensurate with its importance to the public health.

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RESOLUTION PASSED AT THE 1971 ANNUAL MEETING, UNIVERSITIES COUNCIL ON WATER RESOURCES, CORVALLIS, OREG., AUGUST 4, 1971

RESOLUTION REAFFIRMING INTEREST IN NATIONAL POLICY CONCERNING SAFETY OF PUBLIC WATER SUPPLIES

Whereas, the Universities Council on Water Resources has a continuing interest in national policy concerning the safety of public water supplies, expressed in its resolution of July 29, 1970, as follows:

“. . . that federal responsibility for the provision of safe community water systems be recognized through new legislation applicable to all public water supplies, which would establish and maintain applicable national chemical, biological, and physical drinking water standards, strengthen and encourage state and local programs, provide for adequate monitoring and supervision, and substantially increase appropriations for the purposes together with a vigorous

research program to establish the safety of water supplies under varying conditions of raw water quality and water treatment technology; and that steps be taken to assure that the public water supply program be given administrative status in the Environmental Protection Agency commensurate with its importance to the public health."

Whereas, the Public Health and Environment Subcommittee of the Committee on Interstate and Foreign Commerce, U.S. House of Representatives under the leadership of Chairman Paul Rogers is currently considering legislation to attain these objectives; Therefore, be it

*Resolved*, That the appropriate Members of Congress and Committee Chairmen be complimented on their concern for the safety of public water supplies and their conscientious efforts to draft and enact sound legislation in this area and be informed of continued interest of the Universities Council on Water Resources in, and support for, legislation dealing with this important national problem.

#### UNIVERSITIES COUNCIL ON WATER RESOURCES

Alabama, Auburn University, University of Alabama; Alaska, University of Alaska; Arizona, University of Arizona; California, California Institute of Technology, Stanford University, University of California (Berkeley, Davis, Los Angeles, Riverside), University of Southern California; Colorado, Colorado State University, University of Colorado; Connecticut, University of Connecticut; Florida, University of Florida;

Georgia, Georgia Institute of Technology; Hawaii, University of Hawaii; Idaho, University of Idaho; Illinois, University of Chicago, University of Illinois, Southern Illinois University; Indiana, Indiana University, Purdue University; Iowa, Iowa State University, University of Iowa; Kansas, University of Kansas; Kentucky, University of Kentucky; Louisiana, Louisiana Polytechnic Institute;

Maine, University of Maine; Maryland, The Johns Hopkins University; Massachusetts, Massachusetts Institute of Technology, University of Massachusetts; Michigan, Michigan State University, University of Michigan; Minnesota, University of Minnesota; Mississippi, Mississippi State University; Missouri, University of Missouri; Montana, Montana State University; Nebraska, The University of Nebraska; Nevada, University of Nevada, Reno;

New Hampshire, University of New Hampshire; New Jersey, Princeton University, Rutgers—The State University; New Mexico, New Mexico Institute of Mining & Technology, New Mexico State University, University of New Mexico; New York, Cornell University, State University College of Forestry at Syracuse, State University of New York at Binghamton, The City College of the City University of New York; North Carolina, University of North Carolina; Ohio, Ohio State University; Oklahoma, University of Oklahoma; Oregon, Oregon State University; Pennsylvania, Pennsylvania State University, Drexell Institute of Technology;

South Carolina, Clemson University; Tennessee, The University of Tennessee; Texas, Texas A&M University, Texas Technology University, The University of Texas at Austin; Utah, Utah State University; Virginia, Virginia Polytechnic Institute; Washington, University of Washington, Washington State University; Wisconsin, University of Wisconsin; Wyoming, University of Wyoming.

#### AFFILIATES

Australia, University of New South Wales; Canada, University of Alberta, University of Saskatchewan; Israel, Technion, Israel Institute of Technology; Thailand, Asian Institute of Technology; The Netherlands, International Course in Hydraulic Engineering.

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Drinking water is a matter of life and death to human beings. Before the age of bacteriology in the last third of the 19th Century, and even in antiquity, men recognized many of the characteristics of a clean drinking water supply. With bacteriology came new knowledge and new scientific procedures and devices to produce a much safer drinking supply. Wherever this new knowledge has been effectively applied the tragedy of classic water-carried epidemics has been avoided.

During the first quarter of the 20th Century and increasingly since then greater concern has developed about the chemical contamination of drinking water supplies. The scientific community, including government technical staffs, has attempted to advise those in decision-making positions in the Executive Branch and in the Congress about their concern with chemicals in drinking water.

This Appendix contains an initial summary of selected aspects of developments in drinking water management. Reference is then made to a series of documents which indicate the problems associated with drinking water management and the growing concern of the scientific community and government with chemicals in such waters.

#### HISTORICAL HIGHLIGHTS: DRINKING WATER IN THE UNITED STATES

##### The New Nation--Water Supplies and Epidemic Disease

In 1799 a small section of Philadelphia was served water through wooden pipes. The source was the Schuylkill River; the power obtained by the new steam pumps. By 1822, iron pipes carried water to the entire city from the Fairmont Waterworks. The first central water supply for New York was an effort of the Manhattan Water Company, created by a legislative act sponsored by Aaron Burr, in reality a banking company to compete with Alexander Hamilton's New York Bank. This company initiated and developed the water supply at Groton Reservoir in 1842. Beginning with less than sixteen waterworks in 1800, by 1860 over 400 major water systems developed under local arrangements served the Nation's major cities and towns.

While municipal water supplies grew apace with the new towns and cities (by 1900 over \$1 billion had been invested in water systems), health and sanitary conditions did not begin to improve significantly until the end of the period. The increase of water supply systems to over 3,000 by 1900 contributed to major outbreaks of disease since such pumped and piped supplies, when contaminated, provided a highly efficient vehicle for the delivery of pathogenic bacteria. Fortunately, the introduction in the mid-1870's of slow sand filtration and later, in the mid-1880's, of rapid sand filtration methods of drinking water purification initiated a rapid downward trend in typhoid death rates that culminated in rates of under five per 100,000 in Massachusetts by 1916 and under ten for the Nation by 1918.

Typical of the typhoid fever rates before 1900 were those of Massachusetts. Deaths per 100,000 population ranged from an average of 92 during the decade 1861-1870 to 30 for the decade 1891-1900. The U.S. average was perhaps one-fourth to one-third higher than Massachusetts.

##### TYPHOID AND PARATYPHOID FEVER RATES 1861-1900 (Deaths per 100,000 population)

<u>Decade</u>	
1861-1870. . . . .	92
1871-1880. . . . .	63
1881-1890. . . . .	46
1891-1900. . . . .	30

Cities of the 19th Century, American and European alike, used the new steam pumps to reach into the nearest watercourse for a source of water supply. The relation of sewage dumped into these same waters to the water supply intake was not recognized through most of the century, although Dr. Snow, as early as 1854, had traced cholera to the water supply of the Broad Street pump in Golden Square.

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#### Organization and Technology--Prelude to Control

Widespread epidemic disease in the growing urban centers coupled with improved knowledge flowing from the findings of the European scientists in the new science of bacteriology led to the formation of State Boards of Health. Leading the way was Massachusetts. Its State Board was established in 1869, largely as an outgrowth of Lemuel Shattuck's "Census of the City of Boston" in 1845 and the "Report of the Sanitary Commission of Massachusetts" in 1850. Following Massachusetts came California (1870), the District of Columbia (1871), Virginia (1872), Minnesota and Michigan (1873), Maryland (1874), and Alabama (1875).

But Boards of Health and administrative agencies had to wait for technology to provide the tools to overcome water-borne epidemics. The invention by the English and Scotts of the slow sand filter provided the tool and the first installation was made at Poughkeepsie, New York, in 1872-74. This was followed by the development of the rapid sand filter between 1880-85. However, progress in placing these new developments into practice came slowly. Allen Hazen and his colleagues at the Lawrence, Massachusetts, Experiment Station initiated (1892) the task of developing further information on these new devices. This they did in classic experiments and their findings, accepted with confidence by professionals and administrators, contributed greatly to widespread acceptance of filtration after the turn of the century.

As indicated earlier, the cause of water-borne epidemics was not merely the lack of water purification facilities. The concomitant condition was the discharge of human sewage into streams close enough to water intakes to provide for the effective transfer of pathogens from the waste to the water supply.

#### Initial Efforts in Science and Public Policy: 1900-1919

In 1901, the Congress authorized construction of the Public Health Service Hygienic Laboratory, "for the investigation of infectious and contagious diseases." This new laboratory, completed and occupied in 1905, replaced the inadequate facilities first established by Dr. Kinyoun in the Staten Island Marine Hospital in 1887, and moved to Washington in 1891. In 1901, too, a division of scientific research was organized. Typhoid caused by polluted drinking water was widespread at that time, and it was natural that attention should be directed to the importance of studying stream pollution in relation to that disease.

In 1908, at the recommendation of the Mayor of Chicago, an interstate commission to study and report on pollution in Lake Michigan was formed. The cooperation of the Public Health Service was requested. Membership of the Commission included representatives of the War Department, the Public Health Service, the cities of Chicago, Milwaukee, and Grand Rapids, and the States of Wisconsin, Illinois, Michigan and Indiana. Later that year a similar group, composed of representatives of cities on the borders of Lake Erie, was organized to collect data, "and excite interest regarding the necessity of protecting water supplies." The findings of both of these groups pointed to the need for legislation to prevent pollution of interstate waters. Such legislation was introduced in the Congress, but was not enacted.

In 1910, the first systematic investigation of the status and effects of sewage pollution in any large area was begun in the Great Lakes region. This included study of the extent of pollution of the water supplies of cities in the area, and its relation to the prevalence of typhoid fever and other water-borne diseases, and an examination of State and municipal ordinances relating to its control.

In 1912, Congress enacted the first direct law aimed at the problem of water pollution by extending the function of the Public Health Service to include that of investigating "the diseases of man and conditions influencing the propagation and spread thereof, including sanitation and sewage and the pollution, either directly or indirectly, of the navigable streams and lakes of the United States." (Not until 1948 would this law be replaced by a new statute.) In 1913, an appropriation was made which enabled the Public Health Service to establish field laboratories and to employ scientific personnel especially qualified to conduct investigations in various fields of research. A group of sanitary engineers, chemists, biologists and bacteriologists was assembled and a beginning was made on a concerted plan for investigating stream pollution and water supplies.

When America entered the war in 1917, the major resources of the Public Health Service were employed in support of the military and defense program.

After the war, the Public Health Service formulated a comprehensive program to meet the pressing health needs then apparent. Since past experience had proved that success in public health activities could best be achieved through cooperation of Federal, State and local health authorities and voluntary organizations, the program was developed on this basis. Segments of the proposed program included the following:

- development of safe water supplies throughout the Nation by stimulating the use of water purification methods;
- extension of safe methods of sewage disposal by stimulating the extension of municipal sewerage systems; eliminating cesspools and privies inside municipalities; and establishing minimum standards to control the pollution of streams, lakes and rivers used for water supplies.

Released from war-time tasks, the Cincinnati research group of the Public Health Service actively pursued the development of basic knowledge on the pollution of streams. Concurrently, Harold W. Streeter was examining in detail 31 water supply systems in the Ohio River and Great Lakes area, including observations of the efficiency of these systems to remove bacterial contamination resulting from pollution caused by sewage. The conclusions he developed have found continuous use in the design of modern water purification works.

#### State-Federal Cooperation

By the end of World War I it was evident that the control of water pollution, particularly in relation to water supplies, was a major problem, and that any attack on the problem would require the cooperation of States, cities, the Federal Government and private industry. The Federal role was limited by Congress to research and investigations and the scientific information that resulted from these efforts contributed significantly to the national development of control programs.

Actual control of water pollution, however, rested with the States. This responsibility developed traditionally out of the authority of the State Health Departments to preserve public health. In addition, it was not uncommon to find concurrent authority

lodged piecemeal in several other departments of State government responsible for fish and wildlife, mines and minerals and agriculture.

By 1915 activity had been initiated by a substantial number of States to reduce the discharge of untreated municipal sewage. From that time up to 1948 the actual task of controlling water pollution in the United States was almost entirely a State matter. At the close of World War I, most State Health Departments had established sanitary engineering organizations to look after environmental problems that had a relationship to public health. Foremost among these problems were safe drinking water supplies, the disposal of sewage and the control of water pollution.

A development having far-reaching public health influence took place in the year following the end of World War I. In December, 1919, a group of State sanitary engineers attending the American Public Health Association meeting in New Orleans discussed for the first time the need for closer cooperation among the States in environmental control activities. Those present formed a temporary organization and on May 25, 1920 an official organization meeting was held to which all Chief Engineers of State Health Departments were invited. In outlining the purpose of the proposed organization at that meeting, Mr. V.M. Ehlers, then Chief Sanitary Engineer of the Texas State Board of Health, said:

In these days of progress and accomplishment, cooperation and unity of purpose have been deciding factors to success. Captains of industry as well as the knights of labor recognize in cooperation and union the signposts that direct the way to the goal of attainment....

The field of proposed cooperation covers the entire sphere of activity of the State sanitary engineer. While it is true that some of the problems confronting us down in the South are not as pertinent in the Northern States, the fact remains, nevertheless, that mutual good could be accomplished by comparison of methods practiced and results obtained. Nearly all really important propositions have a close sectional co-relationship.

Among the problems listed by Mr. Ehlers as being most vexing to the State engineers of that time and the solution of which was most urgently needed, were treatment and disposition of domestic and industrial wastes; need for a definition of what constitutes stream pollution (this was especially important for interstate streams); lack of uniform standards and uniform State laws; and protection of water supplies.

The Conference of State Sanitary Engineers contributed a great deal to the effective development of environmental health programs, especially in connection with the development of common objectives between the States and the Federal Government; of the acceptance of common standards and technical procedures as the foundation for programs to be carried out in the States. In addition the Conference provided a meeting ground for the informal testing and sharing of new ideas. This resulted, over a period of time, in voluntary acceptance by the Conference members of many common views.

The value of the Conference is indicated by a brief review of some of the matters taken up by the members during the first years of its existence.

At the time of the first Conference, in 1920, most of the States were seriously concerned with the matter of drinking water purity. The general situation was well

expressed in the paper on "Coordination of the Control of Drinking Water in Interstate Carriers with Engineering Functions of State Departments of Health", presented by C.M. Baker, then State Sanitary Engineer, Wisconsin State Board of Health. In discussing the 1914 Drinking Water Standards, Mr. Baker stated:

It should be borne in mind that these early regulations were put into force at a time when few if any of the States had adequate facilities for proper control of their water supplies by sanitary surveys, and that in many cases even suitable laboratories were not available. In fact, a survey of the facilities of the various States for the control of water supplies by the USPHS early in 1919 showed that less than one-half of the States were well equipped for this work, 12 of the remainder had no sanitary engineers, but were equipped with meager laboratory facilities, while one State had neither an engineer nor laboratory. It is obvious, therefore, that although some States were well qualified to control their own public water supplies, and in connection therewith those of all common carriers, general control by the USPHS is still essential. The purity, not only of public water supplies, but also of those of common carriers within the State, should, however, be of prime interest to the State itself, because of the great danger to the inhabitants thereof when these supplies are impure....

It is believed that the control of the water supplies of common carriers as well as of all public supplies should be mainly if not wholly under the supervision of the respective State departments of health, providing these departments are adequately equipped for such control

In his summary, Mr. Baker re-emphasized:

In those States where such facilities are not available, the USPHS should retain control and, in cooperation with State officials, should endeavor to build up the necessary organization. In this connection, the Service should be in a position to furnish engineering and laboratory personnel to assist these States. In connection with this work, assistance could be given not only in the control of water supplies of common carrier, but also in building up effective State organizations for the control of sanitary conditions generally within the State.

One of the objectives of the Public Health Service was to strengthen State organizations. The means set up for interstate quarantine practice had been conceived as one means by which the development of State agencies might be stimulated. In 1919 ten Service officers were assigned to the States to help prevent the interstate spread of disease. Requests were received from more than thirty States, but the number provided was limited to ten because of the scarcity of available personnel.

The interchange of technical documents through the Secretary of the Conference (a Public Health Service Officer) was initiated in 1921 and resulted in the establishment of Public Health Engineering Abstracts, one of the earliest efforts to effectively

disseminate technical information to using agencies. Also in 1921, questionnaires were distributed by the Water Supply Committee on Stream Pollution to develop an assessment of the National problem in these fields.

The Committee on the Limitation and Control of Chlorination of Water was concerned with the efficiency of chlorination practice in protecting drinking water supplies. It presented its first technical report at the 1922 meeting.

The 1926 meeting considered the adoption of coliform standards for bathing places and initiated a census of water treatment plants in the United States. (This census was later extended to the field of Sewage Works.)

During succeeding years the Conference of State Sanitary Engineers continued to play an important role in communications between the Federal Government and the States in water supply, water pollution control and closely related activities. In the first half of the 1919-1948 period, the States were primarily responsible for operating control programs in the environmental engineering field. Beginning in 1935, the Federal Government extended its research, investigations and technical assistance programs to include the administration of grant-in-aid funds authorized under the Social Security Act of that year. The new program allowed a stronger Federal contribution to State program development and administration.

Broad national programs of public works, social security, and national resources planning, initiated between 1933-1940, were part of a national experiment to cushion or eliminate future depression cycles. These gave major impetus to public health activities in a variety of areas including water pollution control.

Section VI of the Social Security Act of 1935 was designed to stimulate a comprehensive, nation-wide program of public health, financially and technically aided by the Federal government, but administered and supported so far as possible by the States and local communities. It gave to the Public Health Service legal authority to act as partner, adviser, and technical assistant to State health departments, and through them to municipal and local health services. The Federal funds made available under the Act were utilized to strengthen the State and Territorial health departments and provide adequate facilities, through State agencies, to strengthen and aid in development of district, county and city health services; to train personnel in State and local health departments. State and Territorial health authorities cooperated in the development of the regulations promulgated for the administration of these grant-in-aid funds.

Grants-in-aid to States for public health work did not become available until February, 1936, yet by the end of that fiscal year thirty-three states' forces had expanded their sanitary engineering. By 1939, practically all States had done so. According to reports of the Conference of State Sanitary Engineers, the number of assistant engineers and other technical personnel attached to State health departments increased between 1931 and 1939 by 90 percent and between 1931 and 1944 by 169 percent. By enabling increases in personnel, grant-in-aid money gave great impetus to decentralization and wider coverage of State health department services. Water supply and water pollution efforts shared in this expansion through the provision of greater technical aid to cities and industries to survey and plan water supply and pollution control needs; training of water and waste treatment plant operators; and the development of much greater public awareness about water supplies and pollution.

During World War II science again had to give way to the urgent demands of national survival. Following the national emergency, water pollution research attempted to catch up with the new developments that had taken place during the wartime period of great economic activity. The enactment of the Federal Water Pollution Control Act of 1948 created a surge toward water pollution research in response to the crisis proportions of this long delayed national endeavor. Concern for water supply was reduced, relatively, as a consequence. It was not until the mid 1950's that a strong concern about the effect of new chemicals and growing volumes of known chemicals on drinking water supplies became visible.

Stress was placed on the development and evaluation of analytical techniques for both organic and inorganic materials; studies of persistence of particular organic compounds in water; application of biological oxidation processes to waste purification; studies of industrial waste sources, characteristics, and corrective measures; inventory surveys on pollution of water resources, development of biological methods for determining the severity and extent of pollution; studies of toxicity of water pollutants to aquatic life; development of bio-assay methods and their application to pollution control; development of methods for control of organisms responsible for tastes and odors in water supplies; studies of pollution and purification of shellfish in aquatic environments; determination of radioactivity in surface and ground water and in fresh water life; and determination of cyanide in water and wastes. Field investigations of various types of industrial wastes--synthetic rubber, steel, and kraft paper mill wastes and others--were also undertaken in order to assist in developing industrial waste treatment methods.

While this list of activities appears extensive, it should be noted that the Federal budget assigned to research for water was measured only in hundreds of thousands of dollars.

#### Drinking Water Standards

Official drinking water standards were first adopted in 1914 as an aid to administering the Interstate Quarantine Regulations. Their adoption stemmed from the need to have a common base for the determination of the sanitary condition of water supplies, and a foundation for the actions being taken to prohibit use of certain water supplies by common carriers. They were recommended by a Commission on Water Standards, appointed on January 22, 1913, by the Secretary of the Treasury. The Chairman of the Commission was the director of the Hygienic Laboratory, and other membership included fourteen public health and engineering specialists from universities, State health departments, and technical organizations.

Considerable care was exercised in determining the standards, more than a year being devoted to discussion and study of the problems involved. As recommended by the Commission and adopted by the Department of the Treasury on October 14, 1914, the standards provided certain maximum limits of permissible bacteriological impurity. It was emphasized that they did not represent the nearest approximation to purity which it is desirable to attain in drinking waters, but rather the furthest deviation from purity considered permissible and safe. They were in no sense a standard for municipalities, nor did they indicate the ideal potable water. They were based solely on the results of laboratory examinations and did not include sanitary surveys of watersheds and the enumeration of undesirable or dangerous conditions thereon (a procedure which, it was noted, would be of great value). The matters of physical properties, mineral constituents, and chemical impurities were not dealt with in the adopted standards, but were left for future consideration.

Between 1914 and 1917 there was continued activity in the control of common carrier water supplies along the same general lines as first initiated. Throughout this period, continued cooperation was maintained with State and local health authorities in the processes of supervising and controlling the water supplies served to common carriers. Suggested amendments to the Interstate Quarantine Regulations were considered at the 1915 Conference of State and Territorial Health Officers. (An annual conference between these officers and the Surgeon General had been initiated in 1902, in accordance with the direction in the 1902 Public Health Service Act, as a means of furthering cooperation with the States.) At this 1915 Conference, the Chairman stated: "As you know, the Federal law provides that the government shall cooperate with the States, and that the regulations to be enacted by the Secretary of the Treasury shall operate uniformly. There is nothing in this or any other Federal law to prevent the States from enacting such further regulations as they may deem necessary. I think it is the intention of the Bureau that amendments to these regulations shall be made an order of business of this conference hereafter from year to year."

#### Updating the Drinking Water Standards

In 1922, the Surgeon General appointed an Advisory Committee on Official Water Standards to review the 1914 Standards for Drinking Water for Interstate Carriers and to recommend a standard or standards based on specific methods of laboratory analysis and field survey and applicable to all classes of water supplies coming within the supervision of the Interstate Quarantine Regulations. This action was deemed necessary for several reasons. The wide divergence of practice existing among State health departments in making bacteriological and chemical examinations of water, in making sanitary surveys of water supplies, and in judging the sanitary quality and safety of water had caused difficulty in the administration of the regulations relating to drinking water. In addition, contrary to the intent of the Commission which recommended the 1914 Standards, these standards were being applied in many instances to municipal water treatment plants and were being used in courts as the legal standard for the purity of water. Because of their obvious importance, a review of the current standards and a specific definition of their limitations and applications seemed called for.

The standards were revised to reflect the experience of municipal water supply systems that had an excellent record of safety against water-borne diseases. The standards required that the source of the water supply be carefully investigated to insure that it was protected against sewage discharges. It also established limits over the bacterial content of the drinking water by means of standard laboratory tests. The importance of the standard was obvious. It guided and controlled the selection of the drinking water supplies used by millions of persons and the Committee was keenly aware of this. Largely as a result of using these standards as guides, the safety of the Nation's drinking water supplies is one of the unique public health engineering feats of the world.

In February, 1941, an Advisory Committee on Revision of the 1925 Drinking Water Standards was appointed by the Surgeon General, at the suggestion of the American Public Health Association, American Water Works Association, and American Chemical Society. The Committee was composed of representatives of Federal agencies, scientific associations, and three members at large. The major revisions, apart from some administrative changes, included modification of laboratory examinations of water to take advantage of new scientific developments and limiting the concentration of selected chemicals like lead, selenium and copper.

In 1946, slightly revised standards were adopted by the Surgeon General on recommendation of the Committee. These revisions clarified wording to facilitate uniform application and to permit application to all public water supplies if the States so desired rather than to water supplies used in interstate commerce.

While the American Water Works Association had given full support to the idea of standard development, it preferred voluntary compliance rather than government direction. Accordingly, the Association on January 14, 1946, adopted a resolution voluntarily accepting for the Association the 1946 revision as standards for all public water supplies.

In its Manual of Water Quality and Treatment, the American Water Works Association states with respect to standards that:

However meritorious the purpose or performance of any water works man, it is important to provide him with a yardstick by which he can measure his achievement. Standards of quality can do not only that, but, properly enforced, can guarantee at least a minimum level of achievement. Moreover, the progress of the water works field as a whole can best be measured by the progressive improvement of its standard of quality.

#### Water Quality Standards and Chemicals

The establishment of limiting values for selected chemicals in the Public Health Service Drinking Water Standards, beginning in 1925, has had a major impact on water quality management, and its full influence has yet to be exerted. Important changes have been induced in each succeeding revision and, in developing the 1962 revision of the standards, the Advisory Committee adopted a number of guidelines, three of which are pertinent here. They recommended that:

- "(2) A new section on radioactivity (should) be added."
- "(3) Greater attention should be given to the chemical substances being encountered increasingly in both variety and quantity in water sources."
- "(4) In establishing limits for toxic substances, intake from food and air should be considered."

The recommendation on radioactivity highlights the fact that new and unique breakthroughs in science create new situations highly dangerous to society unless rigidly controlled. In the case of radioactivity, the dangers were so apparent that the development of controls limiting exposure was adopted early in other regulatory programs. The recent application to drinking water gives further strength to this control effort.

A few synthetic organic chemicals producing new and unforeseen problems affecting water use illustrate the impact of technologic advances. At the time of the 1946 revision of the drinking water standards, synthetic detergents were just beginning to make their way into the market. By 1962, they had largely replaced soaps for most domestic use, had been identified as contaminants in ground waters used for water supply in thousands of private homes in metropolitan areas and had created problems in surface

waters with which we are all familiar. The 1962 standards, setting a limit of 0.5 mg/liter on A.B.S., together with attempts to control and remove this pollutant by legislation, highlights a standard setting procedure which can occur again as the pollution problem intensifies.

Improved technologic capability to identify substances contributing to pollution is and will continue to be an important factor inducing changes in water quality standards. In 1946, the 0.5 mg/liter limit for chromium (as hexavalent chromium ion) "was based on the lowest amount analytically determinable at the time it was established. In another instance, later, in 1962, the Advisory Committee considered the problem of protecting water quality against "the intrusion of excessive amounts of potentially toxic material." In view of the "general inability to clearly define the chemical and toxicological nature of this material," the Committee believed it "most desirable to limit to the lowest obtainable level." Thus, a limiting concentration of 200 micrograms of carbon chloroform extract materials per liter was set "as a technically practical procedure..."

New scientific findings also force a continued readjustment of water quality in relation to how waters are used. The 1946 Drinking Water Standards established a limiting value of 0.5 mg/liter for arsenic. By 1962, evaluation based on new toxicological studies required that limiting recommended concentrations should not exceed 0.01 mg/liter. Lead and selenium are two other metals whose allowable concentrations were considered under the revised standards. In the case of lead, the allowable intake was considered in relation to three other sources: ingested foodstuffs, inhaled atmosphere and tobacco smoke. This new view, a consideration of total allowable intake, will leak ultimately to giving a position of enlarged importance of drinking water standards.

Notwithstanding the interest of the technical committees in chemical quality, the interpretation of the General Counsel of HEW remained unchanged. Regulations imposed for water quality were to relate only to "communicable diseases" and no legal requirement could be imposed regarding chemicals in drinking water under the interstate quarantine regulations.

NOTE: This section on Historical Highlights is based largely on material contained in Conservation in the United States: A Documentary History, Volume I - Water and Air Pollution, Leonard B. Dworsky, Chelsea House and Van Nostrand Reinhold Company, New York, 1971

Document No. 1      "... the best criteria ... [is] showing that the man is dead ... that the water he drank killed him." Dr. Abel Wolman.

The "best criteria" cited by Dr. Wolman has, too often, provided the basis for action by society to meet public health or public safety problems. The air pollution problem is an excellent example. So are floods, and typhoid and cholera epidemics.

Chemicals and the environment is a new and little understood condition. The effects of detergents (foaming waterways and deterioration of water resources); DDT (serious and sometimes deadly effects on plants and animals); and mercury (concentrations in fish life dangerous to man's life) are examples of this new condition.

We must develop the will to take positive and wise actions now before we are driven to action by Dr. Wolman's "best" criteria. In the nature of the "chemical" game, such action may come too late.

#### *Calculated Risks*

How has the health worker balanced criteria against risk to life? The past record of accomplishment in the field of public health, of which one has reason to be eminently proud, is singularly devoid of such quantitative evaluations. The fact that the American public lives in one of the most protected public health environments in the world is not contested. That this is the result of the composite of public health measures, standard of living, genetic influence, and other factors is likewise true.

But the saving of lives and the extension of life have been the result of public health practice to a significant degree. It must be recognized, however, that the guiding principle that "public health is purchasable" was a qualitative philosophic precept, rarely a quantitative equating of protective criteria against loss of men or dollars. Efforts to apply the latter equation have not been rare, but they have been quite unimpressive in general impact either on the people or on their legislators. Persistent efforts have been made to measure the economic value of the newborn babe, but the western acceptance of the general obligation of society to prevent disease and death is the prevailing one. It is only in the search for criteria for radiation limits that one finds suggestions that it should be permissible to kill X people to attain Y benefits to society. This has undoubtedly been in the minds of all criteria makers, but rarely has it reached the frank and stark pronouncements of recent years.

#### *Safety Factors for the Public*

Has there been a discernible factor of safety in public health criteria invariably in favor of the public? The answer is unquestionably "yes," and the factor of safety has always been large. This principle is well illustrated in drinking water quality standards to protect man against typhoid fever, the dysenteries, infectious hepatitis, and cholera. Obviously the best criteria for detecting a dangerous public water supply are the doctor's certificates showing that the man is dead and the epidemiologic evidence showing that the water he drank killed him. The health official does not wait for such criteria, specific and quantitative as they are. They cannot be applied promptly enough, and they do not provide a wide area of protection. The health official chooses to widen this

### *Standards of Health and Safety*

area immensely by moving to far less specific criteria with broad empiric relationships to disease.

The index preferred for half a century for detecting an unsafe water supply was the coliform organism group—nonspecific, even generally nonpathogenic, and only a qualitative indication of a climate of unsafe quality. But it has served its purpose effectively and is a striking example of intelligent empiricism preceding more refined measures of risk. Fortunately, no easy method of detection of the specific typhoid bacillus was available 30 years ago, because its adoption as a universal indicator would have narrowed measurably the area of safety for the consumer. It is not an unmixed blessing that already the radiation industry is plagued in fixing criteria by a startling multiplicity of specific nuclides and their effects. Another look at the value of gross criteria may be warranted.

The factor of safety was even more enlarged by the essential application of administrative judgment. Water quality appraisal was a composite of an understanding of heredity or origin of source, environmental adjustment or treatment, and of final product. The equilibration of these three factors was a *sine qua non* of assessment and depended on professional proficiency. There were always those, of course, who looked to a single quantitative unit for appraisal. They, in fact, did damage to administrative justice by attempting to oversimplify the complexity of interpretation of many criteria.

### *Higher Standards*

Scientific understanding pressed toward ever more dramatic hopes in public health. Shifts in objective toward ever lower death rates became marked as the means for accomplishment became more evident or were created. For example, in the 1920's a residual typhoid fever death rate of 10 per 100,000 was assumed to be inevitable. To attempt to lower the death rate was considered "impracticable." Yet public health measures were persistently enforced, so that the typhoid death rate last year in the United States was one-hundredth of this figure. Was this desire to save lives foolish? It is to be doubted.

Were the results of continually higher standards for health protection unduly costly in dollars? It is rare to have encountered public or private agencies in the past which did not plead poverty or maintain that costs of correction were excessive. History shows that the public health demand for pasteurized milk was consistently opposed with the argument that capital and maintenance costs would price milk off the market. It is a credit to industry that it meets such challenges while it fights them.

Improvements in water quality have come about rapidly at remarkably low costs, because the technologist has been able to design, con-

struct, and operate plants to meet ever increasing and more rigid criteria. Fear has been expressed that the establishment of too rigid criteria in the field of radiation may stifle progress because of excessive costs of attainment. One may view this fear with some cynicism in the light of the whole history of health and safety endeavor. This fear has always been expressed, but history consistently belies it. Criteria must be based on public health protection and not cost. No one, of course, should advocate excessive and unnecessary restraints. Those restraints most logically suggested, however, within the framework of current scientific understanding should not be resisted solely because resulting costs may threaten to throttle their application.

Dr. Abel Wolman,  
Water, Health and Society;  
Journal American Water Works  
Association, Vol. 52, No. 11,  
1960.

Document No. 2      70% Do Not Meet USPHS Standards (1946 Report; Cook County Ill.)

At the request of local and state officials the United States Public Health Service in 1946 conducted a detailed health survey of the City of Chicago and Cook County, Illinois. The sanitary quality of the drinking water supplies of the communities in Cook County, Illinois excluding Chicago is summarized in this document.

**SANITARY QUALITY OF PUBLIC WATER SUPPLIES** The 1946 *Public Health Service Drinking Water Standards* were used as a guide. In making an analysis of the sanitary quality of each of the 77 municipal water supplies in Cook County. The status of each water supply was determined in relation to each of the three parts of the U.S.P.H.S. standards: (1) as to *source and protection*, (2) as to *bacteriological quality* and (3) as to *physical and chemical characteristics*. The over-all character of the water supply, considering all items, was also determined. Table 16 summarizes the results of this analysis.

TABLE 16. PUBLIC WATER SUPPLIES COMPLYING WITH U. S. PUBLIC HEALTH SERVICE STANDARDS FOR DRINKING WATER, BY POPULATION GROUPS, COOK COUNTY, ILLINOIS

POPULATION GROUPS (Tot. pop.: 606,185)	MEETING U.S.P.H.S. STANDARDS (Pop.: 139,069)			NOT MEETING U.S.P.H.S. STANDARDS (Pop.: 460,846)			NO WATER SUPPLY (Pop.: 6,270)			
	A	B	C	A	B	C	A	B	C*	
1	26	2	2.2	0.2	12	13.5	1.1	12	13.5	1.0
2	23	2	2.2	0.4	21	23.6	5.7	0	0.0	0.0
3	23	7	7.8	6.6	16	18.0	11.6	0	0.0	0.0
4	12	2	2.2	4.9	10	11.2	23.6	0	0.0	0.0
5	5	1	1.1	10.8	4	4.5	33.9	0	0.0	0.0
Total	89	14	15.5	22.9	63	70.8	75.9	12	13.5	1.0

\* A: number of municipalities.  
B: percent of total municipalities.  
C: percent of total population.

The table indicates that 63 of the 77 municipalities with public water-supply facilities provided a water supply that *did not* meet all the U.S.P.H.S. standards. These 63 municipalities have 75.9 percent of the total municipal population. Forty of the 63 use Chicago water, which the United States Public Health Service has approved only provisionally.

Professor Leonard B. Dworsky,  
The Chicago-Cook County Health  
Survey, Columbia University  
Press, 1949.

Document No. 3     The National Health Assembly Advocates a Stronger Drinking  
Water Program (1948).

In 1948 President Truman's Administrator for the Federal Security Agency (the precedent agency to HEW) Mr. Oscar Ewing convened a National Health Assembly. The Chapter on the environment included the following among its conclusions and recommendations.

#### CONCLUSIONS AND RECOMMENDATIONS WATER SUPPLY, SEWERAGE, AND WATER POLLUTION

##### *Water Supply*

Human beings cannot live without water. The quality of water in any given location has a direct effect on health.

Public water supplies of proper quality are an essential requirement of our modern city existence. In 1900 there were only 3,400 public water supplies in the United States, and the quality of the water served was generally poor. In that year over 23,000 people in the nation died of typhoid fever, and more than 100,000 deaths were due to diarrhea-enteritis and dysenteries. Today over 14,000 systems provide water to about 85 million people, and the quality of the water furnished is generally excellent. In recent years the deaths from typhoid have dropped to less than 600 and deaths from other enteric diseases to about 15,000 per year.

There is need to continue service at the highest practicable standard and to be constantly alert to the danger of cross connections, uncovered purified water reservoirs, and other degrading influences. Water-safety programs, including more frequent bacteriological examination, supervision over construction and repairs, and elimination of sanitary defects, are essential to assure a water supply of the highest quality. Future needs include extension of the present systems as well as the construction of new systems in communities growing to the point where they can profit by such supplies.

Although much has been accomplished, a great deal has yet to be done. On the basis of a reasonable estimate of the needs, the United States Public Health Service survey of the nation's sanitation requirements<sup>1</sup> indicated that approximately 2,360,000 people in 5,710 communities with

no public waterworks systems need such facilities; that almost 15,000 communities with over 79 million people have waterworks which need improvements or extensions; and that in rural areas, where community systems are impracticable, 27 million people need either new or improved water supplies. In terms of 1947 costs, it was estimated that to meet these needs would cost about \$2¼ billion, of which roughly \$400 million was allocated to work ready for construction, \$600 million to work in various stages of planning, and about \$1¼ billion to future projects.

At the present time there are many unknown effects from water impurities, in spite of the fact that drinking-water standards have been established. The immediate needs and those for the years just ahead include constant study and research to improve methods of treatment and of water-quality measurement.

#### *Research Needs*

Environmental sanitation is emerging from its pioneer age into a scientific age. The trial-and-error methods used in the past to develop environmental control measures will not suffice in the scientific age of today and tomorrow. A large amount of basic research is needed to make possible effective control of environmental hazards.

There are very few research centers in the United States where any significant amount of basic research in environmental sanitation is being done. Few individuals are engaged in such research. Many of them are engaged in "testing station" work which, though desirable, does not usually develop significant basic data of universal applicability. Inadequate remuneration for the research worker is a handicap. Individuals who might engage in basic research following the completion of their college training obtain employment instead in other work which offers greater financial returns. State and local control agencies, such as health departments, seldom have the time, facilities, or personnel for basic research.



The basic procedures in water treatment and in sewage disposal have not changed significantly in the past several decades. New principles may be discovered which would render many of our present methods extremely inefficient and expensive in comparison. There are strong indications that the long-honored test for the safety of drinking water, the coliform index, may furnish only part of the information that is necessary to enable us to determine whether or not a drinking-water supply is safe. There may be unrecognized contaminants of water which have an important bearing on the incidence of disease, just as the role water may play in the spread of certain diseases may not be understood.

America's Health,  
A Report to the Nation  
by The National Health  
Assembly, Harper & Brothers,  
New York, 1948.

Document No. 4      The National Institutes of Health Environmental Sciences Study Section Advocates a Concern About Chemicals and Human Physiology (1960).

In a 1956 paper tracing out 75 years of improvement in water supply quality, Dr. Abel Wolman wrote,

" The fragments presented in this paper illustrate the long road traversed, the great progress made, the ever-tightening criteria of chemical, physical, and biological characteristics, and the rapid trend toward the literal tailoring of water for the domestic, industrial, or farming customer. The requirements become more numerous and more complex.

Simultaneously with these demands, investigators move forward as in the past toward new solutions, new experiments, and the adjustment of old concepts to new challenges. "

(J. ~~AMA~~ ~~August~~ August 1956; given May, 1956)

In the same month he made this statement investigators were moving forward to new ventures. In a conference on "Man versus Environment" sponsored by the National Institutes of Health the subjects of "...pollution of the air, the processing of human food, and the contamination of the water supply of mankind..." and the need to bring these matters under rigid scrutiny through extensive and sustained research were considered.

Four years later a corresponding conference was convened for the purpose of focusing "...the attention of experts on one of the principal hygienic problems of all time, including the present-namely, the quality of the water which should be made available to man in accordance with his physiological needs". The major questions dealt with what was known and what needed to be learned about the effects of minerals, trace elements, insecticides, and organic substances in potable water.

In his keynote address, Dr. Robert A. Kehoe considers a Pandora's Box.

#### Pandora's Box of Chemical Pollutants

Scientific man has released not only atomic energy from its natural confines, in concentrating it in his service, but he has also opened up a virtual Pandora's box of chemical agents with the idea of employing them for his convenience, comfort and enrichment. Only in the immediate sense, has he perceived their potentialities for harm, and only recently has he developed some awareness of the consequence of their distribution upon the earth, into its waters and into its atmosphere. As yet, however, he has not gone far enough in his recognition and limitation of their spread.

On the other hand, it is likely that these contributions to the hazards of human life, significant as they seem in experience and anticipation, are not as much of a threat to life on this planet, and perhaps to that of man, as are the disruptions in the balance of nature induced by the man-made changes in the face of the earth, in the disposition of its land and its waters to serve human purposes. Many such disruptions that have been brought about may have to be corrected at great cost, and certainly, in the future they should be anticipated and accepted or counteracted.

It has been my privilege to sit in the councils of the Study Section that conceived of this conference and the one which preceeded it. Here in fields foreign to my experience, I learned something of the complexities of aquatic life, something of the interrelated participants and events in the biology of streams, something about sewage, mostly organic sewage, and something about the reclamation and use of waste waters.

This was a rewarding but an humbling experience, for I saw again, as I had seen before in exchanges between men of wide knowledge and vision, that the search for knowledge, while eminently successful, had but opened up still larger fields for further inquiry. But to learn something more of the dynamic processes of life, and to be aware of the greater expanse of the unknown, is not necessarily to be discouraged or deterred, but perhaps, more often, to be challenged. This has been the role of man since first he ate of the tree of knowledge and acquired an undying taste for it.

Robert A. Kehoe,  
Proceedings, Conference on  
Physiological Aspects of Water  
Quality, Human Health and Well-Being  
and the Aqueous Environment,  
Washington, D. C., 1960.

Document No. 5      "...We Need Expanded Development and Research of the Deepest Kind", Dr. Abel Wolman.

In a summary of the Conference on Physiological Aspects of Water Quality, Dr. Abel Wolman indicated the Directions for the Future.

#### Directions for the Future

Where do we go from here was one of the questions Dr. Kehoe posed. I am reminded of a recent comment by a prominent statistician at Princeton who was asked to do a similar job before the American Statistical Society this past spring. In answer to the confusion of information which had been given to him in the symposium, he said, "Well, some people suggest we ought to go at once to the psychiatrist."

No such pessimistic route is necessary for us. There is a better route, which has been spelled out already by almost every speaker. We need more investigation. This is more than a literary cliché in our particular field. This is an area in which we need expanded development and research of the deepest kind. This is an area in which we need increasing emphasis on our attention to the total ecology of man, with whatever tools we are able to summon up.

We must move toward a rational, conscious equilibrium between the use of technology and its misuse. This relationship has been spelled out before. It is peculiarly a responsibility of industry; a responsibility which I think, in many major industries, is already recognized and practiced, but which must be expanded to all of industry busily engaged in this rapid-fire production of new materials. The production of industrial materials of unknown character, concentration and, certainly, of unknown biological effect is a major joint responsibility of industry. In the next conference of this type, industry should be invited to come and present in greater detail how it intends to cope with this kind of stress over the next twenty years.

Dr. Abel Wolman,  
Proceedings, Conference on  
Physiological Aspects of Water  
Quality, Directions for the  
Future, Washington, D. C., 1960.

Document No. 6     83 Scientists Advocate a Solution (Effects of Chemicals in Water Supplies) ... "Because It Is a Necessity for Human Existence" (1961).

In 1961 eighty-three nationally known scientists jointly sponsored a volume outlining 100 major problems pertaining to the environment. The effect of chemical elements and compounds in water supplies was one of these.

**418. The Effect Upon the Domestic Consumer of Trace Chemical Elements and Compounds in Water Supplies**

**The Problem:** The problem of chemical contamination of drinking water occurs everywhere, but is probably more prevalent in areas being served by surface water supplies. The problem is caused by an increased reuse of waters contaminated by greater industrial and agriculture uses. A solution is needed so that we may understand the effects of these contaminants upon people before we proceed any further in the indiscriminate disposal of such substances into surface waters. Some illnesses may actually be caused by consuming these contaminated waters. Adequate river dilution has kept the problem from becoming more serious to date. Unfortunately, this dilution will be less effective in future years. The trend will be toward more concentration of these contaminants with the possibility of ill effects resulting from the use of these waters.

**Aims:** The effects of these contaminants upon human beings should be ascertained. The medical profession should be encouraged to cooperate with the sanitary engineer in undertaking this research. An approach similar to that used in the cigarette situation and fluoride consumption eventually must be used. Controlled populations using contaminated and non-contaminated waters should be studied.

**Present and Past Efforts:** Bibliographies of the effects of trace metals on plants, animals, and bacteria were collected in one study at the Kettering Institute. Methods for analyzing waters for trace quantities of insecticides have been proposed by the Taft Center at Cincinnati. A conference was held on this subject by the USPHS in 1960. Conjectures have been made on the possible effects of contaminants in water supplies. Little or no effort has been made in organized research on this problem.

**Potential Lines of Attack:** We can be hopeful of a solution to this problem because it is a necessity for human existence. Research has been thwarted up to now by (1) analytical techniques, (2) lack of cooperation of the engineering and medical professions, (3) reluctance to utilize humans as subjects of the research efforts, and (4) the magnitude of the problem. The USPHS can do a great deal in eliminating the barriers that exist between the two professions and in providing analytical methods for trace elements. Educational institutes and private foundations for research can instigate controlled research. Four questions must be answered: (1) what are the toxic elements and compounds; (2) how much is being removed by present water treatment methods; (3) what are the human toxic limits of these elements and compounds and (4) how may we remove them from water supplies with greater efficiency?

**Other Pertinent Considerations:** The work might be carried out at many locations, but controlled centrally. This is not a new problem. It has been suggested by many scientific persons - mainly at the progressive Taft Center - and inferred by other "laymen". But, suggestions and inferences are not sufficient. They must be augmented by positive and immediate action. It is quite a paradox that the Secretary of Health, Education, and Welfare issued orders preventing the human consumption of contaminated cranberries and poultry which are eaten by a portion of the people, but has not yet considered in our present day the consumption of contaminated water by all the people.

**References:**

1. Proceedings of the Conference on Physiological Aspects of Water Quality, U.S. Public Health Service, Wash., D.C. (Sept. 1960).
2. "Water Quality Criteria", Publication No. 3, California State Water Pollution Control Board, Sacramento, (1952).

Jack E. McKee, et. al.,  
100 Problems in Environmental  
Health, Jones Composition Co.  
& Kirby Lithograph Co.,  
Washington, D. C. 1961.

Document No. 7 The Surgeon General Committee on Environmental Health Problems  
(Gross Committee, 1962) Advocates a Drinking Water Program.

The Gross Committee was established by the Surgeon General in 1961 to develop long range objectives for the environmental health program of the Public Health Service. Among its recommendations were:

*Epidemiological Studies:* Current methods of disease reporting seem to indicate that waterborne infection is infrequent and not a major route of disease dissemination; yet there remain troublesome endemic occurrences of diarrheal diseases, infectious hepatitis, and poliomyelitis not explained by "contact" spread. More refined techniques must be developed to reveal the less obvious cause and effect relationships.

Few systematic appraisals of the health effects of pollutants have been made other than traditional investigations of infectious diseases. We need to know much more of the effects of mineral salts, organic compounds, domestic and industrial waste components, as well as the etiological agents of infectious disease; also, we need to know the effects of deficient trace elements, molybdenum, selenium, vanadium, nickel, zinc, and copper.

*Evaluating Toxic Effect of a Waste on Humans:* Many of the waste substances now entering water supplies are known to be toxic in sufficient concentrations, but there are many others of unknown toxicity. Detailed studies of the toxicologic effects of individual chemicals and mixtures of chemicals are time consuming and costly, and it is hazardous to predict toxicity potentials of mixtures on the basis of individual components, especially if they vary in specific biological, physical, and chemical properties. Increased attention must be directed to the development of rapid screening tests for waste materials which may carry toxicity hazards in the area of water supply. The fundamental studies in toxicology and the related sciences required by the development of such tests can probably be best conducted in concert with other programs having similar interests and competency.

*Improvement in Bacterial Indices of Fecal Contamination:* The major research goal of sanitary microbiology is to develop simpler, more rapid and more specific procedures for identifying contamination by human wastes. Such procedures are important in health protection and are needed where questions of important regulatory action are involved.

*Recovery, Identification, and Evaluation of Viruses:* During the last 15 years more than 70 viruses have been detected in human feces. All may be present in sewage. Viruses pass through the sewage treatment plant, persist in contaminated waters, and may penetrate the water treatment plant. Numerous outbreaks of infectious hepatitis have been traced to contaminated drinking water. The occurrence of such incidents appears to be increasing.

An assessment of the significance of water in transmitting viruses will depend on the development of improved techniques. The development of an effective method of culturing the virus of infectious hepatitis represents the single most important task for research on waterborne viruses.

*Recovery and identification of chemical contaminants:* Increased production and widespread use of organic chemicals are introducing more new and highly complex chemicals into the water resource for which no methodology for their detection and measurement exist. The development of more effective methods for capturing, concentrating, identifying, and measuring organic contaminants represents an important need in water quality surveillance, and in development of controls. Improved, highly refined instrumentation for micro-chemical analysis must be developed for this purpose. It is clear that this will require evaluation and adaptation of the most advanced techniques of chemical separation and analysis.

#### WATER TREATMENT

The modern water purification plant represents a solution to the treatment problems of a generation ago. Its main function then, as it is now, was to remove particles suspended in the water and to destroy micro-organisms that manage to survive flocculation and filtration procedures. A well operated modern water treatment plant still performs this function efficiently.

However, the modern water treatment plant does not remove dissolved impurities efficiently and is unable to handle satisfactorily problems involving soluble organics. This situation will become progressively worse as the challenge increases. Where taste and odor are objectionable, carbon is usually applied, but carbon is selective in its action, and sometimes ineffective.

To increase the efficiency and economy of water treatment, it is necessary to develop a fundamental understanding of physical-chemical principles applicable to the removal of foreign substances in water, soluble and colloidal as well as in particulate form.

Report of the Committee on  
Environmental Health Problems  
to the Surgeon General,  
Public Health Service,  
Washington, D. C., 1962.

Document No. 8

"...Chemical Substances May have Delayed Toxic Effects." Dr. René Dubos (1966).

Dr. Rene Dubos, in a presentation to the United States Department of Agriculture Graduate School, comments on the matters of chemicals in drinking water and environmental pollution generally.

Chronic pulmonary disease now constitutes the greatest single medical problem in Northern Europe, as well as the most costly, and it is becoming increasingly prevalent also in North America. There is good evidence, furthermore, that air pollution also increases the numbers of fatalities among persons suffering from vascular diseases as well as the incidence of various types of cancers. But the long and indefinite span of time that usually sepa-

rates cause and effect makes it difficult to relate the manifestations of the pathological conditions to the primary physiological insults. It is for this reason, and for this reason only, that so far, "no clear connection has been established between air pollution and health."

One can almost take it for granted that unless social attitudes change, society will become adjusted to the levels of air pollution that do not have gross immediate nuisance value—even though this apparent adaptation will eventually result in much pathological damage and many social burdens. A similar situation will probably develop with regard to other aspects of the environmental pollution problem such as concern water.

Highly effective techniques have been developed to control the acute diseases that used to be caused by the microbial contamination of water. Microbial pathogens can be held in check by chlorination; organic matter content can be minimized by dilution, oxygenation, and other chemical techniques; and water can be made limpid by filtration. But there are no practical techniques for removing the inorganic materials and the various synthetic organic substances that tend to accumulate in water supplies as a result of industrial and domestic usage. Even though clear and free of pathogens, many sources of potable water now contain a variety of chemical substances that may have delayed toxic effects. This constitutes a new kind of threat to health which, though ill-defined, bids fair to become of increasing importance in the near future.

Allowing that the dangers created by modern technologies and environmental changes have been exaggerated, there are many facts which nevertheless justify anxiety for the future. One of the alarming aspects of environmental pollution is that despite all the new powers of science, or rather because of them, man is rapidly losing control over his environment. He introduces new forces at such a rapid rate and on such a wide scale that the effects are upon him before he has a chance to evaluate their consequences and can afford to change his course. For example, the photochemical conversion of hydrocarbons and of nitrous oxides into the toxic products responsible for the Los Angeles type of smog was recognized only after the California economy had become dependent on an excessive concentration of automobiles and industries. The absorption of radioisotopes in the human body became known only several years after the beginning of large scale nuclear testing. The resistance of synthetic detergents to bacterial decomposition began to cause trouble only after their universal use as household items had led to their accumulation in water supplies.

Dr. René Dubos,  
Environmental Improvement (Air,  
Water, and Soil), Graduate School,  
USDA, 1966.

Document No. 9 The Secretary's Task Force on Environmental Health (Linton Committee, 1967) Advocates a Drinking Water Program.

The Linton Committee reported its findings on Environmental Health and Related Problems to the Secretary of Health, Education and Welfare in June, 1967. The Task Force identified ten Action Goals which deserved the highest priority. Those portions dealing with water supplies and chemical substances are provided in this abstract of the Task Force Report.

The ten Action Goals cover the areas which the Task Force felt deserve the highest priority today.

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Water quality is at a shocking level for the wealthiest Nation in the history of the world. About one-third of the 19,200 communities in the United States which have municipal water systems fail to meet existing Public Health Service standards. But, to compound the problem, it is not certain that the present standard is meaningful.

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Materials, metals, and chemicals in ever-increasing abundance and complexity come to the market place with no previous analysis of their toxic effect upon the environment. This cannot be permitted to continue.

#### ACTION GOALS

The country today is faced with environmental challenges from a number of areas. Some are greater problems than others; some threaten to become serious problems for tomorrow unless action against them begins today. The need of the Department of Health, Education, and Welfare is to act now on those matters which most urgently demand attention.

We recommend the following immediate action goals:

A water quality effort by 1970 to test all existing and proposed public drinking water supply systems and produce meaningful public drinking water standards which, through an enforcement program, will ensure health-approved drinking water for 100% of the Nation's public systems. (Chapter II, page 13)

A materials, trace metals, and chemicals control effort to establish human safety levels for synthetic materials, trace metals, currently in use, and prohibit after 1970 general use of any new synthetic trace metal, or chemical until approved by the Department of Health, Education, and Welfare. (Chapter II, page 20)

### Water Quality Goal

Fifty million Americans drink water that does not meet Public Health Service drinking water standards. Another 45,000,000 Americans drink water that has not been tested by the Public Health Service. Alarming as this situation sounds, it could easily be either more—or less—ominous, since the Task Force is not satisfied that the present Public Health Service standards for drinking water adequately reflect the health needs of the people.

Therefore, the Task Force recommends that the Department undertake an effort by 1970 to test all existing and proposed public drinking water supply systems and produce meaningful public drinking water standards which, through an enforcement program, will ensure health-approved drinking water for 100% of the Nation's public systems.

Water-borne disease in the United States is apparently controlled and declining. However, reporting of information on illness associated with drinking water is grossly inadequate. Moreover, there is virtually no information available or being systematically sought on the health implications of trace substances in drinking water which may produce disease only after a very long period of time.

Present Federal authority to inspect and certify drinking water supplies and systems is severely limited. The Public Health Service is responsible for testing and certifying water supplies used by interstate carriers and by ships and aircraft that touch the United States (Appendix IV B). Rising air, rail, and bus traffic in recent years has made it necessary for the Public Health Service to assume regulatory jurisdiction over an increasing number of water supplies, now estimated to serve some 80,000,000 people. However, these systems are inspected an average of only once in three years, and about one-fifth of them now enjoy only provisional approval from the Public Health Service. If the experience of this Public Health Service program is indicative of the drinking water quality of the entire Nation, then about 6,000 of the 19,000 public drinking-water systems of the United States are not able to meet Federal standards for the quality of drinking water.

### Quality of U. S. Drinking Water

105 million people . . .

95 million people . . .

drink water  
that is below  
Federal  
Standards  
or of unknown  
quality

The transfer of the Federal Water Pollution Control Administration to the Department of the Interior left the Department of Health, Education, and Welfare with the responsibility for the health aspects of water pollution and water pollution abatement. Thus, the Department has a major legal responsibility for the safety of the water that Americans drink. The Task Force finds, unfortunately, that the people can and should have serious concern about the current ability of their Federal government to determine whether water is safe to drink, and if it is unsafe, to do anything about it.

The Task Force feels that the Department will have to undertake a fundamentally new and enlarged approach to protection of the public from environmental health hazards actually or potentially present in drinking water supplies. To begin with, present standards for water quality should be thoroughly reviewed to determine their appropriateness in the protection of health. Secondly, the Department should undertake the testing of all public water supplies to determine whether they meet Federal standards. Finally, the Department should make certain that any public water supply that fails to meet Federal standards is promptly brought up to those standards.

The Task Force suggests that the Department of Health, Education, and Welfare develop a grant-in-aid program to States and local governments to plan, build, or improve regional water supply systems, provided the recipient is willing to meet minimum Federal standards. It is estimated that a 5 year, \$500 million Federal program would enable all of the 6,000 deficient municipal water supplies to meet minimum Federal standards.

The Department of Agriculture, through its Farmers Home Administration, and the Department of Housing and Urban Development, through its Land and Facilities Administration, are helping upgrade water supply facilities with their loan programs to municipalities.

These loan programs to rural communities for water systems began in 1961. Since then, Farmers Home has brought good water to 1,100,000 people in 1,588 rural communities at an investment of \$240 million in loans. This agency estimates, however, there are at least 30,000 rural communities without water systems or with inadequate facilities that still need help.

And, even though the Department of Housing and Urban Development is authorized to make public facilities loans to communities for water systems, only a small number of loans for all water systems have been made since 1956 because of a shortage of loan funds.

The Department of Housing and Urban Development is also authorized to make grants to communities to build water and water-related systems. Some 143 communities received such grants in 1967. But twenty applications were received for every grant awarded. Because of budgetary limitations, no grant larger than \$1.5 million was made. All of these programs should be carried out in cooperation with the Department of Health, Education, and Welfare from the standpoint of assuring that adequate health standards are met.

### **Materials, Metals, and Chemicals Control Goal**

The Task Force finds that materials, metals, and chemicals which are known or suspected to be harmful to human beings are being produced and marketed at an increasing rate. Little is known about the adverse effects of these substances with regard to allergies, chronic diseases, or long-term genetic changes.

Therefore, the Task Force recommends an effort to establish by 1970 human safety levels for synthetic materials, trace metals, and chemicals currently in use and prohibit after 1970 general use of any new synthetic material, trace metal, or chemical until approved by the Department of Health, Education, and Welfare.

It may take years unless research is specifically aimed at a given chemical compound to determine toxicity. An example of this is the story of the manufacture of radium watch dials. In this case, workers painting the dials of watches were ingesting minute quantities of radium from which many of them died prematurely years later. We believe such long term damage can and should be stopped before it occurs.

Human experience with overexposure to radioactivity unfortunately was a prerequisite to establishing safe levels for radium. Sometimes toxicological studies with experimental animals can be used as the basis for setting safe levels for some poisons. But data obtained from animals does not always accurately predict effects in humans. Furthermore, animal studies are exceedingly difficult to relate to humans when dealing with long-term or chronic effects.

Initially, safety levels may seem to the manufacturers affected by them to be based upon grossly inadequate information, and to be much too conservative. However, prudence dictates that we must regulate the use of known dangerous items such as trace metals, as well as synthetic chemicals used individually and in complex compounds, until we are certain that they are not harmful to man under prescribed use.

Except for the makers of drugs and food additives, manufacturers presently are not obligated by law to file with any public agency full information on the composition and hazards of their products, nor to secure approval of those products or their labeling prior to distribution; consequently, such information is very difficult to obtain when needed.

Technical information is available and useful to professionals, but there is no ready reference for public use in case of an emergency. The scope of the problem is large. Some information on perhaps 35,000 (of an estimated total of 500,000 to 600,000 products) has been accumulated in files at the Food and Drug Administration.

The Task Force believes that the toxicity of all chemical compounds which may come into contact with individuals, either directly or through environmental links, should be systematically investigated, analyzed, and made available through a modern information system.

The burden of proof that materials meet safety standards should rest with the manufacturer who markets them. However, the Department must develop the in-house laboratory and administrative capability to evaluate the manufacturer's submissions expeditiously. When an

A Strategy for a Livable Environment, A Report to the Secretary of Health, Education and Welfare, by The Task Force on Environmental Health and Related Problems, 1967.

Document No. 10     The Secretary of the Interior's Advisory Committee on Water Quality Criteria (1968)

Upon assuming the responsibility for the administration of the Federal Water Pollution Control Act Secretary Udall established an Advisory Committee to assist him in establishing Water Quality Criteria. In considering criteria applicable to Public (Drinking) Water Supplies the Committee noted, with respect to "Arsenic, Abrium, Cadmium, Chromium (Hexavalent), Cooper, Chloride, Cyanide, Iron, Lead, Manganese, Phenols, Selenium, Silver, Sulfate, Zinc, and Radioactive substances," that, "with the possible exception of iron and in some instances copper and zinc, the defined (standard) treatment plant does little or nothing to remove these substances."

Of the 50 constituents involved in surface water criteria for public water supplies (Table II-1), the Subcommittee on Public Water Supplies notes that 39 of these 50 constituents are but "...little effect(ed)..." by the water treatment process commonly used.

The document included herein includes references primarily to the chemical quality criteria relating to drinking water supplies.

**T**HE NATIONAL Technical Advisory Subcommittee on Public Water Supplies has found it necessary to make some rather arbitrary decisions in order to proceed with its task of developing raw water quality criteria for public water supplies. Because public water supplies commonly involve processing of the raw water to improve its quality before distributing it to consumers, and because treatment processes exist which can, at a price, convert almost any water including sea water and grossly polluted fresh water into a potable product, it is necessary to consider the type of treatment in any discussion of raw water quality criteria for public water supplies.

We have adopted as the considered treatment the most common processes in use in this country in their simplest form for the treatment of surface waters for public use. This may include coagulation (less than about 50 ppm alum, ferric sulfate, or coppers with alkali addition as necessary but without coagulant aids or activated carbon), sedimentation (6 hours or less), rapid sand filtration (3 gal/sq ft/min or less) and disinfection with chlorine (without consideration to concentration or form of chlorine residual). A wide variety of modifications of this basic treatment process are in use for removing various impurities or altering quality characteristics, but we have arbitrarily excluded these modifications in our deliberations because of the difficulty in deciding where to stop in considering the many modifications and elaborations of the basic process.

## Definitions

We have listed two types of criteria defined as follows:

- (a) *Permissible criteria*.—Those characteristics and concentrations of substances in raw surface waters which will allow the production of a safe, clear, potable, aesthetically pleasing, and acceptable public water supply which meets the limits of Drinking Water Standards (10) after treatment. This treatment may include, but will not include more than, the processes described above.
- (b) *Desirable criteria*.—Those characteristics and concentrations of substances in the raw surface waters which represent high-quality water in all respects for use as public water supplies. Water meeting these criteria can be treated in the defined plants with greater factors of safety or at less cost than is possible with waters meeting permissible criteria.

Several words used in the table and in the text require explanation in order to convey the Subcommittee's intent:

**Narrative**.—The presence of this word in the table indicates that the Subcommittee could not arrive at a single numerical value which would be applicable throughout the country for all conditions. Where this word appears, the reader is directed to the appropriate explanatory text.

**Absent**.—The most sensitive analytical procedure in Standard Methods (9) (or other approved procedure) does not show the presence of the subject constituent.

**Virtually absent**.—This terminology implies that the substance is present in very low concentrations and is used where the substance is not objectionable in these barely detectable concentrations.

THE SUBCOMMITTEE recognizes that surface waters are used for public water supply without treatment other than disinfection. Such waters at the point of withdrawal should meet Drinking Water Standards (10) in all respects other than bacterial quality.

It should be emphasized that many raw water sources which do not meet these permissible criteria have been and are being used to provide satisfactory public water supplies by suitable additions to and elaboration of the treatment processes defined above. In some instances, however, the water delivered to the customer is of marginal quality. Also the finished water is much more likely to become unsatisfactory if treatment plant irregularities occur. It is recognized that most of the surface water treatment plants providing water for domestic use in the United States are relatively small (7) and without sophisticated technical controls. Marginal quality characteristics, therefore, assume considerable importance to the managers of plants treating such supplies. This is the importance of the factors of safety mentioned in the definition of "desirable criteria". However, managers of all supplies would welcome improved raw water quality.

This Subcommittee believes that the criteria set forth herein can be used in setting standards of raw water quality only with a substantial amount of understanding and discretion. To a considerable extent this is related to the very great regional variations in water quality entirely aside from manmade pollution. In addition, human occupation and activity have inevitable effects on water quality. These facts make it difficult and sometimes impossible to develop uniform numerical criteria suitable for national application.

The criteria selected by the Subcommittee are listed in the table and discussed in the numbered paragraphs cited in the table. The paragraphs also include some rationale of the basis for the criteria. The fact that a substance is not included in these criteria does not imply that its presence is innocuous. It would be quite impracticable to prepare a compendium of all toxic, deleterious, or otherwise unwelcome agents that may enter a surface water supply.

## Sampling

Sampling should be of such frequency and of such variety (time of day, season, temperature, river stage or flow, location, depth) as to properly describe the body of water designated for public water supply. Sampling should also be conducted in full cognizance of findings of the sanitary survey. Judgment should be exercised as to the relative desirability of frequent sampling at one point, such as the raw water intake, as compared to less frequent sampling at numerous locations, such as is required for stream profiles or cross sections.

It is clearly not possible to apply these criteria solely as maximum single sample values. The criteria should not be exceeded over substantial portions of time. If they are exceeded, efforts should be made to determine the cause, and corrective measures undertaken.

## Analytical methods

The criteria are based upon those analytical methods described in Standard Methods for the Examination of Water and Wastewater (9) or upon methods acceptable to water pollution control agencies.

TABLE II-1. Surface Water Criteria for Public Water Supplies

Constituent or characteristic	Permissible criteria	Desirable criteria	Paragraph
<b>Physical:</b>			
Color (color units)	.75	<10	1
Odor	Narrative	Virtually absent	2
Temperature *	do	Narrative	3
Turbidity	do	Virtually absent	4
<b>Microbiological:</b>			
Coliform organisms	10,000/100 ml <sup>1</sup>	<100/100 ml <sup>1</sup>	5
Fecal coliforms	2,000/100 ml <sup>1</sup>	<20/100 ml <sup>1</sup>	5
<b>Inorganic chemicals:</b>			
	(mg/l)	(mg/l)	
Alkalinity	Narrative	Narrative	6
Ammonia	0.5 (as N)	<0.01	7
Arsenic *	0.05	Absent	8
Barium *	1.0	do	8
Boron *	1.0	do	9
Cadmium *	0.01	do	3
Chloride *	250	<25	3
Chromium, * hexavalent	0.05	Absent	8
Copper *	1.0	Virtually absent	8
Dissolved oxygen	>4 (monthly mean) ≥3 (individual sample)	Near saturation	10
Fluoride *	Narrative	Narrative	11
Hardness *	do	do	12
Iron (filterable)	0.3	Virtually absent	8
Lead *	0.05	Absent	8
Manganese * (filterable)	0.05	do	8
Nitrates plus nitrites *	10 (as N)	Virtually absent	13
pH (range)	6.0-8.5	Narrative	14
Phosphorus *	Narrative	do	15
Selenium *	0.01	Absent	8
Silver *	0.05	do	8
Sulfate *	250	<50	8
Total dissolved solids * (filterable residue).	500	<200	16
Uranyl ion *	5	Absent	17
Zinc *	5	Virtually absent	8
<b>Organic chemicals:</b>			
Carbon chloroform extract * (CCE)	0.15	<0.04	18
Cyanide *	0.20	Absent	8
Methylene blue active substances *	0.5	Virtually absent	19
Oil and grease *	Virtually absent	Absent	20
<b>Pesticides:</b>			
Aldrin *	0.017	do	21
Chlordane *	0.003	do	21
DDT *	0.042	do	21
Dieldrin *	0.017	do	21
Endrin *	0.0018	do	21
Heptachlor *	0.018	do	21
Heptachlor epoxide *	0.018	do	21
Lindane *	0.056	do	21
Methoxychlor *	0.035	do	21
Organic phosphates plus carbamates, *	0.1 <sup>2</sup>	do	21
Toxaphene *	0.005	do	8
<b>Herbicides:</b>			
2,4-D plus 2,4,5-T, plus 2,4,5-TP *	0.1	do	21
Phenols *	0.001	do	8
<b>Radioactivity:</b>			
	(pc/l)	(pc/l)	
Gross beta *	1,000	<100	8
Radium-226 *	3	<1	8
Strontium-90 *	10	<2	8

\* The defined treatment process has little effect on this constituent.

<sup>1</sup> Microbiological limits are monthly arithmetic averages based upon an adequate number of samples. Total coliform

limit may be relaxed if fecal coliform concentration does not exceed the specified limit.

<sup>2</sup> As parathion in cholinesterase inhibition. It may be necessary to resort to even lower concentrations for some compounds or mixtures. See par. 21.

#### Paragraph 5: Coliform and Fecal Coliform Organisms

Bacteria have been used as indicators of sanitary quality of water since 1880 when *B. coli* and similar organisms were shown to be normal inhabitants of fecal discharges. The coliform group as presently recognized by Drinking Water Standards (10) is defined in Standard Methods for the Examination of Water and Wastewater (9). This group includes organisms that vary in biochemical and serologic characteristics and in their natural sources and habitats; i.e., feces, soil, water, vegetation, etc.

Because the sanitary significance of the various members of the coliform group derives from their natural sources, differentiation of fecal from non-fecal organisms is important to evaluate raw water quality (5). Fecal coliforms are characteristically inhabitants of warmblooded animal intestines. Members of other coliform subgroups may be found in soil, on plants and insects, in old sewage, and in waters polluted some time in the past.

The objective of using the coliform group as an indicator of the sanitary quality of water is to evaluate the disease-producing potential of the water. To estimate the probability of pathogens being contributed from feces, the coliform and fecal coliform content must be quantified.

In relation to raw water sources, the following suggestions are offered to help resolve some of the difficulties of data interpretation.

Fecal coliform organisms may be considered indicators of recent fecal pollution. It is necessary to consider all fecal coliform organisms as indicative of dangerous contamination. Moreover, no satisfactory method is currently available for differentiating between fecal organisms of human and animal origin.

In the absence of fecal coliform organisms, the presence of other coliform group organisms may be the result of less recent fecal pollution, soil runoff water, or, infrequently, fecal pollution containing only those organisms.

In general, the presence of fecal coliform organisms indicates recent and possibly dangerous pollution. The presence of other coliform organisms suggests less recent pollution or contributions from other sources of non-fecal origin.

In the past the coliform test has been the principal criterion of suitability of raw water sources for public water supply. The increase in chlorination of sewage treatment plant effluents distorts this criterion by reducing coliform concentrations without removing many other substances which the defined water treatment plant is not well equipped to remove. It is essential that raw water sources be judged as to suitability by other measures and criteria than coliform organism concentrations.

The defined water treatment plant is considered capable of producing water meeting Drinking Water Standards (10) bacteriological criteria from these limits. The difference between the suggested concentration of 10,000 coliforms per 100 ml and the erstwhile figure of 5,000 per 100 ml is justified by the difference between the Phelps Index and the MPN. The Subcommittee suggests these numbers and the additional consideration of fecal coliforms in order to provide more realistic parameters in full recognition of modern knowledge and not as a means of sanctioning increased bacterial pollution of waters destined for public water supply use.

**Paragraph 8: Arsenic, Barium, Cadmium, Chromium (Hexavalent), Copper, Chloride, Cyanide, Iron, Lead, Manganese, Phenols, Selenium, Silver, Sulfate, Zinc, and Radioactive Substances**

The significance of these substances as contaminants of drinking water is discussed in Drinking Water Standards (10). The permissible criteria in this report are those included in Drinking Water Standards. With the possible exception of iron and in some instances copper and zinc, the defined treatment plant does little or nothing to remove these substances.

**Paragraph 9: Boron**

Boron is found in the natural ground and surface waters in some areas of the United States, notably in the Western States where as much as 5 to 15 mg/l are encountered. However, extensive data on boron in both well and surface waters in North America show that the amount of boron normally encountered is less than 1 mg/l. The ingestion of large amounts of boron can affect the central nervous system and protracted ingestion may result in a clinical syndrome known as borism.

Boron is an essential element to plant growth but is toxic to many plants at levels as low as 1 mg/l. The Public Health Service has established a limit of 1 mg/l which provides a good factor of safety physiologically and also considers the domestic use of water for home gardening.

**Paragraph 13: Nitrate plus Nitrite**

A limit of 10 mg/l(N) of nitrate ion plus nitrite ion will be recommended by Drinking Water Standards (10). Because the nitrite ion is the substance actually responsible for causing methemoglobinemia, a combined limit on the two ions is more significant than a limit on nitrates only.

**Paragraph 15: Phosphorus**

The Subcommittee has considered establishing criteria on phosphorus concentrations but has not been able to establish any generally acceptable limit because of the complexity of the problem. The purpose of such a limit would be twofold:

- (a) To avoid problems associated with algae and other aquatic plants, and
- (b) To avoid coagulation problems due particularly to complex phosphates.

Phosphorus is an essential element for aquatic life as well as for all forms of life and has been considered the most readily controllable nutrient in efforts to limit the development of objectionable plant growths. Evidence indicates that high phos-

phorus concentrations are associated with the eutrophication of waters that is manifest in unpleasant algal or other aquatic plant growths when other growth-promoting factors are favorable; that aquatic plant problems develop in reservoirs or other standing waters at phosphorus values lower than those critical in flowing streams; that reservoirs and other standing waters will collect phosphates from influent streams and store a portion of these within the consolidated sediments; that phosphorus concentrations critical to noxious plant growths will vary with other water quality characteristics, producing such growths in one geographical area but not in another.

Because the ratio of total phosphorus to that form of phosphorus readily available for plant growth is constantly changing and will range from two to 17 times or greater, it is desirable to establish limits on the total phosphorus rather than the portion that may be available for immediate plant use. Most relatively uncontaminated lake districts are known to have surface waters that contain 10 to 30  $\mu\text{g}/\text{l}$  total phosphorus as P; in some waters that are not obviously polluted, higher values may occur (4). Data collected by the Federal Water Pollution Control Administration, Division of Pollution Surveillance, indicate that total phosphorus concentrations exceeded 50  $\mu\text{g}/\text{l}$  (P) at 48 percent of the stations sampled across the Nation (6). Some potable surface water supplies now exceed 200  $\mu\text{g}/\text{l}$  (P) without experiencing notable problems due to aquatic growths. Fifty micrograms per liter of total phosphorus (as P) would probably restrict noxious aquatic plant growths in flowing waters and in some standing waters. Some lakes, however, would experience algal nuisances at and below this level.

Critical phosphorus concentrations will vary with other water quality characteristics. Turbidity and other factors in many of the Nation's waters negates the algal-producing effects of high phosphorus concentrations. When waters are detained in a lake or reservoir, the resultant phosphorus concentration is reduced to some extent over that in influent streams by precipitation or uptake by organisms and subsequent deposition in fecal pellets or dead organism bodies. See the report of the Subcommittee for Fish, Other Aquatic Life, and Wildlife, and the section on Plant Nutrients and Nuisance Organisms for a more complete discussion of phosphorus associations with the enrichment problem.

At concentrations of complex phosphates of the order of 100  $\mu\text{g}/\text{l}$ , difficulties with coagulation are experienced.

**Paragraph 21: Pesticides and Herbicides**

Consideration was given by the Subcommittee to three groups of pesticides: the more common chlorinated hydrocarbons, herbicides, and the cholinesterase-inhibiting group which include the organic phosphorus types and the carbamates. The permissible levels are based upon recommendations of the Public Health Service Advisory Committee on Use of the PHS Drinking Water Standards. These values were derived for that Committee by an expert group of toxicologists as those levels which, if ingested over extensive periods, could not cause harmful or adverse physiological changes in man. In the case of aldrin, heptachlor, chlordane, and parathion, the Committee adopted even lower than physiologically safe levels; namely, amounts which, if present, can be detected by their taste and odor. It should be noted that this National Technical Advisory Subcommittee on Public Water Supplies is not a group of toxicological experts. Hence, the promulgation of additional criteria by the Public Health Service would also be accommodated by this Subcommittee, tempered—as was done above—by its experience and judgment in the area of water treatment, as for example, in public acceptance of organoleptic properties.

The limit for the cholinergic pesticides is established relative to parathion and is expressed as 0.1 mg/l parathion equivalent. This equivalence is the ratio that a given pesticide of this group has to parathion as unity in its cholinesterase inhibiting properties. This makes it incumbent upon an administrator of this limit to determine the pesticide involved and to obtain expert toxicological opinion on its parathion equivalence. Nearly all the organophosphorus compounds and the cholinergic carbamates have high acute toxicity to mammals and some have even higher toxicity to fish. Ingestion of small quantities of these compounds over long time periods causes damage to mammalian central nervous systems. Many organophosphorus pesticides hydrolyze rapidly in the environment to harmless or less harmful products. The hazards from the chlorinated hydrocarbon pesticides in water results from both direct effects, because they tend to persist in their original form over long periods, and indirect effects because they may be concentrated biologically in man's food chain. The values which were selected by the Public Health Service as limits for this group of pesticides are, however, set with substantial safety factors insofar as they adversely affect the human body. Generally, fish are more sensitive to this group of pesticides and, therefore, may serve as a rough method for determining when the chlorinated hydrocarbon pesticides content of water is approaching a danger level. See the report of the Fish, Other Aquatic Life, and Wildlife Subcommittee for pesticide limits relative to maintaining healthy and productive aquatic life.

It should be noted that limits for pesticides and herbicides have been set with relation only to human intake directly from a related domestic water supply. The consequence of higher and possibly objectionable concentrations in fish available to be eaten by man due to biological concentration is considered not within the scope of the charge to this Subcommittee.

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Water Quality Criteria  
Report of the National Technical Advisory  
Committee to the Secretary of the Interior  
Federal Water Pollution Control Administration  
April 1, 1968  
Washington, D. C.

Document No. 11 Mercury: "... a near total surprise, without warning or anticipation..." U.S. Senate Hearings (May 1970).

The public concern for chemicals reached a new peak with the unfolding of the mercury incident. Even the most sanguine of persons must have been shaken by these developments. Detergents, followed by D.D.T., followed by mercury, followed by whatever else may occur would seem to provide enough incentive to alert the unconvinced mind, including those with a responsibility for the development of domestic policies, of the reality of the hazards that have been identified again and again, as illustrated in these documents.

The comments of the Deputy Director of the Michigan Natural Resources Department provide interesting insights into this question and leaves one with a great sense of uncertainty about the next incident and what it may do.

STATEMENT OF RALPH PURDY, EXECUTIVE SECRETARY, MICHIGAN WATER RESOURCES COMMISSION, LANSING, MICH.; ACCOMPANIED BY WAYNE TODY, CHIEF, DEPARTMENT OF NATURAL RESOURCES' FISH DIVISION

Mr. Purdy, Senator, ladies and gentlemen of the audience, I am Ralph Purdy, deputy director, Michigan Department of Natural Resources, and executive secretary, Michigan Water Resources Commission.

I am pleased to have this opportunity to meet with you today to discuss the problems of environmental contamination by mercury compounds. We are very concerned over this matter and the State of Michigan has placed high priority on fully investigating and dealing with the problems of mercury contamination.

In my presentation, I would first like to briefly review the background of mercury contamination and, then, to advise you of the steps we have taken, particularly regarding mercury contamination in Lake St. Clair, the St. Clair and Detroit Rivers and Lake Erie.

Proceeding from this review, I will indicate some of the lessons we have learned from this situation and suggest certain new courses of action that we feel are necessary if we are to deal effectively with possible future problems involving environmental contamination from mercury and other dangerous substances.

The recent mercury contamination problem in the Lake St. Clair-Detroit River area came as a near total surprise, without warning or anticipation. It seems that nobody recognized the problem of mercury contamination in the United States prior to the emergence of certain problems within the last year.

In view of the limited, although catastrophic world experience with the problem, the lack of knowledge and apprehension over mercury throughout the United States at both State and Federal levels is a complete paradox.

During the last two decades, there have been three recognized cases of widespread environmental contamination by mercury compounds in the world—two in Japan and one in Sweden. In Minamata, Japan, 111 persons contracted Minamata disease resulting in the death of 43 persons and severe disability to the remainder. The first case of the disease appeared in 1953 and the disease reached epidemic proportions in 1956. The cause of the disease, methyl mercury poisoning, was not ascertained until 1959.

In this tragic incident, Minamata Bay received the wastes of a chemical plant which used a large volume of mercury as a catalyst. The victims of the disease were primarily local fishermen who consumed a large amount of fish caught in Minamata Bay. The fish contained high levels of methyl mercury.

A second Japanese incident of mercury poisoning occurred in 1964 in the City of Niigata. Here, local fishermen were again the principal victims and the source of the contamination was traced to an industrial plant. Thirty persons were afflicted and six persons died.

In Sweden, methyl mercury seed dressings, which were first marketed in the 1940's and which received wide acceptance, were shown to have caused severe poisoning of seed-eating birds and their predators

Moreover, Swedish studies indicated that crops grown with minimal quantities of methyl mercury contained amounts sufficient to cause an accumulation in the food chain reaching man both when the crop is consumed directly or indirectly through animal products.

As a result of these findings, licenses for the use of mercury seed dressings were revoked by Swedish officials in October 1965. Since that time, the mercury content of certain Swedish meat products and eggs has decreased considerably.

Subsequent investigations revealed that Swedish fish contained large amounts of mercury compounds. Swedish officials attributed the source of this contamination to pulp and paper factories, certain chlor-alkali manufacturing plants, and a number of other miscellaneous activities. As a result, fish from certain waters were declared unfit for human consumption in November 1967.

In North America, the Province of Alberta, Canada, closed its hunting season on pheasants and Hungarian partridges last fall because some birds contained high levels of mercury residues. The gamebirds had apparently consumed seed grain treated with mercury fungicides. High levels were also found across the border in Montana pheasants.

Due to these developments, the Department of Natural Resources initiated a special study earlier this year to check for mercury levels in Michigan pheasants. To date, some 61 birds from southern Michigan have been collected and preliminary results indicate that mercury residues are present, apparently at levels less than 1 p.p.m. We are working at refining the testing procedures and expect to have more definite information available in the near future. The study is also being expanded to investigate mercury levels in waterfowl and small game animals.

In spite of this history of mercury contamination, the problem was largely unrecognized in this country. The pollution problems of the St. Clair River, Lake St. Clair, the Detroit River, and Lake Erie have been thoroughly studied and extensively documented.

In April 1965, the U.S. Public Health Service of the Department of Health, Education, and Welfare, now the Federal Water Quality Administration, with the cooperation of the Michigan Water Resources Commission, completed an exhaustive report on the pollution of the Detroit River, Michigan waters of Lake Erie, and their tributaries. There was no mention of mercury problems in that report.

The State of Michigan is also actively participating in the Lake Erie Federal-State Enforcement Conference and in the pollution studies of the International Joint Commission. The possibility of widespread mercury contamination has never been considered in these studies until the last 2 months.

We have on many occasions collected and analyzed samples of the waste water effluent from the Wyandotte Chemical plant which was until recently discharging mercury compounds in its waste water. This testing was undertaken in the development of an appropriate water pollution control program for this plant. The mercury levels of this discharge were never considered, partially because the need was unknown, and secondly because we did not have the capability to analyze for mercury on a regular basis.

In April 1968, the report of the National Technical Advisory Committee on Water Quality was published by the Federal Water Pollution Control Administration. This document was considered the most comprehensive document on water quality requirements at that time. It was the work of five subcommittees involving some 90 experts in the field of water pollution. There was only a very brief mention of mercury and there was no indication of its possible significance.

In this discussion, my point is not to justify our lack of knowledge about mercury contamination of the environment, but rather to emphasize a gap, a rather serious gap, in our present environmental protection programs. The current mercury crisis developed almost overnight without warning; however, the contamination has apparently existed for some time. I strongly believe that we must take appropriate steps to insure that any similar problem is recognized and countered in the early stages before serious damage results.

The urgency of these needed programs is becoming clearer each day. To illustrate this urgency, I would like to call the committee's attention to our current concern over two other chemical substances now being released into the environment.

The first example is a group of related compounds called polychlorinated biphenyls commonly referred to as PCB's. These compounds are found in hydraulic fluids and coolants used in industry. They are very similar in chemical makeup to some of the persistent pesticides such as DDT and DDE. We estimate that about 300,000 gallons per year of PCB materials are presently being used by Michigan industries and that there is a potential market of about 1 million gallons per year. Most apparently finds its way in waste effluents into our lakes and streams. Preliminary studies suggest that PCB's may have caused the destruction of aquatic life in sectors of certain streams. We are attempting to learn more about these compounds and about their present use in Michigan. As we do not have the resources to investigate the full effects of the discharge of chlorinated biphenyls on the aquatic environment, I wrote last November to Mr. David Dominick, Commissioner, Federal Water Quality Administration, urging that immediate studies be initiated to determine the significance of PCB's discharged to the aquatic environment. As a result, some attention has been focused on this matter but I am left with the feeling that the response does not measure up to the urgency of the need in this case.

We are also very concerned about another substance, sodium nitrotriacetate, commonly referred to as NTA. It is our understanding that this material is now contained in a significant percentage of certain companies' cleaning products being marketed at retail. It is apparently being used as a partial substitute for phosphorus in laundry detergents. According to the limited literature which we have seen on NTA, it has the ability to sequester heavy metals. This characteristic, if it is verified, could have definite pollutional effects on the water environment. I have also written to Mr. Dominick within the last 2 weeks requesting Federal assistance in evaluating the pollutional significance of NTA. We have not yet received a reply.

Last week I was at a meeting in Duluth, and at that time had a discussion with members of the Federal Water Quality Administration Staff, and a program has been set up to evaluate the environmental effects of NTA.

These are only two compounds of the hundreds of thousands now in use which may adversely affect the environment. New compounds are being introduced daily without any knowledge of their environmental effects. Today, we require extensive testing of medicines and pesticides before they are marketed. I believe that we must go further and begin to systematically screen all new compounds used in industry and home use, before they are marketed. This is, screened as to their effect upon the environment.

Products that contain unknown, untested and possibly harmful pollutants may very likely have interstate commerce implications which would seriously limit the ability of a State to take effective action. Therefore, the establishment of a national clearinghouse appears to be the most logical way of achieving this objective.

"Effects of Mercury on Man and Environment," Hearings before the Subcommittee on Energy, Natural Resources, and the Environment of the Committee on Commerce, U.S. Senate, Ninety-First Congress, 2nd Session, May 8, 1970, Serial 91-73.

Document No. 12 The National Institute of Environmental Health Sciences Task Force (Nelson, Whittenberger Committee) Advocates a Drinking Water Program (1970).

Man's health and the environment was again reviewed in 1970 by a prestigious group of scientists and engineers under the leadership of Dr. Norton Nelson, New York University Medical Center and Dr. James L. Whittenberger, Director, Kreske Center for Environmental Health, School of Public Health, Harvard University. Developed under the auspices of the National Institute of Environmental Health Sciences and its Director Dr. Paul Kotin, the Task Force again, now in 1970, reiterated many of the same needs expressed a decade before. Continued lack of action with respect to chemicals in drinking water, in the face of the possibilities about which we are now aware, can lead only to a continued and strong disenchantment between the people and their government with the potential of devastating situations if an incident occurs seriously affecting the supplies of drinking water.

## FOOD AND WATER\*

### I. Introduction

Animal life is dependent on the environment for the basic essentials of air (oxygen), water and food. The ability to sustain life in the absence of oxygen is measured in minutes, in the absence of water in days and in the absence of food in weeks. Although maintenance of an adequate supply of the essential nutrients and their presentation to the organism in a proper balance is an essential aspect of the relation of food and water to health, the primary concern of the Subtask Force was with the non-nutrient aspects of food and water. Two basic questions were involved: (a) What are these non-nutrient components, and how much of each is present? (b) What are their biological effects and what is the health significance of these effects in terms of the concentration found in the environment?

From the standpoint of infectious diseases, it is the living components in food and water that are of primary importance. The response to these components generally occurs in a relatively short time after exposure, producing acute effects. Non-living components in food and water sometimes cause acute injury and at other times may cause subtle or chronic effects that are so long delayed from time of exposure that the correlation of cause and effect is very difficult. Similarly, the relationship of environmental causes to man's many metabolic and degenerative diseases is obscure and difficult to demonstrate.

From the standpoint of overall research priorities in the field of environmental health, the greatest need is to develop methods for the evaluation of the long term effects of environmental agents. One of the basic requisites to meeting this need is the development of adequate indices to detect the presence and significance of such agents. In this regard, it is pertinent to note that the water, foodstuffs, and food processing procedures that are accepted today without reservation as to safety and wholesomeness enjoy this acceptance entirely on the basis of short term observations.

With respect to food and water, consideration must be given to substances that are present in relatively large amounts (that is, parts per hundred), as well as to those that are truly minor components (that is, present in terms of parts per billion). The criteria of purity, obviously, must be considered not from the

\* The Subtask Force which developed this chapter was chaired by Dr. Leo Friedman, assisted by Co-Chairmen, Dr. Virgil H. Freed and Dr. Harold W. Wolf. Individuals who contributed to the writing of the chapter included Drs. John C. Ayres, Leonard B. Dworsky, Hans Falk, Leon Golberg, Joseph J. Harrington, Brian MacMahon, Herbert Sokinger, and Gerald N. Wogan.

point of view of "how pure?", but "is it pure enough?" Questions such as these should be answered by toxicological criteria rather than by analytical criteria.

Also to be considered is the fact that a variety of substances released into the environment prove to be very mobile and tend to translocate to areas distant from their point of origin. Transport by wind, water and other agents, has resulted in global distribution of such substances as chlorinated hydrocarbons and radionuclides. The dynamics of escape, transport and partitioning of substances into living organisms is an area of increasing interest and significance for environmental health.

The initial sections of this chapter relate to research recommendations concerning the use of water in potable form for drinking and food preparation. Considered in other sections are applications of water for domestic, municipal, industrial, agricultural, and recreational uses, and for the cultivation and harvesting of aquatic and marine life. These uses present potential health hazards due to biological and chemical contaminants which must be evaluated and controlled. Problems in this area are increased by the growing pressure to reuse water both for potable and non-food purposes.

## II. Microbiology of Food and Potable Water

Food scientists are concerned about the continuing prevalence of gastro-enteritis and gastro-enteritis-like illnesses. In recent years there has been an increasing gap between the rate of technological changes in certain segments of the food industries and the level of effort being made to evaluate and control the hazards associated with new products and processes. Radical departures from conventional procedures in production, processing, preservation, packaging, distribution and utilization of foods have raised questions concerning microbiological contamination of products in partially or completely prepared form now reaching large segments of the public. Increased attention needs to be directed toward developing the knowledge and techniques necessary to evolve a more wide-reaching and vigorous national program to coordinate efforts of industries and government so that the consumer receives adequate protection.

Most conventional water treatment systems have been designed primarily for the control of bacterial pathogens. Historically, these systems have been eminently successful. Control is based largely on chlorination, the effectiveness of which is dependent upon the quality of the water. The deteriorating quality of water sources throughout the nation, a lag in the Federal support of developmental research on new water treatment systems, and the inability or unwillingness of municipalities and industry to finance the necessary development, are together resulting in narrowing of the margins of safety. These deficiencies have increased apprehension among public health and water works officials.

This environmental decay can in a large measure be attributed to the nation's technological growth. Despite this growth, the environmental health control programs at the federal level have been dwindling and suffering through a number of major reorganizations (three in less than four years). Research needs are becoming more urgent every year.

In examining the problems that have been enumerated in the area of food and water microbiology, it became apparent to the Subtask Force that these problems can be categorized into the following three broad areas: Methodology, Mechanisms, and Evaluation of Technology.

#### A. Methodology

Methodology is concerned with the detection, identification and evaluation of microorganisms and viral agents in food and water. Studies in this area are relevant both for purposes of monitoring and for developing new techniques appropriately fitted to specific media.

**Recommendation 2-1:** Rapid, reliable, and adequate techniques for the isolation, identification and quantification of the viruses and pathogenic bacteria in foods and water need to be developed.

The most important water-borne pathogenic virus, that of infectious hepatitis, still cannot be cultivated. Gastroenteritis outbreaks of unknown etiology but suspected to be of water-borne viral origin continue to be exported (Green, *et al.*, 1968). Viral contamination of foods occurs, generally, via the water route. Investigations of viruses in food and water are hindered by the low concentrations of these infectious agents. New concentration procedures, recently developed, need additional study (Berg, 1967; Oliver, 1967; Dack, 1963).

A diversity of tests are available for detecting and identifying pathogens such as Salmonellae, staphylococci, Shigellae, Clostridia, etc., and pseudomonads in foods and water; yet these tests are neither rapid nor reliable. For example, the conventional tests used to detect *Salmonella* in foods require at least four or five days to reach the stage where the organisms can be identified with any degree of certainty. No single screening procedure will give all *Salmonella* of importance, yet this organism was involved in the most recent large scale water-borne outbreaks. The ubiquity of *Salmonella* makes this organism a top priority target for public health workers (Summers, 1969). Insofar as staphylococci are concerned, authorities differ regarding the use of solid—as opposed to liquid—media (Prost and Riemann, 1967; Casman, 1965).

**Recommendation 2-2:** Procedures for isolation and enumeration of a) pseudomonads and b) fecal streptococci in food and water need to be developed. Such studies should include the development of standardized media, particularly for culturing enteric bacteria.

Pseudomonads have presented unusual difficulties in storage of water in plastic containers, aftergrowth in faucet strainers, and proliferation in filtration equipment and carbon adsorption treatment systems. Since these organisms may also cause infections among swimmers, their public health significance needs study. Procedures and media presently in use do not delineate these potential pathogens from many of the ordinary psychrophilic flora found in food and water.

Streptococci can be valuable tools for evaluating the sanitary quality of water. The use of these organisms has been limited largely because of conflicting results concerning media and methodology (Geldreich, 1969; Kabler, 1962).

Investigators in various laboratories have experienced great difficulties in repeating work of others even though both sets of workers use the same medium. Different batch-lots of these media often give variable results. Similarly, media from two different commercial manufacturers often give widely different results. Since sanitary indices for potable water and food are based on measurements using such media, this is an area of direct public health concern (North and Bartram, 1953).

**Recommendation 2-3:** Studies are needed to determine the reliability of indicators and/or indices as these relate to a) the coliform index and the presence or absence of viruses in foods and water, b) fecal coliform indicators as a substitute for total coliforms, c) the coliform indicator concept and the control of pathogenic bacteria, and d) the total bacterial count and its application to potable water quality (particularly as it relates to renovated water).

Coliform organisms have been used as indicators of sanitary quality for water for decades, yet it has long been known that their absence does not assure absence of viral or bacterial pathogens. For example, the traditional coliform index failed to forewarn of two important water-borne epidemics by *Salmonella* and *Shigella*, i.e., the Riverside and Madera episodes. For this and other reasons, it is desirable to find alternative or new indicators of pathogenicity (Kabler, *et al.*, 1964; Fair and Geyer, 1954; Greenberg and Ongerth, 1966; Browning and Mankin, 1966; Kabler, 1962).

**Recommendation 2-5:** More accurate reporting of food and water-borne illnesses (food infections and toxemias) should be required.

The usual data on food and water-borne illnesses are those provided voluntarily and are almost wholly dependent upon the degree of concern of health departments in the individual states. The inadequacies of this approach are well illustrated by the fact that two or three states report almost all of the salmonellosis in the United States. As a result, accurate data on the prominence of this food-borne infection are not available.

**Recommendation 2-10:** Studies are needed on the relationship of nitrate-reducing intestinal bacteria to infant methemoglobinemia.

The Public Health Service drinking water standard for nitrates plus nitrites (10 mg/l as N) is subject to question and requires confirmation. Extensive use of ammonia fertilizers is resulting in increasing concentrations of nitrates in ground waters underlying agricultural areas. Part of this basic problem is the microbiological aspect. Denitrification—and nitrification—in the environment is primarily a microbiological function. The objective of this recommendation is to clarify the microbiological role (Alexander, 1967).

### C. Evaluation of Technology

A vigorous and continuing evaluation of technology in food and water processing in regard to microbiological hazards is required in order to a) develop microbiological reference specifications for new technology, and b) to develop appropriate techniques for the monitoring and surveillance of these processes.

**Recommendation 2-12:** Basic research should be conducted to determine the microbiological, chemical and physical criteria necessary for establishing sound health guidelines for the reuse of waste water and for the national water pollution control programs.

Waste water reclamation techniques of considerable promise have been developed that produce water of a quality which meets drinking water standards. However, the lack of basic guidelines for protecting the public from health hazards associated with this source of water precludes use as a domestic supply. Furthermore, improved health guidelines are needed in connection with the national water pollution control program.

**Recommendation 2-16:** Intensive research should be undertaken on a) the production of safe water from waste water; b) techniques for the reduction or elimination of microbial agents in waste water; c) the effectiveness of conventional and new water treatment processes on enteric viruses; and d) factors relating to the production and control of tastes and odors in water.

The management of waste-waters, primarily of municipal and industrial origin, has traditionally been concerned with the removal of pollutants in order to minimize pollution of the nation's water resources. A new concern has been the total renovation of waste-waters in order to conserve water resources. In both cases the control of microbial agents exerts a controlling influence on man's use of water, either in the natural state or through municipal systems (e.g., recreational and bathing use in natural waters; drinking water in municipal systems). Additionally, the control of selected chemical agents (e.g., nitrates, sodium) in water renovation processes needs to be given consideration since these are important to human health and to the potability of the drinking water supply.

Studies so far conducted on water treatment processes and epidemiological experience suggest that conventional water treatment processes are effective in coping with the virus problem. However, the virus technology used in these studies is recognized as deficient and pursuance of definitive studies must await improved methodology. Water-borne pathogenic viruses remain a matter of concern (Walton, 1961; Clarke, *et al.*, 1964; Kabler, 1962; Kabler, *et al.*, 1961; Green, *et al.*, 1968).

Tastes and odors continue to be the most troublesome problem of the waterworks industry. Consumers of water with bad tastes and odors frequently turn to other sources of potable water which may be of questionable sanitary quality. The presence of tastes and odors derived from algal metabolism suggests the possible presence of other substances with other physiological activities such as the toxic components of blue-green algae. Research on water quality should include studies of methods for the removal of tastes and odors. Such methods may also be effective in removing other undesirable components (U.S. Dept. of Interior, 1968; Fogg, 1965).

### III. Health Aspects of Chemicals in Water

All natural waters contain a variety of substances in addition to the burden of chemicals that man's technology is releasing. Since chemicals reach man through air, water, and food, any measure of the challenge to the human organism must consider all routes. From the standpoint of health, it is the total intake that is important. The need for awareness of specific chemical species involved should be emphasized. For example, the inorganic arsenic that occurs in water is far more accessible to the human organism and its biologic processes than the organically bound arsenic in shrimp.

Tremendous strides have been made in recent years in analytical methods. However, further development of analytical techniques, especially those relating to routine control operations, is still required. Such control should be exercised before the deleterious effects are demonstrated in the human population. If man awaits epidemiologic confirmation, the situation may well become unmanageable (Dubos, 1966).

*Recommendation 2-17:* Methods for the concentration, separation and identification of organic chemicals in water supplies need development. These compounds exist in extremely dilute concentration which makes it difficult to obtain sufficient quantities for an assessment of their activity and health significance.

Many concentration procedures have been developed by chemists and biologists that have not been applied to the problem of concentrating dilute organic materials in water. These techniques should be evaluated for this purpose. Availability of suitable concentrates will enable a determination of their physiological effects as well as an evaluation of the effects of various water treatment processes on their removal. Some materials which enter waterways are known to be carcinogenic to test animals. Others may have a physiological activity of which we are currently unaware. The organic contaminants should be identified and the physiological significance of the concentrations found in the environment determined. Also, the physiological significance of the heterogeneous mixtures as they exist in water should be evaluated.

*Recommendation 2-18:* Further information should be obtained with respect to the biological significance of a number of elements and groups of elements in water. Particular attention should be paid to cadmium and nitrates. Such studies should include further epidemiologic investigations to (a) verify the linking of environmental cadmium (food, air, and water) to hypertension of renal origin; (b) elucidate the relationship of methemoglobinemia in infants to the content of nitrates in water; and (c) determine the validity of the observed correlation between cardiovascular disease and drinking of

soft water. If, in the last case, a relation exists, the factor(s) in soft waters contributing to the disease or those in hard waters that may be exerting a protective influence should be identified.

Schroeder (1965) reported a higher frequency of renal hypertension among people in which there was either increased amounts of kidney cadmium or increased ratios of kidney cadmium to zinc. The findings in man were similar to results in animals (Schroeder, 1964). Drinking water and beverages in contact with cadmium-containing galvanized containers and in food grown on soil containing cadmium derived from superphosphate fertilizers are considered chief sources of environmental cadmium.

Because of the extensive use of high nitrogen fertilizers in agriculture, the wider cultivation of nitrogen fixing crops, intensive animal husbandry and the large contribution from decay of vegetation, a rise can be expected first in nitrate in ground waters, and later in surface waters. Already, some ground waters exceed the federal drinking water standard. Infants up to six weeks of age are the principal population at risk. The possibility of chronic effects of sub-clinical methemoglobinemia on infants and young children also deserves attention (see also Recommendation 2-9).

Schroeder (1960) reported a very high negative correlation between consumption of hard water in the U.S.A. and death rates from cardiovascular and coronary heart disease, i.e., soft water was associated with higher death rates. Subsequent studies in England and Canada appear to verify that a "water factor" is associated with vascular disease death rates.

*Recommendation 2-19:* Analytical instrumentation to maintain surveillance of drinking water supply sources should be developed to insure against contamination by toxic industrial chemicals. Vigilance should be maintained to identify the types, amounts and toxicologic potential of industrial chemicals frequently finding their way into drinking water supplies. Drinking water standards should be extended to provide for inclusion of existing and newly identified chemical agents on the same basis as for biological agents.

*Recommendation 2-22:* A technology intelligence program should be established to forecast the rate of use and the probable effects of new chemicals, industrial materials or other substances at an early point in their development and use.

Environmental control efforts have been characterized by "being concerned after the fact." A major need is the development of early intelligence to forecast future events and their effect on health (See Chapter 10).

#### VI. Agricultural Chemicals

Chemicals of great variety and complexity are manufactured and used by man. The methods of manufacture and use inevitably result in situations whereby man may be exposed through air, food, and water. The escape of chemical contaminants may be inadvertent or deliberately allowed as in the case of pesticides and fertilizers. In most instances, a considerable amount of information on the toxicology of these compounds has been obtained by research and by experience. The evidence thus obtained indicates few, if any, instances of immediate health hazard to man under recommended conditions of use. However, knowledge is not adequate with respect to chronic and indirect effects of pesticide use. It is especially important that research on possible long-term effects on intact animals and successive generations be pursued. Such research should be directed to problems of microsomal enzyme induction and other effects which may be more indicative of exposure than of deleterious health effects, as well as to biochemical alterations which might be correlated with the health or performance of man.

*Recommendation 2-31:* Research is recommended on the effects of long-term, low-level exposure to pesticides including the biochemical, physiologic, psychobiologic, and epidemiologic aspects. This should include investigations of: (1) The interrelationship among pesticides, nutrition, and environmental stressors to evaluate the potential direct or contributory hazards. (2) The efficiency of uptake by test organisms including man at various levels of exposure to pesticides from food, water or other elements of the environment. (3) The mass balance of the material ingested to that retained, the amount metabolized and the quantity deposited in various tissues and fluids.

Pesticides are representative of classes of organic chemicals commonly used by man, selected specifically for their biological activity. Their use on large areas exposes other components of the environment to contamination. Evidence exists that nutritional status may modify the biological effects of many chemicals and in other instances expressions of effect are delayed until the organism is otherwise stressed by cold, food deprivation, illness and other factors.

Although great efforts have been expended to measure the level of residues in food stuffs as a route of ingestion of pesticides, less has been done on levels in water and considerably less on exposure through other media. Very few studies have been attempted to quantify the total amount of such residues retained by the organism upon exposure through food or other avenues of intake.

Metabolism and excretion represent major defense mechanisms against chemical challenge. Knowledge of these factors helps to provide a reasonable estimate of innocuous levels of exposure.

It will be necessary to continue to use pesticides for protection of man's health and production of his food to meet the needs of a growing population. For this reason, toxicity of agricultural chemicals will continue to merit attention. It may be pointed out, however, that studies on pesticides are valuable not only because they contribute information on these compounds, but also because the enlarged knowledge of the toxicology of pesticides can be a valuable resource in dealing with the toxic effects of industrial and waste compounds of similar nature (Brady, 1967; Mrak, 1969; NAS/NRC, 1966 and 1969).

Modern crop production demands extensive use of fertilizers. Not only may the manner of use of these materials result in some accumulation of the fertilizer element in foods, but possible traces of other elements accompanying them may be a health factor. In some instances the presence of a given material in trace amounts may be beneficial, but in other instances it may pose health problems. Little attention has been directed either to the kinds and amounts of materials that may be found in fertilizers and subsequently picked up by food or from the irrigation water used on crops. Such water could receive chemicals from other treated areas by extraction of natural deposits and subsequently add these to the fields and crops being irrigated. Similarly, with the growing use of reclaimed water, attention must be directed to the burden of chemicals that this water may carry and transfer to man through his crops. Such waters carry not only nitrates from fertilizers, but trace substances, pesticides, and other organic chemicals, and in certain areas, radionuclides. It would thus be possible for substances such as cadmium, chromium, copper, various metals from metallurgical plant waste, and a host of organics to become residues in food crops through either fertilizer or soil.

*Recommendation 2-32:* A program of investigation should be undertaken to evaluate trace contaminants with known health implications which may be introduced into foods by fertilizers and irrigation waters. The latter portion of this study should include an evaluation of the role of reused or reclaimed water as a carrier of trace amounts of various minerals and organic substances such as pesticides.

There is suggestive evidence that trace amounts of certain substances may influence the health of man. These trace substances may be introduced into fertilizers through the raw materials used and the manufacturing process, and then into foods and water. A distinct possibility also exists that water can become contaminated by various minerals which are not removed in the usual treatment processes. Similarly, so-called natural waters may pick up a burden of such materials by influx into surface and ground water or by extraction from deposits. This water, subsequently used in irrigation or for other purposes, could result in an exposure of man to potentially noxious agents.

#### VII. Chemodynamics

Literally thousands of chemicals are mined, manufactured, and used by man. Inevitably, in the processing or use of these chemicals, some escape and become environmental contaminants. In other instances, a chemical may be deliberately applied in the environment as is the case with pesticides. The amount of chemicals escaping or being applied is estimated to run into the millions of pounds per year. Some of these chemicals are very short-lived in the environment, others, by virtue of their physical properties, may persist for a considerable time. In addition, radionuclides which are released take their place as environmental contaminants. Through a variety of as yet not completely understood processes, these chemicals may be transported from the point of release to a site wherein they become an exposure hazard to man. The ease of mobility and the amount of chemical transported depend not only on the transport mechanism itself, but also on the properties of the compound and the amount released. Thus, chemicals may contaminate the home or factory in which they are used and may result in widespread exposure to man either directly or in his food and water. In some instances, such substances become incorporated in the food chain, often with resulting magnification of concentration affording an even higher level of exposure. Unfortunately, these matters have received all too little investigation. For these reasons, the Subtask Force believes problems involving the kinds and amounts of chemicals released into the environment, their transport, behavior and the resulting exposure to man urgently require investigation.

*Recommendation 2-33:* Research is needed to (1) identify the kinds and amounts of stable and radioactive chemicals that contribute to the environmental burden; and (2) elucidate their physical and chemical properties and the effect of these properties upon their transportation and partitioning among the various environmental phases. This work should be designed to provide information on the identity of the agents, their source, their persistence and ultimate fate in the environment, and the development of analytical methods required for surveillance.

Among identified environmental contaminants are organochlorine compounds from industrial as well as agricultural sources. It is probable that others are also present in the environment in measurable amounts, as evidenced by some preliminary data, but little research has been done to detect and identify the major portion of such chemicals. Application of new analytic methodology should permit identification and quantification.

Chemicals such as DDT, p-chlorobiphenyl and radionuclides are known to appear at great distances from points of release, clearly indicating their mobility. Partial explanations of transport on the basis of meteorology and hydrology can be afforded. However, more sophisticated knowledge is needed on the in-

terrelationships of the properties of compounds and their interaction with the environment as factors in transport and partitioning. On the basis of known chemical composition of organisms and properties of compounds, for example, it has been possible to estimate the amount of chemical uptake from a given level of concentration in the environment. Further, the energy of adsorption on inorganic surfaces (particles) and proteins (biocolloids) have been shown to be related to readily measured properties of both the colloid and the chemical. From these data accurate predictions of environmental behavior and likelihood of exposure can be made (Freed, *et al.*, 1967; Cohen and Pinkerton, 1966).

Chemicals are broken down in the environment by a number of processes including those of a photochemical, chemical, and biological nature. These occur at varying rates depending on the nature of the chemical and the conditions. The products formed depend both on the process of breakdown and the chemical. Such degradation products in themselves may have health significance. Too little is known about rates of breakdown, material balance or reaction products. Data should be readily obtainable to permit accurate estimations of rates of breakdown and thereby rates of accumulation for specific products and product groups (Alexander, 1967; Nash and Woolson, 1967; Freed, *et al.*, 1967).

Lastly, little is known about the quantitative aspects of the biological availability and efficiency of partitioning of environmental contaminants into organisms. It is known, of course, that materials are partitioned across the organism-environment interface and subsequently are deposited in the tissues, but dynamics of this process are poorly understood. Thus, while it has been possible in some cases to estimate uptake from chemical data and to confirm this experimentally, much more needs to be known (Godsil and Johnson, 1968; Wheatley and Heartman, 1968).

*Recommendation 2-34:* It is recommended that careful assessment be made of direct alterations in ecologic aspects of the environment as they bear on man's health and well being. Examples are an upset in the oxygen cycle and the nitrogen cycle or the interruption of the food chain that may be induced by environmental contaminants.

It is becoming increasingly accepted that man's health and welfare are not only affected by direct environmental insult, but may also be influenced by ecological changes in the environment. Chemically induced changes may influence the oxygen supply and amounts of soluble nitrogen compounds to which man is exposed; they may encourage overgrowth of objectionable organisms, or the release or production of secondary toxicants (NAS/NRC, 1969; NAS/NRC, 1966).

It is of environmental health relevance to determine the kinds and amounts of chemicals arising from all sources that contribute to environmental contamination. There is need, also, to assess the total environmental burden of such contaminants and their distribution in air, water, soil and food chains. The objective of this work is to develop information based on physical and chemical principles on the nature and amounts of chemicals, mechanism of distribution and partitioning and the fate of these chemicals in the environment. By establishing these quantitative relationships based on the properties of the chemicals and the systems and mechanisms of transport, it would be possible to predict the probable exposure level and hazard to man and to develop appropriate preventive measures.

### VIII. Summary

Few things have more influence on man's health than the food he eats and the water he drinks. Rapid technologic change, increased population, and greater concentration of people into urban centers are threatening to overwhelm the limited measures currently provided for protection against harmful agents in food and water. Earlier successes in controlling food and water-borne infectious diseases have resulted in complacency. Current microbiologic methods and understanding of pathogenicity are inadequate. Recent outbreaks of food-related disease in animals have emphasized the health significance of naturally occurring food components and underlined our ignorance of the non-nutrient components of ordinary foods. The unquestioning acceptance of the natural constituents of such foods as safe is based on relatively short term observations, albeit repeated many times during the course of man's history. Little is known either from the experimental laboratory or epidemiologic studies concerning the possible roles that our daily food may play in neoplastic and degenerative diseases.

To answer these questions, the Subtask Force recommended increased effort to improve the reporting of food- and water-borne illnesses and to improve analytical methodology for recognizing, characterizing and measuring microbiologic and chemical agents in food and water. Also cited was the need for the performance of supportive research to determine the mechanisms of the resulting biologic effects. Guidelines for this effort are specified in a series of recommendations for more accurate reporting of food- and water-borne illnesses (Recommendation 2-5) and for the development of rapid, reliable analytical and evaluative techniques for viruses, pathogenic bacteria, pseudomonads, and fecal streptococci in food and water, for organic chemicals in water, and for microbial and anti-microbial hazards of conventional and new methods of food processing (Recommendations 2-1, 2-2, 2-11, 2-13, 2-14, and 2-17). Other recommendations call for improvements in procedures for evaluating and gathering data on the distribution patterns of disease organisms (*Salmonellae*, *Shigellae*, and *Clostridia*) and their indicators in food and water (Recommendations 2-3 and 2-4), and on the mechanisms of action of organisms such as *Proteus spp.*, *staphylococci*, and *E. histolytica* (Recommendations 2-6 through 2-9).

While certain trace elements in food and water are essential for life (and a deficiency produces disease), others are known to cause poisoning and any element is toxic if the dose is excessive. Because some trace element deficiencies are probably still unrecognized and many questions remain concerning the known elements ingested by man, the Subtask Force recommended increased research on defining the relationships of certain bacteria and chemicals to various disease conditions (Recommendations 2-10, 2-18, 2-24 and 2-28), and the impact of conventional and projected treatment processes and equipment on water quality (Recommendations 2-15 and 2-16). Also called for is research to develop improved procedures for the surveillance, control and maintenance of water supplies. Specifically, the Subtask Force urged that basic research be conducted to determine the microbiologic, chemical and physical criteria necessary for establishing sound health guidelines for the reuse of waste water (Recommendation 2-12), and that a study be made to find ways of removing financial and organizational obstacles to the utilization of environmental services (e.g., water supply and waste-water services) necessary for public health protection (Recommendation 2-20).

Other specific problems related to water quality and on which the Subtask Force recommended greater research effort included improvements in analytical instrumentation for surveillance of drinking water supply sources (Recommendation 2-19), the control of schistosomiasis (Recommendation 2-25), elucidation of the role of dissolved oxygen in water quality and factors which affect this role (Recommendation 2-21), and initiation of basic studies on the chemical quality of marine, estuarine, and fresh waters in relation to the growth, physiology, and toxicity of aquatic organisms (Recommendation 2-26).

In a broader sense, the Subtask Force called for the development of a program to forecast the rate of use and probable effects of new chemicals and other substances (Recommendation 2-22), and the placing of greater emphasis on research programs concerned with the recreational needs of people which result from population growth, urbanization, mechanization, and crowding (Recommendation 2-23).

The Subtask Force also urged greater effort on the evaluation of the acute and long-term effects of mycotoxin contamination and on biological toxins, and other naturally occurring pharmacologically active substances in foods (Recommendations 2-29 and 2-30). In addition, the Subtask Force recommended consideration of food toxicology in research now directed primarily to flavor chemistry and reaction chemistry (Recommendation 2-27).

Pesticides and other agricultural chemicals present special problems because they are generally biologically potent substances and are widely used. Since foodstuffs represent man's greatest source of intake of these materials, it is urgent that research on the effects of long-term, low-level exposure to pesticides be increased. Particular emphasis should be placed on biochemical, physiologic, psychobiologic, and epidemiologic aspects of such substances (Recommendations 2-31 and 2-32). The unexpected appearance of pesticide residues in fish from oceans and lakes and the increase in nitrates in certain natural waters indicate also the need to understand the chemodynamics whereby environmental contaminants are translocated from where they are used or liberated to where they may unexpectedly appear (Recommendations 2-33 and 2-34).

Man's Health and the Environment -  
Some Research Needs, Report of the  
Task Force on Research Planning in  
Environmental Health Science, U.S.  
Department of Health, Education,  
and Welfare, National Institute of  
Environmental Health Sciences, 1970.

Document No. 13    The Council on Environmental Quality Advocates Increased Efforts to Assure the Safety of Drinking Water Supplies (August, 1970).

The President's Environmental Quality Report clearly and succinctly stated the issue before the Nation:

#### EFFECTS OF PROBLEMS

##### *Health*

The impact of environmental deterioration on health is subtle, often becoming apparent only after the lapse of many years. The speed of change in a rapidly altering technological society and the complex causes of many environmental health problems produce major uncertainty about what environmental changes do to human well-being. Nevertheless, it is clear that today's environment has a large and adverse impact on the physical and emotional health of an increasing number of Americans.

### III

## *Water Pollution*

**T**HROUGHOUT history man has been ravaged by plague and epidemics visited on him by poor sanitation and polluted water. In more modern times, the great typhoid epidemics that swept London in the mid-19th century underscored the peril of water pollution and launched the first organized steps to combat it. And until very recent times this stress on preventing waterborne disease was the major thrust of efforts to stem the decline of the environment.

Americans have acted, until recently, as though their rivers and lakes had an infinite capacity to absorb wastes. Pollution was considered the price of progress. Not until 1948 was comprehensive Federal water pollution control legislation enacted, and the first permanent legislation was not passed until 1956. The original overriding concern was with human health, and almost all State water pollution programs were carried on by State health departments.

Water pollution control legislation and programs have now been broadened to embrace a host of environmental concerns, including recreation and esthetics. Epidemics due to waterborne causes are largely of the past, and our health efforts have moved to a more sophisticated concern for the effects of small amounts of toxic chemicals on humans and other forms of life.

*. . . to Health*

Epidemics of typhoid, dysentery, and salmonellosis borne by polluted water are no longer serious public health threats in the United States. To protect the public from these and other pollution dangers, however, water must often be treated to high levels before it is drinkable. Beaches often must be closed and shellfish left unharvested and unmarketed. Inadequately disinfected municipal wastes, overflows from combined sewer systems, and runoff from animal feedlots often create high bacteria densities in local water supplies.

A survey prepared by the Department of Health, Education, and Welfare points to disquieting quality deficiencies in some community water systems, particularly in small communities. Also, there is mounting public health concern over chemical constituents in water. The effects on humans of small amounts of toxic chemicals in water supplies are not known, but health authorities show increased concern over their potential effects. Accelerated research is needed for better understanding of these dangers. The technology to maintain safe bacteriological quality and to remove many of the potentially dangerous chemicals from drinking water exists but is not as widely employed as necessary.

14. *Efforts to assure the safety of municipal water supplies should be increased.* This will mean greater research on the potential health hazards which may be contained in drinking water and more thorough surveillance of drinking water supplies. Current knowledge, surveillance, and control of such hazards are inadequate.

Environmental Quality, The First  
Annual Report of the Council on  
Environmental Quality together  
with the President's Message to  
Congress, August 1970.

Senator SPONG. Mr. Johnson, you have been the most patient of all. I just received a note that you have to step out of here for just a few minutes.

If you would excuse me while we have a brief recess, we will be back and look forward to hearing from you and then questioning all of you.

[Recess.]

Mr. VOGT. Mr. Charles Johnson is our next panelist.

Mr. JOHNSON. Thank you, Mr. Chairman. You have had a long day and you have heard a lot of us say pretty much the same thing. I think one of the things that comes through during this whole discussion today is that we are talking about a health matter.

I happen to represent a health association. For one thing that isn't new is that we have been at this game for a hundred years. It happens that just about a month from now we celebrate our 100th anniversary as an association.

You might be interested to know that our particular association got started fighting the unsanitary conditions of the times back in 1892. Among the problems they dealt with were the conditions of our water supplies. Out of these deliberations came the impetus to do something about the diseases associated with our water supplies.

Here we find ourselves again today talking about protecting people and protecting people's health as associated with water supplies, but a different disease entity. You have heard about viruses; you have heard about the diseases that come about through the introduction of heavy metals into our body systems. Cancer, stroke, heart disease, all associated with water. These are associated with water; they are associated with people, and they are killers.

So this is very vital legislation that we are talking about. I can't impress too much as we enter into this period of crisis orientation to our environment that all of our environmental problems are health associated and it is the health of people that we have to put at the prime of our concern. I am glad to see the emphasis that all of my colleagues have given today and those that have been on this morning. Rather than give my prepared text, which in many respects supports and emphasizes the kind of thing that you have heard already, I would like to make a few side comments, Mr. Chairman.

The comments are somewhat predicated on some of the things that you have heard and some of the things that you have been told today. For instance, the commentary at one point this morning was on the relationship between water pollution control legislation and the water bill with respect to raw water quality. We should not at any time be misled to thinking that this bill is a duplication because it is not.

For example, if we can consider the water pollution control legislation now pending before this Congress on which I have testified giving some health viewpoints on that particular legislation, water supply takes a secondary position in the text of that legislation. Very specifically, the effluent standards have primacy in that pending legislation. When you set an effluent standard only if someone proves that the water quality in that body of water to which an effluent standard has been assigned on a point source discharge, only

after you prove that this is harmful to the health, can you go back and correct this in terms of water quality.

This legislation would preempt that. I think it is very essential that we make sure that the raw water supplies that are there for our communities gets the protection that people need and not the protection you need in terms of a discharge from an industry as provided by an effluent discharge type of standard.

I think if you read that legislation as now written, you will find that water supplies take a back seat to point source discharges in terms of industrial effluents. I think it is important to recognize that we are already and have been for some time recycling water, recycling sewage, recycling waste. We do this on any stretch of stream heavily polluted from which we also take the water we use as a source for community water supply.

The Mississippi River, the Hudson River, you name it, where a surface supply is heavily contaminated by sewage and other industrial wastes, you are already recycling water. The important thing to remember is that we don't know what we are doing to ourselves.

I have to emphasize and reiterate the need for research. I would go one step further than Leonard here. We have worked together for many years in the Public Health Service. The research has to apply not only to what we want to take out and how we take it out, but what it is doing to us in terms of epidemiological concerns. It is only then that we have a final basis for setting a standard and knowing that in fact things are of such a nature that the health of people is protected. Without the two of these you don't have the whole picture. You don't know where the floor is, you don't know where the ceiling is. We don't know how much to take out until we do the epidemiological studies that assures the health of people is being protected.

I would want to emphasize that there is a need to have an office of community water supply. Mr. Spong, I have been before you before. I don't know whether you remember or not, but for some time now I have been representing public health interests. I was the first administrator of the Environmental Health Service. I have testified on other water pollution control bills and I think it is important to recognize that if we are going to get the most efficient and most effective effort done, we must keep the enforcement activity as close to the people as possible with those safeguards that allow us to assure ourselves that the work in fact will get done.

So I would support and our association supports a strong State effort in this kind of an activity. On the other hand, a strong State effort is not going to be forthcoming if it is not supported. So you have to have program grants.

I could almost predict you will have an unsuccessful program unless you give the States the resources to go along with the responsibility and authority that such an act is assigning to them. I can give you historical evidence of this. This was brought out this morning when you spoke of the water pollution control effort. Up to the forties we had good water supply programs at the State level. As the water pollution control monies became available, as the pressure became apparent that they had to do something in this field, they

took their trained manpower, moved it to where the gold was, you mine where the gold is if you want to get gold, and they produced a water pollution control effort at the expense of a water supply effort. As long as there are Federal funds made possible in environmental efforts you have to be sure that there is sufficient money to make sure that the staff, the support, the activities that you require for all environmental activities are indeed supported.

I think it is very important that you have a strong surveillance effort. That is part of the problem today. We know we have problems. It was during, again, the time that I headed the Environmental Health Service, that I set out three special goals for our programs to achieve. One, to do something for occupational health and we have an occupational safety and health law now; the other was to do something about pesticides. We have a lot of attention, and I believe strong movement in the direction for controlling pesticides.

Mr. McDermott was there when we discussed it in my early stages in the Environmental Health Service; as a matter of fact, I brought Mr. McDermott into the program for this purpose, and we said that we are going to awaken the Americans to the fact that we have to do something about the domestic water supplies.

That was 4 years ago. I am very pleased we have arrived at this point, but it is going to be most important that we do not arrive here only with the desire and not the resources to get the job done. We have to have strong support; we have to have a surveillance system; we have to have enforcement action; it has to be backed up by Federal determination to see that the States do their job.

I have worked with the water industry for some time now; as a matter of fact, they were on my head for a while during the early days of this study, but we are friends again, and they are determined to make sure that we not only have the best water supplies in the world, but we have the safest. They have started an "action now" program to build in stronger training programs for their operators and they are working for and they are supporting this legislation.

It is going to take a Federal, State, industry effort to do the job so that we don't have the crisis in this portion of the environment that we have in solid waste, pesticides, water pollution, and the other environmental problems that we are facing today. I think that this emphasizes some of the points that I have made in my testimony.

I know the day is getting late. I would be willing to answer questions along with the rest of the panel. I think there is one more representative that wants to submit his statement for the record. I would yield my other 5 minutes to Mr. Kappe.

Senator SPONG. Thank you very much, Mr. Johnson.

(The statement follows.)

STATEMENT OF CHARLES C. JOHNSON, JR., ASSOCIATE EXECUTIVE DIRECTOR,  
AMERICAN PUBLIC HEALTH ASSOCIATION

Mr. Chairman, this statement is being submitted on behalf of the American Public Health Association which will celebrate its Centennial in 1972. This organization is the oldest and largest organization of its kind dedicated solely to the preservation and promotion of personal and environmental health. With our State and local affiliated organizations, APHA has a total membership of

over 52,000 dedicated health workers in some 30 disciplines. They are drawn together in the Association out of their shared interest in securing optimum health for the total population of the United States. Our organization was founded by a group of sanitary reformers and credits much of its initial success to efforts to improve the environment in which people were living. Thus, it is only natural that our Association joins with other organizations on this panel to express its concern for the necessity to enact Federal legislation which will help to assure adequate quantities of safe drinking water to the people of this Nation. This Committee is to be applauded for recognizing this need and making it possible for us to discuss these matters with you.

Mr. Chairman, when I was Administrator of the Environmental Health Service in the Department of Health, Education, and Welfare, we released in August 1970 the findings of the first national survey of the Nation's community water supply systems. The introductory commentary on this survey as found in the forward to the study report is repeated here for the benefit of this Committee.

"The ecological crisis with which our Nation, and the world, is today confronted has been building for many years. Yet, for many, the magnitude of the damage which we have inflicted on our environment, in ignorance and carelessness, has come as a recent, stunning surprise. However, the urgency of our environmental problems can no longer be ignored or denied. President Nixon expressed the national mood about these sobering realities when he declared that 'the 1970's absolutely must be the years when America pays its debt to the past by reclaiming the purity of its air, its water and our living environment.'

"Of special concern is the fact that the waste products of our highly urbanized and technological society—many of them not even identified—which pollute our land, air, and water, persist in the environment, and react, with one another, in complex and little-understood ways, to affect the life cycles of plant, animal, and human organisms.

"Our water resources, more perhaps than any other, illustrate the interaction of all parts of the environment, and also the recycling process that characterizes every resource of the biosphere. Everything that man injects into his environment—chemical, biological, or physical—can ultimately find its way into the earth's water and these contaminants must be removed, by nature or by man, before the water is again potable.

"Concern for our water quality, until quite recently, has centered principally on the danger of bacteriological contamination from inadequately treated sewage discharged into our rivers and streams. Today we are confronted with the fact that chemical pollution of source waters poses additional, possibly even more difficult, problems. Moreover, we deceive ourselves if we assume that even the most complete and effective treatment of municipal and industrial wastes can ever remove all threats of water contamination.

"In a world subjected to a growing burden of interacting pollutants, many other sources of contamination exist, so that the quality and safety of our drinking water must finally depend upon constant vigilance and application of the best techniques of water treatment and distribution.

"That only recently has attention been focused on the problems of maintaining safe drinking water is illustrative of the dangerous complacency with which we have viewed the whole spectrum of environmental ills. This report by the Bureau of Water Hygiene, Environmental Health Service, represents the first real attempt to determine, on a nationwide basis, the efficacy of current practices in water treatment and to assess future prospects for maintaining safe, high quality drinking water.

"It may be concluded, on the basis of survey findings, that, while the overwhelming majority of the people of the United States can be assured that the water they drink today is safe, several million drink water containing potentially hazardous amounts of chemical or bacteriological contamination. Clearly there is an immediate need, in many localities, for upgrading present water treatment and distribution practices.

"Moreover, as in so many aspects of our environmental situation, the findings are not reassuring with regard to the future. It seems abundantly clear that we will need, in the years ahead, to give increasing attention to the broad problems of water supply in order to assure the public of an adequate supply of safe drinking water on a continuing basis."

Amendment Number 410 to amend S. 1478 will provide the specific legislative focus necessary for development of a strong national program, involving the

Federal, State, and industry effort required for adequate production of safe drinking water.

The Federal program must be charged with responsibility for continuous modernization of criteria and standards encompassing the full range of quality of drinking water. The creation of a National Drinking Water Advisory Council will help to assure wide acceptance of the national standard as well as continued attention by the government to the problems of supplying the Nation with an adequate quantity of safe water. Inasmuch as a basic purpose of this bill before the Committee is the protection of the public's health, we would recommend that the Secretary of HEW have the legal responsibility for the appointment of at least one health oriented person to each of the three categories that make up the National Drinking Water Advisory Council.

Next, the Federal program must be capable of supplying the kind of support that assures every State the opportunity to carry out its primary responsibility for safety of design, dependability of operation and maintenance of water purification and distribution systems, and development and implementation of an effective surveillance and evaluation system.

The provisions in the bill which authorize grants for program support and provide for expert consultation and technical assistance to the States and to the water supply industry are essential elements for the success of this aspect of the national program.

In addition, there are obvious advantages to be gained and sound rationale for a nationwide research, demonstration and training program coordinated with the industry, educational institutions, agencies and other organizations. In addition, there is need for coordination of research and demonstration efforts at the Federal level in this area of concern. You may wish to assign such responsibility to the office established for implementing community water supply legislation.

For the Act to be most effective, minimum national drinking water standards must be enforced in a determined and consistent manner. Full use should be made of the State's recognized primary enforcement responsibility. This should minimize overlapping and duplication of effort.

Mr. Chairman, we wish to highlight our agreement with the bill's provision establishing an Office of Water Hygiene. Without such emphasis, considerable difficulty can be expected in keeping the community water supply concerns viable in view of the much larger attention and support accorded the Nation's water pollution control effort. Further, we would suggest its designation as the Office of Community Water Supply, which is more descriptive of its functions as outlined in the bill.

Under the section on definitions, we would raise one question with respect to item 6 which defines the term *public water system*. In our opinion this definition is somewhat limiting in that there are problems with other types of water supply systems that are not covered by the definition. For instance, this definition does not provide for control of the bottled water industry or the large private settlements such as motels, recreational areas, resorts, or unincorporated small subdivisions. Perhaps the Committee would consider adding on to the definition after the phrase "or which is a water utility regulated by the state law" the following: "or regulated by the state and supplying water to a minimum (X) individual premises or a minimum of (Y) persons."

Finally, Mr. Chairman, the American Public Health Association expresses its support of the Amendment that is currently before this Committee and offers its assistance to the Committee in whatever way it can as you pursue the development of this very significant legislation.

MR. VOGT. Mr. Chairman, Mr. Kappe, of the American Society of Engineers, has a statement he will file for the record. He would like a couple of minutes to make a couple of points.

Senator SPONG. We would be pleased to hear from him.

MR. KAPPE. Mr. Chairman, I would like to bring out some highlights of the testimony which was presented.

Everyday the public hears a great deal about the efforts being made at all levels of government and by spirited citizens and organizations to protect the Nation's waterways from manmade pollutants

and Congress is committed to passing laws and appropriating funds and creating the interest that it has to protect the Nation's waterways.

However, most of the emphasis seems to be on the removal of nutrients for control of algal growth. There seems to be little emphasis on the removal of pollutants that may be harmful to the health of the users of these waterways as sources of drinking water supplies that are getting more scarce each day.

The current drinking water standards developed by the U.S. Public Health Service contributed immensely to the development of safe water supplies in this country. They were adopted, in principle, by the States without argument, because the State regulatory engineers, the public, and engineers in private practice recognized the priceless value of these standards and the assistance the Public Health Service offered and made available to States, local government, and engineers in private practice to develop safe, public water supply systems.

This grassroots teamwork proved the worthiness and effectiveness of the national program as is encouraged by this legislation for execution and operation at the State and local levels.

Today, surveillance and enforcement seems to mean a clipboard questionnaire inspection often by personnel not adequately trained by education and experience followed by a strong letter on items often found not needing correction.

Such actions were seldom used during the years the water supply systems were developed in this country. In those days, surveillance meant cooperative teamwork between operators and engineers who were well qualified by education and experience in locating troubles and solving problems.

This teamwork and spirit between the operators and the regulatory agencies should be reinstated and encouraged by staffing the regulatory agencies at all levels with competent personnel. It is more effective than enforcement procedures.

When Hon. William D. Ruckelshaus testified before the House subcommittee he identified the significance of safe drinking water in his testimony. In the testimony which was submitted by EPA it was disclosed that for the fiscal year 1971 the division of water programs had a budget authorized by Congress of \$2.837 million and 180 positions which was increased to \$4.6 million and 206 positions for the fiscal year 1972. An encouraging improvement but still a very meager funding for such an important program for the health and welfare of the Nation.

It would be encouraging and comforting to our people to know whether the increase in budgetary and position strength authorized by Congress was actually made available to the program during the fiscal year 1972.

The recent internal decision of EPA that threatens the sharp curtailment this year, and elimination next year, of support for graduate training programs in the environmental field is an action by EPA that is contrary to the wishes and views of Congress and to the urgent need for such trainees in the environmental program—it would be most disturbing to our citizens to learn that such action might have

been taken—to compensate for and to cover the ever-increasing costs being put into a buildup of a massive administrative bureaucracy at the sacrifice of the program where Congress wants the authorized money to be spent.

This decision comes at a time when many well-trained engineers in depressed industries are unemployed. A year of post-graduate training in environmental technology for these people could serve two purposes; one, provide much needed technical skills in a field which is in short supply on all levels of government, industry and private practice, and, two, reduce the unemployed labor force of these highly trained technical people.

The American Academy of Environmental Engineers is also disturbed by the alleged policy of EPA to place individuals with little or no experience in the field of environmental controls in decisionmaking positions and relegate those with many years of experience to positions far removed from the policymaking level.

The reduction by EPA on funding the training grant programs can only make this situation more deplorable than it is at present. Congress should see that the deleted training grant funding is reinstated to at least its original level for the training so vital to the enhancement of the program and that a similar action will not be taken by EPA on training grants encouraged and authorized by Congress in legislation now being considered by Congress.

The water industry cannot afford to be complacent nor can it ignore potential water borne health hazards, as ways pollution of the Nation's waterways. If the water utilities are not warned about such contaminants, and if they are not educated of the measures that should be adopted to protect the health of the consumers, the sickness incidence and death rate therefrom could be disastrous.

It is encouraging to note that the bill provides for the creation of a council to advise, consult with, and make recommendations to the administrator of water programs. Congress should be assured that the program personnel and council members will be well qualified and will be responsive.

The bill should require the administrators responsible for the program and each member of council to be knowledgeable and to have broad expertise by education and experience and active membership in water-oriented organizations in the field of water hygiene and public water supply.

Congress should also be assured that the water programs will not flounder under subbasement type operations as the public seems to feel occurred and was experienced by the water pollution control program as it made its rounds from the Public Health Service to HEW, to Interior to its current resting place, EPA.

This committee could do a great public service by assuring immediate visibility to the administration of legislation under the bill by requiring in the legislation the appointment of a competent and well qualified assistant administrator for the water program directly under the Administrator of EPA.

Mr. Chairman, I wish to thank you for the time that you have allowed me to present this statement.

Senator Spong. Thank you.

(The statement follows.)

STATEMENT OF STANLEY E. KAPPE, P.E. AND EXECUTIVE DIRECTOR,  
AMERICAN ACADEMY OF ENVIRONMENTAL ENGINEERS

The American Academy of Environmental Engineers is an organization of environmental oriented registered professional engineers sponsored by eight national associations, namely:

1. Air Pollution Control Association
2. American Institute of Chemical Engineers
3. American Public Health Association
4. American Public Works Association
5. American Society of Engineering Education
6. American Society for Civil Engineers
7. American Water Works Association
8. Water Pollution Control Federation

The organization is not new. It was founded in 1955 for the purpose of improving the practice, elevating the standards, and advancing the cause of environmental engineering through a program of certification of qualified engineers. At the present time, AAEE has approximately 1,270 members, which encompasses the greatest single concentration of professional engineering talent in the environmental field. Included among our members (past and present) are engineers who have been interested and influential throughout their professional careers in environmental control legislation and programs at all levels of government and in private industry. An excerpt from our news publication, *The DIPLOMATE*, volume 6, No. 2, April 20, 1971, entitled "History and Progress," is attached, which explains in more detail the history and progress of the organization.

Over the years, the environmental engineers in government and in private practice has played a big part in the advancement, Welfare and progress of our country through the production of a safe and an adequate public drinking water supply system, and to a degree not enjoyed by any other country. The environmental engineer will continue to do a good job if his creative ability, genius and talents are used resourcefully and judiciously for administration and execution of laws and programs, as well as for study, research, design, treatment, operation, and construction of new water supply systems, and for surveillance and upgrading of existing systems. Currently, this talent of special knowledge and training has not been used to the degree warranted for the benefit of programs envisioned by Congress at high government policy-making levels of the programs. Congress should spell out the qualification requirements of the administrators in each of its actions.

The comfort and assurance our citizens have enjoyed knowing that the water coming out of the faucet in their homes is safe is priceless. The committee, its staff, and Congress are commended for their foresight and for their determination to assure our citizens that the water coming out of the faucet will continue to be safe and adequate in the face of the complex, exotic, and rare organic and inorganic pollutants that may be discharged in waste waters or surface runoff, or may be washed out of the atmosphere in increasing amounts into waterways used as sources of public water supplies.

Everyday the public hears a great deal about the efforts being made at all levels of government and by spirited citizens and organizations to protect the nation's waterways from man made pollutants and Congress is commended for passing laws and appropriating funds and for creating the interest it has to protect the nation's waterways. However, most of the emphasis seems to be on the removal of nutrients for control of algal growth. There seems to be very little emphasis, comparatively speaking, on the removal of pollutants that may be harmful to these waterways as sources of drinking water supplies which are getting more scarce each day. The question often asked—does it make sense to treat wastewater effluents to the extent they are sterile when the waterway used as a source of drinking water supply may be contaminated with infectious bacteria, virus, rare metals, low level radioactive contaminants and other contaminants from atmospheric fallout, the earth's crust and land use—is challenging and full of pros and cons. Why, because our lack of knowledge regarding the many unknowns associated with water, which is a universal solvent and on which life and man's health depends are still a mystery. These potential dangers to man through drinking water supplies can only be ascertained by diligent and meaningful studies and research on a long term continuous program basis not only for today but also for tomorrow and the tomorrows

that follow. Each day is a new life, a new experience and a new institution of learning. Congress has done an excellent task passing legislation and programs for the protection and enhancement of the waterways from man-made pollutants. Congress is strongly encouraged to take similar action now and before it is too late to protect and enhance the nation's precious sources of drinking water supplies not only from man-made pollutants but also from contaminants that are not man-made.

Current responsibilities for the safety of water delivered by public water supply systems is based upon State law and supervisory control is carried out by State water hygiene surveillance programs. The Federal Government has authority only to evaluate public water supplies used as sources of water by public carriers traveling in interstate commerce, and it has provided technical assistance to the States in the conduct of water hygiene programs.

A Federal-State partnership, as a national effort, as provided in the bill is needed and is encouraged to continue assured protection of the Nation's public water supplies.

The current drinking water standards developed by the U.S. Public Health Service contributed immensely to the development of safe water supplies in this country. They were adopted, in principle, by the States without argument, because the State regulatory engineers, the public, and engineers in private practice recognized the priceless value of these drinking water standards and the assistance the Public Health Service offered and made available to States, local government, and engineers in private practice to develop safe public water supply systems.

The benefits which have accrued and were achieved through the development and administration of the PHS drinking water standards strongly support and substantiate the need for legislation as provided for in the bill that will establish and enforce national drinking water standards which will benefit the entire population using public water supplies and not only water systems which supply water to interstate carriers.

The provision in S1478 which recognizes the responsibility of State and local governments and the need for interstate cooperation is encouraged. State rights should include and require State responsibility. Federal enforcement should be used only when the States are unable or unwilling to accept responsibilities. States should be allowed to develop their own standards, providing the State standards are equal to or more stringent than the Federal standards. However one set of standards for both the nation and the states should be given serious consideration to neutralize confusion and controversy. Every effort should be made, however to reduce or eliminate duplication of effort between State and Federal Government on enforcement and other provisions in the bill. Unfortunately, provisions for surveillance and enforcement are a requirement for the few who are stubborn and must be forced to adopt corrective measures and to correct defects in facilities and operations. Today, surveillance and enforcement, however, seem to mean a clipboard questionnaire inspection, often by personnel that have not been adequately trained by education and experience, followed by a strong letter on items often found not needing correction. Such actions were seldom used during the years the water supply systems were developed in this country. In those days, surveillance meant cooperative teamwork between waterplant operators and State engineers who were well qualified by education and experience in locating troubles and solving problems. This spirit played an important part in the development of safe and adequate water supplies in this country. This cooperative teamwork and spirit between waterplant operators and regulatory agencies should be reinstated and encouraged by staffing the regulatory agencies at all levels with competent personnel in the interest of producing and delivering to the public a safe, potable, and adequate water supply. It is more effective than enforcement procedures.

The water supply industry was encouraged by the recent reorganization which established the Water Supply Programs Division as a separate entity within the Environmental Protection Agency. This committee and the Appropriations Committees of Congress should, however, make sure that all authorized and appropriated funds for the new Division of Water Supply Programs are earmarked for use only by the Division of Water Supply Programs and are not siphoned off by inadvertent or intentional administrative decisions for other programs.

When the Honorable William D. Ruckelshaus, Administrator EPA, testified before the House of Representatives, Subcommittee on Public Health and Envi-

ronment, Committee on Interstate and Foreign Commerce on Safe Drinking Water, he identified the significance of safe drinking water when in his testimony (Serial No. 92-24, page 356) he stated:

"We have placed a high priority on our responsibilities for the protection of public drinking water. First, we have substantially increased the budget for drinking water activities this year. Two-thirds of that budget is addressed to increased research needs. We also will be surveying 10 state programs to help those states better identify program deficiencies and needs, and will be updating our national inventory of public water supply systems."

Testimony from EPA also disclosed that for the fiscal year 1971 the Division of Water Programs had a budget authorized by Congress of \$2.837 million and 180 positions which was increased to \$4.6 million and 206 positions for the fiscal year 1972. An encouraging improvement but still a very meagre funding for such an important program for the health and welfare of the nation. It would be encouraging and comforting to our citizens to know whether the increase in budgetary and position strength authorized by Congress were actually made available to the program during the fiscal year 1972.

Federal legislation is encouraged as provided in the bill which will provide financial and technical assistance to State, regional, and local governments for program planning, development, operation, demonstration grants and for training. The emphasis during the last few years on controlling water pollution, accompanied by Federal Financial assistance in the form of grants and loans for pollution control programs has, unfortunately, adversely affected the overall drinking water supply program at all governmental levels. Most of the experienced technicians and scientists were, unfortunately, transferred from water supply programs to water pollution control activities, and very little activity took place on water supply programs.

The training requirement of the bill should receive high priority in the expenditure of these moneys. The need for training at all levels of government, management and operation in both private and public water supplies is equally important if this Nation is to mount the kind of pure drinking water program that is needed and seems to be envisioned by this committee.

The recent internal decision of EPA, that threatens the sharp curtailment this year, and the elimination next year of support for graduate training programs in the environmental field is an action by EPA that is contrary to the wishes and views of congress and to the urgent need for such trainees in the environmental programs. It would be most disturbing to our citizens to learn that such action might have been taken to compensate for and to cover the ever increasing costs being put into a build up of a massive administrative bureaucracy at the sacrifice of the program where congress wants the authorized money to be spent. This decision comes at a time when many well trained engineers in depressed industries are unemployed. A year of post graduate training in the field of environmental technology for these unemployed engineers could serve two purposes. (1) Provide much needed technical skills in a field which is in short supply on all levels of government, industry and private practice and (2) reduce the unemployed labor force of these highly trained technical people.

AAEE is also disturbed by the alledged policy of EPA to place individuals with little or no experience in the field of environmental controls in decision making positions and relegate those with many years of experience in positions far removed from the policy making level. The reduction by EPA on funding the training grant programs can only make this situation more deplorable than it is at present. Congress should see that the deleted training grant funding is reinstated to at least its original level for trainees that are so vital to the enhancement of the program and that a similar action will not be taken by EPA on Training Grants encouraged and authorized by Congress in legislation now being considered by Congress.

In order to assure our citizens that the water coming out of the faucet will continue to be safe for drinking and other domestic and industrial needs, the requirement for an expanded and continuously operated and adequately financed and staffed national research program is a "must" for the protection of the Nation's sources of water supply and for the production of a finished product that is safe and potable. The water industry cannot afford to be complacent, nor can it ignore potential waterborne health hazards, as was pollution of the Nation's waterways. If it had, the cry of the public, due to a high incidence of illness and death rates, would be greater than the current cry about stream

pollution and its effects on the economy and well being of the country would have been disastrous.

The water industry today is faced with unknown pollutants which are complex and exotic toxic organic and inorganic chemical pollutants and minute amounts of trace metals discharged through ever increasing exhaust pipes and smokestacks into the atmosphere and in everincreasing volumes of waste waters from industrial and domestic operations which reach waterways used as sources of public water supply. We are also continuously faced with the pollution of drinking water supplies by viral and tropical diseases that are being carried and spread by the jet traveler, our Armed Forces and others returning home from foreign operations. We are also faced with contaminants that are increasing the colloidal and suspended solids of the Nation's waterways from new products as well as old products in ever-increasing amounts, the effect of which on the human system we know very little. For example we know little about the carcinogenic effects on humans from drinking water containing radioactive contaminants, rare metals, and other dissolved organic compounds which may remain in drinking water delivered to the consumer. If the water utilities are not warned about such contaminants, and if they are not educated of the measures that should be adopted to protect the health of the consumers, the sickness incidence and death rate therefrom could be disastrous.

James B. Coulter, (Secretary) Maryland Department of Natural Resources, in a paper published in the AWWA Journal, volume 62, No. 3, March 1970, effectively summarized the problem with these words:

\* \* \* the philosophy of letting the Nation's control over public water supplies deteriorate until adverse health effects are noted is condemned, in fact, it is generally conceded that the involuntary use of our citizens for bioassay is immoral.

These potential health hazards in water supplies, strongly indicate that the provisions in S1478 for an expanded research program, including research grants to educational institutions, public authorities, and individual research facilities is highly commendable and is strongly encouraged.

The benefits that can be derived from demonstration grants have been proven by recent developments in the use of demonstration grants in the water pollution control field. While not all demonstration grants can be expected to be 100-percent successful, those that do prove worthwhile greatly reduce the time between bench research and practical application in the field. The provision in S1478 for demonstration grants should prove to be an asset to the program if the demonstration projects are judiciously selected and they are strategically located for inspection and observation by the water industry and the public.

It is encouraging to note that S1478 provides for the creation of a council to advise, consult with, and make recommendations to the administrator on water programs. Congress should be assured that the program personnel and Council members will be well qualified and will produce results. The bill should require the administrators responsible for the program and each member of the Council to be knowledgeable and to have broad expertise by education and experience and active membership in water-oriented organizations in the field of water hygiene and public water supply. A good source of such qualified persons are the Diplomates of the American Academy of Environmental Engineers and members of the American Waterworks Association.

Congress should also be assured that the water programs will not flounder under sub-basement type operations as the public seems to feel occurred and was experienced by the water pollution control program as it made its rounds from PHS, to HEW, to Interior, to its current resting place—EPA. This committee could do a great public service by assuring immediate visability to the Administration of legislation under S1478 by requiring in the legislation the appointment of a competent and well qualified assistant administrator for the water program directly under the Administrator of EPA. The current EPA chart shows that the Director of the water program reports to the Administrator of EPA through (1) the Director of standards development and implementation programs (2) the Deputy Assistant Administrator for water programs and (3) the Administrator for air and water programs before reaching the Administrator of EPA. Sounds like a game of hide and seek in a deep pile of red tape instead of a flow chart that would be conducive and effective in executing the water program envisioned by Congress.

The committee should also assure itself either through the Council, or by legislative intent, that the research program will serve only the needs of the water

program and that it will not become engulfed in an overall environmental research activity and thus lose its identity, purpose and comforting assurance to our fellow citizens.

The waterworks industry, as a whole, has demonstrated that the water utilities in this country are viable institutions, capable of financing their own capital expenditures in an efficient and profitable manner. Federal financial and technical assistance for research, training and for development and demonstration of new techniques are desirable but the issuance of construction grants to existing water supply systems is debatable except in cases of emergency brought on by floods, earthquakes and other similar disasters. If construction grants should be offered, the grantee should be required by law to deposit all monies collected by the water utility in a special fund earmarked only for the use of and expenditures for operation, maintenance, improvements, betterments and expansions to the water supply system and for no other purpose and that a fixed amount of the collected monies shall be set aside annually in a sinking fund for improvements, betterments and expansions to the water supply system on a programmed need basis.

Referring to the Bill as printed, the following changes are suggested for consideration.

Page 4.—Section (a) (1) "National Drinking Water Standards". The terminology "primary" and "secondary" drinking water standards used throughout this title and bill is confusing and is likely to be interpreted in the same vain as primary and secondary treatment for wastewater treatment plants. The intent should be clarified and by other wording than "primary" and "secondary".

Page 5.—Section (b) (1) (B) insert "source" ahead of the word "treatment".

Page 5.—Section (b) (1) (C) is not clear. Is the intent to read—"shall prescribe the minimum permissible levels for contaminates which may exist in any public drinking water system."

Page 7.—Under title "Failure by State to Assure Enforcement of Standards Sec. (a) (1) line 5&6 delete words "any primary" and add words in lieu thereof—"the then issued and adopted". Likewise under Section (a) (2) line 5.

Page 10.—Under title "Research, Technical Assistance, Information, Training of Personnel" Sec. (a) (1) (D) insert after "improvements in"—Line 3 "source of water supply, conservation of water usage".

Page 12.—Section (2) (B) (4) (C) delete the word "or" and insert after the word municipal "or investor owned".

Page 12.—Under title "Special Study and Demonstration Project Grants" Sec. (a) (1) insert at end of paragraph after word "Nation" and (2) will encourage conservation and will discourage excessive and wasteful use of drinking water".

Page 13.—Section (b) (3) last line after the word "methods" insert word—"conservation".

Page 13.—Under title "Safe Drinking Water Programs Grants Sec. (a) insert in last line after the word "public"—"and private".

Page 15.—Section (d) (8) second line after the word "whereby" insert the words "the supplier of" and in the last line thereof delete the words "in transmitting" and insert in lieu thereof the words—"in a prescribed time depending on the severity of the violation through".

Page 19.—Under title "National Drinking Water Advisory Council" Sec. (a) (1) line 5 after the words—"Five members" insert the words—"who have demonstrated knowledge and expertise about drinking water systems". In the same paragraph line 9 after the words "an active interest" insert the words "knowledge and expertise".

Page 19.—Section (b) after the word "functions" insert the words "programs, procedures".

Page 20.—Section (c) line 5 after the words "per diem" insert the words—"or the amount that may be set from time to time by the Administrator".

The American Academy of Environmental Engineers wishes to congratulate the committee and its staff for the foresight, determination, and comprehensive coverage which is evident in the proposed legislation to continuously assure the public of a safe and potable drinking water supply, and wishes to encourage Congress to enact a Safe Drinking Water Act during this session. The need is urgent. It cannot be too strongly emphasized as a must to protect the health and welfare of our country and its citizens.

The academy wishes to thank the committee for being given the opportunity to appear and offers its reservoir of talent and know-how to the committee and its staff and to the execution of the program.

## HISTORY AND PROGRESS

EEIB is a corporate structure created and incorporated on October 21, 1955, under the laws of the State of Delaware. It was originally incorporated as American Sanitary Engineering Intersociety Board (ASEIB). On February 16, 1966, by action of its Board of Trustees, the Articles of the Corporation were amended and the name was changed from ASEIB to Environmental Engineers Intersociety Board (EEIB). At the same time, the name of its roster of certified engineers was changed from American Academy of Sanitary Engineers (AASE) to American Academy of Environmental Engineers (AAEE).

On June 4, 1967 the Board of Trustees under Article 111(f) of the amended Certificate of Incorporation changed the status of AAEE from a roster of certified engineers to an organization with its own rights, bylaws, and officers and as an active responsible structure created to work cooperatively with EEIB in the advancement of all aspects of environmental engineering.

The Intersociety Board is responsible for certification, overall policy, and is the instrument through which business of EEIB and AAEE is conducted. Currently its Board of Trustees is composed of 18 Trustees, one from each of the eight sponsoring societies, eight from AAEE and two elected at large by the Board. The current sponsor societies are AICE, APCA, APHA, APWA, ASCE, ASEE, AWWA, and WPCF. The principal officers of the Board are elected annually by the Board of Trustees.

It should be noted that a certificate granted or issued by EEIB will not confer a legal qualification to practice environmental engineering any more than a certificate from a medical specialty board will confer a legal qualification or privilege to practice medicine. The legal requirement for practicing engineering in any form is a license or registration certificate used by a state board of engineer examiners. The value of the certification procedures adopted by EEIB is a means of attesting the competency of persons in different areas of specialization and it has proven effective in other professions. The roster of AAEE provides a list of engineers who have been certified by their professional peers as being competent to practice in their elected specialty.

AAEE was reorganized on June 4, 1967 to relieve EEIB of some of its responsibilities and so that AAEE could function in its own right in cooperation with EEIB to improve, enhance, promote, encourage, stimulate and support the practice of environmental engineering, the status of professional engineers, sound legislation, good public relations, interest and awareness of man's relation to his environment and education in the field of environmental engineering and to represent the membership of the Academy in its relations with EEIB and to work cooperatively with EEIB in the advancement of all aspects of environmental engineering. The officers of AAEE include a President, President Elect, Vice President, Past President, and four Directors, all of which (except the Secretary-Treasurer) are elected by the membership of the Academy. AAEE receives its financial support from dues and other income collected by EEIB which amounts to only a small operating budget.

Mr. VOGT. Mr. Chairman, that completes the presentation of the panel. We would be very happy to answer any questions providing you have some time.

Senator SPONG. We will. Thank you very much. Yes, we do. I understand, Dr. Lehr, that you have to catch a plane. I will submit my first question to you.

Mr. VOGT. I have a plane to catch, too.

Senator SPONG. Well, we won't take more than about 20 minutes now if you have that much time.

Mr. VOGT. Fine.

Senator SPONG. First of all, I understand that all of you agree substantially with the draft legislation submitted by Mr. Vogt. I want to herewith invite any of you to make specific individual comments in writing to the subcommittee. I am not trying to promote discord; I want to make sure we have the benefit of your best thinking on it.

Now, we are working under some time limitation, but I would very much appreciate hearing from you if there are any specifics

whereby you think you can improve not only upon Amendment 410, but also your own collective draft.

Now, we heard testimony earlier which revealed that viruses have been found in treated drinking waters drawn from surface sources in the United States. We further established that a large percentage of the population served by community systems gets its drinking water from surface sources under similar conditions of the treatment. One of you might tell us to what extent ground water systems in this country have been found to be contaminated by viruses or bacteria; also, Dr. Lehr, in your written statement you note that ground water sources serve 77 percent of all municipal systems in the United States and one-third of the general population.

What degree of treatment is commonly applied to these waters and what are the possible public health implications for such a large segment of the population relying on them for drinking water?

Third, should individual water wells be regulated under this legislation?

I have given you three questions there.

Dr. LEHR. To begin with, ground water generally is free from viruses in its native state. The only time that ground water would obtain virus is if a well is subject to contamination from a surface water source. That deals, then, with the third part of your question about the regulation of the construction of wells. That is if a well is improperly constructed or improperly placed with regard to the topography it is possible to get human pollution in the form of a virus in the ground.

It is, however, fairly rare and it is something that we can see, the source of this pollution can be seen very quickly and we can cut it off.

More readily obviously, then, we can with the surface water sources. So that we have a tremendous resource in the ground water. The problem is, however, that most of these 77 percent of all the systems that use ground water are very small and are even more poorly regulated than are the larger systems that utilize surface water. They, more than anything, need the trained personnel and surveillance that this bill would offer to see that these smaller systems are brought up to par.

With regard to the regulation of well construction, I strongly recommend some sort of Federal recommendations along this line.

Mr. JOHNSON. Mr. Chairman, it is very important when you are talking about ground water, and pollution in surface sources, to keep this in mind as you go through the new water pollution control legislation and the promotion of the concept of zero discharge, that there are some parts of the country in which this would work without much hazard. There are others in which it would be extremely hazard. I think when you begin to talk about zero discharge in terms of sewage water pollution effluent you have to be careful of where you are talking about it and not allow it to become a panacea, I think we can jeopardize our ground water supplies.

Dr. LEHR. Let me finish with these questions. I am saying well construction should be regulated in some form. We are trying to do it State by State, but less than half our States have adequate legislation

at this time. I think something should be in legislation that would control the construction of water wells and thus the utilization of ground water. Whether or not it is included in this bill depends on the political realities of the situation. If it can be included in the present form without slowing the bill down, I would favor it.

If, on the other hand, it would create problems that would impede the progress of this bill, I would rather see it in a separate piece of legislation to follow in the future.

Senator SPONG. Thank you, Mr. Black?

Mr. BLACK. Yes, I am afraid I would have to dispute Dr. Lehr's statement about ground water is not being contaminated with viruses. First of all, the ground waters all came from the rain and it just depends on how long it took them to filter down and just what purification it got. Viruses are submicroscopic and are not really filterable and are almost in true solution. We cannot say, I don't think, that they are or are not in well water. I know of a number of wells, for instance, in Florida, that are directly affected by sink holes in the near vicinity of these wells and we get, during periods of higher rainfall, even high organic colors from these wells 500 or 600 feet deep.

It has nothing to do with construction of the well. It has to do with the cavernous type formations we have in the area. This is not uncommon in the United States in any areas where you have lime formations or any other breaks in the subsurface which would allow water to filter down.

So I don't believe we can make that statement in whole.

Dr. LEHR. I would agree to the exception Mr. Black brings up, but I would say it is not common as we look at the broad scope of ground water resources.

Senator SPONG. Professor Dworsky, do you want to comment?

Professor DWORSKY. I just wanted to recall the rather—the situation in the Long Island area. Nassau and Suffolk Counties, the experience there has shown that the visible contamination has largely been that which was from the detergents as a result of draining septic tanks, the public system did not follow the housing developments so people have individual sewage home systems and so on.

These discharges into the ground and the visible effort has been detergents. What you are finding, of course, is materials from the septic tank. Professor Black has indicated that these viruses are very, very small, and one would hazard a concern for a good deal of the ground water in the heavily developed area which is not what Jay is talking about. We are talking about the heavily developed areas and this water supply becomes nearly in many ways unusable.

Mr. BLACK. I would also like to point out, Mr. Chairman, there are a number of drainage wells in various areas that allow surface water to drain directly into the underground formations. This is being largely stopped, but there is still a number in existence.

Senator SPONG. Mr. Vogt, in your statement you urge the Federal enforcement of drinking water standards be limited to when imminent and substantial dangers exist. Mr. Fri and I discussed this morning that very thing. I question whether we should tolerate any danger to health and suggest that EPA ought to enforce the standards if the States fail to.

One of the reasons you site against Federal enforcement of standards is the large duplicative force of inspectors that would occur. Granted, there would have to be a monitoring capability on the part of EPA. Wouldn't the bulk of information come to EPA by way of reports required of the States under section 302 (1) of the amendment?

Mr. Vogr. Mr. Chairman, some of the information would come in the form of reports but we believe that with the language elsewhere the Administrator would be obtaining the bulk of his information through routine surveys, studies, and investigations to determine compliance with the standards by his own staff. In any public water supply there are multiple barriers of defense designed into it and as Professor Dworsky pointed out back in the early forties when we had an active public water supply program in the Nation and the States had viable programs, we built in these multiple barriers of defense.

Now, in many cases those have been reduced to a minimum and the standards will not be met initially. There are a minimum of gross health hazards however it will take a while to build back the needed safety factors. With Federal financial assistance the States will build up their programs and through the constraints in the provisions for program grants the administrator will assure a timely and effective enforcement program without the need for specific sections on noncompliance, civil penalties, and so forth with their built-in duplication of routine surveillance by the Administrator. This will in effect be Federal enforcement through the States. Thus the authority of the Administrator through the constraints built into program grants plus the emergency authority results in a two-prong Federal enforcement authority.

Senator Spong. Mr. Black, in your statement you question whether drinking water standards can be developed within 90 days after passage of the act. For those contaminants that we know very little about, you have a good point. But I wonder why we should wait until we know enough about all the contaminants before we establish standards for those that we are most sure of.

EPA has a series of standards that are in effect now for interstate carriers. It seems we could adopt those standards quickly while we might have to wait longer for others. Do you agree?

Mr. BLACK. Mr. Chairman, we certainly agree that you should adopt some standards immediately. We had suggested that the existing U.S. Public Health Service standards be adopted as a start and certainly that those contaminants that you positively know and scientifically know that you can set limits for should be added.

I think you have pointed out this morning that we don't know how to determine whether or not viruses are in water except by the electron microscope and they just discovered this last year. How can we add that in a standard when we can't control it? We have no knowledge of it.

I further point out, mercury is an example. I don't know whether you know this or not, but we adopted our mercury standard, the one they were thinking about from the Japanese and the Japanese got it from the Russians and the Russians adopted it because it was

the limit to which they could analyze for. It had no basis insofar as physiological effects are concerned.

So it is an arbitrary standard. I don't think this committee or anyone wants to adopt a standard which is arbitrary or which is just conjured up just to have a standard in the standards. We certainly have no objection to the adoption of any proven standards. But what we are saying that there are so many that—so many unknowns, we should not put guesstimates in, we should know what we are doing and take the existing Public Health Service standards as a beginning and build from that. Have provisions in the law to add or take from as they are developed.

Senator SPONG. Thank you. I'll address this to any of you who care to comment. This will be the last question. If it occurs to the staff or myself to put any additional questions to you upon reviewing this testimony, we will do it in writing and we would appreciate it very much if you would respond in writing.

On Wednesday of last week, the Environmental Health Letter, a biweekly newsletter printed here in Washington, reported a proposal that EPA's laboratory facilities and personnel be transferred from their present location within the Categorical Programs and be consolidated under the more generalized authority of the Research and Monitoring Division.

Do any of you have an assessment of the significance of this proposal for the future of water supply development and research programs?

Dr. LEHR. I am aware of it and I strongly oppose it because it disarms what is left of the water supply agency within EPA now. This is what I addressed myself to that when you butcher it up and spread it out into the various functions, nobody has the whole picture. This is what is happening in moving all research into research areas.

Mr. BLACK. We would agree, we want to build it up, not take away from it.

Mr. VOGT. We would feel the same way, Mr. Chairman, in CSSE, that his would be a mistake.

Senator SPONG. Further comment?

Mr. JOHNSON. Yes, Mr. Chairman. I am afraid that at the risk of differing with my colleagues, I have to express a concern that we look at the environment a little bit in its totality and just as we cannot separate some of the concerns, some of the research and even some of the epidemiological investigation that accrues to the water pollution program, you can't isolate the water program either. Certainly I would want to see every stratagem used to make sure we have a strong national office for community water supply. I don't necessarily think that means that you have to have all of everything that the water supply office needs in one set of circumstances and isolate it from everything else. I think there has to be the authority as well as the responsibility to see that things get done. But I am very much in favor of a functionalized approach to the kinds of research that has to be done to protect the environment. Everything is interrelated and they are not separate. Just as we are concerned about our wall water supplies for domestic water supplies that same

supply that has to be the same environment that protects other ecological factors that support man or earth.

You can't look at it as a separate entity. Any way you look at it, what comes into that stream from wherever it comes eventually goes into some water supplies somewhere at some time. When you consider we need 1,300 billion gallons of water, we will have 700 to recycle, everything will have to be recycled. I think you have to show the relationship.

As a matter of fact, Leonard and I have agreed for many, many years that the tail is wagging the dog. The water pollution control effort ought to be an arm of the domestic water supplies because that is the primacy as far as man is concerned. It has been turned around. If you try to pull things out and keep them separately and all the dollars go to water pollution, you will not get the program that you really need to make sure that we keep our community water supply programs and systems in No. 1 shape. I don't think you can do it as a separate entity, necessarily.

Professor Dworsky. I think the most important matter is to see to it that new legislation of this sort, the Congress makes its intent known clearly to the administration so that there is some legislation after this. If there is nobody to look at it, it won't make any difference because nobody will be around. If you tell them what you want as a public policy and indicate the interest of the American people through your actions, then they will have some orders. Then I won't be too concerned about how it is organized as long as there are legitimate people, top-notch guys who can look after the technical interests within the organization. So what you do here is by far the most important thing.

Senator Spang. Well, I want to thank all of you for your testimony here today. I think we made a rather good record and I think the urgency is here and I hope that this committee will move forward without any undue delays on this legislation.

I thank you.

(Whereupon, at 4:12 p.m., the hearing was adjourned.)

## ADDITIONAL ARTICLES, LETTERS, AND STATEMENTS

STATEMENT OF HON. JOHN S. MONAGAN, U.S. REPRESENTATIVE  
FROM CONNECTICUT

Mr. Chairman, I am pleased to have the opportunity to present my views on water quality standards to the Subcommittee on Environment of the Senate Commerce Committee. The Subcommittee's findings have already proved both enlightening and alarming. They have revealed considerable shortcomings in present drinking water standards, and have evidenced the urgent need for a more inclusive system of public water supply regulations. For these disclosures, I offer the Subcommittee my commendation.

I am particularly interested in devising effective standards for what until recently was a virtually ignored aspect of our water resources—bottled drinking water. The growth of the bottled water industry is intimately related to the shortcomings in municipal water systems which the Subcommittee has revealed, and should logically be included in any legislation to improve public drinking water. I ask the Subcommittee to make this inclusion for the safety of the growing number of consumers of bottled water.

It is no secret that lack of confidence in the nation's drinking water has caused bottled water sales to soar. Citizens across the country, wary of their municipal water supplies, are quickly turning to supermarket substitutes. Each new pollution report increases demand. Bottled drinking water was once considered a luxury or a health cure. Today, it is considered a necessity by many, a daily item which significantly more citizens are now willing to pay for.

The bottled water industry has not failed to meet this extraordinary demand. Bottled drinking water is now sold from the shelves of most supermarkets. In some places, such water is dispensed through vending machines, and in many communities, it is delivered door-to-door with the morning milk and orange juice. No exact figures are available on bottled water sales, but it is clear that the industry has grown at an unprecedented rate. One estimate has placed the increase in home consumption during the last five years at over 50%.

While this increased demand is understandable, the present lack of safety standards for this product is incomprehensible, and demands immediate corrective legislation. At present, no specific and uniform federal standards exist to assure the quality and safety of bottled water products. And while the Food and Drug Administration has made a belated attempt to fill the gap in this area, there is presently no specific agency designated to handle this problem in the comprehensive fashion which the situation demands.

This lack of federal interest has left the responsibility in this field to the states. Unfortunately, as is clear from a survey of State laws which I have made, the states have done no better than the federal government in guaranteeing the quality of bottled water products. Most State laws are vague and ambiguous. Some do not mention bottled water at all, and often no governmental machinery is established to administer regulatory authority when it is granted.

The result of this patchwork of laws is minimal federal oversight, contradictory state participation, and considerable uncertainty for producers and consumers of bottled water. A producer may meet the standards of one State only to find that his product cannot be sold in another state. The majority of legitimate producers in the industry may be critically damaged by the one fly-by-night company which makes no attempt to establish quality or safety. Finally the consumer has no assurance that the bottled water he drinks is safe. In some locations, bottled water can actually reach the supermarket shelves without any kind of governmental testing.

A recent case in the Washington, D. C. area dramatically illustrates the confusion which can arise from this lack of federal standards. On July 11, 1971, the Washington *Evening Star* published the results of a bacteria test which showed that of four bottled waters tested, three were found to contain

much higher levels of bacteria than the six tap waters tested. As a result, two of Washington's largest supermarket chains, encompassing over 250 stores, removed several brands of bottled water from their shelves. The absence of a specific agency with power to regulate in this field prevented prior scientific advice in this case. While the supermarkets eventually obtained assistance, the ambiguity of jurisdiction served to erode public confidence in the safety of bottled water products.

It was to prevent this type of occurrence that I introduced H.R. 4147 over a year ago to authorize the Administrator of the Environmental Protection Agency to establish uniform Federal quality standards for bottled drinking water. This bill would allow the EPA to prescribe minimum health and safety standards for bottled water to monitor the industry for possible violations. The interstate transportation of bottled water products which fail to meet these standards would be illegal.

By establishing clear-cut responsibilities and specific regulations, this legislation would reduce the confusion which presently exists. Both consumers and the bottled water industry have recognized this fact, and I have received considerable support from distributors and buyers for this bill. I have also received considerable support in Congress, and on July 26 reintroduced my proposal with 32 co-sponsors from both sides of the aisle.

I urge the Subcommittee on Environment to translate this support into legislative action by including the provisions of H.R. 4147 in the water quality legislation now under consideration. The bill before the Subcommittee would "initiate and accelerate" a research and development program, and allow the Environmental Protection Agency to set minimum national hygiene standards for public drinking water supplies. It is only logical that the Environmental Protection Agency be empowered to establish uniform standards for commercial, bottled drinking water also. There is certainly a managerial advantage to placing authority for all water quality standards under one agency, the EPA. More importantly, however, there is a safety and health advantage. Both consumers and legitimate producers of bottled drinking water have a right to this protection. I ask the Subcommittee to assure that right by including the regulation of bottled water in the general water quality bill now before you.

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STATEMENT OF HON. HOWARD W. ROBISON, U.S. REPRESENTATIVE  
FROM NEW YORK

Mr. Chairman, and members of the subcommittee, some 4,000 years ago—according to an ancient Sanskrit source—the prudent man was ". . . directed to heat foul water by boiling and exposing to sunlight and by dipping seven times into it a piece of hot copper, then filter and cool in an earthen vessel." This direction, as we are told, was one given ". . . by the god who is the incarnation of medical science."

Well, we've come a long way in the water-hygiene field since then—or *have* we?

To be sure, from the standpoint of sanitation and the yardstick of some not-so-ancient standards, marvelous progress has been made—so much so, here in America and in many other parts of our World, that such words as typhoid, dysentery and cholera, have become mere anachronisms.

It is, indeed, a matter of national pride—though we have come to think of it as just a part of our way-of-life—that one can now travel anywhere in the United States and drink water from public supplies without fear of getting sick, a fact the accomplishment of which in many other nations, today, and even in our own land less than a century ago, would have been considered an idealistic dream.

But, Mr. Chairman and members of the subcommittee, as you already know, it would be terribly wrong of us to suggest that the quality, safety and adequacy of the municipal water-supply systems in America, today, are above reproach; and we would be guilty of apathy and contributors to a myth of the future if we allowed our satisfaction in what we have accomplished to lull us into the thought that we already know all that needs to be known about water-hygiene.

As the original House sponsor in the last Congress of legislation worked out in collaboration with Dr. Leonard Dworsky, the Director of the Water Resources and Marine Sciences Center at Cornell University—which legislation

we called the "Pure Drinking Water Act," and which bill, with some revisions, I have re-introduced in this Congress as H.R. 437, I enthusiastically welcome your interest, and am proud to be associated with all of you in now turning the public's attention away from those things that have been done in the field of water hygiene and focusing it on those other things still remaining to be done.

Mr. Chairman, Amendment 410 and H.R. 437 are so similar that one can assume we are virtually of like mind. It is not, therefore, necessary for us to waste our time attempting to convince one another of the need for action. Let me, instead then, concentrate during the balance of these brief remarks on two points which probably will echo throughout many of the statements that will be presented to you during these hearings.

The first is that Congressional action is necessary, *now* to assign safe drinking water—with established and enforceable health standards—a *specific, national priority*. The second is that debate over enforcement of those standards—which could become a thorny issue—should not be allowed to impede our common purpose of making at least a legislative beginning *during this session* in the area of demonstrable need.

As I have said, Mr. Chairman, our two proposals—the "Pure Drinking Water Act" and "Amendment 410"—are comparable in most respects. They differ in one major fashion, however, in that you add into the context of the basic purpose of the categories of water used not just for drinking but for "... recreation, and other human uses." I have some concern; I feel compelled to say with all due respect, that thereby we may run a risk of fragmenting that concentration of effort and allocation of resources necessary to develop, as rapidly as possible, the best possible standards for safe *drinking* water.

This is not to say, of course, that similar problems of public health do not exist for recreational waters. Assuredly, they do—but our most immediate concern must be with the water our citizens use daily for drinking or for preparing their food. As we all know, though it is important to avoid arousing public fears that there is some immediate health emergency, we are discovering more and more reasons to question the quality of the water we drink. The 1970 Community Water Supply Study, as released by the Environmental Health Service of HEW, and which report I assume is before this subcommittee, points up dramatically some of the reasons why Congress has an *immediate* responsibility to pursue those questions, and to enact legislation dealing *directly* with this *primary* problem. So, I would respectfully propose, Mr. Chairman, that the question of recreational water quality—which is a subject in and of itself—be considered in a separate amendment.

Also, I know from the public discussions that ensued after my introduction of the "Pure Drinking Water Act," that the professional and research organizations most responsible for the distribution and safety of drinking water in this Nation almost unanimously seek an increased Federal commitment to improved drinking water standards. At the same time, however, there is a wide area of disagreement among them as to the most suitable enforcement procedures for such national standards as we may help evolve. One has to assume that the fact of such disagreement will be graphically presented to you during these hearings, but along with—I am certain—a clear agreement that debate over enforcement procedures should not be allowed to serve as an obstacle to the establishment, *now*, of national drinking water standards, or to an expanded Federal research effort, *now*, in this essential public health field, along the lines you propose in your bill, Mr. Chairman.

Some compromise may, therefore, be indicated here if this essential progress is to occur. A host of options are possible, of course, but one I would also respectfully propose is that the non-compliance and enforcement sections of my "Pure Drinking Water Act" be joined with the "State Standards" section of the "National Water Hygiene Act of 1971," in order to arrive at an apparently more-agreeable, and yet still viable, enforcement program.

As to all this, then, I would merely conclude by saying that I fully believe it is time to begin to match our efforts and success at treating *waste* water—or in curbing the discharge of organic pollutants at the source—by a comparable effort to protect and treat the water resources and water in our drinking water systems. In doing so—and the legislation now before you provides such a starting point—we will, at last, be recognizing the need to consider the water-hygiene environment as a *total system* which, of course, it is.

Mr. Chairman, I thank you for this opportunity. I have great confidence in your wisdom and objectivity—and in that of your colleagues—and I look forward, under your leadership, to quick legislative action.

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STATEMENT OF ALICE T. RODES, WASHINGTON, D.C.

Mr. Chairman, members of the Committee, first of all I would like to say that I very much appreciate the privilege to be able to present to you, a statement, strongly supporting S. 1478, as amended, to protect the national public water supply.

I am Alice T. Rodes, wife of a retired Foreign Service Reserve Officer. My home State is New York, but presently I reside in Washington, D. C. I represent myself, my principal who is a senior citizen and a property owner of the Commonwealth of Pennsylvania, also several others with property interests in the same State.

My numerous inquiries as to the existence of Federal statutes whereunder individual water consumers may compel State officers to enforce regulations for drinking water standards, frequently prompts the question as to what consumer group I represent. The answer is: None. But countless persons, aware of my six-year dispute over a potentially dangerous water problem, with Commonwealth of Pennsylvania public officers at both local and State levels, describe me as the embattled chairman of a committee of one, for the enforcement of State laws pertaining to public water supplies to protect the individual domestic water consumer. In this respect, I conceivably represent, informally, certainly one of the largest consumer groups in the United States. To my knowledge, though, also according to the most informed sources in the Environmental Protection Agency, there is no known association or established groups formed by domestic water users in the country.

Perhaps domestic water consumers—users, buyers, or whatever they may be called—are not yet organized and have no advocates (or lobbyists), like the consumers of manufactured goods, is because they do not consider themselves as “consumers” within the common speech meaning or legal definition of the word, “one who uses economic goods and so diminishes or destroys their utilities.” But under previous and present pollution control programs and operations, the finished potable substance, furnished to millions daily, comes closer to the meaning of the word “product” than to the dictionary definition of water, “the liquid that descends from the clouds in rain.” Clearly, the time has come for lexicographers to re-define the word “consumer” to include the users of finished, potable substances.

Of major importance to the average citizen is the provision in the bill for Federal enforcement, by actions against violators, in the name of the United States, thus obviating costly and invariably unsuccessful litigation by individuals, who may and often have substantial disputes with violators of State laws, even with the State itself. Present Federal statutes give no standing to consumers, for instance, of potable substances, to sue in Federal court. The pending legislation is badly needed and long overdue, because of the failure by too many States to enforce their own laws for the protection of their public water supplies used for domestic purposes.

It would be presumptuous on my part, since I'm not a qualified environmentalist, to add to the testimony already given by scientists and other experts, in support of this Committee's notable efforts to put through effective legislation to control one of the nation's greatest problems—pollution—of its air, and of its most needful and priceless natural resource, its waters. My statement, therefore, will be limited to the subject of my six-year water problem dispute with Pennsylvania's public officers that has become complex to the point of absurdity, because of (1) the failure of responsible State officers to uphold and enforce existing State laws, (2) absence of needed State statutes, and the need for clarification of some muddled laws, and (3) lack of a Federal statute expressly providing for an action, in such disputes, in a Federal court. It would be my hope this statement will evidence the need and urgency for the Federal enforcement provision.

For more than a decade the persistent voices of scientists have been heard in every State, warning of the potential dangers to humans, if uncontrolled, of the ever increasing pollution of our waters, including drinking water supplies. Their voices have been joined in recent years by those of the technologists in every field touching upon our environment, within the meaning of

the word as defined under Section 202. (g) of the bill, S. 1478. Additionally, there have been daily and thunderous attacks upon the polluters in the national press, yet despite the mighty sound heard throughout the land, it is incredible that the States do not include the water consumers within the protection of any provision of their consumer laws. Among the States which specifically do not is Pennsylvania, the third most densely populated in the nation, with some pretty awfully polluted waters.

On March 13, 1972, in response to my latest letter to the Bureau of Consumer Protection, Office of the Attorney General, Commonwealth of Pennsylvania, Harrisburg, Pa., relative to a complaint I registered originally with that bureau four years earlier, I was advised by Mr. Joel Weisberg, its new director, that "Your letter of February 29, 1972, addressed to my predecessor, Mrs. Bette Clemens, has come to my attention. I am sorry to have to inform you that the Bureau of Consumer Protection is only authorized to deal with complaints against merchants and cannot act in any facet in the case which you outlined." He advised, however, that he had reviewed the complaint carefully in the hope he might be of help, noting there had been difficulties with the Public Utility Commission and that he would urge the PUC to take action. He also stated court action would seem to be appropriate in this case.

In view of all the adverse decisions already entered in this heinous case between the years 1966 and 1971, without so much as one hearing on the merits—by a corporate agency of the State, by four different courts, and by the Public Utility Commission—further court action in Pennsylvania without the support of the Federal Government, would be a waste of time, and no more effective than an assault on a large June bug by a little, "rained-on bee."

In all fairness to Mr. Weisberg it should be noted, the referenced letter omitted background details, since they are of record in the Attorney General's office, in the courts, the PUC, and in several administrative agencies.

In 1970 two complaints were registered with Mr. Weisberg's predecessor. Mrs. Clemens acted promptly by requesting the director of the PUC's Bureau of Investigations, Service and Enforcement, to follow up the case, but obviously, the PUC as theretofore since 1966, did absolutely nothing, in defiance of the law that created the Commission and defined the duties of its officers.

Two years earlier the original complaint was made to Mrs. Virginia Knauer who headed the Bureau in 1968. She too, had acted promptly, by assigning the complaint to an investigator who, she advised, would be contacting me shortly. This was on April 24, 1968. In my February 29, 1972 letter, I wrote Mrs. Clemens, among other things, I had yet to hear from any investigator although I had spent much time and money in the attempt to contact the one assigned to the case. I resisted the urge to include the fact that in 1969, shortly after I had informed a division of the U. S. Department of Justice by letter that there was reason to believe the case was being tampered with, I discovered from persons who were interrogated that I was among two persons who had been "thoroughly investigated".

In essence, the several complaints to the Bureau of Consumer Protection outlined a case where a serious deficiency existed in one part of the public water system that State Health Department officials believed constituted a health hazard to the entire community. It was set forth that the local purveyors, several different entities, were improperly operating the vital utility, contrary and in violation of existing State laws, and that they refused to correct or alleviate the condition which was most acute on the properties owned and administered by my principal. Consequently, she refused to pay for service not rendered—only on paper. The complaints asked a simple and logical question: Whether an unregistered, not duly organized entity may collect water rentals, on direction (and threats of legal action) by a functionless but registered corporate agency of the State, from a water consumer who is badly served and disputes the unregistered, illegal entity's right to collect such rentals, or to penalize the consumer for failing to pay for service rendered only on paper?

This water dispute is part of another, multiple-issue legal case, now in its seventeenth (17th) year of litigation in the local, inferior State court, involving a disputed agreement for the sale of land.

(In that protracted case, refusal by the elderly defendants (one now dead) to deliver a deed to the plaintiff, a developer, precipitated the water problem—

in an act of retaliation. Ultimately, the developer procured a court-ordered deed, but ever since, the widow (my principal) has been attempting, by due process of law, to recover her own and her decedent's realty. Although the lands in dispute have already been cut up into a subdivision in which public officers, and the owners and operators of the local water system have vested or other interests, construction has been held up by the pending litigation. Consequently, the purveyors refuse to repair or replace one section of the public waterline in an area voluntarily served, i.e., outside the municipality's corporate limits. It is the same section serving, among others, the properties owned and administered by the widow.)

The genesis of this water problem is of paramount importance in that it fully discloses its public nature. Local officers, to circumvent the law, and shun public duty and responsibility, have continually made it appear as though the matter were a private one. On the other hand, State officers, whose duty it is to enforce the relevant State laws and collect the penalties for the violations, have looked the other way.

About 1932 State Highway Department engineers began to make maps for the relocation of Legislative Route 8 in Northeastern Pennsylvania which would cut through a tract of land owned by my family. In 1935 when the bulldozers dug the roadbed for the new route, all of the old and new water and sewage lines running to and from the property were totally destroyed, resulting from the connivance and collusion by the engineers with local officers, who among other things, altered the original map which showed the precise position of all the lines, including other obstructions. Each and every entity involved at the time, such as the State, the adjacent Borough, the Township, the County, the local water company, and all of their officers, disclaimed responsibility for the catastrophic damage. Only after a member of the family made a direct appeal to the Governor the water service was restored to the estate (containing 96 acres). In those days a governor was not surrounded by several cordons of attorneys-general. The personal contact produced immediate action. However, reinstallation of the water line, directly at a point that was to be the intersection of the old and new highways, was haphazard, contrary to Highway Department regulations, and without consideration for future repair or replacement.

In 1956 the local water company extended service outside its chartered territory to accommodate a motel then under construction, by connecting the new line to the old, defective section running under the highway. Aside and apart from the obvious foul play involved, the new extension proved to be an engineering disaster. The local water system is powered by gravity wherefore the water on the properties situated on higher levels was diverted to the motel, on the lower level. Eventually, it too, complained about deficiencies, the primary cause of which was the old, inadequate-sized line under the intersection.

(The local water company's solicitor was the legal counsel for the plaintiff developer in the disputed contract case in which my principal and her husband were the defendants. In 1962 the solicitor was shot to death by a Borough resident with whom he reportedly had a long and bitter dispute over a water or sewage line running under a rug-sized parcel of land in the town.)

In 1966 the deficiency on all the surrounding properties became acute. By this time the face of the political subdivision had changed, as well as the ownership of the local water company in the adjoining Borough (an incorporated town.) In addition, the entire area had come within the fuzzy boundaries of the Federally sponsored and planned recreation area around the now-controversial Tock's Island Dam, established by Public Law 89-158 on September 1, 1965.

In the same year, i. e., 1965, the adjacent Borough (pop. 1,200) formed an authority under the Pennsylvania Municipality Authorities Act of 1945 to finance the purchase of the privately owned water company which was under the regulation of the Public Utility Commission. In Pennsylvania such authorities are not government entities in the same sense as cities or boroughs are, but as local government units they enjoy liberties not granted by the Legislature to the municipalities that form them nor are these authorities under any State supervision.

When the deficiency developed into an emergency (in 1966), no one, neither the affected property owners nor their prospective counsel could determine which entity to register a complaint with. Several different entities appeared

to be operating the public utility, but not in a manner provided for by State laws. They were: (1) the Lessee (Borough) which fixed the rates, established the rules and regulations, appointed the officers, and controlled the finances; (2) the Lessor (Municipal Authority), nominal owner of substantially all, but not all of the predecessor utility's properties, which entity, instead of retiring into its shell after lease-back to the Borough in 1965, as provided for in its Deed of Trust in connection with a \$205,000.00 bond issue, acted as the legal advisor to all the entities, chief enforcer of the Borough's ordinances relative to the water business, and as the supreme authority thereof; (3) the agent (Water Authority), whose sole function, on paper, was collection of water rentals and arrearages, but according to general belief by local residents, this entity was the principal one, yet public records fail to disclose the formation of a "water authority" or registration of its fictitious name. Likewise, the records fail to indicate any change of status, by amendment, of the Borough's registered authority which was made functionless by the lease-back. Causing more confusion was the similarity of names of the Borough, the Municipal Authority, the Water Authority, the old water company, and two other fictitious names used in the business. Only two of the six are registered. Compounding the confusion was the fact that most of the old water company's agents and servants were the same as those of the various entities.

The emergency was first reported to the Borough's mayor who referred it to the agent (Water Authority), and after it failed to act, an informal complaint was made to the "Municipal Authority", which entity dismissed it without hearing, for lack of jurisdiction of the line causing the trouble, without identifying the particular one believed to cause the problem. All requests to be heard at public hearings on the matter were ignored, and a second written complaint was also dismissed.

Every State remedy was tried without success, including an attempt to present an emergency petition in the local court to compel production of a copy of the official pipeline map, to enable privately retained engineers to ascertain the cause of the acute deficiency. The court declined to accept it. Indirectly, it was learned the court lacked jurisdiction of the matter. Thereafter, a complaint for mandatory injunction to compel restoration of water to her premises was filed by my principal against the Municipal Authority (nominal owner of the water system) in the United States District Court, under the only available Federal remedy, Section 1983, Title 42 of the United States Code and the Fourteenth Amendment of the U. S. Constitution.

The complaint was dismissed without hearing on the merits for lack of jurisdiction by the court. The defendant authority claimed governmental immunity. A timely motion (to rehear the motion to dismiss) was denied as untimely and illegally filed—by me—which it was not.

An appeal was taken in the U. S. Court of Appeals to determine the question of jurisdiction where it was dismissed for lack of timeliness, before it was perfected. Upon proof of timeliness the appeal was purportedly reinstated. At this stage of the irregular proceeding, I was improperly appointed guardian ad litem for the aged complainant (in a court decidedly without jurisdiction), and at the same time I was improperly, unnecessarily, and trickishly substituted as "appellant". I was never made a party to the original action, having accompanied and assisted the plaintiff as a "friend of the court" because she is deaf.

Subsequently the Court of Appeals affirmed the District Court's dismissal without determining the question of jurisdiction. The judgment was entered against me, with costs, in a hypothetical case, ingeniously brought before the Appeals Court by the Authority's mischievous counsel, numbering more than a dozen whereas the one, senior attorney I retained had long since withdrawn representation for health reasons.

Rehearing was denied. A second petition for rehearing, with documented evidence in support, was also denied.

A petition for certiorari physically reached the clerk's office of the highest tribunal where it was read-listed, and never came before the Court. A "cloak and dagger" interlude followed the service upon the Solicitor General of a notice of the existence of a Constitutional Question, with regard to Public Law 89-158. My former attorney had notified the Court of Appeals about this Question but the record fails to disclose it.

Had anyone in the Solicitor General's office taken the time to read any portion of the record other than the deceptive judgment of the Court of

Appeals in the hypothetical case, the matter would have been remanded back to the District Court. Instead, it was scheduled for disposal in the waste basket. I recovered my papers eventually as they contained an irreplaceable document that was included by error.

In the interim, a formal complaint was filed with the Public Utility Commission against the Borough as Lessee, and the old water company (given perpetual life by the State Legislature in 1873) that has never duly dissolved. Both respondents filed motions to dismiss on grounds the Commission lacked jurisdiction. Without hearing of any kind, the PUC granted both motions and dismissed the complaint for lack of jurisdiction, on January 12, 1970. A petition for rescission was promptly filed but never acted on.

Aside from the Federal Court and PUC complaints, an avalanche of letters and petitions were directed to State officers. It was pointed out that private citizens lacked the authority to open State highways, and lacked the right of eminent domain. In July, 1970, after the State Health Department was convinced that the PUC had jurisdiction of the pending action it filed a petition to intervene, and shortly thereafter, the Commission vacated the order of dismissal, but improperly, so that it has been impossible to proceed therein according to the Commission's own procedural rules.

In the same month, July 1970, the Municipal Authority triumphantly announced receipt of an "award" of \$275,000.00 for damages to its reservoir in the construction of Interstate 84; also, that it would dissolve immediately upon receipt of the money. Since the termination of the Borough's legal dummy would substantially disturb the status quo in the two pending actions, I requested the Secretary of the Transportation Department to withhold payment of the non-judicial award until conclusion of the PUC case and the still pending Federal Court action. The Secretary suggested an application for injunction if I had any legal basis for same.

On September 1, 1970 a complaint to preserve status quo was instituted against the Secretary in the new Commonwealth Court of Pennsylvania, docketed as Case No. 1. Several days later a deputy attorney general authorized payment of the money, without my knowledge, and three days later an assistant attorney general filed preliminary objections without disclosing that the payment had been made. In July, 1971 the complaint was dismissed for failure to show a cause of action. The preliminary objections have never been disposed of.

By this time the State Health Department turned the matter over to the Strike Force, reportedly the most effective enforcement arm of the State Government. However, Pennsylvania's Department of Justice theretofore ignored all requests for intervention in the PUC case although warranted, and disregarded all reported violations of State laws in the matter of the improper operation of the local public utility. In addition, the Attorney General himself, improperly opposed me in the Commonwealth Court case which was not an action against the State, merely an application to enjoin the Secretary of Transportation from performing a discretionary act—not a duty. The proposed converse solution by the Strike Force was turned down as contrary to common sense and justice.

To illustrate the extent of absurdities here involved I'll set forth the gist of one paragraph of a letter to a State officer:

In 1966 the deficiency was reported as a health and engineering problem. The purveyors dismissed it as a legal matter. When it was presented to the Health Department, together with the legal facts, the Department advised the problem could not be looked into only after the complex legal situation was settled in the courts. But the courts dismissed the matter for lack of jurisdiction. Previously, the Health Department advised if the Public Utility Commission had jurisdiction it could file a formal complaint with the Commission. Upon dismissal of my formal complaint by the PUC, for lack of jurisdiction, and subsequent proof that the Commission had jurisdiction, the Health Department was unable to file suit locally for inability to secure local counsel to represent the Department. Thereafter, the Borough's dummy alleged that only matters of engineering and technical natures were involved. When pursued again from an engineering angle, the purveyors stirred up a new legal question and the Regional Health Office referred the case back to its Office of Legal Counsel, for need of a legal decision since an engineering decision would not resolve the problem. The Strike Force's proposed solution would result

in a purely engineering decision. The matter cannot be resolved with common sense and justice without a legal decision also—which would automatically resolve the engineering question.

Several State officials had commented that solid gold pipes could have been installed, in view of the high cost of litigation to both sides. The Borough reportedly spent some \$18,000.00 in defense of its dummy's claim of immunity, and the alleged lack of jurisdiction of the various judicial bodies before which the matter was presented in one form or another.

It is pertinent to state here that the nub of this "perfect nonplus and baffle to all human understanding" was the taking of the choice portion of my family's property for the use of the traveling public, during the relocation of Legislative Route 8, by the Commonwealth of Pennsylvania—without any compensation. This was accomplished by the artful combination of two separate takings, discovered only in 1968-69 in my personal search for the cause of the deficiency, after it was reported but ignored by the local purveyors. For lack of a day in court or before the Public Utility Commission on the merits, the major health hazard was never fully studied by the Health Department that appears to have lost interest in the matter. But in the light of recent disclosures in the press relative to harmful viruses found in some drinking water supplies the potential hazard should be investigated.

Buried from view, sitting astride the intersection of the old and new Legislative Routes 8, whereunder runs the defective, improperly reinstalled waterline, is a large cesspool, jerry-built in 1935, on the site specially selected by State Highway Department engineers, over the vigorous objections of the registered owner of the premises at that time—in further consequence of the alteration of the original map, approved by the State Governor in 1934. This fact is a matter of official record, but also buried—deep in Harrisburg files.

When one considers the lay of the land, and position of the unprotected and defective waterline under the intersection, also the generally low pressure in the entire area, it is anyone's guess how much pathogenic bacteria enters the community's water system at this point. One of the reported "leading motels" in the Northeastern United States, according to a travel brochure, is furnished with water directly through this defective line.

In closing, Mr. Chairman, I would like to stress again the need for Federal enforcement of all violations of laws pertaining to public drinking water supplies, as proposed by the bill. From my own awful, personal ordeal I know that court action by a private citizen against a corporate entity, to compel compliance with State laws, is an exercise in futility, as evidenced by the dismissals in the courts and by the Public Utility Commission. In Pennsylvania, the Municipality Authorities Act itself is, to a certain extent, one of the reasons. In a State Supreme Court decision of a case with about eleven plaintiffs brought against a city and its authority, entered January 25, 1971, involving similar issues as in the instant matter, Chief Justice Bell said in part: "I join in the Majority Opinion, but feel compelled to add the following: The legislation in the field . . . , and the jurisdiction of the issues . . . are so muddled and confusing that they should be quickly clarified by the Legislature. . ." But the Pennsylvania Legislature may not get around to clarifying the Act of 1945 for some time—and maybe never. I sincerely believe the pending legislation sponsored by this Committee will cure the muddled laws in all the States, and thereby secure the safety of America's drinking water.

Thank you for the opportunity to present my views.

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MARCH 7, 1972.

Mr. WILLIAM D. RUCKELSHAUS,  
*Administrator, Environmental Protection Agency,*  
*Washington, D.C.*

DEAR MR. RUCKELSHAUS: The Subcommittee on the Environment will hold a hearing on March 20 on Amendment No. 410 to S. 1478, the Toxic Substances Control Act. As Amendment No. 410 would expand the potable water program now existing within your agency, the subcommittee would appreciate your testimony on the pending amendment.

The hearing will begin at 10:00 a.m. in room 5110 of the New Senate Office Building. Please bring 50 copies of your prepared statement to the hearing and make three copies available to the committee staff by March 17.

To enable the subcommittee to properly evaluate the need for the legislation I would appreciate your furnishing the following:

1. A brief synopsis of the Environmental Protection Agency's survey of 10 State public water supply programs. It is my understanding that one survey has been published and progress has been made in the evaluation of several other State programs.
2. The results of any studies you might have made to review EPA's administration of interstate quarantine regulations.
3. A status report on EPA's review of manpower and training needs to administer public water supply programs at the State and local level of government.
4. A brief description of EPA's research program to insure a quality drinking water supply and the laboratory facilities at your disposal to carry out that program.
5. A brief description of any survey's EPA might have made with respect to water supply programs and conditions at Federal installations.
6. The results of any studies on the quality of bottled water in this country.

In spite of this lengthy list, I must ask for your response by March 16. If you have any questions please contact Michael B. Brownlee, at the committee staff, at 225-9345.

Sincerely yours,

WILLIAM B. SPONG,  
*U.S. Senator.*

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ENVIRONMENTAL PROTECTION AGENCY,  
OFFICE OF THE ADMINISTRATOR,  
*Washington, D.C., March 20, 1972.*

HON. WILLIAM B. SPONG,  
*U. S. Senate,*  
*Washington, D.C.*

DEAR SENATOR SPONG: The Environmental Protection Agency is pleased to accept your invitation to testify on Amendment 410 to S. 1478, the Toxic Substances Control Act. In response to your request for certain information as to the status of the current Environmental Protection Agency's drinking water program, I am enclosing the material for which you asked.

I hope that this information will be helpful to you and am looking forward to working with the Committee on the drinking water program.

Sincerely yours,

ROBERT W. FRI,  
*Deputy Administrator.*

Enclosure.

1. *Survey of State public water supply programs.*—Current evaluations of water supply programs are being conducted in nine States during this fiscal year. Last year an evaluation of Tennessee was completed, and partial evaluations conducted in Maryland and New Mexico. During FY 72 the evaluations in these two States, as well as seven other States as listed below, will be continued. These evaluations are being made as a result of the findings of the 1970 Community Water Supply Study of 969 water systems which revealed gross inadequacies in State surveillance programs, such as the fact that seventy-eight percent of supplies had not been inspected in over a year. The evaluations involve a representative sample of water supply systems and include a review of State policies, surveillance, monitoring, training, and technical assistance activities; a study of their bacteriological and chemical analytical capability; and field evaluations supported by bacteriological and chemical analysis of water quality. In addition, on the basis of the initial selection of the ten States for evaluation, a contract was awarded to Tobin Associates. This contractor assembled pertinent laws, rules, regulations, and policy statements concerning drinking water in each of these States. The contract was completed in January, and data was compiled for Connecticut, Puerto Rico, Maryland, Kentucky, Indiana, Kansas, New Mexico, Wyoming, Arizona, and Idaho. This information will enable the States to determine their legislative needs for the future.

The report of the findings of the survey will include detailed recommendations of needed improvements and associated costs. In the already completed

Tennessee evaluation, serious problems have been discovered, leading to the conclusion that the annual State water supply budget should be increased from \$330,000 to \$510,000 to support an adequate program. In Maryland, the engineering staff should be increased from four to ten positions in order to upgrade surveillance over water supply systems. A similar level of increase is indicated in New Mexico.

A summary of the status of the evaluation of State programs in the current fiscal year is as follows:

<i>State</i>	<i>Status</i>
Connecticut -----	Evaluation to be started in April and completed in September.
New Jersey (replaces Puerto Rico at request of regional office).	Evaluation to be started in March and completed in October.
Maryland -----	Final report under preparation with completion scheduled for June.
Kentucky -----	Final report drafted with completion scheduled for May.
Ohio (replaces Indiana at request of State).	Field work in progress. Report completion scheduled for June.
New Mexico -----	Field work substantially completed. Report completion scheduled for June.
Kansas -----	Evaluation to be started in March and completed in July.
Wyoming -----	Field work completed. Report completion scheduled for June.
Arizona -----	Evaluation canceled—no schedule established due to regional priorities.
Idaho -----	Field work substantially completed. Report completion scheduled for June.

2. *EPA review of the Administration of Interstate Quarantine Regulations.*—EPA has considered the merits of redefining an interstate carrier water supply system under existing legislation. Presently the term refers to systems serving trains, planes, buses, and vessels engaged in interstate travel. Legal authority for this activity is based on Section 361 of the Public Health Service Act of 1944, as amended, 42 U.S.C. 264, authorizing the establishment of regulations to prevent the interstate transmission of communicable disease.

When the first drinking water regulations were enacted in 1912, trains and vessels were the most common means of interstate transportation. Subsequently, the definition was broadened to include buses and planes. Now, however, with the advent of the Nationwide highway system and the modern automobile, this conveyance should truly be defined as an interstate carrier. Thus, it is conceivable that every water supply system serving the interstate traveler at rest stops, Federal and State public camp areas, service stations, restaurants, and motels along interstate highways could be classified as an interstate carrier water supply system. No accurate estimate of the number of systems involved is available but certainly it would be many thousands, compared with the 670 now subject to Federal jurisdiction.

A basic problem in this approach to expanding the definition of an interstate carrier water supply is that the basic authority is limited to factors causing the transmission of *communicable* diseases. Therefore, existing authority does not provide for the establishment and enforcement of standards relating to chemicals in drinking water.

It is felt that to simply amend the current regulations and expand their limited coverage would result in a regulatory system that would be cumbersome and impractical to enforce.

3. *Environmental Protection Agency's review of manpower and training needs to administer public water supply programs at the State and local level of government.*—In June of 1971, EPA completed a compilation of State expenditures for State drinking water supply programs. Based on estimates of the 1970 budgets, the average expenditure per system for all 50 States, the District of Columbia, and the Territories was \$287.00. Studies conducted by the Water Supply Programs Division indicates that a minimum of \$650-800

per water supply system should be spent by States for their drinking water program.

On a National basis, the States are spending a total of about \$10,000,000 annually. Based on EPA's estimates, they should be spending about \$30,000,000. In terms of manpower, the States currently employ about 300 engineers involved in water supply activities. This is about one third the number required to support an effective program at the State level.

The detailed evaluations of State water supply programs noted in item 1 are confirming the cost and manpower figures developed by prior studies and estimates.

There is a continuing need to upgrade the qualifications of State personnel administering water supply programs and to encourage new personnel to enter the water supply field, but the major training need is among the managers and operators of water supply systems. Increased staff and resources at the State level to conduct training programs is a prerequisite to providing a meaningful training effort at the water plant level.

4. *Environmental Protection Agency's Water Supply Research Program.*—The EPA Water Supply Research Program has the ultimate objective of providing the scientific base to assure safe and aesthetically acceptable drinking water for all consumers in the Nation. This research is essential for the promulgation of drinking water quality standards, the improvement in water storage treatment and distribution practices, and intelligent surveillance and monitoring of drinking water supply systems. Major research activities include:

A. Identification and health related evaluation of disease producing and toxic agents that may find their way into drinking water supplies. The following are examples of research in this area:

(1) Development and application of methods for the isolation and identification of viruses and bacterial pathogens of sufficient sensitivity to detect the quantities likely to be present in finished drinking water. The products of this research are applicable to the development of treatment methods, to the development of bacterial criteria for drinking water, and to the determination of finished drinking water quality.

(2) Development and application of methods for recovery and identification of organics in drinking water. These procedures will isolate organics from the water in an unaltered state and provide means for identification, purification, and the production of a material suitable for toxicological assessment.

(3) Studies to determine the acute and the long-range chronic effects of organic and inorganic chemicals that may be found in drinking water. Many of the 12,000 different toxic chemicals in industrial use today may find their way into drinking water sources. Knowledge of the long-range effects of man's exposure to water is essential for the development of safe tolerance limits for these materials in drinking water.

(4) Epidemiological investigations of water-borne diseases and toxicities are needed to elucidate the relationship between water quality and disease. Such information is required in the development of quality.

B. Development and evaluation of water treatment processes. Conventional water treatment processes are ineffective in removing many inorganic and organic chemicals that may be found in drinking water supply sources. Research is conducted to develop and evaluate innovated processes and techniques for the removal of these potentially toxic chemicals.

Recent studies have demonstrated that many types of enteric viruses are resistant to the usual levels of chlorine doses. This evidence has been obtained for approximately 25 of the 100+ known enteric viruses, using laboratory cultured strains of the viruses. Studies are continuing on the remaining 75 types, and if indicated the findings will be validated in *in situ* studies on naturally occurring viruses.

C. Development of simple rapid methods for detection and quantification of bacteria, chemicals and toxic agents in water. Many of the current assay methods for contaminants in water are complicated and time-

consuming. They are, therefore, not applicable to routine monitoring of drinking water supplies, particularly if the analyses are to be conducted in water plant laboratories or by field investigations personnel. Our scientists are engaged in the development of bacterial assays that can be completed in a few hours, the development of automated analytical systems for chemical constituents, and the development of rapid screening tests using cell culture techniques for toxic agents in water.

At the present time available facilities related to public water supply standards and development and other drinking water oriented research activities are shown in the attached Table I.

TABLE I.—EXISTING LABORATORY RESEARCH FACILITIES; WATER SUPPLY PROGRAMS DIVISION

Name and location	Occupancy status	Gross space (square feet)	Staff		Types of laboratory facilities
			Capacity	On board*	
Northeastern Water Supply Laboratory, Narragansett, R.I.	Government-owned....	20,000	33	35	Chemistry, virology, microbiology, toxicology, wet laboratory with water temperature control.
Gulf Coast Water Supply Laboratory, Dauphin Island, Ala.	-----do-----	12,000	23	25	Similar to the Northeastern Laboratory.
Northwestern Water Supply Laboratory, Big Harbor, Wash.	Temporary building, State-owned.	3,700	7	12	Bacteriology, virology, limited chemistry capability, small wet laboratory.
Cincinnati Water Supply Laboratory, Cincinnati, Ohio.	Government owned....	15,000	51	43	Chemistry, microbiology, toxicology, pilot plant for water treatment studies.

5. *Environmental Protection Agency surveys of water supply programs and conditions at Federal installations.*—EPA has no legislative authority to investigate any Federal water supply installation other than those serving interstate carriers. However, under the broader authorities contained in Section 301 of the Public Health Service Act of 1944, as amended, 42 U.S.C. 241, it does not have the authority to conduct studies pertaining to man's health. On this basis EPA is conducting a series of pilot studies of potable water supply systems built by, or with the assistance of, Federal agencies. There are an estimated 11,500 Federally related water supply systems in the United States.

As part of the State evaluations discussed in Item I, we are in the process of conducting studies of closely related activities including water supplies at Federal reservoir installations constructed by the Corps of Engineers and Bureau of Reclamation and at national park camp areas and on Federal interstate highways.

The results of pilot studies completed show 15 percent of the water supplies exceed bacteriological quality limits and 23 percent of the supplies exceed either the bacteriological or the chemical mandatory limits. Summation of data for the Corps of Engineers and Bureau of Reclamation Studies is contained in Tables II, III, and IV.

TABLE II.—SUMMARY OF CORPS OF ENGINEERS RESERVOIR PROJECT WATER SYSTEMS EXCEEDING DRINKING WATER STANDARDS

	Systems exceeding limit				From mandatory list	Systems exceeding limit			
	Indiana (23)		Ohio (33)			Indiana (23)		Ohio (34)	
	Number	Percent	Number	Percent		Number	Percent	Number	Percent
Iron.....	13	57	13	40	Coliform organisms.	4	17	7	21
Manganese.....			14	42					
Total dissolved solids.....	4	17	3	9					
Zinc.....	4	17	1	3					
Chloride.....			1	3					
Turbidity.....	5	22	24	73					
Color.....	2	9	4	12					





6. *Studies of bottled water quality.*—After the release of the Community Water Supply Study in May of 1970 which cited deficiencies among the Nation's water supply systems, a rapid growth occurred in the sale of bottled water.

This prompted EPA to look into the quality of this source of drinking water. A meeting with the Food and Drug Administration revealed that they had developed no specific standards or regulations governing bottled water, had no active monitoring program, and could not provide any definitive information concerning the quality of bottled water. The Water Supply Programs Division's review of State or territorial laws and regulations governing bottled water, completed in February 1971 indicated that 22 had no specific regulations, 24 had vague requirements, and 8 had possibly acceptable requirements.

Consequently, a small pilot study of bottled water was initiated in November 1971 to lay the groundwork for a more definitive study if it was found to be warranted. Field and laboratory work has been completed. A report of findings and recommendations is now under preparation.

The survey consisted of a field evaluation of the water source, processing facilities, and bottling operations; chemical and bacteriological examinations; and a special study to determine the change in bacteriological quality of stored water.

Preliminary findings do not indicate a significant number of violations of the constituent limits of the Federal Drinking Water Standards, however, evidence of inadequate quality control was found. The effect of storage upon the quality of the water is yet to be determined.

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ILLINOIS STATE WATER SURVEY,  
Urbana, Ill., March 17, 1972.

HON. PHILIP HART,  
Chairman, Subcommittee on Environment, Committee on Commerce, Washington, D.C.

DEAR SENATOR HART: As an individual, a chemist by profession, and Chairman of the American Chemical Society's Joint Board-Council Committee on Environmental Improvement—and as the responsible Chairman of the Task Force which prepared the A.C.S. Report on "Cleaning Our Environment"—I should like to commend the purposes of Amendment 410 to S1478, and specifically those Sections relating to Research and Training.

Your attention is called to the number one priority for the water environment on p. 11 of "A Supplement to—Cleaning Our Environment, the Chemical Basis for Action" which has been reproduced as an Appendix to this letter. Of the 23 recommendations for the water environment in the original document, 5 are designated in the Supplement as urgent priorities for action. The suggested level of funding in this recommendation is truly a bare minimum for organization and development of programs in research. Therefore, the authorizations proposed in Amendment 410 are entirely appropriate.

In part, these authorizations are required for research related to the development of sound scientific bases for the establishment of rational Standards. As the American Chemical Society's representative on the 1962 committee and on the current E.P.A. Public Advisory Committee on the Revision and Application of Drinking Water Standards, I have noted with concern that an adequate scientific base is not available for many of the proposed limits, and is nonexistent for other limits that may or should be established. This type of research takes much time and manpower, and is long overdue. The single most urgent need, in addition to greater knowledge on viruses, is in the area of organic chemicals some of which are becoming increasingly visible as current or potential hazards to man. Your attention is called to two additional recommendations on p. 151 of the original document.

*Recommendation W17:* Research should be strongly encouraged on the effects of known water pollutants in long-term, low-level exposure. Both laboratory and epidemiological work will be required.

*Recommendation W18:* Studies should be maintained on enteric viruses and their movement in soil and ground water.

In the absence of a sound scientific base, a standard can be overly restrictive and an unnecessary economic burden, or it may provide only a limited protection from the hazard it is intended to prevent.

On the subject of training, I should like to quote the last 3 paragraphs of the Introduction (p. 3 and 4) of the the Supplement to Cleaning Our Environment.

"One further overriding theme, not stressed in the original document, warrants emphasis here. That is the lack of manpower, trained and untrained. . . . People are needed to operate . . . public water supply facilities, to train operators, to teach in the schools, to handle research and design, and to organize and manage the human element in environmental control.

"A major reason for the lack of manpower is the lack of funds at all levels of government. As funds for facilities become available, and we feel strongly that they must, the growing need for training manpower will become serious. We see, moreover, little evidence of long-range planning designed to coordinate the closely related needs for money and manpower.

"One further point on funding. In each of our priority recommendations, we indicate the responsibility for implementation. Often the responsibility already has been assigned to the agency we name; often that agency is already working in at least a preliminary way on the action we recommend. Some agencies no doubt discharge their responsibilities more effectively than others, but we must stress that where an urgently needed program is lagging or nonexistent the problem very often can be traced to insufficient funding."

I can only add that the public water supply industry is performing admirably, considering the increasingly disproportionate attention it has received at both the State and Federal agency levels during the past 10-12 years. Your interest in helping to provide the necessary aid by research, training and agency capabilities is welcome for the increasing needs of the near future.

Very truly yours,

T. E. LARSON,  
*Head, Chemistry Section.*

#### THE WATER ENVIRONMENT

The five recommendations that follow are ranked in descending order of priority. They have been selected on the basis of both short-range and long-range need, and in some instances because of relatively low cost combined with reasonable anticipation of successful application. We make no specific recommendations on analytical chemical methods. We would stress, however, that where improved methods are required, notably in research on trace-metal contamination and on eutrophication, their development should be assigned very high priority. For ready reference to our original document, with its fuller discussion, we have listed with each recommendation its number(s) and location in the body of that document.

#### PUBLIC WATER SUPPLIES

Public water supply treatment plants often draw their raw water from a source that receives treated waste water. Waste water treatment practices, however, do not remove certain known substances from the wastes and, doubtless, do not remove other substances that are present but undetected. Also, waste waters can bypass the treatment process with insufficient dilution during plant outage periods or in times of disaster, such as power failures. Too little

is known of the specific compounds in waste treatment plant effluents. Accidents, negligence, and disasters do occur. The technology used to treat public water supplies, and the normal design treatment capacities, are not necessarily adequate to cope with unknown contaminants, sudden pollution loads, and manmade or natural disasters.

Recommendation (W20 Page 151): Methods of treating public water supply should be upgraded through research on removal or destruction of low concentrations of harmful substances and organisms that now pass through the waste treatment process unchanged or whose fate in the process is unknown. Such research is a responsibility of the Bureau of Water Hygiene in the Environmental Protection Agency.

A minimum of \$2 million per year should be budgeted for this kind of research and for research on the effects of the quality of public water supplies on human health. For fiscal 1970, by comparison, less than \$160,000 in federal support was available specifically for research on treatment and distribution of public water supplies. It appears at this time (November 1970) that no federal funds at all will be available for these purposes or for training in fiscal 1971. Meanwhile, we see a good deal of excitement over agricultural fertilizers and mercury, cadmium, and certain other metals in water. The fact is that we have virtually no information on how these metals are affected by the processes used in the normal public water supply treatment plant. The fate of viruses and the effects of disinfection on viruses and other organisms in such plants also remain open questions. Further support for greater effort is supplied by the recent study of 989 community water supply systems by the Bureau of Water Hygiene. The results showed that about 16% of the 18 million people served by these systems were drinking water that in some respect did not meet Public Health Service mandatory drinking water standards.

THE AMERICAN LEGION,  
Washington, D.C., March 22, 1972.

HON. PHILIP A. HART,  
Chairman, Subcommittee on Environment, Senate Committee on Commerce,  
New Senate Office Building, Washington, D.C.

DEAR CHAIRMAN HART: Enclosed is a copy of a resolution adopted by our National Convention last fall calling for legislation to establish standards of quality for underground water and means of enforcing such measures in cooperation with the several states.

I would appreciate your including this letter and resolution in the permanent record of the hearings conducted by your Subcommittee March 20 on amendment No. 410 to S.1478.

Your continued cooperation with The American Legion is appreciated.

Sincerely yours,

HERALD E. STRINGER,  
Director, National Legislative Commission.

NATIONAL EXECUTIVE COMMITTEE, THE AMERICAN LEGION,  
OCTOBER 20-21, 1971

Resolution: 12.  
Committee: Internal Affairs.  
Subject: Water pollution abatement.

Whereas, the Federal Government and the several State Governments are now establishing standards of water quality and instituting measures to raise the quality of water in navigable streams and bodies of water to meet those standards by predetermined dates; and

Whereas, existing legislation and programs, as far as we have been able to determine, do not include standards for underground water; and

Whereas, underground water is the sole source of supply for the water wells of millions of people; and

Whereas, underground water is also the source of supply for springs and artesian wells which feed into runs, creeks and rivers; and

Whereas, water, whether pure or contaminated, which enters the earth will eventually flow out of the earth; Now, therefore, be it

Resolved, by the National Executive Committee of The American Legion in regular meeting assembled in Indianapolis, Indiana, October 20-21, 1971,

that the Congress of the United States be petitioned to adopt such additional legislation as may be necessary (1) to authorize and direct the appropriate federal agency to establish standards of quality for underground water and (2) in cooperation with the several states, to establish and enforce measures necessary to raise underground water supplies to such standards wherever needed.

AMERICAN DENTAL ASSOCIATION,  
Washington, D.C., March 30, 1972.

HON. PHILIP A. HART,  
Chairman, Subcommittee on Environment, Committee on Commerce, U.S.  
Senate, Washington, D.C.

DEAR MR. CHAIRMAN: I am writing you with respect to Amendment 410 to S. 1478, on which hearings were held by your Subcommittee on March 20. On behalf of the American Dental Association, I wish to express our support for the intent and purposes of Amendment 410.

In official policy adopted in 1969, the Association took note "of the health hazards presented by the pollution of our air and water" and recognized that it shared with other private and public agencies the responsibility of "instituting and supporting effective legislation to control" such pollution.

Within its particular area of expertise, the Association's special concern with water quality relates to the dental profession's long espousal of fluoridation. Fluoridation of water supplies is today the most effective, economical and safe public health measure known for substantial reduction of the incidence of dental caries. Today, more than 92 million people use water supplies that are either naturally fluoridated or have been adjusted to contain the optimum amount of fluoride. Exhaustive surveys in many regions of the nation have shown that the incidence of dental caries among the young can be reduced by as much as 60 per cent through use of this public health measure; a benefit that lasts a life-time, it costs only about 10¢ per person annually.

Recent surveys of water quality surveillance undertaken by the Environmental Protection Agency, however, have given rise to concern that not all fluoridated water supplies are monitored with sufficient care or expertise to guarantee that the fluoride content of the water supply is optimally adjusted at all times. These difficulties have been found mostly in water supplies serving small towns and cities. Almost without exception, the problem involves either under-fluoridating or sporadic fluoridating. While there is admittedly no question of safety involved, a serious disservice is being done to the people living in such communities and who understandably believe that they and their children are drinking water that provides the full benefits of fluoridation. The Association has commended EPA for its surveillance program and urged that it continue and expand its efforts. Much more, however, can be done and Amendment 410 to S. 1478 seems to us to provide the potential for offering help to states and communities needing to improve the quality of their water supply management.

The Amendment, as we understand it, would essentially establish minimum national water hygiene standards and national drinking water standards. The implementation and enforcement of such standards would, as the Amendment states, "be the primary responsibility of State and local governments." The bill would authorize the federal government to provide financial and technical assistance to regional, state and local agencies for purposes of upgrading their water supply programs. Research on water contaminants and on related matters affecting water quality would be authorized on the federal level.

The Amendment also establishes a 15-member National Water Hygiene Advisory Council and establishes in broad terms the qualifications of those eligible for appointment to the Council. We think it essential that some seats on the Council be filled by those professionally qualified to deal with the public health questions related to water supplies and would urge that the Subcommittee make explicitly clear in their report that this is its intent as well.

The Association recognizes that Amendment 410 does not specifically deal with the proper monitoring of fluoridation in those areas where fluoridation programs are in operation. Provisions of the bill would upgrade all water surveillance procedures, however, and fluoridation surveillance would benefit accordingly. It is for this reason that the Association wishes to make known to you and the Subcommittee its support of the Amendment.

I would be grateful if this letter could be made a part of the hearing record.  
Sincerely,

LEROY N. LARSON, D.D.S.,  
Chairman, Council on Legislation.

#### EPA-CEQ ISSUE PAPER ON WATER SUPPLY LEGISLATION

This paper was developed to accompany the EPA-CEQ legislative proposal on water supply during review and discussion within the Executive Branch. The rationale for the proposed Federal program and the elements of the legislative proposal are presented. In addition, the paper presents the rationale and implications of the proposed State program grant authority and considers anticipated costs and benefits associated with the proposed Federal program.

#### I. BACKGROUND

The Federal government has a long standing history of involvement with community water supply systems through administration of the interstate quarantine regulations under the Public Health Service Act. We are now proposing to improve that involvement through a more effective Federal program—a program designed to enhance State and local program effectiveness in assuring adequate supplies of safe drinking water. The need for program improvements was documented by the Community Water Supply Study which was originally undertaken in response to an OMB (then BOB) initiative.

Following publication of the Community Water Supply Study in August of 1970, a joint EPA-CEQ study of water supply problems was undertaken during the early part of 1971. The result of that effort was an issue paper, dated May 11, 1971, which summarized a number of facts concerning the problem and outlined alternative solutions and legislative options.

Briefly, the major problems were found to be as follows:

A. A number of communities—particularly communities of less than 5,000 population—are delivering *potentially dangerous* water. Based on extrapolation of the findings of the Community Water Supply Study, the phenomenon affects approximately 5.4% of the national population served by public water supply. Problems are generally related to bacterial contamination and/or harmful quantities of toxic or hazardous constituents.

B. Nearly 25% of the 160 million persons served by community water supply systems are using water which *exceeds recommended drinking water limits* for one or more parameters. Although consumption of such water is not considered to represent an immediate threat to health, aesthetic (related to taste and odor), economic and convenience (related to excessive mineralization) problems exist, and such water supply systems may not provide adequate protection over the longer term.

C. Most community water supply systems, including some large systems but most prevalent with smaller community systems, evidence *deficiencies* relating to construction, operation, maintainance and surveillance which may inhibit the ability of the suppliers to deliver water of an acceptable quality on a continuing basis.

When the magnitude of current national water supply problems was considered in light of anticipated future conditions, it became apparent that new and expanded Federal leadership and assistance should be given serious consideration. A number of options, ranging from no additional Federal action to strong Federal regulatory authority were considered and presented in the previous issue paper.

Publication of the Community Water Supply Study led to national concern about the quality of drinking water. As a result, five Congressionally sponsored bills—each of which proposed various extensions of Federal authority in the area of drinking water supply—were introduced in the current session of Congress. The Administrator of EPA testified on the subject of drinking water before the House Committee on Interstate and Foreign Commerce, Subcommittee on Public Health and the Environment, on May 26, 1971, indicating that EPA was currently studying the problem and would consider the need for both legislative and administrative actions. Since that time, the House Committee has prepared draft water supply legislation.

## II. RATIONALE FOR THE PROPOSED FEDERAL WATER SUPPLY PROGRAM

Development of the proposed Federal program was premised on the fact that basic and primary responsibility for maintaining, operating and regulating public water supply systems rests with State and local government. Past Federal involvement has dealt with establishment and limited enforcement of standards to prevent interstate spread of communicable disease, research, and technical assistance and training to enhance State and local capabilities. The proposed program envisions a continuance of these basic Federal-State relationships but is designed to more effectively deal with major institutional deficiencies related to the current water supply situation.

A substantial majority of existing water supply problems may be attributed to the general ineffectiveness of State and local water supply programs, which are largely understaffed and inadequately funded. This situation, on the other hand, may be attributed to a general lack of public awareness of the sometimes tenuous state of public water supply systems. Most people—because of inadequate surveillance of water supply systems and lack of procedures for informing the public—are simply not aware of the quality of their drinking water or of the dependability of their water supply systems. As a result, there is little incentive for public support of expanded regulatory programs.

The problems of inadequate regulatory programs and lack of public involvement are thus interrelated, and there is every reason to believe that neither State and local governments nor the private sector will be able to resolve these problems without additional Federal leadership and assistance. In view of this, it seems unreasonable to wait until existing water supply problems become more serious or new ones emerge before taking corrective action.

The proposed program would provide the public and local and State government with new incentives for action and more effective means of control. The program would involve and rely upon the public and each level of government in the following ways:

A. Improved public awareness of drinking water problems would be achieved through a provision whereby each community or private water supply system found out of compliance with established standards would have to so notify its customers. This would allow and enhance public choice between accepting known problems or petitioning local government for improvement of drinking water quality.

B. Better local support and new forms of Federal assistance would lead to improved programs for regulation of water supply systems. As a result, the states would be in a better position to deal with the public's demands for adequate quantities of safe drinking water.

C. The Federal role would be largely stimulatory in nature, involving financial and technical support of State regulatory programs. Enforcement authority would be available to deal with problems of an imminent and substantial nature in cases where the States are unable to implement remedial actions. In most cases, however, remedial actions would result from public demands and would be dealt with at the State and local levels of government.

A strengthened Federal role in the water supply area is in line with current trends in safeguarding the general health and safety of the population. As a part of these trends, Federal agencies have set and enforced standards for drugs, foods, air quality, mine safety, etc. The water supply issue, presenting some of the same health dangers, would also seem to justify continued Federal involvement. Safe water supply will be an area of increasing public concern in the overall environmental field. The question appears to be one of how extensive that Federal involvement should be.

After considering several alternative levels of future Federal involvement, we find extension and improvement of Federal drinking water standards and more effective Federal enforcement authority, coupled with financial and technical support to State water supply programs, to be the appropriate course of Federal action. The rationale for this broader Federal role is as follows:

A. Health threats in water are not limited to the transmission of communicable diseases, currently covered under interstate quarantine provisions; they include the harmful effects of toxic chemicals and other

hazardous materials as well. Therefore, Federal authority should be extended to cover these constituents.

B. Insuring adequate supplies of safe public drinking water is largely a State and local problem. However, because of the mobility of our population, interstate affects as result of consumption of nearly any public water supply are probable. Direct Federal enforcement involvement under the EPA-CEQ proposal would focus on "imminent and substantial" dangers, which can affect residents other than those of the state or community concerned.

C. Extension of present Federal enforcement authority, which is currently limited to prohibiting interstate carriers from using unsafe supplies rather than initiating action against the water supply system itself, is proposed because interstate carriers represent only one means by which interstate health threats can occur. In addition, current authority is not directed to assist the 82 million residents served directly by interstate carrier water supply systems.

D. For chronic health effects, which require long-term exposure, the proposal would continue to rely on direct State regulatory action. We would provide the Federal financial support and increased technical assistance to State water supply programs to enhance the capability of states to deal with their problems. Promulgation of more comprehensive and more stringent drinking water standards will place increased demands on these now relatively ineffective programs. Thus, any new Federal initiative to improve drinking water quality must include a commitment for Federal assistance in the development and operation of effective State programs in order to insure effective implementation of drinking water standards.

E. The research, technical assistance and training provisions are a continuation of the existing authority. The basic purpose for including these provisions in the proposed legislation is to secure a comprehensive bill.

### III. ELEMENTS OF THE EPA-CEQ SUPPLY LEGISLATIVE PROPOSAL

Major elements of the EPA-CEQ legislative proposal and explanatory notes are as follows:

#### A. Federal standards

1. The standards would include drinking water quality constituent limits as well as standards for water supply treatment and distribution facilities and their operation, maintenance and surveillance to assure that the water quality constituent limits are met consistently.

2. The standards would be applicable to all public water supply systems, not just those serving interstate carriers.

3. The standards would distinguish between those violations which represent an imminent and substantial danger to health and those which represent less than adequate protection over the long-run, but appear to present no immediate threat to health. This distinction concerning the nature or degree of threat would serve as a basis for triggering Federal regulatory action in the absence of appropriate State action.

4. The Federal standards would not deal with the aesthetic, economic and convenience problems—such as taste and odors, and other similar non-health related problems—other than advising as to the preferability of such limits, as is done under current standards. We see no direct Federal regulatory role or exertion of pressure on states or communities to achieve such standards.

#### B. Federal enforcement

1. The primary responsibility for enforcing compliance with the standards would rest with the states. In all cases, the states and communities would be relied upon to enforce against all violations which did not represent a substantial danger to health. State regulatory capability would be strengthened through Federal program grant support described in Section IV of this paper.

2. Despite the primary State and local enforcement responsibility, a strong Federal backup role is necessary. We already have a history of Federal enforcement with respect to supplies serving interstate carriers. An extension of this currently limited authority is proposed, but only in cases of imminent and substantial dangers to health.

3. Federal enforcement authority would be invoked only in cases where a violation of standards representing an imminent and substantial danger to a health occurred, and after determination that State remedial action was not adequate.

*C. Nature of enforcement and regulatory action*

1. As a part of an approved State program plan (see item D.3. below), the Federal government would require inclusion of a provision whereby each community or private water supply system found out of compliance with standards would have to so notify its customers, in transmitting water bills or by other appropriate means. Where the State does not have such a requirement—and therefore no approved program plan—the Federal government could post appropriate notice, even in those cases where no imminent and substantial danger to health exists. This provision would be the full extent of Federal regulatory action in situations of less than imminent and substantial danger to health. It is proposed only for the purpose of assuring that the public is notified when a water supply system is found to be out of compliance with standards so that citizen remedial actions may be instituted in the affected community.

2. In all cases where an imminent and substantial danger to health came to the attention of EPA (through the State program plan or other means), EPA would assure that the following actions would be taken:

- (a) Appropriate notice would be posted in the affected community;
  - (b) Use of the substandard water on interstate carriers would be prohibited;
  - (c) The Food and Drug Administration and the Department of Agriculture would be notified, with a recommendation to prohibit use of the water under their authorities (e.g., use of water in bottling and food processing); and
  - (d) The adequacy of State action to secure remedial measures would be reviewed.
3. If State action were adequate, no further Federal action would be taken.
4. If State action were inadequate, direct Federal enforcement action would be taken. The proposed authority would provide an opportunity to issue compliance orders or to bring civil suit. These measures would be designed to induce community remedial action and would include the following forms of injunctive relief:
- (a) Limitations or prohibition of certain uses of unsafe water;
  - (b) Prohibition of new connections to the substandard water supply system;
  - (c) Holding of water supply user charge receipts in escrow until remedial action is taken; and
  - (d) Other suitable remedies.
5. Other proposed regulatory provisions would include:
- (a) Reservation of authorities in the Public Health Service Act to control interstate spread of communicable disease;
  - (b) Opportunity for EPA entry and inspection of any water supply facility, after reasonable notice and at reasonable times, to determine compliance with Federal standards; and
  - (c) A provision requiring Federal installations to adhere to those standards relating to imminent and substantial threats to health.

*D. State program grants*

1. Since a major deficiency in the national water supply situation relates to the weakness of State programs, one component of the legislative proposal is State program grant support. An initial program of three years duration is proposed at the following funding level:

FY 73—5 million dollars.

FY 74—7 million dollars.

FY 75—10 million dollars.

2. The initial program would provide formula grants (allocated primarily on the basis of population), requiring non-Federal matching funds ranging from one-third to two-thirds of total program costs (matching ratios determined primarily on the basis of per capita income). These provisions would be very similar in nature to those of Section 7 of the Federal Water Pollution Control Act.

3. In order to be eligible for program grant support, States would be required to:

(a) Develop and submit for approval a program plan which provides for administration of the plan by the State agency; sets forth plans, policies and procedures to be followed; and provides for appropriate accounting, budgeting and other fiscal procedures for proper administration of the plan.

(b) Adopt drinking water standards the same as or more stringent than those promulgated by the EPA Administrator. (States could qualify for program grant support during the first year of the program by agreeing to adopt appropriate standards in those instances where State legislative sanction would be necessary.)

(c) Adopt appropriate regulations and procedures which can reasonably be expected to ensure that public water supply systems will comply with the standards.

(d) Report annually to EPA the status of standards compliance in each community. Reporting categories would be: (i) in compliance with standards; (ii) presently in marginal compliance, but required to take remedial action in the foreseeable future; (iii) in violation, but not creating a substantial danger to health; and (iv) in violation and creating a substantial danger to health. These annual reports would serve to focus attention on areas where Federal regulatory action might be needed [category (iv) above].

(e) Implement a standards violation notification system whereby each community or private water supply system found to be out of compliance with standards [categories (iii) and (iv) above] would have to so notify its customers, in transmitting water bills or through other appropriate means.

#### *E. Research, training, technical assistance, etc.*

1. It is proposed to have a general authorization for these activities, rather than specific authorized funding levels. This will provide more flexibility for EPA choice of priorities in administering its budgetary resources.

2. EPA already has general authority, and is conducting these activities under the Public Health Service Act.

#### IV. STATE PROGRAM STATUS AND THE NEED FOR FEDERAL SUPPORT

The Community Water Supply Study and subsequent analyses have very clearly shown that a large majority of our current water supply problems are operational in nature and could be significantly lessened by improving the capabilities of State and local water supply programs. For this reason, a significant component of the proposed Federal program relates to State financial and technical assistance.

##### *A. Current status of State programs*

Many State water supply programs are currently understaffed and inadequately funded to meet their primary responsibilities for insuring adequate supplies of safe drinking water. The impact of this situation is felt severely at the local level of government in the form of ineffective technical assistance and laboratory support, inadequate water treatment plant operator training, and poor surveillance of operating water supply systems.

In June of this year, the EPA Water Hygiene Program conducted a study of State water supply program expenditures and found that total 1970 expenditures for the fifty states and six territories amounted to approximately \$10 million. These expenditures translate to a national per capita expenditure of 6.3 cents per person served by public water supply.

A state-by-state analysis of these data shows that State expenditures (excluding the ocean islands, some of which have very small populations served) ranged from as little as 1.3 cents to 18.2 cents per capita served. About 40 percent of the states (23) provide less than 5 cents per capita served, one-third (19) provide between 5 cents and 10 cents per capita and the remaining states (14) provide in excess of 10 cents.

Data concerning 1960 State program expenditures were also collected as a part of this study. After adjusting the value of the 1970 dollar to that of the 1960 dollar in terms of the services it could purchase, it was found that the per capita expenditures (based on total population as opposed to population served by public water supply) increased by only 14% during the 10 year

period. However, when considering that about 15% more people are now served and that the number of community water supply systems has approximately doubled during the past decade (primarily due to the proliferation of small systems), this rate of increase in expenditures appears insufficient.

Although per capita expenditures can be somewhat misleading when applied to any specific state because of the many local variables, previous studies by the EPA Water Hygiene Program, in which detailed analyses of several State programs were performed, have indicated that a fully effective State water supply program would require funding in the vicinity of 20 cents per capita served. (This estimate appears reasonable when compared with the actual 1970 expenditures of approximately 18 cents per capita by State water pollution control programs—after program needs and differences in the programs are taken into account.)

On this basis then, it can be stated that the states should be spending approximately \$32 million per year on water supply programs, as compared to current expenditures of approximately \$10 million per year. It would be unrealistic to assume that the states will fill this \$22 million per year gap—particularly in view of current State financial problems. For this reason, we feel that Federal financial support should be provided to supplement and, to the extent practicable, increase the level of State program funding—contingent upon the adoption of appropriate enabling and regulatory authority, regulations, policies and procedures and the development, implementation and operation of effective programs.

#### *B. Rationale for proposed State program grant support*

The basic rationale for proposing a program of Federal financial support to the State water supply agencies is that we feel the states could significantly lessen water supply problems by implementing effective control programs at the State and local levels of government. These programs are currently inadequate and ineffective, and they are not now satisfying their primary responsibilities for insuring adequate supplies of safe drinking water. With a program of Federal leadership and assistance in the development of effective State programs, the states could better fulfill their responsibilities.

The Environmental Protection Agency is currently providing State and local program grant support in many of its environmental programs—including air pollution control, water pollution control, solid wastes management planning, etc. As a result, we have gained experience in the formulation and administration of such programs. Each of these existing programs were studied during our consideration of alternative approaches to be applied in the area of State water supply programs.

Consideration of several key issues, discussed below, largely shaped our proposed program:

1. *Duration of Program Authorization.*—Because the proposed program is new and because several proposals for combining various forms of program grant support are under consideration both within and outside EPA, we feel that the program authority should be of relatively short duration. Our proposed three year authorization would thus allow subsequent evaluation of the program in light of our experience with the State water supply agencies and would permit early alteration of the program should a new approach to administration of program grants be adopted.

2. *Type of Grant.*—Three general types of grants were considered: project grants (which provide the greatest leverage for Federal influence and development of the grant's recipient's program), straight formula grants (which have their virtue in simplicity and ease of administration), and formula grants modified by bonus provisions (similar to that currently proposed in the area of water pollution control program support). We feel that a straight formula grant provision with language similar to that of Section 7 of the Federal Water Pollution Control Act would be most appropriate during the initial three-year phase of the program. Upon evaluation of our experience during this initial phase, we could modify the program—possibly toward bonus provisions to provide incentives for development of desirable control program elements.

3. *Magnitude of the Program.*—A state-by-state analysis of the financial impact of alternative Federal funding levels was conducted on the basis of the allocation equations and matching ratios specified in Section 7 of the Federal Water Pollution Control Act. Summary results of that analysis are shown in Table 1. The analysis indicated that a program of more than \$4 million or \$5 million in the first year would place a significant number of

the states in the position of requiring additional non-Federal funds to meet minimum matching requirements. With an advance indication of these needs for additional funds, however, it would appear reasonable that most of the states could obtain the necessary funds (which would amount to about \$2.7 million or a 26% increase above current expenditures) over the three year period. As a result, a \$5 million initial program is proposed, with increases to \$7 million and \$10 million over the subsequent two years. This program would provide an incentive for increased non-Federal spending in more than half of the states and would result in a more than doubling of expenditures to 14.2 cents per capita served.

TABLE 1.—FINANCIAL IMPACT OF ALTERNATIVE LEVELS OF FEDERAL FINANCIAL SUPPORT

[Dollars in thousands]

	Alternative Federal funding levels				
	No Federal support	\$4 million	\$5 million	\$7 million	\$10 million
Number of States currently spending less than minimum matching requirements (number, as related to a total of 56 jurisdictions).....	0	9	11	23	29
Required additional State funding to meet minimum matching requirements.....	0	\$207	\$348	\$1,078	\$2,667
State programs with minimum matching requirements.....	\$10,124	\$10,331	\$10,472	\$11,202	\$12,792
Total Federal/State program.....	\$10,124	\$14,331	\$15,472	\$18,202	\$22,792
Total per capita expenditure with Federal/State program (cents/capita served).....	6.3	8.9	9.7	11.4	14.2

Note: Calculations assume State water supply program funding levels during 1970 and are based on allocation equations and matching ratios specified in section 7 of the Federal Water Pollution Control Act. Calculations also assume that all States will satisfy minimum matching requirements and that no Federal funds will be reallocated.

## V. PROGRAM COSTS AND BENEFITS

## A. Program costs

The EPA budget now pending before the Congress contains a request of \$4.6 million for the Water Hygiene Program in fiscal year 1972. The extent to which various aspects of the program will be increased over the next five years has not yet been determined, although preliminary estimates of future resource requirements for the program are currently under internal review. It can be assumed that there will be some increase in Water Hygiene budgets in future fiscal years, but the magnitude of these increases will have to be determined in competition with other EPA programs in relation to overall EPA ceilings and allowances.

If the proposed legislation were enacted, certain additional increases over and above those which might be required under existing legislation would be called for. These increases fall into two categories: those that would be mandatory and those that would be desirable in view of our increased commitment to the program as a result of the new legislation.

The mandatory increases would be required to fund the new State program grants (together with certain additional administrative costs) and to increase Federal enforcement efforts as a result of broader enforcement authority. The commitments necessary as a result of the new legislation are summarized as follows:

[In thousands of dollars]

	Additional resources required (fiscal years)				
	1973	1974	1975	1976	1977
State program grants.....	5,000	7,000	10,000	(1)	(1)
Grants administration.....	250	300	400	(1)	(1)
Enforcement.....	800	1,000	1,500	1,500	1,300
Totals.....	6,050	8,300	11,900	1,500	1,300

<sup>1</sup> No commitment of Federal funds would be involved inasmuch as authority for State program grants is not being requested beyond fiscal year 1975. It would be reasonable to assume, however, that reevaluation of the program in fiscal year 1975 would indicate the need for continued State program support at a level of \$10,000,000 to \$15,000,000 annually in future years.

The implied Federal commitment for an expanded water supply program as a result of new legislation could also absorb additional costs in other program elements such as research, technical assistance and training. These costs would not be mandatory, however, and would be determined in light of other EPA program priorities on a discretionary basis.

#### *B. Program benefits*

The true measure of anticipated benefits attributable to the proposed program would be expressed in terms of reduced incidence of waterborne disease and health effects, and in terms of reduced societal costs associated therewith. However, our ability to precisely quantify benefits of this type on an incremental basis is limited. Epidemiological surveys have yet to define a true demarcation between infection or disease per se and economically critical physical disability. The major cost to society of waterborne disease and illness is probably not the cost of medical treatment or even time lost from work, but the 365 days spent each year in semi-productive work due to chronic disease and illness.

The correlation between water supply and disease and toxicity is a complex matrix of cause and effect, interrelated with innumerable other factors. However, the downward trend of enteric disease with improved water supply technology is universal, irrespective of per capita income and health expenditure. These trends are supported by incontrovertible laboratory, clinical and epidemiological evidence that water is a major carrier of disease-bearing organisms and toxic chemicals.

Even though no quantitative assessment of program benefits is available, several significant—although not mutually exclusive—anticipated benefits can be described. Enactment and implementation of the proposed legislation could be expected to result in the following:

1. *Broader Preventative Program Coverage of the Population.*—Current Federal enforcement authority under the Public Health Service Act is limited to prohibiting interstate carriers from using unsafe water supplies, but is not directed toward protection of the 82 million residents served by interstate carrier water supply systems. The proposed standards and regulatory authority would not only provide better protection for these 82 million people, but would serve to protect all of the 160 million people served by public water supply systems.

In addition to broader population coverage, the new standards would provide much broader coverage in terms of toxic materials and other pathogenic micro-organism constituent limits and would cover water supply treatment and distribution facilities and their operation, maintenance and surveillance.

2. *Reduced Waterborne Disease Outbreaks and Health Damage.*—Extrapolation of findings of the Community Water Supply Study indicated that approximately 5.4% of the 160 million people served by public water supply systems are consuming water considered to be potentially dangerous, and some 274,000 persons (or 3.3% of the 82 million people served by interstate carrier systems) are consuming water now prohibited under interstate quarantine regulations.

During the ten-year period 1961–1970, there were 128 known outbreaks of disease or poisoning attributed to drinking water. Of these, 35 outbreaks involving 39,810 cases of illness were attributed to drinking water from public water supply systems. Nearly half of these outbreaks were caused by contamination of distribution systems, and the causes of most of the remaining outbreaks were evenly distributed between inadequate treatment facilities and improper control of treatment processes. About one waterborne outbreak that we know about occurs per month with something over 100 persons becoming ill. Some of the illness is quite severe and about two deaths per year are attributed to waterborne outbreaks.

Although we do not have adequate data on which to base a prediction of the anticipated reduction in waterborne disease outbreaks and health damage, we are convinced that some reduction will accrue as a result of the proposed program. Many of our current water supply problems are operational in nature and could be rectified rather easily if they were first recognized as problems and if pressure for remedial action were instituted through strengthened regulatory programs and increased public awareness.

3. *Enhanced Opportunity for Citizen Choice Through Public Awareness.*—The proposed program is designed to bring about improved drinking water quality throughout the nation—but largely at the option of local citizens who

would be expected to bear the burden of most of the additional costs of safer drinking water. We believe that the proposed approach of informed citizen decision, coupled with strengthened State and local regulation of public water supply systems, has many advantages over both the current situation as well as the less desirable alternative approach of strict imposition of Federal regulation upon local jurisdictions.

4. *Better Capital Investment Safeguards.*—The Department of Commerce in 1967 estimated the capital investment in public water supply facilities to be about \$50 billion. When this investment is considered in relation to the 160 million people served by community water supply systems, we find an average of \$312 per capita served.

Most of the investment is in municipally owned and operated public water supply systems and is thus considered to be part of the social overhead capital comprising basic public services, such as police, public health, fire protection, etc., that are necessary so that other productive activities may function in a specialized society. The industry, though large, is largely non-profit and in many cases tax-supported, which has limited the amount of funds available for overseeing the construction, operation, maintenance and surveillance of water supply facilities.

As a result of these minimal administrative overhead expenditures, many water supply facilities are inadequately designed and constructed, improperly operated, and poorly maintained (findings of the Community Water Supply Study support these contentions). The proposed program—through improved standards, strengthened State regulatory programs, and better public awareness of water supply problems—would serve not only to correct many of these current deficiencies, but to prevent them from occurring in the future. Over a period of time the public costs saved as a result of reducing and minimizing the rate of depreciation of these facilities could be substantial.

