GREAT BAY COAST WATCH
A CITIZEN WATER MONITORING PROGRAM

VOLUNTEER WATER QUALITY MONITORING MANUAL

Original Manual July 1990
Revised February 2005
Ann S. Reid GBCW Coordinator

Original By:

ANITA HAYDEN
SHARON MEEKER
ANN REID
JEFF SCHLOSS

Revised By:

STEVE COOPER
KAREN DIAMOND
CANDACE DOLAN
AMBER PERKINS
ANN REID

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Great Bay Coast Watch

MISSION STATEMENT

The Great Bay Coast Watch is citizen volunteers, working within the UNH Cooperative Extension/NH Sea Grant College Program, protecting the long-term health and natural resources of New Hampshire's coastal waters and estuarine systems through monitoring and education projects.

The University of New Hampshire's Cooperative Extension has provided funding in support of the Great Bay Coast Watch's work and the publishing of this manual. The University of New Hampshire Cooperative Extension is an equal opportunity educator and employer, US Department of Agriculture and NH counties cooperating.

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The following people are responsible for the production of this manual:

Authors of Original Manual (1990):
Anita Hayden
B. Sharon Meeker
Ann S. Reid
Jeff Schloss

Revised (2005):

Steve Cooper
Karen Diamond
Candace Dolan
Amber Perkins
Ann S. Reid

Edited By:

Steve Adams
GBCW Technical
Advisory Committee

Photographs:

Steve Cooper
Ann S. Reid
Amber Perkins

Video Clip Production:

Steve Cooper
Karen Diamond
Joe Danahy

Volunteers:

The volunteer monitors in the Great Bay Coast Watch must be recognized and gratefully acknowledged, for it is through their efforts that we all better understand and appreciate the Great Bay Estuarine System and the New Hampshire Atlantic Coast.

Figure 1: The site 6 Fox Point sampling team: Barbara Hill, Sam Wensman, Michele Wensman, Sophie Wensman, and Bill Macklin.

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this document is to present step-by-step instructions for conducting water quality testing in support of the Great Bay Coast Watch (GBCW). As you use these procedures, please note any errors or suggestions and report them to Ann Reid, GBCW Coordinator, at (603) 749-1565 or ann.reid@unh.edu.

1.2 GBCW Mission

The Great Bay Coast Watch is citizen volunteers, working within the UNH Cooperative Extension/NH Sea Grant Program, protecting the long-term health and natural resources of New Hampshire's coastal waters and estuarine systems through monitoring and education projects.

1.3 GBCW History

Great Bay Coast Watch is New Hampshire's most wide-ranging program for direct citizen involvement in monitoring estuarine and coastal waters. Its volunteers are comprised of adults from many different occupations, as well as students and teachers from local schools. GBCW was formed as Great Bay Watch in 1990, with funding from NOAA, in response to the Great Bay National Estuarine Research Reserve Management Plan, which listed the formation of a citizen estuarine monitoring program as one of its objectives. GBCW has been a consistent part of the educational efforts of UNH Cooperative Extension/ NH Sea Grant Program of the University of New Hampshire. To more accurately reflect a growing involvement of our volunteers in coastal shoreline surveys and phytoplankton monitoring projects, "Coast" was added to the name in 1999. The number of monitors has tripled since 1990, and the GBCW now samples more than twice as many sites as when it began. We have continued our dedication to monitoring on the NH Seacoast through the addition of phytoplankton monitoring, and through community science-based projects. GBCW has assisted the New Hampshire Estuaries Project (NHEP), the New Hampshire Department of Environmental Services (NH DES) Shellfish Program, the New Hampshire Coastal Program (NHCP), and the multiple communities that surround the Great Bay Estuary in helping to protect the health and natural resources of the Great Bay Estuary and its watershed (the Great Bay Estuarine System), the NH Atlantic coastline, and Hampton Harbor.

GBCW has three specific goals:

1. To monitor the chemical, physical, and biological systems of the New Hampshire coastal waters and Great Bay estuarine system.
2. To educate residents of New Hampshire's coastal and estuarine communities about the ecological status and protection of these systems.
3. To develop a management structure that engages volunteers in all aspects of the GBCW and continuously improves the quality of monitoring and education projects.

An extension specialist, Mark Wiley and coordinator, Ann Reid, from UNH's Cooperative Extension/NH Sea Grant, manage the GBCW. Currently, the GBCW has more than 100 active adult members. More than 300 adults have been members of the GBCW over the past 15 years, with 13 current volunteers having been enrolled in the program since its inception. through the years, monitors have driven thousands of miles and have given over 135,000 volunteer hours to the program. Area schools have been a part of GBCW since 1990. Growing from from one school in 1990, to eight by 2003, they are an important part of the educational program. Two examples of school participation are; Portsmouth Middle School regularly sampling since 1999 , and Newmarket High School teachers and students rejoining the program in 2002.

1.4 New Hampshire Estuaries

"New Hampshire has over 230 miles of sensitive inland tidal shoreline in addition to 18 miles of open ocean coastline on the Gulf of Maine. New Hampshire's estuaries contain bays, tidal rivers and salt marsh systems. The coastal watershed that drains water into New Hampshire's estuaries via rivers and streams, spans three states and approximately 80% of it is located in New Hampshire. Forty-two New Hampshire communities are entirely or partially located within the coastal watershed. The largest estuaries in the system include Great Bay and Hampton-Seabrook Harbor. Other estuaries of importance in the State are Little Bay, Little Harbor, Rye Harbor and portions of tidal tributaries.'

'Great Bay - The Great Bay is a tidally dominated, complex embayment on the New Hampshire-Maine border. Estuarine tidal waters cover 17 square miles with nearly 150 miles of tidal shoreline. Land surrounding the Bay includes steep, wooded banks with rocky outcrops, cobble and shale beaches and salt marshes. The estuary extends inland from the mouth of the Piscataqua River between Kittery, ME and New Castle, NH to Great Bay proper, a distance of 15 miles. Great Bay's tidal exchange with the ocean generates rapid currents and keeps the estuary well mixed.'

'Hampton-Seabrook Harbor - Hampton-Seabrook Harbor encompasses 480 acres of open water at high tide. Characterized by extensive salt marshes and separated from the ocean by a series of barrier beaches, the approximately 8 square miles of contiguous salt marsh within the Hampton-Seabrook Harbor is the largest salt marsh in the State. It is also one of the busiest tourist venues because of Hampton Beach and the productive clam flats in the harbor.'

'New Hampshire's estuaries are dynamic, complex systems that greatly influence the Seacoast's economy, communities, quality of life and environment."[1]

Figure 1.4-1: Map of the Great Bay Estuary and GBCW Monitoring Sites

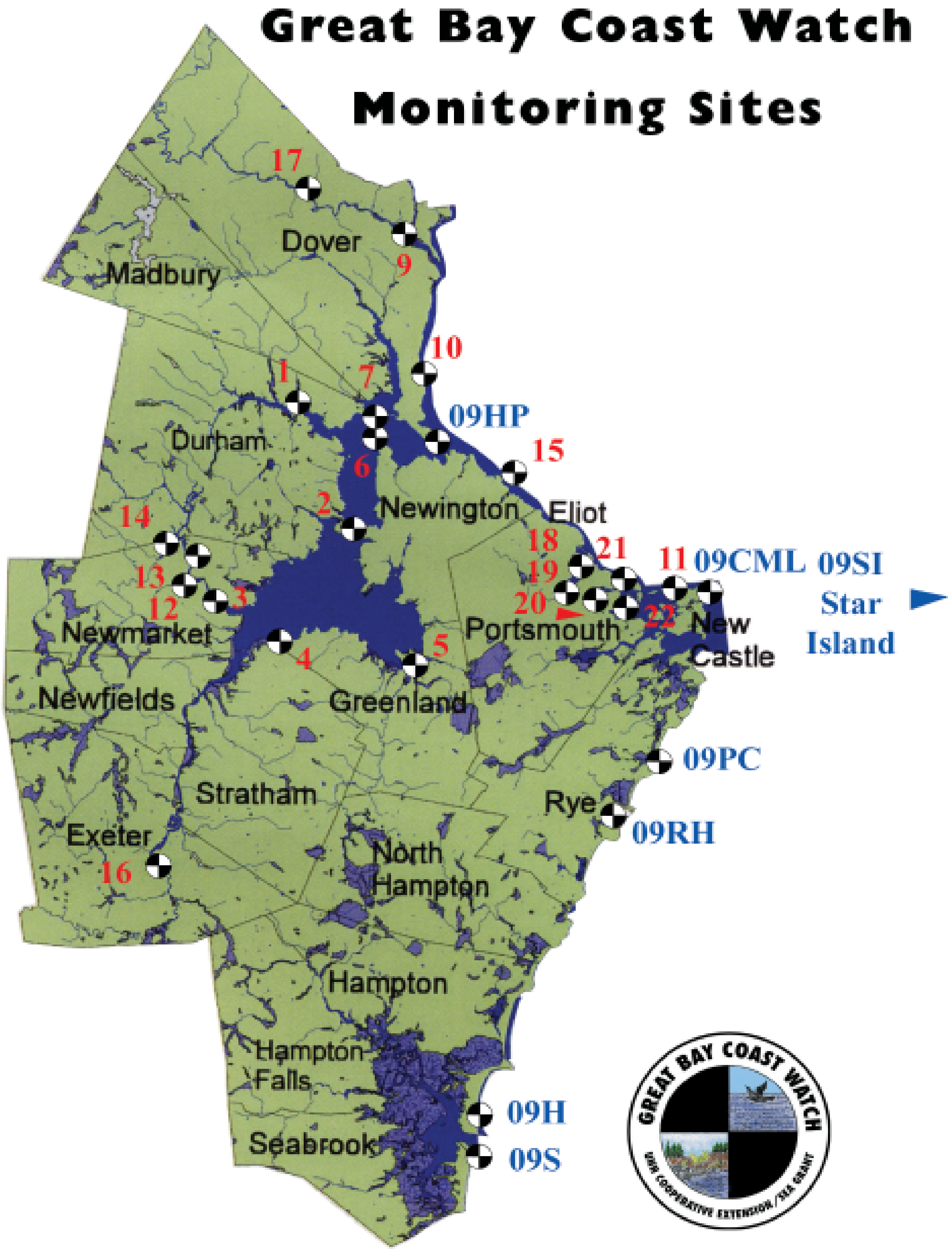


Figure 1.4-2: Table of Great Bay Coast Watch Sites

Site Name	Site #	Location	Town	1st Yr.	Comments
Water Quality Sites					
Peninsula	1	Oyster River	Durham	1990	
JEL	2	Great Bay	Durham	1990	
Lamprey River	3	Lamprey River	Newmarket	1990	
Depot Road	4	Great Bay	Greenland/Stratham	1990	High tide only as of 1993
PCC	5	Winnicut River	Greenland/Stratham	1990	
Fox Point	6	Little Bay	Newington	1990	
Cedar Point	7	Little Bay	Durham	1990	
Rakoskes’	8	Piscataqua River	Dover	1990	Inactive as of 1992
Neal’s	9	Cochecho River	Dover	1990	
Clark’/Peterson’s	10	Piscataqua River	Dover	1991	
Coastal Marine Lab	11	Piscataqua River	New Castle	1991	
STP	12	Lamprey River	Newmarket	1992	
Marina Falls Land.	13	Lamprey River	Newmarket	1992	
Fowler’s	14	Lamprey River	Newmarket	1992	
Patten Yacht Yard	15	Piscataqua River	Eliot, ME	1993	
Exeter Docks	16	Squamscott River	Exeter	1994	
Dover Foot-Bridge	17	Cochecho River	Dover	1996	
Maplewood Ave.	18	North Mill Pond	Portsmouth	1997	
Bartlett Ave.	19	North Mill Pond	Portsmouth	1997	
Junkins Ave.	20	South Mill Pond	Portsmouth	1997	
Pleasant Ave.	21	South Mill Pond	Portsmouth	1997	
Little Harbor	22	Little Harbor	Portsmouth	1998	High tide only
Phytoplankton Sites					
Hilton Park	09HP	Piscataqua River	Dover	1999	
Coastal Marine Lab	09CML	Piscataqua River	New Castle	2000	
Star Island	09SI	Isles of Shoals	Rye	2000	
Parsons Creek	09PC	Parsons Creek	Rye	2000	
Rye Harbor	09RH	Rye Harbor	Rye	1999	
Hampton	09H	Hampton Harbor	Hampton	1999	
Seabrook	09S	Seabrook Harbor	Seabrook	1999	

Figure 1.4-3: Ken Hawkins, a teacher at Portsmouth Middle School, at Site 20, South Mill Pond

1.5 Why and How To Monitor?

Ecological monitoring can be defined as repetitive measurements or observations recorded over time for determining a condition or tracking change. A number of scientific studies point to the necessity of conducting long-term ecological monitoring before drawing conclusions as to the cause and effect of observed changes. Changes are often gradual and subtle. Analysis of long-term data can help determine if these changes represent trends. For example, is the apparent sea level rise due to warming of earth's atmosphere or just a natural fluctuation? In general, these studies have shown that:

1. Complex ecological systems require long-term observation and study for understanding;

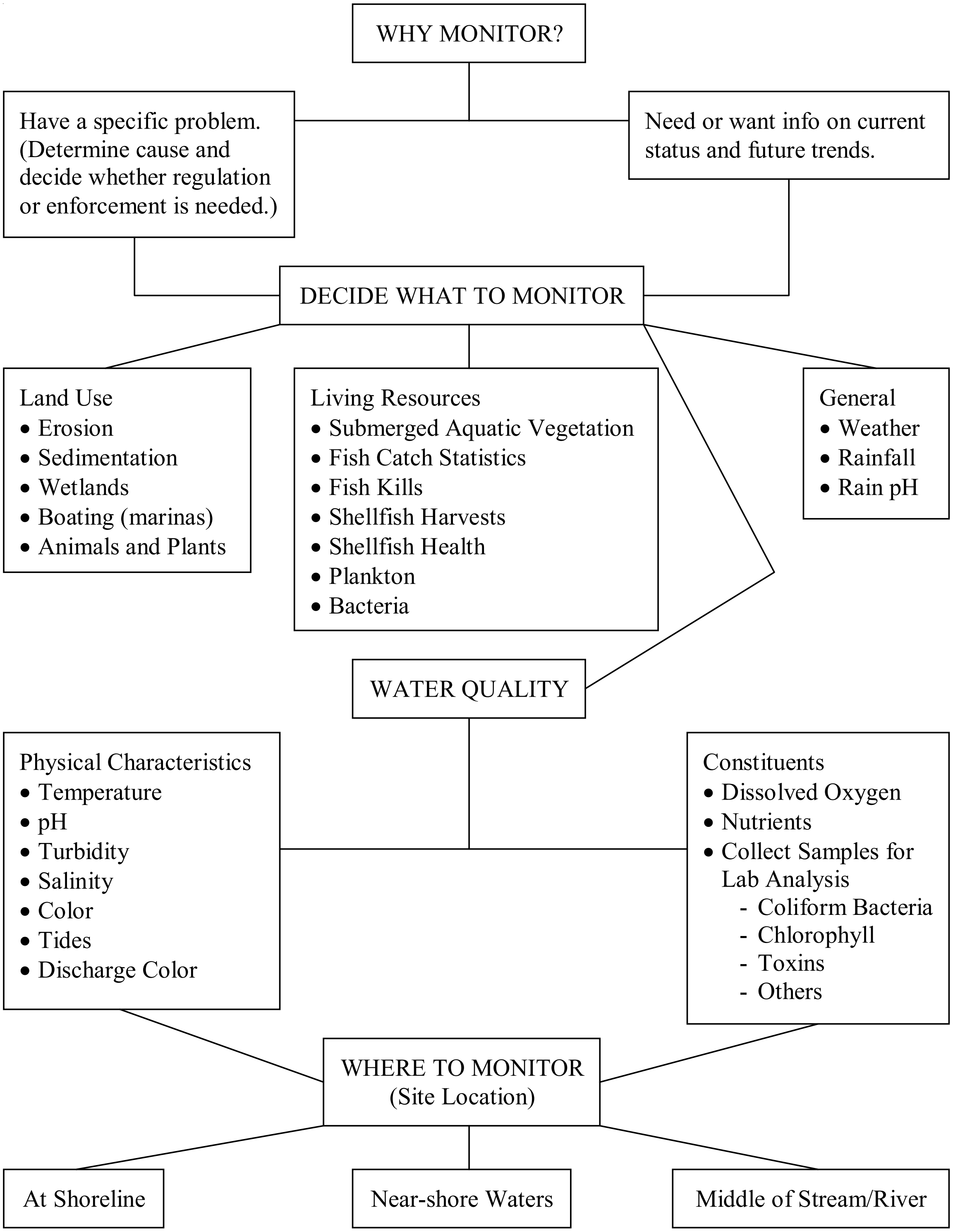
2. A sequence of only two to three years of data can be very misleading about trends in environmental quality; and

3. Environments have a "memory" or response time which varies greatly. It takes a certain amount of time to detect a change – perhaps a decade for lakes and streams, and a century for soil.

The general methodology for choosing sites to monitor and the information to record is illustrated in Figure 1.5-1. While those involved in citizen monitoring efforts are usually not trained scientists, they can, with relatively little training and simple equipment, collect information that will contribute to an ecological study of the site they are investigating. Data collected at GBCW sites form a vital part of the ecological picture of the Great Bay Estuary.[2]

Figure 1.5-1: Why and How to Monitor?

This organizational chart is a decision making matrix used for selecting what type of monitoring is useful and necessary. This is the process followed in selecting the water quality monitoring methods for the Great Bay Estuary by the GBCW.



1.6 GBCW Monitoring Process

1.6.1 Philosophy

It is very important that the data collected by GBCW volunteers be accurate and consistent for the data to be scientifically valid. To achieve this, GBCW provides each volunteer with the necessary training, equipment and procedures needed to do the job. In return GBCW expects each volunteer to make a minimum two-year (and hopefully much longer) commitment to the monitoring program.

To maximize the accuracy and consistency of the data, GBCW protocols incorporate some essential elements of the scientific method. The goal is to remove any biases or prejudices which could impact the validity of the data. To achieve this, GBCW does the following:

- Develops and maintains EPA accepted procedures.
- Trains volunteers in these procedures.
- Calibrates equipment periodically.
- Provides educational meetings which offer a forum for volunteers to communicate, discuss issues and share infromation about special projects.
- Conducts twice-per-year Quality Assurance Quality Control (QAQC) testing of all volunteers.

The semi-annual QAQC testing is mandatory and comprises a full exercise of all tests by each volunteer under the supervision of expert water quality personnel. Certification of each volunteer is important for validating our program in accordance with organizations such as the Environmental Protection Agency (EPA). The goal of QAQC testing is also to ensure that volunteers are using the proper methodology. If not, GBCW provides corrective instruction. Any confusing aspects of these procedures will be corrected on a continuing basis.

1.6.2 Schedule

GBCW sampling is conducted monthly at the 21 sites listed in Figure 1.4-2. The sampling schedule is shown in Appendix A, Tidal and Sampling Times for 2005 Season. For each date, sampling is conducted twice – once at low tide and once at high tide. Tidal times are also provided in Appendix A.

In addition to the monthly sampling, GBCW organizes or participates in the events listed in the schedule in Appendix B, Dates To Remember. Highlights from this list include:

- Semiannual QAQC testing
- Educational Meetings
- Summer Barbecue
- Fall Chili and “Chowdah” Fest (Season wrap-up meeting.)
- Annual Report Meeting
- Secchi Dip-In Event
- World Wide Monitoring Day Event
- United Way Day of Caring
- International Coastal Clean Up

Figure 1.6-1: GBCW Events

Photos: 1) Beverly Brinkman at a GBCW QAQC Session; 2) Ann Reid presents "Blue Mussel Award" to Dr. Richard Langan with Duane Hyde at the 4th Annual Meeting and Barbecue; 3) Kaori Tsukui, Amber Perkins and Paul Kilian at the Newmarket Heritage Festival; and 4) Ann Reid and Candace Dolan at Hilton Park for the United Way Annual Coastal Cleanup.

1.7 Scope

The remainder of this instruction manual comprises nine sections, one section for each of the six test procedures sandwiched between a "Getting Started" section and a "Clean-Up" section.

2.0 GETTING STARTED

This section of the manual prepares you for conducting the sampling process. There is a checklist of the equipment and supplies that you will need, a summary of the procedures to be followed at the field site, a copy of the data sheet that you will use, and a description of safety considerations. A tip sheet has been included in appendix H, Things To Do and Things To Think About, as a handy guide to use in the field. A laminated copy will be provided with each site clipboard.

2.1 Safety First

YOUR SAFETY IS PARAMOUNT

- Read all instructions to familiarize yourself with the sampling procedures before you begin. Note any precautions in the instructions.
- For your safety and reliable data recording, you must work with at least one partner.
- Read the Material Safety Data Sheets. Note that some of the reagents are caustic. A summary has been provided for you in Appendix F.
- Keep all equipment and reagent chemicals out of the reach of small children and animals.

PROTECT YOURSELF AND YOUR EQUIPMENT BY ADHERING TO THE FOLLOWING TECHNIQUES:

- Avoid contact between reagent chemicals and skin, eyes, nose and mouth.
- Wear safety goggles or glasses when handling the reagents.
- Use stoppers, not your fingers, to cover the bottles during shaking or mixing.
- Rinse and wipe up any reagent chemical spills, liquid or powder as they occur.
- Thoroughly rinse jars and bottles with fresh water before and after each use. Dry your hands and the outside of the bottles.
- Avoid prolonged exposure of equipment and reagents to direct sunlight. Keep reagents in a dark location, protected from extremes in temperatures.
- Alway wash you hands after monitoring. When monitoring, do not eat, or put your hands in your mouth or in your eyes with out washing them first.

In case of an accident or suspected poisoning, immediately call **1-800-562-8236,** the Poison Control Center in New Hampshire. If a reagent gets into your eyes or on your skin, irrigate the area immediately with fresh water. We have the details on the reagents we are using. See Appendix F, Material Safety Data Sheets.

Also notify the Kingman Farm GBCW office at **(603)749-1565** during office hours. During non-office hours, notify **Ann Reid** at **(603) 749-3880**, or **Mark Wiley** at home **(603) 749-7516**, or mobile phone **(603) 978-9950.**

2.2 Equipment Checklist

Before going to the field, review the Equipment Checklist shown in Figure 2.2-1 to ensure that you have all the items needed for the sampling process in the field. If you followed the Section 10 Clean-Up procedures after last month's sampling, you will have already restocked and refurbished the kit as necessary. However, it doesn't hurt to check!

Figure 2.2-1: Water Quality Sampling Kit

Photo: Water Quality Monitoring Kit

Photo: Water Quality Monitoign Kit ready for use in the field.

Figure 2.2-2: EQUIPMENT LIST FOR WATER QUALITY MONITORING

Site #_______ Site Name___________________________ Tool Box #_______________

TEMPERATURE

__________ Air thermometer with string
__________ Armored water thermometer #______

SALINITY

__________ Hydrometer with case and stopper #__________
(inside paper on hydrometer stem)
__________ Hydrometer jar (plastic 500 mL cylinder)

pH

__________ pH meter #______
__________ Small brown bottles with caps Count_________
__________ Small bottle for extra buffer

DISSOLVED OXYGEN

__________ Graduated burette (2)
__________ Glass rods (2)
__________ Glass BOD bottle and stopper (2)
__________ 100 mL graduated cylinder
__________ Plastic beaker
__________ Container manganese sulfate pillows Count_________
__________ Container iodide-azide pillows Count_________
__________ Container sulfamic acid pillows Count_________
__________ Bottle starch solution
__________ Bottle of sodium thiosulfate
__________ Scissors
__________ Glass marbles (2)
__________ Transfer Pipette (Optional)

FECAL COLIFORM

__________ Collecting tongs
__________ Whirl-pak® bags (sterilized) Count_________
__________ Permanent marker
__________ Cold pack
__________ Cooler container for samples

SAFETY ITEMS

__________ Ziploc bag with emergency numbers, Band-Aids, Q-tips, and antiseptic
__________ Plastic container for tap water (for eyewash, pH test, and clean-up)
__________ Protective glasses

WATER TRANSPARENCY

__________ Secchi disk with measured line attached

MISCELLANEOUS

__________ Clipboard with "Things To Do and Things To Think About" and #2 pencil attached
__________ Waste container (1 gallon plastic detergent container)
__________ Clean cloth for drying equipment
__________ GBCW manual and data sheets
__________ Water sample collection container with rope, tubing, clamp and spigot attached

NAME (Please print) _________________________________ **DATE** ________________

SIGNATURE ____ Revised 2/24/2005

2.3 Sampling Procedure Order and Summary

This section defines the order in which the sampling procedures should be performed. A tip sheet has been included in Appendix H, Things To Do and Things To Think About, and on the clipboard. Please refer to the individual procedure sections for testing protocols.

Procedure at the water's edge:

1. Bring instruction manual.
2. Fill out data sheet heading completely. Record the ID numbers of the water thermometer, pH meter and hydrometer.
3. Put air thermometer in place. We suggest hanging it in a nearby bush out of the sun. Record temperature on data sheet after at least 3 minutes.
4. Take the sample of water in sterile bag for Fecal coliform bacteria test and place in coolerat 4° C± 2^{o}C. Collecting this sample prior to performing other testing is important. Disturbing the water column may resuspend fecal coliform bacteria and produce a false reading.

The proper procedure for filling a whirl-pack bag and the collection of field sample procedures are demonstrated in the GBCW Videos found on the GBCW 2005 Manual CD.

5. Take the Secchi disk reading. Record on data sheet.

6. Take the water depth measurement. Record on data sheet.

7. Collect the water sample with the bucket.

8. Immediately immerse the armored thermometer to measure water temperature. Read it after three minutes. Record on data sheet.

9. While you are waiting for the temperature reading, draw off water for dissolved oxygen (DO) test into your BOD bottle. Complete steps 1-4 of the DO procedure.

Steps 10-17 may be completed at the site or in a laboratory.

10. Pour a small amount of sample into the pH Sample Rinse and Test containers, and obtain the pH result.

11. Fill the hydrometer jar and immerse both the armored thermometer and the hydrometer in the jar. Read the thermometer after three minutes. Record the temperature on the data sheet. Read the hydrometer. Record the density on the data sheet.

12. Determine the salinity using the tables in your manual and the density reading.

13. Complete the dissolved oxygen titration protocol.

14. Wash all the equipment that was in contact with chemicals or salt water after every test. Dry everything thoroughly, including the inside of the bucket. Salt water quickly corrodes the equipment and cleaning will help prevent deterioration.

15. Complete data sheet:
    a) Weather, Water, Activity, and Observation Narrative.
    b) Record the time and mileage of each volunteer, including the names of each student present, and have data sheet signed by a member of the site team who has successfully completed a QAQC session. This signature is important as it validates the sampling data.

16. Complete the entries on the Cumulative Data Sheet and Time & Mileage Sheets.

17. Bring the water sample for fecal coliform bacteria testing to Kingman Farm before 6 PM on the sampling day.

2.4 The Field Data Sheet

The GBCW Field Data Sheet is shown in Figure 2.3-2. You should always maintain a supply of blank sheets for use in the field. Use the sheets as follows:

1. On the front, fill in the (1) names of the samplers, (2) day, date and military time the sample is collected, and (3) site number and name, as well as whether it is high tide or low tide.

2. Fill out the remaining parts on the front by recording data observations as you perform the various sampling procedures.

3. On the back of the data sheet, describe the conditions at your sampling site. Your comments regarding the weather and activities at the site during sampling time assist us in evaluating the data collected. Anything causing water conditions to change, such as animals present or strong current are of particular interest. Precipitation for the last 24 hours will be obtained by the GBCW office from the State of NH meteorologist and included in the final data.

4. Fill in the name of the person collecting the sample for fecal coliform testing, as well and the name of the person who is transporting the water sample to Kingman Farm.

5. Fill out the birds and horseshoe crabs sections. If none of these animals are present, please write a zero in this space to indicate that you looked and none were found.

6. Once the sampling is completed, fill out the time & mileage estimates section on the back for each person at the site, including students.

7. A QAQC certified member of the sampling team must sign and date the field data sheet and deliver the completed data sheet to GBCW at Kingman Farm.

An unsigned data sheet is considered invalid and cannot be used in the database.

Figure 2.4-1: **Barbara Balaguer, Audrey Fortin, Candace Dolan, Sam Wensman and Lydia Scott (in front) demonstrate that wearing protective glasses can be fun.**

Figure 2.4-2:

GREAT BAY COAST WATCH FIELD DATA SHEET

Sampling Team (full names please)

1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________

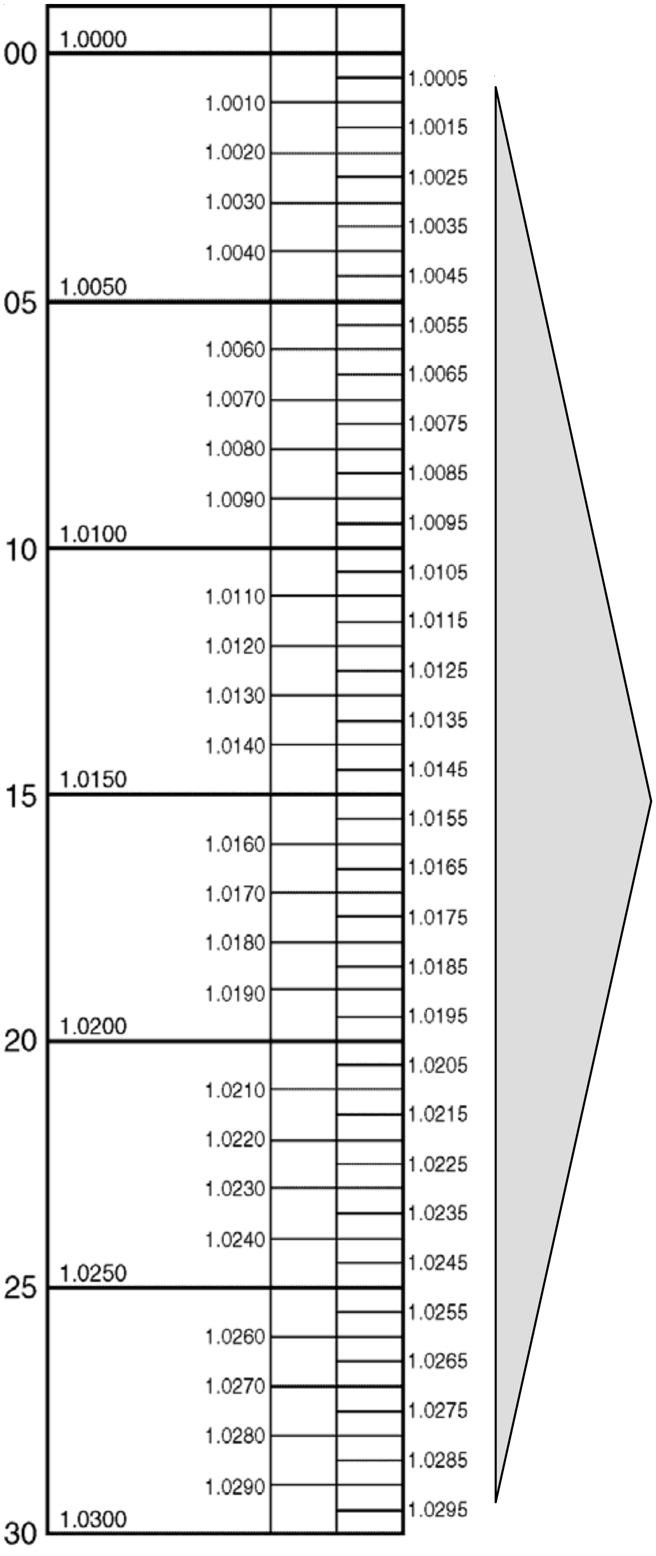
Day____________ **Date** ________

Tide _______ **Time** ___________

(H or L) **(Military)**

Site Number _________________

Site Name ___________________



Air Temperature _____________ **°C**

Water Transparency:

________**cm** ________**cm** ________**cm**

disappear **appear** **average**

Water Depth __________________**cm**

Water Temperature ____________ **°C**

Thermometer # _______________

Salinity:

Hydrometer # ________________

Water Temp (jar) ______________ **°C**

Density ________________ **g/cc**

Salinity ____________ **ppt (from chart)**

pH:

Meter # ______ **Reading** _________

Dissolved Oxygen:

Bottle # ___________

Test 1 _______ **ml** **Test 2** _______ **ml**

Test 3 (only if diff > 0.3 ml) _______ **ml**

Total D.O. Reading ___________ **mg/L**

(over)

revised 12/30/2003

Figure 2.4-2:

GREAT BAY COAST WATCH FIELD DATA SHEET

Please describe the conditions at your site today:

Water: Calm _____ Ripple _____ Waves _____ Whitecaps ____

Weather: Clear___ Partly Cloudy ___ Overcast ___ Fog/Haze__
Showers ___ Downpour ___ Snow ___ Other ___________

Activities: Fishing ___ Oystering ___ Boating ___ Hunting ___
Other ____

Water for *Fecal coliform* Bacteria Testing:
Person taking sample _________________________________
Person transporting sample ____________________________

Birds: Type ______________ # ___
Type ______________ # ___
Type ______________ # ___

Horseshoe Crabs:
Total # seen: ________
young (< 2 in.): _____
amplexus: _________
laying eggs: _______

Please write an observation narrative:

____

____

____

____

Time & Mileage Estimates:

	Sampler 1	Sampler 2	Sampler 3
Field Work (Min):			
Lab Work (Min):			
Travel (Min):			
Total (Min):			
Mileage:			

FOR OFFICE USE ONLY

	Date	Initials
Reviewed		
Entered		
Accepted		

I certify that I have reviewed the data entry on this form and that it is accurate and complete.

Signature _______________________________ Date __________________
(QA/QC Qualified)

3.0 FECAL COLIFORM BACTERIA SAMPLING

3.1 Fecal Coliform Bacteria Discussion

Fecal coliform bacteria in the water are used as an indicator of human sewage pollution. While fecal coliform bacteria are found in the feces of all warm-blooded animals, their presence in the water can indicate that other, more dangerous bacteria are present. Their presence in high numbers can also indicate pollution from improperly treated sewage effluent, waste discharges from boats, improperly functioning or failed septic systems, untreated urban storm water, runoff from agricultural operations, feces from wildlife, or other sources. New Hampshire water quality standards for tidal waters use another kind of bacteria (i.e., *Enterococci)* to determine if waters are safe for swimming. State standards for tidal shellfish waters, however, do specify acceptable levels of fecal coliform bacteria. While direct application of shellfish water standards to GBCW data would not be appropriate, these standards can be used to give a general sense of contamination in the estuary.

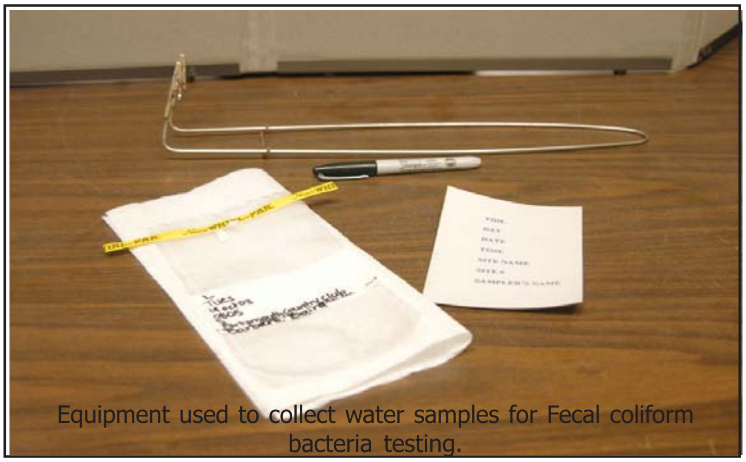
Fecal coliform bacteria tests are performed using the membrane filtration (plate count) method. This method requires that sample processing be completed within 6 hours of the sample being obtained (the "holding time"). Since low and high tides are approximately six hours apart, our laboratory would have to function all day and all evening to accomplish processing within this limited holding time. Also, our results are used as a water quality guide and our laboratory is run by volunteers. Due to these restraints, we have permission to process all of our samples in the evening, after the high tide samples have been collected for this monitoring program. Should abnormally high levels of bacteria be detected, the NHDES is informed. They will then proceed according to their protocols. GBCW adheres to the 6 hour holding time for other projects, such as the Dover Storm Water Investigation.

Figure 3.1-1: Bill Macklin demonstrates use of the Whirl-Pac® bag.

3.2 Required Equipment/ Sample Collection for Fecal Coliform Bacteria Testing

- Whirl-Pac® bags
- Marking pen
- Sampling tongs
- Cold packs and a cooler

Figure 3.2-1: Sample Collection Equipment



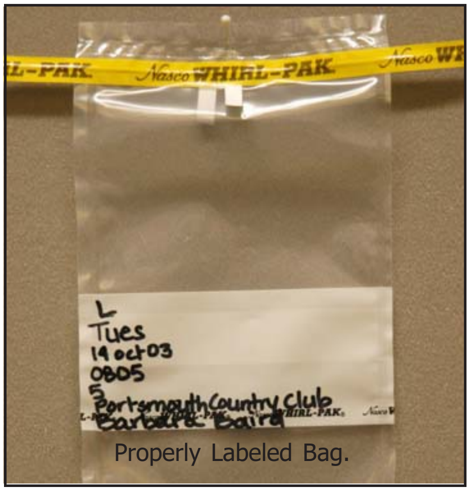
Equipment used to collect water samples for Fecal coliform bacteria testing.

3.3 Fecal Coliform Sample Collection Procedure

1. Label bag in the white area with a medium tip permanent marker:

- Sample Site Number
- Site Name
- Date
- Day
- Time of Sample (Military Time)
- Tidal Stage (Low or High)
- Sampler's Name.

Figure 3.3-1: Labeled Whirl-Pac® Bag



Properly Labeled Bag.

2. Attach the alligator clips of the tongs to the metal tabs of the sterile Whirl-Pac® bag. Curl tab over and pinch clips to secure bag to the tongs. The use of gloves here is optional. Finally, tug bottom of bag to make certain the bag is securely held.

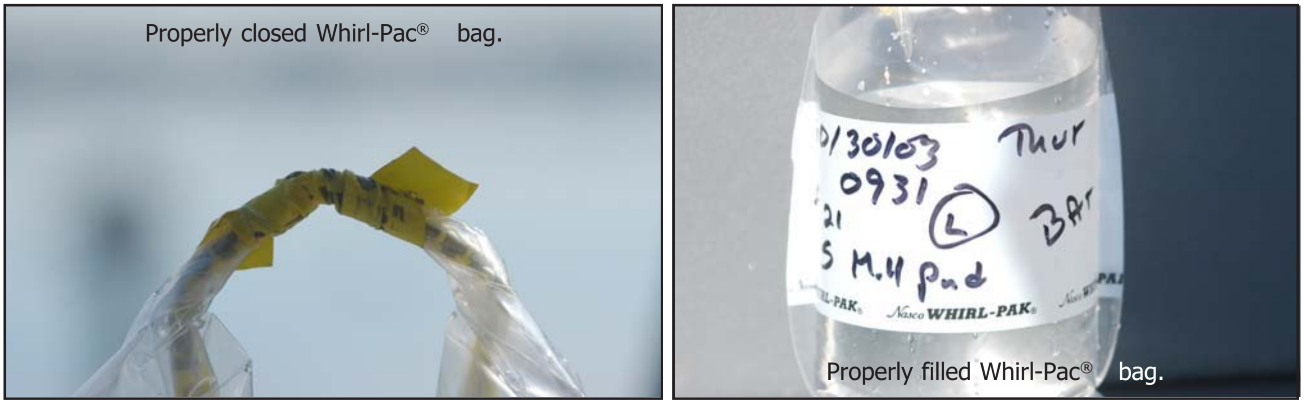
3. Remove perforation strip from the top of the bag. Check again that the bag is secure on the clips.

> Do not touch the bag opening with fingers or gloves, as this will contaminate the sample. Also do not touch the mouth or inside of the bag!

4. With the bag still closed plunge the bag into the water to a depth of about 12 inches.

5. Open the bag by squeezing the tongs together and pulling the bag open with the white tabs if necessary, filling the bag. Close the bag at this depth by releasing the pressure on the tongs. You do not want surface water in the collection bag.

Figure 3.3-2: Whirl-Pac® Bags in Use



Properly closed Whirl-Pac® bag.

Properly filled Whirl-Pac® bag.

6. Immediately remove the filled bag from the water. Use one hand to support the bottom of the bag, to ease the weight off the tabs. The bag needs to be about 2/3 full. Pinch the bottom of the bag to spill excess water over the top of the bag. Air space over the surface of the water is required to keep any bacteria present alive until the sample is processed.

7. Spin the bag over itself several times to close the bag securely, so that water will not leak out. Wearing protective glasses during this step is recommended.
8. Remove the clips and twist the metal tabs together in the shape a bracelet, curling the ends in. This prevents the sharp ends from puncturing other samples when the bag is stored at the lab.
9. Keep the samples in a cooler with a cold packat 4° C± 2^{o}C. Bring samples to Kingman Farm before 6:00 PM on the day of sampling. If you need the sample picked up, please call Kingman Farm at (603)749-1565 to make arrangements.

To review this procedure you may borrow the Processing Fecal Coliform Bacteria video. The proper filling of a Whirl-Pac® bag procedure is demonstrated in the GBCW Videos found on the GBCW 2004 Manual CD.

10. The samples should be kept at 4° C± 2^{o}C and can be stored for up to six hours.

4.0 TEMPERATURE

4.1 Temperature Discussion

Although temperature is one of the easiest measurements to perform, it is one of the most important parameters to be considered. It dramatically affects the rates of chemical and biochemical reactions within the water. Many biological, physical, and chemical principles are temperature dependent. Among the most common of these are the solubility of compounds in sea water, the distribution and abundance of organisms living in the estuary, rates of chemical reactions, density, current movements, inversions and mixing. Since Great Bay and its tributaries are so shallow, their capacity to store heat over time is relatively small and water temperatures fluctuate considerably.

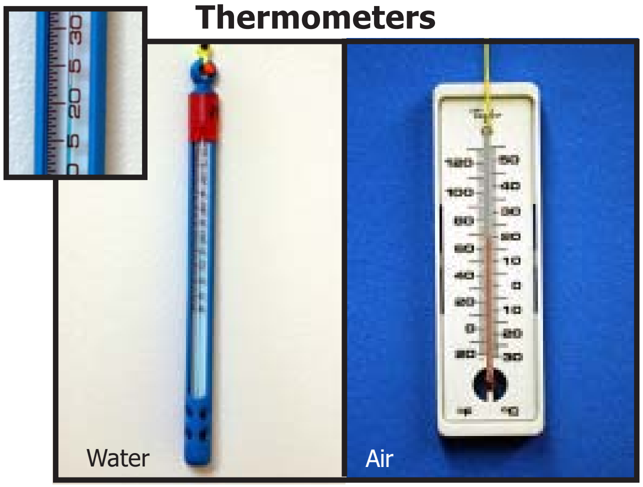
The temperature of surface and underlying water usually differs. With increase in depth, the water generally becomes colder, producing a thermal stratification. Vertical temperature profiles are fairly predictable. During the spring and summer months, the surface waters are warmer than the deeper waters, due to the warmth of the sun. In the fall, the warming radiation of the sun begins to diminish. As the surface water cools, it increases in density. Once the surface water becomes colder and denser than the waters toward the bottom, it begins to sink and vertical mixing occurs. Wind and tide may speed up the process. This mixing action, or upwelling, can bring nutrients up from the bottom into higher water where more plants and organisms may use it to their advantage. Normally, during the winter the water temperature becomes relatively constant from surface to bottom until March, when the process of surface warming begins again. The Great Bay estuary contains a number of narrow straits, which combined with rapid currents (from multiple rivers and tidal flushing), create a system in which the water is well mixed year round.

Temperature is reported on the field data sheet in degrees Celsius. You can make conversions from Fahrenheit to Centigrade or vice versa using the following formulas:

Fahrenheit to Centigrade:
Subtract 32 degrees from Fahrenheit temperature; divide by 9; multiply by 5.

Centigrade to Fahrenheit:
Divide Centigrade temperature by 5; multiply by 9; add 32.

Figure 4.3-1: Detail of Thermometers



4.2 Required Equipment for Temperature Testing

- Air thermometer
- Armored thermometer
- Sampling Bucket

4.3 Temperature Procedure

Check thermometers for continuous fluid to ensure that no breaks are present.

A. Air Temperature

1. Place or hang the air thermometer out of the sun. Read after at least 3 minutes.

2. Record air temperature to the nearest whole degree, making sure to use Celsius scale. Convert from Fahrenheit, if necessary. Please see Appendix G, Significant Figures and Rounding, for rounding instructions.

Figure 4.3-2: Air Thermometer


Thermometer in the shade.

B. Water Temperature

1. Rinse sampling bucket twice by filling it halfway with sample water and disposing of contents in an area away from the sampling spot (e.g. downstream). Let water flow through the dispenser tube (at the base of the sampling bucket) in order to rinse it out and then clamp the dispenser tube shut.

2. Collect water sample with bucket at a depth of one to two feet.

3. Hang armored thermometer in bucket and record reading after three minutes. Read this temperature between 3-5 minutes as the water temperature may change while sitting in the bucket. If too much time elapses, dispose of the water and collect another water sample.
4. When reading the thermometer, make sure the bulb of the thermometer remains in the water. The water will also act as a magnifying glass if the thermometer is immersed. Read the thermometer straight on and not at an angle.

5. Record water temperature to the nearest half degree, making sure to use Celsius scale. Convert from Fahrenheit, if necessary. Please see Appendix G, Significant Figures and Rounding, for rounding instructions.

Figure 4.3-3: Water Thermometer


Keep thermometer in water when reading.

5.0 WATER TRANSPARENCY/SECCHI DISK

5.1 Water Transparency Discussion

Transparency of water is a quick and easy measurement that integrates many important features of an aquatic system. Algae, microscopic animals, eroded soil, and resuspended bottom sediment contained in the water column interfere with light penetration and lessen the transparency of the water. In late spring and early fall, transparency is usually reduced because of plankton and algal blooms. In the early spring, the water may become more turbid with silt being carried into the estuary with spring runoff. Since the sunlight is the basic energy source for all life, the degree of water transparency has an important effect on fish and aquatic life. Some effects of poor transparency are listed below:

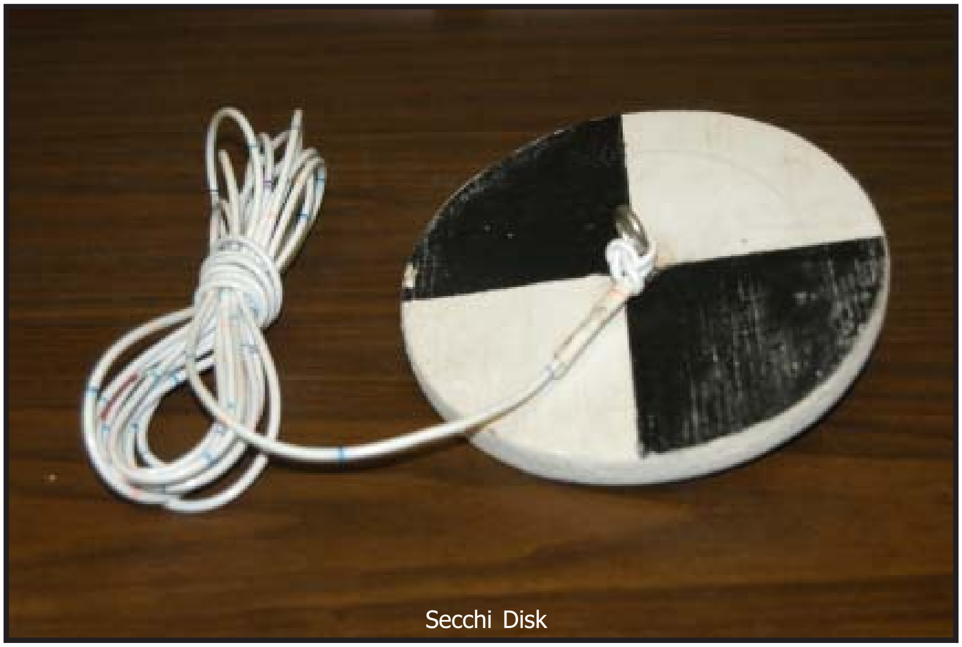
- Limiting photosynthetic processes,
- Increasing plant respiration relative to photosynthesis, oxygen use and the amount of carbon dioxide produced,
- Clogging of fish gills by suspended particles, and
- Obscuring vision of fish and shellfish as they hunt food.

Water color influences transparency to a degree, so it is useful to record the color.

5.2 Required Equipment for Water Transparency Testing

- Secchi disk with line marked every five centimeters

Figure 5.2-1: Secchi Disk and Line



Secchi Disk

5.3 Water Transparency Procedure

Take transparency readings at the same spot each time. Stand with your back to the sun to shade the sampling spot. Do not wear a hat or sunglasses when taking these readings.

A. Water Transparency

1. Lower the Secchi disk into the water until it just goes out of sight. Note this depth to the closest five centimeters and record as the "disappear" depth.

2. Raise Secchi disk until it just reappears. Note this depth to the closest five centimeters and record "reappear" depth.

3. Record the average of the two depths.

4. If the disk is resting on the bottom and is still visible, record the depth of the water for the average value.

Note: Bottom Still Visible or "BSV" is no longer acceptable due to reporting requirements. Please do **NOT** use this notation.

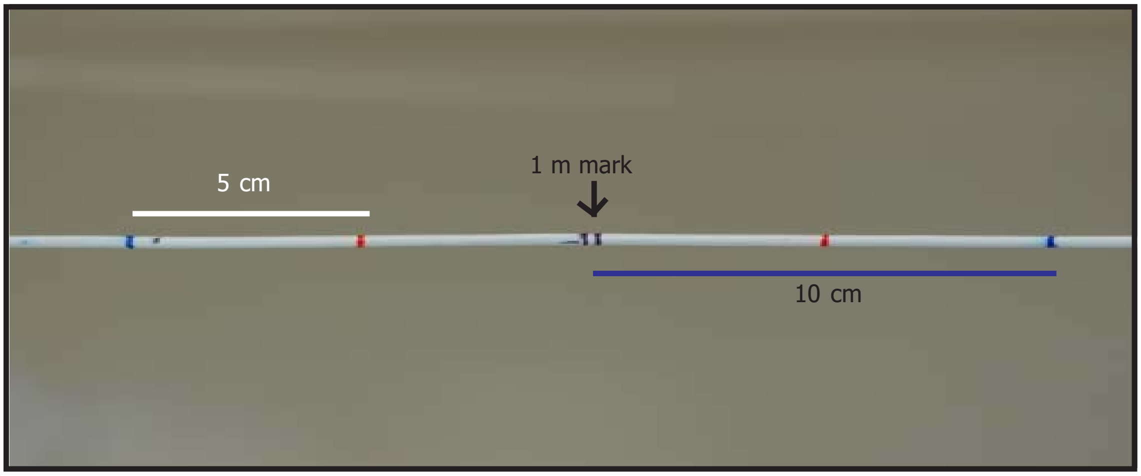
B. Water Depth

1. Lower the Secchi disk into the water until you feel or see the Secchi disk hit bottom. At this point the rope will go slack. Record the water depth to the closest five centimeters.

5.4 How to Read the Secchi Disk Depth

Begin measuring from the "surface" of the Secchi disk. From the "surface" up to the first BLUE mark is 10 centimeters (10 cm). The first RED mark is 15 cm from the "surface" of the Secchi disk. The marks on the line are at 5 cm intervals, alternating BLUE and RED. Ten BLUE marks represent 1 meter (100 cm), which is represented by 2 BLACK marks.

Figure 5.4-1: Secchi Disk Line

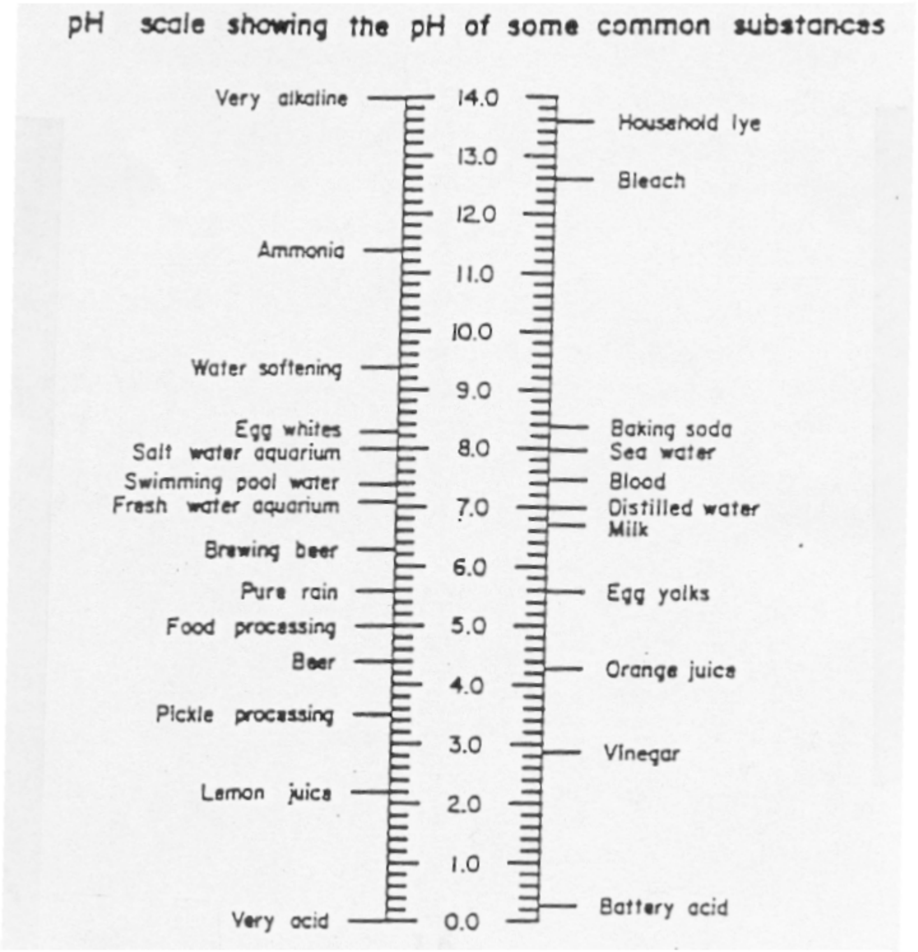


6.0 pH

6.1 pH Discussion

pH is the measure of how alkaline or acidic the water is. The pH scale runs from zero to fourteen, acidic to basic, with 7.0 being neutral. The scale is logarithmic, which means that for each change of one unit on the pH scale,the acidity or alkalinity changes by a factor of ten. For example, at a pH of 4.0 there are ten times as many hydrogen ions as there are at a pH of 5.0, and so on. The pH of ocean water is slightly basic, usually at 8.0 to 8.4. In estuaries, the pH varies more, usually from 7.0 to 8.6, but can vary even more widely at times of extreme influx of fresh water or a high degree of biological activity. Water dissolves the mineral substances it contacts, picks up aerosols and dust from the air, receives wastes, and supports photosynthetic organisms, all of which affect pH. Salt water has a buffering capacity, which helps it resist pH change, but some change does occur. Generally, aquatic life can exist between pH of 9.0 and 5.0.

Figure 6.1-1: pH Scale of the pH of Some Common Substances[3]



6.2 Required Equipment for pH Testing

- pH meter
- pH 7.0 buffer solution
- Tap water
- Six labeled containers and a tray
- Extra pH 7.0 buffer solution container

Figure 6.2-1: pH Testing Equipment

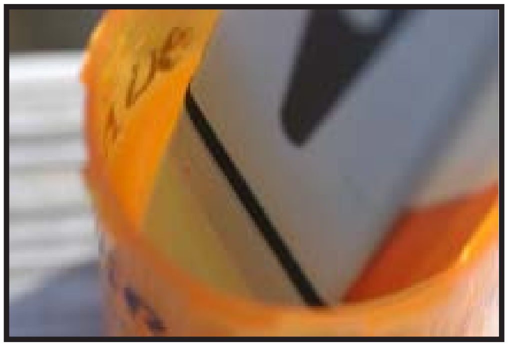
6.3 pH Procedure

1. Check pH meter function prior to sampling time. If your meter does not calibrate during steps 7-12, follow the directions provided in Appendix F, pH Meter Instructions. If the meter still does not calibrate correctly call Kingman Farm at (603)749-1565 for assistance in repairing or replacing the meter.

2. Immerse the pH probe for at least one hour prior to sampling in enough tap water to cover the probe without going above the O-ring (black band). We recommend that steps 1 and 2 be completed the night before sampling.

3. pH is temperature dependent so, calibration liquid must be near your sample temperature. Allow the pH 7.0 buffer to adjust to the same temperature as your sample by leaving it outside for at least one hour.

Figure 6.3-1: pH Meter in Use



Immersed pH meter (Note the water level is below the black O-Ring).

4. Rinse the "Rinse Sample" and "Test Sample" containers twice with sample water, then fill up to the marked line with water from the sampling bucket.

5. Rinse the "Rinse Tap" and "Test Tap" containers twice with tap water, then fill up to the marked line with tap water. (This step may be done earlier at home.)

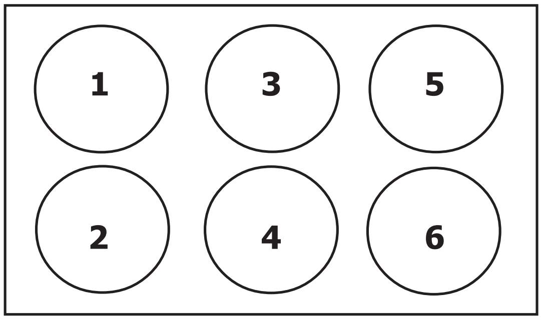
6. The container marked "Rinse Buffer pH 7.0" should contain the old, used buffer. Rinse the container marked "Test Buffer pH 7.0" with a vary small amount of fresh pH 7.0 buffer twice, then fill up to the marked line.

7. Arrange all six small containers in the test kit as per Figure 6.3-2.

8. Remove protector cap from the pH probe.

9. Turn the meter on by pressing the "ON/OFF" button.

Figure 6.3-2: Diagram of pH Testing Set Up



1 - Rinse Tap Water
2 - Test Tap Water
3 - Rinse Buffer pH 7.0
4 - Test Buffer pH 7.0
5 - Rinse Sample Water
6 - Test Sample Water

Place the pH meter in the containers in the following order:

- 1, 2 clean meter in tap water
- 3, 4 calibrate meter in buffer pH7
- 1, 2 clean meter in tap water
- 5, 6 test sample water pH
- 1, 2 clean meter in tap water

In the following steps, place pH probe in enough liquid to cover the electrode without going beyond the black band. This band is a seal to help protect the meter from liquid. It is water resistant, but not waterproof. If liquid is allowed to go above this point, it can damage instrument electronics.

10. Rinse electrode in containers marked "Rinse Tap" and then in "Test Tap" by stirring gently. There is no need to take pH readings at this point.

11. Rinse probe in bottle of buffer solution marked "Rinse Buffer pH 7.0," then place in "Test Buffer pH 7.0."

12. Press the "CAL" button to enter calibration mode and "CA" will flash in the display window. Stir gently and wait for the displayed value to stabilize.

13. After at least 30 seconds, press "HOLD/CON" to confirm calibration and "CO" will appear in the display window, followed by the calibrated pH. If this number is less than 6.9 or greater than 7.1, repeat steps 9-13. If this does not resolve the error, contact Kingman Farm at (603) 749-1565 for further direction.

14. Rinse the probe in tap water, first the "Rinse Tap" then the "Test Tap" containers. Do not record any numbers at this point.

15. Rinse probe in the container of “Rinse Sample” container, then immerse in the “Test Sample” container. Stir once and allow reading to stabilize. The meter will correct for temperature changes.

16. Read pH value in the display window. Record on data sheet. If you press the “HOLD/CON” button again, the most recent reading will remain on the display window for a few seconds.

17. Press “ON/OFF” button to shut off pH meter.

18. Rinse probe again in the “Rinse Tap” container, then rinse in the “Test Tap” container. Gently shake off excess water and replace cap.

19. Store pH meter in a dry section at the top of the tool-box.

20. At the end of the sampling day, throw out the “Rinse Buffer pH 7.0”. Wash and dry the “Rinse Buffer pH 7.0” container and wash the cap. The used “Rinse Buffer pH 7.0” solution can be disposed of by pouring down the drain if the waste goes to a sewage treatment plant. Otherwise, place it into a waste container and dispose of it later at a proper facility (not a septic system).

21. Pour the used “Test pH 7.0 Buffer” solution into the “Rinse pH 7.0 Buffer” container. Wash “Test pH 7.0 Buffer” container and fill with fresh pH 7.0 buffer solution from extra buffer solution bottle on the next sampling day. Rinse the other containers in fresh water and dry thoroughly.

22. The meter must be dry for storage. Check the battery compartment for dryness or rust before storing. Clean and dry if necessary.

The pH sample processing procedure is demonstrated in the GBCW Videos found on the GBCW 2005 Manual CD.

7.0 SALINITY

7.1 Salinity Discussion

Salinity is the total amount of all the dissolved solids in the water. The salinity of the open ocean is approximately 35 parts per thousand (ppt), but in the Gulf of Maine, salinity is slightly lower at about 32 or 33 ppt due to river influx. Seven rivers bring fresh water into the Great Bay Estuary, and during the spring runoff, levels of salinity have been recorded as low as zero. Tolerance of wide-ranging and sometimes rapidly changing salinity determines which species of plants and animals can survive in an estuary. Salinity levels are higher at the mouth of the Piscataqua River, and generally become lower as ocean water mixes with fresh water within Great Bay proper. Salinity levels vary as salt water mixes with fresh water, so differences in salinity at each site help to show the degree of mixing in the bay.

Temperature in the Great Bay estuary has a marked pattern of seasonal variation from a winter low of -1.9° C to as much as 30° C in the summer. Great Bay is quite shallow, averaging about eight feet, which allows for rapid warming and cooling as the seasons change. From 1973 to 1982, time series analyses of hydrographic trends in the estuary by UNH Professor Ted Loder and others showed that water temperature decreased 0.17° C per year, while salinity rose 0.34 ppt per year at Dover Point. This trend to colder, saltier water may indicate either local river-flow changes or regional trends affecting the Gulf of Maine.[4]

There are several ways of determining salinity, most of them requiring the use of expensive equipment. However, GBCW volunteers use a hydrometer, an instrument which measures the density of a fluid by making use of Archimedes' Principle. This principle states that "a floating body will displace a volume of water, the mass of which is equal to its own mass." The mass of a hydrometer is fixed so that it floats in pure, distilled water at 1.0000 grams per cubic centimeter (g/cc). The position of the hydrometer in the water column is directly related to the salinity of the water. Salinity is also related to temperature of the water, which we measure. Then we use conversion tables to relate the density and temperature measurements, and extrapolate our salinity reading in parts per thousand (ppt), which equals grams per milileter (g/ml).

7.2 Required Equipment for Salinity Testing

- Armored thermometer
- Hydrometer
- Hydrometer jar (500 mL cylinder)
- Hydrometer case with cork stopper

Figure 7.2-1: Salinity Testing Equipment

From back to front: jar, hydrometer case, hydrometer, and water thermometer.

7.3 Salinity Procedure

1. Using water from the sampling bucket, fill the 500 mL cylinder to approximately one inch below the rim.

2. Hang the armored thermometer in the cylinder.

3. Record the ID number of your hydrometer on the data sheet. It is found near the neck on white paper inside the stem.

4. Gently insert the hydrometer with a twisting motion. This removes any air bubbles. Be sure not to drop the hydrometer into the jar as this could cause it to hit the bottom of the cylinder too hard and break.

> The water temperature measured in the sampling bucket cannot be used for this test. The temperature of the water in the cylinder must be measured immediately prior to reading the hydrometer as temperature can change once it is in the cylinder.

5. Level the cylinder so hydrometer is vertical and not touching the sides. Try to keep it out of the wind.

6. After three minutes, read the thermometer to the nearest 0.5° C and record on data sheet. When taking reading, make sure the bottom of the thermometer remains in the water.

7. Remove the thermometer.
8. Read the density using the scale on the hydrometer, taking care to read at the bottom of the curve formed where the water rises slightly as it touches the sides of

Figure 7.3-1: Salinity Testing Equipment in Use

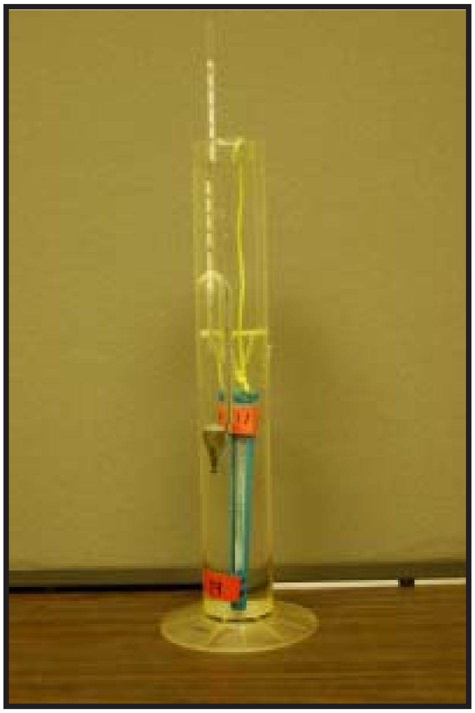
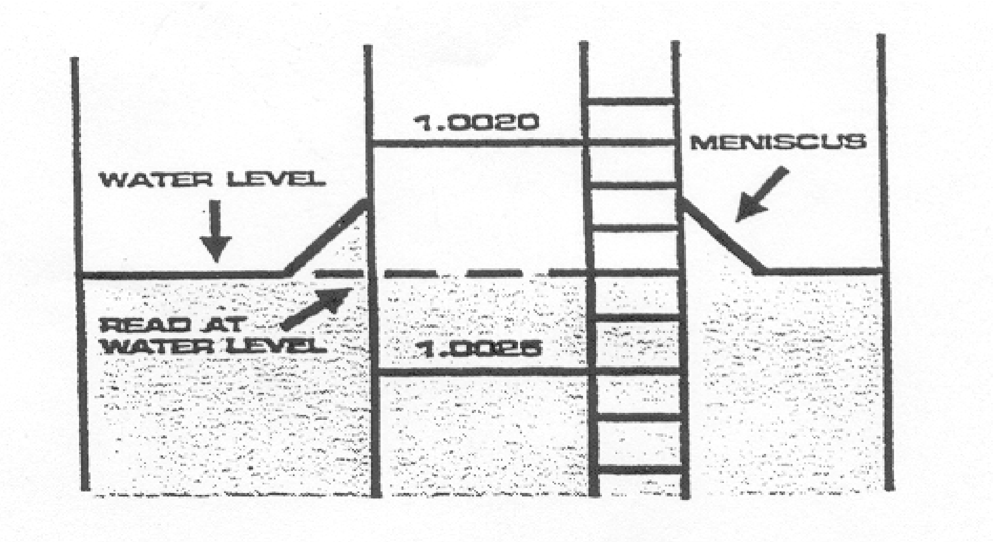


Figure 7.3-2: Reading a Hydrometer

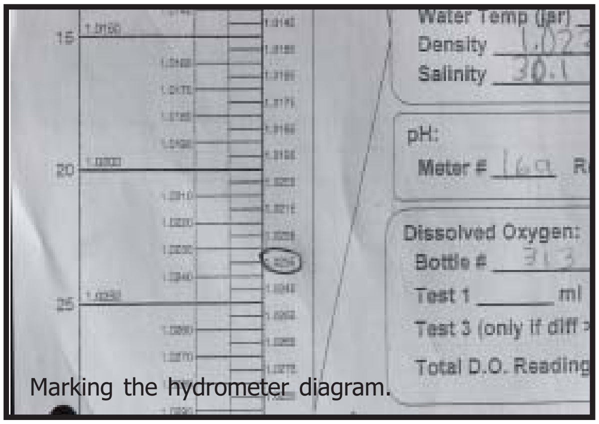
Diagram of Meniscus[5]



the hydrometer. (A magnifying glass may be helpful.) This curve is called the meniscus. (See diagram on the next page.)

9. On your data sheet, show where the meniscus is by marking the "READING THE HYDROMETER" diagram. Record the density reading on your field data sheet.

Figure 7.3-3: Field Data Sheet Example



Water Temp (jar)

Density 1.022

Salinity 30.1

pH:

Meter # 169 R

Dissolved Oxygen:

Bottle # 313

Test 1 ______ ml

Test 3 (only if diff

Total D.O. Reading

Marking the hydrometer diagram.

10. To determine the salinity, use Table 7.3-1, the five-page salinity table that follows. Locate the observed density reading in the left hand column and the recorded temperature across the top of the appropriate page. Then, read down to the appropriate salinity and record the result on your field data sheet.

If you find the density or temperature reading to be a value which ends with a five, you will need to calculate the result. This is done by averaging the values closest to the reading. See Appendix G, Significant Figures and Rounding for details and examples of averaging numbers.

TABLE 7.3-4: Salinity (Temperatures 1.0 - 8.0 °C)

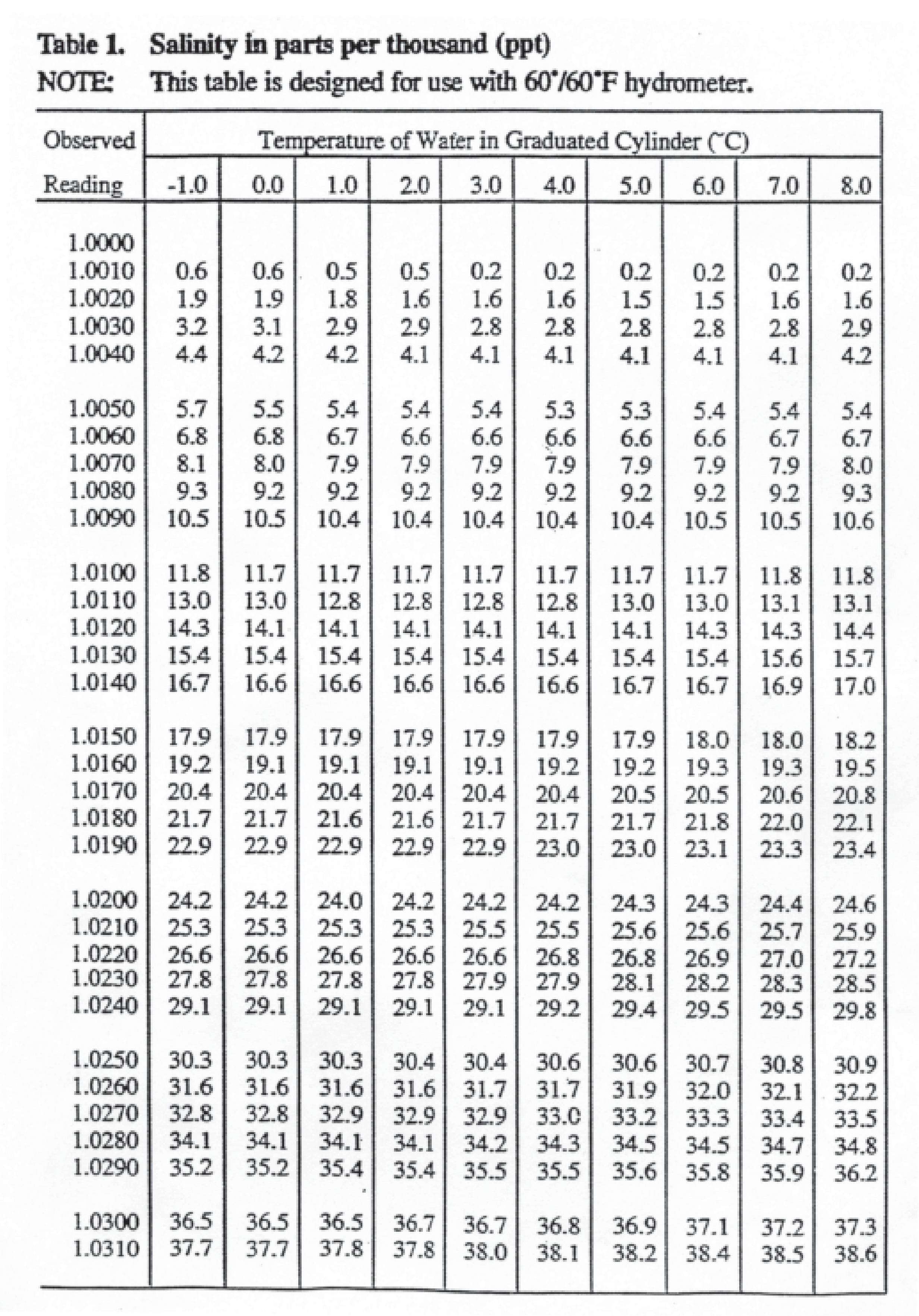


Table 1. Salinity in parts per thousand (ppt)

NOTE: This table is designed for use with 60°/60°F hydrometer.

Observed Reading	Temperature of Water in Graduated Cylinder (°C)									
	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
1.0000										
1.0010	0.6	0.6	0.5	0.5	0.2	0.2	0.2	0.2	0.2	0.2
1.0020	1.9	1.9	1.8	1.6	1.6	1.6	1.5	1.5	1.6	1.6
1.0030	3.2	3.1	2.9	2.9	2.8	2.8	2.8	2.8	2.8	2.9
1.0040	4.4	4.2	4.2	4.1	4.1	4.1	4.1	4.1	4.1	4.2
1.0050	5.7	5.5	5.4	5.4	5.4	5.3	5.3	5.4	5.4	5.4
1.0060	6.8	6.8	6.7	6.6	6.6	6.6	6.6	6.6	6.7	6.7
1.0070	8.1	8.0	7.9	7.9	7.9	7.9	7.9	7.9	7.9	8.0
1.0080	9.3	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.3
1.0090	10.5	10.5	10.4	10.4	10.4	10.4	10.4	10.5	10.5	10.6
1.0100	11.8	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.8	11.8
1.0110	13.0	13.0	12.8	12.8	12.8	12.8	13.0	13.0	13.1	13.1
1.0120	14.3	14.1	14.1	14.1	14.1	14.1	14.1	14.3	14.3	14.4
1.0130	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.6	15.7
1.0140	16.7	16.6	16.6	16.6	16.6	16.6	16.7	16.7	16.9	17.0
1.0150	17.9	17.9	17.9	17.9	17.9	17.9	17.9	18.0	18.0	18.2
1.0160	19.2	19.1	19.1	19.1	19.1	19.2	19.2	19.3	19.3	19.5
1.0170	20.4	20.4	20.4	20.4	20.4	20.4	20.5	20.5	20.6	20.8
1.0180	21.7	21.7	21.6	21.6	21.7	21.7	21.7	21.8	22.0	22.1
1.0190	22.9	22.9	22.9	22.9	22.9	23.0	23.0	23.1	23.3	23.4
1.0200	24.2	24.2	24.0	24.2	24.2	24.2	24.3	24.3	24.4	24.6
1.0210	25.3	25.3	25.3	25.3	25.5	25.5	25.6	25.6	25.7	25.9
1.0220	26.6	26.6	26.6	26.6	26.6	26.8	26.8	26.9	27.0	27.2
1.0230	27.8	27.8	27.8	27.8	27.9	27.9	28.1	28.2	28.3	28.5
1.0240	29.1	29.1	29.1	29.1	29.1	29.2	29.4	29.5	29.5	29.8
1.0250	30.3	30.3	30.3	30.4	30.4	30.6	30.6	30.7	30.8	30.9
1.0260	31.6	31.6	31.6	31.6	31.7	31.7	31.9	32.0	32.1	32.2
1.0270	32.8	32.8	32.9	32.9	32.9	33.0	33.2	33.3	33.4	33.5
1.0280	34.1	34.1	34.1	34.1	34.2	34.3	34.5	34.5	34.7	34.8
1.0290	35.2	35.2	35.4	35.4	35.5	35.5	35.6	35.8	35.9	36.2
1.0300	36.5	36.5	36.5	36.7	36.7	36.8	36.9	37.1	37.2	37.3
1.0310	37.7	37.7	37.8	37.8	38.0	38.1	38.2	38.4	38.5	38.6

TABLE 7.3-4: **Salinity (Temperatures 9.0 - 18.0 °C)**

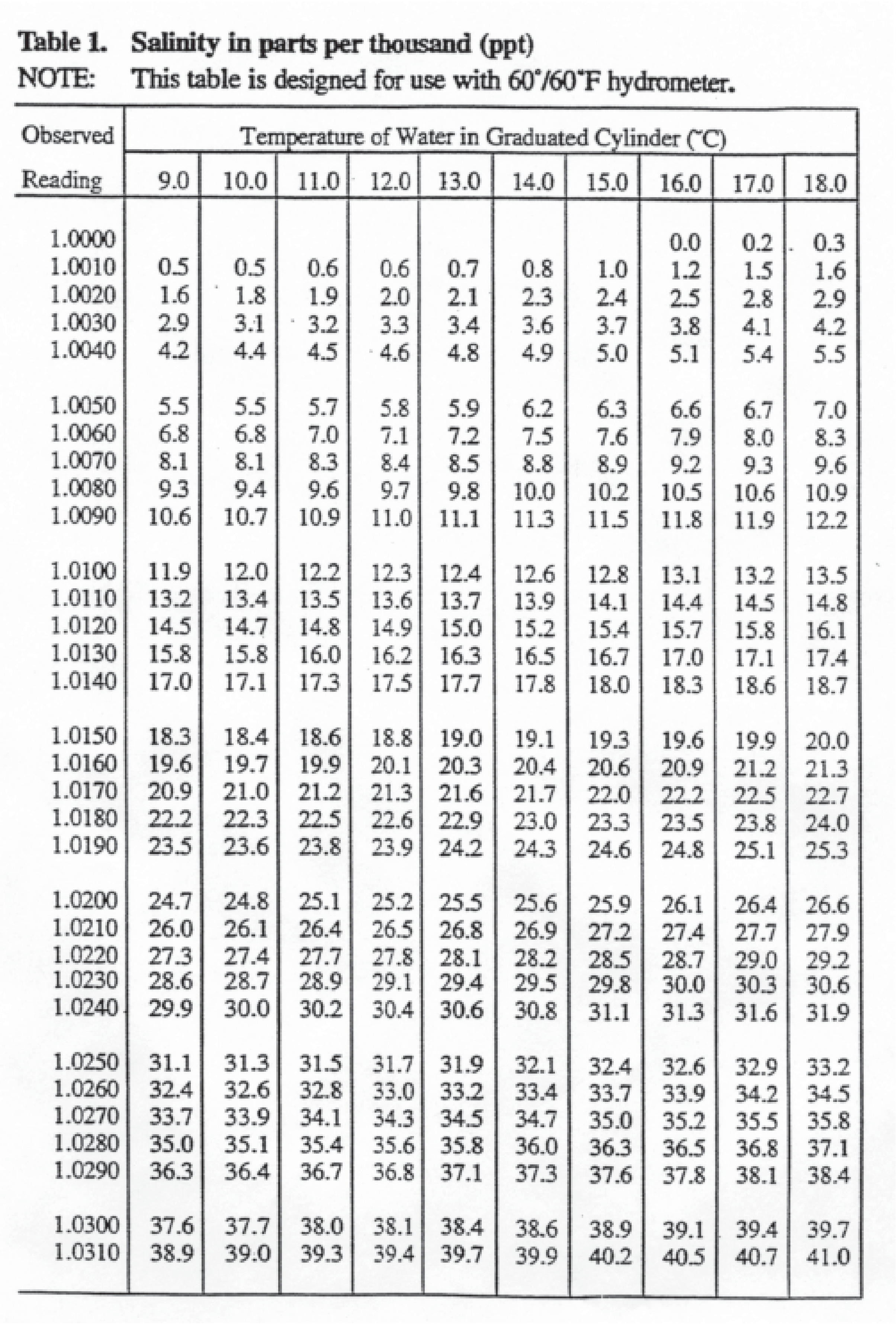


Table 1. **Salinity in parts per thousand (ppt)**

NOTE: This table is designed for use with 60°/60°F hydrometer.

Observed Reading	Temperature of Water in Graduated Cylinder (°C)									
	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0
1.0000								0.0	0.2	0.3
1.0010	0.5	0.5	0.6	0.6	0.7	0.8	1.0	1.2	1.5	1.6
1.0020	1.6	1.8	1.9	2.0	2.1	2.3	2.4	2.5	2.8	2.9
1.0030	2.9	3.1	3.2	3.3	3.4	3.6	3.7	3.8	4.1	4.2
1.0040	4.2	4.4	4.5	4.6	4.8	4.9	5.0	5.1	5.4	5.5
1.0050	5.5	5.5	5.7	5.8	5.9	6.2	6.3	6.6	6.7	7.0
1.0060	6.8	6.8	7.0	7.1	7.2	7.5	7.6	7.9	8.0	8.3
1.0070	8.1	8.1	8.3	8.4	8.5	8.8	8.9	9.2	9.3	9.6
1.0080	9.3	9.4	9.6	9.7	9.8	10.0	10.2	10.5	10.6	10.9
1.0090	10.6	10.7	10.9	11.0	11.1	11.3	11.5	11.8	11.9	12.2
1.0100	11.9	12.0	12.2	12.3	12.4	12.6	12.8	13.1	13.2	13.5
1.0110	13.2	13.4	13.5	13.6	13.7	13.9	14.1	14.4	14.5	14.8
1.0120	14.5	14.7	14.8	14.9	15.0	15.2	15.4	15.7	15.8	16.1
1.0130	15.8	15.8	16.0	16.2	16.3	16.5	16.7	17.0	17.1	17.4
1.0140	17.0	17.1	17.3	17.5	17.7	17.8	18.0	18.3	18.6	18.7
1.0150	18.3	18.4	18.6	18.8	19.0	19.1	19.3	19.6	19.9	20.0
1.0160	19.6	19.7	19.9	20.1	20.3	20.4	20.6	20.9	21.2	21.3
1.0170	20.9	21.0	21.2	21.3	21.6	21.7	22.0	22.2	22.5	22.7
1.0180	22.2	22.3	22.5	22.6	22.9	23.0	23.3	23.5	23.8	24.0
1.0190	23.5	23.6	23.8	23.9	24.2	24.3	24.6	24.8	25.1	25.3
1.0200	24.7	24.8	25.1	25.2	25.5	25.6	25.9	26.1	26.4	26.6
1.0210	26.0	26.1	26.4	26.5	26.8	26.9	27.2	27.4	27.7	27.9
1.0220	27.3	27.4	27.7	27.8	28.1	28.2	28.5	28.7	29.0	29.2
1.0230	28.6	28.7	28.9	29.1	29.4	29.5	29.8	30.0	30.3	30.6
1.0240	29.9	30.0	30.2	30.4	30.6	30.8	31.1	31.3	31.6	31.9
1.0250	31.1	31.3	31.5	31.7	31.9	32.1	32.4	32.6	32.9	33.2
1.0260	32.4	32.6	32.8	33.0	33.2	33.4	33.7	33.9	34.2	34.5
1.0270	33.7	33.9	34.1	34.3	34.5	34.7	35.0	35.2	35.5	35.8
1.0280	35.0	35.1	35.4	35.6	35.8	36.0	36.3	36.5	36.8	37.1
1.0290	36.3	36.4	36.7	36.8	37.1	37.3	37.6	37.8	38.1	38.4
1.0300	37.6	37.7	38.0	38.1	38.4	38.6	38.9	39.1	39.4	39.7
1.0310	38.9	39.0	39.3	39.4	39.7	39.9	40.2	40.5	40.7	41.0

TABLE 7.3-4: Salinity (Temperatures 18.5 - 23.0 °C)

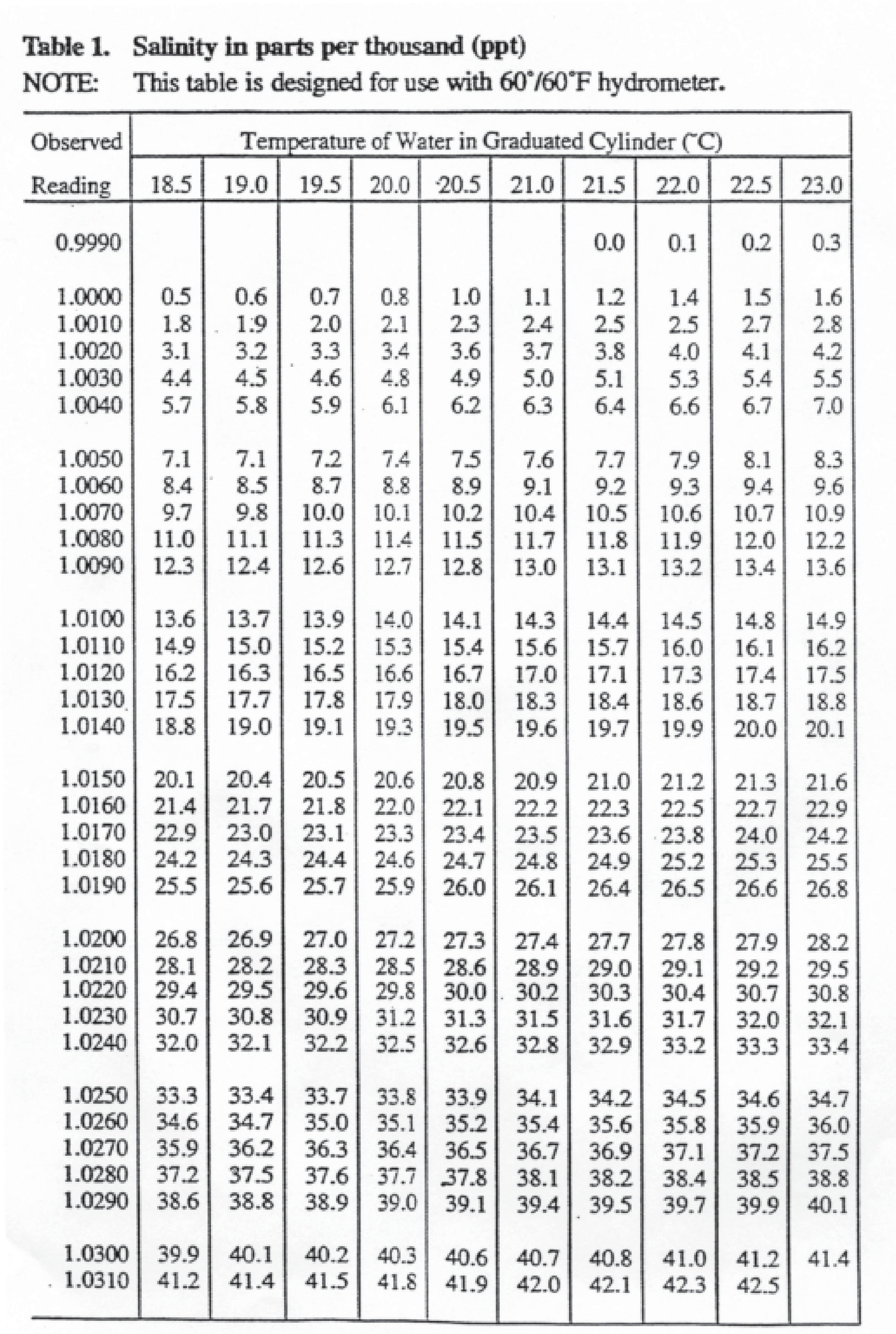


Table 1. **Salinity in parts per thousand (ppt)**

NOTE: This table is designed for use with 60°/60°F hydrometer.

Observed	Temperature of Water in Graduated Cylinder (°C)									
Reading	18.5	19.0	19.5	20.0	20.5	21.0	21.5	22.0	22.5	23.0
0.9990							0.0	0.1	0.2	0.3
1.0000	0.5	0.6	0.7	0.8	1.0	1.1	1.2	1.4	1.5	1.6
1.0010	1.8	1.9	2.0	2.1	2.3	2.4	2.5	2.5	2.7	2.8
1.0020	3.1	3.2	3.3	3.4	3.6	3.7	3.8	4.0	4.1	4.2
1.0030	4.4	4.5	4.6	4.8	4.9	5.0	5.1	5.3	5.4	5.5
1.0040	5.7	5.8	5.9	6.1	6.2	6.3	6.4	6.6	6.7	7.0
1.0050	7.1	7.1	7.2	7.4	7.5	7.6	7.7	7.9	8.1	8.3
1.0060	8.4	8.5	8.7	8.8	8.9	9.1	9.2	9.3	9.4	9.6
1.0070	9.7	9.8	10.0	10.1	10.2	10.4	10.5	10.6	10.7	10.9
1.0080	11.0	11.1	11.3	11.4	11.5	11.7	11.8	11.9	12.0	12.2
1.0090	12.3	12.4	12.6	12.7	12.8	13.0	13.1	13.2	13.4	13.6
1.0100	13.6	13.7	13.9	14.0	14.1	14.3	14.4	14.5	14.8	14.9
1.0110	14.9	15.0	15.2	15.3	15.4	15.6	15.7	16.0	16.1	16.2
1.0120	16.2	16.3	16.5	16.6	16.7	17.0	17.1	17.3	17.4	17.5
1.0130	17.5	17.7	17.8	17.9	18.0	18.3	18.4	18.6	18.7	18.8
1.0140	18.8	19.0	19.1	19.3	19.5	19.6	19.7	19.9	20.0	20.1
1.0150	20.1	20.4	20.5	20.6	20.8	20.9	21.0	21.2	21.3	21.6
1.0160	21.4	21.7	21.8	22.0	22.1	22.2	22.3	22.5	22.7	22.9
1.0170	22.9	23.0	23.1	23.3	23.4	23.5	23.6	23.8	24.0	24.2
1.0180	24.2	24.3	24.4	24.6	24.7	24.8	24.9	25.2	25.3	25.5
1.0190	25.5	25.6	25.7	25.9	26.0	26.1	26.4	26.5	26.6	26.8
1.0200	26.8	26.9	27.0	27.2	27.3	27.4	27.7	27.8	27.9	28.2
1.0210	28.1	28.2	28.3	28.5	28.6	28.9	29.0	29.1	29.2	29.5
1.0220	29.4	29.5	29.6	29.8	30.0	30.2	30.3	30.4	30.7	30.8
1.0230	30.7	30.8	30.9	31.2	31.3	31.5	31.6	31.7	32.0	32.1
1.0240	32.0	32.1	32.2	32.5	32.6	32.8	32.9	33.2	33.3	33.4
1.0250	33.3	33.4	33.7	33.8	33.9	34.1	34.2	34.5	34.6	34.7
1.0260	34.6	34.7	35.0	35.1	35.2	35.4	35.6	35.8	35.9	36.0
1.0270	35.9	36.2	36.3	36.4	36.5	36.7	36.9	37.1	37.2	37.5
1.0280	37.2	37.5	37.6	37.7	37.8	38.1	38.2	38.4	38.5	38.8
1.0290	38.6	38.8	38.9	39.0	39.1	39.4	39.5	39.7	39.9	40.1
1.0300	39.9	40.1	40.2	40.3	40.6	40.7	40.8	41.0	41.2	41.4
1.0310	41.2	41.4	41.5	41.8	41.9	42.0	42.1	42.3	42.5	

TABLE 7.3-4: Salinity (Temperatures 23.5 - 28 °C)

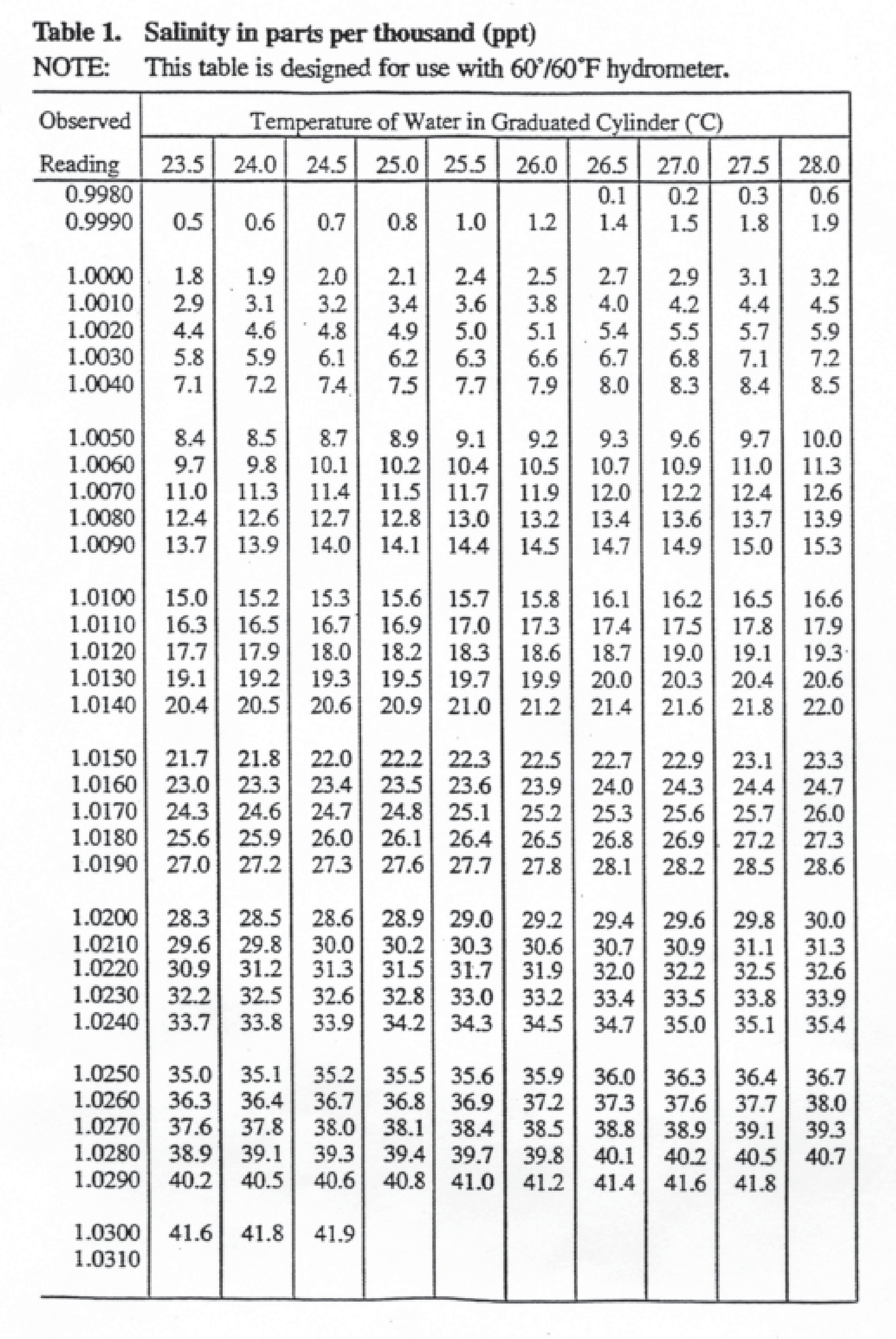


Table 1. Salinity in parts per thousand (ppt)

NOTE: This table is designed for use with 60°/60°F hydrometer.

Observed	Temperature of Water in Graduated Cylinder (°C)									
Reading	23.5	24.0	24.5	25.0	25.5	26.0	26.5	27.0	27.5	28.0
0.9980							0.1	0.2	0.3	0.6
0.9990	0.5	0.6	0.7	0.8	1.0	1.2	1.4	1.5	1.8	1.9
1.0000	1.8	1.9	2.0	2.1	2.4	2.5	2.7	2.9	3.1	3.2
1.0010	2.9	3.1	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.5
1.0020	4.4	4.6	4.8	4.9	5.0	5.1	5.4	5.5	5.7	5.9
1.0030	5.8	5.9	6.1	6.2	6.3	6.6	6.7	6.8	7.1	7.2
1.0040	7.1	7.2	7.4	7.5	7.7	7.9	8.0	8.3	8.4	8.5
1.0050	8.4	8.5	8.7	8.9	9.1	9.2	9.3	9.6	9.7	10.0
1.0060	9.7	9.8	10.1	10.2	10.4	10.5	10.7	10.9	11.0	11.3
1.0070	11.0	11.3	11.4	11.5	11.7	11.9	12.0	12.2	12.4	12.6
1.0080	12.4	12.6	12.7	12.8	13.0	13.2	13.4	13.6	13.7	13.9
1.0090	13.7	13.9	14.0	14.1	14.4	14.5	14.7	14.9	15.0	15.3
1.0100	15.0	15.2	15.3	15.6	15.7	15.8	16.1	16.2	16.5	16.6
1.0110	16.3	16.5	16.7	16.9	17.0	17.3	17.4	17.5	17.8	17.9
1.0120	17.7	17.9	18.0	18.2	18.3	18.6	18.7	19.0	19.1	19.3
1.0130	19.1	19.2	19.3	19.5	19.7	19.9	20.0	20.3	20.4	20.6
1.0140	20.4	20.5	20.6	20.9	21.0	21.2	21.4	21.6	21.8	22.0
1.0150	21.7	21.8	22.0	22.2	22.3	22.5	22.7	22.9	23.1	23.3
1.0160	23.0	23.3	23.4	23.5	23.6	23.9	24.0	24.3	24.4	24.7
1.0170	24.3	24.6	24.7	24.8	25.1	25.2	25.3	25.6	25.7	26.0
1.0180	25.6	25.9	26.0	26.1	26.4	26.5	26.8	26.9	27.2	27.3
1.0190	27.0	27.2	27.3	27.6	27.7	27.8	28.1	28.2	28.5	28.6
1.0200	28.3	28.5	28.6	28.9	29.0	29.2	29.4	29.6	29.8	30.0
1.0210	29.6	29.8	30.0	30.2	30.3	30.6	30.7	30.9	31.1	31.3
1.0220	30.9	31.2	31.3	31.5	31.7	31.9	32.0	32.2	32.5	32.6
1.0230	32.2	32.5	32.6	32.8	33.0	33.2	33.4	33.5	33.8	33.9
1.0240	33.7	33.8	33.9	34.2	34.3	34.5	34.7	35.0	35.1	35.4
1.0250	35.0	35.1	35.2	35.5	35.6	35.9	36.0	36.3	36.4	36.7
1.0260	36.3	36.4	36.7	36.8	36.9	37.2	37.3	37.6	37.7	38.0
1.0270	37.6	37.8	38.0	38.1	38.4	38.5	38.8	38.9	39.1	39.3
1.0280	38.9	39.1	39.3	39.4	39.7	39.8	40.1	40.2	40.5	40.7
1.0290	40.2	40.5	40.6	40.8	41.0	41.2	41.4	41.6	41.8	
1.0300	41.6	41.8	41.9							
1.0310										

TABLE 7.3-4: Salinity (Temperatures 28.5 - 33.0 °C)

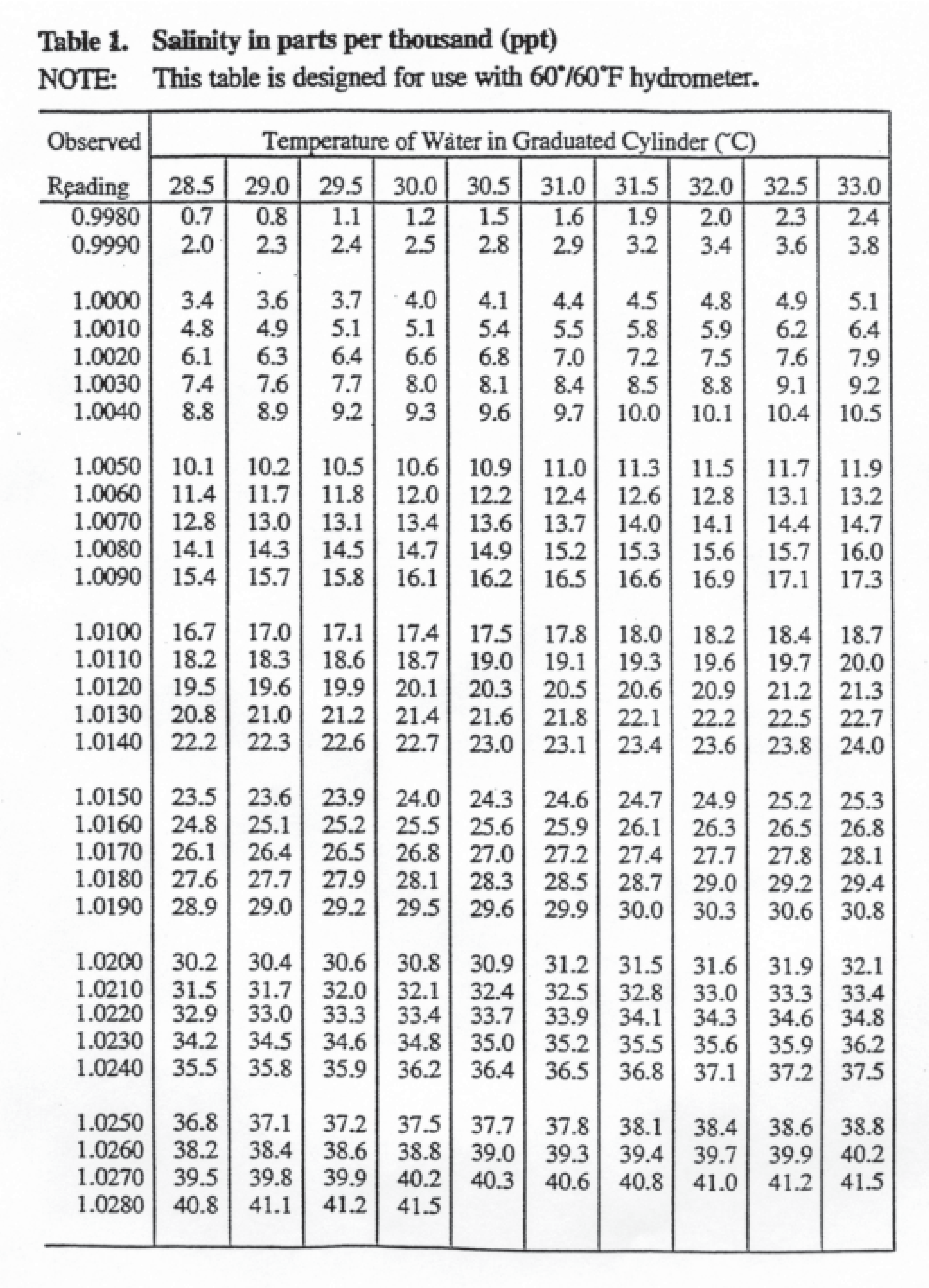


Table 1. Salinity in parts per thousand (ppt)

NOTE: This table is designed for use with 60°/60°F hydrometer.

Observed	Temperature of Water in Graduated Cylinder (°C)									
Reading	28.5	29.0	29.5	30.0	30.5	31.0	31.5	32.0	32.5	33.0
0.9980	0.7	0.8	1.1	1.2	1.5	1.6	1.9	2.0	2.3	2.4
0.9990	2.0	2.3	2.4	2.5	2.8	2.9	3.2	3.4	3.6	3.8
1.0000	3.4	3.6	3.7	4.0	4.1	4.4	4.5	4.8	4.9	5.1
1.0010	4.8	4.9	5.1	5.1	5.4	5.5	5.8	5.9	6.2	6.4
1.0020	6.1	6.3	6.4	6.6	6.8	7.0	7.2	7.5	7.6	7.9
1.0030	7.4	7.6	7.7	8.0	8.1	8.4	8.5	8.8	9.1	9.2
1.0040	8.8	8.9	9.2	9.3	9.6	9.7	10.0	10.1	10.4	10.5
1.0050	10.1	10.2	10.5	10.6	10.9	11.0	11.3	11.5	11.7	11.9
1.0060	11.4	11.7	11.8	12.0	12.2	12.4	12.6	12.8	13.1	13.2
1.0070	12.8	13.0	13.1	13.4	13.6	13.7	14.0	14.1	14.4	14.7
1.0080	14.1	14.3	14.5	14.7	14.9	15.2	15.3	15.6	15.7	16.0
1.0090	15.4	15.7	15.8	16.1	16.2	16.5	16.6	16.9	17.1	17.3
1.0100	16.7	17.0	17.1	17.4	17.5	17.8	18.0	18.2	18.4	18.7
1.0110	18.2	18.3	18.6	18.7	19.0	19.1	19.3	19.6	19.7	20.0
1.0120	19.5	19.6	19.9	20.1	20.3	20.5	20.6	20.9	21.2	21.3
1.0130	20.8	21.0	21.2	21.4	21.6	21.8	22.1	22.2	22.5	22.7
1.0140	22.2	22.3	22.6	22.7	23.0	23.1	23.4	23.6	23.8	24.0
1.0150	23.5	23.6	23.9	24.0	24.3	24.6	24.7	24.9	25.2	25.3
1.0160	24.8	25.1	25.2	25.5	25.6	25.9	26.1	26.3	26.5	26.8
1.0170	26.1	26.4	26.5	26.8	27.0	27.2	27.4	27.7	27.8	28.1
1.0180	27.6	27.7	27.9	28.1	28.3	28.5	28.7	29.0	29.2	29.4
1.0190	28.9	29.0	29.2	29.5	29.6	29.9	30.0	30.3	30.6	30.8
1.0200	30.2	30.4	30.6	30.8	30.9	31.2	31.5	31.6	31.9	32.1
1.0210	31.5	31.7	32.0	32.1	32.4	32.5	32.8	33.0	33.3	33.4
1.0220	32.9	33.0	33.3	33.4	33.7	33.9	34.1	34.3	34.6	34.8
1.0230	34.2	34.5	34.6	34.8	35.0	35.2	35.5	35.6	35.9	36.2
1.0240	35.5	35.8	35.9	36.2	36.4	36.5	36.8	37.1	37.2	37.5
1.0250	36.8	37.1	37.2	37.5	37.7	37.8	38.1	38.4	38.6	38.8
1.0260	38.2	38.4	38.6	38.8	39.0	39.3	39.4	39.7	39.9	40.2
1.0270	39.5	39.8	39.9	40.2	40.3	40.6	40.8	41.0	41.2	41.5
1.0280	40.8	41.1	41.2	41.5						

8.0 DISSOLVED OXYGEN

8.1 Dissolved Oxygen Discussion

Dissolved oxygen (DO) is one of the most important indicators of the quality of water for aquatic life. It is essential for all aquatic plants and animals. When oxygen levels in the water fall below about 3-5 parts per million (ppm), fish and many other aquatic organisms become stressed and some cannot survive. Oxygen is a particularly sensitive constituent because chemicals present in the water, biological processes, and temperature greatly influence its availability during the year.

A DO test (using kit or meter) measures how much oxygen is dissolved in the water, but it does not tell you how much dissolved oxygen the water can hold at the tested temperature. When water holds the maximum DO at a given temperature, it is said to be saturated with oxygen. The warmer the water is, the less DO it can hold and the colder the water, the more DO it can hold. Table 7.1-1 shows this relationship at various temperatures.

Oxygen is transferred from the atmosphere into the surface waters by the aerating action of the wind. It is also added at or near the surface as a by-product of plant photosynthesis. As a result phytoplankton, algae, and rooted aquatic plants increase DO levels. Since the existence of plants also depends on the availability of light, the oxygen-producing processes occur only near the surface or in shallow waters. Oxygen levels may be reduced because the water is too warm (e.g., near a power plant) or because there are too many bacteria or aquatic organisms in the area. When algae growth is excessive, as in a “bloom,” the upper levels of algae can shade the light from lower levels, causing fish kills, death of other organisms, as well as unpleasant odors. At night, photosynthesis stops and the algae respire (i.e.use oxygen).

While the overall oxygen content in the water is important in assessing the health of a water body, it is also useful to look at DO in terms of “percent saturation.” Percent saturation is the ratio of oxygen concentration that is in the water compared to the oxygen concentration that could be in the water at a given temperature and salinity. One might expect that the highest obtainable percent saturation value to be 100 percent. However, “supersaturation” (i.e., values greater than 100 percent) can occur under certain conditions. Very high concentrations of oxygen are possible in areas with a great deal of aquatic vegetation (i.e., oxygen production through photosynthesis) or in areas with strong wind and wave action (i.e., addition of oxygen through “entrainment” of atmospheric oxygen into the water).

Table 8.1-1: Solubility of Dissolved Oxygen in Fresh Water (at 100% sautration)

Temperature (^{0}C)	Solubility (ppm or mg/L)	Temperature (^{0}C)	Solubility (ppm or mg/L)
0	14.6	16	10.0
1	14.2	17	9.8
2	13.8	18	9.6
3	13.5	19	9.4
4	13.1	20	9.2
5	12.8	21	9.0
6	12.5	22	8.9
7	12.2	23	8.7
8	11.9	24	8.6
9	11.6	25	8.4
10	11.3	26	8.2
11	11.1	27	8.1
12	10.9	28	7.9
13	10.6	29	7.8
14	10.4	30	7.7
15	10.2		

As shown above in Table 8.1-1, the amount of dissolved oxygen which can be held at various temperatures varies greatly. DO levels depend not only upon temperature, but on conditions such as photosynthesis, wind, light, algae blooms, etc. Very low readings (under 4 ppm) should be rechecked. Very high readings above those in Table 8.1-1 at a given temperature may indicate supersaturated levels of dissolved oxygen. These should also be rechecked. If confirmed by a second reading, such supersaturated levels may be explained by high wind or very sunny conditions, combined with large amounts of live plant material.

8.2 Required Equipment for Dissolved Oxygen (DO) Testing

- 2 graduated burettes
- 2 glass rods
- 2 glass marbles
- 2 glass Wheaton DO/BOD bottles with stoppers
- 1 100 mL graduated cylinder
- 1 box manganese sulfate pillows (Pillow #1)
- 1 box iodide-azide pillows (Pillow #2)
- 1 bag of sulfamic acid pillows (Pillow #3)
- 1 pair scissors or clippers
- 1 dropper bottle starch solution
- 1 bottle sodium thiosulfate
- 1 plastic beaker
- Transfer pipette (Optional)


Figure 8.2-1: DO Testing Equipment

8.3 Dissolved Oxygen Procedure

Figure 8.3-1: **BOD bottle ready to be filled**

1. Release clamp on the sampling bucket tube, empty the tubing of bubbles, and insert flow tube from sample bucket into bottle, all the way to the bottom of bottle.

2. Keep track of the amount of time it takes to fill the bottle to the point of overflow (counting as it fills will be fine), and allow enough time for the bottle to have filled 3 times. Remove the flow tube from the BOD slowly before stopping the flow of water. This ensures the BOD is full to the brim.

3. Examine sample to make sure no bubbles are trapped inside. Don't splash water out. Repeat step 2 until there are no bubbles. Temporarily replace glass stopper if carrying sample away from water's edge to do the procedure. Once a satisfactory sample has been collected, proceed to steps 4, 5 and 6.

Figure 8.3-2: **Properly filling a BOD Bottle**


Water overflowing to fill BOD bottle.

Should powder stick to the neck of the bottle, use the cap to wet the neck and mix the powder in. Do not remove the cap after it has been set in place until you are ready for the next step. Some liquid will overflow.

4. Cut open the manganese sulfate powder (pillow #1) and add to sample.

5. Cut open the alkaline iodide-azide powder (pillow #2) and add to sample.

6. Carefully add a small marble to the bottle before replacing the stopper. Replace stopper, twist 1/4 turn to get a good seal. Place finger on top to hold the stopper on the bottle. Swirl bottle gently several times, using a circular wrist motion, to mix reagents with water. A precipitate will form. Place sample aside and allow precipitate to settle to bottom half of bottle. Once precipitate has settled, repeat the mixing and settling process once to ensure the chemical reaction is complete.

Figure 8.3-3: **Settled precipitate in BOD bottle.**

Addition of the marble in step 6 has two benefits. It tops off the level of the liquid in the bottle and eliminates the air bubble that can sometime form between the liquid and the stopper. Also, the marble helps to mix the powered reagents when the bottle is swirled. The marble should be clean and should be added gently to prevent the possibility of introducing air into the bottle.

After finishing step 6, go on to your other tests while the precipitate is settling. Now that step 6 is complete, contact between the water sample and the atmosphere will not affect the test result. Once the sample has been “fixed” in this manner, it is not necessary to perform the actual test procedure immediately. Thus, several samples can be collected and “fixed” in the field and then carried back to a testing station or laboratory where the titration procedure is to be performed. Make certain samples are kept cool if titrating later. However, the test must be completed within eight hours.

7. Cut open the sulfamic acid (pillow #3) and add to sample. Replace stopper and swirl gently several times and swirl to mix until powdered reagents have dissolved. All of the powder chemicals must be dissolved before you go on. Look in the bottom to see if there are crystals that look like grains of sugar. If there are some visible, continue to mix. A clear yellow to brown-orange color will develop, depending on the oxygen content of the sample.

8. Pour 100 mL of the sample carefully into a clean 100 mL graduated cylinder. Tilt the cylinder and pour the sample carefully down the inside wall to avoid mixing bubbles into the sample. Bubbles will not add dissolved oxygen to the water at this point, but can displace the water and give you an incorrect measurement. Tap the cylinder to remove the bubbles and make sure the meniscus is at 100 mL. A transfer pipette may be used to add/remove sample to obtain the exact volume. Then pour the sample from the cylinder into the test beaker, again carefully pouring down the inside of the beaker.

9. Fill burette to above the zero mark with sodium thiosulfate titrant and clear bubbles out of burette. Tap the burette to get rid of bubbles above the bead valve. Point the tip up over your waste container and tap or squeeze the bead valve to remove the bubbles below the bead valve. Make sure liquid fills burette from tip to the zero mark. Refill to zero mark if necessary.

Figure 8.3-4: Examples of Measuring Liquids

Pouring sample.

Measuring sample.

Measuring sodium thiosulfate.

10. Slowly add sodium thiosulfate titrant to test beaker containing the 100 mL of sample, constantly stirring as titrant is added. Stop titrating when the amber-colored solution in beaker begins to lighten to a light hay color. Place white paper under beaker to watch for test color change in step 12.

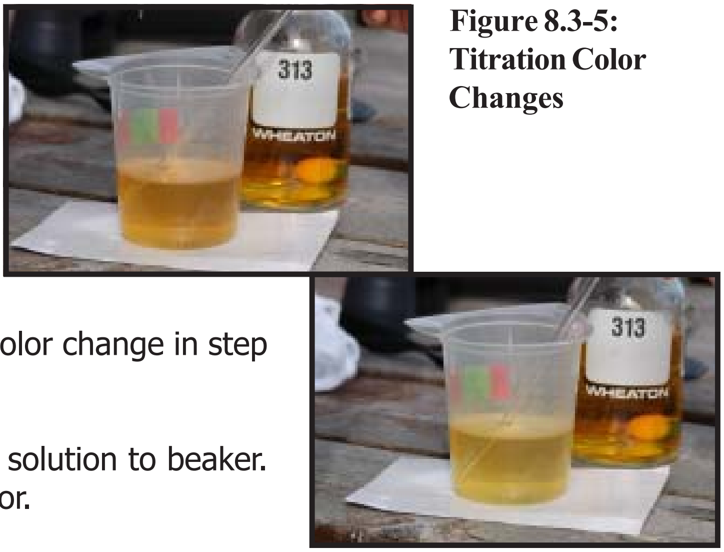


Figure 8.3-5: Titration Color Changes

11. Add about eight drops of starch solution to beaker. Sample will turn a dark blue color.

12. Continue the titration process with the sodium thiosulfate remaining in the burette until test sample turns colorless. Be sure to stir sample as each drop is added. If you are not positive you have reached the color change, read the current number, add more drop by drop until you are sure, and record the correct value.

13. Using the scale on the side of the burette, count the total number of mL of sodium thiosulfate used in the titration. Make sure you are reading the burette down from the zero mark at the top. Enter this number in the space provided on your data sheet.

14. Rinse out the beaker and repeat steps 8 through 13 on a second 100 mL of the water sample.

15. Record results of the second titration in the space provided on your data sheet.

16. Add the results of the two titrations (mL = mg/L) and enter the value on your data sheet.

Duplicate titrations are run to guard against analysis errors. If the two DO results differ by equal to or greater than 0.3 mL, a third titration needs to be performed. If less than 100 mL of the sample remains for the third titration, use 50 mL and double the result. As before, fill the burette to the zero mark to titrate. Record all three results; however, only add the two results that are within 0.3 mL difference.

17. Once the DO testing has been completed, pour all remaining liquids into waste container, rinse and dry all equipment thoroughly.

9.0 DELIVERY AND CLEANUP

9.1 Delivery

Once sampling is completed for the day, deliver the fecal coliform sample in a cooler with a cold pack along with your data sheets to Kingman Farm to arrive no later than 6:00 PM. If you are not able to do so, either make sure someone else on your team delivers them, or call Ann at Kingman Farm (603)749-1565 or at home (603)749-3880 to arrange for pickup. Please make these arrangements prior to the sampling day.

9.2 Cleanup

At the end of the sampling day, you should do the cleanup work necessary to make sure that the kit is ready for the next month's sampling activities. Removing the corrosive salt water also helps to extend the life of the equipment. This requires that you do the following:

1. Make sure the kit has been cleaned with fresh water and dried as provided for in the preceding test procedures.

2. Renew the pH kit as follows:

    a) Discard the "Rinse pH 7.0 Buffer" solution.
    b) Wash and dry the "Rinse pH 7.0 Buffer" container.
    c) Pour the used test pH 7.0 buffer solution into the "Rinse pH 7.0 Buffer" container.
    d) Wash and dry the "Test pH 7.0 Buffer" container.
    e) Fill the "Test pH 7.0 Buffer" container with new test pH 7.0 buffer solution from the "Extra pH 7.0 buffer solution" container.

3. Empty the tap water container and allow it to dry.

4. Inventory the kit using the equipment check list to make sure that all components are in good condition and take note of any chemicals or supplies that need to be replenished. Likely candidates for replenishment are:

    a) Field Data Sheets
    b) Sodium Thiosulfate
    c) Test pH 7.0 Buffer Solution
    d) Manganese Sulfate Pillows (pillow #1)
    e) Iodide-Azide Pillows (pillow #2)
    f) Sulfamic Acid Pillows (pillow #3)
    g) Starch Solution
    h) Whirl-Pac® Bags
    i) Permanent Marker
    j) Batteries
    k) Burette Parts

5. Replenish necessary supplies at you earliest convenience and prior to the next sampling day.

10.0 FECAL COLIFORM BACTERIA SAMPLE PROCESSING

10.1 Required Equipment

- Sterile Petri dishes
- Coliform record sheet
- Spray disinfectant
- Water bath incubator
- Distilled water
- Filtration flask
- Filter base with stopper
- Aluminum foil
- Labeling tape
- Alcohol
- Phosphate buffer
- Absorbent filter pads
- Membrane filters
- Ampules of growth medium (MFC Broth)
- Sterile pipettes (10 mL and 1 mL)
- Automatic pipette
- Oil lamp or candle
- Tissues
- UV sterilizer
- Filter funnel
- Filter forceps
- Autoclave tape
- Vacuum pump or hand pump
- Whirl-Pac® bags

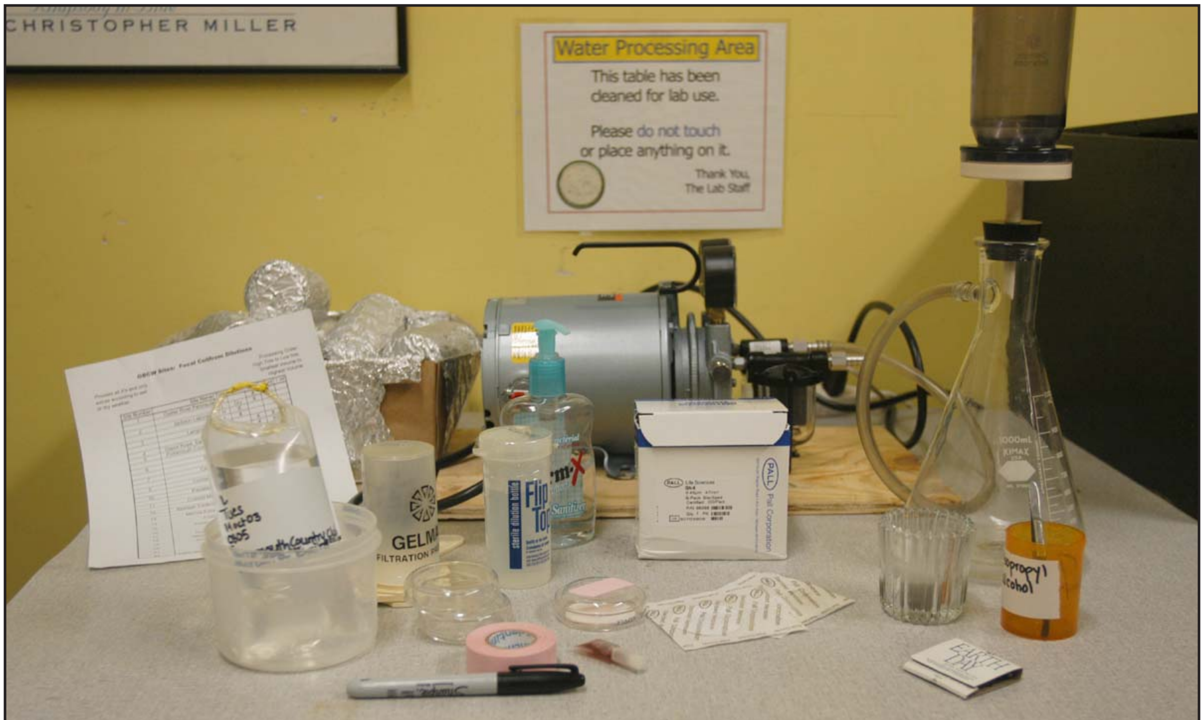


Figure 10.1-1: Equipment used to process water samples for fecal coliform bacteria testing.

10.2 Preparation for Sample Processing for Fecal Coliform Bacteria Testing

1. Fill incubator, and check that the temperature is set to 44.50° C. Incubator temperature may fluctuate ± 0.2° C.
2. Record the following information on the fecal coliform bacteria record sheet: site number, site name, date, time the sample was obtained, tide, and the sampler's initials.
3. Make sure that all of filtration equipment is sterilized. The UV bulb should be cleaned with ethanol at least once a month. Sterilize all filtration equipment for at least ten minutes using the UV light box. The filtration apparatus should be placed in the UV light box with the inside of the funnel facing towards the bulb. Place the filter funnel base into the flask.

4. Check that a sufficient number of Petri dishes have been sterilized in an autoclave, or other steam sterilizer device. To sterilize:

   a.) Place the support stand in the bottom of the sterilizer and pour in two inches of tap water.

   b.) Wrap all the Petri dishes to be sterilized in aluminum foil in packages of 6 tops and bottoms. Place a piece of autoclave tape around it the ends and edge.

   c.) Then place as many packages as will fit into the autoclave bucket. Place the bucket in the sterilizer with the exhaust channel on the right hand side.

   d.) Make sure there is a thin layer of petroleum jelly along the beveled edge of the lid. This will help provide a tight seal on the sterilizer. The petroleum jelly should be applied every three to four times the sterilizer is used.

   e.) Place the lid on the sterilizer by feeding the steam exhaust tube into the exhaust channel of the bucket. Twist the lid so that the engraved marks on the lid and the sterilizer meet.

   f.) Tighten the lock nuts, two at a time (opposite from each other), to make a tight seal. Put the exhaust valve in open or vertical position. Turn the power switch on.

   g.) Once steam begins to escape from the exhaust valve (after about 20 minutes), it is necessary to wait five minutes to allow the "cold zones" to be flushed out of the sterilizer.

   h.) Close the exhaust valve by putting it in the horizontal position. When the pressure gauge reads 17 psi, it is sterilizing. It must sterilize at 17 psi for at least 35 minutes to sterilize the items completely.

   i.) After the time is up, turn the sterilizer off. Release the pressure by carefully opening the exhaust valve using a hot pad.

5. Disinfect the working surface with Lysol® spray disinfectant or alcohol.

6. Wash your hands.

10.3 Processing the Sample for Fecal Coliform Testing

1. Order the samples according to those which need to be processed first. Include the follwing QAQC requirements:

    a.) Two start blanks (labeled SBI and SBII respectively). Process these before any samples are started.
    b.) Two mid blanks (labeled MBI and MBII respectively). Process these about midway through the samples.
    c.) Two end blanks (labeled EBI and EBII respectively). Process these after all of the samples are completed.
    d.) One duplicate (labeled Dup with the rest of the sample identification) per every ten samples to ensure a 10% rate of duplication to demonstrate that results can be replicated.

2. Complete the “Sample Processing for Fecal Coliform” sheet by entering the following information:

    a.) Sample Processing Team
    b.) Date
    c.) Incubator Temperature
    d.) Incubator Used
    e.) Site #
    f.) Site Name
    g.) Sampler Name
    h.) Time of Sample
    i.) Type of Discharge
    j.) Dilution
    k.) Holding Time (Y if sample was processed before the holding time was over, N if not).

3. Remove the aluminum foil from the petri dishes and place each Petri dish up side down on the lab surface. It is important you not touch the inside of the Petri dish at any time.

4. Label the bottom of the Petri dishes (the smaller plate) with paper tape and a permanent marker. Identify the sample site number, date, and tide on the tape.

5. Aseptically place a sterile absorbent pad into the bottom of the Petri dish by using the sterile pad dispenser. Twist the cap off the plastic ampoule of MFC broth. Squeeze the nutrient medium onto the absorbent pad. **It is not necessary to get every drop of the medium into the dish.**

6. Sterilize a pair of forceps by dipping them into a container of alcohol while holding them open. Then place them into a flame and allow the alcohol to burn off. Do not hold them in the flame. Using the sterile forceps, place a membrane filter on the steel support of the filtration assembly. Keep the filter flat and grid side up. Discard the blue protective paper. Place the funnel cup over the filter. Place a small amount of buffer solution into the funnel and allow it to drip into the flask. Check for leaks. If there is a leak, remove the funnel and reattach.

7. Mix the bag containing the sample by inverting 20 to 30 times to mix thoroughly. Open the sample bag and pipette the desired dilution amount (See Figure 8.6-1) into a fresh bottle of buffer solution.

8. Slowly pour the diluted sample into the filter funnel. If the dilution required is 50 mL or greater, pour the sample directly into the funnel up to the appropriate volume marking on the side of the funnel. Avoid splashing and running the sample down the side of the funnel.

9. Filter the sample using a vacuum pump or hand pump. When the water is completely filtered, rinse the inside of the funnel with a new bottle of phosphate buffer solution. This ensures that all of the fecal coliform bacteria washes onto the filter.

10. Use alcohol and flame to sterilize forceps before lifting membrane from filter. After lifting the funnel, remove the membrane filter from the support with sterile forceps. Place the filter onto the absorbent pad in the Petri dish, grid side up.

The filter should be placed on the absorbent pad using a “rolling action”, touching one end first and proceeding to the other side. Be careful to avoid trapping air bubbles under the membrane.

11. Wash your hands between each sample.

12. Enclose the Petri dishes in a tightly sealed Whirl-Pac® bag that is labeled with the sample information. Place two dishes in each bag. These samples should be from different sites. If this is not possible, ensure they are from different tides or placed alone in separate bags.

13. Slide the bags into the Petri dish rack, placing the Petri dishes upside down to ensure condensation does not ruin the sample. Submerse the rack in a water incubator set at 44.5° C and let the samples incubate for 24 hours. Record the “Time In Incubator” on the data sheet.

14. After 24 hours (± two hours), record the "Time Out of Incubator" on the data sheet. Remove the dishes and count the number of colonies with a blue, metallic sheen which have grown on the filter paper. Use a dissecting microscope set at 10X, if available. This count gives an approximation of the number of fecal coliform bacteria in 100 mL of water.

15. For each sample, record the number of colonies per 100 mL sample on the data sheet. Use this formula:

$$\frac{(\#\text{ of colonies}) \text{ x } (100\text{ mL})}{\#\text{ of mL used in sample}} = \text{colonies/100 mL}$$

The generally accepted range for colonies to be counted on a membrane filter is 20 - 80 colonies. If you have more than 60 colonies on a single filter, use a smaller dilution or write TNTC (i.e., too numerous to count) on the data sheet.

There is a possibility that other colonies may be present on the filter other than the blue colonies with the metallic sheen. The other most commonly occurring colonies are yellow. Do not include them in your count on the data sheet; note them in the "Other Colonies" or "Comments" columns.

If colonies do not look rounded, the water was not completely filtered.

16. When you are finished counting the colonies, place the Petri dishes, with their contents, into a biohazard bag and sterilize for 35 minutes at 17 psi.

17. After sterilizing the Petri dishes, dispose of the pads and filters, and wash dishes in plain, hot water.

Table 10.3-1: Suggested sample volumes for membrane filter fecal coliform test

Site Number	Site Name	Tide	100 ml	10 ml	1 ml
1	Oyster River Peninsula	H	X	X	
		L	X	X	
2	Jackson Laboratory	H	X		
	(JEL)	L	X		
3	Lamprey River	H	X	X	
		L	X	X	
4	Depot Road, Sandy Point	H	X	X	
5	Portsmouth Country Club	H	X	X	
	(PCC)	L	X	X	
6	Fox Point	H	X		
		L	X		
7	Cedar Point	H	X	X	
		L	X		
9	Cochecho River	H	X	X	
		L	X	X	
10	Piscataqua River	H	X	X	
		L	X	X	
11	Coastal Marine Lab	H	X		
	(CML)	L	X		
12	Sewage Treatment Plant	H		X	X
	(NSTP)	L		X	X
13	Marina Falls Landing	H	X	X	
		L	X	X	
14	Fowler's Dock	H	X	X	
		L	X	X	
15	Patten Yacht Club	H	X		
		L	X		
16	Exeter Docks	H		X	X
		L		X	X
17	Dover Foot Bridge	H		X	X
		L		X	X
18	Maplewood Avenue	H	X	X	
		L	X	X	
19	Woodbury Avenue	H		X	X
		L		X	X
20	Junkin's Avenue	H		X	X
		L		X	X
21	Pleasant Avenue	H	X	X	
		L	X	X	
22	Little Harbor School (LHS)	H	X		

11.0 REFERENCES

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2. Anne Arundel County, 1986. **1986 Citizen Monitoring Water Quality Monitoring Manual.** Office of State Planning and Zoning, Annapolis, Maryland. Pages 3, 4, Introduction.

3. S. Meeker, A. Reid, J. Schloss, A. Hayden, 1995. **Great Bay Coast Watch, A Citizen Water Monitoring Program.** University of New Hampshire, Durham, NH. Page 20.

4. New Hampshire Office of State Planning, Linda Maxson, Jackson Estuarine Laboratory. 1989. **Great Bay National Estuarine Research Reserve Management Plan.** New Hampshire Office of State Planning, NH. Page 7.

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6. Eaton et al., editors, 1995. **Standard Methods for the Examination of Water and Wastewater. 19th Edition, 1995.** American Public Health Association” Washington, DC.

12.0 Appendixes

A Tidal and Sampling Times for 2005 Season
B 16th Sampling Season Dates To Remember
C Activities for 2005
D GBCW Cumulative Data Sheet
E Time and Mileage Record Sheet
F pH Meter Instructions
G Significant Figures and Rounding
H Things To Do and Things To Think About
I 2005 Calendar

Tidal and Sampling Times for 2005 Season

	Adjustment		26-Apr	24-May	22-Jun	6-Jul	4-Aug	20-Sep	18-Oct	3-Nov
	LOW		7:04	5:58	5:39	6:00	5:39	7:08	5:57	5:08
	HIGH		12:40	12:12	11:53	12:13	11:49	13:01	11:04	11:19
Site 1 Peninsula - Oyster River	LOW	1:50	**8:54**	**7:48**	**7:29**	**7:50**	**7:29**	**8:58**	**7:47**	**6:58**
	HIGH	1:45	**14:25**	**13:57**	**13:38**	**13:58**	**13:34**	**14:46**	**12:49**	**13:04**
Site 2 Jackson Laboratory	LOW	2:00	**9:04**	**7:58**	**7:39**	**8:00**	**7:39**	**9:08**	**7:57**	**7:08**
	HIGH	2:00	**14:40**	**14:12**	**13:53**	**14:13**	**13:49**	**15:01**	**13:04**	**13:19**
Site 3 Lamprey River	LOW	3:00	**10:04**	**8:58**	**8:39**	**9:00**	**8:39**	**10:08**	**8:57**	**8:08**
	HIGH	2:40	**15:20**	**14:52**	**14:33**	**14:53**	**14:29**	**15:41**	**13:44**	**13:59**
Site 4 Depot Road (Sandy Pt)	LOW	2:45	**9:49**	**8:43**	**8:24**	**8:45**	**8:24**	**9:53**	**8:42**	**7:53**
	HIGH	2:45	**15:25**	**14:57**	**14:38**	**14:58**	**14:34**	**15:46**	**13:49**	**14:04**
Site 5 Portsmouth Country Club	LOW	2:40	**9:44**	**8:38**	**8:19**	**8:40**	**8:19**	**9:48**	**8:37**	**7:48**
	HIGH	2:20	**15:00**	**14:32**	**14:13**	**14:33**	**14:09**	**15:21**	**13:24**	**13:39**
Site 6 Fox Point	LOW	2:00	**9:04**	**7:58**	**7:39**	**8:00**	**7:39**	**9:08**	**7:57**	**7:08**
	HIGH	2:00	**14:40**	**14:12**	**13:53**	**14:13**	**13:49**	**15:01**	**13:04**	**13:19**
Site 7 Cedar Point	LOW	1:50	**8:54**	**7:48**	**7:29**	**7:50**	**7:29**	**8:58**	**7:47**	**6:58**
	HIGH	1:55	**14:35**	**14:07**	**13:48**	**14:08**	**13:44**	**14:56**	**12:59**	**13:14**
Site 9 Cocheco River	LOW	1:20	**8:24**	**7:18**	**6:59**	**7:20**	**6:59**	**8:28**	**7:17**	**6:28**
	HIGH	1:20	**14:00**	**13:32**	**13:13**	**13:33**	**13:09**	**14:21**	**12:24**	**12:39**
Site 10 Piscataqua River	LOW	1:20	**8:24**	**7:18**	**6:59**	**7:20**	**6:59**	**8:28**	**7:17**	**6:28**
	HIGH	1:20	**14:00**	**13:32**	**13:13**	**13:33**	**13:09**	**14:21**	**12:24**	**12:39**
Site 11 Coastal Marine Lab	LOW	0:16	**7:20**	**6:14**	**5:55**	**6:16**	**5:55**	**7:24**	**6:13**	**5:24**
	HIGH	0:16	**12:56**	**12:28**	**12:09**	**12:29**	**12:05**	**13:17**	**11:20**	**11:35**

Tidal and Sampling Times for 2005 Season

		Adjustment	26-Apr	24-May	22-Jun	6-Jul	4-Aug	20-Sep	18-Oct	3-Nov
		LOW	7:04	5:58	5:39	6:00	5:39	7:08	5:57	5:08
		HIGH	12:40	12:12	11:53	12:13	11:49	13:01	11:04	11:19
Site 12	LOW	3:00	**10:04**	**8:58**	**8:39**	**9:00**	**8:39**	**10:08**	**8:57**	**8:08**
Newmarket STP	HIGH	3:00	**15:40**	**15:12**	**14:53**	**15:13**	**14:49**	**16:01**	**14:04**	**14:19**
Site 13	LOW	3:00	**10:04**	**8:58**	**8:39**	**9:00**	**8:39**	**10:08**	**8:57**	**8:08**
Marina Falls Landing	HIGH	3:00	**15:40**	**15:12**	**14:53**	**15:13**	**14:49**	**16:01**	**14:04**	**14:19**
Site 14	LOW	3:00	**10:04**	**8:58**	**8:39**	**9:00**	**8:39**	**10:08**	**8:57**	**8:08**
Fowler's Dock	HIGH	3:00	**15:40**	**15:12**	**14:53**	**15:13**	**14:49**	**16:01**	**14:04**	**14:19**
Site 15	LOW	1:00	**8:04**	**6:58**	**6:39**	**7:00**	**6:39**	**8:08**	**7:12**	**6:23**
Patten Yacht Yard, Inc.	HIGH	1:00	**13:40**	**13:12**	**12:53**	**13:13**	**12:49**	**14:01**	**12:04**	**12:19**
Site 16	LOW	2:50	**9:54**	**8:48**	**8:29**	**8:50**	**8:29**	**9:58**	**8:47**	**7:58**
Exeter Docks	HIGH	3:10	**15:50**	**15:22**	**15:03**	**15:23**	**14:59**	**16:11**	**14:14**	**14:29**
Site 17	LOW	2:50	**9:54**	**8:48**	**8:29**	**8:50**	**8:29**	**9:58**	**8:47**	**7:58**
Dover Foot Bridge	HIGH	3:10	**15:50**	**15:22**	**15:03**	**15:23**	**14:59**	**16:11**	**14:14**	**14:29**
Site 18	LOW	1:01	**8:05**	**6:59**	**6:40**	**7:01**	**6:40**	**8:09**	**6:58**	**6:09**
Maplewood Ave	HIGH	1:01	**13:41**	**13:13**	**12:54**	**13:14**	**12:50**	**14:02**	**12:05**	**12:20**
Site 19	LOW	0:41	**7:45**	**6:39**	**6:20**	**6:41**	**6:20**	**7:49**	**6:38**	**5:49**
Bartlett St.	HIGH	0:41	**13:21**	**12:53**	**12:34**	**12:54**	**12:30**	**13:42**	**11:45**	**12:00**
Site 20	LOW	0:41	**7:45**	**6:39**	**6:20**	**6:41**	**6:20**	**7:49**	**6:38**	**5:49**
Jenkins Ave.	HIGH	0:41	**13:21**	**12:53**	**12:34**	**12:54**	**12:30**	**13:42**	**11:45**	**12:00**
Site 21	LOW	0:41	**7:45**	**6:39**	**6:20**	**6:41**	**6:20**	**7:49**	**6:38**	**5:49**
Pleasant St.	HIGH	0:41	**13:21**	**12:53**	**12:34**	**12:54**	**12:30**	**13:42**	**11:45**	**12:00**
Site 22	LOW	0:41	**7:45**	**6:39**	**6:20**	**6:41**	**6:20**	**7:49**	**6:38**	**5:49**
Little Harbor School	HIGH	0:41	**13:21**	**12:53**	**12:34**	**12:54**	**12:30**	**13:42**	**11:45**	**12:00**

16th Sampling Season for Great Bay Coast Watch

Contacts:
Kingman Farm
(603) 749-1565
Fax (603) 743-3997
Ann S. Reid
(603) 749-3880 (H)
Mark Wiley
(603) 749-7516 (H)

Address:
GBCW
UNH/Kingman Farm House
Durham, NH 03824
e-mail
gbcw@ceunh.unh.edu
web-site
www.gbcw.unh.edu

Dates to Remember

January			
17	M	All Day	Portsmouth Middle School Volunteer Day (United Way VAC)
February			
9	W	7:30-8:30	GBCW at Kiwanis Club, Portsmouth Community Campus
22	T	1:00-4:00 PM	Secchi Disk Rehab, Kingman Farm
March			
2	W	9:00-12:00	Equipment Calibration, Kingman Farm
3	Th	1:00-4:00	Equipment Calibration, Kingman Farm
4	F	9:00-12:00	Equipment Calibration, Kingman Farm
10	Th	7:00-9:00 PM	GBCW Annual Meeting, NH Fish and Game
15	T	6:00-8:00 PM	Water Quality Training and Refresher Course
17	Th	6:00-8:00 PM	Phytoplankton Training and Refresher Course
21	M	2:30-4:30 PM	Student Training at Oyster River High School (for all schools, RSVP by 4/18/05)
23	W	6:00-8:00 PM	Water Quality Training and Refresher Course
April			
5	T	12:00-4:00 PM	QAQC Session (for QAQC Team Only)
6	W	12:00-6:00 PM	QAQC Session (sign up for a 1.5 hr session)
7	Th	10:00-4:00 PM	QAQC Session (sign up for a 1.5 hr session)
10-13	Su-W	All Day	Soundings Institute Presentation (Nova Scotia)
26	T	All Day	Sampling Day
27	W	5:30-10:00 PM	Bacteria Plate Counts, **Time &Mileage Due***
May			
11	W	7:00-8:30 PM	Sampling Question &Answer Session
24	T	All Day	Sampling Day
25	W	5:30-9:30 PM	Bacteria Plate Counts, **Time &Mileage Due***
June			
4		All Day	Exeter Alewife Festival
22	W	All Day	Sampling Day
23	Th	5:00-9:00 PM	Bacteria Plate Counts, **Time &Mileage Due***

"TBA" indicates "To Be Announced." All dates and times are subject to change.
Please read your Docent Doings and contact the GBCW Office for confirmation of all scheduled events.
Email is preferred at ann.reid@unh.edu, Candace.dolan@unh.edu, or Karen.diamond@unh.edu.

July			
6	W	All Day	Sampling Day, Great North American Secchi Dip-In
7	Th	5:30-9:30 PM	Bacteria Plate Counts, **Time & Mileage Due***
11-18	M-M	All Day	National Marine Educator's Association (NMEA) Conference, Maui Hawaii
27	W	5:30-8:30 PM	Annual BBQ – GBCW, & Great Bay, US Coast Guard Station, New Castle
August			
4	Th	All Day	Sampling Day
5	F	5:00-9:00 PM	Bacteria Plate Counts, **Time & Mileage Due***
12-22	F-M	All Day	Karen Away – Office Support Needed
24-26	W-F	All Day	Equipment Calibration
30	T	12:00-4:00 PM	QAQC Session (for QAQC Team Only)
31	W	12:00-6:00 PM	QAQC Session (sign up for a 1.5 hr session)
September			
1	Th	10:00-4:00 PM	QAQC Session (sign up for a 1.5 hr session)
17	Sat	All Day	International Coastal Cleanup Day, at Sampling Sites
20	T	All Day	Sampling Day
21	W	6:00-10:00 PM	Bacteria Plate Counts, **Time & Mileage Due***
TBA	Sun	All Day	Duckers Day
TBA	Sat	All Day	Newmarket Heritage Festival, Main Street
TBA	TBA	All Day	United Way Day of Caring
October			
1	Sat	All Day	Dover Apple Harvest Festival, Central Ave.
18	T	All Day	Sampling Day, World Wide Monitoring Day
19	W	5:00-9:00 PM	Bacteria Plate Counts, **Time & Mileage Due***
November			
3	Th	All Day	Sampling Day
4	F	5:00-9:00 PM	Bacteria Plate Counts, **Time & Mileage Due***
7-9	M-W	All Day	Kit Return, Kingman Farm
10	Th	1:00-4:00	Kit Inventory, Kingman Farm
14	M	All Day	Kit Inventory, Kingman Farm
16	W	6:00-9:00 PM	Annual "Chili & Chowdah Fest"
30	T	12:00 PM	**All Time & Mileage Due***
12	Sat	All Day	NHDES Rivers Conference, Concord
December			
TBA	TBA	11:00-3:00PM	Holiday Lunch

"TBA" indicates "To Be Announced." All dates and times are subject to change.
Please read your Docent Doings and contact the GBCW Office for confirmation of all scheduled events.
Email is preferred at ann.reid@unh.edu, Candace.dolan@unh.edu, or Karen.diamond@unh.edu.

GREAT BAY COAST WATCH ACTIVITIES 2005

	ACTIVITIES AND PROJECTS	BEGINNING & END DATE	LOCATION	HOW MANY PEOPLE NEEDED	TASK & TIME	SPONSOR $
1.	WATER QUALITY SAMPLING	APR – NOV	21 Sites Great Bay Estuary See map in manual	2 People per Site MINIMUM	Monthly Low & High Tides	NHEP NHCP UNH Coop Ext. (Potentially NH Conservation Committee)
2.	PHYTOPLANKTON MONITORING	MAR – OCT	5 Sites NH Coast & 1 Site Star Island	2 People per Site MINIMUM	Weekly @ High Tide Day Varies per Site	NHCP NHEP
3.	TRANSPORTATION OF SAMPLES	FEB – DEC	Transport From Coast, Kingman Farm or Pease to Concord	34 People to Rotate Duties	Varies	NHEP Shellfish Program
4.	MUSSEL GATHERING & DELIVERY TO STAR ISLAND AND RETRIEVAL	MAY – OCT	Transport to & from Hampton, Portsmouth, Star Island or Concord	6 People to Rotate Duties	Weekly	
5.	AMBIENT SAMPLING	FEB – DEC	Great Bay, Atlantic Coast, Little Harbor & Hampton Harbor	1-2 to Sample and/or Transport	Scheduled Weekly	
6.	SPECIAL EVENTS DISPLAY PRESENTATIONS	ONGOING	See “Dates to Remember”	2-3	2-3 hours per Person	UNH Coop Ext NHSG
7.	COMMITTEES	2 x YEAR 4x YEAR MONTHLY ONGOING	Kingman Farm (usually)	6-12 People per Committee	Advisory Tech.Advisory Area Leaders Development	UNH Coop Ext NHSG
8.	CLERICAL	ONGOING	Kingman Farm or Home	4 People	Assist with Office & Data Entry, Scheduled Monthly,Varies	UNH Coop Ext

UNH Coop Ext = UNH Cooperative Extension
NHEP = New Hampshire Estuaries Project
NHSG = New Hampshire Sea Grant
NHDES = Department of Environmental Services
NHCP = New Hampshire Coastal Program
NH Conservation Committee funding will be through the NH State Moose Plate Grant pending its acceptance.

GREAT BAY COAST WATCH CUMULATIVE DATA SHEET FOR 2005

Site Name:____ **Site Number:**____________

Sample Date	**Tide**	4/26	5/24	6/22	7/06	8/04	9/20	10/18	11/03
Air Temperature (°C)	**Low**								
	High								
Water Temperature (°C)	**Low**								
	High								
Water Transparency (cm)	**Low**								
	High								
Water Depth (cm)	**Low**								
	High								
pH	**Low**								
	High								
Salinity (ppt)	**Low**								
	High								
Dissolved Oxygen (mg/l)	**Low**								
	High								
Percent Saturation	**Low**								
	High								
Samplers Names	**Low**								
	High								
Fecal Coliform	**Low**								
	High								
Water	**Low**								
	High								
Weather	**Low**								
	High								
Activities	**Low**								
	High								

Additional Observation Narrative by Date	
4/26/05	
5/24/05	
6/22/05	
7/06/05	
8/04/05	
9/20/05	
10/18/05	
11/03/05	

Time and Mileage Sheet

Name______________________________

Phone ______________________________

Email ______________________________

Site ______________________________

Date	Task	Time	Hours or Minutes	Mileage	Office Use Only
Example: 3/10/05	Annual Meeting	3.5	[✓ H] M	10	
			H M		
			H M		
			H M		
			H M		
			H M		
			H M		
			H M		
			H M		
			H M		
			H M		
			H M		
			H M		
			H M		
			H M		
			H M		

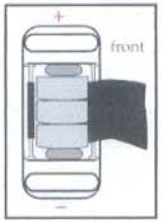
I certify that I have reviewed the data entry on this form and that it is accurate and complete.

Signature____________________________________

Open this booklet for calibration / testing / maintenance instructions.

Changing Batteries:

1. Flip up battery compartment lid.
2. Remove old batteries; replace with fresh ones. Note polarity (shown in battery compartment and in picture at right).



3. Recalibrate Testr after battery change.

Error Messages:

ER1 Weak batteries—replace

ER2 Wrong or bad buffer value, or electrode is failing.

OR Over range signal, or electrode is not in contact with solution, or electrode is failing.

Warranty:

The pHTestr 2 is warranted against defects in materials and workmanship for a period of 6 months from the date of purchase. If repair, adjustment or replacement is necessary and has not been the result of abuse or misuse within the 6 month period, please return the Testr—freight prepaid—and correction will be made without charge. Out of warranty products will be repaired on a charge basis.

Return of Items:

Authorization must be obtained from your OAKTON Distributor before returning items for any reason. When applying for authorization, please include information regarding the reason the item(s) are to be returned.

Note: We reserve the right to make improvements in design, construction and appearance of products without notice. Prices are subject to change without notice.

68X247726 4/00 Rev 0

pHTestr 2

OAKTON®
INSTRUMENTS

Setting the Standard, again and again™

ISO 9001 CERTIFIED

Microprocessor based, economical

pHTestr

with ATC

CE

35624-20

pH Testr 2 Instructions

Before you Begin:

If necessary, remove plastic strips between batteries and contacts.

Remove electrode cap. To condition electrode, immerse electrode in electrode storage solution, buffer or tap water for at least 30 minutes before use. DO NOT use de-ionized water.

Calibration:

Calibration should be done regularly, typically every day that the Testr is used. You can calibrate at up to three points (pH 4, 7, and 10).

1. Switch unit on (ON/OFF button).
2. Dip electrode into chosen buffer (pH 4, 7, or 10). **DO NOT immerse above color band!**
3. Press CAL button to enter Calibrate mode. 'CA' flashes on the display. Then, a pH value close to the buffer value will flash.
4. After at least 30 seconds (about 30 flashes) **press the HOLD/CON button** to confirm calibration. The display will show 'CO' and then switch to the buffer value reading.
5. Repeat with other buffers if necessary. Rinse electrode in tap water before dipping into next buffer.

Calibration Troubleshooting:

Failure to press HOLD/CON to confirm calibration (step 4 above). Pressing the CAL button will resume measuring mode but will not enter the calibration value.

Insufficient sampling time. The testr needs at least 30 seconds sampling time to reach a stable calibration point. Wait at least 30 seconds before pressing HOLD/CON.

Failure to re-hydrate the electrode. A dry electrode will give fluctuating readings, causing errors.

pH Testing:

1. Remove cap from electrode. Switch unit on (ON/OFF button).
2. Dip the electrode into the test solution. Stir once and let the reading stabilize.

Caution: Never immerse the electrode above color band! This will damage instrument electronics!

3. Note the pH or press HOLD/CON button to freeze the reading. Press HOLD/CON again to release the reading.
4. Press ON/OFF to turn off Testr. If you do not press a button for 8.5 minutes the Testr will automatically shut off to conserve batteries.

Instrument Maintenance:

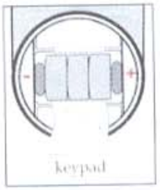
- Rinse the electrode with tap water or electrode storage solution after each measurement.
- In aggressive chemicals, dirty or viscous solutions, and solutions with heavy metals or proteins, take readings quickly and rinse electrode immediately afterward.
- Periodic soaks in warm pH 4 buffer will help remove contaminants.
- If possible, keep a small piece of paper or sponge in the electrode cap—moistened with clean water or electrode storage solution (NOT de-ionized water)—and close the cap over the electrode.

NOTE: Testr life is dependent on meter and electrode care. If the electrode is exposed to materials that contaminate the reference junction, testr life will be shortened.

Open this booklet for calibration / testing / maintenance instructions.

Changing Batteries:

1. Open battery compartment lid (with attached lanyard loop).
2. Remove old batteries; replace with fresh ones. Note polarity (shown in battery compartment and in picture at right).



3. Recalibrate Testr after battery change.

Error Messages:

ER1 Weak batteries—replace

ER2 Wrong or bad buffer value, or electrode is failing.

OR Over range signal, or electrode is not in contact with solution, or electrode is failing.

Warranty:

The waterproof pHTestr 2 meter body is warranted against defects in materials and workmanship for a period of 12 months from the date of purchase; the electrode module is warrantied for a period of 6 months from the date of purchase. If repair, adjustment or replacement is necessary and has not been the result of abuse or misuse within the time period, please return the Testr—freight pre-paid—and correction will be made without charge. Out of warranty products will be repaired on a charge basis.

Return of Items:

Authorization must be obtained from your OAKTON Distributor before returning items for any reason. When applying for authorization, please include information regarding the reason the item(s) are to be returned.

Note: We reserve the right to make improvements in design, construction and appearance of products without notice. Prices are subject to change without notice.

68X247741 1/02 Rev 1

Waterproof pHTestr 2

OAKTON®
INSTRUMENTS
Setting the Standard, again and again™

CE
ISO 9001 CERTIFIED

Microprocessor based
pHTestr
with ATC
that floats!

35624-22

WP pH Testr 2 Instructions

Before you Begin:

Remove electrode cap. To condition electrode, immerse electrode in electrode storage solution, buffer or tap water for at least 30 minutes. DO NOT use de-ionized water.

Calibration:

Calibration should be done regularly, typically every day that the Testr is used. You can calibrate at up to three points (pH 4, 7, and 10).

1. Press ON/OFF button to switch unit on.
2. Dip electrode 1/2 to 1" into chosen buffer (pH 4, 7, or 10).
3. Press CAL button to enter Calibrate (CA) mode. 'CA' flashes on the display. Then, a pH value close to the pH buffer value will flash repeatedly.
4. After at least 30 seconds (about 30 flashes) **press the HOLD/CON button** to confirm calibration. The display will show 'CO' and then switch to the buffer value reading.
5. Repeat with other buffers if necessary. Rinse electrode in tap water before dipping into next buffer.

Calibration Troubleshooting:

Failure to press HOLD/CON to confirm calibration (step 4 above). Pressing the CAL button will resume measuring mode but will not enter the calibration value.

Insufficient sampling time. If the Testr does not have a long enough exposure to the buffer, a stable calibration point will not be reached. Wait at least 30 seconds before pressing HOLD/CON.

Failure to re-hydrate the electrode. A dry electrode will give fluctuating readings while it re-hydrates in a buffer, causing errors.

pH Testing:

1. Remove cap from the electrode and press the ON/OFF button to switch Testr on.
2. Dip the electrode 1/2 to 1" into the test solution. Stir once and let the reading stabilize.
3. Note the pH or press HOLD/CON button to freeze the reading. Press HOLD/CON again to release the reading.
4. Press ON/OFF to turn off Testr. If you do not press a button for 8.5 minutes the Testr will automatically shut off to conserve batteries.

Instrument Maintenance:

- Rinse the electrode with tap water or electrode storage solution after each measurement.
- In aggressive chemicals, dirty or viscous solutions, and solutions with heavy metals or proteins, take readings quickly and rinse electrode immediately afterward.
- Periodic soaks in warm pH 4 buffer will help remove contaminants.
- If possible, keep a small piece of paper or sponge in the electrode cap—moistened with clean water or electrode storage solution (NOT de-ionized water)—and close the cap over the electrode.

NOTE: Testr life is dependent on meter and electrode care. If the electrode is exposed to materials that contaminate the reference junction, electrode life will be shortened.

When you need a new electrode, see "**Electrode Replacement**" on insert in back of box.

G Significant Figures and Rounding

1. Significant Figures
In the near future, GBCW will be offering an on-line data entry form. For volunteers to use this form, it is important for everyone to understand how to use “significant digits” and round averaged values properly.

In science, significant digits are used to represent values that are known without doubt, except for the last digit, which may be in doubt. For example, when you read the water thermometer, there are lines at each half a degree. When you record your result of 4.5°C, there are two significant digits. The first (4) is certain, the second (5) is in doubt because it could be 4 or 6, you can’t see closer than a half degree. When you read the salinity chart, the density has five significant figures, and the salinity has three significant figures, unless it equals less than ten, when it has two significant figures.

For the tests that GBCW uses, this results in the same number of decimal places being needed for each result. The table below provides the number of decimal places required for each of our parameters.

Test	Decimal Places		Examples		Incorrect Number of Digits	
					Too Few	**Too Many**
Air Temp.	**Zero**	1°C	3	21		18.5
Water Temp.	**One**	1.0°C	14.5	10.0	7	12.05
Secchi Disk	**Zero**	1 cm	130 Disappearing + 125 Reappearing = 255 255 ÷ 2 = 127.5 Average Final Result = 128 cm		127.5	355.65
pH	**One**	1.0 Units	6.8	7.0	5	6.95
Salinity	**One**	1.0	2.0	15.3	8	6.16
DO	**One**	1.0	3.5 + 3.3 = 6.8	7.6 + 7.7 = 15.3	12	9.55

2. Rounding
When two values are averaged, such as when averaging two salinities, sometimes an extra digit can be calculated. In this case, the extra digit is not used, but rounded to the nearest number. If the digit that is dropped equals 6,7,8 or 9, the preceding digit is **increased** by one unit. If it equals 0, 1, 2, 3, or 4, the preceding digit **stays the same**. If it equals 5, round to the nearest **even number**.

Calculating Salininty can seam complicated. However, when you follow the steps, the process becomes clear. The examples below show all the calculations you may need to use.

Salinity	**Example 1**	**Example 2**	**Example 3**
Water Temp.	10.0 °C	11.5 °C	14.5 °C
Density Reading	1.0020	1.0130	1.0075
Look up	1.0020 at 10.0°C = 1.8	1.0130 at 11.0°C = 16.0 1.0130 at 12.0°C = 16.2	1.0070 at 14.0°C = 8.8 1.0070 at 15.0°C = 8.9 1.0080 at 14.0°C = 9.4 1.0080 at 15.0°C = 9.6
Calculate		(16.0 + 16.2) ÷ 2 = 16.1	(8.8 + 8.9 + 9.4 + 9.6) ÷ 4 = 9.175
Round	1.8	16.1	9.2

THINGS TO DO

The Night Before
- Wet the pH meter probe and calibrate it.
- Put cool packs in the freezer.
- Fill container with fresh tap water to bring with you.

Bring the Kit and Instruction Manual
- Refer to your manual if you have any doubts. (This is a tip sheet only.)

Fill Out Field Data Sheet Heading Completely

Put Air Thermometer In Place
- Use a shaded place.

Collect Fecal Coliform Sample
- Write all of the information on the bag before dipping it in the water.

Secchi Disk Readings
- Record the Transparency first, then the Depth.

Take Water Sample with Bucket
- Rinse three times, then fill.

Water Temperature Reading
- Immerse thermometer immediately after filling bucket.
- Read after 3 minutes to the nearest ½ degree.
- Read the thermometer while it is in the water, and not at an angle to your eye.

DO Sample
- Place the end of the tube to the bottom of the BOD bottle when filling.
- Allow BOD to over flow for three times the number of seconds it takes to fill it.
- Remove the tube before stopping the flow.
- Add Pillow 1 then 2, agitate and check for bubbles. (Start over if there are bubbles.)

pH Sample
- After properly rinsing in solutions, place pH probe in "Sample Test" water, and allow it to rest for a few minutes.
- Keep the water line below the O-ring.
- Record pH to one decimal place.

Salinity Sample
- Read the hydrometer in the center of the water column and at the bottom of the meniscus.
- Mark the field data density chart on the line you see the meniscus at.
- Record the density result, found next to the marked line on the field data sheet density chart.
- Record temperature to the nearest ½ degree and salinity to one decimal place.

Air Temperature
- Record the temperature after 3-5 minutes to the nearest whole degree.

DO Processing
- Add Pillow 3, and make sure grains are dissolved.
- Measure out the volume and pour into the beaker.
- Add some Sodium Thiosulfate.
- Add some Starch.
- Titrate until solution is clear.
- Record DO to one decimal place.
- Repeat from "Measuring" step.

Complete Data Sheet
- Record your time and mileage.
- Sign and date the back of the field data sheet.

Wash Everything
- Use fresh tap water and pour it into the waste container.
- Dispose of the waste in a properly treated waste disposal system (sewer system).

Deliver Fecal Coliform Sample to Kingman Farm Before 6:00 PM

THINGS TO THINK ABOUT

The Night Before

- Check the pH meter batteries.

pH Sample

- Did it calibrate? “E1” indicates low batteries, “E2” indicates a bad probe.
- Were the containers rinsed before they were filled?
- Did you throw out the rinse buffer after sampling is completed, and then clean and dry the bottles?
- After testing is done, did you follow directions for refilling the “test buffer” bottle?
- Did you dry the pH meter?

Salinity Sample

- Did you fill below the lip on the hydrometer jar?
- Did you wait three minutes to read the thermometer?
- Did you remove the thermometer before trying to read the hydrometer?
- Did you read from the bottom of the meniscus in reading the hydrometer?
- Did you use chart on the field data sheet to mark the water line?
- Did you use the temp chart and salinity conversion charts correctly?

DO Processing

- Did you pour down the side of the cylinder rather than dumping water in?
- Did you fill burette to zero and clear the bubbles?
- Did you add titrant carefully and stir?
- Did you add starch?
- Is the color completely clear?
- Did you do the test twice and add the results?

Complete Data Sheet

- Did you fill in the Time and Mileage box for each person?
- Did you include travel time for each person?
- Did a QAQC Certified person sign and date the back of the Data Sheet?

Deliver Fecal Coliform Sample

- Was the sample stored at 4° Celsius?
- Was the Data Sheet signed?

In case of an accident or suspected poisoning, immediately call **1-800-562-8236**, the Poison Control Center in New Hampshire. If a reagent gets into your eyes or on your skin, irrigate the area immediately with fresh water. We have the details on the reagents we are using. See Appendix F, Material Safety Data Sheets.

Also notify the Kingman Farm GBCW office at **(603)749-1565** during office hours. During non-office hours, notify Ann Reid at **(603) 749-3880**, or
Mark Wiley at home **(603) 749-7516**, or mobile phone **(603) 978-9950**.

I 2005 Calendar

I 2005 Calendar 2

I 2005 Calendar 3

I 2005 Calendar 4

I 2005 Calendar 5

Material Safety Data Sheet

Section 1. Product and Company Identification

Product Name Buffer pH 4.0, Red

Product Code 34170−127

Manufacturer EMD Chemicals Inc.
P.O. Box 70
480 Democrat Road
Gibbstown, NJ 08027
Prior to January 1, 2003 EMD Chemicals Inc. was EM Industries, Inc. or EM Science, Division of EM Industries, Inc.

Effective Date **3/4/2003**

For More Information Call
856−423−6300 Technical Service
Monday−Friday: 8:00 AM − 5:00 PM

In Case of Emergency Call
800−424−9300 CHEMTREC (USA)
613−996−6666 CANUTEC (Canada)
24 Hours/Day: 7 Days/Week

Synonym None.

Material Uses Laboratory Reagent

Chemical Family Solution.

+ Section 2. Composition and Information on Ingredients

Component	CAS #	% by Weight
Potassium Hydrogen Phthalate	877−24−7	0−1
AMARANTH	915−67−3	0−1
WATER	7732−18−5	98−99
Dowacide A	132−27−4	0.05

+ Section 3. Hazards Identification

Physical State and Appearance Liquid.

Emergency Overview
CAUTION !
MAY BE HARMFUL IF INHALED OR SWALLOWED.
MAY CAUSE EYE AND SKIN IRRITATION.
WARNING: This product contains a chemical(s) known to the State of California to cause cancer.

Routes of Entry Ingestion.

Potential Acute Health Effects

Eyes May be hazardous in case of eye contact (irritant).

Skin May be hazardous in case of skin contact (irritant). Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Inhalation May be hazardous in case of inhalation.

Ingestion May be hazardous in case of ingestion.

Potential Chronic Health Effects

Carcinogenic Effects This material is not known to cause cancer in animals or humans.

Additional information See Toxicological Information (section 11)

Medical Conditions Aggravated by Overexposure:	Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4. First Aid Measures

Eye Contact	Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.
Skin Contact	In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.
Inhalation	If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion	Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Section 5. Fire Fighting Measures

Flammability of the Product	Non−flammable.
Auto−ignition Temperature	Not applicable.
Flash Points	Not applicable.
Flammable Limits	Not applicable.
Products of Combustion	Not applicable.
Fire Hazards in Presence of Various Substances	Not applicable.
Explosion Hazards in Presence of Various Substances	**Risks of explosion of the product in presence of static discharge:** No. **Risks of explosion of the product in presence of mechanical impact:** No.
Fire Fighting Media and Instructions	Not applicable.
Protective Clothing (Fire)	Not applicable.
Special Remarks on Fire Hazards	Not available.
Special Remarks on Explosion Hazards	Not available.

Section 6. Accidental Release Measures

Small Spill and Leak	Absorb with an inert material and put the spilled material in an appropriate waste disposal. If necessary: **Neutralize the residue with a dilute solution of sodium carbonate.**
Large Spill and Leak	Absorb with an inert material and put the spilled material in an appropriate waste disposal. **Neutralize the residue with a dilute solution of sodium**

carbonate.

Spill Kit Information	No specific spill kit required for this product.

Section 7. Handling and Storage

Handling	Avoid contact with eyes, skin and clothing. Do not ingest. Avoid breathing vapors or spray mists. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling.
Storage	Keep container tightly closed. Keep container in a cool, well−ventilated area.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective occupational exposure limits. Ensure that eyewash stations and safety showers are proximal to the work−station location.
Personal Protection	
Eyes	Splash goggles.
Body	Lab coat.
Respiratory	Vapor respirator. Be sure to use an approved/certified respirator or equivalent.
Hands	Gloves.
Feet	Not applicable.
Protective Clothing (Pictograms)	
Personal Protection in Case of a Large Spill	Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self−contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Product Name	**Exposure Limits**
Potassium Hydrogen Phthalate	Not available.
AMARANTH	Not available.
WATER	Not available.
Dowacide A	Not available.

Section 9. Physical and Chemical Properties

Odor	Odorless.
Color	Clear. Red.
Physical State and Appearance	Liquid.
Molecular Weight	Not applicable.
Molecular Formula	Not applicable.
pH	4 [Acidic.]
Boiling/Condensation Point	The lowest known value is 99.9°C (211.8°F) (Water).
Melting/Freezing Point	May start to solidify at −0.1°C (31.8°F) based on data for: Water.
Specific Gravity	Not available.
Vapor Pressure	Not available.
Vapor Density	Not available.

Odor Threshold	Not available.
Evaporation Rate	0.36 (Water) compared to (n−BUTYL ACETATE=1)
LogKow	Not available.
Solubility	Very slightly soluble in water.

Section 10. Stability and Reactivity

Stability and Reactivity	The product is stable.
Conditions of Instability	Not available.
Incompatibility with Various Substances	Not available.
Rem/Incompatibility	Not available.
Hazardous Decomposition Products	COx
Hazardous Polymerization	Will not occur.

+ Section 11. Toxicological Information

RTECS Number:

Potassium Hydrogen Phthalate	CZ4326000
Amaranth	QJ6550000
Water	ZC0110000
Dowicide A	DV7700000

Toxicity	LD50: Not available. LC50: Not available.
Chronic Effects on Humans	Not available.
Acute Effects on Humans	May be hazardous in case of eye contact (irritant). May be hazardous in case of skin contact (irritant). Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering. May be hazardous in case of inhalation.
Synergetic Products (Toxicologically)	Not available.
Irritancy	Draize Test: Not available.
Sensitization	Not available.
Carcinogenic Effects	This material is not known to cause cancer in animals or humans.
Toxicity to Reproductive System	Not available.
Teratogenic Effects	Not available.
Mutagenic Effects	Not available.

Section 12. Ecological Information

Ecotoxicity	Not available.
BOD5 and COD	Not available.
Toxicity of the Products of	The products of degradation are less toxic than the product itself.

Biodegradation

Section 13. Disposal Considerations

EPA Waste Number	Not available.
Treatment	Material does not have an EPA Waste number and is not a listed waste, however consultation with a permitted waste disposal site (TSD) should be accomplished. ALWAYS CONTACT A PERMITTED WASTE DISPOSER (TSD) TO ASSURE COMPLIANCE WITH ALL CURRENT LOCAL, STATE AND FEDERAL REGULATIONS.

Section 14. Transport Information

DOT Classification	Not available.
TDG Classification	Not available.
IMO/IMDG Classification	Not available.
ICAO/IATA Classification	Not available.

Section 15. Regulatory Information

U.S. Federal Regulations	TSCA 8(b) inventory: Potassium Hydrogen Phthalate; AMARANTH; Water; Dowacide A SARA 302/304/311/312 extremely hazardous substances: No products were found. SARA 302/304 emergency planning and notification: No products were found. SARA 302/304/311/312 hazardous chemicals: AMARANTH; Dowacide A SARA 311/312 MSDS distribution − chemical inventory − hazard identification: AMARANTH: Delayed (Chronic) Health Hazard; Dowacide A: Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard Clean Water Act (CWA) 307: No products were found. Clean Water Act (CWA) 311: No products were found. Clean air act (CAA) 112 accidental release prevention: No products were found. Clean air act (CAA) 112 regulated flammable substances: No products were found. Clean air act (CAA) 112 regulated toxic substances: No products were found.
WHMIS (Canada)	Not controlled under WHMIS (Canada). CEPA DSL: Potassium Hydrogen Phthalate; AMARANTH; Water; Dowacide A This product has been classiifed in accordance with the hazard criteria of the Controlled Product Regulations and the MSDS contains all required information.
International Regulations	
EINECS	Potassium Hydrogen Phthalate 212−889−4 AMARANTH 213−022−2 Water 231−791−2

Dowacide A 205−055−6

DSCL (EEC) This product is not classified according to the EU regulations.

International Lists Australia (NICNAS): Potassium Hydrogen Phthalate; AMARANTH; Water; Dowacide A

Japan (MITI): Potassium Hydrogen Phthalate; AMARANTH; Water; Dowacide A

Japan (MOL): Dowacide A

Korea (TCCL): Potassium Hydrogen Phthalate; Water; Dowacide A

Philippines (RA6969): Potassium Hydrogen Phthalate; AMARANTH; Water; Dowacide A

China: No products were found.

State Regulations Massachusetts RTK: Dowacide A

New Jersey: Buffer pH 4.0, Red

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: AMARANTH; Dowacide A

California prop. 65 (no significant risk level): AMARANTH; Dowacide A

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: AMARANTH; Dowacide A

Section 16. Other Information

National Fire Protection Association (U.S.A.)

0 **Fire Hazard**

20

Health

Reactivity

Specific Hazard

Changed Since Last Revision +

Notice to Reader

The statements contained herein are based upon technical data that EMD Chemicals Inc. believes to be reliable, are offered for information purposes only and as a guide to the appropriate precautionary and emergency handling of the material by a properly trained person having the necessary technical skills. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use, storage and disposal of these materials and the safety and health of employees and customers and the protection of the environment. EMD CHEMICALS INC. MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE, WITH RESPECT TO THE INFORMATION HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS.

Material Safety Data Sheet

Section 1. Product and Company Identification

Product Name Buffer pH 7.0, Yellow

Product Code 34170−130

Manufacturer
EMD Chemicals Inc.
P.O. Box 70
480 Democrat Road
Gibbstown, NJ 08027
Prior to January 1, 2003 EMD Chemicals Inc. was EM Industries, Inc. or EM Science, Division of EM Industries, Inc.

Effective Date **3/4/2003**

For More Information Call
856−423−6300 Technical Service
Monday−Friday: 8:00 AM − 5:00 PM

In Case of Emergency Call
800−424−9300 CHEMTREC (USA)
613−996−6666 CANUTEC (Canada)
24 Hours/Day: 7 Days/Week

Synonym	None.
Material Uses	Laboratory Reagent
Chemical Family	Solution.

Section 2. Composition and Information on Ingredients

Component	**CAS #**	**% by Weight**
SODIUM PHOSPHATE, DIBASIC, ANHYDROUS	7558−79−4	0−1
Potassium Phosphate, Monobasic	7778−77−0	0−1
Tartrazine	1934−21−0	0−1
WATER	7732−18−5	97−99
Dowacide A	132−27−4	0.05

Section 3. Hazards Identification

Physical State and Appearance Liquid.

Emergency Overview
CAUTION !
MAY BE HARMFUL IF INHALED OR SWALLOWED.
MAY CAUSE EYE AND SKIN IRRITATION.
WARNING: This product contains a chemical(s) known to the State of California to cause cancer.

Routes of Entry Eye contact. Inhalation. Ingestion.

Potential Acute Health Effects

Eyes May be hazardous in case of eye contact (irritant).

Skin May be hazardous in case of skin contact (irritant). Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Inhalation May be hazardous in case of inhalation.

Ingestion May be hazardous in case of ingestion.

Potential Chronic Health Effects

Carcinogenic Effects This material is not known to cause cancer in animals or humans.

	Additional information See Toxicological Information (section 11)
Medical Conditions Aggravated by Overexposure:	Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4. First Aid Measures

Eye Contact	Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.
Skin Contact	In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.
Inhalation	If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion	Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

+ Section 5. Fire Fighting Measures

Flammability of the Product	Non−flammable.
Auto−ignition Temperature	Not applicable.
Flash Points	Not applicable.
Flammable Limits	Not applicable.
Products of Combustion	Not applicable.
Fire Hazards in Presence of Various Substances	Not applicable.
Explosion Hazards in Presence of Various Substances	**Risks of explosion of the product in presence of static discharge:** No. **Risks of explosion of the product in presence of mechanical impact:** No.
Fire Fighting Media and Instructions	Not applicable.
Protective Clothing (Fire)	Not applicable.
Special Remarks on Fire Hazards	Not available.
Special Remarks on Explosion Hazards	Not available.

Section 6. Accidental Release Measures

Small Spill and Leak	Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.
Large Spill and Leak	Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Spill Kit Information	No specific spill kit required for this product.

Section 7. Handling and Storage

Handling	Avoid contact with eyes, skin and clothing. Do not ingest. Avoid breathing vapors or spray mists. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling.
Storage	Keep container tightly closed. Keep container in a cool, well−ventilated area.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective occupational exposure limits. Ensure that eyewash stations and safety showers are proximal to the work−station location.
Personal Protection	
Eyes	Splash goggles.
Body	Lab coat.
Respiratory	Vapor respirator. Be sure to use an approved/certified respirator or equivalent.
Hands	Gloves.
Feet	Not applicable.
Protective Clothing (Pictograms)	
Personal Protection in Case of a Large Spill	Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self−contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Product Name	**Exposure Limits**
SODIUM PHOSPHATE, DIBASIC, ANHYDROUS	Not available.
Potassium Phosphate, Monobasic	Not available.
Tartrazine	Not available.
WATER	Not available.
Dowacide A	Not available.

Section 9. Physical and Chemical Properties

Odor	Odorless.
Color	Clear. Yellow.
Physical State and Appearance	Liquid.
Molecular Weight	Not applicable.
Molecular Formula	Not applicable.
pH	7 [Neutral.]
Boiling/Condensation Point	The lowest known value is 99.9°C (211.8°F) (Water).
Melting/Freezing Point	May start to solidify at −0.1°C (31.8°F) based on data for: Water.
Specific Gravity	Not available.
Vapor Pressure	Not available.

Vapor Density	Not available.
Odor Threshold	Not available.
Evaporation Rate	0.36 (Water) compared to (n−BUTYL ACETATE=1)
LogKow	Not available.
Solubility	Soluble in water.

Section 10. Stability and Reactivity

Stability and Reactivity	The product is stable.
Conditions of Instability	Not available.
Incompatibility with Various Substances	Not available.
Rem/Incompatibility	Not available.
Hazardous Decomposition Products	Not applicable.
Hazardous Polymerization	Will not occur.

Section 11. Toxicological Information

RTECS Number:

Sodium Phosphate, Dibasic, Anhydrous, GR	WC4500000
Potassium Phosphate	TC6615500
Tartrazine	UQ6400000
Water	ZC0110000
Dowicide A	DV7700000

Toxicity	LD50: Not available. LC50: Not available.
Chronic Effects on Humans	Not available.
Acute Effects on Humans	May be hazardous in case of eye contact (irritant). May be hazardous in case of skin contact (irritant). Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering. May be hazardous in case of inhalation. May be hazardous in case of ingestion.
Synergetic Products (Toxicologically)	Not available.
Irritancy	Draize Test: Not available.
Sensitization	Not available.
Carcinogenic Effects	This material is not known to cause cancer in animals or humans.
Toxicity to Reproductive System	Not available.
Teratogenic Effects	Not available.
Mutagenic Effects	Not available.

Section 12. Ecological Information

Ecotoxicity	Not available.

BOD5 and COD	Not available.
Toxicity of the Products of Biodegradation	The products of degradation are less toxic than the product itself.

Section 13. Disposal Considerations

EPA Waste Number	Not available.
Treatment	Material does not have an EPA Waste number and is not a listed waste, however consultation with a permitted waste disposal site (TSD) should be accomplished. ALWAYS CONTACT A PERMITTED WASTE DISPOSER (TSD) TO ASSURE COMPLIANCE WITH ALL CURRENT LOCAL, STATE AND FEDERAL REGULATIONS.

Section 14. Transport Information

DOT Classification	Not available.
TDG Classification	Not available.
IMO/IMDG Classification	Not available.
ICAO/IATA Classification	Not available.

Section 15. Regulatory Information

U.S. Federal Regulations	TSCA 8(b) inventory: SODIUM PHOSPHATE, DIBASIC, ANHYDROUS ; Potassium Phosphate, Monobasic; Tartrazine; Water; Dowacide A SARA 302/304/311/312 extremely hazardous substances: No products were found. SARA 302/304 emergency planning and notification: No products were found. SARA 302/304/311/312 hazardous chemicals: Sodium Phosphate, Dibasic, Anhydrous; Dowicide A SARA 311/312 MSDS distribution − chemical inventory − hazard identification: Sodium Phosphate, Dibasic, Anhydrous: Immediate (Acute) Health Hazard; Dowicide A: Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard Clean Water Act (CWA) 307: No products were found. Clean Water Act (CWA) 311: Sodium Phosphate, Dibasic, Anhydrous Clean air act (CAA) 112 accidental release prevention: No products were found. Clean air act (CAA) 112 regulated flammable substances: No products were found. Clean air act (CAA) 112 regulated toxic substances: No products were found.
WHMIS (Canada)	Not controlled under WHMIS (Canada). CEPA DSL: SODIUM PHOSPHATE, DIBASIC, ANHYDROUS ; Potassium Phosphate, Monobasic; Tartrazine; Water; Dowacide A This product has been classiifed in accordance with the hazard criteria of the Controlled Product Regulations and the MSDS contains all required

information.

International Regulations

EINECS SODIUM PHOSPHATE, DIBASIC, ANHYDROUS
231−448−7
Potassium Phosphate, Monobasic 231−913−4
PYRAZOLE−3−CARBOXYLIC ACID, 5−HYDROXY−1−(P−SULFOPHENYL)−4−(P−SULFOPHENYL)AZO−,TRISODIUM SALT 217−699−5
WATER 231−791−2
2−BIPHENYLOL, SODIUM SALT 205−055−6

DSCL (EEC) This product is not classified according to the EU regulations.

International Lists Australia (NICNAS): SODIUM PHOSPHATE, DIBASIC, ANHYDROUS
; Potassium Phosphate, Monobasic; Tartrazine; Water; Dowacide A

Japan (MITI): SODIUM PHOSPHATE, DIBASIC, ANHYDROUS
; Potassium Phosphate, Monobasic; Tartrazine; Water; Dowacide A

Japan (MOL): Dowacide A

Korea (TCCL): SODIUM PHOSPHATE, DIBASIC, ANHYDROUS
; Potassium Phosphate, Monobasic; Tartrazine; Water; Dowacide A

Philippines (RA6969): SODIUM PHOSPHATE, DIBASIC, ANHYDROUS
; Potassium Phosphate, Monobasic; Tartrazine; Water; Dowacide A
China: No products were found.

State Regulations Pennsylvania RTK: Sodium Phosphate, Dibasic, Anhydrous: (environmental hazard, generic environmental hazard)
Massachusetts RTK: Sodium Phosphate, Dibasic, Anhydrous; Dowicide A
New Jersey: Buffer Solution, pH 7.0 (Yellow)
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Dowicide A
California prop. 65 (no significant risk level): Dowicide A
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Dowicide A

Section 16. Other Information

National Fire Protection Association (U.S.A.)

0 0

Health 2

Fire Hazard

Reactivity

Specific Hazard

Changed Since Last Revision +

Notice to Reader

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Material Safety Data Sheet

Section 1. Product and Company Identification

Product Name Buffer pH 10.0, Blue.

Product Code 34170−133

Manufacturer
EMD Chemicals Inc.
P.O. Box 70
480 Democrat Road
Gibbstown, NJ 08027
Prior to January 1, 2003 EMD Chemicals Inc. was EM Industries, Inc. or EM Science, Division of EM Industries, Inc.

Effective Date **4/23/2003**

For More Information Call
856−423−6300 Technical Service
Monday−Friday: 8:00 AM − 5:00 PM

In Case of Emergency Call
800−424−9300 CHEMTREC (USA)
613−996−6666 CANUTEC (Canada)
24 Hours/Day: 7 Days/Week

Synonym None.
Material Uses Laboratory Reagent
Chemical Family Solution.

Section 2. Composition and Information on Ingredients

Component	CAS #	% by Weight
Sodium Carbonate	497−19−8	0−1
Sodium Bicarbonate	144−55−8	0−1
Patient Blue A	3486−30−4	0−1
Dowicide 75	4080−31−3	0.05
Water	7732−18−5	97−100

Section 3. Hazards Identification

Physical State and Appearance Liquid.

Emergency Overview
CAUTION !
MAY BE HARMFUL IF SWALLOWED.
MAY CAUSE EYE IRRITATION.

Routes of Entry Eye contact. Inhalation. Ingestion.

Potential Acute Health Effects
Eyes May be hazardous in case of eye contact (irritant).
Skin No known effect on skin contact; rinse with water for a few minutes.
Inhalation No known acute effects of this product resulting from inhalation.
Ingestion May be hazardous in case of ingestion.

Potential Chronic Health Effects
Carcinogenic Effects This material is not known to cause cancer in animals or humans.
Additional information See Toxicological Information (section 11)

Medical Conditions Aggravated by Repeated or prolonged exposure is not known to aggravate medical condition.

Overexposure:

Section 4. First Aid Measures

Eye Contact	Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.
Skin Contact	In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.
Inhalation	If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion	Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Section 5. Fire Fighting Measures

Flammability of the Product	Non−flammable.
Auto−ignition Temperature	Not applicable.
Flash Points	Not applicable.
Flammable Limits	Not applicable.
Products of Combustion	Not applicable.
Fire Hazards in Presence of Various Substances	Not applicable.
Explosion Hazards in Presence of Various Substances	**Risks of explosion of the product in presence of static discharge:** No. **Risks of explosion of the product in presence of mechanical impact:** No.
Fire Fighting Media and Instructions	Not applicable.
Protective Clothing (Fire)	Not applicable.
Special Remarks on Fire Hazards	Not available.
Special Remarks on Explosion Hazards	Not available.

Section 6. Accidental Release Measures

Small Spill and Leak	Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: **Neutralize the residue with a dilute solution of acetic acid.**
Large Spill and Leak	Absorb with an inert material and put the spilled material in an appropriate waste disposal. **Neutralize the residue with a dilute solution of acetic acid.**
Spill Kit Information	No specific spill kit required for this product.

Section 7. Handling and Storage

Handling	Avoid contact with eyes. Do not ingest. Wash thoroughly after handling.
Storage	Keep container tightly closed. Keep container in a cool, well−ventilated area.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective occupational exposure limits.
Personal Protection	
Eyes	Splash goggles.
Body	Lab coat.
Respiratory	Not applicable.
Hands	Not applicable.
Feet	Not applicable.
Protective Clothing (Pictograms)	
Personal Protection in Case of a Large Spill	Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Product Name	**Exposure Limits**
Sodium Carbonate	Not available.
Sodium Bicarbonate	Not available.
Patient Blue A	Not available.
Dowicide 75	Not available.
Water	Not available.

Section 9. Physical and Chemical Properties

Odor	Odorless.
Color	Clear. Blue.
Physical State and Appearance	Liquid.
Molecular Weight	Not applicable.
Molecular Formula	Not applicable.
pH	10 [Basic.]
Boiling/Condensation Point	The lowest known value is 99.9°C (211.8°F) (Water).
Melting/Freezing Point	May start to solidify at −0.1°C (31.8°F) based on data for: Water.
Specific Gravity	Not available.
Vapor Pressure	Not available.
Vapor Density	Not available.
Odor Threshold	Not available.
Evaporation Rate	0.36 (Water) compared to(n−Butyl Acetate =1)
LogKow	Not available.
Solubility	Easily soluble in water.

Section 10. Stability and Reactivity

The product is stable.

Stability and Reactivity	
Conditions of Instability	Not available.
Incompatibility with Various Substances	Slightly reactive to reactive with acids. Non−reactive with oxidizing agents, reducing agents, combustible materials, organic materials.
Rem/Incompatibility	Not available.
Hazardous Decomposition Products	Not applicable.
Hazardous Polymerization	Will not occur.

Section 11. Toxicological Information

RTECS Number:

	Sodium Carbonate	VZ4050000
	Sodium Bicarbonate	VZ0950000
	Patent Blue A	DA4427950
	Dowicil 75	XX8450000
	Water	ZC0110000

Toxicity	LD50: Not available. LC50: Not available.
Chronic Effects on Humans	Not available.
Acute Effects on Humans	May be hazardous in case of eye contact (irritant). May be hazardous in case of ingestion.
Synergetic Products (Toxicologically)	Not available.
Irritancy	Draize Test: Not available.
Sensitization	Not available.
Carcinogenic Effects	This material is not known to cause cancer in animals or humans.
Toxicity to Reproductive System	Not available.
Teratogenic Effects	Not available.
Mutagenic Effects	Not available.

Section 12. Ecological Information

Ecotoxicity	Not available.
BOD5 and COD	Not available.
Toxicity of the Products of Biodegradation	The products of degradation are less toxic than the product itself.

Section 13. Disposal Considerations

EPA Waste Number	Not available.
Treatment	Material does not have an EPA Waste number and is not a listed waste,

however consultation with a permitted waste disposal site (TSD) should be accomplished.
ALWAYS CONTACT A PERMITTED WASTE DISPOSER (TSD) TO ASSURE COMPLIANCE WITH ALL CURRENT LOCAL, STATE AND FEDERAL REGULATIONS.ALWAYS CONTACT PERMITTED WASTE DISPOSER (TSD) TO ASSURE COMPLIANCE WITH ALL CURRENT LOCAL, STATE AND FEDERAL REGULATIONS.

Section 14. Transport Information

DOT Classification	Not available.
TDG Classification	Not available.
IMO/IMDG Classification	Not available.
ICAO/IATA Classification	Not available.

Section 15. Regulatory Information

U.S. Federal Regulations

TSCA 8(b) inventory: Sodium Carbonate
; Sodium Bicarbonate; Patient Blue A; Dowicide 75; Water
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Sodium Carbonate
; Patient Blue A
SARA 311/312 MSDS distribution − chemical inventory − hazard identification: Sodium Carbonate
: Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard; Patient Blue A: Delayed (Chronic) Health Hazard
Not on TSCA list.
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.
Clean air act (CAA) 112 accidental release prevention: No products were found.
Clean air act (CAA) 112 regulated flammable substances: No products were found.
Clean air act (CAA) 112 regulated toxic substances: No products were found.

WHMIS (Canada)

Not controlled under WHMIS (Canada).
CEPA DSL: Sodium Carbonate
; Sodium Bicarbonate; Patient Blue A; Dowicide 75; Water
This product has been classiifed in accordance with the hazard criteria of the Controlled Product Regulations and the MSDS contains all required information.

International Regulations

EINECS

Sodium Carbonate
207−838−8
Sodium Bicarbonate 205−633−8
Patient Blue A 222−476−0

Dowicide 75 223−805−0
Water 231−791−2

DSCL (EEC)	This product is not classified according to the EU regulations.
International Lists	Australia (NICNAS): Sodium Carbonate ; Sodium Bicarbonate; Patient Blue A; Dowicide 75; Water Japan (MITI): Sodium Carbonate ; Sodium Bicarbonate; Patient Blue A; Dowicide 75; Water Korea (TCCL): Sodium Carbonate ; Sodium Bicarbonate; Patient Blue A; Dowicide 75; Water Philippines (RA6969): Sodium Carbonate ; Sodium Bicarbonate; Patient Blue A; Dowicide 75; Water China: No products were found.
State Regulations	New Jersey: Buffer pH 10.0, Blue. California prop. 65: No products were found.

Section 16. Other Information

National Fire Protection Association (U.S.A.)

0 **0**

Health **0**

Fire Hazard

Reactivity

Specific Hazard

Changed Since Last Revision +

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The statements contained herein are based upon technical data that EMD Chemicals Inc. believes to be reliable, are offered for information purposes only and as a guide to the appropriate precautionary and emergency handling of the material by a properly trained person having the necessary technical skills. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use, storage and disposal of these materials and the safety and health of employees and customers and the protection of the environment. EMD CHEMICALS INC. MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE, WITH RESPECT TO THE INFORMATION HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS.

The following list contains the Material Safety Data Sheets you requested. Please scoll down to view the requested MSDS(s).

Product	MSDS	Distributor	Format	Language	Quantity
34953	N/A	Hach Company	OSHA	English	1
107166	N/A	Hach Company	OSHA	English	1
107266	N/A	Hach Company	OSHA	English	1
107399	N/A	Hach Company	OSHA	English	1

Total Enclosures: 4

World Headquarters
Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Material Safety Data Sheet

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1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Starch Indicator Solution
Catalog Number: 34953

Hach Company	Emergency Telephone Numbers:
P.O.Box 389	(Medical and Transportation)
Loveland, CO USA 80539	(303) 623-5716 24 Hour Service
(970) 669-3050	(515)232-2533 8am - 4pm CST

MSDS Number: M00294
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: May cause irritation.
Date of MSDS Preparation:
Day: 3
Month: 05
Year: 2002

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2. COMPOSITION / INFORMATION ON INGREDIENTS

Demineralized Water
CAS No.: 7732-18-5
TSCA CAS Number: 7732-18-5
Percent Range: >95.0
Percent Range Units: volume / volume
LD50: None reported
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: No effects anticipated.

Salicylic Acid
CAS No.: 69-72-7
TSCA CAS Number: 69-72-7
Percent Range: < 1.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 891 mg/kg, Oral mouse LD50 = 480 mg/kg, Oral cat LD50 = 400 mg/kg, Oral rabbit LD50 = 1300 mg/kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: Causes severe eye irritation.

Starch
CAS No.: 9005-84-9
TSCA CAS Number: 9005-84-9
Percent Range: < 1.0
Percent Range Units: weight / volume
LD50: None reported
LC50: None reported
TLV: 10 mg/m^3 total dust

PEL: 15 mg/m^3 total dust
Hazard: May cause allergic reaction. May cause irritation.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: Clear to slightly turbid, colorless solution
Odor: None
MAY CAUSE EYE IRRITATION

HMIS:
Health: 1
Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 0
Flammability: 0
Reactivity: 0
Symbol: Not applicable
Potential Health Effects:
Eye Contact: May cause irritation
Skin Contact: No effects are anticipated
Skin Absorption: No effects anticipated
Target Organs: Not applicable
Ingestion: No Effects Anticipated
Target Organs: Not applicable
Inhalation: No effects anticipated
Target Organs: Not applicable
Medical Conditions Aggravated: Allergies or sensitivity to aspirin or salicylates.
Chronic Effects: No effects anticipated
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

This product does NOT contain any IARC listed chemicals.

This product does NOT contain any NTP listed chemicals.

Additional Cancer / Reproductive Toxicity Information: Contains: an experimental mutagen. an experimental teratogen.
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with plenty of water.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.
Inhalation: None required.

5. FIRE FIGHTING MEASURES

Flammable Properties: Material will not burn.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not applicable

Hazardous Combustion Products: This material will not burn.
Fire / Explosion Hazards: None reported
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Use media appropriate to surrounding fire conditions
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Absorb spilled liquid with non-reactive sorbent material. Dike large spills to keep spilled material from entering sewage and drainage systems or bodies of water.
Clean-up Technique: Cover spilled material with a dry acid, such as citric or boric. Scoop up slurry into a large beaker. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Flush reacted material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate as needed to perform spill clean-up. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: None

7. HANDLING / STORAGE

Handling: Avoid contact with eyes Do not breathe mist or vapors. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Store between 10° and 25°C.
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes Do not breathe: mist/vapor Wash thoroughly after handling.
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: Clear to slightly turbid, colorless solution
Physical State: Liquid
Molecular Weight: Not applicable
Odor: None
pH: 3.1
Vapor Pressure: Not determined
Vapor Density (air = 1): Not determined
Boiling Point: ~100 °C (~212 °F)
Melting Point: Not applicable
Specific Gravity (water = 1): 0.986
Evaporation Rate (water = 1): 0.53
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not applicable
Solubility:
Water: Soluble

Acid: Soluble
Other: Not determined
Metal Corrosivity:
Steel: Not determined
Aluminum: Not determined

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10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Extreme temperatures
Reactivity / Incompatibility: None reported
Hazardous Decomposition: No hazardous decomposition products known.
Hazardous Polymerization: Will not occur.

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11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: None reported
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: Salicylic Acid: Oral rat LD50 =891 mg/kg, Oral mouse LD50 = 480 mg/kg, Oral cat LD50 = 400 mg/kg, Oral rabbit LD50 = 1300 mg/kg

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12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
No ecological data available for the ingredients of this product.

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13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: None
Special Instructions (Disposal): Dilute to 3 to 5 times the volume with cold water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Open cold water tap completely, slowly pour the reacted material to the drain. Allow cold water to run for 5 minutes to completely flush the system.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

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14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA
ICAO Subsidiary Risk: NA
ICAO ID Number: NA
ICAO Packing Group: NA

I.M.O.:

I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA

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15. REGULATORY INFORMATION

U.S. Federal Regulations:

O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)

E.P.A.:

S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard

S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
Clean Water Act (40 CFR 116.4): Not applicable
RCRA: Contains no RCRA regulated substances.
C.P.S.C.: Not applicable

State Regulations:

California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): Not applicable

Trade Secret Registry: Not applicable

National Inventories:

U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).
TSCA CAS Number: Not applicable

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16. OTHER INFORMATION

Intended Use: Oxidation-reduction indicator

References: TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. In-house information. Technical Judgment. Vendor Information. CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993.

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

World Headquarters
Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M00029

Material Safety Data Sheet

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Manganous Sulfate Powder Pillows
Catalog Number: 107166

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00029
Chemical Name: Sulfuric acid, manganese(2+) salt (1:1)
CAS No.: 7785-87-7
Chemical Formula: $MnSO_4$
Chemical Family: Inorganic Salt
Hazard: May cause irritation. Cumulative poison. Experimental mutagen. Experimental teratogen.
Date of MSDS Preparation:
Day: 3
Month: 05
Year: 2002

2. COMPOSITION / INFORMATION ON INGREDIENTS

Manganous Sulfate
CAS No.: 7785-87-7
TSCA CAS Number: 7785-87-7
Percent Range: 100.0
Percent Range Units: weight / weight
LD50: None reported
LC50: None reported
TLV: 0.2 mg/m^3 (Mn)
PEL: Ceiling: 5 mg/m^3 (Mn)
Hazard: May cause irritation. Cumulative poison. Experimental mutagen. Experimental teratogen.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: Pink powder
Odor: Not determined
HARMFUL IF INHALED MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION

HMIS:
Health: 2
Flammability: 0
Reactivity: 1
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 2
Flammability: 0
Reactivity: 1

Symbol: Not applicable

Potential Health Effects:

Eye Contact: May cause irritation

Skin Contact: May cause irritation

Skin Absorption: No effects anticipated

Target Organs: Not applicable

Ingestion: Very large doses may cause: gastrointestinal irritation nausea

Target Organs: None reported

Inhalation: May cause: respiratory tract irritation pneumonitis

Target Organs: Lungs

Medical Conditions Aggravated: Pre-existing: Respiratory conditions Central nervous system diseases Liver conditions

Chronic Effects: Chronic inhalation of manganese (or Mn compounds) may cause psychiatric disorders characterized by irritability, difficulty walking, speech disturbances, and compulsive behavior. If the conditions persist, manganese poisoning may cause a mask-like facial expression, symptoms similar to Parkinson's disease, and cirrhosis of the liver.

Cancer / Reproductive Toxicity Information:

O.S.H.A. Listed: No

IARC Listed: No

NTP Listed: No

Additional Cancer / Reproductive Toxicity Information: Contains: an experimental mutagen. an experimental teratogen.

Toxicologically Synergistic Products: None reported

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4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.

Skin Contact (First Aid): Wash skin with plenty of water. Call physician if irritation develops.

Ingestion (First Aid): Give 1-2 glasses of water. Induce vomiting using syrup of ipecac or by sticking finger down throat. Never give anything by mouth to an unconscious person. Call physician immediately.

Inhalation: Remove to fresh air. Give artificial respiration if necessary. Call physician.

---

5. FIRE FIGHTING MEASURES

Flammable Properties: During a fire, corrosive and toxic gases may be generated by thermal decomposition.

Flash Point: Not applicable

Method: Not applicable

Flammability Limits:

Lower Explosion Limits: Not applicable

Upper Explosion Limits: Not applicable

Autoignition Temperature: Not determined

Hazardous Combustion Products: This material will not burn.

Fire / Explosion Hazards: None reported

Static Discharge: None reported.

Mechanical Impact: None reported

Extinguishing Media: Use media appropriate to surrounding fire conditions

Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear. Evacuate area and fight fire from a safe distance.

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6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:

Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.

Containment Technique: Stop spilled material from being released to the environment.

Clean-up Technique: Scoop up spilled material into a large beaker and dissolve with water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Flush reacted material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.

Evacuation Procedure: Evacuate local area (15 foot radius or as directed by your facility's emergency response plan) when: a pound or more of loose powder is spilled. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Product is regulated as a hazardous air pollutant.
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: Not applicable

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin Do not breathe dust. Wash thoroughly after handling. Use with adequate ventilation. Maintain general industrial hygiene practices when using this product.
Storage: Store at 10 - 30°C. Keep away from: oxidizers powdered metals
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Have a safety shower nearby. Maintain adequate ventilation to keep vapor level below TWA for chemicals in this product. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes skin Do not breathe: dust Wash thoroughly after handling. Use with adequate ventilation. Keep away from: oxidizers powdered metals
TLV: 0.2 mg/m^3 (Mn)
PEL: Ceiling: 5 mg/m^3 (Mn)

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: Pink powder
Physical State: Solid
Molecular Weight: 151.01
Odor: Not determined
pH: 3.7 (5% sol'n)
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: Not determined
Melting Point: > 400°C (> 752°F)
Specific Gravity (water = 1): 3.25
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not applicable
Solubility:
Water: Soluble
Acid: Not determined
Other: Insoluble in alcohol
Metal Corrosivity:
Steel: Not determined
Aluminum: 0.002 in/yr (0.051 mm/yr)

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Extreme temperatures Heating to decomposition.
Reactivity / Incompatibility: Incompatible with: oxidizers powdered metals
Hazardous Decomposition: Heating to decomposition releases toxic and/or corrosive fumes of: sulfur oxides manganese oxides
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: None reported
Mutation Data: Oral mouse sperm morphology @ 513 mg/kg/5D (Continuous); Hamster ovary cytogenetic analysis @ 180 mg/l; Hamster ovary sister chromatid exchange @ 5 mg/l; more data reported in RTECS.
Reproductive Effects Data: Oral mouse TDLo = 513 mg/kg (Paternal effects - spermatogenesis).
Ingredient Toxicological Data: --
Not applicable

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
Not applicable

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: Not applicable
Special Instructions (Disposal): Dilute to 3 to 5 times the volume with cold water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Open cold water tap completely, slowly pour the material to the drain. Flush system with plenty of water.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA
ICAO Subsidiary Risk: NA
ICAO ID Number: NA
ICAO Packing Group: NA
I.M.O.:
I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:

S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard Delayed (Chronic) Health Hazard

S.A.R.A. Title III Section 313 (40 CFR 372): This product contains a chemical(s) subject to the reporting requirements of Section 313 of Title III of SARA.

Manganese compounds

302 (EHS) TPQ (40 CFR 355): Not applicable

304 CERCLA RQ (40 CFR 302.4): Manganese Compounds 1 lb.

304 EHS RQ (40 CFR 355): Not applicable

Clean Water Act (40 CFR 116.4): Not applicable

RCRA: Contains no RCRA regulated substances.

C.P.S.C.: Not applicable

State Regulations:

California Prop. 65: No Prop. 65 listed chemicals are present in this product.

Identification of Prop. 65 Ingredient(s): None

Trade Secret Registry: Not applicable

National Inventories:

U.S. Inventory Status: TSCA Listed: Yes

TSCA CAS Number: 7785-87-7

16. OTHER INFORMATION

Intended Use: Laboratory Reagent

References: 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor). Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991. Cassaret and Doull's Toxicology, 3rd Ed. New York: Macmillan Publishing Co., Inc., 1986. List of Dangerous Substances Classified in Annex I of the EEC Directive (67/548) - Classification, Packaging and Labeling of Dangerous Substances, Amended July 1992. Technical Judgment. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. Vendor Information.

Legend:

NA - Not Applicable
ND - Not Determined
NV - Not Available

w/w - weight/weight
w/v - weight/volume
v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

World Headquarters
Hach Company
P.O.Box 389 ***MSDS No: M00028***
Loveland, CO USA 80539
(970) 669-3050

Material Safety Data Sheet

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Alkaline Iodide-Azide Reagent Powder Pillows
Catalog Number: 107266

Hach Company	Emergency Telephone Numbers:
P.O.Box 389	(Medical and Transportation)
Loveland, CO USA 80539	(303) 623-5716 24 Hour Service
(970) 669-3050	(515)232-2533 8am - 4pm CST

MSDS Number: M00028
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: Toxic. Causes severe burns.
Date of MSDS Preparation:
Day: 29
Month: 01
Year: 2003

2. COMPOSITION / INFORMATION ON INGREDIENTS

<u>Potassium Iodide</u>
CAS No.: 7681-11-0
TSCA CAS Number: 7681-11-0
Percent Range: 30.0 - 40.0
Percent Range Units: weight / weight
LD50: Oral Mouse LD50 = 1862 mg/kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: Causes irritation.

<u>Lithium Hydroxide</u>
CAS No.: 1310-66-3
TSCA CAS Number: 1310-65-2
Percent Range: 55.0 - 65.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 225 mg/kg
LC50: Inhalation rat LC50 = 980 mg/m^3/4H
TLV: Not established
PEL: Not established
Hazard: Toxic. Causes severe burns.

<u>Sodium Azide</u>
CAS No.: 26628-22-8
TSCA CAS Number: 26628-22-8
Percent Range: 1.0 - 5.0
Percent Range Units: weight / weight
LD50: Oral rat LD_{50} = 27 mg/kg; Oral mouse LD_{50} = 27 mg/kg.
LC50: None reported
TLV: C: 0.29 mg/m^3 as Sodium azide; C 0.11 ppm as Hydrazoic acid vapor

PEL: Not established
Hazard: Highly toxic. May cause irritation. Cumulative poison. Experimental mutagen. Explosive. Contact with acid may generate toxic fumes.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White crystals
Odor: None
CAUSES SEVERE BURNS HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN

HMIS:
Health: 3
Flammability: 1
Reactivity: 1
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 3
Flammability: 1
Reactivity: 1
Symbol: Not applicable
Potential Health Effects:
Eye Contact: Causes severe burns
Skin Contact: Causes severe burns
Skin Absorption: Toxic. Effects similar to those of ingestion
Target Organs: Central nervous system
Ingestion: Toxic Causes: severe burns hypotension May cause iodism, which symptoms include skin rash, conjunctivitis, runny nose, sneezing, bronchitis, headache, fever and irritation of mucous membranes. May cause: abdominal pain dizziness nausea vomiting respiratory stimulation convulsions followed by respiratory depression central nervous system effects kidney damage liver damage spleen damage lung damage coma death
Target Organs: Central nervous system Bone marrow Kidneys Liver Spleen Lungs
Inhalation: Causes: severe burns May cause: coughing shortness of breath bronchitis headache dizziness weakness respiratory stimulation convulsions followed by respiratory depression death
Target Organs: None reported
Medical Conditions Aggravated: Sodium azide produces a larger blood pressure drop in persons with high blood pressure than in persons with normal blood pressure. Pre-existing: Eye conditions Skin conditions Respiratory conditions Kidney conditions Liver conditions
Chronic Effects: Lithium compounds have been implicated in development of aplastic anemia. Signs of lithium poisoning include dehydration, extreme weight loss, fine tremor of hands, nausea, vomiting and diarrhea, Chronic overexposure may cause headache central nervous system effects kidney damage liver damage
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

This product does NOT contain any IARC listed chemicals.

This product does NOT contain any NTP listed chemicals.

Additional Cancer / Reproductive Toxicity Information: Contains: an experimental mutagen. an experimental teratogen.
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with plenty of water for 15 minutes. Remove contaminated clothing. Call physician immediately.
Ingestion (First Aid): Do not induce vomiting. Give 1-2 glasses of water. Never give anything by mouth to an unconscious person. Call physician immediately.

Inhalation: Remove to fresh air. Give artificial respiration if necessary. Call physician.

5. FIRE FIGHTING MEASURES

Flammable Properties: Does not burn, but may melt in a fire, releasing toxic fumes. During a fire, corrosive and toxic gases may be generated by thermal decomposition.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
  Lower Explosion Limits: Not applicable
  Upper Explosion Limits: Not applicable
Autoignition Temperature: Not determined
Hazardous Combustion Products: None reported
Fire / Explosion Hazards: Contact with metals gives off hydrogen gas which is flammable Closed containers may explode if heated.
  Static Discharge: None reported.
  Mechanical Impact: None reported
Extinguishing Media: Do NOT use water. Carbon dioxide Dry chemical.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear. Evacuate area and fight fire from a safe distance.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment.
Clean-up Technique: Avoid contact with spilled material. Sweep up material. Dispose of material in an E.P.A. approved hazardous waste facility. Decontaminate the area of the spill with a weak acid solution.
Evacuation Procedure: Evacuate general area (50 foot radius or as directed by your facility's emergency response plan) when: any quantity is spilled. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Mixture contains a component which is regulated as hazardous waste.
304 EHS RQ (40 CFR 355): Sodium Azide - RQ 1000 lbs.
D.O.T. Emergency Response Guide Number: 154

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin clothing Do not breathe dust. Wash thoroughly after handling. Use with adequate ventilation. Maintain general industrial hygiene practices when using this product.
Storage: Store in a cool, dry place. Keep away from: metals acids / acid fumes.
  Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Have a safety shower nearby. Use a fume hood to avoid exposure to dust, mist or vapor. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
  Eye Protection: chemical splash goggles
  Skin Protection: disposable latex gloves lab coat
  Inhalation Protection: laboratory fume hood
Precautionary Measures: Avoid contact with: eyes skin clothing Do not breathe: dust Wash thoroughly after handling. Keep away from: metals acids/acid fumes
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White crystals
Physical State: Solid

Molecular Weight: Not applicable
Odor: None
pH: 12.6 (5% sol'n)
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: 110°C (230°F)
Specific Gravity (water = 1): 1.94
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not applicable
Solubility:
- ***Water:*** Soluble
- ***Acid:*** Not determined
- ***Other:*** Not determined

Metal Corrosivity:
- ***Steel:*** Not determined
- ***Aluminum:*** 0.248 in/yr (6.30 mm/yr)

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Excess moisture Extreme temperatures
Reactivity / Incompatibility: May react violently in contact with: acids oxidizers
Hazardous Decomposition: Heating to decomposition releases toxic and/or corrosive fumes of: iodine iodine compounds potassium oxide nitrogen oxides sodium oxides Contact with metals may release flammable hydrogen gas.
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
- ***LD50:*** Oral rat LD_{50} = 350 mg/kg
- ***LC50:*** None reported
- ***Dermal Toxicity Data:*** None reported
- ***Skin and Eye Irritation Data:*** None reported
- ***Mutation Data:*** Sodium Azide: DNA inhibition in human fibroblasts @ 50 mg/l; other data reported in RTECS.
- ***Reproductive Effects Data:*** None reported

Ingredient Toxicological Data: Lithium Hydroxide: Oral rat LD_{50} = 225 mg/kg. Sodium Azide: Oral rat LD_{50} = 27 mg/kg; Dermal rabbit LD_{50} = 20 mg/kg.

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
No ecological data available for the ingredients of this product.

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: P105
Special Instructions (Disposal): Never put unreacted azides down the drain! Dispose of material in an E.P.A. approved hazardous waste facility.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:

D.O.T. Proper Shipping Name: Lithium Hydroxide, Solid Mixture
--
DOT Hazard Class: 8
DOT Subsidiary Risk: NA
DOT ID Number: UN2680
DOT Packing Group: II

I.C.A.O.:
I.C.A.O. Proper Shipping Name: Lithium Hydroxide, Solid Mixture
--
ICAO Hazard Class: 8
ICAO Subsidiary Risk: NA
ICAO ID Number: UN2680
ICAO Packing Group: II

I.M.O.:
I.M.O. Proper Shipping Name: Lithium Hydroxide, Solid
--
I.M.O. Hazard Class: 8
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: UN2680
I.M.O. Packing Group: II

15. REGULATORY INFORMATION

U.S. Federal Regulations:

O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)

E.P.A.:

S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard Delayed (Chronic) Health Hazard

S.A.R.A. Title III Section 313 (40 CFR 372): This product contains a chemical(s) subject to the reporting requirements of Section 313 of Title III of SARA.
Sodium azide

302 (EHS) TPQ (40 CFR 355): Sodium Azide 500 lbs.
304 CERCLA RQ (40 CFR 302.4): Sodium azide 1000 lbs.
304 EHS RQ (40 CFR 355): Sodium Azide - RQ 1000 lbs.
Clean Water Act (40 CFR 116.4): Not applicable
RCRA: Contains RCRA regulated substances. See Section 13, EPA Waste ID Number.

C.P.S.C.: The label for this product bears the signal word "POISON" because the concentration of Lithium Hydroxide in the product is greater than/ equal to 10%

State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): None

Trade Secret Registry: Not applicable

National Inventories:
U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).
TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Determination of dissolved oxygen

References: 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor). Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991. List of Dangerous Substances Classified in Annex I of the EEC Directive (67/548) - Classification, Packaging and Labeling of Dangerous Substances, Amended July 1992. Outside Testing. Technical Judgment.

Legend:

NA - Not Applicable	w/w - weight/weight

ND - Not Determined
NV - Not Available
w/v - weight/volume
v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

World Headquarters
Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M00007

Material Safety Data Sheet

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1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Sulfamic Acid Powder Pillows
Catalog Number: 107399

Hach Company	Emergency Telephone Numbers:
P.O.Box 389	(Medical and Transportation)
Loveland, CO USA 80539	(303) 623-5716 24 Hour Service
(970) 669-3050	(515)232-2533 8am - 4pm CST

MSDS Number: M00007
Chemical Name: Sulfamic Acid
CAS No.: 5329-14-6
Chemical Formula: H_3NO_3S
Chemical Family: Inorganic Acid
Hazard: Causes eye burns.
Date of MSDS Preparation:
Day: 8
Month: 04
Year: 2003

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2. COMPOSITION / INFORMATION ON INGREDIENTS

<u>**Sulfamic Acid**</u>
CAS No.: 5329-14-6
TSCA CAS Number: 5329-14-6
Percent Range: > 99.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 3160 mg/kg.
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: Causes eye burns.

<u>**Other component**</u>
CAS No.: Not applicable
TSCA CAS Number: Not applicable
Percent Range: < 1.0
Percent Range Units: weight / weight
LD50: Not applicable
LC50: Not applicable
TLV: Not established
PEL: Not established
Hazard: Any ingredient(s) of this product listed as "Other component(s)" is not considered a health hazard to the user of this product.

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3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White crystals
Odor: None
CAUSES EYE BURNS CAUSES SKIN AND RESPIRATORY TRACT IRRITATION

HMIS:
Health: 2
Flammability: 1
Reactivity: 1
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 2
Flammability: 1
Reactivity: 1
Symbol: Not applicable
Potential Health Effects:
Eye Contact: Causes eye burns.
Skin Contact: Causes severe irritation
Skin Absorption: None reported
Target Organs: None reported
Ingestion: May cause: irritation of the mouth and esophagus gastrointestinal irritation
Target Organs: None reported
Inhalation: May cause: irritation of nose and throat
Target Organs: None reported
Medical Conditions Aggravated: Pre-existing: Eye conditions Skin conditions Respiratory conditions
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
O.S.H.A. Listed: No

IARC Listed: No

NTP Listed: No

Additional Cancer / Reproductive Toxicity Information: Not applicable
Toxicologically Synergistic Products: None reported

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4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with plenty of water for 15 minutes. Call physician immediately.
Ingestion (First Aid): Do not induce vomiting. Give 1-2 glasses of water. Call physician immediately. Never give anything by mouth to an unconscious person.
Inhalation: Remove to fresh air.

---

5. FIRE FIGHTING MEASURES

Flammable Properties: During a fire, irritating and highly toxic gases may be generated by thermal decomposition.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not applicable
Hazardous Combustion Products: Toxic fumes of: ammonia nitrogen oxides. sulfur oxides.
Fire / Explosion Hazards: May react violently with: chlorine / chlorine compounds metal nitrates metal nitrites nitric acid
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Dry chemical. Water.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

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6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment. Cover spilled solid material with sand or other inert material.
Clean-up Technique: Scoop up spilled material into a large beaker and dissolve with water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Flush reacted material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate local area (15 foot radius or as directed by your facility's emergency response plan) when: a pound or more of loose powder is spilled. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Product is regulated as RCRA hazardous waste.
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: 154

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin Do not breathe dust. Maintain general industrial hygiene practices when using this product.
Storage: Store away from: oxidizers alkalies chlorine/chlorinated metals Protect from: heat moisture
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes skin Do not breathe: dust Wash thoroughly after handling. Keep away from: alkalies metals Protect from: heat moisture
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White crystals
Physical State: Solid
Molecular Weight: 97.10
Odor: None
pH: 1% soln = 1.18
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: Product decomposes at 205 °C; 401 °F
Specific Gravity (water = 1): 2.15
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): None reported
Solubility:
Water: 1:2 ratio @ 80 ° C (176 °F)
Acid: Soluble
Other: Slightly soluble in alcohol, methanol.
Metal Corrosivity:
Steel: 0.814 in/yr
Aluminum: 0.212 in/yr

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Heating to decomposition. Excess moisture
Reactivity / Incompatibility: May react violently in contact with: chlorates metal nitrates metal nitrites nitric acid Incompatible with: alkalies oxidizers
Hazardous Decomposition: Heating to decomposition releases toxic and/or corrosive fumes of: ammonia nitrogen oxides sulfur oxides
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: Oral rat LD50 = 3160 mg/kg.
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: Skin Human 4%/5 days intermittent MILD, Skin rabbit 500 mg/24H SEVERE, Eye rabbit 20mg MODERATE, Eye rabbit 250µg/24H SEVERE.
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: --
Not applicable

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
Not applicable

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: None
Special Instructions (Disposal): Dilute to 3 to 5 times the volume with cold water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Open cold water tap completely, slowly pour the reacted material to the drain.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Sulphamic Acid
--
DOT Hazard Class: 8
DOT Subsidiary Risk: NA
DOT ID Number: UN2967
DOT Packing Group: III
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Sulphamic Acid
--
ICAO Hazard Class: 8
ICAO Subsidiary Risk: NA
ICAO ID Number: UN2967
ICAO Packing Group: III
I.M.O.:
I.M.O. Proper Shipping Name: Sulphamic Acid
--
I.M.O. Hazard Class: 8
I.M.O. Subsidiary Risk: NA

I.M.O. ID Number: UN2967
I.M.O. Packing Group: III

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
Clean Water Act (40 CFR 116.4): Not applicable
RCRA: Contains no RCRA regulated substances.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): Not applicable
Trade Secret Registry: Not applicable
National Inventories:
U.S. Inventory Status: TSCA Listed: Yes
TSCA CAS Number: 5329-14-6

16. OTHER INFORMATION

Intended Use: Laboratory Reagent
References: Vendor Information. NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86. Cincinnati: U.S. Department of Health and Human Services, April, 1987. Gosselin, R. E. et al. Clinical Toxicology of Commercial Products, 5th Ed. Baltimore: The Williams and Wilkins Co., 1984. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991. Outside Testing. Technical Judgment. The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992.
Revision Summary:

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

MATERIAL SAFETY DATA SHEET

Prepared in accordance with OSHA Hazard Communication Rule 29CFR Part 1910.

RODUCT IDENTIFICATION

Product Name: M-FC Broth, Fecal Coliform (with or without Rosolic Acid)

INGREDIENTS WITH KNOWN HEALTH HAZARDS (Comprising 1% or More; 0.1% if a Potential Carcinogen):

Chemical (Common) Name	CAS No.	Effective Date

As Pall Corporation Inc. interprets the U.S. Occupational Safety and Health Act and Regulations, including the Hazard Communication Standard 29CFR.1910.1200 dated August 29, 1987, this product should NOT be considered a health hazard.

"Hazardous chemical" means any chemical which is a physical hazard or a health hazard. "Health hazard" means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes or mucous membranes.

INGREDIENTS WITH KNOWN PHYSICAL HAZARDS

Chemical (Common) Name	CAS No.	Effective Date
ƆNE		

THIS MATERIAL IS NOT HAZARDOUS AS DEFINED BY OSHA 1910.1200*

"Hazardous chemical" means any chemical which is a physical hazard or a health hazard.

"Physical hazard" means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, and organic peroxide, an oxidfizer, pyrophoric, unstable (reactive) or water reactive.

HMIS*	Rating
Health hazard:	None
Flammability	None
Reactivity hazard	None

*HMIS (Hazardous Materials Identification System): Rating for the product as it is supplied.

MATERIAL SAFETY DATA SHEET

SECTION I

nufacturer's Name: **Pall Corporation**	Emergency Telephone Numbers	**800-521-1520** **734-665-0651**
Address (Number, Street, City, State and Zip Code): **600 South Wagner Rd.**	Chemical Name and Synonyms:	N/A
Ann Arbor, Michigan 48103-9019	Trade Name and Synonyms:	M-FC Broth, Fecal Coliform (with or without Rosalic acid)
Facsimile Numbers:	CAS No.:	N/A
734-913-6114 **734-913-6353**	Product No.	**All applicable**

THIS MATERIAL IS NOT HAZARDOUS AS DEFINED BY OSHA 1910.1200*

"Hazardous chemical" means any chemical which is a physical hazard or a health hazard.

"Health hazard" means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes or mucous membranes.

"Physical hazard" means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, and organic peroxide, an oxidfizer, pyrophoric, unstable (reactive) or water reactive.

*See also Section IX, Special Precautions. N/A = Not Applicable N/F - Not Found

SECTION II - PHYSICAL DATA

Boiling Point (°F):	**N/A**	Specific Gravity (H_2O = 1) at 0°C:	N/A
Vapor Pressure (mm/Hg):	**N/A**	Percent Volatile by Volume (%):	**N/A**
Vapor Density (AIR = 1):	**N/A**	Evaporation Rate (= 1):	**N/A**

Solubility in Water: **N/A**

Appearance and Odor: N/A

SECTION III - FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): N/A	Flammable Limits:	Lel : N/A	Uel: N/A

Extinguishing Media : N/A

Special Fire Fighting Procedures: N/A

Unusual Fire and Explosion Hazards: N/A

SECTION IV - LISTED IN AS A CARCINOGEN

NTP		IARC		
OSHA		OTHER		Specifiy: N/A

Comments:

ffective: March, 1999

Trade Name: M-FC Broth, Fecal Coliform (with or without Rosalic Acid

SECTION V - HEALTH HAZARD DATA

reshold Limit Value (TLV):	N/A
rmissible Exposure Limit (PEL):	N/A
Other:	N/A
Effects of Overexposure:	N/A
Emergency First Aid Procedures:	N/A
Primary Routes of Entry:	N/A

SECTION VI - REACTIVITY DATA

Stability:	Unstable	☐	Conditions to Avoid: N/A
	Stable	☐	

Incompatibility (Materials to Avoid):

N/A

Hazardous Decomposition Products or Combustible Products:

N/A

Hazardous Polymerization:	May Occur	☐	Conditions to Avoid: N/A
	Will Not Occur	☐	

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be Taken in Case Material is Released or Spilled:

N/A

Waste Disposal Method (ALL FEDERAL, STATE AND LOCAL LAWS TAKE PRECEDENCE):

N/A

SECTION VIII - SPECIAL PROTECTION INFORMATION

Respiratory Protection : ☐ NIOSH approved self-contained breathing apparatus, and / or ☐ Other (specify) N/A

entilation:	Local Exhaust	☐	N/A
	Mechanical (General)	☐	*Please refer to the ACGIH document "Industrial Ventilation, A Manual of Recommended Practices," for details.

Protective Gloves:	N/A	Eye Protection:	N/A
Other Protective Equipment:	N/A		

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be Taken in Handling and Storing:

N/A

Other Precautions: Despite being non-hazardous, it is still advisable to follow prudent laboratory practices to avoid contact i.e., breathing, touching, etc., of a laboratory reagent or material.

SECTION X- PRODUCT REGULATORY INFORMATION

Workplace Classification

N/A

Transportation Classifications

US DOT Hazard Class N/A

Emergency Planning & Community Right-To-Know (Sara Title 3)
Section 311/312 Categorizations (40 CFR 370)

N/A

The information above is believed to accurate to the best of our knowledge and represents the best information currently available to us but it is not purported to be all inclusive and shall be used only as a guide. Pall Corporation makes no warranty of merchantability or any other warranty, express or implied, with respect to such information and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall Pall Corporation be liable for any claims.

Material Safety Data Sheet
acc. to ISO/DIS 11014

Printing date 06/04/2001
Reviewed on 04/05/2001

1 Identification of substance

· **Product details**

· **Trade name: Phosphate Buffer**

· **Product number:** BR-PHB-400, FT-PHB-90, FT-PHB-99, TS-PHB-90, TS-PHB-99

· **Manufacturer/Supplier:**
International BioProducts
21312 30th Drive
Bothell, Washington 98021
1-800-729-7611
Fax: 1-425-398-7972

· **Information department:** Environment protection department.

2 Composition/Data on components

· **Chemical characterization:**
· **CAS No. Description**
7732-18-5 water, distilled, conductivity or of similarpurity
· **Identification number(s)**
· **EINECS Number:** 231-791-2

3 Hazards identification

· **Hazard description:** Not applicable.
· **Information pertaining to particular dangers for man and environment:** Not applicable.
· **Classification system:**
· **NFPA ratings (scale 0 - 4)**
Health = 0
Fire = 0
Reactivity = 0
· **HMIS-ratings (scale 0 - 4)**
Health = 0
Fire = 0
Reactivity = 0

4 First aid measures

· **General information:** No special measures required.
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:**
Generally the product does not irritate the skin.
Rinse with water.
· **After eye contact:** Rinse opened eye for several minutes under running water.
· **After swallowing:** If symptoms persist consult doctor.

5 Fire fighting measures

· **Suitable extinguishing agents:**
CO2, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
· **Protective equipment:** No special measures required.

6 Accidental release measures

· **Person-related safety precautions:** Not required.

(Contd. on page 2)

(Contd. of page 1)

· ***Measures for environmental protection:*** *No special measures required.*
· ***Measures for cleaning/collecting:***
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
· ***Additional information:*** *No dangerous substances are released.*

7 Handling and storage

· ***Handling:***
· ***Information for safe handling:*** *No special measures required.*
· ***Information about protection against explosions and fires:*** *No special measures required.*

· ***Storage:***
· ***Requirements to be met by storerooms and receptacles:*** *Store in a cool location.*
· ***Information about storage in one common storage facility:*** *Not required.*
· ***Further information about storage conditions:*** *Store in cool, dry conditions in well sealed receptacles.*
· ***Class according to regulation on flammable liquids:*** *Void*

8 Exposure controls and personal protection

· ***Additional information about design of technical systems:*** *No further data; see item 7.*

· ***Components with limit values that require monitoring at the workplace:*** *Not required.*
· ***Additional information:*** *The lists that were valid during the creation were used as basis.*

· ***Personal protective equipment:***
· ***General protective and hygienic measures:***
Keep away from foodstuffs, beverages and feed.
Wash hands before breaks and at the end of work.
Shower or take a bath at the end of work.
Avoid contact with the eyes and skin.
Do not eat, drink, smoke or sniff while working.
Do not store food in the working area.
· ***Breathing equipment:*** *Not required.*
· ***Protection of hands:*** *Protective gloves*
· ***Eye protection:*** *Safety glasses*
· ***Body protection:*** *Protective work clothing*

9 Physical and chemical properties

· ***Form:***	*Fluid*
· ***Color:***	*Colorless*
· ***Odor:***	*Odorless*
· ***Change in condition***	
Melting point/Melting range:	*0°C (32°F)*
Boiling point/Boiling range:	*Undetermined.*
· ***Flash point:***	*Not applicable.*
· ***Danger of explosion:***	*Product does not present an explosion hazard.*
· ***Vapor pressure at 20°C (68°F):***	*23 hPa*
· ***Density at 20°C (68°F):***	*1 g/cm³*
· ***Solubility in / Miscibility with***	
Water:	*Not applicable*

(Contd. on page 3)

(Contd. of page 2)

Organic solvents:	*0.0 %*
Water:	*98.8 %*

10 Stability and reactivity

- ***Thermal decomposition / conditions to be avoided:*** *No decomposition if used according to specifications.*
- ***Dangerous reactions*** *No dangerous reactions known.*
- ***Dangerous products of decomposition:*** *No dangerous decomposition products known.*

11 Toxicological information

- ***Acute toxicity:***
- ***Primary irritant effect:***
- ***on the skin:*** *No irritant effect.*
- ***on the eye:*** *No irritating effect.*
- ***Sensitization:*** *No sensitizing effects known.*
- ***Additional toxicological information:***
  When used and handled according to specifications, the product does not have any harmful effects according to our experience and the information provided to us.
  The substance is not subject to classification.

12 Ecological information

- ***General notes:*** *Not known to be hazardous to water.*

13 Disposal considerations

- ***Product:***
- ***Recommendation:*** *Smaller quantities can be disposed of with household waste.*

- ***Uncleaned packagings:***
- ***Recommendation:*** *Disposal must be made according to official regulations.*

14 Transport information

- ***Maritime transport IMDG:***
- ***Marine pollutant:*** *No*

15 Regulations

- ***Sara***
- ***Section 355 (extremely hazardous substances):***
  Substance is not listed.
- ***Section 313 (Specific toxic chemical listings):***
  Substance is not listed.
- ***TSCA (Toxic Substances Control Act):***
  Substance is listed.

(Contd. on page 4)

Trade name: Phosphate Buffer

(Contd. of page 3)

· **Proposition 65**

· **Chemicals known to cause cancer:**

Substance is not listed.

· **Chemicals known to cause reproductive toxicity:**

Substance is not listed.

· **Product related hazard informations:**
The substance is not subject to classification according to the sources of literature known to us.
Observe the general safety regulations when handling chemicals.

· **National regulations:**

· **Classification according to VbF:** Void

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Department issuing MSDS:** Environment protection department.
· **Contact:** Mrs. Sherri Riley

Material Safety Data Sheet

Section 1. Product and Company Identification

Product Name Sodium Thiosulphate 0.0250N

Product Code VW3227

Manufacturer EMD Chemicals Inc.
P.O. Box 70
480 Democrat Road
Gibbstown, NJ 08027
Prior to January 1, 2003 EMD Chemicals Inc. was
EM Industries, Inc. or EM Science, Division of
EM Industries, Inc.

Effective Date **3/4/2003**

For More Information Call
856−423−6300 Technical Service
Monday−Friday: 8:00 AM − 5:00 PM

In Case of Emergency Call
800−424−9300 CHEMTREC (USA)
613−996−6666 CANUTEC (Canada)
24 Hours/Day: 7 Days/Week

Synonym None.

Material Uses Laboratory Reagent

Chemical Family Mixture.

Section 2. Composition and Information on Ingredients

Component	**CAS #**	**% by Weight**
SODIUM THIOSULFATE	10102−17−7	
SODIUM HYDROXIDE	1310−73−2	
Water	7732−18−5	>99

Section 3. Hazards Identification

Physical State and Appearance Liquid.

Emergency Overview CAUTION !
Handle in accordance with good laboratory, industrial hygiene and safety practices.However, in light of good industrial hygiene, exposure to any chemical should be kept to a minimum.
WARNING: This product contains a chemical(s) known to the State of California to cause cancer.

Routes of Entry Inhalation.

Potential Acute Health Effects

Eyes No known acute effects of this product resulting from eye contact.

Skin No known effect on skin contact; rinse with water for a few minutes.

Inhalation No known acute effects of this product resulting from inhalation.

Ingestion No known acute effects of this product resulting from ingestion. Ingestion of large amounts may be hazardous.

Potential Chronic Health Effects

Carcinogenic Effects This material is not known to cause cancer in animals or humans.

Additional information See Toxicological Information (section 11)

Medical Conditions Aggravated by Overexposure:	Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4. First Aid Measures

Eye Contact	Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.
Skin Contact	In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.
Inhalation	If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion	Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Section 5. Fire Fighting Measures

Flammability of the Product	May be combustible at high temperature.
Auto−ignition Temperature	Not available.
Flash Points	Not available.
Flammable Limits	Not available.
Products of Combustion	Not applicable.
Fire Hazards in Presence of Various Substances	Not available.
Explosion Hazards in Presence of Various Substances	**Risks of explosion of the product in presence of static discharge:** No. **Risks of explosion of the product in presence of mechanical impact:** No.
Fire Fighting Media and Instructions	SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.
Protective Clothing (Fire)	Be sure to use an approved/certified respirator or equivalent.
Special Remarks on Fire Hazards	Not available.
Special Remarks on Explosion Hazards	Not available.

Section 6. Accidental Release Measures

Small Spill and Leak	Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.
Large Spill and Leak	Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.
Spill Kit	No specific spill kit required for this product.

Information

Section 7. Handling and Storage

Handling	Avoid breathing vapors or spray mists.
Storage	Keep container tightly closed. Keep container in a cool, well−ventilated area.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective occupational exposure limits. Ensure that eyewash stations and safety showers are proximal to the work−station location.
Personal Protection	
Eyes	Splash goggles.
Body	Lab coat.
Respiratory	Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Hands	Gloves.
Feet	Not applicable.
Protective Clothing (Pictograms)	
Personal Protection in Case of a Large Spill	Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self−contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Product Name	**Exposure Limits**
SODIUM THIOSULFATE	Not available.
SODIUM HYDROXIDE	**ACGIH (United States).** CEIL: 2 mg/m3 **OSHA (United States).** CEIL: 2 mg/m3 **AUVA (Austria, 1995).** Spitzenbegrenzung: 4 mg/m3 8 times per shift, Period: 5 minute(s). TWA: 2 mg/m3 **Belgium Minister of Labour (Belgium, 1998).** CEIL: 2 mg/m3 VL: 2 mg/m3 **BAUA (Germany, 1997).** Spitzenbegrenzung: 2 mg/m3 MAK: 2 mg/m3 **DK−Arbejdstylsinet (Denmark, 1996).** Loftværdi: 2 mg/m3 GV: 2 mg/m3 **Tyterveyslaitos (Finland, 1998).** TWA: 2 mg/m3 **INRS (France, 1996).** VME: 2 mg/m3 **National Authority for Occupational Safety/Health (Ireland, 1999).**

	STEL: 2 mg/m3 **Arbeidsinspectie (Netherlands, 1999).** MAC−C: 2 mg/m3 TGG 8 uur: 2 mg/m3 **N−Arbeidstylsinet (Norway, 1996).** AN: 2 mg/m3 **AFS (Sweden, 1996).** KTV: 2 mg/m3 **EH40−OES (United Kingdom (UK), 1997).** STEL: 2 mg/m3 **NIOSH REL (United States, 1994).** CEIL: 2 mg/m3 **OSHA Final Rule (United States, 1989).** CEIL: 2 mg/m3
Water	Not available.

Section 9. Physical and Chemical Properties

Odor	Odorless.
Color	Clear. Colorless.
Physical State and Appearance	Liquid.
Molecular Weight	Not applicable.
Molecular Formula	Not applicable.
pH	Not available.
Boiling/Condensation Point	The lowest known value is 99.9°C (211.8°F) (Water).
Melting/Freezing Point	May start to solidify at −0.1°C (31.8°F) based on data for: Water.
Specific Gravity	Not available.
Vapor Pressure	Not available.
Vapor Density	Not available.
Odor Threshold	Not available.
Evaporation Rate	0.36 (Water) compared to (n−BUTYL ACETATE=1)
LogKow	Not available.
Solubility	Soluble in water.

Section 10. Stability and Reactivity

Stability and Reactivity	The product is stable.
Conditions of Instability	Not available.
Incompatibility with Various Substances	Not available.
Rem/Incompatibility	Not available.
Hazardous Decomposition Products	Not available.
Hazardous Polymerization	Will not occur.

Section 11. Toxicological Information

RTECS Number:		
	Sodium Thiosulfate	WE6660000
	Sodium Hydroxide	WB4900000
	Water	ZC0110000

Toxicity	LD50: Not available. LC50: Not available.
Chronic Effects on Humans	Not available.
Acute Effects on Humans	Not available.
Synergetic Products (Toxicologically)	Not available.
Irritancy	Draize Test: Not available.
Sensitization	Not available.
Carcinogenic Effects	This material is not known to cause cancer in animals or humans.
Toxicity to Reproductive System	Not available.
Teratogenic Effects	Not available.
Mutagenic Effects	Not available.

Section 12. Ecological Information

Ecotoxicity	Not available.
BOD5 and COD	Not available.
Toxicity of the Products of Biodegradation	The product itself and its products of degradation are not toxic.

Section 13. Disposal Considerations

EPA Waste Number	Not available.
Treatment	Material does not have an EPA Waste number and is not a listed waste, however consultation with a permitted waste disposal site (TSD) should be accomplished. ALWAYS CONTACT A PERMITTED WASTE DISPOSER (TSD) TO ASSURE COMPLIANCE WITH ALL CURRENT LOCAL, STATE AND FEDERAL REGULATIONS.

Section 14. Transport Information

DOT Classification	Not available.
TDG Classification	Not available.
IMO/IMDG Classification	Not available.
ICAO/IATA Classification	Not available.

Section 15. Regulatory Information

U.S. Federal Regulations

TSCA 8(b) inventory: SODIUM THIOSULFATE ; SODIUM HYDROXIDE; Water

SARA 302/304/311/312 extremely hazardous substances: No products were found.

SARA 302/304 emergency planning and notification: No products were found.

SARA 302/304/311/312 hazardous chemicals: SODIUM THIOSULFATE ; SODIUM HYDROXIDE

SARA 311/312 MSDS distribution − chemical inventory − hazard identification: SODIUM THIOSULFATE : Immediate (Acute) Health Hazard; SODIUM HYDROXIDE: Immediate (Acute) Health Hazard

SARA 313 toxic chemical notification and release reporting: No products were found.

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: SODIUM HYDROXIDE

Clean air act (CAA) 112 accidental release prevention: No products were found.

Clean air act (CAA) 112 regulated flammable substances: No products were found.

Clean air act (CAA) 112 regulated toxic substances: No products were found.

WHMIS (Canada)

Class D−2A: Material causing other toxic effects (VERY TOXIC).

CEPA DSL: SODIUM HYDROXIDE; Water

This product has been classiifed in accordance with the hazard criteria of the Controlled Product Regulations and the MSDS contains all required information.

International Regulations

EINECS

SODIUM THIOSULFATE 231−867−5

SODIUM HYDROXIDE 215−185−5

Water 231−791−2

DSCL (EEC)

This product is not classified according to the EU regulations.

International Lists

Australia (NICNAS): SODIUM THIOSULFATE ; SODIUM HYDROXIDE; Water

Japan (MITI): SODIUM THIOSULFATE ; SODIUM HYDROXIDE; Water

Korea (TCCL): SODIUM HYDROXIDE; Water

Philippines (RA6969): SODIUM THIOSULFATE ; SODIUM HYDROXIDE; Water

China: No products were found.

State Regulations

Pennsylvania RTK: SODIUM HYDROXIDE: (environmental hazard, generic environmental hazard)

Massachusetts RTK: SODIUM HYDROXIDE

New Jersey: Sodium Thiosulphate 0.0250N

California prop. 65: No products were found.

Section 16. Other Information

National Fire Protection Association (U.S.A.)

0 **0**

Health **1**

Fire Hazard

Reactivity

Specific Hazard

Changed Since Last Revision +

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