

Document # 160  
GATEWAY NATIONAL RECREATION AREA Division Natural Resources  
DIVISION OF PROFESSIONAL SERVICES Gateway National Recreation Area  
WATER QUALITY LABORATORY

OPERATIONS MANUAL  
FOR  
BACTERIOLOGICAL ANALYSIS OF BEACH WATER QUALITY  
AT GATEWAY NATIONAL RECREATION AREA  
USING THE  
MEMBRANE FILTER METHOD

OCTOBER 1984

NATIONAL PARK SERVICES  
GMR A JAMICA EAY  
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## CATALOG NUMBER

Millipore XM100A704  
Millipore XM100A702  
Fisher 08822

Fisher 02-84-7  
All material 12-2-2

## MATERIALS AND EQUIPMENT

Baker 500 ml Bunnels  
Pyrex Ground Glass Bases  
Pyrex 100 ml Graduated Cylinders  
Polycarbonate 500 ml wide mouth sampling  
bottles with screw on caps  
Pressure Sterilizer  
Plastic Glove

This manual is intended to serve as a guide to laboratory operations for the standardization of procedures and to insure the collection of accurate and reliable data. Although it outlines sampling and analysis procedures for the Membrane Filter Method it is recommended that the references listed in the bibliography be consulted for more detailed explanation of procedures and biological principles involved.

1. Water (distilled preferred) is placed in sterilizer over the plate is inserted in sterilizer over the plate of perforated plate.
2. Materials are stacked horizontally inside container. Cover is placed on sterilizer and tightened with wing nuts. Safety valve is in the "LOW" position. Temperature setting is on "121" and switch is "ON".
3. Materials are sterilized for 15-20 minutes at 121° F. (25 psi). Pressure indicator arrow to green "NORMAL" portion of pressure scale. Pressure is lowered by rotating safety valve to the "UP" position. Allow pressure to fall to 14.7° F. (0.5 psi) and set valve down again to "DOWN" position.
4. When sterilization time is completed, rotate valve to "UP" position. Switch to "OFF" and allow temperature to reach zero (0) before removing cover.
5. Materials are taken out with use of plastic gloves and placed inside down on clean paper towels.
6. When dry, bottles are capped and tube are covered with aluminum foil. (inside of foil should be wiped with stream of sterile distilled water before covering glassware). Bunnels and bases are entirely covered with foil.
7. Materials are placed inside storage cabinet and can be stored up to 24 weeks without re-sterilizing.

## APPENDIX

5 Bunnels, 6 bases, 14 bottles and caps, 4 cylinders need 2-3 hours sterilizations and about 2 - 3 hours to complete.

# STERILIZATION OF GLASSWARE

## MATERIALS AND EQUIPMENT

## CATALOG NUMBER

Pyrex 300 ml Funnels  
 Pyrex Ground Glass Bases  
 Pyrex 100 ml Graduated Cylinders  
 Polycopylene 500 ml wide mouth sampling  
     bottles with screw on caps  
 Pressure Sterilizer  
 Plastic Gloves, Aluminum Foil, Lubriscal  
 Non Phosphate Liquidsoap (Liquidinox)

Millipore XX1004704  
 Millipore XX1004702  
 Fisher 08552E  
 Fisher 02-893 C  
 All American 1925 X

1. Bottles, caps, and glassware are washed with hot, soapy water and scrubbed with bottle brush.
2. Materials are rinsed repeatedly with tap water. A final rinse with distilled water is recommended. Allow glassware to drain.
3. Surfaces of sterilizer opening and cover are lined with lubricant to avoid pressure leaks.
4. Water (distilled preferred) is placed in bottom of sterilizer. Perforated plate is inserted in sterilizer over the water. Container is placed on top of perforated plate.
5. Materials are stacked horizontally inside container. Cover is placed on sterilizer and tightened with wing nuts. Safety valve is in the "DOWN" position, temperature setting is on "HI" and switch is "ON".
6. Materials are sterilized for 15-20 minutes at 250° F (15 psi). Do not allow pressure indicator arrow to enter "CAUTION" portion of pressure scale. Pressure is lowered by raising safety valve to the "UP" position. Allow pressure to fall to 245° F (12.5 psi) and set valve down again to build up pressure.
7. When sterilization time is completed, raise valve to "UP" position, flip switch to "OFF" and allow temperature/psi to reach zero (0) before removing cover.
8. Materials are taken out with use of plastic gloves and placed upside down on clean paper towels.
9. When dry, bottles are capped and tops are covered with aluminum foil, (inside of foil should be rinsed with stream of sterile distilled water before covering glassware). Funnels and bases are entirely covered with foil.
10. Materials are placed inside storage cabinet and can be stored up to two weeks without re-sterilizing.

## TIME:

6 Funnels, 6 bases, 24 bottles and caps, 4 cylinders need 2-3 separate sterilizations and about 2 - 3 hours to complete.

## MEDIA PREPARATION

### MATERIALS & EQUIPMENT

### CATALOG NUMBER

|                                            |                      |
|--------------------------------------------|----------------------|
| Plastic, Disposable Petri-Dishes 9 X 49 mm | Millipore PD 1004700 |
| Membrane Filters HC, 145u, 47mm            | Millipore HCWGO47S1  |
| Media Pads. 47mm                           | " "                  |
| Pad Dispenser                              | " "                  |
| Total Coliform Ampoules Endo 2 ml          | Millipore M0000002E  |
| Fecal Coliform Ampoules M-FC 2 ml          | Millipore M0000002F  |
| Ampoule Breaker                            | Millipore XX6200007  |
| Glass Marking Pencils                      |                      |
| Trays                                      |                      |

1. Petri dishes are laid out on clean paper towels.
2. Dishes are labeled with glass marking pencils according to date, site, dilution factor, and media.
3. Petri dishes is opened, media pad is placed inside dish with use of pad dispenser, and dish is covered. Repeat for each dish.
4. Ampoule is gently tapped at base to allow all the media to enter vial. Ampoule is broken at neck, petri dish is opened, media is poured onto pad so as to cover entire surface, and dish is covered. Repeat for each dish.
5. When all dishes are completed, they are placed in labeled trays upside down and refrigerated until used. Dishes may be refrigerated up to 96 hours before drying out occurs.
6. 116 Petri Dishes are required for each week of sampling: 18 sites with 3 dilutions each for total and fecal coliforms and 4 controls for each day of filtering.
7. Only sterile distilled water or sterile phosphate buffer should be used for filtration. Since distilled water left in open storage tanks can become easily contaminated the water should be sterilized by boiling for 15 minutes or membrane filtration before use as rinse or dilutant..

### TIME:

116 dishes needs about 2 hours to prepare.

## SAMPLING TECHNIQUE

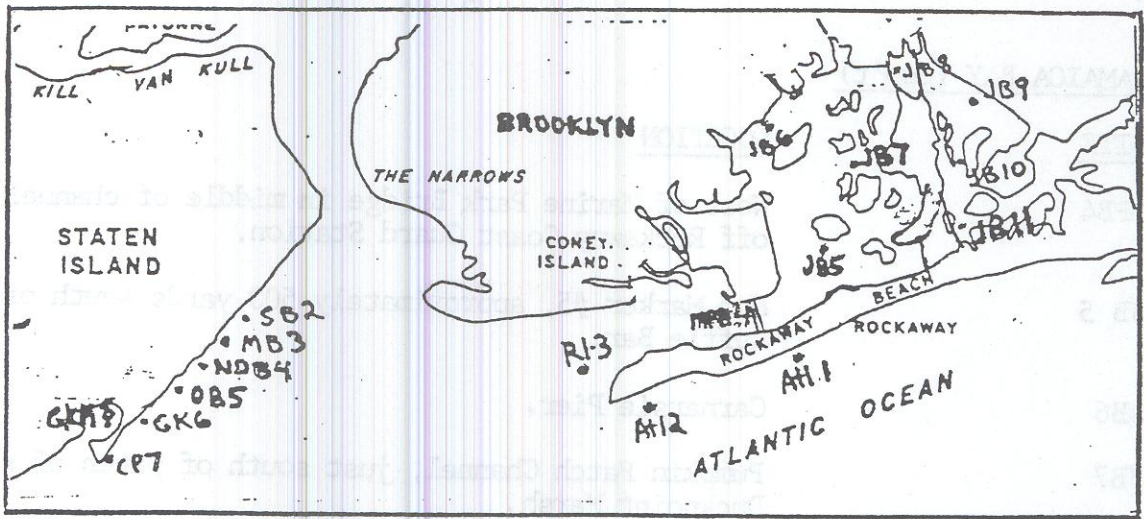
### MATERIALS & EQUIPMENT

Polypropylene 500 ml Wide Mouth Bottles with Screw-on Caps, autoclavable  
Extension Pole with Bottle Harness  
Ice Chest  
Freezer Thermometer  
Water Resistant Tape and Permanent Marker  
Ice or frozen gel  
Clipboard, Pencil, Watch, Sampling Data Sheet.

1. Ice chest is filled with ice or frozen gel blocks. Thermometer is kept in chest to monitor temperature at 4° C.
2. Each bottle is labeled with tape and marker, on bottle and cap, according to the site it will be used at.
3. At the sampling site, bottle is removed from ice chest, uncapped, and held at the base. If harness is used, bottle is placed in harness and then uncapped. In either method, the uncovered cap must not come in contact with any other surface.
4. Bottle is plunged into the water, 6-12 inches below the surface, and pointing into the current and away from the hand, boat, etc. Avoid sampling in wake of a wave, receding tide, shallow water, or areas heavily polluted with oil or physical debris.
5. Bottle is removed from the water when full, some water is poured off to allow an air space for mixing, and cap is put back on.
6. Bottle is placed in ice chest. Sample must be filtered and in incubator within 6 hours after sampling.
7. Time of sampling, tide and physical condition of the sampling site (presence of garbage, flotsam, oil, etc.) are recorded.
8. Sample sites and specific landmarks for each site are indicated on the following page.
9. Samples are collected for each site once weekly from Memorial Day to Labor Day.

### TIME:

Seven Staten Island sites and two Breezy Point sites sampled from shore takes about 3-4 hours including travel time to lab.  
Nine Jamaica Bay sites sampled from boat takes about 2½-3 hours including travel time to lab.



## STATEN ISLAND

## LANDMARKS AND COMMENTS

### SITE

|       |                                                                                                        |
|-------|--------------------------------------------------------------------------------------------------------|
| GKM 8 | Parking area immediately northeast of the marina. Must use sampling pole to reach water from sea wall. |
| CP7   | Direct walk to shore from far end of Crookes Point parking lot.                                        |
| GK6   | Beginning of Great Kills Beach, just above the bathhouse.                                              |
| OB5   | Nearest public access road north of Oakwood Beach Treatment Plant, walk up hill to beach.              |
| NDB4  | Direct walk to beach from parking area off of New Dorp Lane behind tennis courts.                      |
| MB3   | Direct walk from Midland Avenue to beach.                                                              |
| SB2   | Direct walk from Seaview Avenue to beach.                                                              |

## BREEZY POINT

### SITE

|       |                                                                                                                                                                      |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ATL 1 | Direct walk to beach from Riis Park Bathhouse                                                                                                                        |
| ATL 2 | Beach immediately south of the Tern Colony. Easiest access is by parking inside beach club and walking west on beach until sand path through Tern Colony is visible. |

## JAMAICA BAY

### SITE

### LOCATION

|      |                             |
|------|-----------------------------|
| RI-3 | Rockaway Inlet. at gong #9. |
|------|-----------------------------|

JAMAICA BAY (con't)

| <u>SITE</u> | <u>LOCATION</u>                                                                                |
|-------------|------------------------------------------------------------------------------------------------|
| MPB4        | West of Marine Park Bridge in middle of channel just off Rockaway Coast Guard Station.         |
| JB 5        | Nun Marker #5, approximately 500 yards south of Ruffle Bar.                                    |
| JB6         | Carnarsie Pier.                                                                                |
| JB7         | Pumpkin Patch Channel, just south of patch of shells on Duckpoint Marsh.                       |
| JB8         | Eastern side of Cross Bay Bridge, starting down Shell Bank Basin.                              |
| JB9         | Grassy Bay, midway between marker #8 (navigational light) and large hangar at Kennedy Airport. |
| JB10        | Marker #5 in Channel between Broad Creek Marsh and East High Meadow.                           |
| JB11        | Due South of Subway Island just off trestle.                                                   |

## FILTRATION

### MATERIALS & EQUIPMENT

### CATALOG NUMBER

|                                                                 |           |                     |
|-----------------------------------------------------------------|-----------|---------------------|
| Stainless Steel 3-Place Manifold                                | Millipore | XX2504735           |
| Pyrex 300 ml Funnels                                            | Millipore | XX1004704           |
| Pyrex Ground Glass Bases                                        | Millipore | XX1004702           |
| Rubber Stoppers for Bases                                       | Millipore | XX2004718           |
| Spring Clamps                                                   | Millipore | XX1004703           |
| Vacuum Pressure Pump                                            | Millipore | XX6100000           |
| Pyrex 1000 ml Trap Bottles                                      | Millipore | XX1004705           |
| Latex Vacuum Tubing 1/4" ID                                     | Millipore | XX2504755           |
| Blunt Tip Forceps                                               | Millipore | XX6200006           |
| Membrane Filters HC, .45u, 47mm                                 | Millipore | HCW6047SI           |
| Serological Pipettes, 10 X 1/10ml, Plugged Individually Wrapped | Belco     | 4210-04101          |
| Propane Tank Burner                                             |           |                     |
| Burner Striker                                                  |           |                     |
| Spectranalyzed Methanol                                         | Fisher    | A-408               |
| Plastic 140 ml Wash Bottles for Methanol                        |           |                     |
| Sterile Distilled Water                                         |           |                     |
| Plastic 500 ml Wash Bottles for Distilled Water                 | Fisher    | 03 40910E           |
| Prepared Petri Dished                                           |           | (Media Preparation) |

1. Forceps are dipped in methanol and excess burned off by passing through flame of propane burner.
2. Membrane filter is removed from its package with forceps.
3. Filter Funnel is removed and held away from its base while the membrane filter is placed on the base. Filter funnel is replaced on base and secured with clamp.
4. Steps 1, 2, and 3 are repeated for other filter funnel and base units.
5. Put 10-20 ml of distilled water in any funnel which will receive a sample volume less than 10 ml.
6. The order in which samples will be filtered should be the order in which the samples were collected. The first one collected is the first one filtered. The sample bottle is taken from ice chest, shaken vigorously, uncapped, and a pre-determined sample volume (dilution factors) is pipetted into one or more of the filter funnels. (For example, if each funnel is to receive 10 ml of sample, then 3 pipettings are necessary. If each funnel is to receive 3 ml of sample, then only one pipetting is necessary).
7. Sample should be swirled in funnel to allow even mixing.
8. Vacuum is turned "ON". Funnels are rinsed 3 times with sterile distilled water. Clamps are removed. (10-15 liters/week of sterile distilled water are required for analysis).
9. Forceps are dipped in methanol and passed through flame. Prepared petri dish is opened. Filter Funnel is removed and held away from its base while membrane filter is removed by the forceps. Filter funnel is put back on its base.

10. Membrane filter is placed in petri dish with a rolling motion so that the filter will lie evenly on the media pad. Dish is covered. This completes one test. Repeat Steps 9 and 10 for the other funnel-base units.
11. Place completed petri dishes in proper incubator upside down.
12. When proceeding to do another filtration series from the same sample bottle, first rinse each funnel and base with distilled water. Then repeat steps 1 through 11.
13. When proceeding to do another filtration series from a different sample bottle, first rinse each funnel and base with methanol. Then rinse 3 times with sterile distilled water. Repeat steps 1 through 11 using a new pipette.
14. If two filtration sessions are employed, separated by more than 30 minutes, replace filter funnel and bases or re-sterilize the units.
15. Record ice chest temperature at start of the filtration session, start and completion times of the filtration session, and any deviations from normal operating procedures.
16. 2 Controls should be run for each media with every filtered run to monitor sterile procedure. 30 and 10 ml volumes of sterile distilled water should be filtered for each media.
17. Recommended sample volumes to be filtered for each site are listed on the following page. These volumes will give countable plates over the range of values noted for these sites in recent seasons. These are suggestions and different volumes should be used in response to future changes (if any) in coliform densities.
18. Avoid running Millipore Vacuum Pump for extended periods of time. It is designed for intermittent use. Always utilize 2 trap bottles to prevent running water through the pump.

TIME:

58 tests take about 2½-3 hours to complete.

DILUTIONS (VOLUMES) BY SITE FOR MF ANALYSES

|                  | <u>SITE</u> | <u>VOLUMES TO BE FILTERED</u> |                   |
|------------------|-------------|-------------------------------|-------------------|
|                  |             | <u>TOTAL (ml)</u>             | <u>FECAL (ml)</u> |
| STATEN<br>ISLAND | CP-7        | 30, 10, 3                     | 30, 10, 3         |
|                  | GKM-8       | 30, 10, 3                     | 30, 10, 3         |
|                  | GK-6        | 30, 10, 3                     | 30, 10, 3         |
|                  | OB-5        | 30, 10, 3                     | 30, 10, 3         |
|                  | NDB-4       | 30, 10, 3                     | 30, 10, 3         |
|                  | MB-3        | 30, 10, 3                     | 30, 10, 3         |
|                  | SB-2        | 30, 10, 3                     | 30, 10, 3         |
| BREEZY<br>POINT  | ATL-1       | 30, 30, 10                    | 30, 30, 10        |
|                  | ATL-2       | 30, 30, 10                    | 30, 30, 10        |
| JAMAICA<br>BAY   | RI-3        | 30, 10, 1                     | 30, 10, 1         |
|                  | MPB-4       | 30, 10, 3                     | 30, 10, 3         |
|                  | JB-5        | 30, 10, 3                     | 30, 10, 3         |
|                  | JB-11       | 30, 10, 3                     | 30, 10, 3         |
|                  | JB-10       | 30, 10, 3                     | 30, 10, 3         |
|                  | JB-9        | 30, 10, 1                     | 30, 10, 1         |
|                  | JB-8        | 30, 10, 3                     | 30, 10, 3         |
|                  | JB-6        | 30, 10, 3                     | 30, 10, 3         |
|                  | JB-7        | 30, 10, 3                     | 30, 10, 3         |

INCUBATIONMATERIALS & EQUIPMENT

Fecal Coliform Incubator  
Total Coliform Incubator  
Back up Incubator

CATALOG NUMBER

Fisher 11683-230D  
VWR 1520  
Clinical Sci. 120

1. Incubators should be switched on prior to picking up water samples to stabilize temperatures.
2. Petri dishes are placed upside down in respective incubators immediately after placement of filter membrane on media pad. Fecal coliform dishes are incubated for 24 ( $\pm 2$ ) hours at 44.5° ( $\pm 2^\circ$ ) and total coliform dishes are incubated for 24 ( $\pm 2$ ) hours at 35.5° ( $\pm 5^\circ$ ).
3. Incubators must be monitored periodically to adjust changes in temperatures. Air conditioning will affect (lower) incubator temperature readings.
4. Record incubation starting temperature, starting time, ending temperature and ending time.

TIME:

24 Hours

10  
Water Quality Sampling Checklist

Beach Sampling

- \_\_\_\_\_ Sample bottles; polypropylene, labeled with site and date
- \_\_\_\_\_ Extra sample bottles (3 or 4), unlabeled
- \_\_\_\_\_ Extension pole with harness
- \_\_\_\_\_ Tool kit- \_\_\_\_\_ Screwdrivers (2) \_\_\_\_\_ Extra tube clamps (2)
- \_\_\_\_\_ \_\_\_\_\_ Rubber bands \_\_\_\_\_ Waterproof tape
- \_\_\_\_\_ \_\_\_\_\_ Permanent markers \_\_\_\_\_ Pencils, grease pencils
- \_\_\_\_\_ Clipboard with attached pencil and bands
- \_\_\_\_\_ Watch
- \_\_\_\_\_ Ice chest (filled with ice)
- \_\_\_\_\_ Thermometer
- \_\_\_\_\_ Charts of beach sites
- \_\_\_\_\_ Data sheet

Boat Sampling

- \_\_\_\_\_ Sample bottles; polypropylene, labeled by site and date
- \_\_\_\_\_ Extra sample bottles, unlabeled (3 or 4)
- \_\_\_\_\_ Waterproof tape, permanent markers, grease pencils
- \_\_\_\_\_ Clipboard with attached pencil and rubber bands and data sheet
- \_\_\_\_\_ Ice chest (filled with ice)
- \_\_\_\_\_ Thermometer
- \_\_\_\_\_ Charts of Jamaica Bay on separate clipboard

# Field Sampling Record

Date: \_\_\_\_\_

Sampled by: \_\_\_\_\_

| <u>STATION</u> | <u>SAMPLING TIME</u> | <u>REMARKS</u> |
|----------------|----------------------|----------------|
| 1. _____       | _____                | _____          |
| 2. _____       | _____                | _____          |
| 3. _____       | _____                | _____          |
| 4. _____       | _____                | _____          |
| 5. _____       | _____                | _____          |
| 6. _____       | _____                | _____          |
| 7. _____       | _____                | _____          |
| 8. _____       | _____                | _____          |
| 9. _____       | _____                | _____          |
| 10. _____      | _____                | _____          |
| 11. _____      | _____                | _____          |
| 12. _____      | _____                | _____          |

Tide \_\_\_\_\_ Water Conditions \_\_\_\_\_

Wind- speed \_\_\_\_\_ direction \_\_\_\_\_

Precipitation- prior 48 hours \_\_\_\_\_ prior 2 hours \_\_\_\_\_

Air Temp \_\_\_\_\_ °C Ice Chest Temp \_\_\_\_\_ °C

Comments: \_\_\_\_\_

# Membrane Filter Analysis Record

Date \_\_\_\_\_

T \_\_\_\_\_ F \_\_\_\_\_

Analyst \_\_\_\_\_

T \_\_\_\_\_

F \_\_\_\_\_

Incubator Temp - Start \_\_\_\_\_

Finish \_\_\_\_\_

Inoculation Time \_\_\_\_\_

Incubation Time (end) \_\_\_\_\_

| Station   | Total     |       |              | Fecal     |       |              |
|-----------|-----------|-------|--------------|-----------|-------|--------------|
|           | Vol. (ml) | Count | Count/100 ml | Vol. (ml) | Count | Count/100 ml |
| 1. _____  |           |       |              |           |       |              |
| 2. _____  |           |       |              |           |       |              |
| 3. _____  |           |       |              |           |       |              |
| 4. _____  |           |       |              |           |       |              |
| 5. _____  |           |       |              |           |       |              |
| 6. _____  |           |       |              |           |       |              |
| 7. _____  |           |       |              |           |       |              |
| 8. _____  |           |       |              |           |       |              |
| 9. _____  |           |       |              |           |       |              |
| 10. _____ |           |       |              |           |       |              |
| 11. _____ |           |       |              |           |       |              |
| 12. _____ |           |       |              |           |       |              |

COMMENTS:

TNC = Too numerous to count

Con = Confluent

+ Based on plate with less than 20 colonies

\* Based on plate with less than 200 colonies

WEEK OF \_\_\_\_\_

Gateway National Recreation Area

Weekly Summary of Water Quality Data (Count/100 ml)

Staten Island

| <u>Date</u> | <u>Site</u> | <u>Total</u> | <u>Fecal</u> |
|-------------|-------------|--------------|--------------|
|             | CP-7        |              |              |
|             | GKM-8       |              |              |
|             | GK-6        |              |              |
|             | OB-5        |              |              |
|             | NDB-4       |              |              |
|             | MB-3        |              |              |
|             | SB-2        |              |              |

Mean TC/FC: \_\_\_\_\_

RATIO: \_\_\_\_\_

Breezy Point

| <u>Date</u> | <u>Site</u> | <u>Total</u> | <u>Fecal</u> |
|-------------|-------------|--------------|--------------|
|             | Atl-1       |              |              |
|             | Atl-2       |              |              |

Mean TC/FC: \_\_\_\_\_

RATIO: \_\_\_\_\_

Jamaica Bay

| <u>Date</u> | <u>Site</u> | <u>Total</u> | <u>Fecal</u> |
|-------------|-------------|--------------|--------------|
|             | RI-3        |              |              |
|             | MPB-4       |              |              |
|             | JB-5        |              |              |
|             | JB-11       |              |              |
|             | JB-10       |              |              |
|             | JB-9        |              |              |
|             | JB-8        |              |              |
|             | JB-6        |              |              |
|             | JB-7        |              |              |

Mean TC/FC: \_\_\_\_\_

RATIO: \_\_\_\_\_

Comments: \_\_\_\_\_

+ - Based on a plate with <20 colonies

\* - Based on a plate with <200 colonies

TNC = To numerous to count      Con = Confluent

COLIFORM COUNTINGMATERIALS AND EQUIPMENTCATALOG NUMBER

Stereoscopic Microscope  
 Florescent Illuminator  
 Counter  
 Data Sheets

Nikon SMZ-2-203S75  
 Bausch & Lomb 31-35-32

1. After incubation period is completed, dishes are removed from incubators.
2. Dishes may be examined as is (with cover removed) or the membrane may be taken out with forceps, put on blotter paper to dry, and then placed in labeled petri slides. Drying enhances the green sheen on total coliform colonies and makes counting easier. The effect is less noticeable on fecal coliform colonies.
3. Dishes or slides are examined under a stereoscopic microscope with 10-15X magnification. Only florescent lighting (reduces reflections) can be used and preferably directly over the material.
4. Colonies are counted as total coliforms when they exhibit a shiny green or gold surface sheen. Red, pink, or purple colonies are not counted.
5. Colonies are counted as fecal coliforms when they exhibit a blue color. White, pink, beige, or gray colonies are not counted.
6. Count all dishes containing total or fecal coliform colonies from 20 to 200. Convert straight count to number of colonies per 100 ml of sample by using the following formula:

$$\frac{\text{No. of Coliform Colonies Counted}}{\text{Volume (ml) of sample filtered}} \times 100$$

7. Dishes with colonies over 200 are recorded as Too Numerous to Count (TNTC). Dishes with zero or few total or fecal colonies but containing other types of colonies in excess of 200 are recorded as Confluent. Dishes with zero or few total for fecal colonies but containing large amounts of sand, dirt, seaweed, etc. are recorded as Confluent. When more than one countable plate is found for a sample an average value should be calculated. If no plates have more than 20 colonies the standard count would be calculated in the following way:

$$\frac{\text{sum of colonies on all plates with at least one colony}}{\text{sum of volumes filtered on plates with at least one colony}} \times 100$$

If all plates have more than 200 colonies the standard count is indicated by:

$$> \frac{200}{\text{smallest volume filtered}} \times 100$$

8. Data sheets should also contain the following information:

The starting and ending time for water sampling, the numerical order in which sites were sampled, the ice chest temperature (after delivery to lab), the starting and ending times for each filtration session, the starting and ending temperatures for each incubator, the prior 48 hour and 2 hour amount of precipitation (taken from JFK Climatological Data Sheets from the U.S. Weather Bureau), and any other observations or notes. Standard sample sheets are shown on the following pages.

TIME:

58 Petri dishes take 1-2 hours to examine,

WATER QUALITY EMERGENCIES

When a sample determined to have greater than 200/100ml fecal coliform and greater than 2400/100/ml total coliform count is collected at one of Gateway's bathing beach sites the following actions should be taken:

1. Immediately contact the Natural Resource Management Specialist, who will notify the Assistant Superintendent of unit affected, of potential problem and advise to alert lifeguards to look for unusual odors, fecal matter, oil or grease in water or on beach and to pull swimmers from the water at their discretion.
2. Check with NYC Health Department to determine if any overflow incident or accidental release of raw sewage has occurred at local sewage treatment plants. Advise Park's Natural Resource Management Specialist and record conversation with NYC Health Department.
3. Collect 5 samples at different locations (at least 50 yards apart) on the suspect beach and filter volumes of 30, 10, 1 ml for each sample. (Replicate sampling will give a more statistically reliable average value than the individual samples used in the past).

Swimmers should be prevented from bathing by lifeguards if any of the following is observed:

1. Elevated average total (greater than 2400/100ml) and fecal coliform (greater than 200/100ml) counts of replicate samples.
2. Presence of oil, grease, or fecal matter in water or on beach in large quantities.
3. Accidental spillage of raw sewage or of any toxic substance in the waters adjacent to the beach which may adversely affect public health.
4. Any other environmental incident which may be detrimental to the health and safety of the bathers.

Swimmers should be kept out of the water as long as replicate testing continues to show elevated coliform levels or other adverse environmental conditions persist. This will allow continued public access to the beach while still protecting the public health. If these conditions persist for three days or more, however, the beach should be closed officially by public notice and should remain closed until water quality has returned to normal safe levels. It is the responsibility of the water quality technician to carefully document water quality and environmental conditions when beach closure is considered. A loose-leaf laboratory notebook should be carefully maintained for each season's data. The notebook should contain all data and summary sheets and be used as a log for all laboratory and field operations.

- 1 Although complete incubation takes 24 hours, plates for bathing beach sites should be examined the morning after filtration, if high counts are already indicated, the actions described should be initiated.

MATERIALS AND SUPPLIES

The following is a list of the materials and supplies necessary for a 15 week season of sampling. An asterisk (\*) indicates a disposable item that will probably have to be ordered before the start of each season. (Memorial Day). An inventory of laboratory materials should be made to estimate materials to be ordered.

| ITEM                                                                                  | CATALOG #                   | QUANTITY<br>NEEDED | 1984<br>UNIT PRICES                                                                      | \$ VALUE FOR<br>1984 SEASON  |
|---------------------------------------------------------------------------------------|-----------------------------|--------------------|------------------------------------------------------------------------------------------|------------------------------|
| *1. Plastic disposable<br>Petri dishes, 9X49mm                                        | Millipore<br>PD1004700      | 2000               | \$14.70/pk. 100                                                                          | \$294. for 20 pk.            |
| *2. Membrane Filters HC<br>.45u, 47mm                                                 | Millipore<br>HCNG 04751     | 2000               | \$282.00/pk.<br>of<br>1000 filters<br>1000 pads<br>1 pad dispenser                       | \$564.00 for 2 pk.           |
| *3. Total coliform<br>Ampoules Endo 2ml                                               | Millipore<br>M0000002E      | 1000               | \$13.10/pk./24                                                                           | \$550.00 for 42 pk.          |
| *4. Fecal coliform<br>Ampoules MFC 2ml                                                | Millipore<br>M0000002F      | 1000               | \$16.00/pk./24                                                                           | \$672.00 for 42 pk.          |
| *5. Serological pippetes<br>10 X 1/10 indiv.<br>wrapped                               | Fisher<br>13-676-10J        | 800                | \$60.00/pk./200                                                                          | \$240.00 for 4 pk.           |
| *6. Kimwipes<br>127 X 216mm                                                           | Sargent-Welsh<br>S-198-12-A | 5                  | \$1.65/box                                                                               | \$9.90 for 6 boxes           |
| *7. Kimwipes<br>381 X 432mm                                                           | Sargent-Welsh<br>S-19812-B  | 12                 | \$4.80/box                                                                               | \$57.60 for 12 boxes         |
| *8. Spectranalyzed<br>Methanol 4l                                                     | Fisher<br>A-408             | 2                  | \$24.50/4 l<br>bottle                                                                    | \$49.00 for 2 bottles        |
| *9. Reagent Alcohol 4l.<br>(for sterilizing<br>bench tops, pre-<br>serving specimens) | A-962                       | 2                  | \$32.00/4l.<br>bottle                                                                    | \$64.00 for 2 bottles        |
| *10. HCl, 2.5 l.                                                                      | A-145                       | 1                  | \$20.85/2.5 l.<br>(to to diluted<br>to 10% HCl for<br>analyzing water<br>still's heater) | \$20.85 for 2.5 l.<br>bottle |

| ITEM                                                         | CATALOG #                                                | QUANTITY<br>NEEDED | 1984<br>UNIT PRICE | \$ VALUE<br>1984 SEASON |
|--------------------------------------------------------------|----------------------------------------------------------|--------------------|--------------------|-------------------------|
| *11. Propane Canisters                                       | Impressed<br>Funds                                       | 3                  | \$2.50/cylinder    | \$7.50 for 3 canisters  |
| 12. Pyrex 300ml<br>funnels                                   | Millipore<br>XX1004704                                   | 12                 |                    |                         |
| 13. Pyrex Ground<br>Glass Bases                              | Millipore<br>XX1004702                                   | 12                 |                    |                         |
| 14. Pyrex 100ml<br>Graduated Cylinders                       | Fisher<br>08552E                                         | 12                 |                    |                         |
| 15. Polypropylene<br>Autoclavable<br>500ml sample<br>Bottles | Fisher<br>02-893C                                        | 24                 |                    |                         |
| 16. Pressure Sterilizer                                      | All American<br>1925 X                                   | 1                  |                    |                         |
| 17. Sampling Pole                                            |                                                          | 1                  |                    |                         |
| 18. Ice Chest                                                |                                                          | 2                  |                    |                         |
| 19. Stainless steel<br>3 piece manifold                      | Millipore<br>XX7504735                                   | 1                  |                    |                         |
| 20. Vacuum Pump                                              | Millipore<br>XX5500000                                   | 2 (one<br>backup)  |                    |                         |
| 21. Forceps                                                  | Millipore<br>XX6200006                                   | 2                  |                    |                         |
| 22. Pyrex 1000ml<br>Trap Bottles                             | Millipore<br>XX1004705                                   | 6                  |                    |                         |
| 23. 125ml rinse<br>bottles                                   | Fisher<br>03-409-10C                                     | 6                  |                    |                         |
| 24. 500ml rinse<br>bottles                                   | Fisher<br>03-409-10C                                     | 12                 |                    |                         |
| 25. Incubators                                               | Fisher<br>11683-230P<br>VWR 1520<br>Clinical<br>Sci. 120 | 2 (one<br>backup)  |                    |                         |
| 26. Stereoscopic<br>Microscope                               | Nikon<br>SM2-2-203575                                    |                    |                    |                         |
| 27. Fluorescent<br>Illuminator                               | Bausch. & Lomb<br>31-35-32                               |                    |                    |                         |

| ITEM | CATALOG # | QUANTITY<br>NEEDE | 1984<br>unit price | \$ VALUE FOR<br>1984 SEASON |
|------|-----------|-------------------|--------------------|-----------------------------|
|------|-----------|-------------------|--------------------|-----------------------------|

28. Counter Fisher  
02-670-12 1

29. Miscellaneous items - Plastic Gloves, Lubrisal, liquinox, marking pencils,  
trays, thermometers, clipboards, watch.

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This manual is intended to serve as a guide to laboratory operations for the standardization of procedures and to insure the collection of accurate and reliable data. Although it outlines sampling and analysis procedures for the Membrane Filter Method it is recommended that the references listed in the bibliography be consulted for more detailed explanation of procedures and biological principles involved.