
WAKE: Water Awareness in the Kennebec Estuary
Estuary Water Monitoring Project

2017



Volunteer Manual

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Contact Information

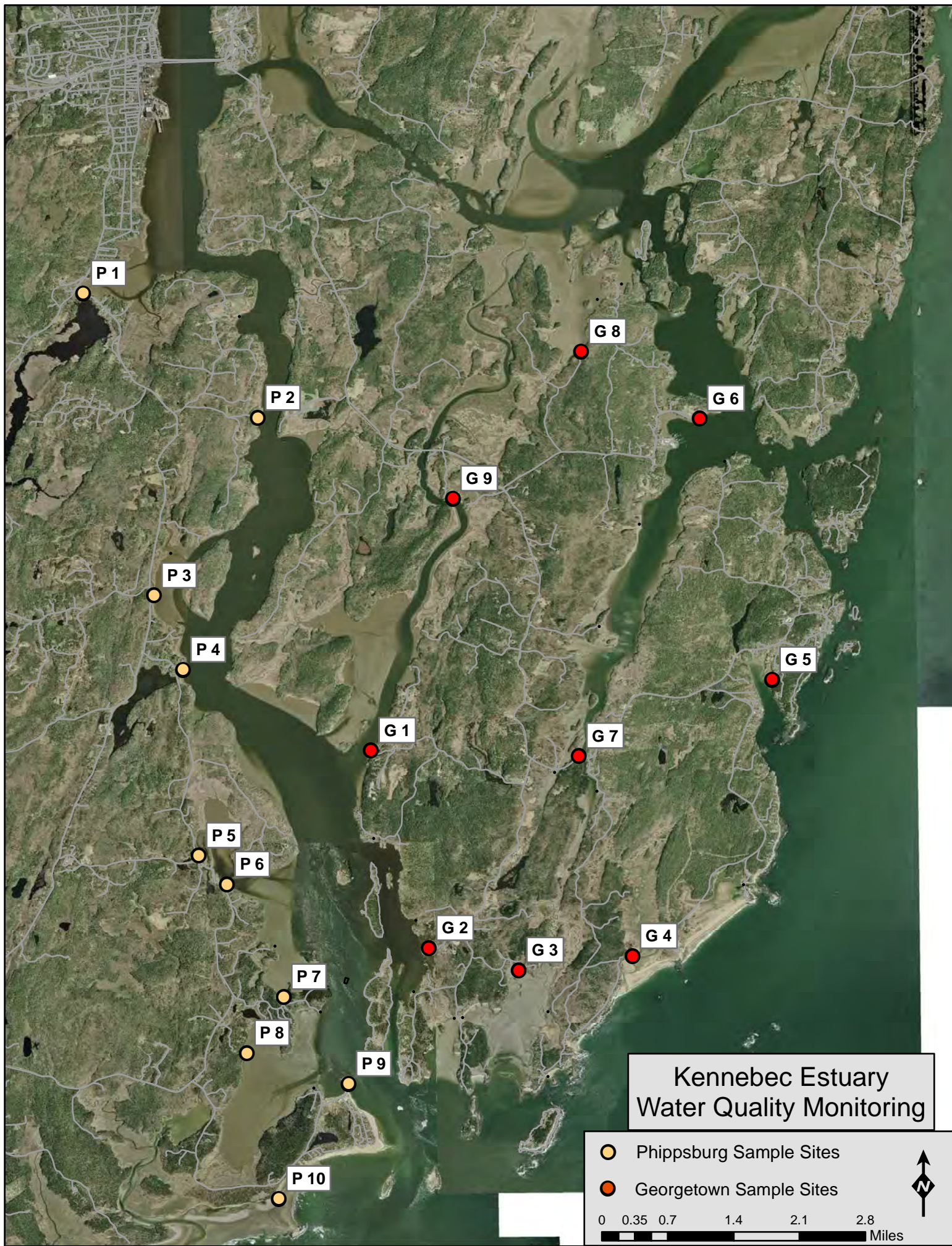
Ruth Indrick

- rindrick@kennebecestuary.org
- (207) 442-8400

During Sampling:

- Cell Phone: (315) 415-4160
- Sometimes, phone reception is a bit dicey. If I don't answer my cell phone, please call the Georgetown Town Hall if sampling is taking place in Georgetown at: (207) 371-2820 or the Phippsburg Town Hall if sampling is taking place in Phippsburg at: 207-389-2653.
- If I am not running around getting samples, I will be at the Town Hall, so you can stop by with questions.

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Sampling Equipment List

- 1 clipboard with plastic pocket on back that includes:
 - 1 3 pages of sampling directions on rite-in-the-rain paper
 - 1 Beaufort wind scale sheet on rite-in-the-rain paper
- 1 water sampling data sheet on rite-in-the-rain paper
- 1 5 gallon bucket
- 1 Toolbox

In top compartments of toolbox:

- 1 bag of gloves
- 1 thermometer in case, attached to string and clothespin and another clothespin
- 1 round Brunton compass and piece of string
- 1 Hanna pH meter
- 1 plastic bag for used gloves
- 1 pen

Inside the toolbox:

- 1 1000 mL plastic water bottle
 - 1 250 mL water bottle with spray top, filled with distilled water
 - 1 box of Kim wipes
 - 1 blue case with Winkler titration kit
 - 30 mL sulfuric acid 1:1
 - 30 mL manganous sulfate solution
 - 30 mL alkaline potassium iodide azide
 - 60 mL sodium thiosulfate, 0.025N
 - 30 mL starch indicator solution
 - 1 direct reading titrator, 0-10 range
 - 1 25 mL glass beaker, with cap
 - 1 25 mL plastic graduated cylinder
 - 1 paint chip card, pale yellow
 - 3 60mL glass bottles
 - 1 round plastic waste bottle, 500mL
 - 1 pair of goggles
- optional: 1 Secci disk

Phippsburg Sampling Dates and Tides (2017)

Weekday	Month	Day	High Tide	Start Time
Tuesday	May	9	11:25	10:00
Tuesday	May	23	9:34	9:00
Tuesday	June	6	10:15	9:00
Tuesday	June	20	8:07	8:00
Friday	July	7	11:14	10:00
Tuesday	July	18	6:40	8:00
Tuesday	August	1	7:15	8:00
Wednesday	August	16	6:24	7:45
Tuesday	September	5	11:26	10:00
Tuesday	September	19	11:17	10:00
Tuesday	October	3	10:07	9:00
Tuesday	October	17	10:11	9:00
Tuesday	October	31	8:38	8:00

Weekday	Month	Day	High Tide	Start Time
Friday	August	18	8:38	8:00

or

Sampling Day Agenda

- Sampling will take place on Tuesdays in Phippsburg.
- If you are sick and unable to sample, please contact Ruth Indrick as soon as possible.
- Ruth will email a day or two before the sampling to verify the time that she will be at the Town Hall.

On the day of sampling:

- Ruth will be at the Town Hall at the scheduled start time.
- Stop by the Town Hall to pick up your sampling supplies and data sheets.
- Drive out to your site. Find a safe spot for your toolbox, and follow the Sampling Procedure directions. Be careful around slippery rocks covered in seaweed and algae.
- Return to the Town Hall with all of your supplies when you are done sampling.

Field Water Sampling Procedure
Coastal Volunteer Water Sampling Program

1. Recording site and date information

- a) Record the **Site #**, short **Site Location Description**, **Town**, **Date**, **Start Time**, and **name(s) of Sampler(s)** (Please list everyone participating in the sampling)

2. Observations About Weather Conditions, Tide, Air Temperature, and Wind Direction

- a) Observe and circle the **% Cloud Cover** (0%=0 cloud cover, 25%=0-25% cloud cover, 50%=25-50% cloud cover, 75%=50-75% cloud cover, 100%=75-100% cloud cover). Record the **Precipitation** (whether or not it is currently raining) on the data sheet. Use the Beaufort wind scale to determine the wind speed, and record the **Beaufort Number**. A copy of the Beaufort wind scale is included on the clipboard.
- b) Observe the water at your site and record if the **Tide** is coming in, going out, or slack at high tide. If you are unable to tell, leave the tide section blank.
- Incoming: Water is flowing upriver, upstream, or toward the shore; sand and rocks above the water level are dry
 - Outgoing: Water is flowing downriver, downstream, or toward the ocean; sand and rocks above the water level are wet
 - Slack: Water appears still; sand and rocks above the water level are dry
- c) Take the thermometer out of the toolbox and let it hang out of direct sun. Wait to record air temperature until step 9.
- The toolboxes are often warmer than the air, so waiting to record temperature will give the thermometer time to equilibrate with the outside air. You can clip your thermometer to the toolbox handle to let it hang in the shade behind the box while you go on to the next few steps.
 - Make sure the thermometer is dry for the air temperature measurement. (If it is raining, don't worry about it, but do try to keep your wet thermometer out of the wind.)
- d) Using the string and compass, determine which direction the wind is blowing from. Circle the **Wind Direction** on the data sheet.

2. Observations About Conditions at the Site

- a) Check off any conditions you observe in the **Observations** section.
- b) In the **Descriptions** section, record information about the observations, precipitation, and tide.
- Descriptions of precipitation could include: fog, sprinkle, light rain, downpour
 - Descriptions of tide could include: tide noticeably higher than usual at the site, tide noticeably lower than usual at the site
 - Descriptions of observations could include: fish- type, number, alive, dead, size; crabs- type, number, alive, dead, size; birds- type, number, on water or on land; animals- type, number, on water or on land; boats- approximate size, number, moorings present or absent; odd color- color of the water if not clear, sediment in the water turning it brown and turbid, oily sheen on top of water; debris- type and amount of trash, loose seaweed, or marine debris; waves- wave intensity (small ripples, glassy crests, whitecaps) angle of waves; other- animal or bird feces, anything else interesting at site

Field Water Sampling Procedure
Coastal Volunteer Water Sampling Program

3. Rinse and Fill Bucket

- a) A few yards away from your sample site, where the water won't flow into your site, fill and empty your bucket 3 times to rinse it.
- b) Bring the bucket to your site and dip the bucket gently underwater until the bucket is submerged.
 - Be careful to avoid splashing the water around; splashing and shaking the water in the bucket can increase the dissolved oxygen content of the water and lead to the test showing a higher value than is actually there. In shallow water, be careful to avoid disturbing the bottom while collecting the sample. Try to dip the entire bucket under the water instead of skimming water off the surface. You can use the rope to send the bucket into deeper water if needed. Sample in at least 10 inches of water.
 - We are using the bucket in order to get a mix of water from both the surface and deeper in the water column.
- c) Pull the bucket out by the handle and carry it gently to the shore.
- d) If possible, put the full bucket somewhere it is not in direct wind or sun.

4. Preparation for Testing Water Temperature and pH

- a) Water temperature and pH will be tested using a Hanna pH meter. Check the Datasheet to make sure the **pH Meter Calibration** was completed earlier in the day.
- b) Take the bottom black cap off of the pH meter. Briefly rinse the meter by pouring water out of the hole in the side of the bucket.
- c) Turn on the pH meter using the "MODE" button.
- d) Clip one clothespin to the side of the bucket and lean the bucket handle against it so it stands upright.
- e) Using the string, clothespin, and clip on the back of the meter, hang the meter from the handle of the bucket. Let the meter sit in the bucket to equilibrate and stabilize (3-5 minutes).

5. Collect and Fix Samples for Dissolved Oxygen

- **Put on your gloves and goggles.**
- Repeat steps a) and b) for each glass bottle.
 - a) Pouring water out of the hole in the side of the bucket, fill and empty the 60 mL glass bottle and cap 3 times to rinse, pouring the water from the bottle into the cap to rinse the cap. Rinse the outside of the glass bottle as well by pouring water over it.
 - b) To fill the bottle, screw the cap on and submerge the closed bottle in the bucket. Unscrew the cap and let the bottle fill underwater. Turn the bottle vertical and upright so all the air leaves the bottle. Tap the side of the bottle with the cap to dislodge any air bubbles. Put the cap on while the bottle is underwater. When you remove the bottle from the water, check to make sure that there are no air bubbles left in it.
- Uncap all 3 bottles:

Field Water Sampling Procedure
Coastal Volunteer Water Sampling Program

- c) Add 8 drops of manganous sulfate solution (#1) to each bottle. Make sure this is the 1st solution added. Add the drops carefully so there is little splashing, and make sure the top of the dropper doesn't touch the sample. Put the caps on and invert the bottles a few times to mix.
- d) Uncap all 3 bottles. Add 8 drops of alkaline potassium iodide azide (#2) to each bottle. Add the drops carefully so there is little splashing, and make sure the top of the dropper doesn't touch the sample. Cap the bottles carefully.
- e) Invert each of the bottles several times to mix. A precipitate, white-brown in color, will form.
- f) Place the bottles in their spaces in the tool box.
- g) Dispose of your gloves in the waste plastic bag, and take off your goggles.

6. Testing Water Temperature and pH

- a) With the pH meter immersed in the water, read and **record the pH measurement** (the top number), and read and **record the Water Temperature** (bottom number).
- b) Put the bottom cap firmly on the pH meter, and return it to the toolbox.

8. (OPTION 1) Collect Sample for Salinity (Do this if you have a salinity sample bottle)

- a) Pouring the water out of the hole in the side of the bucket, fill and empty the 1000mL bottle (the larger bottle) 3 times, emptying the bottle into the cap to rinse the bottle and cap.
- b) Fill the bottle the 4th time, screw on the cap, and place the bottle into the toolbox. **Circle 'Bottle' to show that the salinity sample was collected.**

8. (OPTION 2) Determine the salinity by measuring and recording the specific gravity (Do this if you have a hydrometer)

- a) Pouring the water out of the hole in the side of the bucket, fill and empty the 500mL clear graduated cylinder 3 times. Fill it the 4th time, and then find a relatively flat and stable place to put it down.
 - 1. Because you are now done with the water in the bucket, you could empty your bucket, flip it over, and place the graduated cylinder on the flat bottom of the bucket.
- b) Pick up your hydrometer and remove it from the case. Wipe it off with a kim wipe to clean up any fingerprints, salt, or dirt. Place it in the water in the cylinder. When it stops bobbing up and down, determine the specific gravity to the nearest 0.0005 units.
 - 1. (If it reads 8.0, the number would be 1.0085; if it reads 20.5, the number would be 1.0205)
 - 2. The **1.0** will already be on your datasheet. **Record the specific gravity** that you measured in the box labeled '**Salinity**' with the '**SpGr**' units **using the remaining three numbers** (ex. 085 or 205)
- c) On the datasheet, **Circle 'Hydrometer'** to show the method you used to measure salinity.

9. Air Temperature

- a) Read the thermometer and record the **Air Temperature** in °C on the data sheet.

NOTE: All the work that needs to be completed in the field is done. The remainder of this process can be completed in the Town Office.

Secchi Disk Procedure
Coastal Volunteer Water Sampling Program

(This Measurement is Only Completed at Sites with a Dock or a Bridge.)

1. Measuring Water Transparency

- a) Stand at the edge of the water at your dock or bridge site with your back to the sun. Do not wear sunglasses.
- b) Slowly unroll the rope and lower your Secchi disk into the water. Lower the Secchi disk until it just barely disappears from sight. Record the **Depth Disk Disappears** to the nearest 0.1 meter.
- c) Lower the disk further, until it completely disappears. Slowly raise it until it just begins to reappear. Record the **Depth Disk Reappears** to the nearest 0.1 meter.

Salinity Procedure if Measuring Salinity from a Bottle at the Town Office
Coastal Volunteer Water Sampling Program

(This Measurement is Only Completed if You Collect Your Sample in a Bottle in the Field)

1. Determine the salinity by measuring and recording the specific gravity

- a) Using only 1/2 of the water in your 1L sample bottle, rinse the graduated cylinder 3 times. Empty the rinse water into a bucket.
 1. Use the remaining water in the bottle to fill the graduated cylinder.
- b) Pick up your hydrometer and remove it from the case. Wipe it off with a kim wipe to clean up any fingerprints, salt, or dirt. Place it in the water in the cylinder. When it stops bobbing up and down, determine the specific gravity to the nearest 0.0005 units.
 1. (If it reads 8.0, the number would be 1.0085; if it reads 20.5, the number would be 1.0205)
 2. The **1.0** will already be on your datasheet. **Record the specific gravity** that you measured in the box labeled '**Salinity**' with the '**SpGr**' units **using the remaining three numbers** (ex. 085 or 205)
- c) Place the thermometer in the graduated cylinder. Let it sit for 2 to 3 minutes.
 1. Record the **Temperature**. Record the **Time**.

Indoor Water Sampling Procedure
Coastal Volunteer Water Sampling Program

At the Town Office:

- If you completed the field sampling but **will not** be completing the DO analysis for your site, **sign the Sampler Signature and record the Time**. Leave Water Samples, Clipboards, Buckets, and Sampling Kits at the Town Office.
- If you completed the field sampling and **will** be completing the DO analysis, **continue on to Step 9**.

9. Analyze Sample for Dissolved Oxygen

- **Make sure you have on your gloves and goggles.**
- The oxygen is fixed, so you no longer need to worry about adding oxygen to the sample.

Complete this step for each of the 3 bottles:

a) Mix the bottles a second time

Details: When 1/3 of the glass bottle is clear, invert the bottle several times to mix the water. Then wait to allow the precipitate to settle out again so at least 1/3 of the bottle is clear.

Complete this step for each of the 3 bottles:

b) After precipitate settles, add sulfuric acid (#3) and shake to dissolve

Details: Once the precipitate has settled out for the 2nd time, add 8 drops of sulfuric acid (#3). Put the cap on the bottle and invert it quickly several times to mix well until the precipitate dissolves. If the precipitate is not dissolving well and remains behind as brown floating particles, 1 extra drop of the acid can be added. Invert the bottle quickly several times to mix well after adding. If the precipitate refuses to dissolve, a maximum of 4 additional drops (after the 8) can be added. Be sure to close and shake the bottle well after each drop is added.

Using the 1st sample bottle:

c) Rinse the graduated cylinder and beaker

Details: Rinse the 25 mL plastic graduated cylinder 3 times with small amounts of the mixed solution from the yellow sample bottle. Rinse the 25 mL glass beaker 3 times with small amounts of the mixed solution from the yellow sample bottle. Be sure to use less than half the solution in the bottle for rinsing. **Empty the liquid used for rinsing into the Waste liquid bottle.**

d) Measure out sample

Details: Measure 20 mL of sample in the plastic graduated cylinder. Pour the measured liquid into the glass beaker and put the cap on.

e) Measure out sodium thiosulfate (#4)

Details: Measure out sodium thiosulfate solution (#4) using the titrator (looks like a syringe without a point). To do this, insert the tip of the titrator into the plastic fitting on the sodium thiosulfate solution bottle (#4). Turn the bottle upside down with the titrator stuck in the cover, and make sure the green plunger on the titrator is pushed in all the way. Withdraw the plunger slowly toward the 9 mark. Inspect the titrator for air bubbles at or around the top of the plunger. If there are bubbles, compress the plunger again. You may need to pump it in and out a few times to get it to work without any air bubbles. When there are no bubbles, fill the titrator with the sodium thiosulfate solution until the bottom edge of the plunger (the part that fits snug against the tube) is at the '0' mark.

Indoor Water Sampling Procedure
Coastal Volunteer Water Sampling Program

- If air bubbles appear once the titrator is almost full, **empty it into the Waste liquid bottle** until the bubbles are gone, then continue to fill it. Do not put the liquid back into the sodium thiosulfate bottle as this will contaminate the bottle.

Once the titrator is full, flip the sodium thiosulfate bottle upright, and remove the titrator from the bottle.

f) Titrate to pale yellow

Details: Attach the full titrator to the hole in the glass beaker cap. Add the sodium thiosulfate one drop at a time, swirling the beaker (with titrator attached) after each drop is added. Add the drops one at a time until the color of the yellow-brown solution begins to fade to a straw or pale yellow color. If in doubt when to end this step, it is better to do it earlier than too late.

g) Add starch (#5)

Details: Take off the beaker cap and attached titrator, being careful to avoid changing the position of the plunger or shaking loose any of the liquid. Add 8 drops of the starch indicator (#5) to the beaker. The solution should turn dark blue.

h) Titrate until blue disappears

Details: Replace the cap and the titrator carefully on the beaker and swirl the solution. Continue depressing the titrator and adding the sodium thiosulfate solution one drop at a time, swirling after each addition. Stop titrating when the solution turns from blue to clear and stays clear even after swirled. Hold the solution against white paper to check the color.

- Note: If you need to use a lot of sodium thiosulfate because there is a lot of oxygen in the sample: the titrator should not be completely emptied into the sample. Compress the plunger only until the green rubber plunger reaches the 10 unit line on the titrator. You can then refill the plunger following the steps in 9.e). Continue titrating until the blue color disappears. To get the final DO measurement, add 10mL to number you record from the titrator.

i) Record results

Details: The number you will record is the number at the place on the titrator where the flat green plunger fits snug to the clear tube. Record the units of sodium thiosulfate used to the nearest 0.1 unit for **Dissolved Oxygen** on the data sheet. These units are equivalent to the mg/L of dissolved oxygen.

j) Empty and rinse the beaker

Details: **Empty the glass beaker into the Waste liquid bottle.** Rinse the glass beaker with distilled water and **empty the rinse liquid into the Waste liquid bottle.**

k) Repeat steps c) through j)

Details: Complete steps 9.c) through 9.j) with the second bottle. If the two samples **are more** than 0.6 mg/L different, complete steps 9.c) through 9.j) with the third bottle. If the two samples **are less** than 0.6 mg/L different, you do not need to analyze the third bottle.

l) Empty the titrator and sample bottles

Details: When you are done analyzing all samples, **empty the leftover sodium thiosulfate in the titrator and the remaining liquid in the sample bottles into the Waste liquid bottle.**

Indoor Water Sampling Procedure
Coastal Volunteer Water Sampling Program

m) Rinse sample bottles

Details: Rinse the bottles and caps with distilled water, and **empty the rinse liquid into the Waste liquid bottle**. Make sure the titrator is empty.

n) Dry equipment

Details: Dry the items with Kim wipes, and replace them in the blue box.

o) Dispose of gloves

Details: Turn your gloves inside out and dispose of your gloves in the bag for waste gloves.

10. Finishing Up:

- a) Leave your salinity sample in your toolbox.
- b) Dry the equipment in your toolbox.
- c) Note concerns or comments about anything that happened during the sampling or about the condition of any of the supplies in the **Comments** section.
- d) **Sign the DO Signature space and write the Time** on your data sheets. Hand them over to Ruth or the Lead Volunteer.

11. Leave Water Samples, Clipboards, Buckets, and Sampling Kits at the Town Office

Weather Conditions

Why Record the Weather?

Weather has the potential to cause variations in the conditions we observe while sampling. We might see slightly low dissolved oxygen conditions but realize that the day was overcast so less photosynthesis was happening. Maybe one day the salinity will show up a bit low, but we can use the weather information to tie it to a heavy rainfall.

The weather conditions that you record at your site form the foundation of all your other sampling day tests.

The weather conditions we are recording include air temperature, wind direction, wind speed (based on the Beaufort scale), % cloud cover, and precipitation. We are also recording the status of the tide.

Water Temperature

Why Test Temperature?

Temperature is an important characteristic of the water to test for both its direct and indirect impacts on marine life.

On their own, temperature measurements can give valuable information about the conditions at a sample site. Understanding the rate that water warms up in the spring and summer and cools down in the fall can help to define characteristics of an area. Organisms are adapted to live at certain ranges of temperature at certain times of year and can be stressed when the temperature goes outside of its typical range. Eggs and juvenile fish are particularly sensitive to temperature. Temperature measurements can also reveal potential impacts from fresh water sources or offshore sources of water when tied in with salinity information.

Temperature's relationship to pH, dissolved oxygen, water density, and the metabolic rates of organisms makes it essential that temperature is tested at the same time as any of these other characteristics.

Testing Temperature

Water temperature will be tested using a Hanna pH meter. This meter has an electric thermistor that measures temperature. It gives a digital readout of the temperature to the nearest 0.1 degrees Celsius.

Salinity

What Can Salinity Measurements Tell Us?

The Kennebec Estuary is a huge mixing place of fresh water, from rivers and from the land's surface, and salt water, from the ocean. Salinity measurements are key to identifying where the water at each site is coming from. Water with low salinity suggests that there is a large impact from the Kennebec River or Sheepscot River. Water running off of the land's surface in local towns after rainstorms can also cause the salinity to be low. High salinity water suggests that the impact is from offshore and tidal areas. Salinity at some of the sites is very tidally dependent. As we test other characteristics, including pH, water clarity, and DO, salinity measurements can help us to understand the sources of differences we may note.

Testing for Salinity

Salinity will be tested using a hydrometer. Because salinity is a very stable water characteristic, samples will be collected in the field in 1 L bottles and brought back to the Town Office for analysis.

Water Clarity

Why Measure Water Clarity?

Water clarity, or transparency, has a large impact on organisms living in the water. The more clear the water, the more sunlight can penetrate the water and reach plants under the surface. The more sunlight plants have access to, the more they can photosynthesize and produce oxygen, raising the amount of DO in the water.

There are two main sources of the cloudiness (which can also be called turbidity) we might observe in the water: suspended sediment or algae. Large amounts of suspended sediment are frequently found during windy weather or after a storm. Large amounts of algae may indicate that there are sources of nutrients in the area that are causing the plants to grow very well. These nutrients can come from onshore sources, like fertilizers or animal waste.

Testing for Water Clarity

A Secchi disk will be used to measure water clarity. This will only be measured at sites where there is a dock or a bridge, because deep water is needed for the Secchi disk method. The Secchi disk is lowered into the water to the depth where the disk is first no longer visible. This depth indicates the degree of water clarity. Lowering and raising the disk from visible to invisible can help to refine that depth. To help with getting accurate measurements, the disk is lowered until it first disappears, and that depth is noted. The disk is then lowered deeper and slowly raised until it reappears, and that depth is noted as well. These two values will eventually be averaged to give the best measurement of the degree of water clarity for the site.

Dissolved Oxygen

What is Dissolved Oxygen?

Dissolved oxygen (DO) is all of the oxygen gas that is floating around in the water. It is essential for marine fish, mammals, plants, and other organisms to breathe. If the concentration of oxygen drops to between 3 to 5 mg/L, marine organisms are stressed. If the amount of oxygen drops below 3 mg/L, fish and other marine organisms can die.

What Factors Impact the Amount of Dissolved Oxygen?

Dissolved oxygen enters the water through three primary methods: exchange with the air along the water's surface, the release of oxygen through photosynthesis of marine plants, algae and phytoplankton, and by splashing and waves that mix air with the water.

The temperature of the water, salinity, water clarity, and the amount of organisms using the oxygen can change the amount of DO in the water. Cold water has the ability to hold more gasses than warm water. That is why cold soda is fizzier than warm soda. High water temperatures can result in low DO levels. Salinity has a similar relationship to DO. The higher the salinity, the less oxygen the water is able to hold.

Impacts of Salinity and Temperature on the Amount of Dissolved Oxygen that Water Can Hold

TEMPERATURE	SALINITY			
	fresh water 0 ppt	brackish water 5 ppt	outer Bay 32 ppt	open ocean 35 ppt
0	14.6	14.1	11.6	11.3
5	12.8	12.4	10.3	10.1
10	11.3	11.0	9.2	9.0
15	10.2	9.9	8.4	8.3
20	9.2	9.0	7.6	7.5
25	8.4	8.2	7.0	6.9
30	7.6	7.4	6.2	6.1

Potential dissolved oxygen levels in milligrams per liter (mg/l) at sea level

Water clarity relates to the amount of dissolved oxygen due to the impact it has on plants and algae. Clear water allows in the most sunlight, so plants are able to complete more photosynthesis and release more oxygen into the water. Less clear water blocks the sunlight, limiting the amount that plants can photosynthesize.

Organisms can also use up the oxygen in the water. It typically happens when there is an overpopulation of certain organisms and then a large die off of those organisms. Examples of this include a large fish kill

or excessive amounts of algae that die off at the end of the season. These dead organisms then begin to rot. This means that there are millions of bacteria living and breathing as they break down the remains of these organisms. The bacteria use large amounts of oxygen, resulting in low DO levels.

Because of the factors that impact dissolved oxygen, it changes throughout the day. Plants only photosynthesize during the day, so just before dawn dissolved oxygen levels are typically low. No photosynthesis has been happening all night, but organisms have still been breathing and using the oxygen. In the middle of the day, when the sun's rays are shining most directly on the plants and algae, the most oxygen is being produced.

In warm summer weather, the high amounts of oxygen in the middle of the day are tempered by the high temperatures in the middle of the day. The resulting increases in water temperature decrease the amount of available oxygen.

Testing Dissolved Oxygen

Our sampling takes place in the morning so that we can measure the DO when it is at its daily lower levels. We will be testing dissolved oxygen using the Winkler Titration method.

This Method is a two-part process. The first part 'fixes' the amount of oxygen in the water, preventing it from escaping or being added from the surrounding air so that the amount you measure is accurate for your sample site. To fix the oxygen, two solutions are added. They contain Mn^{+2} ions and OH^- ions that bond to form a white compound that settles to the bottom of the sample. All the dissolved oxygen in the water sample reacts with this white compound to form a new compound that is brown in color. The oxygen is then trapped in those compounds and can't escape into the air. A strong acid is then added that dissolves all of the compounds. At this point, the amount of oxygen in the sample is stable. As the compounds dissolve and form new chemicals, iodine (I_2) is released, two iodine molecules for each dissolved oxygen molecule that was in the water.

The second part of this process measures the amount of iodine (and the corresponding amount of oxygen). The iodine will have turned the sample a yellow/brown color. Into a measured amount of the treated sample (25mL), sodium thiosulfate ($Na_2S_2O_3$) is added in measured drops. The sodium thiosulfate bonds with the iodine to form new compounds, two sodium thiosulfates used for each iodine. This removes the iodine from solution and the yellow/brown color lightens. Before the iodine color disappears, a starch is added that is blue when iodine is in the sample, to make the color change easier to observe. When all the iodine is gone, the blue color will disappear. Because you will have measured how much sodium thiosulfate you used to make the iodine disappear, you will be able to figure out exactly how much oxygen was present in the water. The units on the titrator that is used to add the sodium thiosulfate are set up so that 1 unit on the titrator equals 1mg/L of dissolved oxygen.

pH

What is pH?

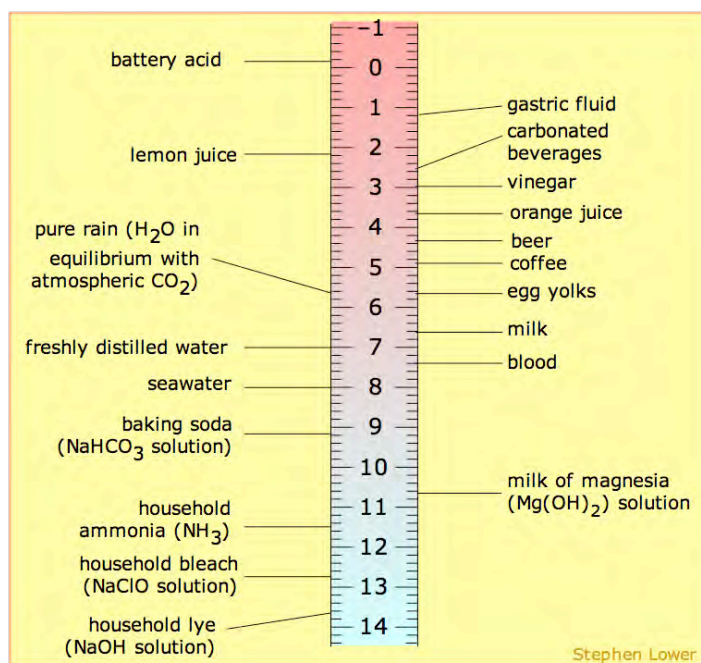
pH is a measurement of acidity, ranging on a scale from 1 to 14. Less than 7 is considered acidic, more than 7 is considered basic, and 7 is considered neutral.

What makes something acidic, basic, or neutral?

- The charged particles (ions) in the solution. The two key ions are H^+ and OH^- .
- When there is more H^+ , the solution is acidic (<7 on the pH scale).
- When there is more OH^- , the solution is basic (>7 on the pH scale).
- Pure water, H_2O , has an even number of H^+ and OH^- ions, so it is considered neutral and has a pH of 7.

Water found in nature, in streams, rain, groundwater, or the ocean, rarely has a pH of exactly 7. Gasses from the air, minerals from soil and rocks, or chemical inputs from human practices mix with the water and result in the water having either more H^+ ions or more OH^- ions.

pH in the World Around Us



Gasses like carbon dioxide (CO_2) or nitrogen dioxide (NO_2) cause the pH to decrease when they mix with water. The natural carbon dioxide in the atmosphere causes the average pH of rain water to be 5.6. As the amount of carbon dioxide in the atmosphere increases, this number will decrease. Acid rain, with a pH of 4 or less, occurs in areas where there are a large amount nitrogen dioxide and sulfur dioxide (SO_2) emissions, from power plants or car exhaust, that mix with the rain water.

Other compounds that have broken down from minerals in rocks can have the opposite impact, either increasing or helping to stabilize the pH. Two ions that are found in large amounts in ocean water are carbonate (CO_3^{2-}) and borate (H_2BO_3^-). These ions have a negative charge, so they can bond with positively charged hydrogen ions to form new compounds. This removes H^+ from solution and raises the pH (decreasing the acidity). They also bond with any new H^+ ions that are added to the water. This serves to buffer the water pH, so the concentration of H^+ stays constant, and the pH doesn't change.

Because of these compounds, the average pH of the ocean is fairly consistent throughout, ranging from 8.0 to 8.3. Ocean life is adapted to live at that pH level. Fresh water lakes usually have more variable and typically lower pH than the ocean because there are fewer mineral ions to buffer the water. Lakes and streams typically have pH values ranging from 6.5 to 8.0.

Carbonate plays another key role in the ocean. Many types of ocean life, from tiny single celled creatures to giant corals, shellfish, and some types of algae, take carbonate out of the water to make their shells. The carbonate bonds with calcium ions (Ca^{+2}) to form calcium carbonate (CaCO_3). In water with a low pH (high acidity), too much of the carbonate is already bonded to H^+ . It takes more energy for animals with shells to access that carbonate, so it is more difficult for them to make shells. If the pH drops too low, delicate calcium carbonate shells can begin to dissolve. The pH and the amount of available carbonate in the water only need to drop low enough that the water does not have an over-saturation of carbonate. Recent studies have shown that this can begin to happen at a pH of 7.5 in the ocean. Decreases in pH have the potential to harm Maine's shellfish populations.

Global and Local Changes in Ocean pH

The pH of the ocean as a whole is decreasing. This process, called ocean acidification, is happening because there are increasing amounts of CO_2 in the atmosphere. This CO_2 mixes with water in the ocean and in rain to form carbonic acid. Because there is such a large influx of CO_2 to the atmosphere, the ocean is unable to completely buffer this added acid. As a result, the pH of the oceans has decreased globally by 0.1 pH units, a 30% increase in H^+ concentration, over the past 100 years.

Although the ocean as a whole is not anywhere near the 7.5 level, there are several reasons that we may find pH values lower than the global average in the Kennebec Estuary. Because fresh water typically has a lower pH than ocean water, the mixing of Sheepscot and Kennebec River waters with ocean water in the estuary can lead to localized areas with lower pH values. Another potential reason the pH might be low is that inputs of nutrients from the surface of the land, from fertilizers and organic waste, can lead to blooms of algae. When these blooms die and rot, the rotting releases organic acids that can locally decrease the pH of an area. Areas with large amounts of rotting organic material from dead plants or animals also have high amounts of organic acids released during the decay of the organisms that decrease the pH.

Georgetown and Phippsburg Shellfish Committees have expressed interest in finding out more about the pH of Kennebec Estuary waters. Clam populations seem to be decreasing in some areas of town, and no one has yet identified the reason for those decreases.

Testing pH

We will be testing pH using a Hanna pH meter. The meters will be calibrated on each day of sampling before sampling starts to help keep the meter readings reliable.

The pH scale is not an arbitrary set of numbers; it is a precise measurement of the concentration of H^+ ions in solution. The smaller the number, the higher the amount of H^+ ions. The pH scale is a negative log scale, so each number smaller on the pH scale has 10 times as many H^+ ions in solution. The change of even a single pH unit means a large change in the concentration of H^+ ions and a large change in the acidity. A change of 0.1 on the pH scale is still a significant change in the amount of H^+ ions.

pH 1 1 H^+ for every 1 water molecule	pH 2 1 H^+ for every 10 water molecules	pH 3 1 H^+ for every 100 water molecules	pH 4 1 H^+ for every 1,000 water molecules	pH 5 1 H^+ for every 10,000 water molecules	pH 6 1 H^+ for every 100,000 water molecules	pH 7 1 H^+ for every 1,000,000 water molecules
pH 8 1 H^+ for every 10,000,000 water molecules	pH 9 1 H^+ for every 100,000,000 water molecules	pH 10 1 H^+ for every 1,000,000,000 water molecules	pH 11 1 H^+ for every 10,000,000,000 water molecules	pH 12 1 H^+ for every 100,000,000,000 water molecules	pH 13 1 H^+ for every 1,000,000,000,000 water molecules	pH 14 1 H^+ for every 10,000,000,000,000 water molecules

**Coastal Volunteer Water Quality Monitoring Program
2015 Datasheet**

Station #		Site Description		Town	
Date		Start Time			
Sampler(s)					

Weather Conditions

% Cloud Cover (circle) (0%=clear, 100%=all clouds)	0%	25%	50%	Precipitation Now (circle)	Yes / No
	75%	100%			
Wind Speed (Record Beaufort Number (1-12))			Tide (circle)	Incoming / Outgoing / Slack	
Direction Wind is Coming From (circle)	N NW W SW S SE E NE			Air Temperature	°C
Observations (within 100m)	<input type="checkbox"/> Jellyfish <input type="checkbox"/> Fish <input type="checkbox"/> Crabs <input type="checkbox"/> Birds <input type="checkbox"/> Animals <input type="checkbox"/> Boats <input type="checkbox"/> Odd Color <input type="checkbox"/> Debris <input type="checkbox"/> Waves <input type="checkbox"/> Other				
Descriptions	_____				

Complete Before Sampling:

pH Meter Calibration	Time		Standards (circle)	7.01	10.01
-------------------------	------	--	-----------------------	------	-------

Water Sample

Complete at the site:

<i>pH meter tests</i>					
Field pH Reading	_____ . _____	Water Temperature	_____ . _____	°C	

Salinity	Salinity Method (circle)	Bottle / Hydrometer			
Salinity	1.0	SpGr	Salinity	ppt	
Time (If not at site)		Temperature (If not at site)	°C		

Complete after leaving site:

Dissolved Oxygen		
Sample 1	_____ . _____ mg/L	Comments:
Sample 2	_____ . _____ mg/L	Comments:
Sample 3	_____ . _____ mg/L	Comments:

Sampling Verification

Sampler Signature		Time	
DO Signature		Time	
Receiver Signature		Time	

Optional for Water Sample if Site is at Dock or Bridge

Water Clarity - Secchi Disk

Depth Disk Disappears	___ ___ . ___ meters	Depth Disk Reappears	___ ___ . ___ meters
Hit Bottom?	Yes / No	If Hit Bottom Depth to Bottom	___ . ___ meters

Comments :

KELT Analyses

Salinity (for bottled samples)

Name		Date	
Time		Temperature	°C
Salinity	SpGr	Salinity	ppt

Notes

Daily Data

Recent Rain? (past 2 days)	Yes / No		Recent Rain >1" (past 2 days)	Yes / No	
Rain Gauge 1 Name:					
Days Before Sample Date	3	2	1	0	
Rain Gauge 2 Name:					
Days Before Sample Date	3	2	1	0	
Average Androscoggin River Discharge	cfs		Average Kennebec River Discharge	cfs	
Average Sheepscot River Discharge	cfs				

Data Entry

Entered By:		Date	
-------------	--	------	--

Data Review

Reviewed By:		Date	
--------------	--	------	--

Appendix B

Measurement Units

Temperature

°C = degrees Celsius

Mass

mg = milligrams, 0.01 grams

Volume

L = liter

mL = milliliters, 0.01 liters

Concentrations

pH = $-\log(\text{H}^+ \text{ ion concentration})$

ppt = parts per thousand - in all of the work we are doing, this refers to the # of parts of the substance being measured that can be found in 1000 parts of water

mg/L = mg of the substance being measured that can be found in 1 L of water

Specific Gravity (SpGr)

density of the substance being measured ÷ density of pure water

(the density of the substances are different at different temperatures, so temperature in °C also needs to be measured when specific gravity is measured)

Beaufort Wind Scale

Beaufort Number	Estimating Wind Speed		World Meteorological Organization Description	Wind Speed		
	Effects Observed on Land	Effects Observed near Land or at Sea		knots	mph	km/hr
0	Calm; smoke rises vertically	Calm, sea like a mirror	Calm	under 1	under 1	under 1
1	Smoke drift indicates wind direction; wind vanes do not move	Small sailboat just has steerage way, ripples	Light Air	1-3	1-3	1-5
2	Wind felt on face; leaves rustle; wind vanes begin to move	Wind fills the sails of small boats, which then travel at about 1-2 knots, small wavelets	Light Breeze	4-6	4-7	6-11
3	Leaves and small twigs in constant motion; light flags extended	Sailboats begin to heel and travel at about 3-4 knots, larger wavelets with scattered whitecaps	Gentle Breeze	7-10	8-12	12-19
4	Dust, leaves, and loose paper raised up by wind; small branches move	Good working breeze; sailboats carry all sail with good heel, small waves, more numerous whitecaps	Moderate Breeze	11-16	13-18	20-28
5	Small trees in leaf begin to sway	Sailboats shorten sail, moderate waves, many whitecaps	Fresh Breeze	17-21	19-24	29-38
6	Larger branches of trees in motion; whistling heard in wires; difficult to use umbrellas	Sailboats have double reefed mainsails, larger waves, many whitecaps	Strong Breeze	22-27	25-31	39-49
7	Whole trees in motion; resistance felt when walking against wind	Boats remain in harbor; those at sea heave to	Near Gale	28-33	32-38	50-61
8	Twigs and small branches broken off trees; progress generally impaired	All boats make for harbor if near	Gale	34-40	39-46	62-74
9	Slight structural damage occurs; slate blown from roofs		Strong Gale	41-47	47-54	75-88
10	Seldom experienced on land; trees broken or uprooted; considerable structural damage occurs		Storm	48-55	55-63	89-102
11	Very rarely experienced on land; usually accompanied by widespread damage		Violent Storm	56-63	64-72	103-117
12			Hurricane	64 +	73 +	118 +

Dissolved Oxygen

Water Quality Test Kit
Instruction Manual • Code 7414/5860



INTRODUCTION

Aquatic animals need dissolved oxygen to live. Fish, invertebrates, plants, and aerobic bacteria all require oxygen for respiration. Oxygen dissolves readily into water from the atmosphere until the water is saturated. Once dissolved in the water, the oxygen diffuses very slowly and distribution depends on the movement of the aerated water. Oxygen is also produced by aquatic plants, algae, and phytoplankton as a by-product of photosynthesis.

The amount of oxygen required varies according to species and stage of life. Dissolved Oxygen levels below 3 ppm are stressful to most aquatic organisms. Dissolved Oxygen levels below 2 or 1 ppm will not support fish. Levels of 5 to 6 ppm are usually required for growth and activity.

This test kit uses the azide modification of the Winkler method for determining dissolved oxygen.

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Short Form Instructions	Back Cover

WARNING! This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision

KIT CONTENTS

QUANTITY	CONTENTS	CODE
30 mL	*Manganous Sulfate Solution	*4167-G
30 mL	*Alkaline Potassium Iodide Azide	*7166-G
50 g	*Sulfamic Acid Powder (7414 Kit)	*6286-H
30 mL	*Sulfuric Acid, 1:1 (5860 Kit)	*6141WT-G
60 mL	*Sodium Thiosulfate, 0.025N	*4169-H
30 mL	Starch Indicator Solution	4170WT-G
1	Spoon, 1.0 g, plastic (7414 Kit)	0697
1	Direct Reading Titrator	0377
1	Test Tube, 5-10-12.9-15-20-25 mL, glass, w/cap	0608
1	Water Sampling Bottle, 60 mL, glass	0688-DO

***WARNING:** Reagents marked with a * are considered to be potential health hazards. To view or print a Material Safety Data Sheet (MSDS) for these reagents see MSDS CD or www.lamotte.com. To obtain a printed copy, contact LaMotte by email, phone or fax.

To order individual reagents or test kit components, use the specified code numbers.

TEST PROCEDURE

PART 1 - COLLECTING THE WATER SAMPLE

1.



Rinse the Water Sampling Bottle (0688-DO) with the sample water.

2.



Tightly cap the bottle, and submerge it to the desired depth.

3.



Remove the cap and allow the bottle to fill.

4.



Tap the sides of the bottle to dislodge any air bubbles.

5.



Replace the cap while the bottle is still submerged.

6.



Retrieve the bottle and make sure that no air bubbles are trapped inside.

TEST PROCEDURE

PART 2 - ADDING THE REAGENTS

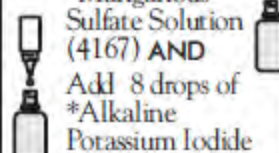
NOTE:

Be careful not to introduce air into the sample while adding the reagents.

1. Remove the cap from the bottle.



2. Immediately add 8 drops of *Manganous Sulfate Solution (4167) AND Add 8 drops of *Alkaline Potassium Iodide Azide (7166).



3.



Cap the bottle and mix by inverting several times. A precipitate will form.

4.



Allow the precipitate to settle below the shoulder of the bottle.

5.

For Kit Code 7414:
Immediately use the 1.0 g spoon (0697) to add one level measure of *Sulfamic Acid Powder (6286).



OR

For Kit Code 5860:
Add 8 drops of *Sulfuric Acid, 1:1 (6141WT).



6. Cap and gently invert the bottle to mix the contents until the precipitate and the reagent have totally dissolved. The solution will be clear yellow to orange if the sample contains dissolved oxygen.



NOTE: At this point the sample has been "fixed" and contact between the sample and the atmosphere will not affect the test result. Samples may be held at this point and titrated later.

TEST PROCEDURE

PART 3 - THE TITRATION

1.

Fill the titration tube (0608) to the 20 mL line with the fixed sample. Cap the tube.



2.

Depress plunger of the Titrator (0377).



3.

Insert the Titrator into the plug in the top of the *Sodium Thiosulfate, 0.025N (4169) titrating solution.



4.

Invert the bottle and slowly withdraw the plunger until the large ring on the plunger is opposite the zero (0) line on the scale.

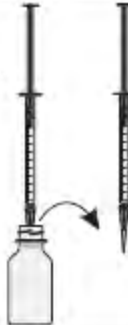


NOTE:

If small air bubbles appear in the Titrator barrel, expel them by partially filling the barrel and pumping the titration solution back into the reagent container. Repeat until bubble disappears.

5.

Turn the bottle upright and remove the Titrator.



NOTE:

If the sample is a very pale yellow, go to Step 9.



continued . . .

TEST PROCEDURE

6.

Insert the tip of the Titrator into the opening of the titration tube cap.



7.

Slowly depress the plunger to dispense the titrating solution until the yellow-brown color changes to a very pale yellow. Gently swirl the tube during the titration to mix the contents.



8.

Carefully remove the Titrator and cap. Do not disturb the Titrator plunger.



9.

Add 8 drops of Starch Indicator Solution (4170WT). The sample should turn blue.



10.

Cap the titration tube. Insert the tip of the Titrator into the opening of the titration tube cap.



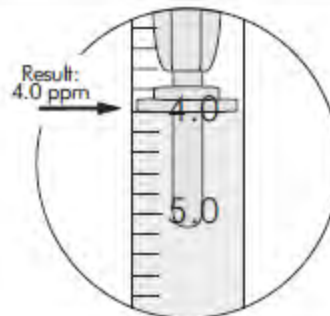
11.

Continue titrating until the blue color disappears and the solution becomes colorless.



12.

Read the test result directly from the scale where the large ring on the Titrator meets the Titrator barrel. Record as ppm Dissolved Oxygen. Each minor division on the Titrator scale equals 0.2 ppm.



TEST PROCEDURE

NOTE:

If the plunger ring reaches the bottom line on the scale (10 ppm) before the endpoint color change occurs, refill the Titrator and continue the titration. Include the value of the original amount of reagent dispensed (10 ppm) when recording the test result.

NOTE:

When testing is complete, discard titrating solution in Titrator. Rinse Titrator and titration tube thoroughly. DO NOT remove plunger or adapter tip.



DISSOLVED OXYGEN FACT SHEET

Oxygen is critical to the survival of aquatic plants and animals, and a shortage of dissolved oxygen is not only a sign of pollution, it is harmful to fish. Some aquatic species are more sensitive to oxygen depletion than others, but some general guidelines to consider when analyzing test results are:

5–6 ppm Sufficient for most species

<3 ppm Stressful to most aquatic species

<2 ppm Fatal to most species

Because of its importance to the fish's survival, aquaculturists, or "fish farmers," and aquarists use the dissolved oxygen test as a primary indicator of their system's ability to support healthy fish.

WHERE DOES THE OXYGEN COME FROM?

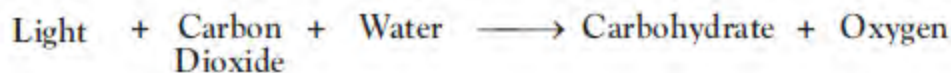
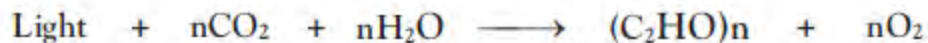
The oxygen found in water comes from many sources, but the largest source is oxygen absorbed from the atmosphere. Wave action and splashing allows more oxygen to be absorbed into the water. A second major source of oxygen is aquatic plants, including algae; during photosynthesis plants remove carbon dioxide from the water and replace it with oxygen.

Absorption

Oxygen is continuously moving between the water and surrounding air. The direction and speed of this movement is dependent upon the amount of contact between the air and water. A tumbling mountain stream or windswept, wave-covered lake, where more of the water's surface is exposed to the air, will absorb more oxygen from the atmosphere than a calm, smooth body of water. This is the idea behind aerators: by creating bubbles and waves the surface area is increased and more oxygen can enter the water.

Photosynthesis

In the leaves of plants, one of the most important chemical processes on Earth is constantly occurring: photosynthesis. During daylight, plants constantly take carbon dioxide from the air, and in the presence of water convert it to oxygen and carbohydrates, which are used to produce additional plant material. Since photosynthesis requires light, plants do not photosynthesize at night, so no oxygen is produced. Chemically, the photosynthesis reaction can be written as:



WHERE DOES THE OXYGEN GO?

Once in the water, oxygen is used by the aquatic life. Fish and other aquatic animals need oxygen to breathe or respire. Oxygen is also consumed by bacteria to decay, or decompose, dead plants and animals.

Respiration

All animals, whether on land or underwater, need oxygen to respire, grow and survive. Plants and animals respire throughout the night and day, consuming oxygen and producing carbon dioxide, which is then used by plants during photosynthesis.

Decomposition

All plant and animal waste eventually decomposes, whether it is from living animals or dead plants and animals. In the decomposition process, bacteria use oxygen to oxidize, or chemically alter, the material to break it down to its component parts. Some aquatic systems may undergo extreme amounts of oxidation, leaving no oxygen for the living organisms, which eventually leave or suffocate.

OTHER FACTORS

The oxygen level of a water system is not only dependent on production and consumption. Many other factors work together to determine the potential oxygen level, including:

- Salt vs. fresh water - Fresh water can hold more oxygen than salt water.
- Temperature - Cold water can hold more oxygen than warm water.
- Atmospheric pressure (Altitude) - The greater the atmospheric pressure the more oxygen the water will hold.

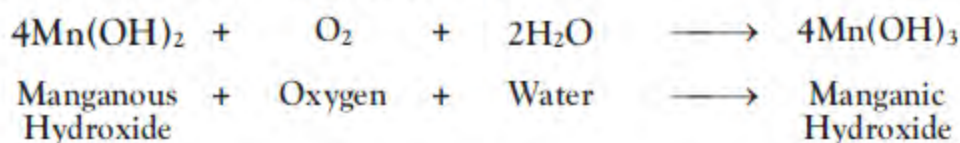
TESTING DISSOLVED OXYGEN

Dissolved oxygen is often tested using the Azide modification of the Winkler method. When testing dissolved oxygen it is critical not to introduce additional oxygen into the sample. Many people avoid this problem by filling the sample bottle all the way and allowing the water to overflow for one minute before capping.

The first step in a DO titration is the addition of Manganous Sulfate Solution (4167) and Alkaline Potassium Iodide Azide Solution (7166). These reagents react to form a white precipitate, or floc, of manganous hydroxide, $Mn(OH)_2$. Chemically, this reaction can be written as:



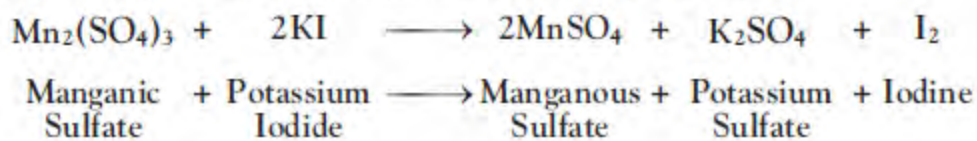
Immediately upon formation of the precipitate, the oxygen in the water oxidizes an equivalent amount of the manganous hydroxide to brown-colored manganic hydroxide. For every molecule of oxygen in the water, four molecules of manganous hydroxide are converted to manganic hydroxide. Chemically, this reaction can be written as:



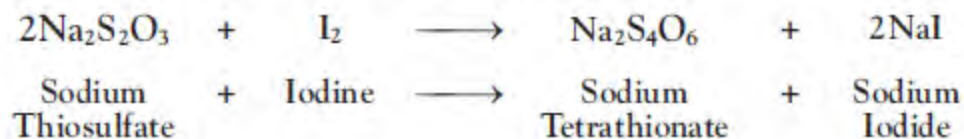
After the brown precipitate is formed, a strong acid, such as Sulfamic Acid Powder (6286) or Sulfuric Acid, 1:1 (6141) is added to the sample. The acid converts the manganic hydroxide to manganic sulfate. At this point the sample is considered "fixed" and concern for additional oxygen being introduced into the sample is reduced. Chemically, this reaction can be written as:



Simultaneously, iodine from the potassium iodide in the Alkaline Potassium Iodide Azide Solution is oxidized by manganic sulfate, releasing free iodine into the water. Since the manganic sulfate for this reaction comes from the reaction between the manganous hydroxide and oxygen, the amount of iodine released is directly proportional to the amount of oxygen present in the original sample. The release of free iodine is indicated by the sample turning a yellow-brown color. Chemically, this reaction can be written as:



The final stage in the Winkler titration is the addition of sodium thiosulfate. The sodium thiosulfate reacts with the free iodine to produce sodium iodide. When all of the iodine has been converted the sample changes from yellow-brown to colorless. Often a starch indicator is added to enhance the final endpoint. Chemically, this reaction can be written as:



GENERAL SAFETY PRECAUTIONS

1.



Store the test kit in a cool, dry area.

2.



Read all instructions and note precautions before performing the test procedure.

3.

Read the labels on all reagent bottles. Note warnings and first aid information. Read all Material Safety Data Sheets.



4.



Keep all equipment and reagent chemicals out of the reach of young children.

5.

Avoid contact between reagent chemicals and skin, eyes, nose, and mouth.



6.

Wear safety glasses when performing test procedures.



7.



In the event of an accident or suspected poisoning, immediately call the Poison Center phone number in the front of your local telephone directory or call a physician. Additional information for all LaMotte reagents is available in the United States, Canada, Puerto Rico, and the US Virgin Islands from Chem-Tel by calling 1-800-255-3924. For other areas, call 813-248-0585 collect to contact Chem-Tel's International access number. Each reagent can be identified by the four digit number listed on the upper left corner of the reagent label, in the contents list and in the test procedures.

USE PROPER ANALYTICAL TECHNIQUES

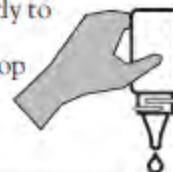
1.



Use test tube caps or stoppers, not your fingers, to cover tubes during shaking or mixing.

2.

Hold dropper bottles vertically upside-down, and not at an angle, when dispensing a reagent. Squeeze the bottle gently to dispense the reagent one drop at a time.



3.

Wipe up any reagent chemical spills immediately.



4.

Thoroughly rinse test tubes before and after each test.



5.

Tightly close all containers immediately after use. Do not interchange caps from containers.



6.

Avoid prolonged exposure of equipment and reagents to direct sunlight. Protect reagents from extremes of temperature.



SHORT FORM INSTRUCTIONS

Read all instructions before performing test. Use this guide as a quick reference.

1. Fill Water Sampling Bottle (0688-DO).
2. Add 8 drops of *Manganous Sulfate Solution (4167).
3. Add 8 drops of *Alkaline Potassium Iodide Azide (7166).
4. Cap and mix.
5. Allow precipitate to settle.
6. Use the 1.0 g spoon to add *Sulfamic Acid Powder (6286) or add 8 drops of Sulfuric Acid, 1:1 (6141WT).
7. Cap and mix until reagent and precipitate dissolve.
8. Fill test tube (0608) to the 20 mL line.
9. Fill Titrator with *Sodium Thiosulfate, 0.025N (4169).
10. Titrate until sample color is pale yellow. DO NOT DISTURB TITRATOR.
11. Add 8 drops of Starch Indicator (4170WT).
12. Continue titration until blue color just disappears and solution is colorless.
13. Read result in ppm Dissolved Oxygen.

LaMOTTE COMPANY

Helping People Solve Analytical Challenges*

PO Box 329 • Chestertown • Maryland • 21620 • USA
800-344-3100 • 410-778-3100 (Outside U.S.A.) • Fax 410-778-6394
Visit us on the web at www.lamotte.com

MATERIAL SAFETY DATA SHEET (MSDS)

MSDS: B4620

This MSDS should be attached or kept with the respective product with which it is associated.

MATERIAL SAFETY DATA SHEET - B4620

MSDS
MATERIAL SAFETY DATA SHEET

LAMOTTE
P.O. BOX 329
802 WASHINGTON AVENUE
CHESTERTOWN, MD 21620
USA

TELEPHONE # FOR INFORMATION: 410 778-3100

24 HOUR EMERGENCY NUMBER (CHEM-TEL):
USA, CANADA, PUERTO RICO: 800-255-3924
OUTSIDE NORTH AMERICAN CONTINENT: 813-248-0585 (CALL COLLECT)

1. PRODUCT IDENTIFICATION

PRODUCT CODE: 4167
PRODUCT DESCRIPTION: MANGANOUS SULFATE SOLUTION
MANUFACTURED BY:
LAMOTTE COMPANY
802 WASHINGTON AVENUE
CHESTERTOWN, MD 21620

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARD	CAS#	NAME	%	PEL	TLV
YES	10034-96-5	MANGANESE SULFATE MONOHYDRATE	36	C: 5 MG/CUBIC M (COMP, AS Mn)	0.2 MG/CUBIC M (INORG COMP AS Mn)
NO	7732-18-5	WATER	TO 100%		

3. HAZARDS OVERVIEW

PRIMARY ROUTE OF ENTRY:
INGESTION
SKIN

MAY IRRITATE EYES AND SKIN, HARMFUL IF SWALLOWED.

HMIS HAZARD:
HEALTH 1
FLAMMABILITY 0
REACTIVITY 0

SCALE:
4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = LEAST

CARCINOGENICITY: NONE

OTHER HEALTH RELATED COMMENTS:
MANGANESE INVESTIGATED AS A TUMORIGEN, MUTAGEN, REPRODUCTIVE EFFECTOR.

4. FIRST AID MEASURES

EYE CONTACT:
IMMEDIATELY FLUSH WITH WATER FOR 15 MINUTES. CONSULT A PHYSICIAN.

SKIN CONTACT:
FLUSH THOROUGHLY WITH WATER. REMOVE AFFECTED CLOTHING AND WASH SKIN WITH SOAP AND WATER. CONSULT PHYSICIAN.

INGESTION: INDUCE VOMITING IMMEDIATELY. CONSULT A PHYSICIAN.

INHALATION: N/A

5. FIRE FIGHTING MEASURES

FLASH POINT (METHOD USED): N/A

LEL: N/A
UEL: N/A

EXTINGUISHING MEDIA: NOT A FIRE HAZARD

SPECIAL FIRE FIGHTING PROCEDURES: N/A

UNUSUAL FIRE & EXPLOSION HAZARD: N/A

6. ACCIDENTAL RELEASE MEASURES

MOP UP CAREFULLY AND HOLD FOR DISPOSAL.

7. HANDLING & STORAGE

STORE IN COOL, DRY, STORAGE AREA AWAY FROM INCOMPATIBLE MATERIALS.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: NORMAL

PROTECTION WHEN HANDLING:
GLOVES
EYE PROTECTION
LAB COAT

WORK/HYGENIC PRACTICES: WASH AFTER HANDLING.

9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE: CLEAR PINK LIQUID

VAPOR DENSITY: <1 (AIR=1)

SOLUBILITY IN WATER: SOLUBLE

VAPOR PRESSURE: <17 MMHg @ 20 DEG C

ODOR: NONE

BOILING POINT: UNKNOWN

pH: 3

MELTING POINT: N/A

10. STABILITY & REACTIVITY

STABLE: YES

CONDITIONS TO AVOID: N/A

INCOMPATIBILITY (MATERIALS TO AVOID): N/A

HAZARDOUS DECOMPOSITION PRODUCTS: N/A

11. TOXICOLOGICAL INFORMATION

TARGET ORGANS: N/A

12. ECOLOGICAL INFORMATION

INFORMATION NOT YET AVAILABLE

13. DISPOSAL CONSIDERATIONS

SMALL QUANTITY: FLUSH DOWN DRAIN WITH EXCESS WATER.

LARGE QUANTITY:
CONTAINERIZE AND DISPOSE OF AS HAZARDOUS WASTE ACCORDING TO FEDERAL, STATE AND LOCAL REGULATIONS.

14. TRANSPORTATION INFORMATION

NOT REGULATED FOR TRANSPORT

15. REGULATORY INFORMATION

CHEMICAL INVENTORY STATUS:

HAZARD	INGREDIENT	USA TSCA	EUROPE EC	CANADA DSL	INDIA NDSL	AUSTRALIA	JAPAN
YES	7785-87-7 MANGANESE SULFATE, ANHYDROUS	YES	YES	YES	NO	YES	YES
NO	7732-18-5 DISTILLED WATER	YES	YES	YES	NO	YES	YES

FEDERAL, STATE, & INTERNATIONAL REGULATIONS:

INGREDIENT	SARA RQ	302 TPQ	SARA LISTED	313 CHEMICAL CATEGORY	CERCLA	RCRA 261.33	TSCA 8(D)
7785-87-7 MANGANESE SULFATE, ANHYDROUS	NO	NO	NO	MANGANESE CMND	1	NO	NO
7732-18-5 DISTILLED WATER	NO	NO	NO	NO	NO	NO	NO
INGREDIENT	ACUTE	SARA 311/312 HAZARD CATEGORIES	CHRONIC FIRE	PRESSURE	REACTIVITY		
7785-87-7 MANGANESE SULFATE, ANHYDROUS	YES	YES	NO	NO	NO		
7732-18-5 DISTILLED WATER	NO	NO	NO	NO	NO		
PRODUCT 4167 AS A WHOLE	YES	NO	NO	NO	NO		

INGREDIENT
HAZCHEM
CODE
AUSTRALIA
POISON
SCHEDULE

THIS MSDS IS
WHMIS COMPLIANT

MANGANESE SULFATE, ANHYDROUS NONE ALLOCATED NONE ALLOCATED
 DISTILLED WATER NONE ALLOCATED NONE ALLOCATED
 PRODUCT 4167 AS A WHOLE NONE ALLOCATED NONE ALLOCATED YES

16. OTHER INFORMATION

AUSTRALIA:
 THIS PRODUCT IS NOT CLASSIFIED AS A HAZARDOUS SUBSTANCE ACCORDING TO THE CRITERIA OF ASCC (BASED ON A RISK ASSESSMENT ACCORDING TO ASCC/NOHSC CRITERIA).

PREPARED BY: IP, REGULATORY AFFAIRS DEPARTMENT

REVISED: 12/6/2007

MSDS

MATERIAL SAFETY DATA SHEET

LAMOTTE
 PO BOX 329
 802 WASHINGTON AVENUE
 CHESTERTOWN, MD 21620
 USA

TELEPHONE NUMBER FOR INFORMATION: 410-778-3100

24 HOUR EMERGENCY NUMBER (CHEM-TEL):
 USA, CANADA, PUERTO RICO: 800-255-3924
 OUTSIDE NORTH AMERICAN CONTINENT: 813-248-0585 (CALL COLLECT)

1. PRODUCT IDENTIFICATION

PRODUCT CODE: 4169

PRODUCT DESCRIPTION: SODIUM THIOSULFATE, .025 N

MANUFACTURED BY:
 LAMOTTE COMPANY
 802 WASHINGTON AVENUE
 CHESTERTOWN, MD 21620

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS	NAME	CAS #	%	OSHA PEL	ACGIH TLV
YES	SODIUM HYDROXIDE	1310-73-2	<0.1	2 MG/CUBIC M	C 2 MG/CUBIC M
YES	SODIUM THIOSULFATE, 5-HYDRATE	10102-17-7	<1	N/E	N/E
	WATER TO 100%				

3. HAZARDS OVERVIEW

PRIMARY ROUTE OF ENTRY:
 INGESTION
 SKIN

LARGE DOSES BY MOUTH CAN CAUSE GI IRRITATION. PROLONGED CONTACT MAY CAUSE SKIN IRRITATION.

HMS HAZARD:
 HEALTH 1
 FLAMMABILITY 0
 REACTIVITY 0

SCALE:
 4 = EXTREME
 3 = HIGH
 2 = MODERATE
 1 = SLIGHT
 0 = LEAST

CARCINOGENICITY: NONE

OTHER HEALTH RELATED COMMENTS:

4. FIRST AID MEASURES

EYE CONTACT: FLUSH WITH WATER FOR 15 MINUTES.

SKIN CONTACT: FLUSH WITH WATER. WASH WITH SOAP AND WATER.

INGESTION: DRINK PLENTY OF WATER. CONSULT A PHYSICIAN.

INHALATION: N/A

5. FIRE FIGHTING MEASURES

FLASH POINT: N/A

LEL: N/A
 UEL: N/A

FIRE RATING:

EXTINGUISHING MEDIA: NOT A FIRE HAZARD

SPECIAL FIRE FIGHTING PROCEDURES: N/A

HAZARDOUS COMBUSTION AND/OR DECOMPOSITION PRODUCTS: N/A

UNUSUAL FIRE & EXPLOSION HAZARD: N/A

6. ACCIDENTAL RELEASE MEASURES

NEUTRALIZE WITH VINEGAR OR OTHER DILUTE ACID TO pH 7 - 8 AND MOP UP.

7. HANDLING & STORAGE

STORE IN COOL AREA OUT OF DIRECT SUNLIGHT.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: USE WITH ADEQUATE VENTILATION.

PROTECTION WHEN HANDLING:
 GLOVES
 EYE PROTECTION

WORK/HYGIENIC PRACTICES: AVOID CONTACT WITH EYES OR SKIN.

9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE: COLORLESS CLEAR LIQUID

BOILING POINT: CA. 100 DEG C

MELTING POINT: UNKNOWN

pH: 12

ODOR: NONE

VAPOR DENSITY: <1 (AIR=1)

SOLUBILITY IN WATER: SOLUBLE

VAPOR PRESSURE: <17 MM @ 20 DEG C

10. STABILITY & REACTIVITY

STABLE: YES

CONDITIONS TO AVOID: HEAT, LIGHT

MATERIALS TO AVOID: N/A

HAZARDOUS DECOMPOSITION PRODUCTS: N/A

11. TOXICOLOGICAL INFORMATION

NON-TOXIC

TARGET ORGANS: N/A

12. ECOLOGICAL INFORMATION

INFORMATION NOT AVAILABLE

13. DISPOSAL CONSIDERATIONS

NEUTRALIZE WITH DILUTE ACID AND WASH DOWN DRAIN WITH EXCESS WATER.

14. TRANSPORT INFORMATION

NOT REGULATED FOR TRANSPORT

15. REGULATORY INFORMATION

CHEMICAL INVENTORY STATUS:

INGREDIENT	USA TSCA	EUROPE EC	CANADA DSL	NDSL	AUSTRALIA	JAPAN
SODIUM HYDROXIDE	YES	YES	YES	NO	YES	YES
SODIUM THIOSULFATE, ANHYDROUS (7772-98-7)	YES	YES	YES	NO	YES	YES
WATER TO 100%						

FEDERAL, STATE, & INTERNATIONAL REGULATIONS:

INGREDIENT	SARA 302 RQ	302 TPO	SARA 313 LISTED	CHEMICAL CATEGORY	CERCLA	RCRA 261.33	TSCA 8 (D)
SODIUM HYDROXIDE	NO	NO	NO	NO	1000	NO	NO
SODIUM THIOSULFATE, ANHYDROUS (7772-98-7)	NO	NO	NO	NO	NO	NO	NO
WATER TO 100%							

INGREDIENT SARA 311/312 HAZARD CATEGORIES AUSTRALIA HAZCHEM CODE POISON SCHEDULE THIS MSDS IS WHMIS COMPLIANT

SODIUM HYDROXIDE	ACUTE: YES CHRONIC: NO FIRE: NO PRESSURE: NO REACTIVITY: YES (PURE/SOLID)	2R	S6
SODIUM THIOSULFATE, 5-HYDRATE	ACUTE: YES CHRONIC: NO FIRE: NO PRESSURE: NO REACTIVITY: NO (PURE/SOLID)	NONE ALLOCATED	NONE ALLOCATED

WATER TO 100%

FOR PRODUCT 4169 ACUTE: YES NONE NONE YES
 LIQUID MIXTURE, CHRONIC: NO ALLOCATED ALLOCATED
 AS A WHOLE FIRE: NO
 PRESSURE: NO
 REACTIVITY: NO

16. OTHER INFORMATION

AUSTRALIA:
 THIS PRODUCT NOT CLASSIFIED AS A HAZARDOUS SUBSTANCE ACCORDING TO THE CRITERIA OF ASCC (BASED ON A RISK ASSESSMENT ACCORDING TO ASCC/NOHSC CRITERIA.

PREPARED BY: IP

REVISED: 12/06/2007

MSDS

MATERIAL SAFETY DATA SHEET

LAMOTTE
 P.O. BOX 329
 802 WASHINGTON AVENUE
 CHESTERTOWN, MD 21620
 USA

TELEPHONE # FOR INFORMATION: 410 778-3100

24 HOUR EMERGENCY NUMBER (CHEM-TEL):
 USA, CANADA, PUERTO RICO: 800-255-3924
 OUTSIDE NORTH AMERICAN CONTINENT: 813-248-0585 (CALL COLLECT)

1. PRODUCT IDENTIFICATION

PRODUCT CODE: 4170

PRODUCT DESCRIPTION: STARCH INDICATOR SOLUTION

MANUFACTURED BY:
 LAMOTTE COMPANY
 802 WASHINGTON AVENUE
 CHESTERTOWN, MD 21620

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARD	CAS#	NAME	%	PEL	TLV
YES	69-72-7	SALICYLIC ACID	0.13	15 MG/CUBIC M TOTAL DUST	10 MG/CUBIC M TOTAL DUST
YES	9005-84-9	SOLUBLE STARCH	0.5	5 MG/CU M (RESP DUST)	10 MG/CU M (TOTAL DUST)
NO	7732-18-5	WATER	TO 100%		

3. HAZARDS OVERVIEW

PRIMARY ROUTE OF ENTRY: INGESTION

MAY BE HARMFUL IF SWALLOWED.

HMS HAZARD:
 HEALTH 1
 FLAMMABILITY 0
 REACTIVITY 0

SCALE:
 4 = EXTREME
 3 = HIGH
 2 = MODERATE
 1 = SLIGHT
 0 = LEAST

CARCINOGENICITY: NONE

OTHER HEALTH RELATED COMMENTS: SEE SECTION 11.

4. FIRST AID MEASURES

EYE CONTACT: FLUSH WITH WATER.

SKIN CONTACT: FLUSH WITH WATER.

INGESTION:
 SOLUTION IS ACIDIC (pH 3) AND MAY IRRITATE STOMACH IF LARGE AMOUNT IS SWALLOWED. DRINK WATER OR MILK. CONSULT PHYSICIAN.

INHALATION: N/A

5. FIRE FIGHTING MEASURES

FLASH POINT (METHOD USED): N/A

LEL: N/A
 UEL: N/A

EXTINGUISHING MEDIA: NOT A FIRE HAZARD

SPECIAL FIRE FIGHTING PROCEDURES: N/A

UNUSUAL FIRE & EXPLOSION HAZARD: N/A

6. ACCIDENTAL RELEASE MEASURES

MOP UP. FLUSH DOWN DRAIN.

7. HANDLING & STORAGE

STORE AT ROOM TEMPERATURE, OUT OF DIRECT SUNLIGHT.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: NORMAL

PROTECTION WHEN HANDLING: EYE PROTECTION

WORK/HYGIENIC PRACTICES: N/A

9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE: COLORLESS LIQUID

VAPOR DENSITY: <1 (AIR=1)

SOLUBILITY IN WATER: SOLUBLE

VAPOR PRESSURE: <17 MMHg @ 20 DEG C

ODOR: NONE

BOILING POINT: CA. 100 DEG C

pH: 3

MELTING POINT: UNKNOWN

10. STABILITY & REACTIVITY

STABLE: YES

CONDITIONS TO AVOID: HEAT, LIGHT

INCOMPATIBILITY (MATERIALS TO AVOID): N/A

HAZARDOUS DECOMPOSITION PRODUCTS: N/A

11. TOXICOLOGICAL INFORMATION

ORAL RAT LD50: 891 MG/KG FOR SALICYLIC ACID SOLID

INVESTIGATED AS A MUTAGEN AND REPRODUCTIVE EFFECTOR.

TARGET ORGANS:

12. ECOLOGICAL INFORMATION

INFORMATION NOT YET AVAILABLE

13. DISPOSAL CONSIDERATIONS

FLUSH DOWN DRAIN WITH EXCESS WATER. DISPOSE ACCORDING TO FEDERAL, STATE AND LOCAL REGULATIONS.

14. TRANSPORTATION INFORMATION

NOT REGULATED FOR TRANSPORT

15. REGULATORY INFORMATION

CHEMICAL INVENTORY STATUS:

HAZARD	INGREDIENT	USA TSCA	EUROPE EC	CANADA DSL	AUSTRALIA NDSL	JAPAN
YES	69-72-7 SALICYLIC ACID (2-HYDROXYBENZOIC ACID)	YES	YES	YES NO	YES	YES
YES	9005-84-9 SOLUBLE STARCH	YES	YES	YES NO	YES	NO
NO	7732-18-5 DISTILLED WATER	YES	YES	YES NO	YES	YES

FEDERAL, STATE, & INTERNATIONAL REGULATIONS:

INGREDIENT	SARA 302 RQ	SARA 303 TPQ	SARA 313 LISTED	SARA 311/312 HAZARD CATEGORIES	CERCLA	RCRA 261.33	TSCA 8 (D)
69-72-7 SALICYLIC ACID (2-HYDROXYBENZOIC ACID)	NO	NO	NO	NO	NO	NO	NO
9005-84-9 SOLUBLE STARCH	NO	NO	NO	NO	NO	NO	NO
7732-18-5 DISTILLED WATER	NO	NO	NO	NO	NO	NO	NO
INGREDIENT	ACUTE	CHRONIC	FIRE	REACTIVITY	HAZARD CATEGORIES	HAZARD CATEGORIES	HAZARD CATEGORIES
69-72-7 SALICYLIC ACID (2-HYDROXYBENZOIC ACID)	YES	YES	NO	NO	NO	NO	NO
9005-84-9 SOLUBLE STARCH	YES	NO	NO	NO	NO	NO	NO
7732-18-5 DISTILLED WATER	NO	NO	NO	NO	NO	NO	NO
PRODUCT 4170 AS A WHOLE	NO	NO	NO	NO	NO	NO	NO

INGREDIENT

HAZCHEM AUSTRALIA POISON

THIS MSDS IS WHMIS COMPLIANT

CODE	SCHEDULE	LEL: N/A	UEL: N/A
69-72-7 SALICYLIC ACID (2-HYDROXYBENZOIC ACID)	NONE ALLOCATED	NONE ALLOCATED	
9005-84-9 SOLUBLE STARCH	NONE ALLOCATED	NONE ALLOCATED	
7732-18-5 DISTILLED WATER	NONE ALLOCATED	NONE ALLOCATED	
PRODUCT 4170 AS A WHOLE	NONE ALLOCATED	NONE ALLOCATED	YES

16. OTHER INFORMATION

AUSTRALIA:
THIS PRODUCT IS NOT CLASSIFIED AS A HAZARDOUS SUBSTANCE ACCORDING TO THE CRITERIA OF ASCC (BASED ON A RISK ASSESSMENT ACCORDING TO ASCC/NOHSC CRITERIA).

PREPARED BY: IP, REGULATORY AFFAIRS DEPARTMENT

REVISED: 12/6/2007

MSDS

MATERIAL SAFETY DATA SHEET

LAMOTTE
PO BOX 329
802 WASHINGTON AVENUE
CHESTERTOWN, MD 21620
USA

TELEPHONE NUMBER FOR INFORMATION: 410-778-3100

24 HOUR EMERGENCY NUMBER (CHEM-TEL):
USA, CANADA, PUERTO RICO: 800-255-3924
OUTSIDE NORTH AMERICAN CONTINENT: 813-248-0585 (CALL COLLECT)

1. PRODUCT IDENTIFICATION

PRODUCT CODE: 6141

PRODUCT DESCRIPTION: SULFURIC ACID, 1:1

MANUFACTURED BY:
LAMOTTE COMPANY
802 WASHINGTON AVENUE
CHESTERTOWN, MD 21620

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS	NAME	CAS #	%	OSHA PEL	ACGIH TLV
YES	SULFURIC ACID	7664-93-9	64	1 MG/CUBIC M	1 MG/CUBIC M
NO	WATER TO 100%	7732-18-5			

3. HAZARDS OVERVIEW

PRIMARY ROUTE OF ENTRY:
INGESTION
INHALATION
SKIN

POISON!

DANGER!

CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. INGESTION MAY BE FATAL. INHALATION CAN CAUSE COUGHING, CHEST PAINS, DAMAGE TO LUNGS.

HMS HAZARD:
HEALTH 3
FLAMMABILITY 0
REACTIVITY 3

SCALE:
4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = LEAST

CARCINOGENICITY: SEE SECTION 11.

OTHER HEALTH RELATED COMMENTS:

4. FIRST AID MEASURES

EYE CONTACT: IMMEDIATELY FLUSH WITH WATER FOR 15 MINUTES.

SKIN CONTACT:
IMMEDIATELY FLUSH WITH WATER FOR 15 MINUTES WHILE REMOVING AFFECTED CLOTHING. CALL A DOCTOR IMMEDIATELY IF SKIN CONTACT HAS BEEN EXTENSIVE OR PROLONGED.

INGESTION:
DO NOT INDUCE VOMITING. RINSE MOUTH, DRINK PLENTY OF WATER. CALL A DOCTOR IMMEDIATELY.

INHALATION:
REMOVE TO FRESH AIR. GIVE ARTIFICIAL RESPIRATION IF NOT BREATHING. IF BREATHING IS DIFFICULT, GIVE OXYGEN AND CALL A DOCTOR IMMEDIATELY.

5. FIRE FIGHTING MEASURES

FLASH POINT: N/A

LEL: N/A
UEL: N/A

FIRE RATING:

EXTINGUISHING MEDIA: DRY CHEMICAL OR CO2, NOT WATER

SPECIAL FIRE FIGHTING PROCEDURES:
WEAR PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS.

HAZARDOUS COMBUSTION AND/OR DECOMPOSITION PRODUCTS: SO_x, HYDROGEN GAS

UNUSUAL FIRE & EXPLOSION HAZARD:
CONCENTRATED MATERIAL IS A STRONG DEHYDRATING AGENT. REACTS WITH ORGANIC MATERIALS AND MAY CAUSE IGNITION OF FINELY DIVIDED MATERIALS ON CONTACT. A VIOLENT EXOTHERMIC REACTION OCCURS WITH WATER. REACTS WITH METALS TO FORM FLAMMABLE, EXPLOSIVE HYDROGEN GAS.

6. ACCIDENTAL RELEASE MEASURES

WEAR GLOVES, EYE AND SKIN PROTECTION. COVER SPILL WITH SODIUM BICARBONATE OR SODA ASH/CALCIUM HYDROXIDE MIXTURE. MIX AND CAREFULLY ADD WATER TO FORM SLURRY, AVOIDING HEAT, SPATTERING, AND FUMES. SCOOP UP NEUTRALIZED SLURRY AND FLUSH TO DRAIN WITH EXCESS WATER.

7. HANDLING & STORAGE

STORE IN COOL, DRY, VENTILATED STORAGE WITH ACID RESISTANT FLOORS AND GOOD DRAINAGE. KEEP OUT OF DIRECT SUNLIGHT AND AWAY FROM HEAT, WATER, AND SUCH INCOMPATIBLE MATERIALS AS COMBUSTIBLES STRONG BASES, METALS, CYANIDES, AND SULFIDES.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: A SYSTEM OF LOCAL AND/OR GENERAL EXHAUST IS RECOMMENDED.

PROTECTION WHEN HANDLING:
GLOVES
EYE PROTECTION
LAB COAT

OTHER: VINYL APRON, FACE SHIELD TO AVOID BODY SPLASHES.

WORK/HYGIENIC PRACTICES:
AVOID CONTACT WITH SKIN AND CLOTHING AND INHALATION OF VAPOR.

9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE: COLORLESS LIQUID

BOILING POINT: >100 DEG C

MELTING POINT: N/A

pH: <1

ODOR: NONE

VAPOR DENSITY: >1 (AIR=1)

SOLUBILITY IN WATER: SOLUBLE

VAPOR PRESSURE: <1 MM @ 20 DEG C

10. STABILITY & REACTIVITY

STABLE: YES

CONDITIONS TO AVOID: MOISTURE

MATERIALS TO AVOID:
ORGANICS, COMBUSTIBLES (MAY CAUSE FIRE), STRONG BASES, METALS (YIELDS HYDROGEN GAS), CYANIDES (YIELDS POISONOUS HCN GAS), SULFIDES (YIELDS POISONOUS H₂S GAS), STRONG OXIDIZERS AND MANY OTHER REACTIVE SUBSTANCES

HAZARDOUS DECOMPOSITION PRODUCTS:
SO_x; REACTS WITH WATER TO PRODUCE TOXIC AND CORROSIVE FUMES; REACTS WITH METALS TO PRODUCE FLAMMABLE HYDROGEN GAS.

11. TOXICOLOGICAL INFORMATION

ORAL RAT LD50: 2140 MG/KG FOR SULFURIC ACID

SULFURIC ACID MISTS INVESTIGATED AS A TUMORIGEN, MUTAGEN, REPRODUCTIVE EFFECTOR. IARC HAS CLASSIFIED "STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID" AS A KNOWN HUMAN CARCINOGEN. (IARC CATEGORY 1). THIS APPLIES TO MISTS - NOT TO LIQUID SULFURIC ACID OR ITS SOLUTIONS.

TARGET ORGANS: SKIN; CORROSIVE TO ALL BODY PARTS.

12. ECOLOGICAL INFORMATION

WHEN RELEASED INTO THE SOIL, SULFURIC ACID MAY LEACH INTO GROUNDWATER. WHEN RELEASED INTO THE AIR, IT MAY BE REMOVED FROM THE ATMOSPHERE TO FALL AS ACID RAIN OR AS DRY DEPOSITION. THIS MATERIAL MAY BE TOXIC TO AQUATIC LIFE.

13. DISPOSAL CONSIDERATIONS

ADD VERY SLOWLY WITH STIRRING TO A LARGE VOLUME OF SODA ASH & CALCIUM HYDROXIDE. SOLUTION NEUTRALIZED TO pH 7 +/- 1 MAY BE Poured DOWN DRAIN WITH EXCESS WATER. DISPOSE ACCORDING TO FEDERAL, STATE AND LOCAL REGULATIONS.

14. TRANSPORT INFORMATION

DOMESTIC:

PROPER SHIPPING NAME: SULFURIC ACID (WITH MORE THAN 51% ACID)

INTERNATIONAL:

PROPER SHIPPING NAME: SULPHURIC ACID (WITH MORE THAN 51% ACID)

HAZARD CLASS/DIV: 8
UN1830:
PACKING GROUP: II

15. REGULATORY INFORMATION

CHEMICAL INVENTORY STATUS:

INGREDIENT	USA TSCA	EUROPE EC	CANADA DSL NDSL	AUSTRALIA	JAPAN
SULFURIC ACID (7664-93-9)	YES	YES	YES NO	YES	YES
WATER	YES	YES	YES NO	YES	YES

FEDERAL, STATE, & INTERNATIONAL REGULATIONS:

INGREDIENT	SARA 302 RQ	SARA 302 TPQ	SARA 313 LISTED	CHEMICAL CATEGORY	CERCLA	RCRA 261.33	TSCA 8 (D)
SULFURIC ACID (7664-93-9)	1000	1000	YES	NO	1000	NO	NO
WATER	NO	NO	NO	NO	NO	NO	NO

INGREDIENT	SARA 311/312 HAZARD CATEGORIES	AUSTRALIA HAZCHEM CODE	POISON SCHEDULE	THIS MSDS IS WHMIS COMPLIANT
SULFURIC ACID (7664-93-9)	ACUTE: YES CHRONIC: YES FIRE: NO PRESSURE: NO REACTIVITY: YES (PURE/LIQUID)	2P	NONE ALLOCATED	YES
FOR PRODUCT #6141 LIQUID MIXTURE, TAKEN AS A WHOLE	ACUTE: YES CHRONIC: YES FIRE: NO PRESSURE: NO REACTIVITY: YES	2P	NONE ALLOCATED	YES

16. OTHER INFORMATION

AUSTRALIA:
THIS PRODUCT CLASSIFIED AS A HAZARDOUS SUBSTANCE ACCORDING TO THE CRITERIA OF ASCC (BASED ON A RISK ASSESSMENT ACCORDING TO ASCC/NOHSC CRITERIA).

PREPARED BY: IP

REVISED: 12/06/2007

MSDS

MATERIAL SAFETY DATA SHEET

LAMOTTE
PO BOX 329
802 WASHINGTON AVENUE
CHESTERTOWN, MD 21620
USA

TELEPHONE NUMBER FOR INFORMATION: 410-778-3100

24 HOUR EMERGENCY NUMBER (CHEM-TEL):
USA, CANADA, PUERTO RICO: 800-255-3924
OUTSIDE NORTH AMERICAN CONTINENT: 813-248-0585 (CALL COLLECT)

1. PRODUCT IDENTIFICATION

PRODUCT CODE: 7166

PRODUCT DESCRIPTION: ALKALINE POTASSIUM IODIDE AZIDE

MANUFACTURED BY:
LAMOTTE COMPANY
802 WASHINGTON AVENUE
CHESTERTOWN, MD 21620

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS	NAME	CAS #	%	OSHA PEL	ACGIH TLV
YES	POTASSIUM HYDROXIDE	1310-58-3	60 - 70	C: 2 MG/CUBIC M	C: 2 MG/CUBIC M
YES	SODIUM AZIDE	26628-22-8	<1	NIOSH (REL): C: 0.1 PPM (SKIN) AS HN3	C: 0.3 PPM (SKIN) AS NaN3
YES	POTASSIUM IODIDE	7681-11-0	14	N/E	N/E
NO	WATER	7732-18-8	TO 100%		

3. HAZARDS OVERVIEW

PRIMARY ROUTE OF ENTRY: SKIN

POISON!

DANGER!

CORROSIVE. CAUSES SEVERE BURNS TO EYES AND SKIN. HARMFUL IF INHALED. MAY BE FATAL IF SWALLOWED. SODIUM AZIDE COMPONENT IS HIGHLY TOXIC.

HMS HAZARD:
HEALTH 3
FLAMMABILITY 0
REACTIVITY 2

SCALE:
4 = EXTREME

3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = LEAST

CARCINOGENICITY: NONE

OTHER HEALTH RELATED COMMENTS: SEE SECTION 11, TOXICITY

4. FIRST AID MEASURES

EYE CONTACT:
IMMEDIATELY FLUSH WITH WATER FOR 15 MINUTES. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
IMMEDIATELY FLUSH WITH WATER WHILE REMOVING AFFECTED CLOTHING AND RINSE SKIN THOROUGHLY FOR 15 MINUTES. CONSULT PHYSICIAN.

INGESTION:
DO NOT INDUCE VOMITING. RINSE OUT MOUTH, DRINK PLENTY OF WATER AND CALL A DOCTOR IMMEDIATELY.

INHALATION: REMOVE TO FRESH AIR.

5. FIRE FIGHTING MEASURES

FLASH POINT: N/A

LEL: N/A
UEL: N/A

FIRE RATING:

EXTINGUISHING MEDIA: NOT A FIRE HAZARD

SPECIAL FIRE FIGHTING PROCEDURES:
WEAR SELF CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO PREVENT INHALATION AND CONTACT WITH EYES.

HAZARDOUS COMBUSTION AND/OR DECOMPOSITION PRODUCTS: HYDROGEN GAS

UNUSUAL FIRE & EXPLOSION HAZARD:
VIOLENT EXOTHERMIC REACTION OCCURS WITH WATER. MAY PRODUCE ENOUGH HEAT TO IGNITE COMBUSTIBLES. CAN REACT WITH METALS TO PRODUCE HYDROGEN, FORMING EXPLOSIVE MIXTURE WITH AIR.

6. ACCIDENTAL RELEASE MEASURES

WEAR GLOVES AND EYE PROTECTION. NEUTRALIZE BY CAREFULLY AND SLOWLY ADDING DILUTE HYDROCHLORIC ACID (CONC. 6M OR LESS) TO pH 7 OR 8. COLLECT WASTE LIQUID. DISPOSE OF COLLECTED LIQUID AS HAZARDOUS WASTE AS DESCRIBED IN SECTION 13.

7. HANDLING & STORAGE

STORE IN COOL, VENTILATED AREA AWAY FROM STRONG ACIDS AND OTHER INCOMPATIBLE MATERIALS.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: USE WITH ADEQUATE VENTILATION.

PROTECTION WHEN HANDLING:
GLOVES
EYE PROTECTION
LAB COAT

WORK/HYGIENIC PRACTICES:

AVOID CONTACT WITH SKIN AND CLOTHING. USE NEOPRENE GLOVES, GOGGLES, FACE SHIELD, PROTECTIVE CLOTHING. NEUTRALIZATION OF WASTE QUANTITIES OF #7166 SHOULD BE DONE IN A FUME HOOD OR WITH GOOD VENTILATION. ADDITION OF STRONG ACID MAY GENERATE A SMALL AMOUNT OF HYDRAZOIC ACID FROM THE SODIUM AZIDE. (HYDRAZOIC ACID IS HARMFUL TO BREATHE).

9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE: COLORLESS CLEAR LIQUID

BOILING POINT: UNKNOWN

MELTING POINT: N/A

pH: 14

ODOR: NONE

VAPOR DENSITY: UNKNOWN

SOLUBILITY IN WATER: SOLUBLE

VAPOR PRESSURE: UNKNOWN

10. STABILITY & REACTIVITY

STABLE: YES

CONDITIONS TO AVOID: HEAT

MATERIALS TO AVOID:
FINELY POWDERED METALS AND METAL SALTS, STRONG ACIDS AND REDUCING AGENTS.

HAZARDOUS DECOMPOSITION PRODUCTS: HYDROGEN GAS, HYDRAZOIC ACID.

11. TOXICOLOGICAL INFORMATION

ORAL RAT LD50: 365 MG/KG FOR POTASSIUM HYDROXIDE
ORAL RAT LD50: 27 MG/KG FOR SODIUM AZIDE SOLID.

SODIUM AZIDE IS HIGHLY TOXIC BY INGESTION.

TARGET ORGANS:

SKIN
EYES
CORROSIVE TO ALL BODY PARTS

12. ECOLOGICAL INFORMATION

INFORMATION NOT AVAILABLE

13. DISPOSAL CONSIDERATIONS

SMALL AMOUNT <25 ML (OF #7166):
FLUSH NEUTRALIZED WASTE TO DRAIN WITH WATER.

LARGE AMOUNT:
SODIUM AZIDE CAN REACT WITH METALS SUCH AS COPPER PIPES TO FORM SHOCK OR FRICTION SENSITIVE METAL AZIDES (EXPLOSIVE). DISPOSE OF LARGER AMOUNTS AS HAZARDOUS WASTE NOT TO SEWERS AND DRAINS. FOLLOW FEDERAL, STATE AND LOCAL REGULATIONS.

14. TRANSPORT INFORMATION

DOMESTIC:

PROPER SHIPPING NAME:
CORROSIVE LIQUIDS, TOXIC, N.O.S. (POTASSIUM HYDROXIDE/SODIUM AZIDE SOLUTION)

UN HAZARD CLASS/DIV: 8, 6.1
UN: 2922
UN PACKING GROUP: II

INTERNATIONAL:

PROPER SHIPPING NAME:
CORROSIVE LIQUID, TOXIC, N.O.S. (POTASSIUM HYDROXIDE/SODIUM AZIDE SOLUTION)

UN HAZARD CLASS/DIV: 8, 6.1
UN: 2922
UN PACKING GROUP: II

15. REGULATORY INFORMATION

CHEMICAL INVENTORY STATUS:

INGREDIENT	USA TSCA	EUROPE EC	CANADA DSL	NDSL	AUSTRALIA	JAPAN
POTASSIUM HYDROXIDE (1310-58-3)	YES	YES	YES	NO	YES	YES
SODIUM AZIDE (26628-22-8)	YES	YES	YES	NO	YES	YES
POTASSIUM IODIDE (7681-11-0)	YES	YES	YES	NO	YES	YES

WATER

FEDERAL, STATE, & INTERNATIONAL REGULATIONS:

INGREDIENT	SARA 302 RQ	302 TPQ	SARA 313 LISTED	CHEMICAL CATEGORY	CERCLA	RCRA 261.33	TSCA 8(D)
POTASSIUM HYDROXIDE (1310-58-3)	NO	NO	NO	NO	1000	NO	NO
SODIUM AZIDE (26628-22-8)	1000	500	YES	NO	1000	P105	NO
POTASSIUM IODIDE (7681-11-0)	NO	NO	NO	NO	NO	NO	NO

INGREDIENT	SARA 311/312 HAZARD CATEGORIES	AUSTRALIA HAZCHEM CODE	POTSON SCHEDULE	THIS MSDS IS WHMIS COMPLIANT
POTASSIUM HYDROXIDE (1310-58-3)	ACUTE: YES CHRONIC: YES FIRE: NO PRESSURE: NO REACTIVITY: YES (PURE/SOLID)	2R	S6	
SODIUM AZIDE (26628-22-8)	ACUTE: YES CHRONIC: NO FIRE: YES PRESSURE: NO REACTIVITY: YES (PURE/SOLID)	2X	NONE ALLOCATED	
POTASSIUM IODIDE (7681-11-0)	ACUTE: YES CHRONIC: YES FIRE: NO PRESSURE: NO REACTIVITY: NO (PURE/SOLID)	NONE ALLOCATED	NONE ALLOCATED	
FOR REAGENT #7166 LIQUID MIXTURE, TAKEN AS A WHOLE	ACUTE: YES CHRONIC: YES FIRE: NO PRESSURE: NO REACTIVITY: YES	2R	S6	YES

16. OTHER INFORMATION

AUSTRALIA:
THIS PRODUCT IS CLASSIFIED AS A HAZARDOUS SUBSTANCE ACCORDING TO THE CRITERIA OF ASCC (BASED UPON A RISK ASSESSMENT ACCORDING TO ASCC/NOHSC CRITERIA).

PREPARED BY: IP

REVISED: 12/06/2007