



State of North Carolina  
Department of Environment, Health, and Natural Resources  
Division of Laboratory Services  
State Laboratory of Public Health  
306 North Wilmington Street • Raleigh, North Carolina 27601

James G. Martin, Governor  
William W. Cobey, Jr., Secretary

Samuel N. Merritt  
Director

MEMORANDUM

TO: Director  
Certified Drinking Water Laboratory

FROM: E.D. Beesley  
Laboratory Certification Branch

DATE: January 31, 1991

SUBJECT: Coliform Methodology - Colilert

EPA has deferred approval of MMO-MUG (Colilert) for E. coli detection in public water supplies (Federal Register, January 8, 1991). Further studies will be conducted by EPA and approval may be granted by April 1991. Consequently "the MMO-MUG test will not be appropriate for determining compliance with the revised total coliform rule".

Please use the Membrane Filter procedure (MF) or the Multiple Tube Fermentation procedure (MTF) for the detection of Total Coliforms and EC broth (or EC plus MUG) at  $44.5^{\circ}\text{C} \pm 0.2^{\circ}$  for detecting fecal coliforms until Colilert is finally approved.

Data acquired using Colilert will be accepted through January, however upon receipt of this notice you must switch to the MF or MTF until Colilert approval is received.

If you cannot perform fecal coliform analysis by EC  $44.5^{\circ}\text{C}$  procedure (SM 16th Ed. 908 C) you must arrange for analysis of samples by a laboratory that can.

We regret the inconvenience and we are embarrassed that EPA, after giving us assurance on several occasions that the MMO-MUG procedure would be approved by December 31, 1990, suddenly decided to require further studies.

If you would care to express your displeasure with the N.C. Certification Branch and EPA please send me your comments. They will be forwarded to the Office of Drinking Water, USEPA, Washington D.C.

7 FEB 91 14 28 Z

STATE LABORATORY OF PUBLIC HEALTH

306 N. Wilmington Street

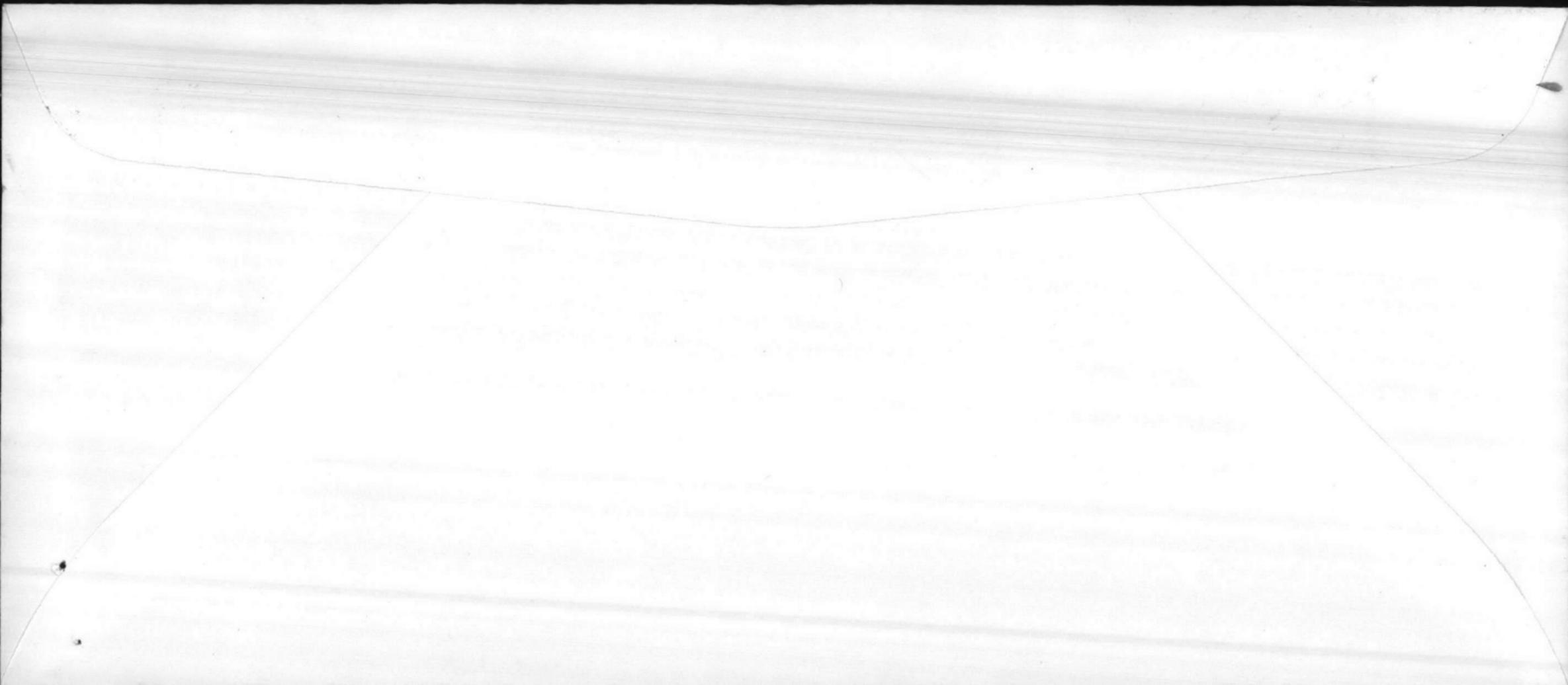
P. O. Box 28047

Raleigh, N. C. 27611-8047

PRESORTED  
FIRST CLASS



Elizabeth Betz (MPN,MF)  
U.S Marine Corps Base  
Natural Resources  
Env. Affairs Div. Bldg 65  
Camp Lejuene, NC 28542





State of North Carolina  
Department of Environment, Health, and Natural Resources  
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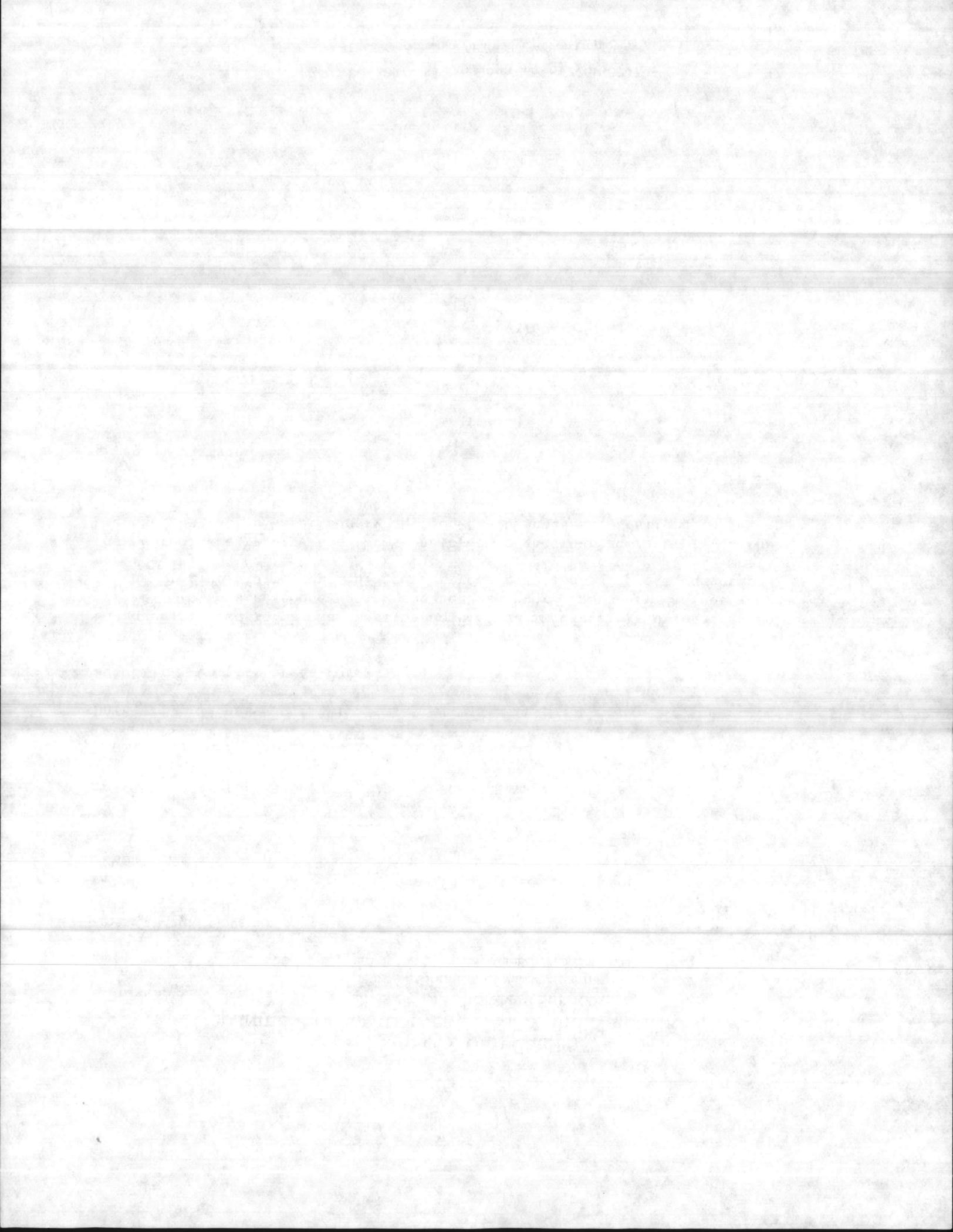
MEMORANDUM

TO: Certified Drinking Water Laboratories  
FROM: North Carolina Certification Branch  
DATE: January 30, 1991  
SUBJECT: Certification Forms

Enclosed are two forms that must be completed immediately and returned to our office. This is a second notice and because your laboratory did not respond to the original forms sent in December your compliance reports cannot be recorded by the North Carolina Public Water Supply Section. It is imperative that our office receive the forms enclosed so that our computer files that are used by Public Water Supply Section can be updated. Failure to return these forms could result in decertification.

If you have any questions please contact Don Beesley or Debbie Moncol at (919) 733-7308.

DJM/mh



# IMPORTANT CERTIFICATION INFORMATION

Coliform testing is undergoing major changes to conform to the Revised Total Coliform Rule. Certification rules will require that laboratories maintain at least two procedures for the analysis of drinking water for total coliforms. We must know which procedures your laboratory wishes to be certified for in order to provide the proper performance samples.

Please check at least two methods below and return to us by January 12, 1990.

DETACH HERE AND RETURN

---

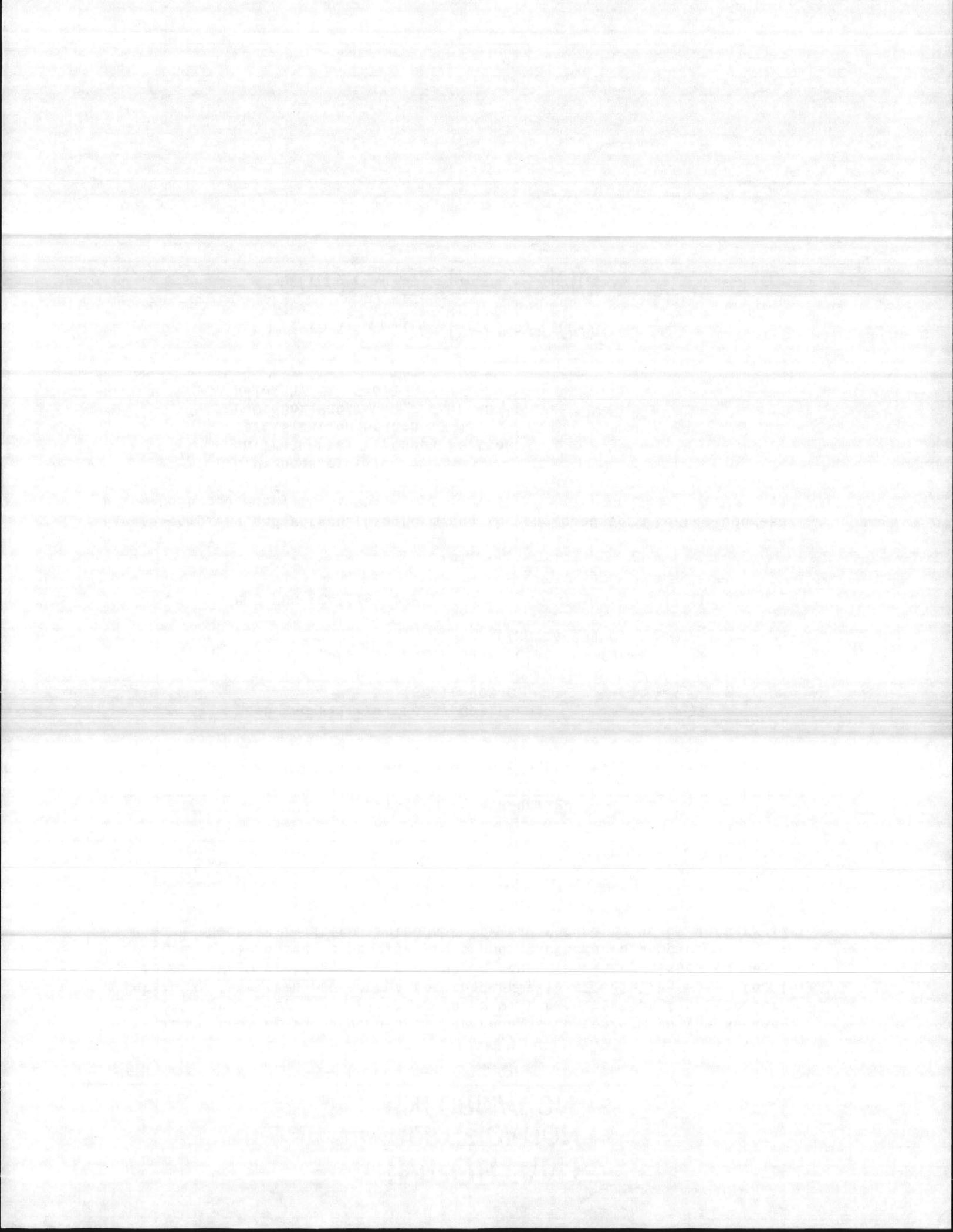
Please indicate coliform methods for which certification is requested:

Membrane Filter + Fecal Coliforms (SM 16 908-C)	<input checked="" type="checkbox"/>
Multiple Tube Fermentation + Fecal Coliforms (SM 16 908-C)	<input checked="" type="checkbox"/>
MMO-MUG (Colilert)	<input type="checkbox"/>

Please complete and return this form and the enclosed form to the address below before January 12, 1990:

E.D. Beesley  
Environmental Sciences Section  
Certification Branch  
P.O. Box 28047  
Raleigh, NC 27611

US Marine Corps Base  
Camp Lejeune NC



N. C. DEPARTMENT OF ENVIRONMENT, HEALTH AND NATURAL RESOURCES  
DIVISION OF LABORATORY SERVICES, ENVIRONMENTAL SCIENCES SECTION

DATE 8 February 1991

MEMORANDUM

TO: Water and/or Milk Laboratory Evaluation Officer

FROM: Name Environmental Chemistry & Microbiology Laboratory  
Business Address Environmental Quality Monitoring Branch, HWPCD, EMD  
Marine Corps Base, Camp Lejeune, NC 28542-5001

SUBJECT: Changes in Water and/or Milk Laboratories

If there have been any changes in your laboratory during the last year please fill in changes below.

1. Changes in personnel performing analyses (Briefly describe changes: new employees, resignations, changes in supervision.)

NO CHANGES SINCE THE 16 OCTOBER 1990 EVALUATION

2. Major changes in facilities

NO CHANGES SINCE THE 16 OCTOBER 1990 EVALUATION

3. Changes in tests performed (Briefly describe additions, deletions or changes in methods used.)

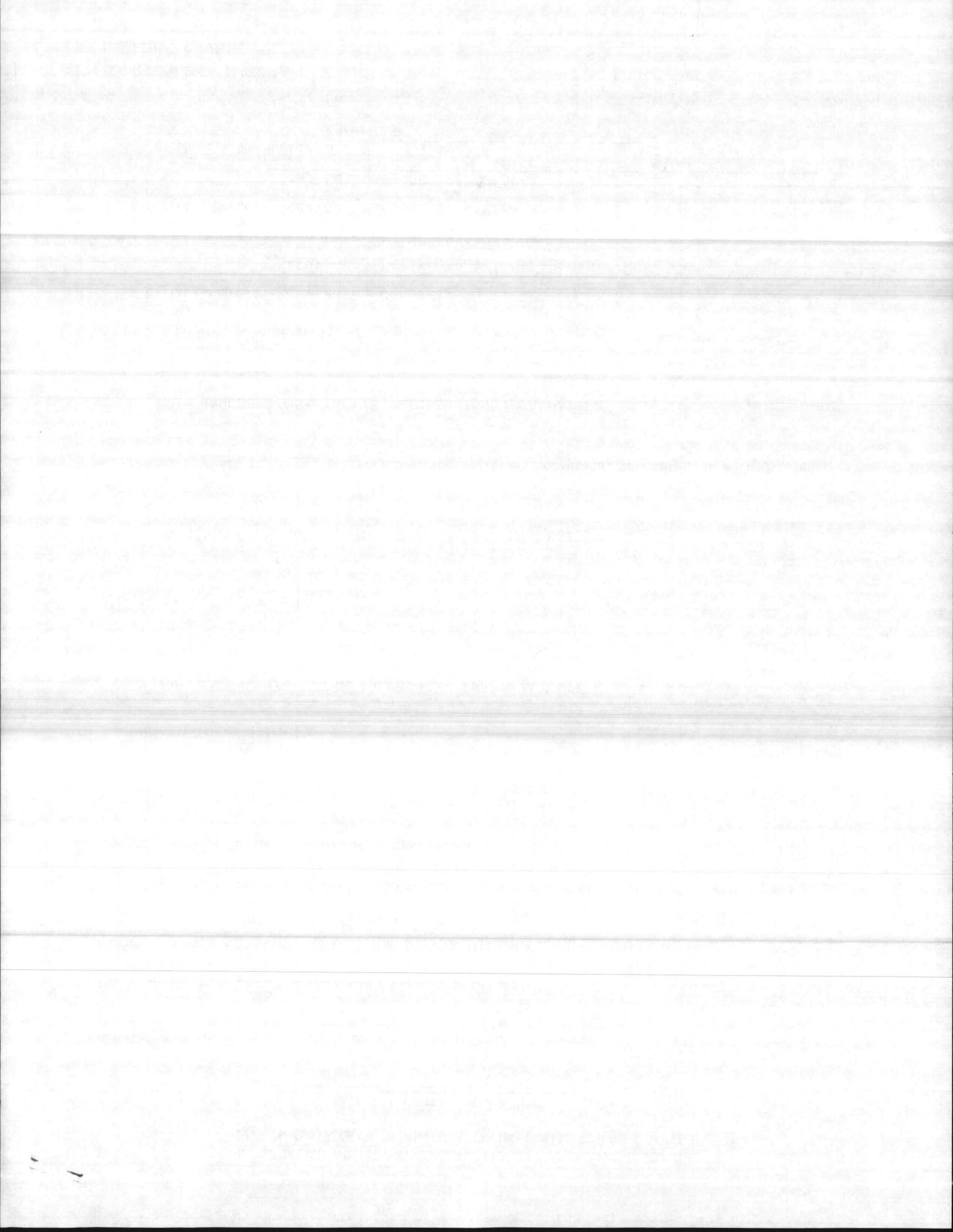
NO CHANGES SINCE THE 16 OCTOBER 1990 EVALUATION

4. Please provide your current:

A. Address:

Mailing address Commanding General  
Attn: AC/S Environmental Management, MCB  
Camp Lejeune, NC 28542-5001  
Street address Bldg 65, Marine Corps Base  
Camp Lejeune, NC 28542-5001

B. Telephone: New number ( 919 ) 451-2471  
Area Code





North Carolina Department of Human Resources  
Division of Health Services  
State Laboratory of Public Health  
306 N. Wilmington Street  
P.O. Box 28047 • Raleigh, North Carolina 27611-8047

James G. Martin, Governor  
Phillip J. Kirk, Jr., Secretary

Ronald H. Levine, M.D., M.P.H.  
State Health Director

January 23, 1987

Ms. Elizabeth Betz  
Camp LeJeune Quality Control Laboratory - Environmental Branch  
NREAD Facilities, MCB  
Camp LeJeune, North Carolina 28542

Dear Ms. Betz:

The findings of the on-site evaluation on October 28, 1986, and your letter of January 13, 1987 citing correction of deviations, indicate that your laboratory has met the minimum requirements for certification as specified in North Carolina Drinking Water Regulations (10NCAC 9D .0301 - .0330). Data shall be accepted for total coliform analysis through October 1988.

If you have any questions or if we may be of further assistance in this matter, please let us know.

Sincerely,

A handwritten signature in cursive script that reads "E. D. Beesley".

E. D. Beesley  
Laboratory Certification Evaluator

EDB/my

January 28, 1987

Mr. Elizabeth Bell

General Electric Quality Control Laboratory

Camp Hill, PA 17011

Dear Mr. Bell:

The following information was received on October 22, 1986, from the  
January 1987 issue of the journal of the American Society for  
Laboratory and Testing. The information was received from the  
North Carolina Printing Works, Raleigh, North Carolina (NCPW) and is  
being accepted for local reform analysis through October 1988.

If you have any questions or need more information, please let us know.

Sincerely,

Quality Control Evaluation

Enclosure

# IMPORTANT CERTIFICATION INFORMATION

Coliform testing is undergoing major changes to conform to the Revised Total Coliform Rule. Certification rules will require that laboratories maintain at least two procedures for the analysis of drinking water for total coliforms. We must know which procedures your laboratory wishes to be certified for in order to provide the proper performance samples.

Please check at least two methods below and return to us by January 12, 1990.

---

## DETACH HERE AND RETURN

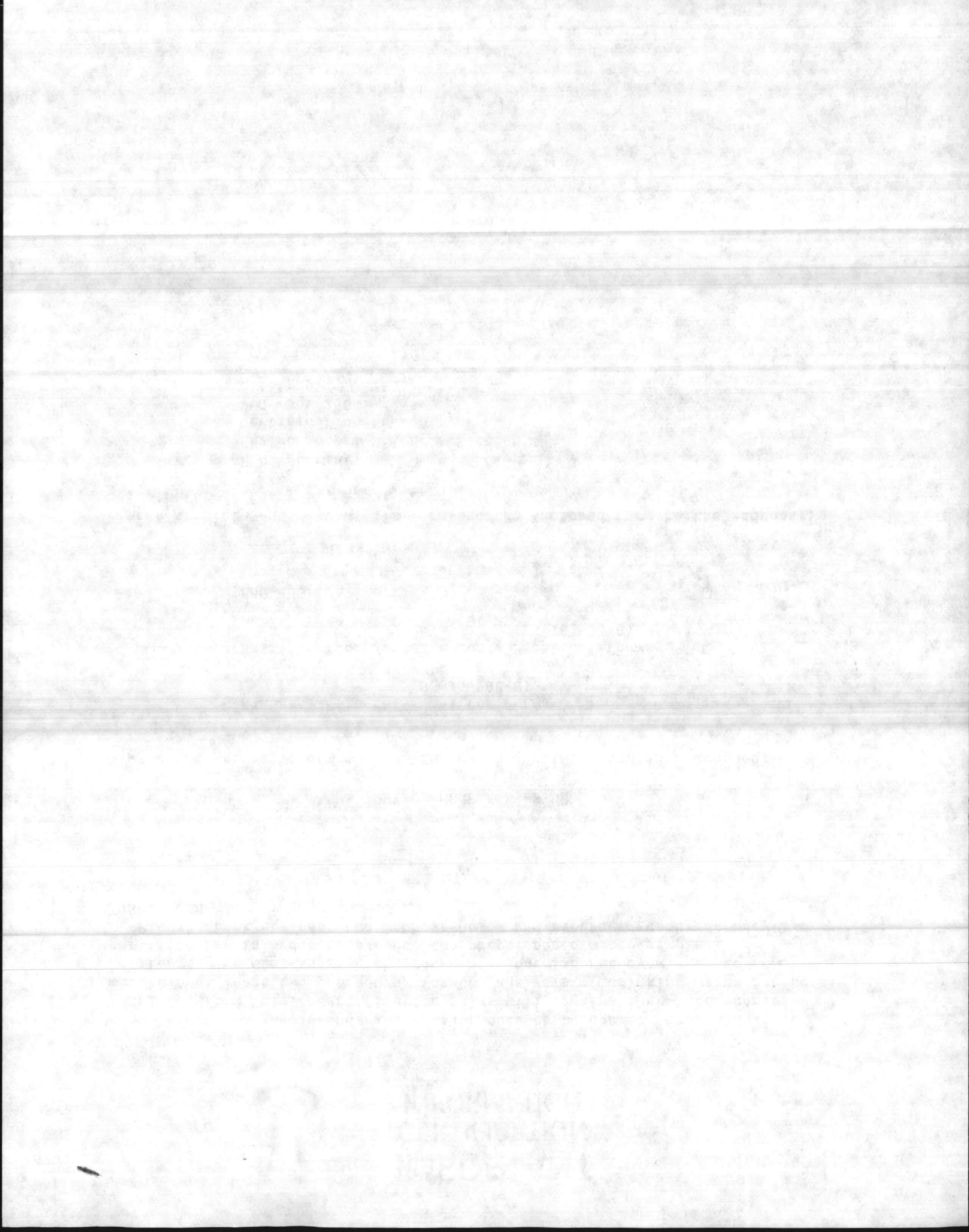
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Please indicate coliform methods for which certification is requested:

- |   |                          |
|---|--------------------------|
| Membrane Filter + Fecal Coliforms<br>(SM 16 908-C)            | <input type="checkbox"/> |
| Multiple Tube Fermentation + Fecal Coliforms<br>(SM 16 908-C) | <input type="checkbox"/> |
| MMO-MUG (Colilert)  | <input type="checkbox"/> |

Please complete and return this form and the enclosed form to the address below before January 12, 1990:

E.D. Beesley  
Environmental Sciences Section  
Certification Branch  
P.O. Box 28047  
Raleigh, NC 27611



PLEASE FILL OUT THE ATTACHED FORM AND  
RETURN TO OUR OFFICE.



N. C. DEPARTMENT OF ENVIRONMENT, HEALTH AND NATURAL RESOURCES  
DIVISION OF LABORATORY SERVICES, ENVIRONMENTAL SCIENCES SECTION

DATE \_\_\_\_\_

MEMORANDUM

TO: Water and/or Milk Laboratory Evaluation Officer

FROM: Name \_\_\_\_\_

Business Address \_\_\_\_\_

SUBJECT: Changes in Water and/or Milk Laboratories

If there have been any changes in your laboratory during the last year please fill in changes below.

1. Changes in personnel performing analyses (Briefly describe changes: new employees, resignations, changes in supervision.)

2. Major changes in facilities

3. Changes in tests performed (Briefly describe additions, deletions or changes in methods used.)

4. Please provide your current:

A. Address:

Mailing address \_\_\_\_\_

Street address \_\_\_\_\_

B. Telephone: New number ( ) \_\_\_\_\_  
Area Code

*Place  
Stamp  
Here*

*Water and/or Milk Laboratory Evaluation Officer  
Division of Laboratory Services  
P. O. Box 28047  
Raleigh, North Carolina 27611-8047*

5221/1  
6740/1  
BEMD

Mr. E. D. Beesley  
Laboratory Certification Evaluator  
State Laboratory of Public Health  
Division of Health Services **LABORATORY SERVICES**  
N.C. Department of **HUMAN ENVIRONMENT, HEALTH + NATURAL**  
Resources  
306 N. Wilmington Street  
Post Office Box 28047  
Raleigh, North Carolina 27611-8047

27601

Dear Sir:

This is in response to your 30 November 1990 correspondence concerning drinking water analysis certification which provided a narrative report on your 16 October 1990 visit to Marine Corps Base, Camp Lejeune. The report listed two points under Deviations and Recommendations which have been corrected as addressed below.

Under laboratory equipment, supplies and materials, the discrepancy concerning the autoclave temperature has been corrected.

Market Forge was contacted on 16 October 1990 and corrective instructions on adjusting the operational range of the temperature controls were explained. Adjustments have been made and a new autoclave thermometer ordered 29 October 1990 **AND RECEIVED.** **PP**

Under General Laboratory Practices, the first discrepancy of using M-Endo Broth instead of the now preferred medium M-Endo Agar LES for Membrane Filter procedure has been corrected. New M-Endo Agar LES was ordered 1 November 1990. **AND RECEIVED** The second discrepancy of Standard

en corrected. The  
ce added to

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a M-Endo Agar LES

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Department at

*Daughter's permit to discharge to river or  
somebody to check pond at  
919-256-9161  
Mike Williams  
backward pond  
Rich Komer  
Re school →*

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Mr. E. D. Beesley  
Laboratory Certification Evaluator  
State Laboratory of Public Health  
Division of Health Services *LABORATORY SERVICES*  
N.C. Department of ~~Human~~ *ENVIRONMENT, HEALTH + NATURAL*  
Resources  
306 N. Wilmington Street  
Post Office Box 28047  
Raleigh, North Carolina 27611-8047

*27601*

Dear Sir:

This is in response to your 30 November 1990 correspondence concerning drinking water analysis certification which provided a narrative report on your 16 October 1990 visit to Marine Corps Base, Camp Lejeune. The report listed two points under Deviations and Recommendations which have been corrected as addressed below.

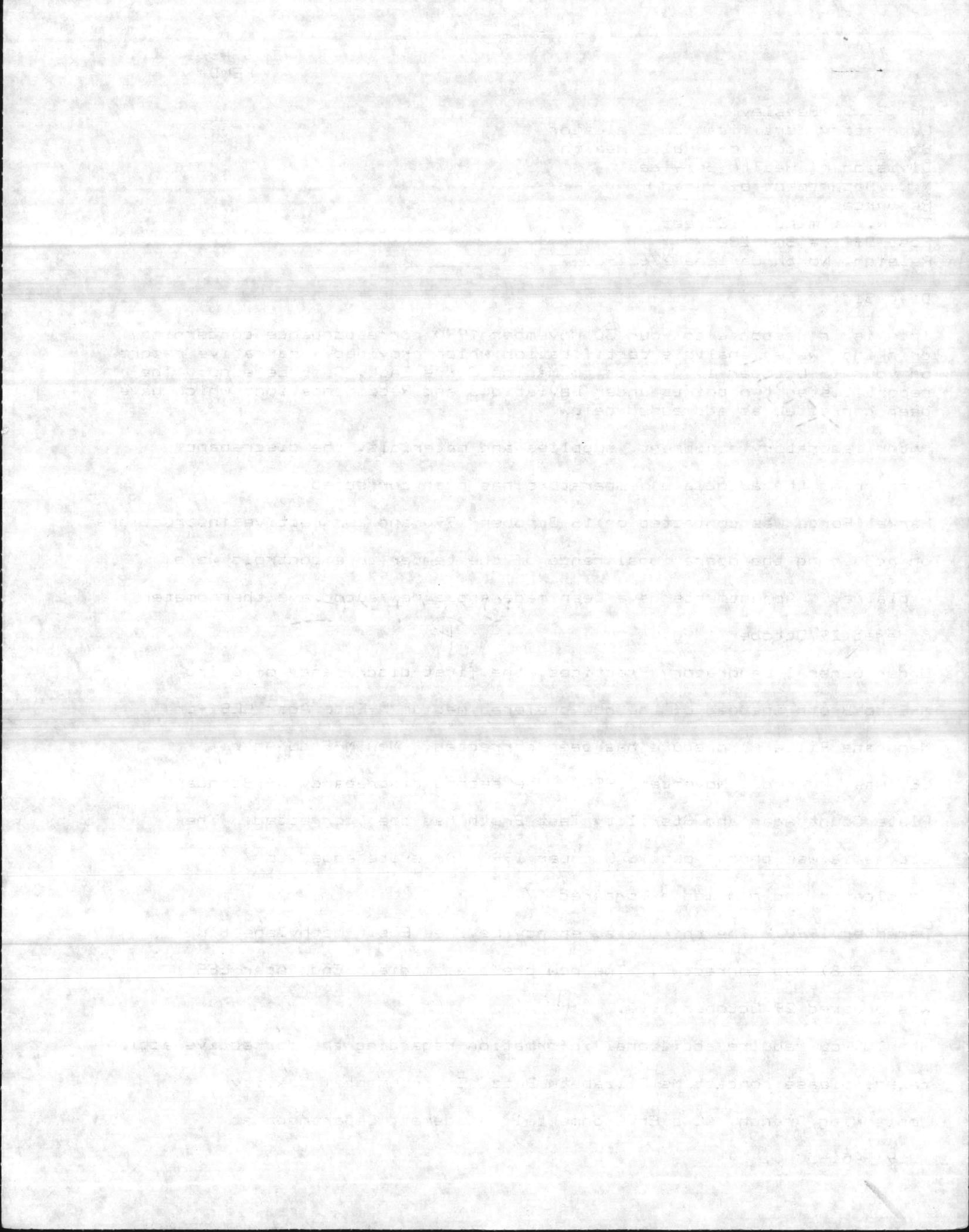
Under laboratory equipment, supplies and materials, the discrepancy concerning the autoclave temperature has been corrected.

Market Forge was contacted on 16 October 1990 and corrective instructions on adjusting the operational range of the temperature controls were explained. Adjustments have been made and a new autoclave thermometer ordered 29 October 1990 *AND RECEIVED.* *HP*

Under General Laboratory Practices, the first discrepancy of using M-Endo Broth instead of the now preferred medium M-Endo Agar LES for Membrane Filter procedure has been corrected. New M-Endo Agar LES was ordered 1 November 1990. *AND RECEIVED* The second discrepancy of Standard Plate Count Agar and Sterility Test Broth has been corrected. The old media was thrown out *ON* 16 October 1990, Drierite added to dessicator and new media ordered 17 *AND RECEIVED*

December 1990. *PERTAINING TO* The third discrepancy *Levines* Eosin Methylene Blue Agar (EMB) was corrected. The new preferred media M-Endo Agar LES was ordered 29 October 1990. *HP*

Should you require additional information regarding the corrective action taken, please contact Ms Elizabeth Betz, Environmental Quality Monitoring Branch, AC/s Environmental Management Department at



6740/1  
NREAD  
13 Jan 87

Mr. E. D. Beesley  
Laboratory Certification Evaluator  
State Laboratory of Public Health  
Division of Health Services  
N. C. Department  
of Human Resources  
306 N. Wilmington Street  
Post Office Box 28047  
Raleigh, North Carolina 27611-8047

Dear Sir:

This in response to your 20 November 1986 correspondence concerning drinking water analysis certification which provided a narrative report on your 28 October 1986 visit to Marine Corps Base, Camp Lejeune. The report listed four points under Deviations and Recommendations which have been corrected as addressed below.

Under laboratory equipment, supplies and materials, the discrepancy concerning a record of equipment maintenance has been corrected. A log book has been set up to record repairs and adjustments to the balances and autoclave separate from the equipment property files. Also included in the log book is a section for recording cartridge changes, cleaning and replacement of parts of the two corning glass stills. This log is in addition to the past system of indicating this information on the still itself.

Under general laboratory practices, the first discrepancy of not recording quality control data for all media used in water testing in the Quality Control Log has been corrected. All data on any media used in microbiological analysis is and will be recorded in the Quality Control Log. The second discrepancy of expired EMB agar is being corrected. New EMB agar was ordered 3 November 1986 and has an expected delivery date of 26 January 1987.

Under methodology, the discrepancy is not running a positive coliform sample by MF through verification and by MPN through the completed test. The laboratory normally runs all coliform by MF and only use MPN as a back up procedure when MF supplies run low before restocking. Drinking water does not normally have positive samples and therefore remembering to run the quarterly samples has been a problem. However, the laboratory regularly receives ice samples for coliform analysis, which have regular positives. A new standard operating procedure for ice samples require the first batch of ice samples received each month to be analyzed by MPN. The positives will be run



6740/1  
NREAD

through to the completed test and logged in the Quality Control Log. Drinking water is analyzed every Tuesday by MF and from now on the first Tuesday of every month the MF positive control will be submitted through verification and logged in the Quality Control Log.

Since the 28 October 1986 visit, one change has occurred. The name of the laboratory has been changed to the Environmental Chemistry and Microbiology Laboratory.

Should you require additional information regarding the corrective action taken, please contact Ms. Elizabeth Betz, Natural Resources and Environmental Affairs Division, Assistant Chief of Staff, Facilities at (919) 451-5977.

Sincerely,

JULIAN I. WOOTEN  
Director, Natural Resources and Environmental Affairs  
By direction of the Commanding General

Blind copy to:

ECML

... the ... of ...





North Carolina Department of Human Resources  
Division of Health Services  
State Laboratory of Public Health  
306 N. Wilmington Street  
P.O. Box 28047 • Raleigh, North Carolina 27611-8047

James G. Martin, Governor  
Phillip J. Kirk, Jr., Secretary

Ronald H. Levine, M.D., M.P.H.  
State Health Director

November 20, 1986

Ms. Elizabeth Betz  
Camp LeJeune Quality Control Laboratory - Environmental Branch  
NREAD Facilities, MCB  
Camp LeJeune, North Carolina 28542

Dear Ms. Betz:

Enclosed is a copy of the narrative report based on the survey of your laboratory for certification to analyze drinking water samples for EPA compliance. Please send a letter explaining what has been done to correct each of the deviations. The list of corrections should be sent to the above address. This laboratory is accredited for 60 days pending receipt of the above mentioned letter.

If you have any questions regarding certification or if we can be of assistance in any other way, please contact us.

Sincerely,

A handwritten signature in cursive script that reads "E. D. Beesley".

E. D. Beesley  
Laboratory Certification Evaluator

EDB/mlj

November 20, 1988

Health Laboratory  
Camp Lejeune Quality Control Laboratory  
Kilham Facility, NCB  
Camp Lejeune, North Carolina 28542

Dear Mr. Jones:

Enclosed is a copy of the narrative report based on the survey of your laboratory for certification for various drinking water samples for RFA monitoring. Please read a letter explaining what has been done to correct each of the deficiencies. The list of deficiencies should be sent to the above address. This laboratory is accredited for 60 days pending receipt of the above mentioned letter.

If you have any questions regarding certification or if we can be of assistance in any other way, please contact us.

Sincerely,



E. D. Hensley  
Laboratory Certification Director

RDW/LV

REPORT OF AN ON-SITE EVALUATION  
CAMP LEJEUNE QUALITY CONTROL LABORATORY - ENVIRONMENTAL BRANCH  
BACTERIOLOGY LABORATORY  
NREAD FACILITIES, MCB  
CAMP LEJEUNE, NORTH CAROLINA

OCTOBER 28, 1986

BY:  
E. D. BEESLEY  
LABORATORY CERTIFICATION EVALUATOR  
ENVIRONMENTAL SCIENCES BRANCH

LABORATORY SECTION  
NORTH CAROLINA DIVISION OF HEALTH SERVICES  
NORTH WILMINGTON STREET  
RALEIGH, NORTH CAROLINA 27611

REPORT ON AN ON SITE EVALUATION  
CARRIAGEWAY QUALITY CONTROL LABORATORY - ENVIRONMENTAL BRANCH  
LABORATORY

CARRIAGEWAY, NORTH CAROLINA

OCTOBER 22, 1988

F. D. BEESLEY  
LABORATORY PARTICIPATION EVALUATOR  
ENVIRONMENTAL CONTROL BRANCH

LABORATORY SECTION  
NORTH CAROLINA DIVISION OF PUBLIC SERVICES  
NORTH WILMINGTON STREET  
Raleigh, North Carolina 27611

CAMP LEJEUNE QUALITY CONTROL LABORATORY - ENVIRONMENTAL BRANCH  
CAMP LEJEUNE, NORTH CAROLINA  
OCTOBER 28, 1986

I. INTRODUCTION:

The equipment and procedures employed in the bacteriological analyses of water by this laboratory conformed with the provisions of the North Carolina Safe Drinking Water Regulations, except for the items indicated.

II. DEVIATIONS AND RECOMMENDATIONS:

A. Laboratory Equipment, Supplies and Materials

18. Maintenance

A record of equipment maintenance should be kept in the Quality Control Log.

B. General Laboratory Practices

5. Quality Control of Media and Reagents

Quality control data for all media used in water testing must be recorded in the Quality Control Log.

11. Levine's Eosine Methylene Blue Agar

A new supply of this medium must be obtained.

C. Methodology

3. Analytical Quality Control

At least once per quarter a coliform positive sample must be analyzed by the MF procedure through verification and the MPN procedure through the completed test and the data recorded in the Quality Control Log.

REMARKS:

It is important to keep the sample cool before analysis. An insulated container containing either crushed ice or frozen "Blue Ice" should be used.

INTRODUCTION

The equipment and procedures employed in the bacteriological analysis of water by this laboratory conform with the provisions of the North Carolina Safe Drinking Water Regulations, except for the items indicated.

DEVIATIONS AND RECOMMENDATIONS:

A. Laboratory Equipment, Supplies and Materials

1. Media

A record of equipment maintenance should be kept in the Quality Control log.

B. General Laboratory Practices

1. Quality Control of Media and Reagents

Quality control data for all media used in water testing must be recorded in the Quality Control log.

2. Positive Control Methods

A new supply of disinfectant must be obtained.

C. Methods

1. Analytical Quality Control

At least one per cent of each lot of positive controls must be analyzed by the procedure through verification and the MPN recorded through the completed test. The data recorded in the Quality Control log.

REMARKS:

It is important to keep the sample cool for analysis. An insulated container containing crushed ice or frozen "blue" ice should be used.

III. LIST OF PERSONNEL:

<u>NAME</u>	<u>POSITION</u>	<u>TEST PERFORMED</u>
Elizabeth Betz	Director/Supervisor	MF & MPN
Hoy Burns	Technician/Analyst	MF & MPN
Thomas Barbee	Technician/Analyst	MF & MPN
Carol Shores	Technician/Analyst	MF & MPN
Linda Lane	Technician/Analyst	MF & MPN

IV. CONCLUSION

The procedures and equipment in use at the time of this survey were in general compliance with the provisions of the North Carolina Drinking Water Regulations (10NCAC 9D .0301 - .0330). This laboratory is accredited for 60 days pending correction of the deviations and receipt of a letter by the evaluation officer detailing the corrections made. Upon receipt of such a letter, full accreditation will be given.

III. LIST OF PERSONNEL:

NAME	POSITION	TEXT PERFORMED
Elizabeth Holt	Director/Supervisor	NR 1, NR 2
Ray Burns	Technician/Analyst	NR 1, NR 2, NR 3
Thomas Barber	Technician/Analyst	NR 1, NR 2, NR 3
Carol Shores	Technician/Analyst	NR 1, NR 2, NR 3
John Lane	Technician/Analyst	NR 1, NR 2, NR 3

IV. CONCLUSION

The procedures and equipment in use at the time of this survey were in general compliance with the provisions of the North Carolina Drinking Water Regulations (NORCA 90C 0707 - 0709). This Laboratory is accredited for 60 days pending re-evaluation of the deviations and receipt of a letter by the evaluation officer detailing the corrections made. Upon receipt of such a letter, full accreditation will be given.

STATE LABORATORY OF PUBLIC HEALTH

DIVISION OF HEALTH SERVICES

NORTH CAROLINA DEPARTMENT OF HUMAN RESOURCES

P. O. BOX 28047, 306 NORTH WILMINGTON STREET,

RALEIGH, NORTH CAROLINA 27611

FORMS FOR ON-SITE EVALUATION OF LABORATORIES INVOLVED IN  
ANALYSIS OF PUBLIC WATER SUPPLIES

MICROBIOLOGY

LAB I.D. NUMBER: 37807

LABORATORY: Camp LeJeune Quality Control Laboratory - Environmental Branch

STREET: NREAD Facilities, MCB

CITY: Camp LeJeune STATE: North Carolina 28542

TELEPHONE NUMBER: (919) 451-5977

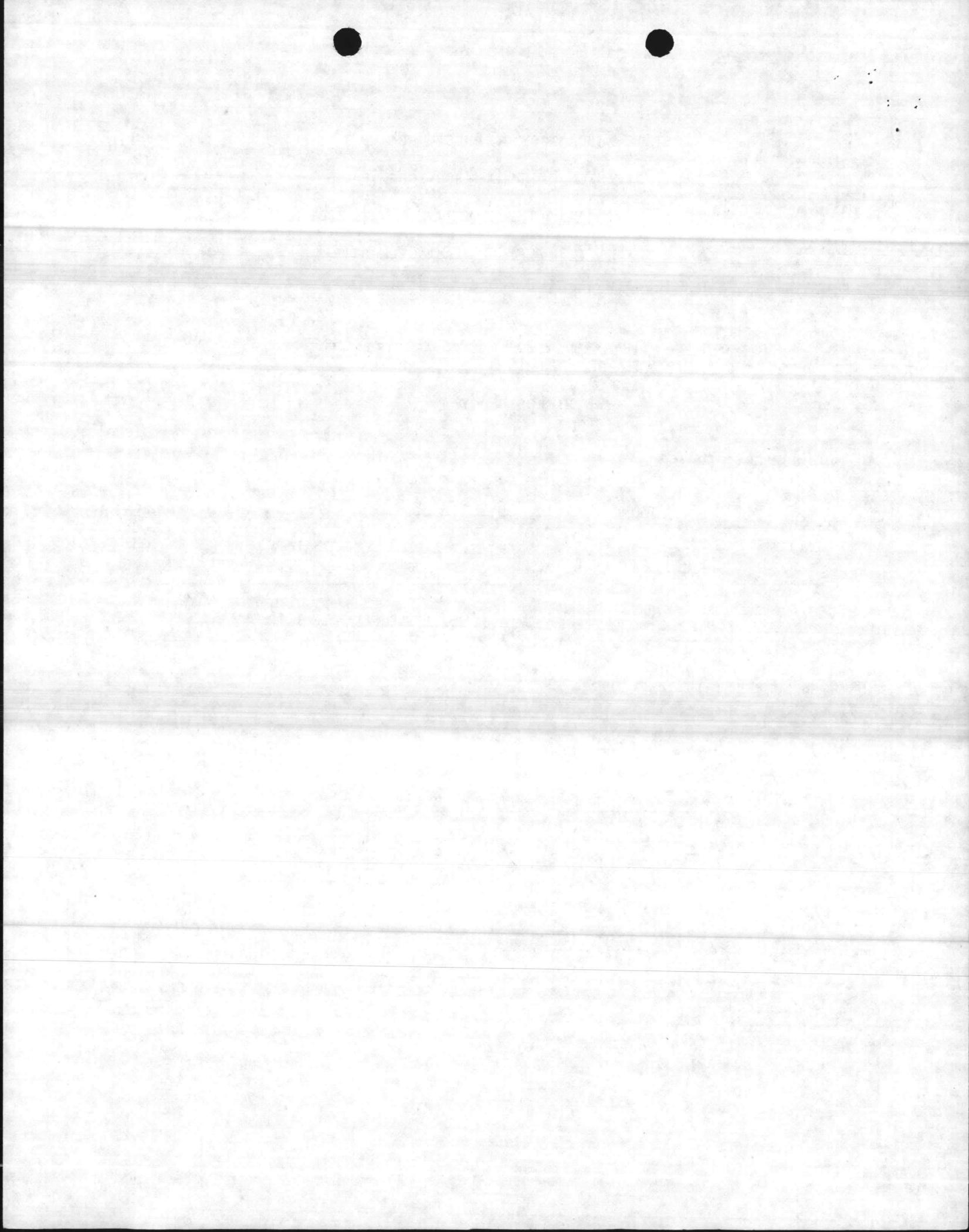
SURVEY BY: E. D. Beesley

AFFILIATION: North Carolina Division of Health Services

DATE: October 28, 1986

Codes for Marking On-Site Evaluation Forms:

- Blank - Satisfactory
- X - Unsatisfactory
- NA - Not Applicable



PERSONNEL

POSITION/ TITLE	NAME	ACADEMIC TRAINING				TESTING METHOD(S)	EXPERIENCE (YEARS/AREA)
		HS	BA/BS	MA/MS	PH.D		
Laboratory Director  Supervisor	Elizabeth Betz*	X	BS Chem			MF & MPN	7 years
Technician/ Analyst	Hoy Burns*	X				MF & MPN	10 years
	Thomas Barbee*	X	BS			MF & MPN	2 years
	Carol Shores	X	BS	MS		MF & MPN	2 years
	Linda Lane	X				MF & MPN	6 months

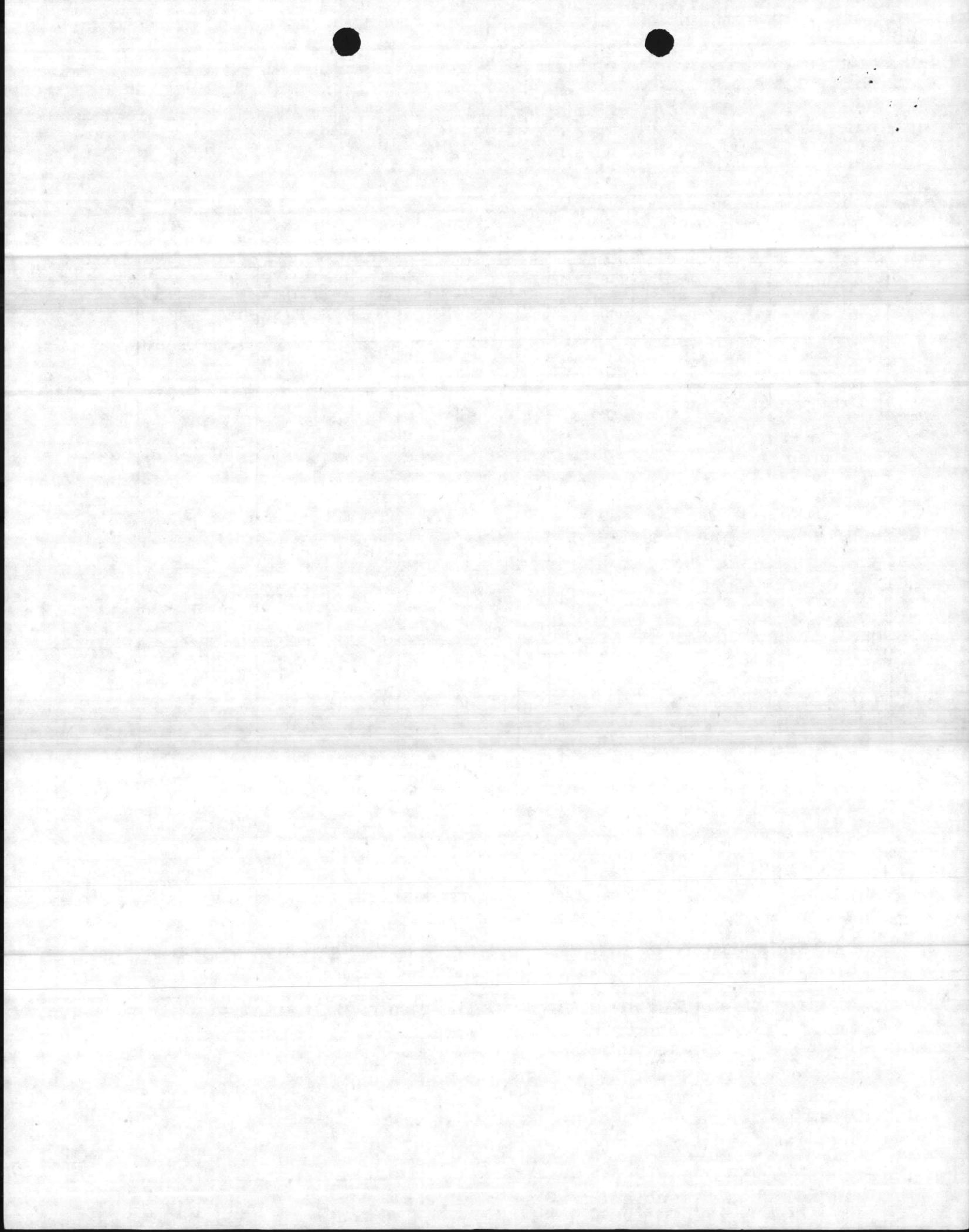
\*Attended NCDHS Water Microbiology Workshop

LABORATORY FACILITIES

Space in laboratory and preparation room is adequate for needs during peak work periods (200 ft and 6 linear ft. of usable bench space per analyst).

Facilities are clean, with adequate lighting (100 ft-candles) and air-conditioning.

Satisfactory



LABORATORY EQUIPMENT, SUPPLIES, AND MATERIALS

1. pH Meter

Manufacturer Orion Model 701  
Orion Model 611

Clean, calibrated to 0.1 pH units each use period; record maintained.. \_\_\_  
Aliquot of standard pH 7.0 buffer used only once..... \_\_\_  
Commercially prepared buffer dated when opened..... \_\_\_

2. Balance-Top Loader or Pan

Manufacturer Ohaus Model Harvard Trip

Clean. Detects a 50-mg weight accurately (for a general media  
preparation of 2-g quantities)..... \_\_\_  
Calibrated annually..... \_\_\_  
Good quality weights in clean condition..... \_\_\_

3. Thermometers

Certified Thermometer:

Manufacturer Fisher (Kessler) Certificate # 836-212

Maximum Registering:

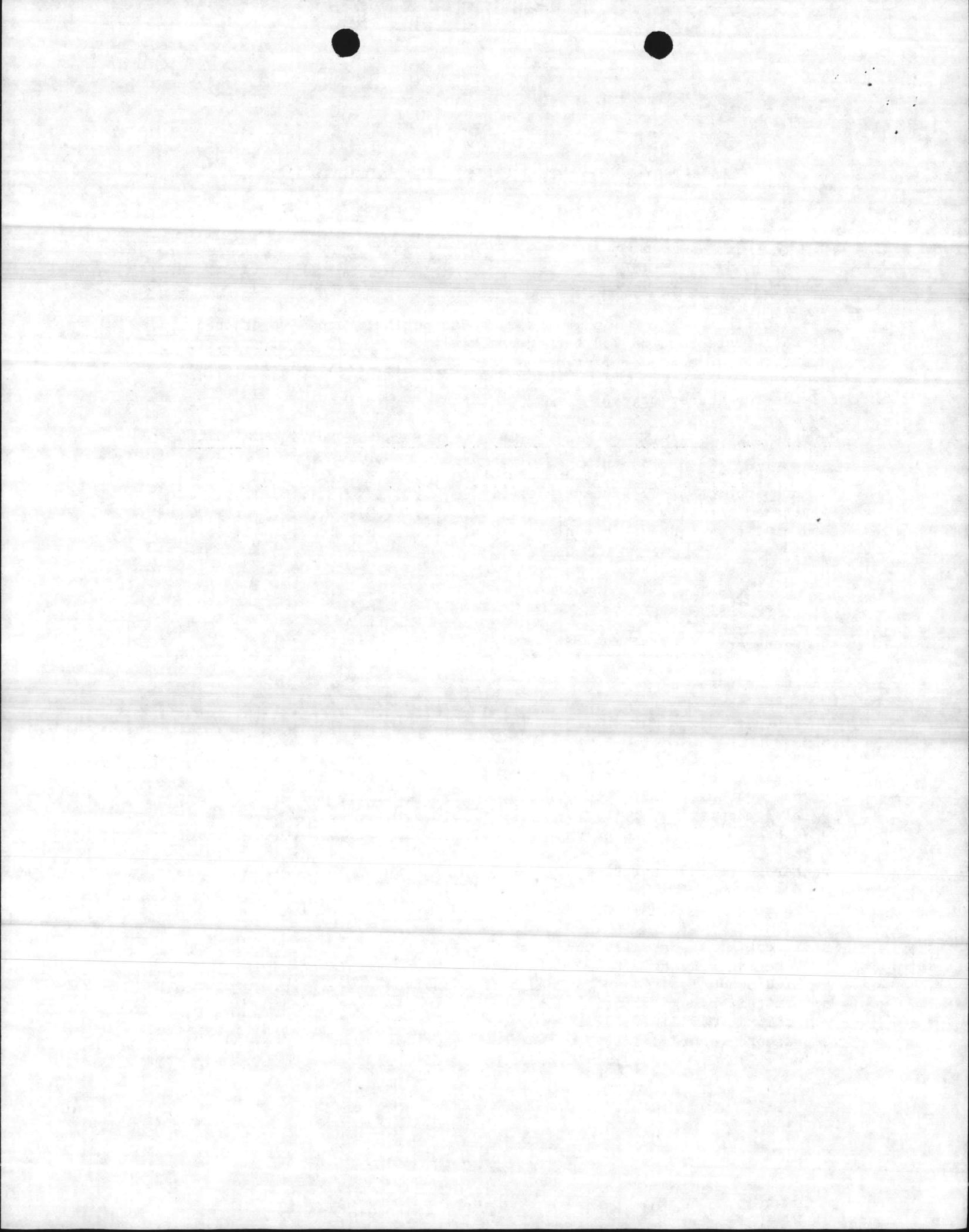
Manufacturer Brooklyn

Glass thermometers calibrated annually against a certified  
thermometer or one of equivalent accuracy; metal thermometers  
checked quarterly..... \_\_\_  
Legible graduations..... \_\_\_  
No separation in liquid column..... \_\_\_

4. Incubator or Incubator Room

Manufacturer Precision Model MZ

Sufficient size for daily work load..... \_\_\_  
Thermometer graduated in 0.5°C increments with bulb immersed in  
liquid and located on top and bottom shelves..... \_\_\_  
Uniform temperature maintained on shelves in all areas used  
(35.0° ± 0.5°C)..... \_\_\_  
Temperature recorded daily or recording thermometer sensitive  
to ± 0.5°C..... \_\_\_



LABORATORY EQUIPMENT, SUPPLIES, AND MATERIALS (Continued)

5. Autoclave

Manufacturer Gelamm Model Sterilimatic

- Reaches sterilization temperature (121°C), maintains 121°C during sterilization cycle, and requires no more than 45 min. for a complete cycle.....
- Temperature checked at least weekly with a maximum registering thermometer calibrated in 1°C increments and results recorded.....
- Pressure and temperature gauges on exhaust side and an operating safety valve.....
- No air bubbles produced in fermentation vials during depressurization.....
- Record maintained on time and temperature for each sterilization cycle.....

6. Hot-Air Oven

Manufacturer NA Model \_\_\_\_\_

- Operates at a minimum of 170°C.....
- Thermometer inserted or oven equipped with temperature-recording thermometer device.....
- Time and temperature record maintained for each sterilization cycle...  
Thermometer bulb in sand (optional)

7. Refrigerator

Temperature maintained at 1° to 5.0°C.....

8. Inoculation Equipment

- Sterilized loops of at least 3-mm, diameter, 22 to 24 gauge Nichrome, Chromel, or platinum-iridium wire.....
- Disposable, dry heat-sterilized, hardwood applicator sticks or presterilized loops..... NA

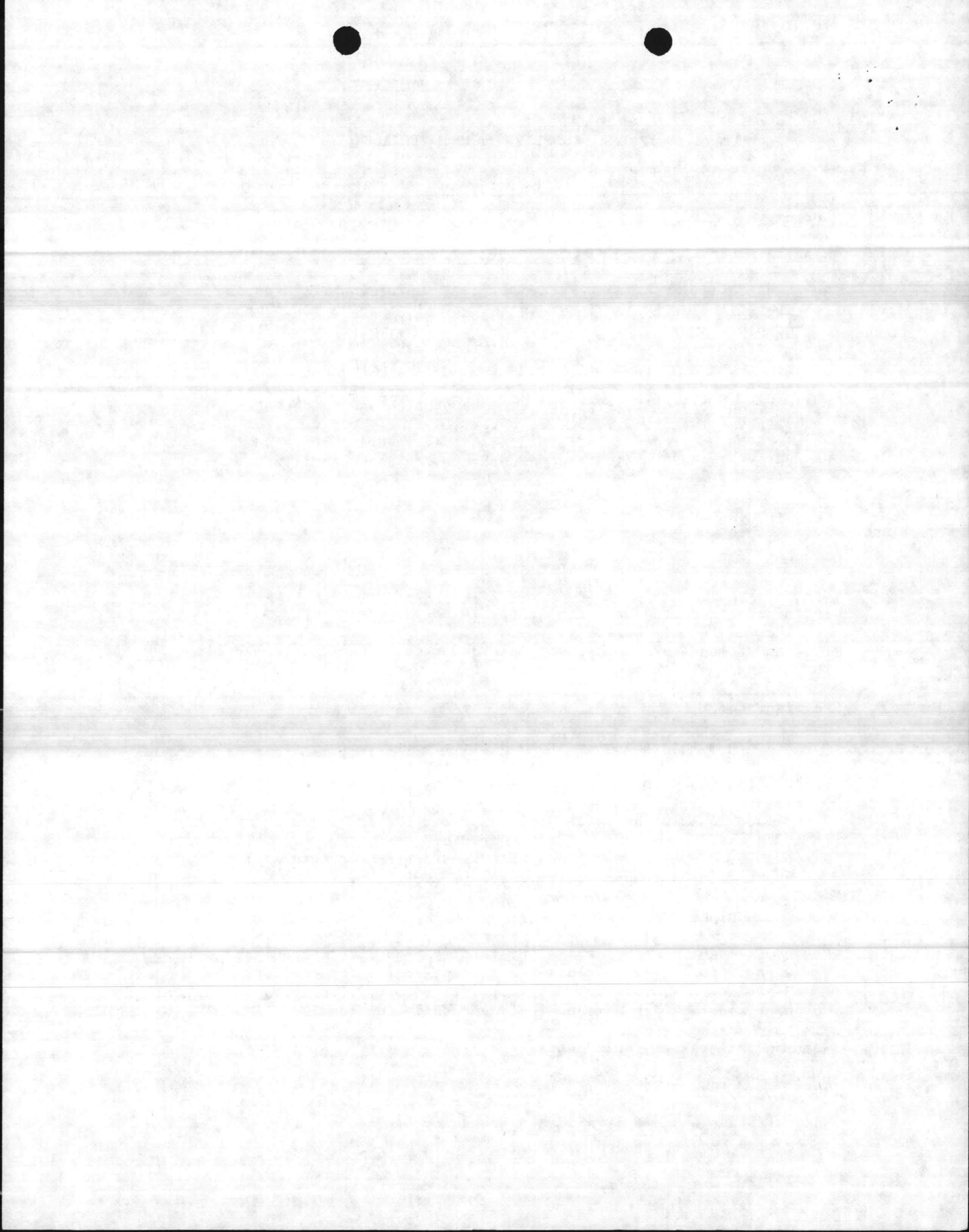
9. Optical Equipment

- Low power magnification device (preferably binocular microscope with 10 to 15X) with fluorescent light source for counting MF colonies.....
- Colonies counted with a mechanical hand tally (optional)

10. Membrane Filtration Equipment

Manufacturer Gelman Model \_\_\_\_\_

- Made of stainless steel, glass, or autoclavable plastic.....
- Nonleaking and uncorroded.....



LABORATORY EQUIPMENT, SUPPLIES, AND MATERIALS (Continued)

11. Membrane Filters and Pads

Manufacturer Millipore Type HAWG

Filters recommended by manufacturer for water analyses.....  
Filters and pads presterilized or autoclavable.....  
Lot numbers and dates of receipt of membrane filters recorded  
(optional)

12. Glass, Plastic, and Metal Utensils for Media Preparation

Washing process provides glassware free of toxic residue as  
demonstrated by the inhibitory residue test and results  
recorded.....

Detergent: Disperse (American Scientific)

Glass items of borosilicate, free of chips and cracks.....  
Utensils clean and free from foreign residues or dried medium.....  
Plastic items clear with visible graduations.....

13. Sample Bottles

Wide-mouth hard glass bottles; stoppered or plastic screw-capped;  
capacity at least 120 ml.....  
Glass-stoppered bottles with tops covered with aluminum foil or  
kraft paper..... NA  
Whirl-Pak Bags..... NA  
Screw-caps have leakproof nontoxic liners that can withstand  
repeated sterilization (30 min at 121°C).....  
Sterility of each batch of sample containers checked using non-  
selective broth and results recorded.....

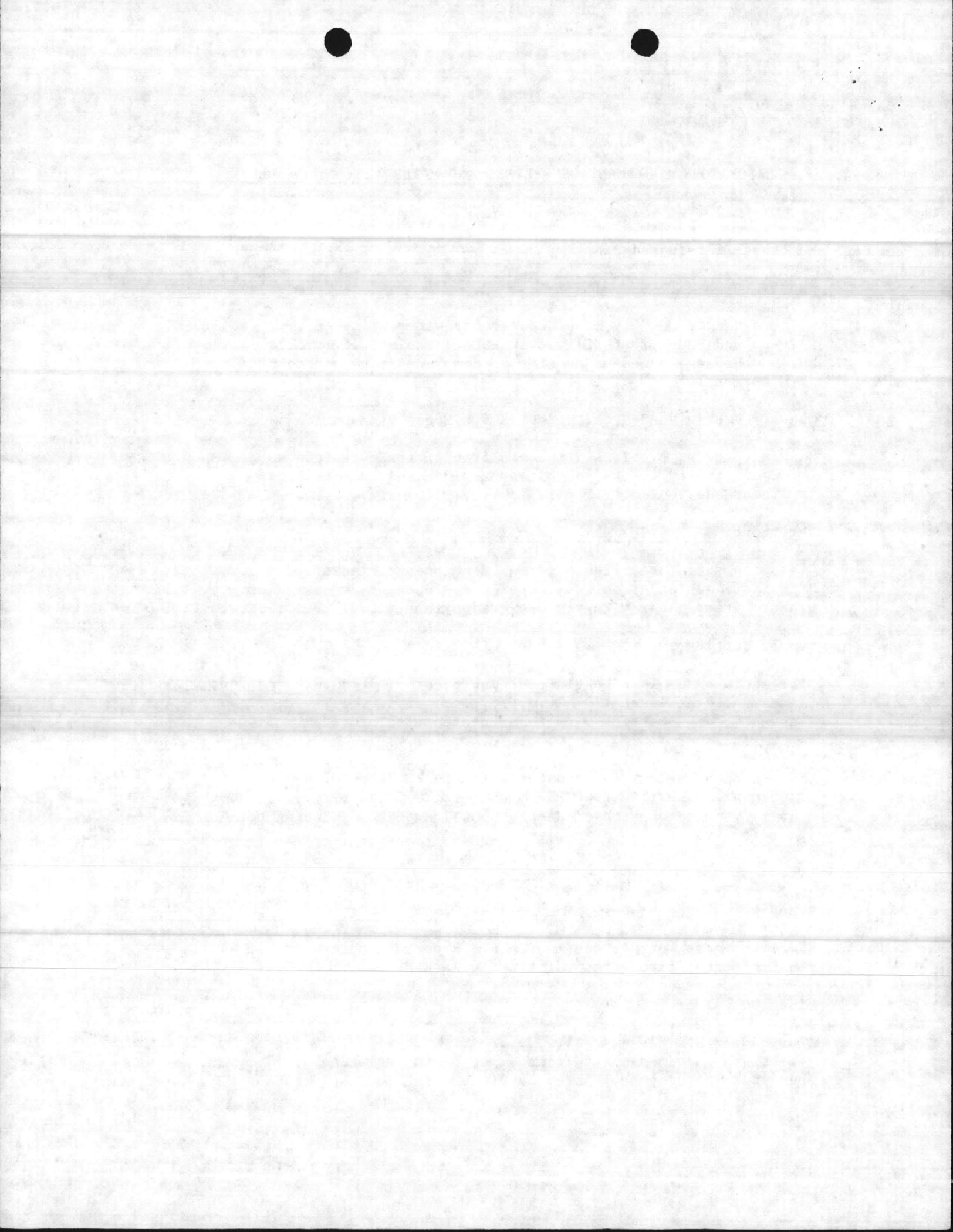
14. Pipets

Brand Falcon, Kimble Type \_\_\_\_\_

Sterile; glass or plastic; with a 2.5 percent tolerance.....  
Tips unbroken; graduations distinctly marked.....

15. Pipet Containers

Aluminum or stainless steel..... NA  
Pipets wrapped in quality kraft paper (char-resistant)..... NA  
Open packs of disposable sterile pipets resealed between uses.....



LABORATORY EQUIPMENT, SUPPLIES, AND MATERIALS (Continued)

16. Culture Dishes

Brand Millipore 49 x 9  
Pyrex Type 100 x 15

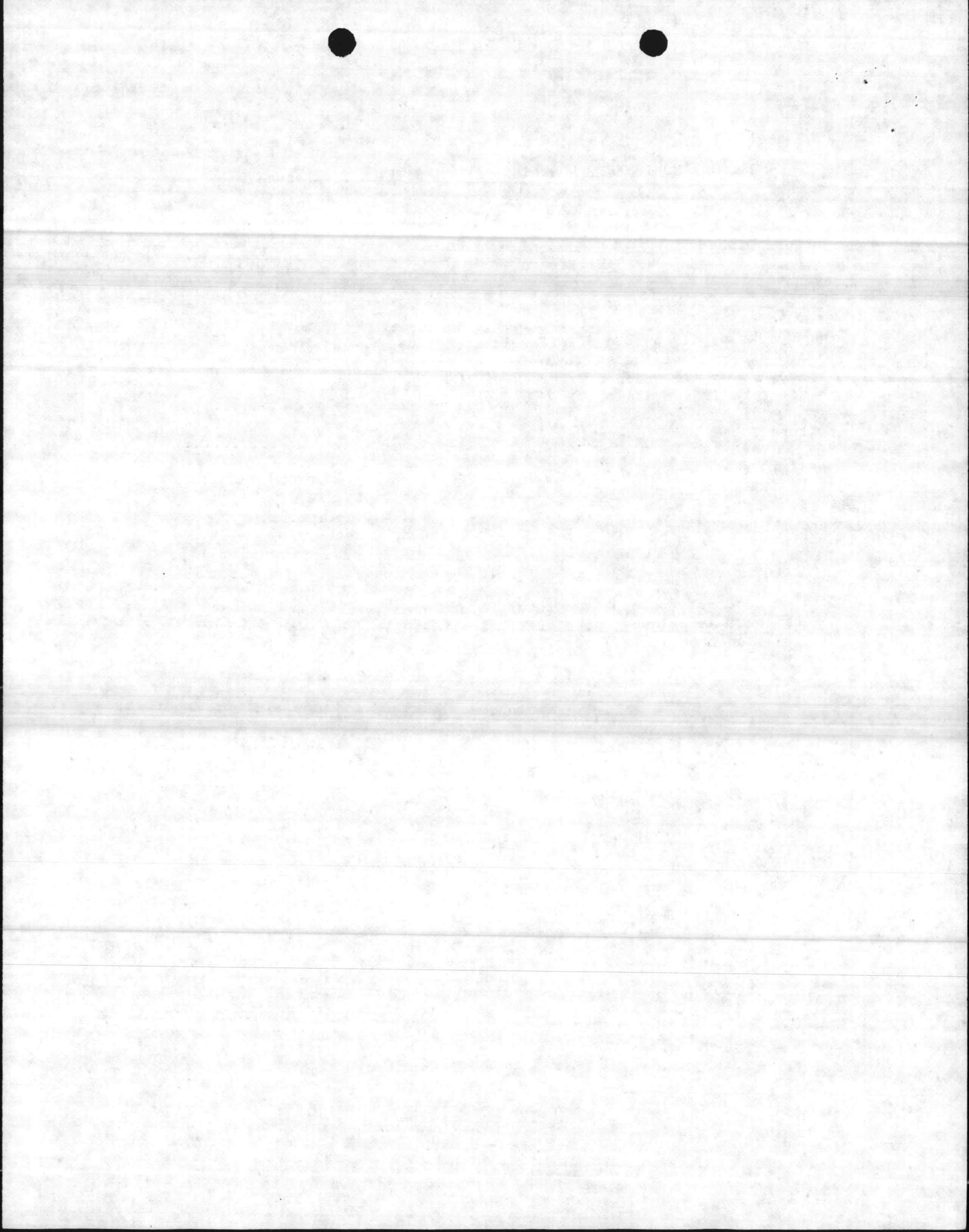
Sterile plastic or glass.....  
 Open packs of disposable sterile plastic dishes resealed between uses.       
 Dishes are in containers of aluminum or stainless-steel with  
 covers or are wrapped with heavy aluminum foil or  
 char-resistant paper.....     

17. Culture Tubes and Closures

Sufficient size to contain medium and sample without danger of  
 spillage.....  
 Metal or plastic caps.....  
 Borosilicate glass or other corrosion-resistant glass.....

18. Maintenance

Service contracts or approved internal protocol maintained on  
 balance, autoclave, water still, etc.; service records entered  
 in a log book.....     X



GENERAL LABORATORY PRACTICES

1. Sterilization Procedures

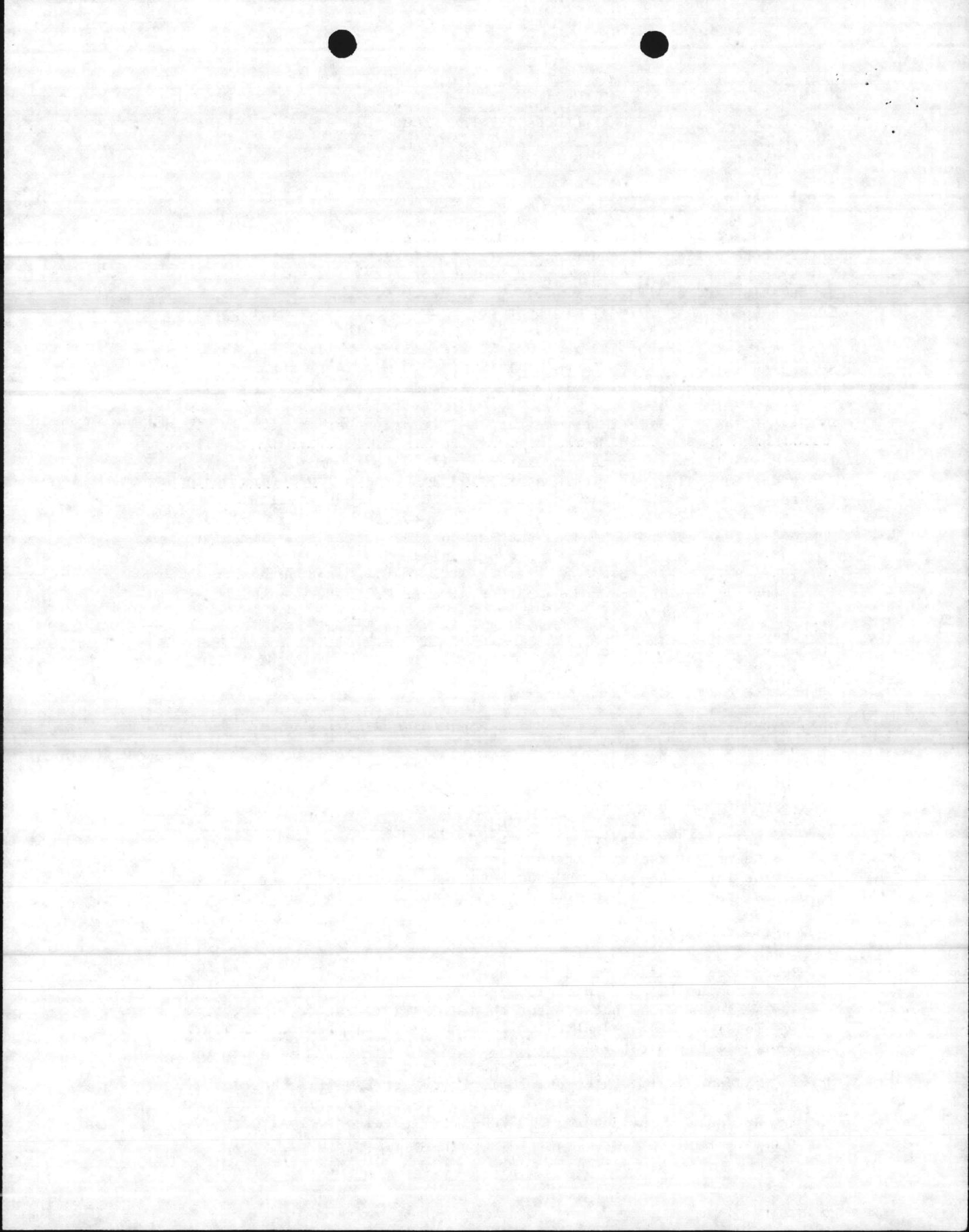
- Timing for sterilization begins when autoclave reaches 121°C.....
- Tubed broth media and reagents sterilized at 121°C 12 to 15 min.....
- Tubes and flasks packed loosely in baskets or racks for uniform heating and cooling.....
- Total exposure of MPN media to heat not over 45 min.....
- Dilution water blanks autoclaved at 121°C for 30 min.....
- Rinse water volumes of 500 to 1,000 ml sterilized at 121°C for 45 min.....
- MF presterilized or autoclaved at 121°C for 10 min fast exhaust.....
- MF assemblies and empty sample bottles sterilized at 121°C for 30 min.....
- MF assemblies sterilized between sample filtration series.....
- Wire loops, needles, and forceps sterilized.....
- Individual glassware items autoclaved at 121°C for 30 min.....
- Individual dry glassware items sterilized 2 hours at 170°C (dry heat).....
- Pipets, culture dishes, and applicator sticks in boxes sterilized at 170°C for 2 hours.....
- MPN media removed and cooled as soon as possible after sterilization and stored in cool dark place (optional)
- UV light or boiling water for at least 2 min may be used on membrane filter assemblies to reduce bacterial carry-over between each filtration (optional)
- Heat-sensitive tapes and/or strips/ampoules used during sterilization (optional)

2. Laboratory Pure Water

- Only laboratory pure water, used in preparing media, reagents, rinse water, and dilution water.....
- Laboratory pure water not in contact with heavy metals.....
- Source: Laboratory-prepared  Purchased
- If Laboratory-prepared:
  - Still Manufacturer Corning Megapure 6L and 3L
  - Deionizer Manufacturer Corning High Cap
  - Record of recharge frequency \_\_\_\_\_
- Production rate and quality adequate for laboratory needs.....
- Inspected, repaired, cleaned by service contract or in-house service..

a. Chemical Quality Control

- Record of satisfactory annual analyses for trace metals (Cadmium, Chromium, Copper, Nickel, Lead, and Zinc)
  - A single metal not greater than 0.05 mg/l.....
  - Total metals: equal to or less than 1.0 mg/l.....
  - Testing laboratory IEA Date 9-86
- Record of monthly analyses of laboratory pure water
  - Conductance: >0.5 megohm resistivity or <2.0 micromhos/cm.....
  - pH: 5.5 - 7.5.....
  - Standard plate count: ≤10,000/ml. Stored or deionized;
    - ≤1000, freshly distilled or ultra-pure.....
    - Free chlorine residual: <0.1.....



GENERAL LABORATORY PRACTICES (Continued)

b. Microbiological Quality Control

Test for bactericidal properties of distilled water  
(0.8 - 3.0) performed at least annually.....  
Testing laboratory \_\_\_\_\_ Date \_\_\_\_\_ Ratio \_\_\_\_\_

3. Rinse and Dilution Water

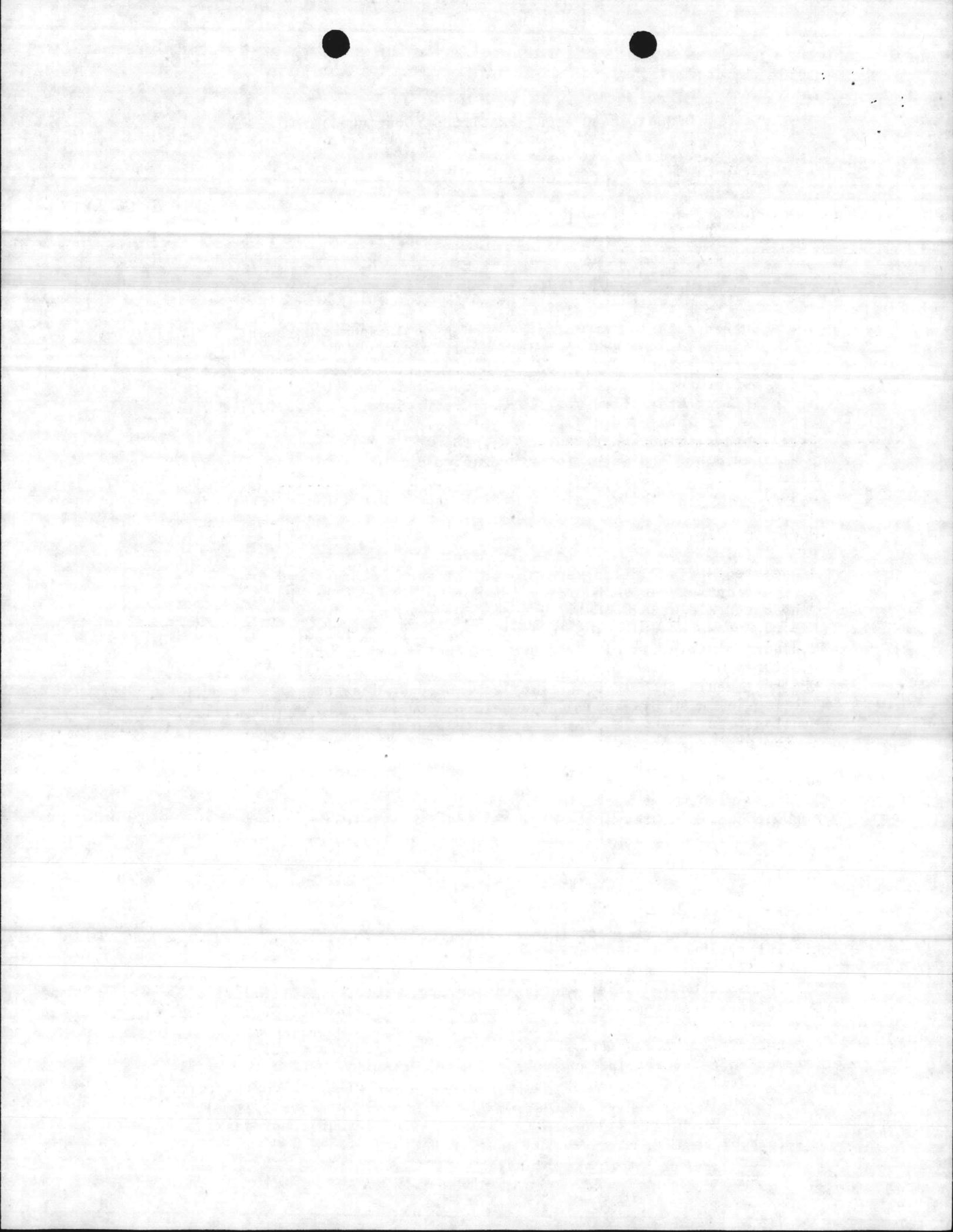
Stock buffer solution prepared according to "Standard Methods",  
14th edition, or EPA Methods Manual.....  
Stock buffer solution adjusted to pH 7.2.....  
Stock buffer autoclaved at 121°C, stored at 1° to 5.0°C  
or filter sterilized.....  
Stock buffer labeled and dated.....  
Stock potassium phosphate buffer solution (1.25 ml) added per  
liter distilled water for rinse and dilution water.....  
Final pH 7.2 ± 0.1.....  
MgSO<sub>4</sub> \_\_\_\_\_ MgCl<sub>2</sub>  5 ml stock solution per liter

4. Media

Dehydrated media bottles kept tightly closed and protected from  
dust and excessive humidity in storage areas.....  
Dehydrated media not used if discolored or caked.....  
Laboratory pure water used in media preparation.....  
Media completely dissolved before dispensing to culture  
tubes or bottles.....  
MPN tube media with loose-fitting caps used in less than 1 week.....  
Tube media in screw-capped tubes held no longer than 3 months.....  
Media stored at low temperatures are incubated overnight prior  
to use and tubes with air bubbles discarded.....  
Media protected from sunlight.....  
MF media stored in refrigerator; broth media used within 96 hours,  
agar within two weeks if prepared in tight-fitting dishes.....  
Ampouled media stored at 1° to 5.0°C and time limited to  
manufacturer's expiration date.....

5. Quality Control of Media and Reagents

Satisfactory records containing complete quality control checks  
on media available for inspection..... X  
Laboratory chemicals of Analytical Reagent Grade.....  
pH checked and recorded on each batch of medium after  
preparation and after sterilization.....  
Causes for deviations beyond ± 0.2 pH units specified.....  
Media ordered on a basis of 12-month need; purchases in 1/4 lb.  
quantities, except those used in large amounts (optional)  
Bottles dated on receipt and when opened (optional)  
Opened bottles of routinely used media discarded within 6 months (if  
stored in desiccator storage may be extended) (optional)  
Shelf life of unopened bottles not in excess of 2 years (optional)  
New lots of media quality tested against satisfactory lot using  
natural water samples (optional)



GENERAL LABORATORY PRACTICES (Continued)

6. Lauryl Tryptose Broth

Manufacturer Difco Lot No. 738671 9/90

Single Strength composition, 35.6g per liter pure water.....  
Single strength pH  $6.8 \pm 0.2$ ; double strength pH  $6.7 \pm 0.2$ .....  
Not less than 10 ml per tube.....  
Media made to result in single strength after addition of  
sample portions.....

7. Brilliant Green Lactose Bile Broth

Manufacturer BBL Lot No. D7DOCX 4/88

Medium composition 40g per liter pure water.....  
Final pH  $7.2 \pm 0.2$ .....

8. M-Endo Media

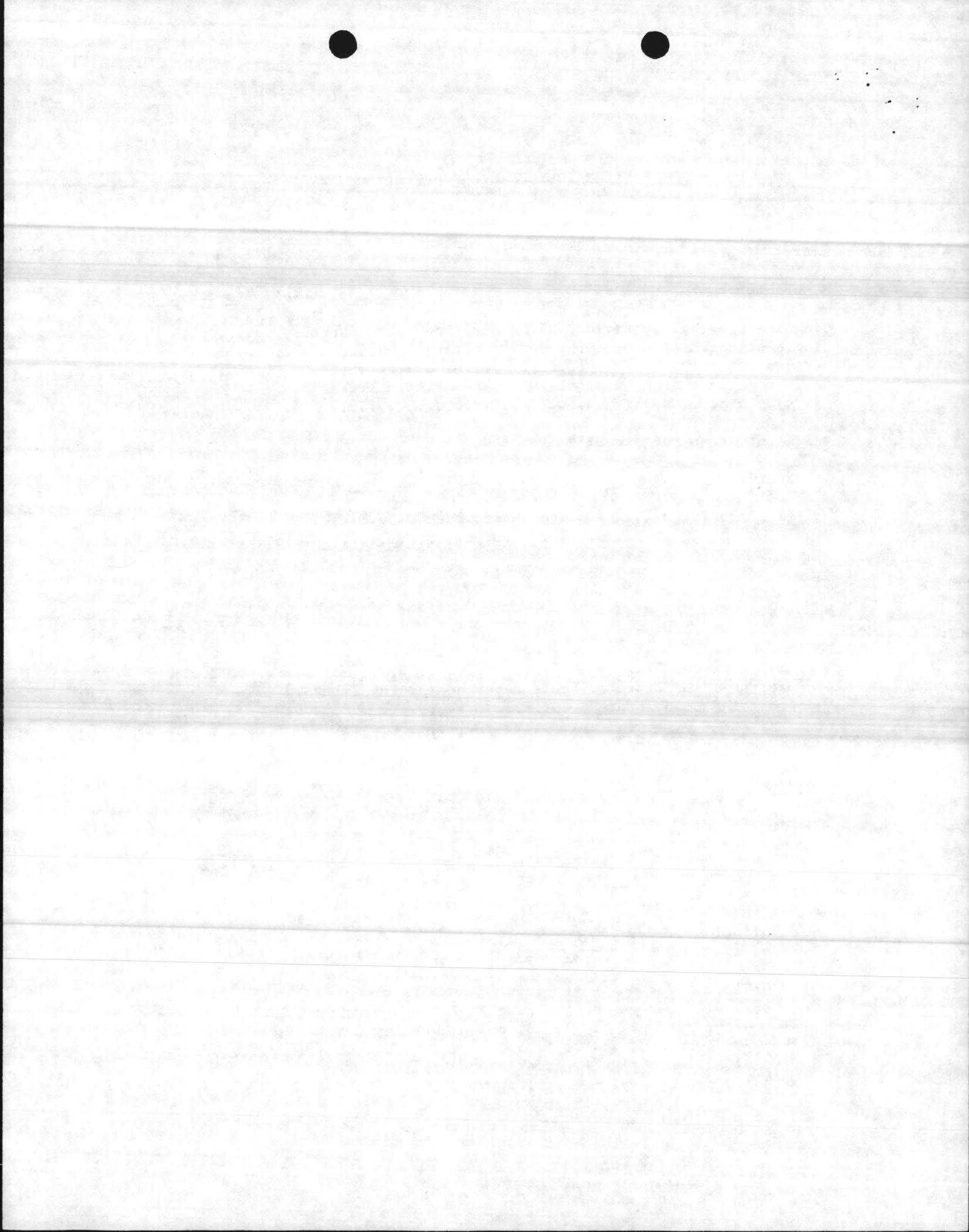
Manufacturer BBL Lot No. G7D010 7/88

Medium composition 48.0g per liter pure water; optionally  
15g agar added/l.....  
Reconstituted in laboratory pure water containing 2 percent  
ethanol (not denatured).....  
Final pH  $7.2 \pm 0.2$ .....  
Medium held in boiling water bath until completely dissolved.....

9. Standard Plate Count Agar

Manufacturer Difco Lot No. 726887 8/89

Correct composition, sterile and pH  $7.0 \pm 0.2$ .....  
Sterile medium not remelted a second time after sterilization.....  
Culture dishes incubated 48 hours at  $35^{\circ} \pm 0.5^{\circ}\text{C}$ .....  
No more than 1.0 ml or less than 0.1 ml sample plated (sample  
or dilution).....  
Liquified agar, 10 ml or more; medium temperature between  
 $44^{\circ}$  to  $46^{\circ}\text{C}$ .....  
Melted medium stored no longer than 3 hours before use.....  
Only plates with between 30 to 300 colonies counted; when 1 ml  
of undiluted sample is plated, colony density may be less  
than 30.....  
Only two significant figures recorded and calculated as  
standard plate count/ml.....



GENERAL LABORATORY PRACTICES (Continued)

10. Levine's Eosin Methylene Blue Agar (EMB)

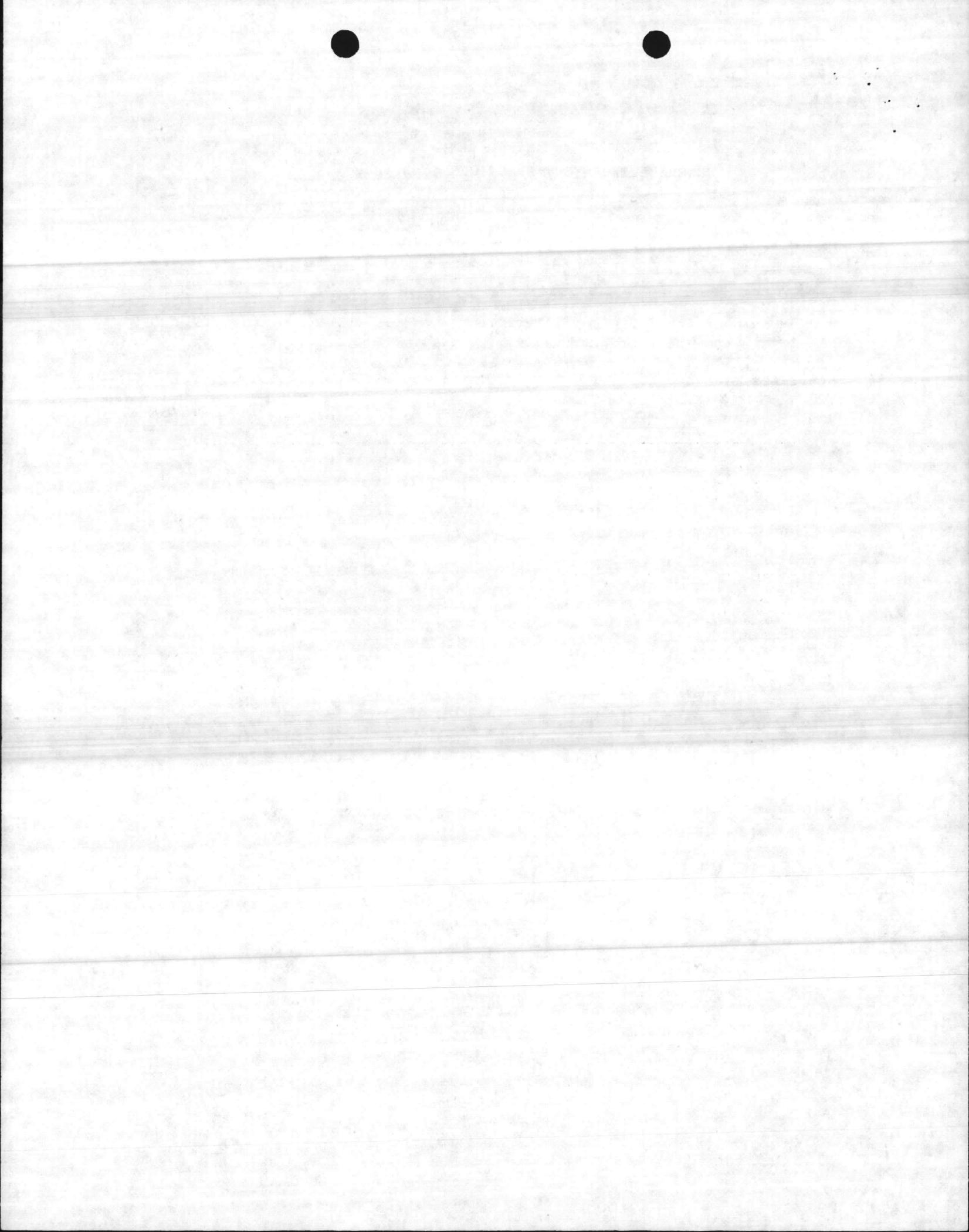
Manufacturer \_\_\_\_\_ Lot No. \_\_\_\_\_ X

Medium composition 37.5g per liter..... \_\_\_\_\_

Final pH  $7.1 \pm 0.2$ ..... \_\_\_\_\_

11. Sterility Test Broth..... \_\_\_\_\_

Manufacturer Difco (Tryptic Soy Broth) Lot No. 709765 8/87



METHODOLOGY

Methodology specified in "Standard Methods" 14th edition, or EPA manual.....
M-Endo broth, M-Endo agar, or Les Endo agar used in a single
step procedure.....
In two-step Les M-Endo procedure, MF incubated on lauryl tryptose broth
saturated absorbent pad for 1.5 to 2 hours at 35 + 0.5 C; then on
M-Endo broth at Les Endo agar for 20 to 22 hours at 35 + 0.5 C..... NA

1. Total Coliform Membrane Filter Procedure

Samples containing excessive bacterial populations (greater
than 200), confluency, or turbidity retested by the MPN
procedure.....
Filtration assembly sterile at start of each series.....
Absorbent pads saturated with medium, excess discarded; or 4.0 ml
of agar medium can be used per culture dish instead of a pad.....
Sample shaken vigorously immediately before test.....
Test sample portions measured and not less than 100 ml analyzed.....
Funnel rinsed at least twice with 20- to 30-ml portions of
sterile buffered water.....
MF removed with sterile forceps, grasping outside effective
filtering area.....
MF rolled onto medium pad or agar so air bubbles are not trapped.....
A start and finish MF control test (rinse water, medium and
supplies) run with each filtration series and results recorded....
When controls indicate contamination occurred, all data on
affected samples rejected and resampling requested.....

a. Incubation of Membrane Filter Cultures

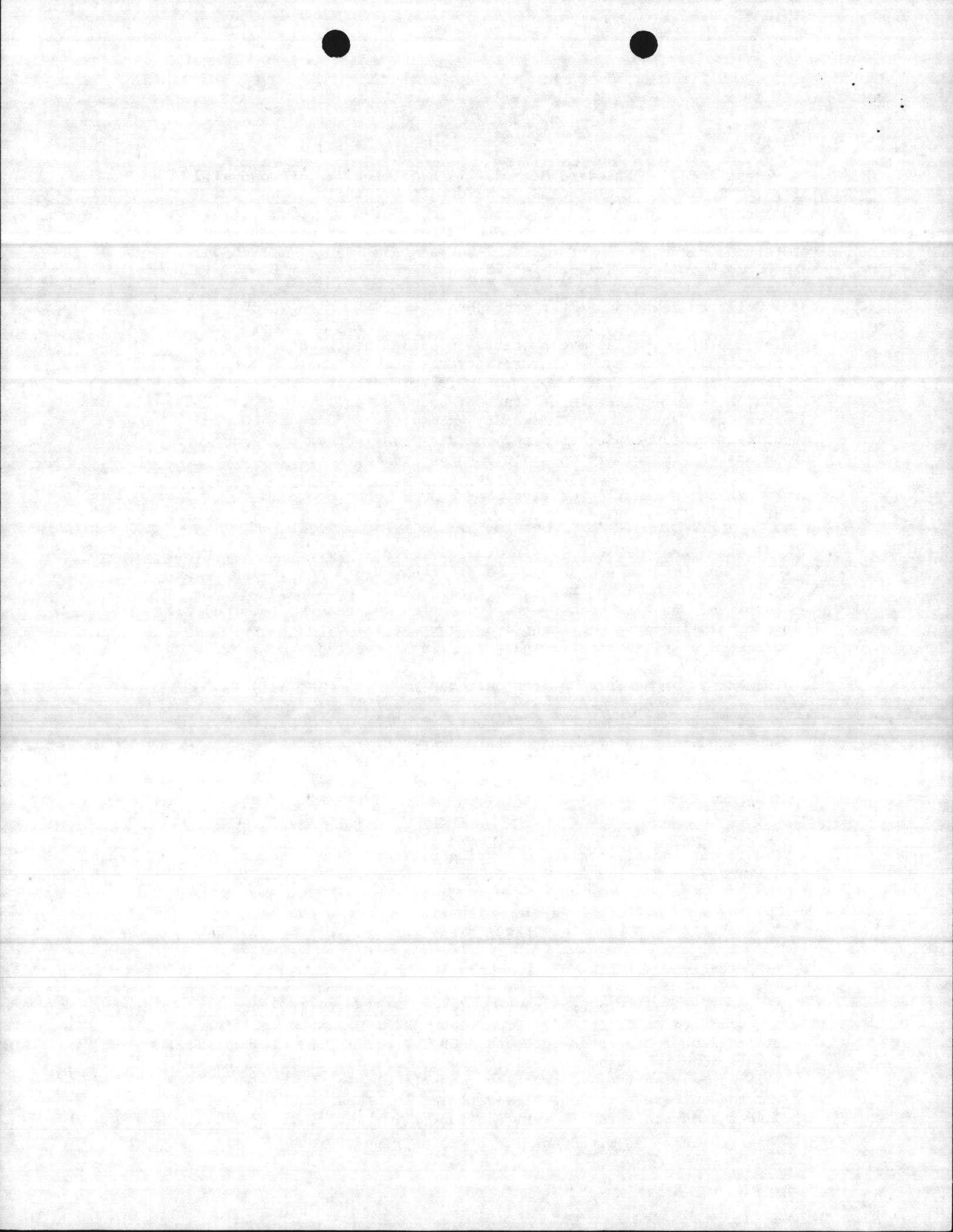
Total incubation time 22 to 24 hours at 35 + 0.5 C.....
Incubated in tight-fitting culture dishes or loose-fitting
dishes incubated in high relative humidity chambers.....

b. Membrane Filter Colony Counting

Samples repeated when coliforms are "TNTC" or colony growth
is confluent, possibly obscuring coliform development
and/or detection.....
Total coliform count calculated in density per 100 ml.....
Low power magnification device with fluorescent light
positioned for maximum sheen visibility.....

c. Verification of Total Coliform Colonies

All typical coliform (sheen) colonies or at least five randomly
selected sheen colonies from each positive sample verified
in lauryl tryptose broth and BGLB.....
Counts adjusted based on verification.....
All atypical coliform (borderline sheen) colonies or at least
randomly-selected colonies verified in LTB and BGLB.....
Counts adjusted based on verification.....
Sheen colonies in mixed confluent growth reported and
verified (optional)



METHODOLOGY (Continued)

d. MF Field Equipment

Manufacturer NA Model \_\_\_\_\_

Only standard laboratory MF procedures adapted to field application.....

2. Total Coliform Most Probable Number Procedure

a. Presumptive Test

- Five standard portions, either 10 or 100 ml.....
- Sample shaken vigorously immediately before test.....
- Tubes incubated at  $35^{\circ} + 0.5^{\circ}\text{C}$  for  $24 + 2$  hours.....
- Examined for gas (any gas bubble indicates positive test).....
- Tubes that are gas-positive within 24 hours submitted promptly to confirm test.....
- Negative tubes returned to incubator and examined for gas within  $48 + 3$  hours; positives submitted to confirm test.....
- Public water supply samples with heavy growth and no gas production confirmed for presence of suppressed coliforms.....
- Adjusted count reported based upon confirmation.....
- Adequate test labeling and tube dilution coding (optional).....

b. Confirmed Test

- Presumptive positive tube gently shaken or mixed by rotating.....
- One loopful or one dip of applicator transferred from presumptive tube to BGLB.....
- Incubated at  $35^{\circ} + 0.5^{\circ}\text{C}$  : checked within  $24 + 2$  hours for gas production.....
- Positive confirmed tube results recorded; negative tubes reincubated and read within  $48 + 3$  hours.....
- Confirmation procedure carried out every  $\frac{1}{3}$  months on one sample from each problem water supply.....

c. Completed Test

- Applied to 10 percent of all positive samples each quarter.....
- Applied to all positive confirmed tubes in each test completed....
- Positive confirmed tubes streaked on EMB plates for colony isolation.....
- Plates adequately streaked to obtain discrete colonies.....
- Incubated at  $35^{\circ} + 0.5^{\circ}\text{C}$  for  $24 + 2$  hours.....
- Typical nucleated colonies, with or without sheen on EMB plates selected for completed test identification.....
- If typical colonies absent, atypical colonies selected for completed test identification.....



METHODOLOGY (Continued)

c. Completed Test (Continued)

- If no colonies or only colorless colonies appear, confirmed test for that particular tube considered negative.....\_\_\_
- An isolated typical colony or two atypical colonies transferred to lauryl tryptose broth.....\_\_\_
- Incubated at  $35^{\circ} + 0.5^{\circ}\text{C}$ ; checked for gas within  $48 + 3$  hours.....\_\_\_
- Cultures producing gas in lauryl tryptose broth within  $48 + 3$  hours are considered coliforms.....\_\_\_

3. Analytical Quality Control

- a. A record of analytical quality control tests available for review..... X

**Duplicate analyses**

Duplicate analyses run on positive polluted samples not to exceed 10 percent but a minimum of one per month (optional)

**Positive Control Samples**

One positive control sample (polluted water) run each month (optional)

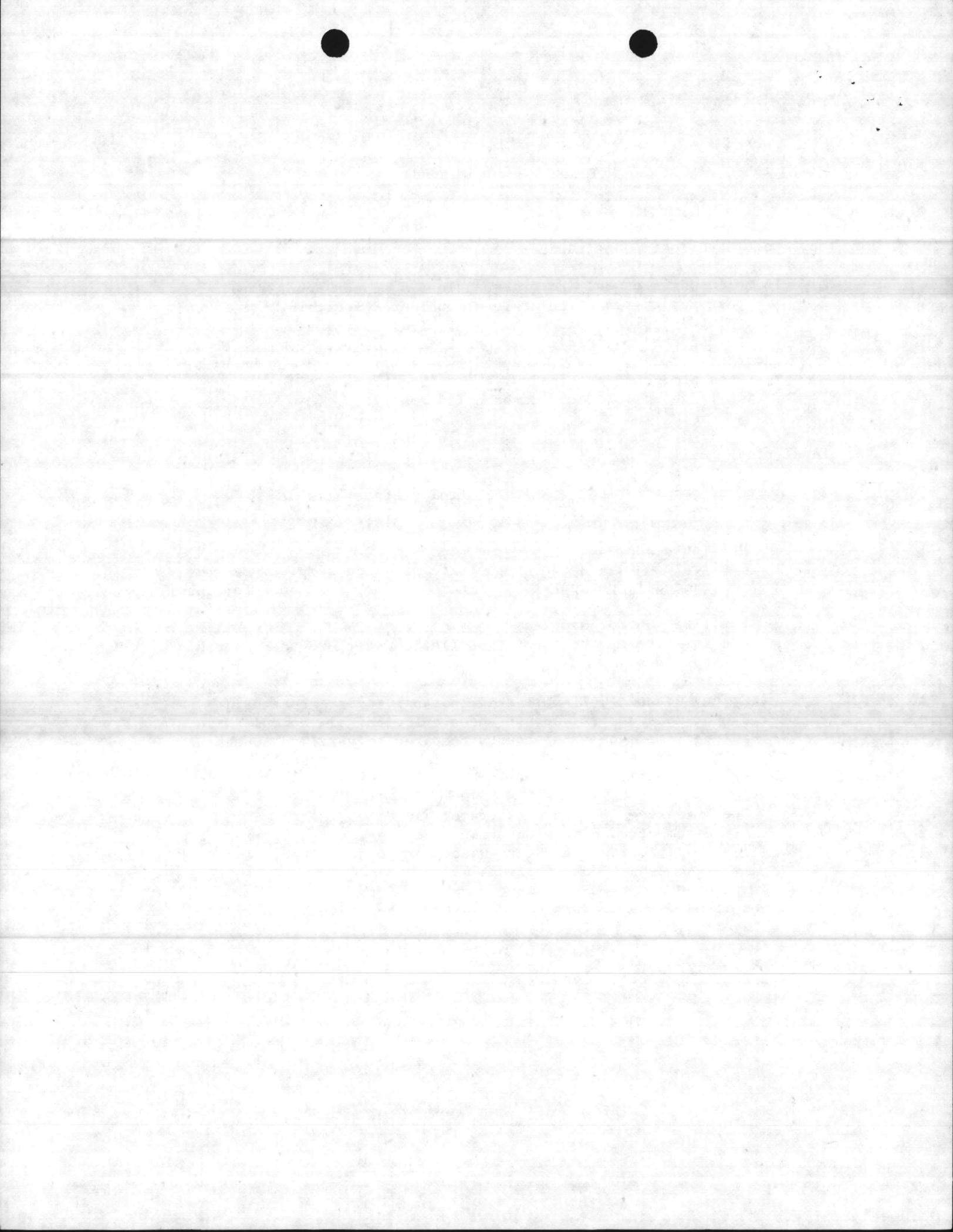
**Colony Counting (If more than one Analyst in Laboratory)**

Two or more analysts count sheen colonies; all colonies are verified analysts' counts compared to verified counts; procedure is carried out at least once per month. (optional)

**Check Analyses by State Laboratories**

A minimum of samples proportional to the local laboratory work load processed by State Laboratory (see criteria for recommendations) (optional)

- b. An outline of the quality control efforts of the laboratory available for review.....\_\_\_







DATA REPORTING

Sample information and laboratory data fully recorded.....\_\_\_  
Direct MF counts and/or confirmed MPN results reported promptly.....\_\_\_  
After MF verification and/or MPN completion, adjusted counts reported.....\_\_\_  
One copy of report form retained in laboratory or by State program  
for 3 years.....\_\_\_  
Test results assembled and available for inspection (optional) \_\_\_\_\_

ACTION RESPONSE TO LABORATORY RESULTS

Unsatisfactory test results given action response and resampled as defined  
in National Interim Primary Drinking Water Regulations.....\_\_\_  
State and responsible local authority notified within 48 hours after  
check samples confirm coliform occurrence.....\_\_\_  
All data reported to State and local authorities within 40 days.....\_\_\_

